



# ROHM GROUP Short Form Catalog



The short form catalogues of the ROHM group were unified and became one book!



[ Viewing the catalog ]

- **New** indicates new product.
- ☆ indicates product under development.

[ Classification by the color ]

- ROHM  Display with this color
- LAPIS Semiconductor  The text displays LAPIS Semiconductor Product
- Kionix  The text displays Kionix, Inc. Product

Company group

**ROHM GROUP**  
**LAPIS SEMICONDUCTOR** LAPIS Semiconductor Co., Ltd. <http://www.lapis-semi.com/en/>

LAPIS Semiconductor excels in a number of technologies, including wireless communication, low power consumption, digital-analog mixed signals, low power microcontrollers and memory design, and provides logic LSIs, memory LSIs, display driver LSIs, and foundry services.

**Products** LAPIS Semiconductor is the leading supplier for the Personal & Mobile Applications.

- **Low Power Microcontrollers**  
Remarkably low power consumption contributes to significant energy savings.
- **Wireless Communications LSIs**  
Greater comfort and convenience through wireless technology
- **Display Drivers**  
Extensive lineup from TVs to cars
- **Memory LSIs**  
Reliable, stable, long-term supply

<p><b>Summary</b></p> <ul style="list-style-type: none"> <li>■ Company Name LAPIS Semiconductor Co., Ltd.</li> <li>■ Address 2-4-8 Shinyokohama, Kouhoku-ku, Yokohama 222-8575 Japan TEL : +81-45-476-9212</li> <li>■ Establishment 1-Oct-08</li> <li>■ President Noriaki Okada</li> <li>■ Business Field Logic LSIs, Memory LSIs, Display driver LSIs, Foundry</li> </ul>	<p><b>Company History</b></p> <ul style="list-style-type: none"> <li>1961 Operations begun at OKI Electric device Production of transistors</li> <li>1967 Production of ICs</li> <li>1977 Production of microprocessors</li> <li>1981 Operations begun at Miyazaki OKI Electric (LAPIS Semiconductor Miyazaki Co., Ltd.)</li> <li>1988 Operations begun at Miyagi OKI Electric (LAPIS Semiconductor Miyagi Co., Ltd.)</li> <li>2008 Affiliated with ROHM Co., Ltd. and establish OKI Semiconductor Co., Ltd.</li> <li>2011 The company name changed to LAPIS Semiconductor Co., Ltd.</li> </ul>
--	---

**Kionix, Inc.** <http://www.kionix.com/>

Kionix, Inc. is a global MEMS inertial sensor manufacturer. Kionix offers high-performance, low-power accelerometers, gyroscopes, and 6-axis combination sensors plus comprehensive software libraries that support a full range of sensor combinations, operating systems and hardware platforms.






































**Products** Incorporates MEMS technology in order to provide market-leading sensors.

- **Accelerometers**  
Offer Industry-Leading Stability and Performance.
- **6-Axis Combo Parts**  
Offer unparalleled performance.
- **Gyroscopes**  
Designed to strike a balance between current consumption and noise performance with excellent bias stability over temperature.

<p><b>Summary</b></p> <ul style="list-style-type: none"> <li>■ Company Name Kionix, Inc.</li> <li>■ Address Ithaca, NY, USA. URL <a href="http://www.kionix.com/">http://www.kionix.com/</a></li> <li>■ Establishment 1993</li> <li>■ President President and Chief Executive Officer Nader Sadrzadeh</li> <li>■ Business Field MEMS Accelerometers, Gyroscopes, 6-Axis Combo Parts</li> </ul>	<p><b>Company History</b></p> <ul style="list-style-type: none"> <li>1993 Operations begun at Kionix, Inc.</li> <li>2009 Affiliated with ROHM Co., Ltd.</li> </ul>
--	--

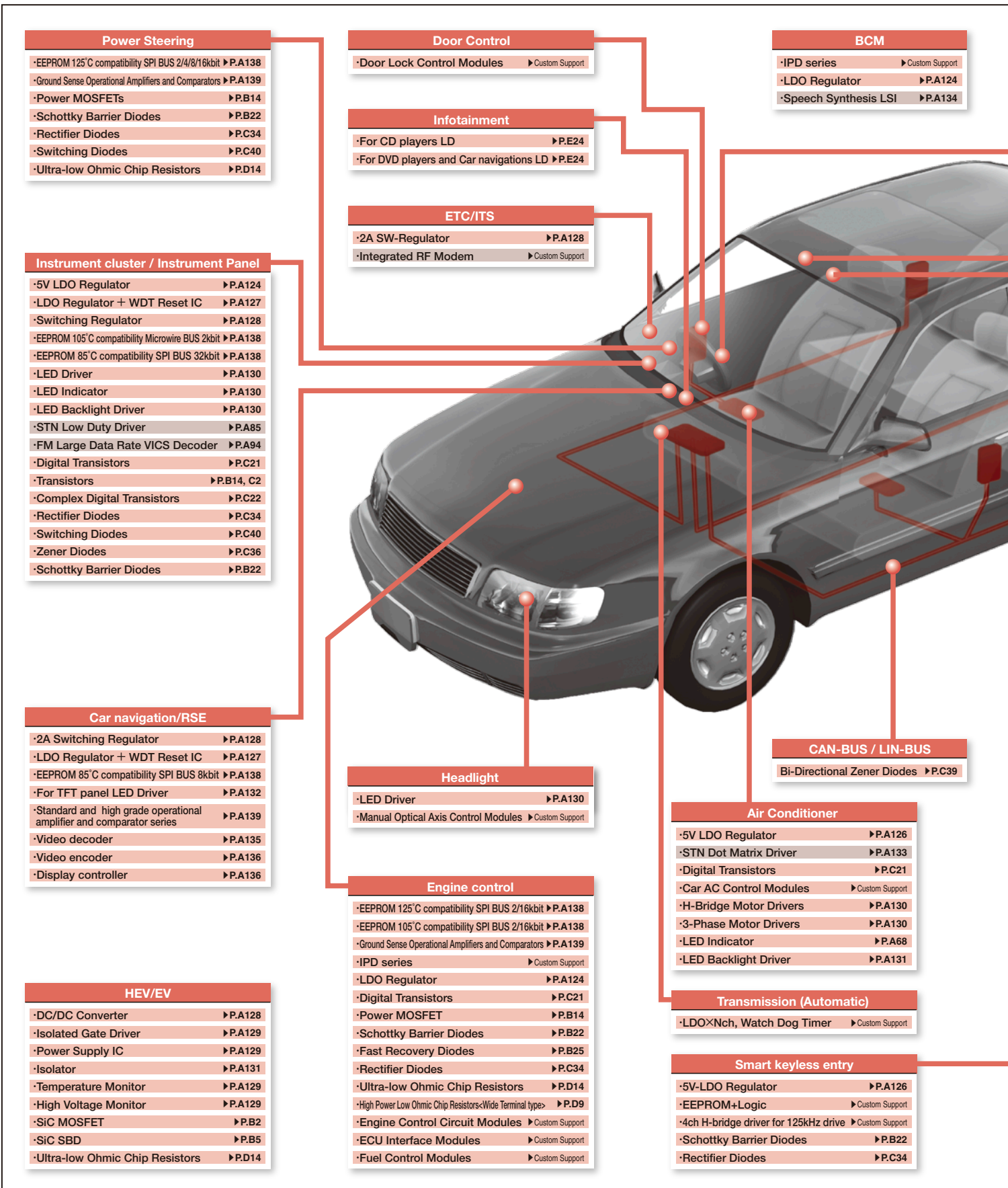


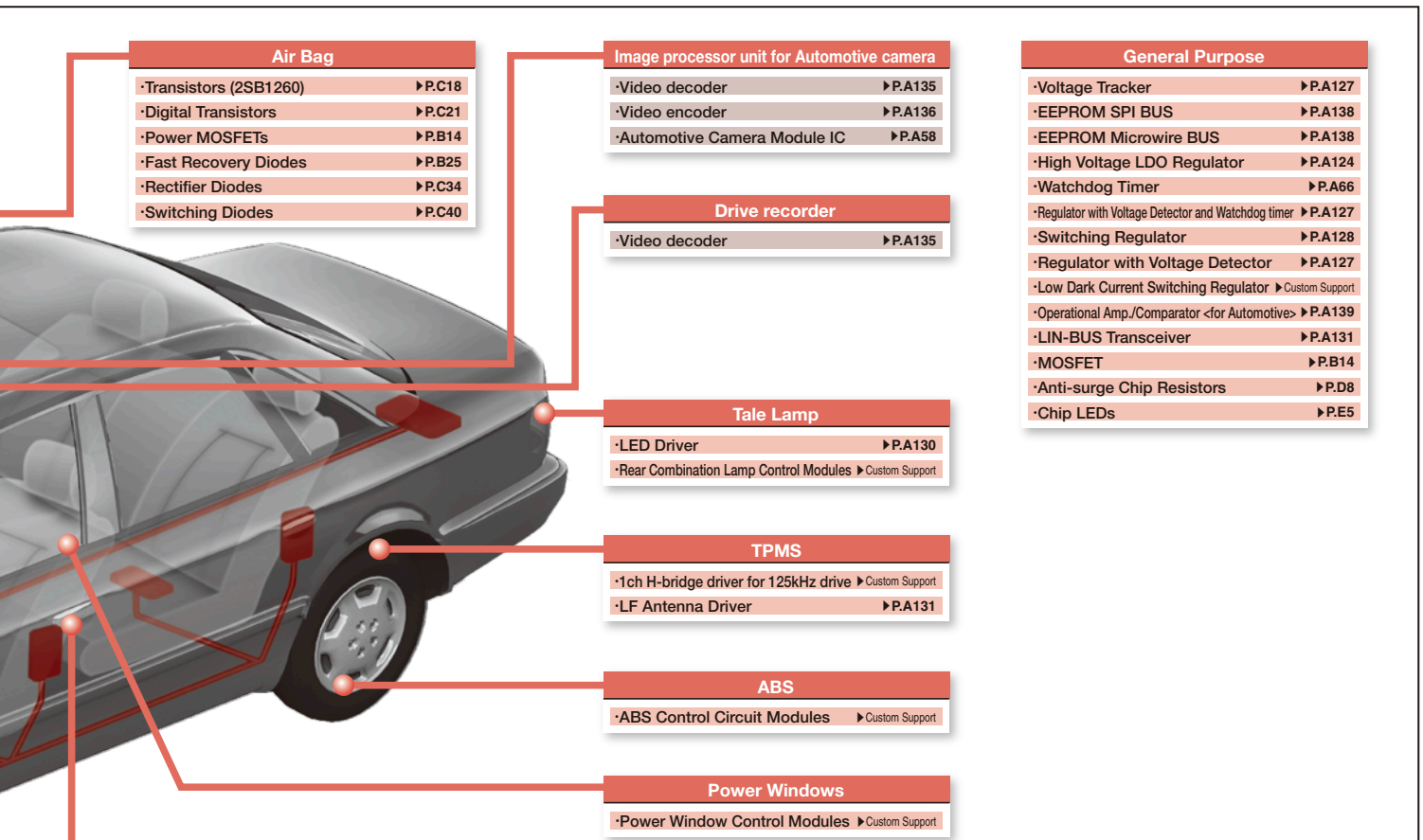
# INDEX

<b>ICs</b>	 <b>Memory</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Amplifiers &amp; Linear</b>	<b>A</b>
	 <b>Clocks &amp; Timers</b>	<b>A</b>
	 <b>Switch &amp; Multiplexer &amp; Logic</b>	<b>A</b>
	 <b>Data Converter</b>	<b>A</b>
	 <b>Interface</b>	<b>A</b>
	 <b>Power Management</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Motor / Actuator Drivers</b>	<b>A</b>
	 <b>LED Drivers</b>	<b>A</b>
	 <b>Display Drivers</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Sensors &amp; MEMS</b> <small>Includes LAPIS Semiconductor products Includes Kionix products</small>	<b>A</b>
	 <b>Communication LSI</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Audio &amp; Video</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Speech Synthesis LSI</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Microcontroller</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
	 <b>Automotive</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>
 <b>IC Packages</b> <small>Includes LAPIS Semiconductor products</small>	<b>A</b>	
<b>Power Devices</b>	 <b>SiC Power Devices</b>	<b>B</b>
	 <b>IGBT</b>	<b>B</b>
	 <b>Intelligent Power Module</b>	<b>B</b>
	 <b>Power Transistors</b>	<b>B</b>
	 <b>Power Diodes</b>	<b>B</b>
	 <b>High Power Chip Resistors</b>	<b>B</b>
<b>Small Signal Devices</b>	 <b>Transistors</b>	<b>C</b>
	 <b>Diodes</b>	<b>C</b>
<b>Passive Devices</b>	 <b>Resistors</b>	<b>D</b>
	 <b>Tantalum Capacitors</b>	<b>D</b>
<b>Opto Devices</b>	 <b>LEDs</b>	<b>E</b>
	 <b>LED Displays</b>	<b>E</b>
	 <b>Laser Diodes</b>	<b>E</b>
	 <b>Optical Sensors</b>	<b>E</b>
	 <b>IrDA Infrared Communication Modules</b>	<b>E</b>
	 <b>Remote Control Receiver Modules</b>	<b>E</b>
<b>Modules</b>	 <b>Power Supply Modules</b>	<b>F</b>
	 <b>Wireless Modules</b> <small>Includes LAPIS Semiconductor products</small>	<b>F</b>
	 <b>Contact Image Sensor Heads</b>	<b>F</b>
	 <b>Thermal Printheads</b>	<b>F</b>
<b>Part No. List</b>		<b>G</b>

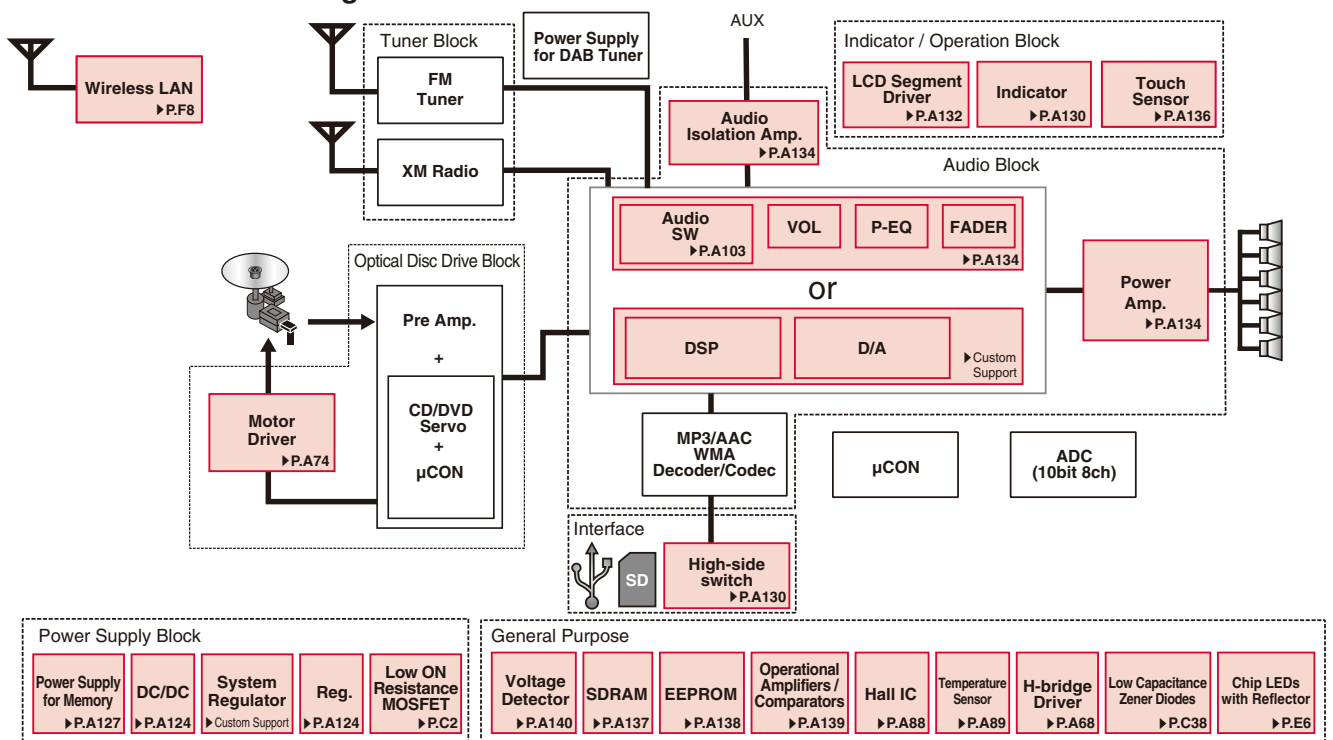


## Automotive Block Diagram



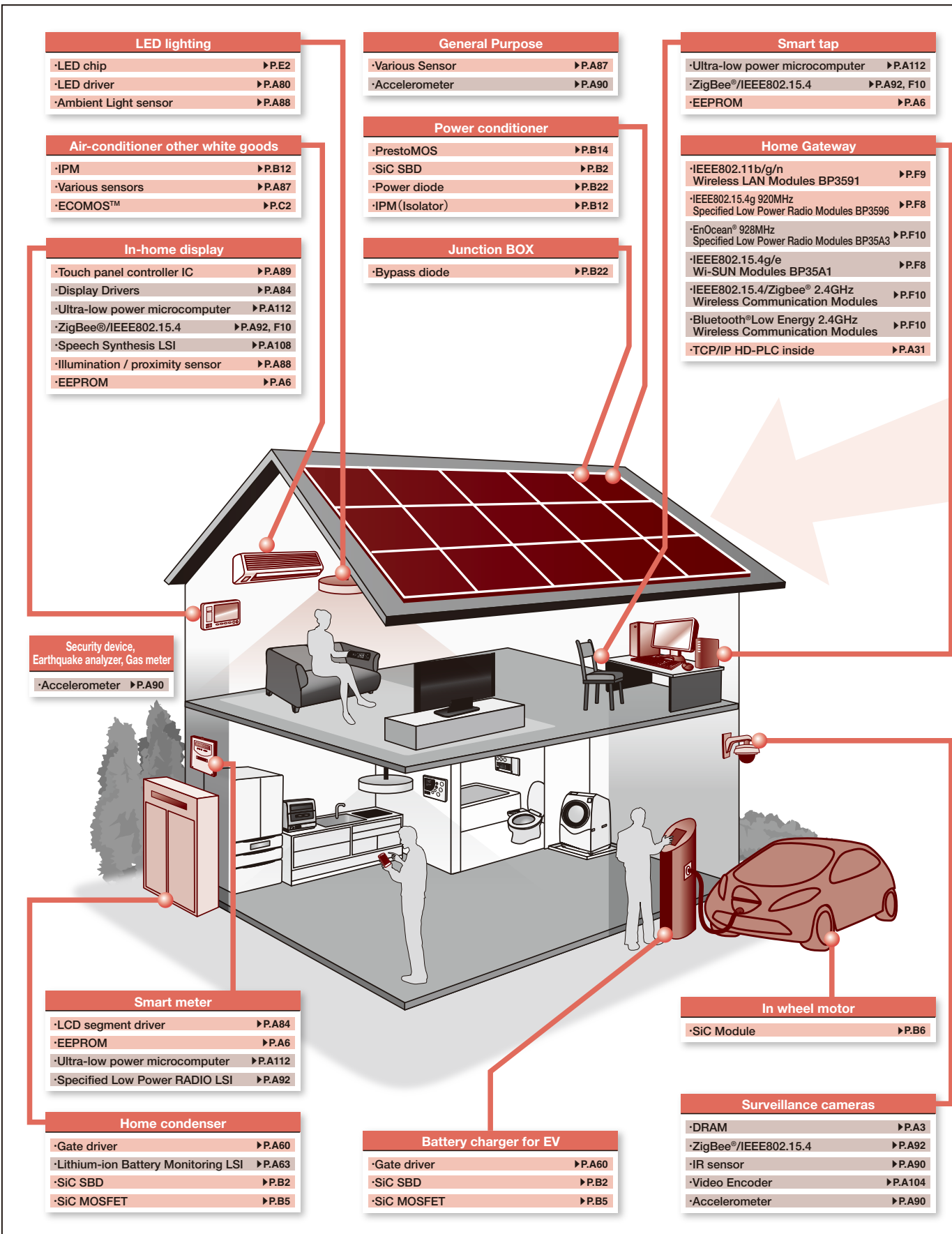


## ●Car Audio Block Diagram

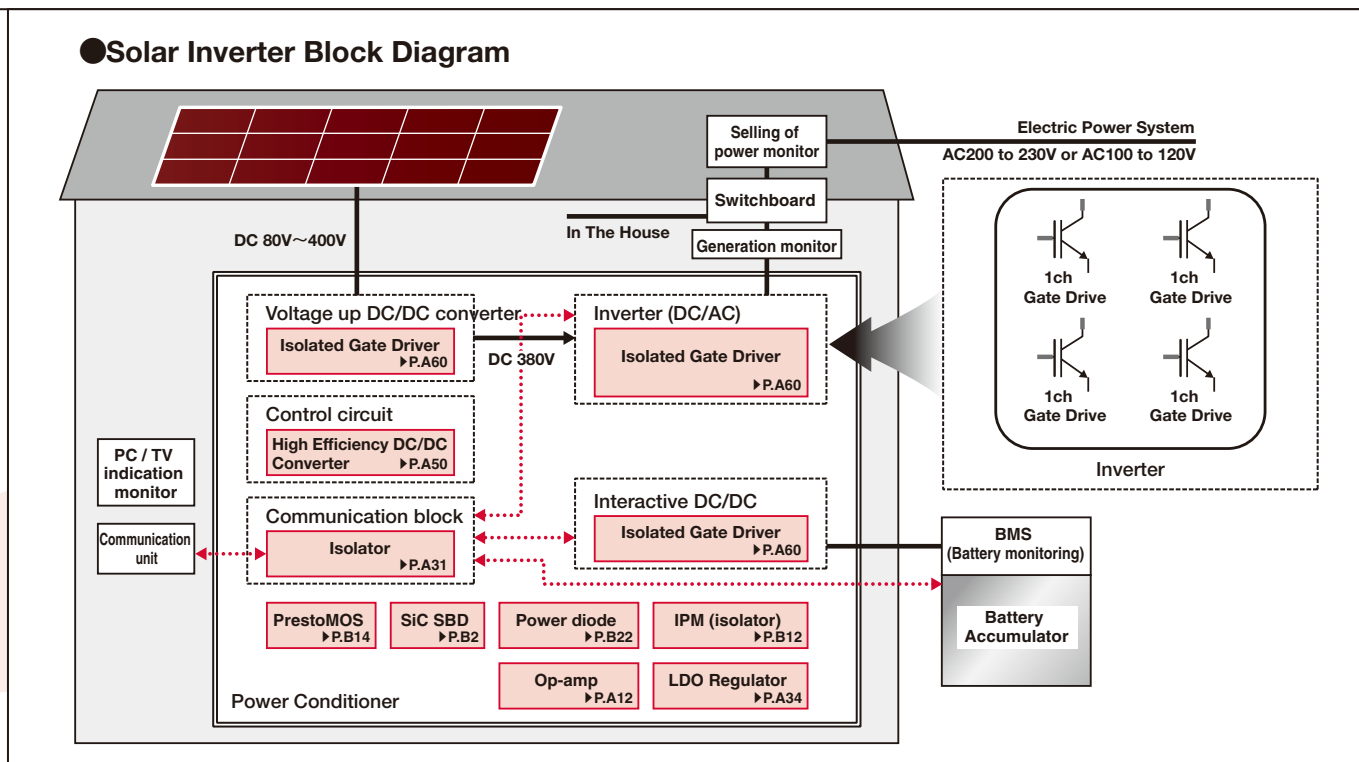




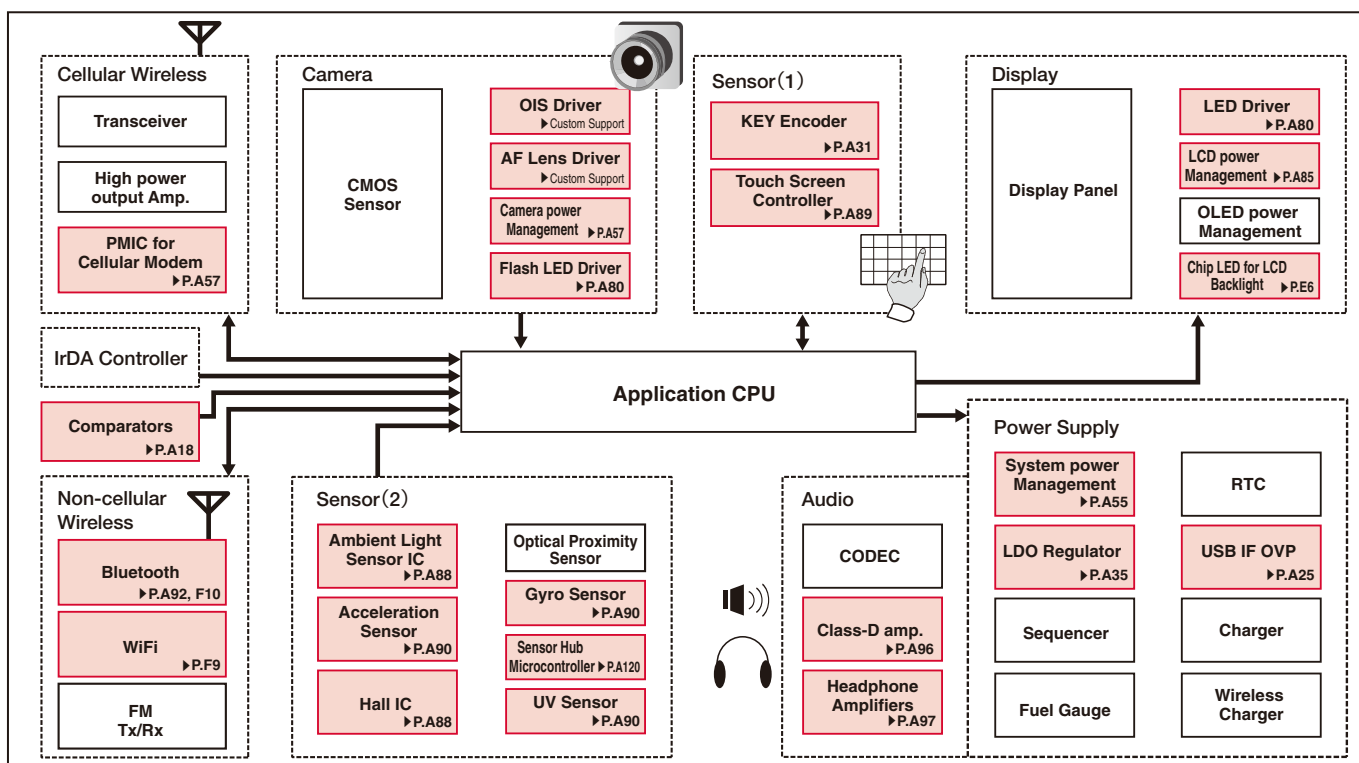
## HEMS (Smart House) Block Diagram

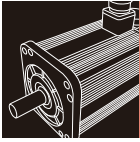


## ●Solar Inverter Block Diagram

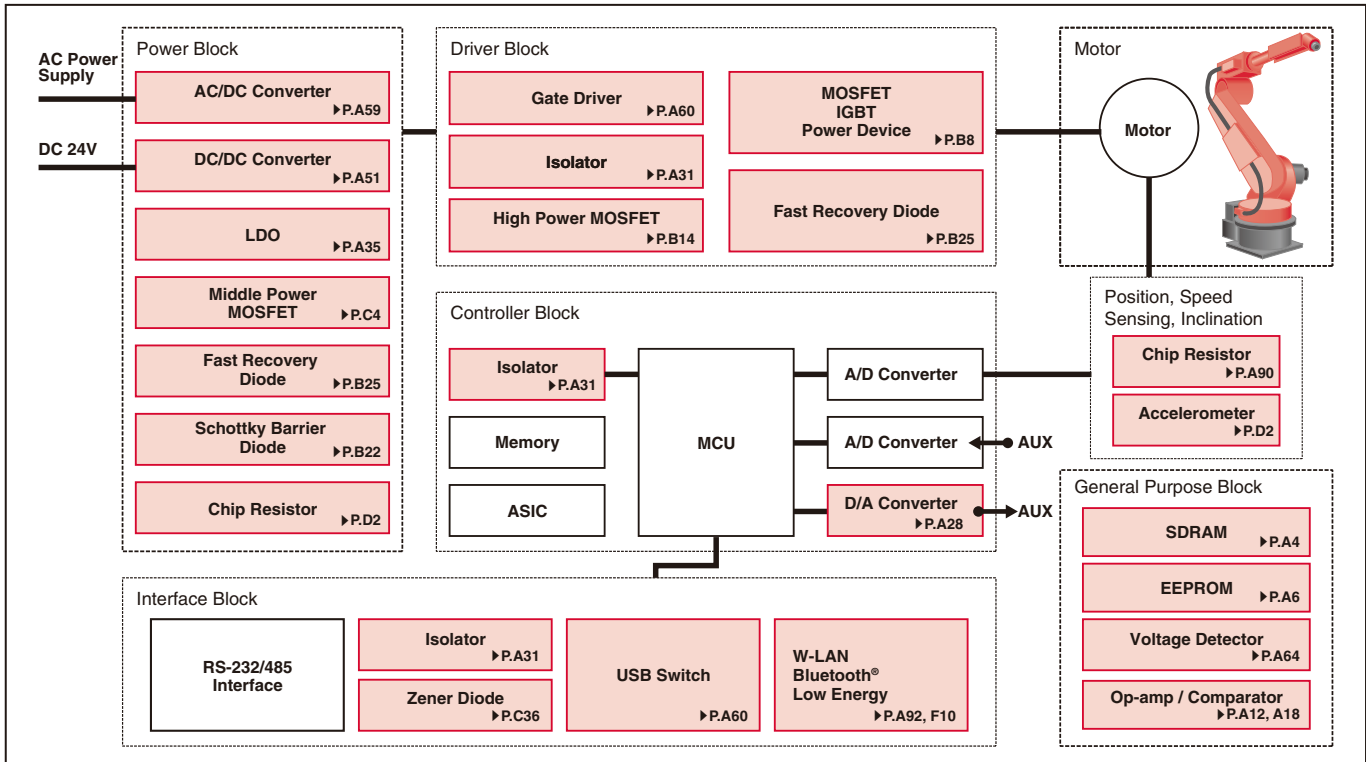


## Smartphone / Tablet / Wearable PCs Block Diagram

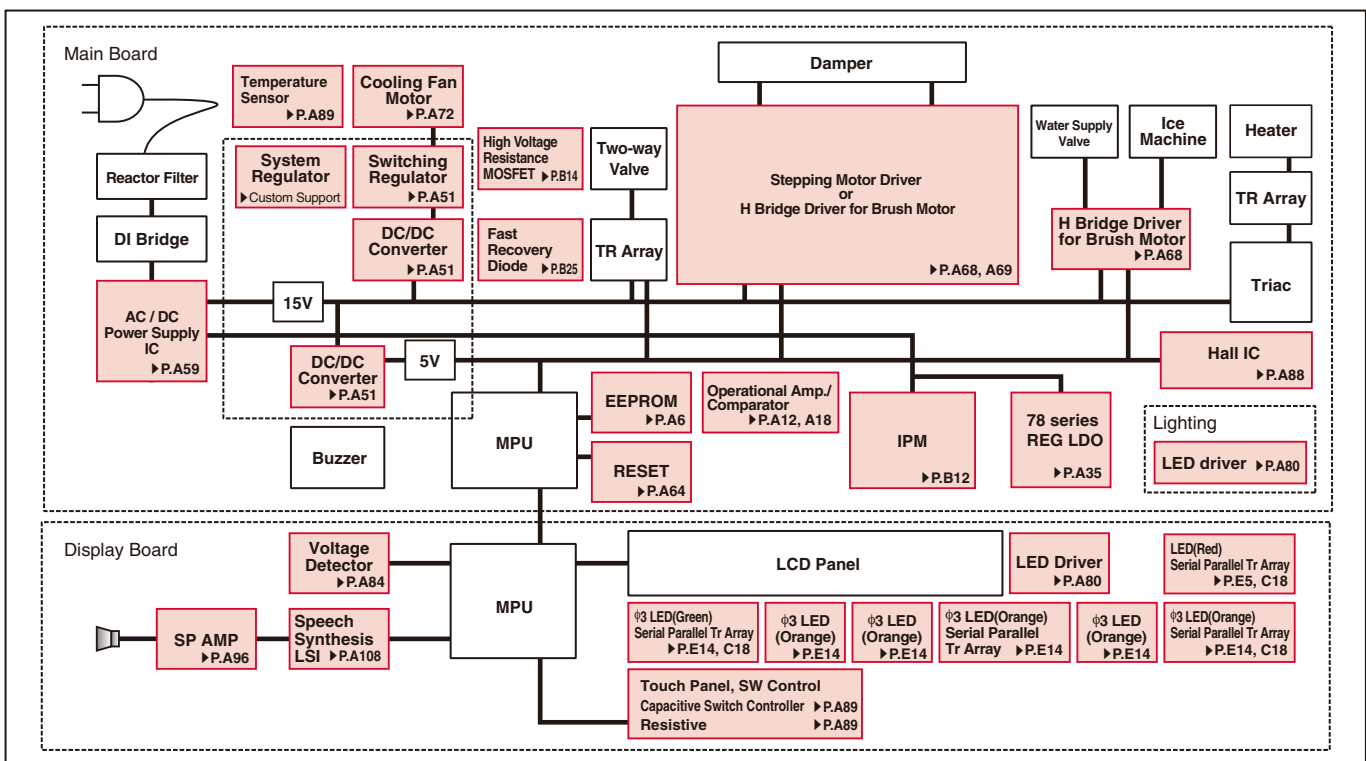




## For Motion Control FA Inverte / AC Servo Block Diagram



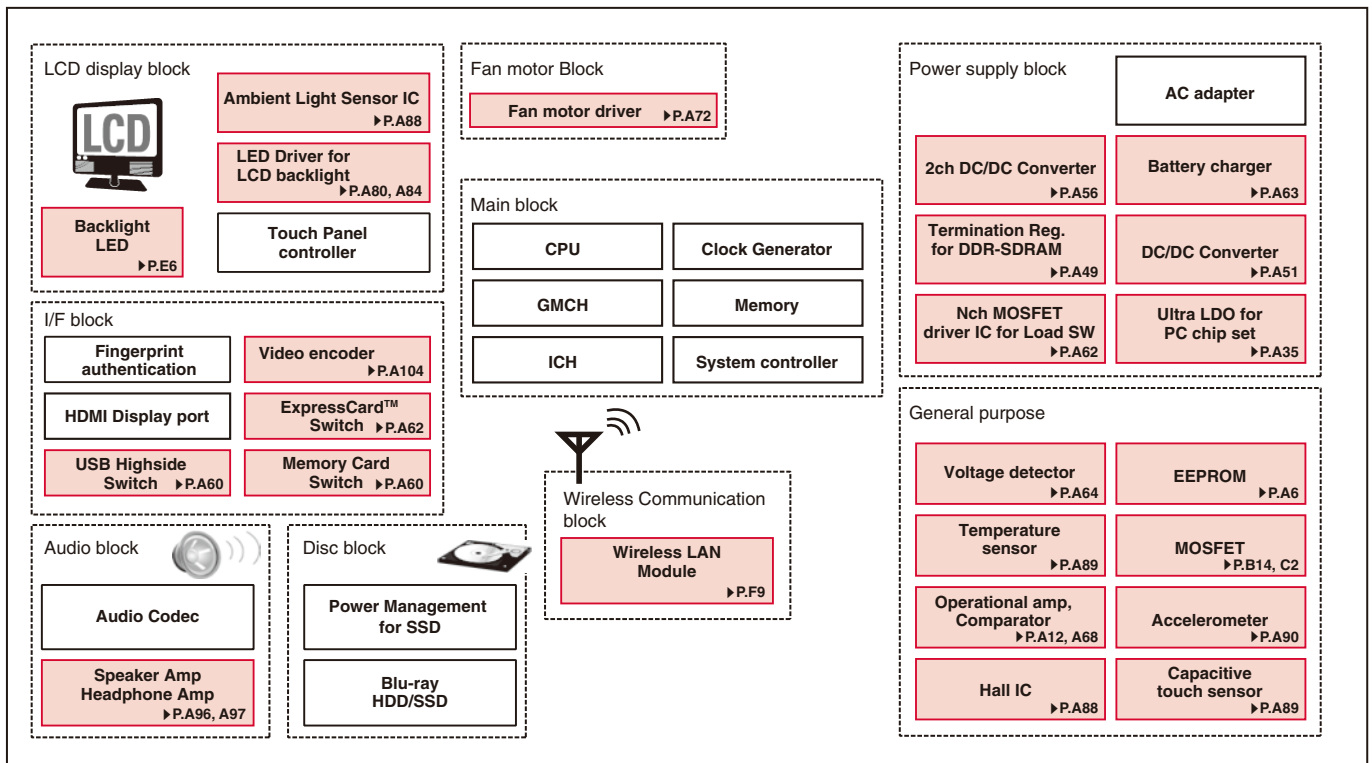
## Refrigerator Block Diagram



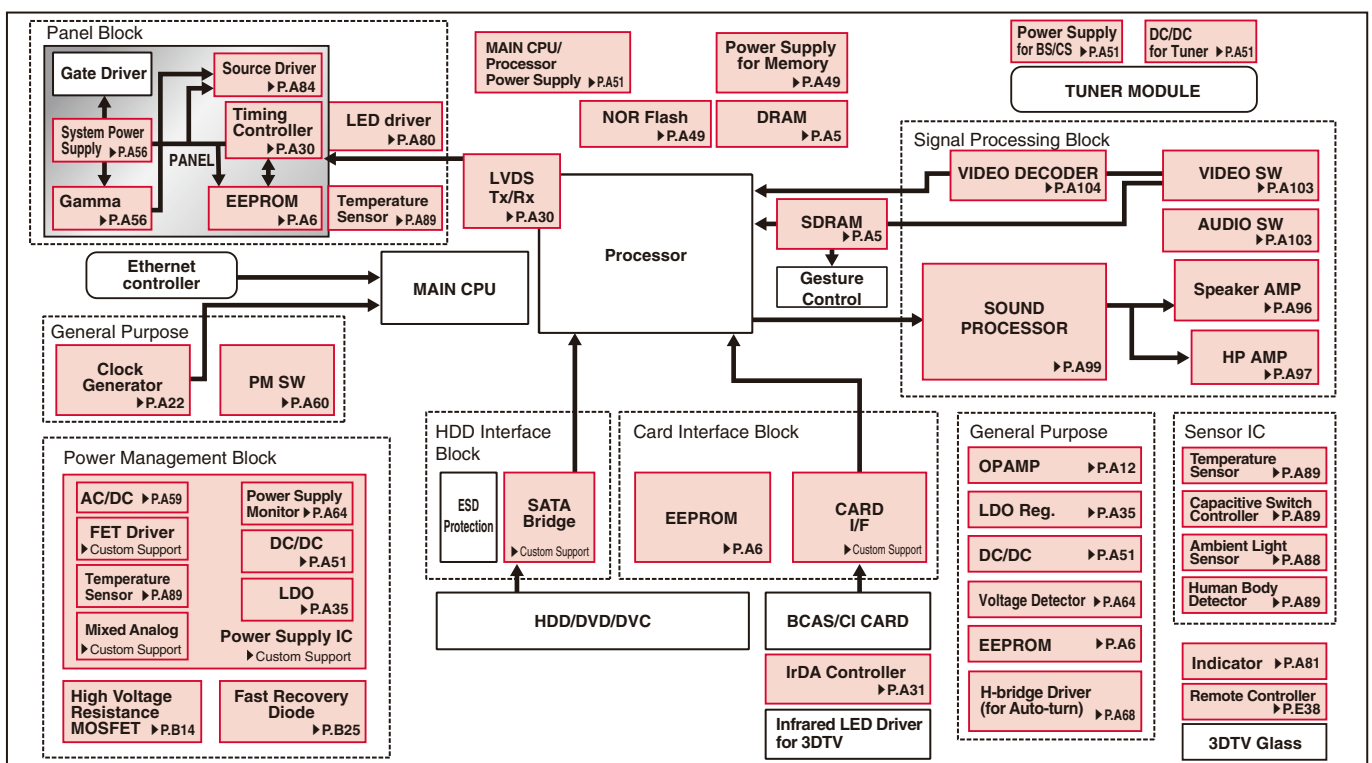




## Laptop PC Block Diagram



## TV Block Diagram



## ICs

### Memory

<b>DRAM</b>	<b>A3</b>
Legacy DRAM FP/EDO	A3
Legacy DRAM SDRAM	A4
SDRAM for SIP	A4
Video Memory	A5
<b>Serial EEPROM</b>	<b>A6</b>
Standard EEPROM	A6
Automotive EEPROM	A8
<b>FeRAM</b>	<b>A9</b>
Ferroelectric Memory	A9
<b>NOR Flash</b>	<b>A9</b>
Parallel NOR Flash	A9
<b>P2ROM™</b>	<b>A9</b>
Parallel BUS Standard P2ROM™	A9
Parallel BUS Page mode P2ROM™	A10
SPI BUS P2ROM™	A10

### IC Amplifiers & Linear

<b>Operational Amplifiers</b>	<b>A12</b>
Standard	A12
High Speed	A13
Low Power Consumption	A15
Low Noise	A17
Low Offset Voltage	A18
<b>Comparators</b>	<b>A18</b>
Standard	A18
High Speed	A19
Low Power Consumption	A19
Low Offset Voltage	A19
<b>Transistor Arrays</b>	<b>A20</b>
Darlington Transistor Arrays	A20

### IC Clocks & Timers

<b>High-performance Clock Generators ICs</b>	<b>A22</b>
Clock Generators for Digital Cameras	A22
DVD-Audio Reference Clock Generators	A22
DVD-Video Reference Clock Generators for A/V Equipments	A22
Clock Generator with Built-in VCXO for A/V Equipments	A22
<b>Real Time Clocks ICs</b>	<b>A22</b>
Real Time Clocks with High-precision Oscillation Adjustment	A22

### IC Switch & Multiplexer & Logic

<b>Standard Logic</b>	<b>A24</b>
Analog Switch / Analog Switch (Single type)	A24
Multiplexer	A24
Logic Gates	A24
Logic Gates (Single type)	A24
Function Logic	A24
<b>Serial-in / Parallel-out Drivers</b>	<b>A25</b>
Serial / Parallel 2-input Drivers	A25
Serial / Parallel 4-input Drivers	A25
<b>USB Switch ICs</b>	<b>A25</b>
SP Type (Single Pole)	A25
DP Type (Double Pole)	A25
Built-in OVP Micro USB Switch with USB2.0, MHL™ and Audio	A25

### IC Data Converter

<b>A/D Converter</b>	<b>A28</b>
10bit	A28
<b>D/A Converters</b>	<b>A28</b>
8bit	A28
10bit	A28

### IC Interface

<b>LVDS Interface ICs</b>	<b>A30</b>
<b>Sub-LVDS Interface ICs</b>	<b>A30</b>
<b>Timing Controllers</b>	<b>A30</b>
<b>GPIO</b>	<b>A31</b>
Keyencoder	A31
IO Expander	A31
<b>IrDA Controllers</b>	<b>A31</b>
<b>Car Access</b>	<b>A31</b>
Antenna Drivers	A31
<b>Isolators</b>	<b>A31</b>
2.5kVrms Isolators	A31
<b>Transceiver</b>	<b>A31</b>
LIN Transceiver	A31
<b>HD-PLC</b>	<b>A31</b>
HD-PLC Inside Compliant Baseband IC	A31

### IC Power Management

<b>Linear Regulators</b>	<b>A34</b>
78 Series Regulators	A35
Single-Output LDO Regulators	A35
LDO Regulators with Voltage Detector and Watchdog Timer	A48
LDO Regulators with Voltage Detector	A48
Voltage Tracker	A48
Multi-Output LDO Regulators	A49
Linear Regulators for DDR SDRAM	A49
<b>Switching Regulators</b>	<b>A50</b>
Integrated MOSFET Switching Regulators	A51
External Switch Switching Regulators	A53
For Automotive Switching Regulators	A54
<b>Switching Regulators(Power Management ICs for System)</b>	<b>A55</b>
Power Management ICs for LCD Panels	A56
Programmable Gamma-Voltage Generator/Gamma Buffer Amp.	A56
Power Management ICs for Mobile Phones	A57
Power Management ICs for DSC/DVCs	A57
Power Management ICs for Automotive Camera Modules	A58
<b>Isolated / No Isolated Power Supply</b>	<b>A59</b>
AC/DC Converter ICs	A59
DC/DC Controller	A59
<b>Gate Drivers</b>	<b>A60</b>
Isolated Gate Drivers	A60
Others	A60
IGBT/MOSFET Low-side Gate Drivers	A60
<b>High Voltage Monitor</b>	<b>A60</b>
Isolated High Voltage Monitor	A60
<b>Temperature Monitor</b>	<b>A60</b>
Isolated Temperature Monitor	A60
<b>Earth Leakage Detector ICs</b>	<b>A60</b>
Earth Leakage Detector ICs	A60



## ICs

<b>Power Management Switch</b>	<b>A60</b>
1 Channel Compact High Side Switch ICs	A60
1 Channel High Side Switch ICs	A61
2 Channel High Side Switch ICs	A62
Load Switch ICs	A62
1 Channel Compact High Side Load Switch ICs	A62
Controller IC for High Side NMOSFET	A62
Power Switch ICs for ExpressCard™	A62
<b>Battery Management</b>	<b>A63</b>
Solar Charge Management IC	A63
Charge Protection ICs	A63
Li-ion Battery Monitoring LSI	A63
<b>Voltage Detectors (Reset ICs)</b>	<b>A64</b>
Standard Voltage Detectors	A64
Voltage Detectors with Adjustable Delay Time	A65
Others	A66
Voltage Detectors with Fixed Delay Time	A66
Voltage Detectors with Watchdog Timer	A66

## IC Motor / Actuator Drivers

<b>DC Brush Motor Drivers</b>	<b>A68</b>
7V Max. H-Bridge Drivers BD621xseries	A68
18V Max. H-Bridge Drivers BD622xseries	A68
36V Max. H-Bridge Drivers BD623xseries	A68
50V Max. H-Bridge Driver	A68
H-Bridge Drivers High-Current Series	A68
36V Max. H-Bridge Drivers Current limit series	A68
H-Bridge Drivers High-Speed Series	A68
Reversible Motor Drivers with Speed Control	A68
1.0A Reversible Motor Drivers (Single Motor)	A68
2.0A or More Reversible Motor Drivers (Single Motor)	A68
1.0A or More Reversible Motor Drivers (2 Motors)	A69
<b>Stepper Motor Drivers</b>	<b>A69</b>
High Performance, High Reliability 36V Stepper Motor Drivers	A69
Standard 36V Stepper Motor Drivers	A70
Microstep 36V Stepper Motor Drivers	A70
Low Voltage Stepper Motor Drivers	A70
45V Stepper Motor Drivers	A70
<b>3-Phase Brushless Motor Drivers</b>	<b>A71</b>
3-Phase Brushless Motor Pre-Drivers with Speed Control	A71
3-Phase Brushless Motor Driver with Speed Control	A71
3-Phase Brushless Motor Pre-Drivers	A71
3-Phase Brushless Motor Pre-Driver (for Automotive)	A71
3-Phase Brushless Motor Drivers	A71
<b>Fan Motor Drivers</b>	<b>A72</b>
5V Single-Phase Full-wave Fan Motor Drivers	A72
Standard Single-Phase Full-wave Fan Motor Drivers	A72
Multifunction Single-Phase Full-wave Fan Motor Drivers	A73
2-Phase Half-wave Fan Motor Drivers	A73
3-Phase Full-wave Fan Motor Drivers	A73
3-Phase Brushless Fan Motor Drivers	A74
3-Phase Brushless Fan Motor Controllers	A74
<b>Driver for ODD</b>	<b>A74</b>
1ch System Motor Driver ICs	A74
2ch to 3ch System Motor Driver IC	A74
4ch System Motor Driver ICs	A74
5ch System Motor Driver ICs	A74
6ch to 9ch System Motor Driver ICs	A74
System Motor Driver ICs for Half Height Drives (3 sensors)	A75
System Motor Driver ICs for Half Height Drives (Sensorless)	A75
System Motor Driver ICs for Slim Drives (3 sensors)	A75

<b>Driver for Printer</b>	<b>A75</b>
3-Phase Brushless Motor Driver for Polygonal Mirrors	A75
Motor Drivers with Brush for Printers	A75
Bipolar Stepper Motor Drivers for Paper Feed / Carriage	A75
3-Phase Brushless Motor Pre-Drivers for Paper Feed	A75
System Drivers for Inkjet Printers	A75
<b>Driver for Digital Still Camera</b>	<b>A76</b>
5ch System Lens Drivers for Digital Cameras	A76
6ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex)	A76
7ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex)	A76
1ch to 2ch Lens Drivers for SLRs (Single Lens Reflex)	A76
Microstep system Lens Drivers for Digital Cameras	A77
<b>Mobile Phone Module Driver</b>	<b>A78</b>
Parallel Interface Lens Driver for Voice Coil Motors	A78
2-wire Serial (I <sup>2</sup> C-compatible) Interface Lens Drivers for Voice Coil Motors	A78
Parallel Interface Lens Driver for Stepping Motors	A78
2-wire Serial (I <sup>2</sup> C-compatible) Interface Lens Driver for Piezo Actuators	A78
Bi-directional VCM Drivers	A78

## IC LED Drivers

<b>LED Drivers</b>	<b>A80</b>
Boost Converter LED Drivers	A80
Buck Converter LED Drivers	A80
Buck-Boost LED Drivers	A80
LED Drivers for Lighting	A81
Inductorless (Charge Pump) LED Drivers	A81
Constant Current / Serial-in Parallel-out LED Drivers	A81
LED Driver Support Function	A81

## IC Display Drivers

<b>TFT Driver Series</b>	<b>A84</b>
Drivers for Large LCD Panels	A84
Drivers for small to medium LCD Panels	A84
<b>TN/STN LCD Driver Series</b>	<b>A84</b>
LCD Segment Drivers	A84
Common/Segment driver for dot matrix LCD	A85
Controller driver for graphic LCD	A85
Controller driver for character LCD	A85
Controller driver for low duty LCD	A85
<b>VFD Driver Series</b>	<b>A86</b>
Anode/ Grid driver for VFD	A86
Controller driver for character VFD	A86
Controller driver for low duty VFD	A86
<b>Car Clock Drivers</b>	<b>A86</b>

## IC Sensors & MEMS

<b>Hall ICs</b>	<b>A88</b>
Omnipolar Detection Hall ICs	A88
Unipolar Detection Hall ICs	A88
Omnipolar Detection Hall ICs with Polarity Discrimination (Polarity detection for both S and N features dual outputs)	A88
Bipolar Latch Hall ICs	A88
<b>Ambient Light Sensor</b>	<b>A88</b>
Analog Current Output Type Ambient Light Sensor ICs	A88
Digital 16bit Serial Output Type Ambient Light Sensor ICs	A88
<b>Color Sensor</b>	<b>A89</b>
Digital 16bit Serial Output Type Color Sensor IC	A89
<b>Pressure Sensor IC</b>	<b>A89</b>
Digital Pressure sensor IC with built-in temperature compensation function	A89

### **IC Sensors & MEMS** *Continue from the previous page*

<b>Temperature Sensor</b> .....	<b>A89</b>
Analog Output Temperature Sensor IC .....	A89
Low Power Thermostat Output Temperature Sensor ICs .....	A89
<b>Amplifier for Human Body Detector</b> .....	<b>A89</b>
Pyroelectric Infrared Sensor Amplifier .....	A89
<b>Capacitive Switch Controller</b> .....	<b>A89</b>
Capacitive Switch Controller ICs .....	A89
<b>Touch Screen Controller</b> .....	<b>A89</b>
Resistive type .....	A89
Touch Screen I/F LSI supporting SPI/I <sup>2</sup> C .....	A89
<b>Accelerometer</b> .....	<b>A90</b>
3-Axis Accelerometer .....	A90
<b>6-Axis Combo Sensor</b> .....	<b>A90</b>
6-Axis Accelerometer/Magnetometer .....	A90
<b>Infrared Image Sensor</b> .....	<b>A90</b>
Infrared (IR) sensor .....	A90
<b>Ultraviolet Sensor</b> .....	<b>A90</b>
Ultraviolet (UV) sensor .....	A90

### **IC Communication LSI**

<b>Digital terrestrial broadcasting reception LSI</b> .....	<b>A92</b>
Japanese System (ISDB-T) .....	A92
Chinese System (DTMB) .....	A92
<b>Wireless communication LSI</b> .....	<b>A92</b>
IEEE802.15.4/ZigBee® LSI .....	A92
Bluetooth® Low Energy LSI .....	A92
Specified low power radio(Sub-GHz band radio) .....	A92
<b>Wireless Modules</b> .....	<b>F8</b>
Specified Low Power Radio Modules .....	F8
Wireless LAN Modules .....	F9
Wireless Communication Modules .....	F10
Bluetooth® Low Energy .....	F10
IEEE802.15.4 / ZigBee® .....	F10
EnOcean® Communication Modules .....	F10
<b>VoIP LSI</b> .....	<b>A93</b>
VoIP CODEC .....	A93
VoIP Processor .....	A93
<b>Echo Cancellor LSI</b> .....	<b>A93</b>
Echo Cancellor .....	A93
Echo Cancellor / Noise Cancellor .....	A93
<b>CODEC LSI</b> .....	<b>A93</b>
PCM CODEC .....	A93
ADPCM CODEC .....	A94
<b>Modem LSI</b> .....	<b>A94</b>
Tele-control IC .....	A94
<b>PHS LSI</b> .....	<b>A94</b>
Baseband IC for PHS .....	A94
PHS modem transcoder .....	A94
<b>Car communication LSI</b> .....	<b>A94</b>
FM data broadcast reception LSI .....	A94

### **IC Audio & Video**

<b>Audio Amplifiers</b> .....	<b>A96</b>
Speaker Amplifiers .....	A96
Headphone Amplifiers .....	A97
Others .....	A98
Audio Subsystems .....	A98
Line Amplifiers .....	A98
Isolation Amplifiers .....	A98
<b>Audio Processors</b> .....	<b>A98</b>
Digital Audio Processors .....	A98
Analog Audio Processors .....	A98
Media Decoders .....	A101
<b>Beamforming</b> .....	<b>A102</b>
Beamforming .....	A102
<b>Video Amplifiers</b> .....	<b>A102</b>
Composite Video Amplifiers .....	A102
Video Switches .....	A103
Others .....	A103
Isolation Amplifier .....	A103
<b>Audio Converters</b> .....	<b>A103</b>
High performance audio CODEC .....	A103
<b>Image Correction</b> .....	<b>A104</b>
Image Correction ICs for Panel .....	A104
Video Encoders built-in Image Correction .....	A104
<b>Video LSIs</b> .....	<b>A104</b>
Video Decoder Series .....	A104
Video Encoder Series .....	A104
Video Interface Series .....	A104
Display Controller Series for Small to Medium-Sized TFT LCD ...	A105
<b>IC Speech Synthesis LSI</b>	
Speech synthesis LSI with built-in large-capacity P2ROM™ —	A108
Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM —	A108
Speech synthesis LSI with external memory —	A109
Speech synthesis LSI for automotive —	A109
<b>Microcontroller</b>	
<b>High Performance &amp; Ultra Low Power MCU</b> .....	<b>A112</b>
16bit ML620500 Series .....	A112
<b>Ultra Low Operating Voltage &amp; Ultra Low Power MCU</b> .....	<b>A112</b>
8bit ML610400 Series .....	A112
<b>High Noise Immunity MCU</b> .....	<b>A118</b>
8bit ML610100 Series .....	A118
16bit ML620100 Series .....	A118
<b>Built-in Speech Output Function MCU</b> .....	<b>A120</b>
8bit ML610300 Series .....	A120
<b>Sensor Hub MCU</b> .....	<b>A120</b>
8bit ML610790 Family .....	A120
32bit ML630790 Family .....	A120
<b>ARM-Based MCU</b> .....	<b>A120</b>
32bit ML674xxx/ML675xxx .....	A120
<b>Power-Saving Solar Power Supply Control LSI</b> .....	<b>A122</b>
Secondary battery control LSI .....	A122
Primary battery control LSI .....	A122

### IC Automotive

<b>Linear Regulators</b> .....	<b>A124</b>
Single-Output LDO Regulators .....	A124
LDO Regulators with Voltage Detector and Watchdog Timer .....	A127
LDO Regulators with Voltage Detector .....	A127
Voltage Tracker .....	A127
Linear Regulators DDR SDRAM .....	A127
<b>Switching Regulators</b> .....	<b>A128</b>
For Automotive Switching Regulators .....	A128
<b>Switching Regulators (Power Management IC for System)</b> .....	<b>A129</b>
Power Management ICs for Automotive Camera Modules .....	A129
<b>High Voltage Monitor</b> .....	<b>A129</b>
Isolated High Voltage Monitor .....	A129
<b>Temperature Monitor</b> .....	<b>A129</b>
Isolated Temperature Monitor .....	A129
<b>Gate Drivers</b> .....	<b>A129</b>
Isolated Gate Drivers .....	A129
<b>Power Management Switch</b> .....	<b>A130</b>
1 Channel Compact High Side Switch ICs .....	A130
<b>Isolated / No Isolated Power Supply</b> .....	<b>A130</b>
DC/DC Controller .....	A130
<b>LED Drivers</b> .....	<b>A130</b>
Buck-Boost LED Drivers .....	A130
Constant Current / Serial-in Parallel-out LED Drivers .....	A130
<b>3-Phase Brushless Motor Drivers</b> .....	<b>A131</b>
3-Phase Brushless Motor Pre-Driver .....	A131
<b>Car Access</b> .....	<b>A131</b>
Antenna Drivers .....	A131
<b>Isolators</b> .....	<b>A131</b>
2.5kVrms Isolators .....	A131
<b>Transceiver</b> .....	<b>A131</b>
LIN Transceiver .....	A131
<b>Car communication LSI</b> .....	<b>A132</b>
FM data broadcast reception LSI .....	A132
<b>Digital terrestrial broadcasting reception LSI</b> .....	<b>A132</b>
Japanese System (ISDB-T) .....	A132
Chinese System (DTMB) .....	A132
<b>TFT Driver Series</b> .....	<b>A132</b>
Drivers for small to medium LCD Panels .....	A132
<b>TN/STN LCD Driver Series</b> .....	<b>A133</b>
LCD Segment Drivers .....	A133
Controller driver for low duty LCD .....	A133
<b>Car Clock Drivers</b> .....	<b>A133</b>
Car Clock .....	A133
<b>Speech synthesis LSI</b> .....	<b>A134</b>
Speech synthesis LSI .....	A134
<b>Audio Processors</b> .....	<b>A134</b>
Analog Audio Processors .....	A134
<b>Audio Amplifiers</b> .....	<b>A134</b>
Speaker Amplifiers .....	A134
<b>Video Amplifiers</b> .....	<b>A134</b>
Isolation Amplifier .....	A134
<b>Beamforming</b> .....	<b>A135</b>
Beamforming .....	A135

<b>Audio Converters</b> .....	<b>A135</b>
High performance audio CODEC .....	A135
<b>Image Correction</b> .....	<b>A135</b>
Image Correction ICs for Panel .....	A135
Video Encoders built-in Image Correction .....	A135
<b>Video LSIs</b> .....	<b>A135</b>
Video Decoder Series .....	A135
Video Encoder Series .....	A136
Display Controller Series for Small to Medium-Sized TFT LCD .....	A136
<b>Touch Screen Controller</b> .....	<b>A136</b>
Resistive type .....	A136
<b>Memory</b> .....	<b>A137</b>
Legacy DRAM FP/EDO .....	A137
Legacy DRAM SDRAM .....	A137
Video Memory .....	A137
EEPROM .....	A138
FeRAM .....	A139
<b>Operational Amplifiers</b> .....	<b>A139</b>
Standard Ground Sense Operational Amplifiers .....	A139
High Speed Ground Sense Operational Amplifiers .....	A139
Low Noise Operational Amplifiers .....	A139
<b>Comparators</b> .....	<b>A140</b>
Standard Open-Collector Comparators .....	A140
<b>Voltage Detectors (Reset ICs)</b> .....	<b>A140</b>
Standard Voltage Detectors .....	A140

### IC IC Packages

<b>ROHM Packages</b>	
<b>QFP Packages</b> .....	<b>A144</b>
<b>SON / QFN Packages</b> .....	<b>A147</b>
<b>SOP Packages</b> .....	<b>A150</b>
<b>HSOP Packages</b> .....	<b>A152</b>
<b>Small Packages</b> .....	<b>A154</b>
<b>Non-Lead Packages</b> .....	<b>A154</b>
<b>Power Packages</b> .....	<b>A155</b>
<b>BGA Packages</b> .....	<b>A157</b>
<b>WL-CSP Packages</b> .....	<b>A159</b>
<b>LAPIS Semiconductor Packages</b>	
<b>SOP Packages</b> .....	<b>A161</b>
<b>QFP Packages</b> .....	<b>A164</b>
<b>QFN Packages</b> .....	<b>A166</b>
<b>BGA Packages</b> .....	<b>A169</b>

# Contents

## Power Devices

### **SiC** SiC Power Devices

SiC-Schottky Barrier Diodes	B2
SiC-MOSFET	B5
Full SiC Power Modules	B6

### **IGBT** IGBT

Field Stop Trench IGBT	B8
Ignition IGBT	B9

### **IPM** Intelligent Power Modules

IGBT-IPM	B12
MOS-IPM	B12

### **Tr** Power Transistors

Power MOSFETs	B14
Power MOSFET Series	B14
Selector Guide for Automotive Power MOSFETs (AEC-Q101)	B19
Power Packages	B19
Part No. Explanation	B20

### **Di** Power Diodes

Power Schottky Barrier Diodes	B22
Power Fast Recovery Diodes	B25
Power Packages	B27
Part No. Explanation	B27

### **R** High Power Chip Resistors

Chip Resistors for Current Detection (Metal plate type)	B30
High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series)	B30
High Power Low Ohmic Chip Shunt Resistors (GMR series)	B30

## Small Signal Devices

### **Tr** Transistors

MOSFETs	C2
Small Signal MOSFET Series	C2
Middle Power MOSFET Series	C4
Selector Guide for Automotive MOSFETs (AEC-Q101)	C14
Bipolar Transistors (Surface mount type)	C16
Transistor Array	C18
Complex Bipolar Transistors	C19
Digital Transistors	C21
Complex Digital Transistors	C22
Packages	C24
Part No. Explanation	C25

### **Di** Diodes

Schottky Barrier Diodes	C28
Rectifier Diodes	C34
Fast Recovery Diodes	C35
Zener Diodes (Including TVS)	C36
Switching Diodes	C40
High Frequency Diodes	C41
JEDEC and Euro Standard Diodes	C42
Packages	C43
Part No. Explanation	C44

## Passive Devices

### **R** Resistors

<b>Quick Reference of Resistance Range</b> .....	D2
<b>Class-leading Compact Size Chip Resistors (RASMID™ series)</b> —	D3
Ultra-Compact Chip Resistors (SMR 003 <009005>) .....	D3
<b>Thick Film Chip Resistors (Standard series)</b> .....	D4
Compact Chip Resistors (MCR series <01005 to 0805>) .....	D4
Chip Resistors (MCR series <1206 to 2512>) .....	D5
Compact Chip Resistor Networks (MNR series <0402×2 to 1206×4>) ...	D6
8-element Chip Resistor Networks (MNR series <0603×5 to 1206×5>) ...	D7
<b>Thick Film Chip Resistors (High reliability series)</b> .....	D8
High Anti-surge Chip Resistors (SDR series) .....	D8
Anti-surge Chip Resistors (ESR series) .....	D8
High Power Chip Resistors <Wide Terminal type> (LTR series) ...	D9
High Voltage Resistance Chip Resistors (KTR series) .....	D10
<b>Thick Film Chip Resistors (Low Ohmic type)</b> .....	D11
Chip Resistors (Low Ohmic MCR series) .....	D11
Low Ohmic Chip Resistors <Face down type> (UCR series) ...	D12
High Power Chip Resistors <Wide Terminal type> (Low Ohmic LTR series) ...	D13
<b>Chip Resistors for Current Detection (Metal plate type)</b> —	D14
Ultra Low Ohmic Chip Shunt Resistors (PMR series) .....	D14
Ultra Low Ohmic Chip Shunt Resistors <Wide Terminal type> (PML series) ...	D15
High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series) ...	D16
High Power Low Ohmic Chip Shunt Resistors (GMR series) ...	D17
<b>Standard Nominal Resistance Values</b> .....	D18

### **Tc** Tantalum Capacitors

#### Tantalum Capacitors

<b>New Bottom surface electrode (Extra large capacitance) : TCS Series</b> —	D20
M case : 1608-10 (0603) size .....	D20
PS case : 2012-09 (0805) Ultra Low profile size .....	D20
P case : 2012-12 (0805) size .....	D20
<b>Bottom surface electrode (Large capacitance) : TCT, TC Series</b> —	D21
U case : 1005-06 (0402) size .....	D21
ML case : 1608-06 (0603) Low profile size .....	D21
M case : 1608-09 (0603) size .....	D21
PL case : 2012-10 (0805) Low profile size .....	D22
P case : 2012-12 (0805) size .....	D22
AS case : 3216-10 (1206) Ultra Low profile size .....	D22
AL case : 3216-12 (1206) Low profile size .....	D22
<b>Standard : TC Series</b> .....	D23
P case : 2012-12 (0805) size .....	D23
A case : 3216-18 (1206) size .....	D23
<b>Fail-safe open structure : TCFG Series</b> .....	D23
B case : 3528-21 (1411) size .....	D23
<b>Conductive polymer capacitors</b>	
<b>New bottom surface electrode (Extra large capacitance) : TCSO Series</b> —	D24
M case : 1608-10 (0603) size .....	D24
PL case : 2012-10 (0805) Low profile size .....	D24
<b>Bottom surface electrode (Large capacitance) : TCTO Series</b> —	D25
U case : 1005-06 (0402) size .....	D25
M case : 1608-09 (0603) size .....	D25
P case : 2012-12 (0805) size .....	D25
AS case : 3216-10 (1206) Ultra Low profile size .....	D26
AL case : 3216-12 (1206) Low profile size .....	D26
A case : 3216-18 (1206) size .....	D26
BL case : 3528-12 (1411) Low profile size .....	D26
<b>Standard : TCO Series</b> .....	D27
B case : 3528-21 (1411) size .....	D27

# Contents

## Opto Devices

### LED LEDs

SMD LEDs	E2
Quick Reference of Brightness	E2
Characteristics	E5
Part No. Configuration	E9
Packages	E10

Through-hole LEDs	E12
Quick Reference of Brightness	E12
Characteristics	E14
Part No. Configuration	E15
Directivity	E16
Packages	E16

### LED Displays

High Brightness LED Numeric Displays	E18
LED Numeric Displays	E18
Single Digit LED Numeric Displays (Surface Mount Type)	E19
Single Digit LED Numeric Displays	E19
Two Digit LED Numeric Displays	E19
Three Digit LED Numeric Displays	E19
LED Dot Matrix Units	E20
16×32 Dots Matrix Units	E20
16×16 Dots Matrix Units	E21
24×24 Dots Matrix Units	E21
24×48 Dots Matrix Units	E21

### Laser Diodes

Red / Infrared Dual Wavelength Lasers	E24
Multi-beam Lasers	E24
Red Lasers	E25
Infrared Lasers	E25
Packaging Specifications	E26

### Optical Sensors

Photointerrupter Selection Guide	E28
Transmission type Photointerrupters	E29
Linear Phototransistor output	E29
Digital Phototransistor output	E30
Reflective type Photosensors (Photoreflectors)	E30
4 Direction Detector	E30
Infrared Light Emitting Diodes	E32
Phototransistors	E33
Photodiodes	E33
Packages	E34

### IrDA Infrared Communication Modules

IrDA Infrared Communication Module Selection Guide	E38
IrDA Infrared Communication Modules	E39
Packages	E39

### Remote Control Receiver Modules

Remote Control Receiver Module Selection Guide	E42
Surface Mount Remote Control Receiver Modules	E43
Lead Frame Remote Control Receiver Modules	E44
Packages	E45

## Modules

### Power Supply Modules

Power Supply Module Selection Guide	F2
AC/DC Converters	F3
DC/DC Converters	F4
LED Lighting Power Supply Modules	F5

### Wireless Modules

ROHM Wireless Modules Technology	F8
Specified Low Power Radio Modules	F8
Wireless LAN Modules	F9
Wireless Communication Modules	F10
Bluetooth® Low Energy	F10
IEEE802.15.4 / ZigBee®	F10
EnOcean® Communication Modules	F10

### Contact Image Sensor Heads

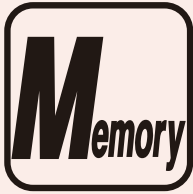
ROHM has unique expertise in key fields	F12
8inch CIS	F12

### Thermal Printheads

ROHM has unique expertise in key fields	F14
Thermal Printheads Selection Guide	F15
For Facsimiles : A series	F16
For Mobile Printers : B series	F16
For Gaming Equipment, ATMs : CF, CG series	F17
For POS Terminals : DF, DG series	F18
For Ticket or Scale Printers : DC92, DC72 series	F19
For Distribution or Food Labels : DC series	F20
For Packaging High-speed Printers : AH series	F20

## Part No. List

Part No. List	G1
---------------	----



ICs

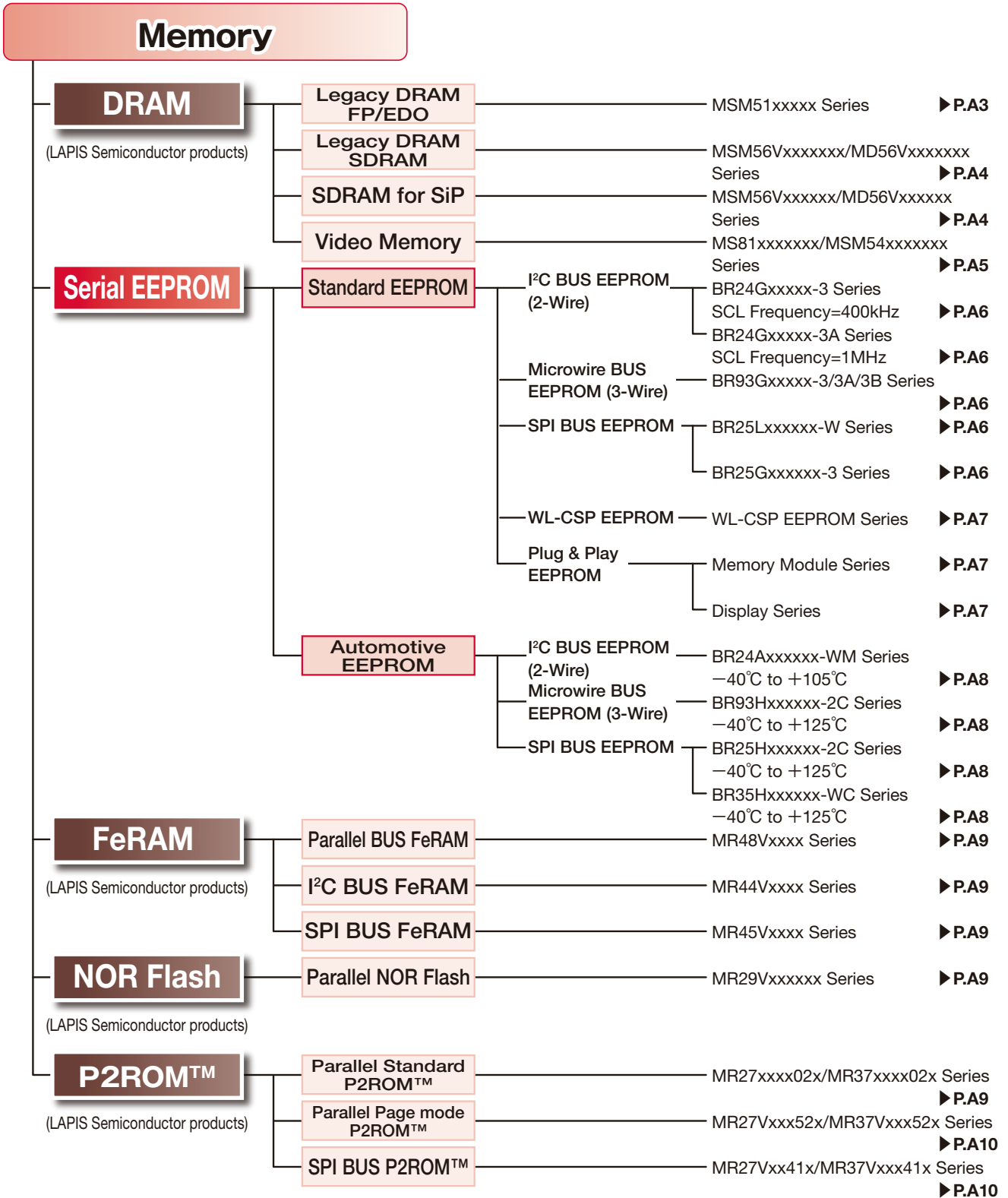
# Memory

## CONTENTS

<b>DRAM</b> .....	<b>P. A3</b>
Legacy DRAM FP/EDO (LAPIS Semiconductor products) .....	P. A3
Legacy DRAM SDRAM (LAPIS Semiconductor products) .....	P. A4
SDRAM for SiP (LAPIS Semiconductor products) .....	P. A4
Video Memory (LAPIS Semiconductor products) .....	P. A5
<b>Serial EEPROM</b> .....	<b>P. A6</b>
Standard EEPROM .....	P. A6
Automotive EEPROM .....	P. A8
<b>FeRAM</b> .....	<b>P. A9</b>
Ferroelectric Memory (LAPIS Semiconductor products) .....	P. A9
<b>NOR Flash</b> .....	<b>P. A9</b>
Parallel NOR Flash (LAPIS Semiconductor products) .....	P. A9
<b>P2ROM™</b> .....	<b>P. A9</b>
Parallel BUS Standard P2ROM™ (LAPIS Semiconductor products) .....	P. A9
Parallel BUS Page mode P2ROM™ (LAPIS Semiconductor products) .....	P. A10
SPI BUS P2ROM™ (LAPIS Semiconductor products) .....	P. A10



# Memory





# DRAM

## Legacy DRAM FP/EDO

(LAPIS Semiconductor products)

Standard															
Part No.	Supply Voltage (V)	Density (bit)	Number of Data bits	Configuration (word×bit)	Circuit function	Access Time (ns)	Refresh cycle (cycles/ms)	Operating Temperature Ta (°C)	Package						
MSM514400E	5.0±0.5	4M	×4	1M×4	Fast Page Mode	60/70	1024/16	0 to +70	TSOP(II)26/20Cu						
MSM514800E			×8	512K×8		60/70	1024/16		TSOP(II)28						
MSM514800ESL							1024/128								
MSM514260E			×16	256K×16	EDO	60/70	512/8		TSOP(II)44/40						
MSM514265E															
MSM5416258B											High Speed EDO	28/30/35			
MSM5116400F		3.3±0.3	16M	×4	4M×4	Fast Page Mode	60		4096/64	0 to +70	TSOP(II)26/24Cu				
MSM5117400F							50/60		2048/32						
MSM5117405F							EDO								
MSM5117800F				×8	2M×8	Fast Page Mode	60					60	TSOP(II)28		
MSM5117805F							EDO								
MSM5116160F							×16		1M×16					Fast Page Mode	60
MSM5118160F			50/60	1024/16											
MSM5118165F			EDO												
MSM51V4400E	3.3±0.3		4M	×4	1M×4	Fast Page Mode	70/100	1024/16	-40 to +85		TSOP(II)26/20Cu				
MSM51V4800E				×8	512K×8		70				TSOP(II)28				
MSM54V16258B				×16	256K×16		EDO				40/45/50	512/64	TSOP(II)44/40		
MD54V16258BSL															
MSM51V4265E						60/70		512/8							
MSM51V16400F				16M	×4	4M×4	Fast Page Mode	60			4096/64	-40 to +85	TSOP(II)26/24Cu		
MSM51V16405F		EDO	50/60												
MSM51V17400F		Fast Page Mode	50/60					2048/32							
MSM51V17405F		EDO	50/60												
MSM51V17800F		×8	2M×8							Fast Page Mode				60	60
MSM51V17805F								EDO							
MSM51V16160F					×16	1M×16	Fast Page Mode	50/60			4096/64		TSOP(II)50/44		
MSM51V16165F		EDO	60												
MSM51V18160F		Fast Page Mode	50/60					1024/16							
MSM51V18165F	EDO														
MSM51V18165F	64M	4M×16	EDO					50/60	4096/54	TSOP(II)50					
MD51V65165E															
Automotive															
MSM514400DP	5.0±0.5	4M	×4		1M×4	Fast Page Mode	60/70	1024/16	-40 to +85	TSOP(II)26/24Cu					
MSM514400EP															
MSM514260EP			×16	256K×16	EDO		60/70	512/8		TSOP(II)44/40					
MSM5118160FP		16M				1M×16	EDO	60		1024/16	TSOP(II)50/44				
MSM5118165FP															
MSM51V4400EP	3.3±0.3	4M	×4	1M×4	Fast Page Mode	70/100	1024/16	-40 to +85	TSOP(II)26/24Cu						
MSM54V16258BP			×16	256K×16		EDO	40/45/50		512/64	TSOP(II)44/40					
MSM51V4265EP							60/70		512/8						
MSM51V17400FP		16M	×4	4M×4	Fast Page Mode	60	2048/32		TSOP(II)26/24Cu						
MSM51V18165FP			×16	1M×16	EDO	60	1024/16								

## Legacy DRAM SDRAM

(LAPIS Semiconductor products)

Memory

Standard													
Part No.	Data Rate Type	Supply Voltage (V)	Density (bit)	Number of Data bits	Configuration (bank × word × bit)	Max. Operating Frequency (MHz)	Refresh Cycle (cycles/ms)	Cycle Time (ns)	Features	Operating Temperature Ta (C)	Package		
MSM56V16800F	SDR	3.3±0.3	16M	×8	2×1M×8	125	4096/64	8/10	—	0 to +70	TSOP(II)44		
MSM56V16160F								8/10			TSOP(II)50		
MSM56V16160K								7/7.5/8/10	Drivability control		TSOP(II)50Cu		
☆MSM56V16161N												6/7/7.5/8/10	
New MSM56V16161K												7/7.5/8/10	
MD56V62160E			64M	×16	4×1M×16	100		10	—		TSOP(II)54		
MD56V62160M						143		7/7.5/10	Drivability control		TSOP(II)54Cu		
New MD56V62161M						143		7/7.5/10					
New MD56V72160C						128M		4×2M×16				166	6/7/7.5/10
New MD56V72161C									166		6/7/7.5/10		
New MD56V82160A	256M	4×4M×16	166	6/7/7.5/10	—	TSOP(II)66Cu							
☆MD58W82160A			DDR	2.5±0.2			200	8192/64	5				
Industrial													
New MSM56V16161KP	SDR	3.3±0.3	16M	×16	2×512K×16	143	4096/64	7/7.5/8/10	Drivability control	-40 to +85	TSOP(II)50Cu		
☆MSM56V16161NP						166		6/7/7.5/8/10					
New MD56V62161M-xxTAP			64M		4×1M×16	143		7/7.5/10			TSOP(II)54Cu		
☆MD56V72161C-xxTAP						128M		4×2M×16				166	6/7/7.5/10
New MD56V82160A-xxTAP												256M	4×4M×16
Automotive													
MSM56V16160FP	SDR	3.3±0.3	16M	×16	2×512K×16	100	4096/64	10	—	-40 to +85	TSOP(II)50		
MSM56V16160KP						125		8/10			Drivability control	TSOP(II)50Cu	
☆MSM56V16161NP						166		6/7/7.5/8/10					
MD56V62160E-xxTAP			64M		4×1M×16	100		10	—		TSOP(II)54		
MD56V62160M-xxTAP						143		7/7.5/10	Drivability control		TSOP(II)54Cu		
New MD56V72160C-xxTAP			128M		4×2M×16	166		6/7/7.5/10					
New MD56V82160A-xxTAP			256M		4×4M×16	166		8192/64				6/7/7.5/10	

DDR : Double Data Rate Synchronous DRAM, SDR : Single Data Rate Synchronous DRAM

☆ : Under Development

## SDRAM for SiP

(LAPIS Semiconductor products)

Standard										
Part No.	Supply Voltage (V)	Density (bit)	Number of Data bits	Configuration (bank × word × bit)	Max. Operating Frequency (MHz)	Refresh Cycle (cycles/ms)	Cycle Time (ns)	Operating Temperature Tj (C)	Features	
MSM56V16160K	3.3±0.3	16M	×16	2×512K×16	143	4096/32	7/7.5/8/10	-40 to +125	KGD	
☆MSM56V16160N					166		6/7/7.5/8/10		KGD	
MD56V62160M		64M		4×1M×16	143		7/7.5/8/10		KGD	
New MD56V72160C		128M		4×2M×16	166		6/7/7.5/10		KGD	
Automotive										
MSM56V16160K	3.3±0.3	16M	×16	2×512K×16	143	4096/32	7/7.5/8/10	-40 to +125	KGD	
☆MSM56V16160N					166		6/7/7.5/8/10		KGD	
MD56V62160M		64M		4×1M×16	143		7/7.5/8/10		KGD	
New MD56V72160C		128M		4×2M×16	166		6/7/7.5/10		KGD	

☆ : Under Development

## Video Memory

(LAPIS Semiconductor products)

A

Memory

Standard												
Part No.	Supply Voltage (V)	Density (bit)	Configuration (word×bit)×port	Number of Data bits	Max.Operating Frequency (MHz)	Access Time (ns)	Cycle Time (ns)	Power Consumption (mW)		Operating Temperature Ta (°C)	Package	Notes
								Operating	Standby			
MSM5412222B	5.0±0.5	3M	262,214×12	×12	40	23/25	25/30	330	27.5	0 to +70	TSOP(II)44	Asynchronous serial read/write, Write mask function, Output data control, Cascade
MS8104160A		4M	(262,214×8)×2	×16	50	18/23	20/25	935	27.5		QFP100	Asynchronous serial read/write, Write mask function, Output data control, Cascade, Two-port, 2 common WCLK ports
MSM54V12222B	3.3±0.3	3M	262,214×12	×12	50	18/23	20/25	216	10.8		TSOP(II)44	Asynchronous serial read/write, Write mask function, Output data control, Cascade
MS81V03120					100	7.5/8	10/12	360	14.4		TSOP(II)70	Asynchronous serial read/write, Write mask function, Output data control, Cascade
MS81V04160A		4M	(262,214×8)×2	×16	50	18/23	20/25	288	10.8		QFP100	Asynchronous serial read/write, Write mask function, Output data control, Cascade, Two-port, 2 common WCLK ports
MS81V04166A												Asynchronous serial read/write, Write mask function, Output data control, Cascade, Two-port, 2 independent WCLK ports.
MS81V05200		5M	583,680×10	×10	77	8	13	780	21.6		TSOP(II)70	Asynchronous serial read/write, Write mask function, Output data control, Cascade
MS81V06160		6M	401,408×16	×16	83	9/12	12/15	756/612	21.6			Asynchronous serial read/write, Write mask function, Output data control, Cascade
MS81V10160												10M
MS81V26000		26M	1,114,112×24	×24	100	8/9	10/12	648/576	18			QFP100
Automotive												
MS81V04160AP	3.3±0.3	4M	(262,214×8)×2	×16	50	18/23	20/25	288	10.8	-40 to +85	QFP100	Asynchronous serial read/write, Write mask function, Output data control, Cascade, Two-port, 2 common WCLK ports.
MS81V26000-25TPZP3		26M	1,114,112×24	×24	40	12	25	576	18		TQFP100Cu	Asynchronous serial read/write, Write mask function, Output data control, Cascade, The top address can be specified

# Serial EEPROM

## Standard EEPROM

Memory

I <sup>2</sup> C BUS EEPROM (2-Wire) BR24Gxxxx-3 series (SCL Frequency = 400kHz)																		
Part No.	Package and suffix								Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	SCL Frequency (Hz)	Operating temperature range(°C)	Endurance (times)	Data retention (years)
	DIP-T8	SOP8	SOP-J8	SSOP-B8	TSSOP-B8	MSOP8	TSSOP-B8J	VSON008X2030				Operating(mA)	Standby(µA)					
BR24G01	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	1K	128×8	1.6 to 5.5	2	2	5	400K	-40 to +85	10 <sup>6</sup>	40
BR24G02	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	2K	256×8	1.6 to 5.5	2	2	5	400K			
BR24G04	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	4K	512×8	1.6 to 5.5	2	2	5	400K			
BR24G08	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	8K	1K×8	1.6 to 5.5	2	2	5	400K			
BR24G16	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	16K	2K×8	1.6 to 5.5	2	2	5	400K			
BR24G32	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	32K	4K×8	1.6 to 5.5	2	2	5	400K			
BR24G64	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	64K	8K×8	1.6 to 5.5	2	2	5	400K			
BR24G128	-3	F-3	FJ-3	FV-3	FVT-3	FVM-3	FVJ-3	NUX-3	128K	16K×8	1.6 to 5.5	2.5	2	5	400K			
BR24G256	-3	F-3	FJ-3	FV-3	FVT-3	-	-	-	256K	32K×8	1.6 to 5.5	2.5	2	5	400K			
I <sup>2</sup> C BUS EEPROM (2-Wire) BR24Gxxxx-3A series (SCL Frequency = 1MHz)																		
Part No.	Package and suffix								Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	SCL Frequency (Hz)	Operating temperature range(°C)	Endurance (times)	Data retention (years)
	DIP-T8	SOP8	SOP-J8	SSOP-B8	TSSOP-B8	MSOP8	TSSOP-B8J	VSON008X2030				Operating(mA)	Standby(µA)					
BR24G01	-3A	F-3A	FJ-3A	-	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	1K	128×8	1.7 to 5.5	2	2	5	1M	-40 to +85	10 <sup>6</sup>	40
BR24G02	-3A	F-3A	FJ-3A	-	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	2K	256×8	1.7 to 5.5	2	2	5	1M			
BR24G04	-3A	F-3A	FJ-3A	-	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	4K	512×8	1.7 to 5.5	2	2	5	1M			
BR24G08	-3A	F-3A	FJ-3A	-	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	8K	1K×8	1.7 to 5.5	2	2	5	1M			
BR24G16	-3A	F-3A	FJ-3A	-	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	16K	2K×8	1.7 to 5.5	2	2	5	1M			
BR24G32	-3A	F-3A	FJ-3A	FV-3A	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	32K	4K×8	1.7 to 5.5	2	2	5	1M			
BR24G64	-3A	F-3A	FJ-3A	FV-3A	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	64K	8K×8	1.7 to 5.5	2	2	5	1M			
BR24G128	-3A	F-3A	FJ-3A	FV-3A	FVT-3A	FVM-3A	FVJ-3A	NUX-3A	128K	16K×8	1.7 to 5.5	2.5	2	5	1M			
BR24G256	-3A	F-3A	FJ-3A	FV-3A	FVT-3A	-	-	-	256K	32K×8	1.7 to 5.5	2.5	2	5	1M			
BR24G512	-3A	F-3A	FJ-3A	-	FVT-3A	-	-	-	512K	64K×8	1.7 to 5.5	4.5	3	5	1M			
BR24G1M	-3A	F-3A	FJ-3A	-	-	-	-	-	1M	128K×8	1.7 to 5.5	4.5	3	5	1M			
Microwire BUS EEPROM (3-Wire) BR93Gxxxx-3/3A/3B series																		
Part No.	Package and suffix								Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)	
	DIP-T8	SOP8	SOP-J8	TSSOP-B8	MSOP8	VSON008X2030	Operating(mA)	Standby(µA)										
BR93G46	-3 <sup>*/1</sup> / -3A <sup>*/2</sup> / -3B <sup>*/3</sup>	F-3 <sup>*/1</sup> / F-3A <sup>*/2</sup> / F-3B <sup>*/3</sup>	FJ-3 <sup>*/1</sup> / FJ-3A <sup>*/2</sup> / FJ-3B <sup>*/3</sup>	FVT-3 <sup>*/1</sup> / FVT-3A <sup>*/2</sup> / FVT-3B <sup>*/3</sup>	FVM-3 <sup>*/1</sup> / FVM-3A <sup>*/2</sup> / FVM-3B <sup>*/3</sup>	NUX-3 <sup>*/1</sup> / NUX-3A <sup>*/2</sup> / NUX-3B <sup>*/3</sup>	1K	64×16(8)	1.7 to 5.5	2	2	5	5	-40 to +85	10 <sup>6</sup>	40		
BR93G56	-3 <sup>*/1</sup> / -3A <sup>*/2</sup> / -3B <sup>*/3</sup>	F-3 <sup>*/1</sup> / F-3A <sup>*/2</sup> / F-3B <sup>*/3</sup>	FJ-3 <sup>*/1</sup> / FJ-3A <sup>*/2</sup> / FJ-3B <sup>*/3</sup>	FVT-3 <sup>*/1</sup> / FVT-3A <sup>*/2</sup> / FVT-3B <sup>*/3</sup>	FVM-3 <sup>*/1</sup> / FVM-3A <sup>*/2</sup> / FVM-3B <sup>*/3</sup>	NUX-3 <sup>*/1</sup> / NUX-3A <sup>*/2</sup> / NUX-3B <sup>*/3</sup>	2K	128×16(8)	1.7 to 5.5	2	2	5	5					
BR93G66	-3 <sup>*/1</sup> / -3A <sup>*/2</sup> / -3B <sup>*/3</sup>	F-3 <sup>*/1</sup> / F-3A <sup>*/2</sup> / F-3B <sup>*/3</sup>	FJ-3 <sup>*/1</sup> / FJ-3A <sup>*/2</sup> / FJ-3B <sup>*/3</sup>	FVT-3 <sup>*/1</sup> / FVT-3A <sup>*/2</sup> / FVT-3B <sup>*/3</sup>	FVM-3 <sup>*/1</sup> / FVM-3A <sup>*/2</sup> / FVM-3B <sup>*/3</sup>	NUX-3 <sup>*/1</sup> / NUX-3A <sup>*/2</sup> / NUX-3B <sup>*/3</sup>	4K	256×16(8)	1.7 to 5.5	2	2	5	5					
BR93G76	-3 <sup>*/1</sup> / -3A <sup>*/2</sup> / -3B <sup>*/3</sup>	F-3 <sup>*/1</sup> / F-3A <sup>*/2</sup> / F-3B <sup>*/3</sup>	FJ-3 <sup>*/1</sup> / FJ-3A <sup>*/2</sup> / FJ-3B <sup>*/3</sup>	FVT-3 <sup>*/1</sup> / FVT-3A <sup>*/2</sup> / FVT-3B <sup>*/3</sup>	FVM-3 <sup>*/1</sup> / FVM-3A <sup>*/2</sup> / FVM-3B <sup>*/3</sup>	NUX-3 <sup>*/1</sup> / NUX-3A <sup>*/2</sup> / NUX-3B <sup>*/3</sup>	8K	512×16(8)	1.7 to 5.5	2	2	5	5					
BR93G86	-3 <sup>*/1</sup> / -3A <sup>*/2</sup> / -3B <sup>*/3</sup>	F-3 <sup>*/1</sup> / F-3A <sup>*/2</sup> / F-3B <sup>*/3</sup>	FJ-3 <sup>*/1</sup> / FJ-3A <sup>*/2</sup> / FJ-3B <sup>*/3</sup>	FVT-3 <sup>*/1</sup> / FVT-3A <sup>*/2</sup> / FVT-3B <sup>*/3</sup>	FVM-3 <sup>*/1</sup> / FVM-3A <sup>*/2</sup> / FVM-3B <sup>*/3</sup>	NUX-3 <sup>*/1</sup> / NUX-3A <sup>*/2</sup> / NUX-3B <sup>*/3</sup>	16K	1K×16(8)	1.7 to 5.5	2	2	5	5					
SPI BUS EEPROM BR25Lxxxx-W series																		
Part No.	Package and suffix						Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)			
	SOP8	SOP-J8	SSOP-B8	TSSOP-B8	MSOP8	TSSOP-B8J				VSON008X2030	Operating(mA)					Standby(µA)		
BR25L010	F-W	FJ-W	FV-W	FVT-W	FVM-W	FVJ-W	-	1K	128×8	1.8 to 5.5	3	2	5	-40 to +85	10 <sup>6</sup>	40		
BR25L020	F-W	FJ-W	FV-W	FVT-W	FVM-W	FVJ-W	-	2K	256×8	1.8 to 5.5	3	2	5					
BR25L040	F-W	FJ-W	FV-W	FVT-W	FVM-W	FVJ-W	-	4K	512×8	1.8 to 5.5	3	2	5					
BR25L080	F-W	FJ-W	FV-W	FVT-W	-	-	-	8K	1K×8	1.8 to 5.5	3	2	5					
BR25L160	F-W	FJ-W	FV-W	FVT-W	-	-	-	16K	2K×8	1.8 to 5.5	3	2	5					
SPI BUS EEPROM BR25Gxxxx-3 series																		
Part No.	Package and suffix						Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)			
	SOP8	SOP-J8	TSSOP-B8	MSOP8	VSON008X2030	Operating(mA)				Standby(µA)								
<b>New</b> BR25G320	F-3	FJ-3	FVT-3	FVM-3	NUX-3	32K	4K×8	1.6 to 5.5	1	1	5	-40 to +85	10 <sup>6</sup>	40				
<b>New</b> BR25G640	F-3	FJ-3	FVT-3	FVM-3	NUX-3	64K	8K×8	1.6 to 5.5	1	1	5							
<b>New</b> BR25G128	F-3	FJ-3	FVT-3	-	NUX-3	128K	16K×8	1.6 to 5.5	1	1	5							
<b>New</b> BR25G256	F-3	FJ-3	FVT-3	-	-	256K	32K×8	1.6 to 5.5	1	1	5							

Microwire BUS EEPROM (3-Wire) BR93Gxxxx-3/3A/3B series : \*1 They are dual organization (by 16bit or 18bit) and it is selected the input of ORG PIN. \*2 1PIN : CS PIN \*3 3PIN : CS PIN

## WL-CSP EEPROM

Part No.	Package						Pull-up resistor	I/F	Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time(ms)	Operating temperature range(°C)	Data retention (years)
	Package Name	Size(mm)	Thickness (mm)Max.	Ball pitch (mm)	RESIN COATING	Operating (mA)						Standby (μA)				
BU9833GUL-W	VCSP50L1	x : 1.27 y : 1.50	0.55	0.5	✓	—	I <sup>2</sup> C	2K	256 × 8	1.7 to 5.5	2	2	5	-40 to +85	40	
BU9847GUL-W	VCSP50L1	x : 1.95 y : 1.06	0.55	0.5	✓	—	I <sup>2</sup> C	4K	512 × 8	1.7 to 5.5	2	2	5	-40 to +85	40	
BU9889GUL-W	VCSP50L1	x : 1.60 y : 1.00	0.55	0.5	✓	—	I <sup>2</sup> C	8K	1K × 8	1.7 to 5.5	2	2	5	-40 to +85	40	
BRCB008GWZ-3	UCSP30L1	x : 0.94 y : 0.94	0.33	0.4	—	—	I <sup>2</sup> C	8K	1K × 8	1.7 to 3.6	2	2	5	-40 to +85	40	
BRCB016GWL-3	UCSP50L1	x : 1.10 y : 1.15	0.55	0.4	—	—	I <sup>2</sup> C	16K	2K × 8	1.7 to 3.6	2	2	5	-40 to +85	40	
<b>New</b> BRCD016GWZ-3	UCSP35L1	x : 1.30 y : 0.77	0.40	0.4	✓	—	I <sup>2</sup> C	16K	2K × 8	1.7 to 3.6	2	2	5	-40 to +85	40	
BRCA016GWZ-W	UCSP30L1	x : 1.30 y : 0.77	0.35	0.4	—	—	I <sup>2</sup> C	16K	2K × 8	1.7 to 3.6	2	2	5	-40 to +85	40	
BRCC016GWX-3	UCSP16X1	x : 1.30 y : 0.77	0.20	0.4	—	—	WP	I <sup>2</sup> C	16K	2K × 8	1.7 to 3.6	2	2	5	-40 to +85	40
<b>New</b> BRCB032GWZ-3	UCSP30L1	x : 1.45 y : 0.77	0.33	0.4	—	—	I <sup>2</sup> C	32K	4K × 8	1.7 to 5.5	2	2	5	-40 to +85	40	
<b>New</b> BRCG064GWZ-3	UCSP35L1	x : 1.50 y : 1.00	0.36	0.4	✓	—	I <sup>2</sup> C	64K	8K × 8	1.6 to 5.5	2	2	5	-40 to +85	40	
BRCB064GWZ-3	UCSP30L1	x : 1.50 y : 1.00	0.35	0.4	—	—	WP	I <sup>2</sup> C	8K × 8	1.6 to 5.5	3.9	2	5	-40 to +85	40	
<b>New</b> BRCE064GWZ-3	UCSP25L1	x : 1.50 y : 1.00	0.30	0.4	—	—	I <sup>2</sup> C	64K	8K × 8	1.6 to 5.5	2	2	5	-40 to +85	40	
BU9897GUL-W	VCSP50L2	x : 2.44 y : 1.99	0.55	0.5	✓	—	I <sup>2</sup> C	128K	16K × 8	1.7 to 5.5	2.5	2	5	-40 to +85	40	
BU9832GUL-W	VCSP50L2	x : 2.09 y : 1.85	0.55	0.5	✓	—	SPI	8K	1K × 8	1.8 to 5.5	3	2	5	-40 to +85	40	
BU9829GUL-W	VCSP50L1	x : 1.74 y : 1.65	0.55	0.5	✓	—	SPI	16K	2K × 8	1.6 to 3.6	2	1	5	-30 to +85	10	
BR25S128GUZ-W	VCSP35L2	x : 2.00 y : 2.63	0.40	0.5	✓	—	SPI	128K	16K × 8	1.7 to 5.5	2*	2	5	-40 to +85	40	
BU9891GUL-W	VCSP50L1	x : 1.60 y : 1.00	0.55	0.5	✓	—	MW	4K	256 × 16	1.7 to 5.5	3	2	5	-40 to +85	40	

## Plug &amp; Play EEPROM For Memory Modules

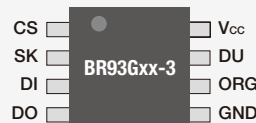
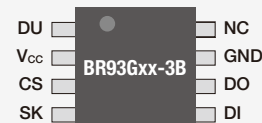
Part No.	Package and suffix		Bit format (word×bit)	Supply voltage (V)	Clock frequency (kHz)	Write cycle time (ms)	Endurance (times)	Data retention (years)	Write Protect
	TSSOP-B8	VSON008X2030							
BR34L02	FVT-W	—	256 × 8	1.7 to 5.5	100 <sup>*1</sup> /400 <sup>*2</sup>	5	1 million	40	Onetime ROM write protect
BR34E02	FVT-3	NUX-3	256 × 8	1.7 to 5.5	400	5	1 million	40	Settable write protect Onetime ROM write protect

## Plug &amp; Play EEPROM For Display

Part No.	Package and suffix							Function Descriptions	Bit format (word×bit)	Supply voltage (V)	Clock frequency (MHz)	Write cycle time (ms)
	SOP8	SOP-J8	SSOP-B8	SOP14	SSOP-B14	SSOP-B16	VSON008X2030					
BR24C21	F	FJ	FV	—	—	—	—	Supports DDC1™ / DDC2™ for displays	128 × 8	2.5 to 5.5	100 / 400	10
BU9882	—	—	—	F-W	FV-W	—	—	Dual-port type compatible with DDC2™ for displays	128 × 8 × 2ch	2.5 to 5.5	100 / 400	10
BU9883	—	—	—	—	—	FV-W	—	2kbit × 3ch EEPROM for HDMI ports	256 × 8 × 3ch	3.0 to 5.5	400	5
<b>New</b> BU99022	—	—	—	—	—	—	NUX-3	2Kbit × 2ch type	256 × 8 × 2ch	1.7 to 5.5	400	5

WL-CSP EEPROM : \* V<sub>cc</sub>=2.5VPlug & Play EEPROM For Memory Modules : \*1 : V<sub>cc</sub>=1.7 to 5.5V \*2 : V<sub>cc</sub>=2.5 to 5.5V

## Micro Wire BUS Pin Assignment

Selectable Bit Format  
(8bit or 16bit)Interchangeable with the  
BR93LxxRxx-W Series

Rotated Pins

**Automotive EEPROM**
**A**  
**Memory**

105°C Operation I <sup>2</sup> C BUS EEPROM (2-Wire) BR24Axxxxx-WM series													
Part No.	Package and suffix			Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range (°C)	Endurance (times)	Data retention (years)	
	SOP8	SOP-J8	MSOP8				Operating(mA)	Standby(μA)					
BR24A01A	F-WM	FJ-WM	—	1K	128×8	2.5 to 5.5	2	2	5	-40 to +105	10 <sup>6</sup>	40	
BR24A02	F-WM	FJ-WM	FVM-WM	2K	256×8	2.5 to 5.5	2	2	5				
BR24A04	F-WM	FJ-WM	—	4K	512×8	2.5 to 5.5	2	2	5				
BR24A08	F-WM	FJ-WM	—	8K	1K×8	2.5 to 5.5	2	2	5				
BR24A16	F-WM	FJ-WM	—	16K	2K×8	2.5 to 5.5	2	2	5				
BR24A32	F-WM	—	—	32K	4K×8	2.5 to 5.5	3	2	5				
BR24A64	F-WM	—	—	64K	8K×8	2.5 to 5.5	3	2	5				
125°C Operation Microwire BUS EEPROM (3-Wire) BR93Hxxxxx-2C series													
Part No.	Package and suffix				Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range (°C)	Endurance (times)	Data retention (years)
	SOP8	SOP-J8	TSSOP-B8	MSOP8				Operating(mA)	Standby(μA)				
BR93H46	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	1K	64×16	2.5 to 5.5	3	10	4	-40 to +125	10 <sup>6</sup>	100
BR93H56	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	2K	128×16	2.5 to 5.5	3	10	4			
BR93H66	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	4K	256×16	2.5 to 5.5	3	10	4			
BR93H76	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	8K	512×16	2.5 to 5.5	3	10	4			
BR93H86	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	16K	1K×16	2.5 to 5.5	3	10	4			
125°C Operation SPI BUS EEPROM BR25Hxxxxx-2C series													
Part No.	Package and suffix				Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range (°C)	Endurance (times)	Data retention (years)
	SOP8	SOP-J8	TSSOP-B8	MSOP8				Operating(mA)	Standby(μA)				
BR25H010	F-2C	FJ-2C	FVT-2C	FVM-2C	1K	128×8	2.5 to 5.5	4	10	4	-40 to +125	10 <sup>6</sup>	100
BR25H020	F-2C	FJ-2C	FVT-2C	FVM-2C	2K	256×8	2.5 to 5.5	4	10	4			
BR25H040	F-2C	FJ-2C	FVT-2C	FVM-2C	4K	512×8	2.5 to 5.5	4	10	4			
BR25H080	F-2C	FJ-2C	FVT-2C	FVM-2C	8K	1K×8	2.5 to 5.5	4	10	4			
BR25H160	F-2C	FJ-2C	FVT-2C	FVM-2C	16K	2K×8	2.5 to 5.5	4	10	4			
BR25H320	F-2C	FJ-2C	FVT-2C	FVM-2C	32K	4K×8	2.5 to 5.5	4	10	4			
BR25H640	F-2C	FJ-2C	FVT-2C	—	64K	8K×8	2.5 to 5.5	5.5	10	4			
BR25H128	F-2C	FJ-2C	—	—	128K	16K×8	2.5 to 5.5	5.5	10	4			
125°C Operation SPI BUS EEPROM BR35Hxxxxx-WC series													
BR35H160	F-WC	FJ-WC	FVT-WC	FVM-WC	16K	2K×8	2.5 to 5.5	3	10	5	-40 to +125	10 <sup>6</sup>	40
BR35H320	F-WC	FJ-WC	FVT-WC	FVM-WC	32K	4K×8	2.5 to 5.5	3	10	5			
BR35H640	F-WC	FJ-WC	FVT-WC	—	64K	8K×8	2.5 to 5.5	5.5	10	5			
BR35H128	F-WC	FJ-WC	—	—	128K	16K×8	2.5 to 5.5	5.5	10	5			

# FeRAM

## Ferroelectric Memory

(LAPIS Semiconductor products)

Memory

Parallel BUS FeRAM MR48Vxxxx Series								
Part No.	Memory Density (bit)	Configuration (word×bit)	Supply Voltage (V)	Operating speed	Read/Write Endurance	Data Retention	Operating Temperature Ta (°C)	Package
<b>New</b> MR48V256C	256K	32K × 8	2.7 to 3.6	t <sub>nc</sub> = 150ns	10 <sup>12</sup> Times	10 years	-40 to +85	TSOP(I)28
I <sup>2</sup> C BUS FeRAM MR44Vxxxx Series								
MR44V064A	64K	8K × 8	2.5 to 3.6	f <sub>clk</sub> = 3.4MHz	10 <sup>12</sup> Times	10 years	-40 to +85	SOP8
SPI BUS FeRAM MR45Vxxxx Series								
MR45V032A	32K	4K × 8	2.7 to 3.6	f <sub>clk</sub> = 15MHz	10 <sup>12</sup> Times	10 years	-40 to +85	SOP8
MR45V256A	256K	32K × 8	3.0 to 3.6	f <sub>clk</sub> = 15MHz				
<b>New</b> MR45V200A	2M	256K × 8	2.7 to 3.6	f <sub>clk</sub> = 34MHz				DIP8

# NOR Flash

(LAPIS Semiconductor products)

Parallel NOR Flash MR29xxxxxxx Series											
Part No.	Supply Voltage (V)	Memory Density (bit)	Configuration (word×bit)	Mode	Page size	Access Time (Address/Page) (ns)	Current Consumption (Max.)		Operating temperature Ta (°C)	Package	Package Frame
							Operating	Standby			
☆MR29V25652B	2.7 to 3.6	256M	16M × 16	NOR	16-word × 16	TBD	TBD	TBD	-40 to +85	TSOP(I)56	—
☆MR29V12852A		128M	8M × 16			70/25	25mA	100uA			—
☆MR29V12852B		128M	8M × 16			TBD	TBD	TBD			—
☆MR29V06452B		64M	4M × 16			TBD	TBD	TBD	-40 to +85	TSOP(I)48	—
☆MR29V03252A		32M	2M × 16			80/25	15mA	30uA			—
☆MR29V03252B		32M	2M × 16			80/25	15mA	30uA			—

☆ : Under Development

# P2ROM™

(LAPIS Semiconductor products)

Parallel BUS Standard P2ROM™									
Part No.	Density (bit)	Configuration (bank × word × bit)	Supply Voltage (V)	Access Time (ns)	Current Consumption (Max.)		Operating temperature (°C)	Package	Package Frame
					Operating	Standby			
MR26T51203L	512M	32M × 16 / 64M × 8	3.0 to 3.6	100	35mA	10μA	0 to +70	TSOP(II)50	—
			2.7 to 3.6	120					
MR37T25602T	256M	16M × 16 / 32M × 8	3.0 to 3.6	100	35mA	10μA		TSOP(I)56	—
			2.7 to 3.6	150					
MR27T25603L	256M	16M × 16 / 32M × 8	3.0 to 3.6	100	35mA	10μA		TSOP(II)50	—
			2.7 to 3.6	120					
MR27T12800L	128M	8M × 16 / 16M × 8	2.7 to 3.6	90	25mA	10μA		TSOP(I)48	—
3.0 to 3.6			80	25mA	10μA				
2.7 to 3.6			90			25mA		10μA	Chip
3.0 to 3.6			85						
MR27T6402L	64M	4M × 16 / 8M × 8	3.0 to 3.6	70	20mA	10μA	SOP44 / TSOP(I)48 / TFBGA48	Cu / TSOP(I)48	
			2.7 to 3.6	90					
			3.0 to 3.6	80	20mA	10μA	-40 to +85		TSOP(I)48
			2.7 to 3.6	90					
MR27V6402L	3.0 to 3.6	70	20mA	10μA	Chip	—			
MR27T3202L	32M	2M × 16 / 4M × 8	3.0 to 3.6	70	20mA	10μA	0 to +70	SOP44 / TSOP(I)48 / TFBGA48	—
			2.7 to 3.6	90					
			3.0 to 3.6	80	20mA	10μA	-40 to +85	TSOP(I)48	
			2.7 to 3.6	90					
MR27V3202L	3.0 to 3.6	80	20mA	10μA	Chip	—			
MR27T1602L	16M	1M × 16 / 2M × 8	2.7 to 3.6	70	16mA	10μA	0 to +70	SOP44 / TSOP(I)48 / TFBGA48	Cu / TSOP(I)48
			3.0 to 3.6	70					
MR27V1602L	3.0 to 3.6	70	16mA	10μA	Chip	—			
MR27T802F	8M	512K × 16 / 1M × 8	2.7 to 3.6	80	18mA	5μA	0 to +70	SOP44 / TSOP(I)48	—
3.0 to 3.6			70						
MR27V802F			3.0 to 3.6	90	18mA	5μA			



Parallel BUS Page mode P2ROM™												
Part No.	Supply Voltage (V)	Density (bit)	Configuration (word × bit)	Mode	Page Size	Access Time (Address/Page) (ns)	Current Consumption (Max.)		Operating Temperature Ta (°C)	Package	Package Frame	
							Operating	Standby				
MR36V01G52B	3.0 to 3.6	1G	64M × 16/128M × 8	NOR	8-word × 16	105/25	100mA	25mA	0 to +70	TSOP(I)56	—	
MR26V51252R		512M	32M × 16/64M × 8			105/25	50mA	4mA			—	
MR37V25652T		256M	16M × 16/32M × 8			100/25	35mA	20μA			—	
MR27V25653L						100/35	60mA	5mA		Chip	—	
MR37V12852B		128M	8M × 16/16M × 8			90/30	50mA	10μA		—		
MR27V12852L						85/30	50mA	10μA		TSOP(I)56	—	
MR27V12850L		64M	4M × 16/8M × 8			85/30	50mA	10μA		—		
MR37V6452B						90/30	50mA	10μA		TSOP(I)48 / Chip	—	
MR27V6452L		2M × 32/4M × 16	2M × 16/4M × 8			90/30	50mA	10μA		—		
MR27V6452R						80/25	40mA	10μA		−40 to +85	TSOP(I)48 / TSOP(I)56	—
MR26V6455J		32M	2M × 16/4M × 8			100/30	100mA	20μA		—		
MR27V3252J						70/25	50mA	10μA		0 to +70	SSOP70	—
MR27V1652L						80/25	60mA	10μA		0 to +70	SOP44 / TSOP(I)48 / Chip	—

SPI BUS P2ROM™									
Part No.	Supply Voltage (V)	Density (bit)	Configuration (word × bit)	Operating Frequency (MHz)		Current Consumption (Max.)		Operating Temperature Tj (°C)	Package
				FAST-READ	READ	Operating*	Standby		
MR37V12841A	3.0 to 3.6	128M	128M × 1	33	20	30mA/20mA*	50μA	0 to +70	SOP16
MR27V6441L		64M	64M × 1	33	20	30mA/20mA*	50μA		SOP16/Chip
MR27V3241L		32M	32M × 1	33	20	40mA/20mA*	50μA		
MR27V1641L		16M	16M × 1	30	20	25mA/20mA*	50μA		

SPI BUS P2ROM™ : \*\* : FAST READ/READ





ICs

# Amplifiers & Linear

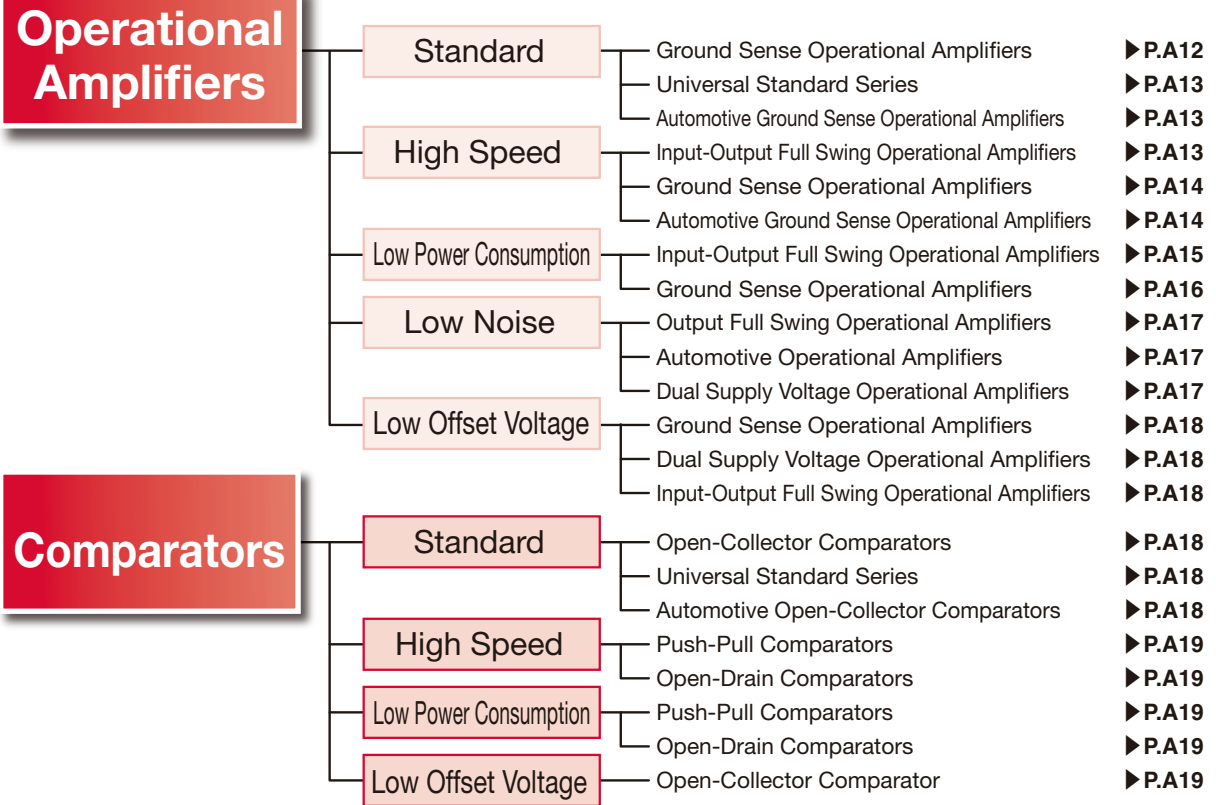
## CONTENTS

<b>Operational Amplifiers</b> .....	<b>P. A12</b>
Standard .....	P. A12
High Speed .....	P. A13
Low Power Consumption .....	P. A15
Low Noise .....	P. A17
Low Offset Voltage .....	P. A18
<b>Comparators</b> .....	<b>P. A18</b>
Standard .....	P. A18
High Speed .....	P. A19
Low Power Consumption .....	P. A19
Low Offset Voltage .....	P. A19
<b>Transistor Arrays</b> .....	<b>P. A20</b>
Darlington Transistor Arrays .....	P. A20

General-purpose ICs

# Operational Amplifiers / Comparators

## Operational Amplifiers / Comparators



## Operational Amplifiers

### Standard

Ground Sense Operational Amplifiers																
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA2904F	○	2	3 to 36	0.5	2.0	20	30	VEE to Vcc-1.5	VEE to Vcc-1.5	100	80	100	0.2	0.5	-40 to +125	SOP8
BA2904FV	○															SSOP-B8
BA2904FVM	○															MSOP8
BA2904SF	○	2	3 to 36	0.5	2.0	20	30	VEE to Vcc-1.5	VEE to Vcc-1.5	100	80	100	0.2	0.5	-40 to +105	SOP8
BA2904SFV	○															SSOP-B8
BA2904SFVM	○															MSOP8
BA2902F	○	4	3 to 36	0.7	2.0	20	30	VEE to Vcc-1.5	VEE to Vcc-1.5	100	80	100	0.2	0.5	-40 to +125	SOP14
BA2902FV	○															SSOP-B14
BA2902SF	○															SOP14
BA2902SFV	○	4	3 to 36	0.7	2.0	20	30	VEE to Vcc-1.5	VEE to Vcc-1.5	100	80	100	0.2	0.5	-40 to +105	SSOP-B14
BA3404F	—	2	4 to 36	2.0	2.0	70	30	VEE to Vcc-2.0	VEE to Vcc-2.0	100	90	94	1.2	1.2	-40 to +85	SOP8
BA3404FJ	—															SOP-J8
BA3404FVM	—															MSOP8
BA10358F	—	2	3 to 32	0.5	2.0	45	20	VEE to Vcc-1.5	VEE to Vcc-1.5	100	80	100	0.2	0.5	-40 to +85	SOP8
BA10358FV	—															SSOP-B8
BA10358FJ	—															SOP-J8
BA10324AF	—	4	3 to 32	0.6	2.0	20	35	VEE to Vcc-1.5	VEE to Vcc-1.5	100	75	100	0.2	0.5	-40 to +85	SOP14
BA10324AFV	—															SSOP-B14
BA10324AFJ	—															SOP-J14

Product Grade : —Standard ○High Grade

Universal Standard Series Ground Sense Operational Amplifiers												
Family	Package	Product Grade	Package					CH	Supply voltage (V)	Operating temperature (°C)	ESD (HBM)	Packing Specification
			SO Package8	TSSOP8	Mini SO8	SO Package14	TSSOP14					
LM358x	-	-	LM358DT	LM358PT	LM358ST	-	-	2	3 to 32	0 to +70	2kV	Reel
			LM358WDT	LM358WPT	-	-	4kV				Reel	
LM2904x	-	-	LM2904DT	LM2904PT	LM2904ST	-	-	2	3 to 32	-40 to +125	2kV	Reel
			LM2904WDT	LM2904WPT	-	-	4kV				Reel	
LM324x	-	-	-	-	-	LM324DT	LM324PT	4	3 to 32	0 to +70	2kV	Reel
			-	-	-	LM324WDT	-				4kV	Reel
LM2902x	-	-	-	-	-	LM2902DT	LM2902PT	4	3 to 32	-40 to +125	2kV	Reel
			-	-	-	LM2902WDT	-				4kV	Reel

Automotive Ground Sense Operational Amplifiers																
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Output voltage range (V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA2904YF-C	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SOP8
BA2904YFV-C	●	2	3 to 36	0.5	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> -1.5	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	80	100	0.2	0.5	-40 to +125	SSOP-B8
BA2904YFVM-C	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MSOP8
BA2902YF-C	●	4	3 to 36	0.7	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> -1.5	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	80	100	0.2	0.5	-40 to +125	SOP14
BA2902YFV-C	●															SSOP-B14
BA2904YF-M	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SOP8
BA2904YFV-M	●	2	3 to 36	0.5	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> -1.5	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	80	100	0.2	0.5	-40 to +125	SSOP-B8
BA2904YFVM-M	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	MSOP8
BA2902YF-M	●	4	3 to 36	0.7	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> -1.5	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	80	100	0.2	0.5	-40 to +125	SOP14
BA2902YFV-M	●															SSOP-B14

Product Grade : ●---Standard ●---Automotive

### High Speed

Input-Output Full Swing Operational Amplifiers																
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Output voltage range (V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BU7261G	-	1	1.8 to 5.5	250	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.1	2.0	-40 to +85	SSOP5
BU7261SG	○														-40 to +105	SSOP5
BU7262F	-	2	1.8 to 5.5	550	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.1	2.0	-40 to +85	SOP8
BU7262FVM	-															MSOP8
BU7262NUX	-															VSON008X2030
BU7262SF	○															SOP8
BU7262SFVM	○	2	1.8 to 5.5	550	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.1	2.0	-40 to +105	MSOP8
BU7262SNUX	○														VSON008X2030	
BU7264F	-	4	1.8 to 5.5	1100	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.1	2.0	-40 to +85	SOP14
BU7264FV	-														SSOP-B14	
BU7264SF	○														-40 to +105	SOP14
BU7264SFV	○														SSOP-B14	
BU7291G	-	1	2.4 to 5.5	470	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	3.0	2.8	-40 to +85	SSOP5
BU7291SG	○														-40 to +105	SSOP5
BU7294F	-	4	2.4 to 5.5	2000	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	3.0	2.8	-40 to +85	SOP14
BU7294FV	-														SSOP-B14	
BU7294SF	○														-40 to +105	SOP14
BU7294SFV	○														SSOP-B14	
BU7295HFV	-	1	1.8 to 5.5	150	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.0	1.0	-40 to +85	HVSOF5
BU7295SHFV	○														-40 to +105	HVSOF5
BU7255HFV	-	1	2.4 to 5.5	540	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	3.4	4.0	-40 to +85	HVSOF5
BU7255SHFV	○														-40 to +105	HVSOF5
BD7561G	-	1	5 to 14.5	440	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.9	1.0	-40 to +85	SSOP5
BD7561SG	○														-40 to +105	SSOP5
BD7562F	-	2	5 to 14.5	900	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.9	1.0	-40 to +85	SOP8
BD7562FVM	-														MSOP8	
BD7562SF	○														-40 to +105	SOP8
BD7562SFVM	○														MSOP8	

Product Grade : ●---Standard ○---High Grade

**High Speed**
**A Amplifiers & Linear**

Ground Sense Operational Amplifiers																	
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package	
BA3472F	—	2	3 to 36	4.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +85	SOP8	
BA3472FV	—															SSOP-B8	
BA3472FJ	—															SOP-J8	
BA3472FVM	—															MSOP8	
BA3472FVT	—															TSSOP-B8	
BA3472RFVM	○															-40 to +105	MSOP8
BA3474F	—	4	3 to 36	8.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +85	SOP14	
BA3474FV	—															SSOP-B14	
BA3474FVJ	—															TSSOP-B14J	
BA3474RFV	○															-40 to +105	SSOP-B14
BU7461G	—	1	1.7 to 5.5	0.15	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.0	1.0	-40 to +85	SSOP5	
BU7461SG	○															-40 to +105	SSOP5
BU7462F	—	2	1.7 to 5.5	0.3	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.0	1.0	-40 to +85	SOP8	
BU7462FVM	—															MSOP8	
BU7462NUX	—															VSON008X2030	
BU7462SF	○															-40 to +105	SOP8
BU7462SFVM	○	MSOP8															
BU7462SNUX	○	VSON008X2030															
BU7464F	—	4	1.7 to 5.5	0.6	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	1.0	1.0	-40 to +85	SOP14	
BU7464SF	○															-40 to +105	SOP14
BU7481G	—	1	1.8 to 5.5	0.42	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	3.2	2.8	-40 to +85	SSOP5	
BU7481SG	○															-40 to +105	SSOP5
BU7485G	—	1	3.0 to 5.5	1.5	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.4	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	10	10.0	-40 to +85	SSOP5	
BU7485SG	○															-40 to +105	SSOP5
BU7486F	—	2	3.0 to 5.5	3.0	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.4	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	10	10.0	-40 to +85	SOP8	
BU7486FV	—															SSOP-B8	
BU7486FVM	—															MSOP8	
BU7486SF	○															-40 to +105	SOP8
BU7486SFV	○																SSOP-B8
BU7486SFVM	○																MSOP8
BU7487F	—	4	3.0 to 5.5	6.0	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.4	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	105	60	80	10	10.0	-40 to +85	SOP14	
BU7487FV	—															SSOP-B14	
BU7487SF	○															-40 to +105	SOP14
BU7487SFV	○																SSOP-B14
BU7465HFV	—	1	1.7 to 5.5	0.12	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	1.0	1.2	-40 to +85	HVSOF5	
BU7465SHFV	○															-40 to +105	HVSOF5
BU7495HFV	—	1	1.8 to 5.5	0.65	1.0	0.001	7	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	5.0	4.0	-40 to +85	HVSOF5	
BU7495SHFV	○															-40 to +105	HVSOF5

Automotive Ground Sense Operational Amplifiers																
BA3472YF-C	●	2	3 to 36	4.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +125	SOP8
BA3472YFV-C	●															SSOP-B8
BA3472YFVM-C	●															MSOP8
BA3474YFV-C	●	4	3 to 36	8.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +125	SSOP-B14
BA3472WFV-C	●	2	3 to 36	4.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +125	SSOP-B8
BA3474WFV-C	●	4	3 to 36	8.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -1.0	100	97	97	10	4.0	-40 to +125	SSOP-B14

Product Grade : —Standard ○High Grade ●Automotive

## Low Power Consumption

Input-Output Full Swing Operational Amplifiers																
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (µA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/µs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BU7241G	—	1	1.8 to 5.5	70	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.4	0.9	-40 to +85	SSOP5
BU7241SG	○														-40 to +105	SSOP5
BU7242F	—	2	1.8 to 5.5	180	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.4	0.9	-40 to +85	SOP8
BU7242FVM	—															MSOP8
BU7242NUX	—															VSON008X2030
BU7242SF	○															SOP8
BU7242SFVM	○	2	1.8 to 5.5	180	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.4	0.9	-40 to +105	MSOP8
BU7242SNUX	○															VSON008X2030
BU7244F	—	4	1.8 to 5.5	360	1.0	0.001	10	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.4	0.9	-40 to +85	SOP14
BU7244FV	—															SSOP-B14
BU7244SF	○														-40 to +105	SOP14
BU7244SFV	○															SSOP-B14
BU7271G	—	1	1.8 to 5.5	8.6	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	0.05	0.09	-40 to +85	SSOP5
BU7271SG	○														-40 to +105	SSOP5
BU7265G	—	1	1.8 to 5.5	0.35	1.0	0.001	2.4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.0024	0.004	-40 to +85	SSOP5
BU7265SG	○														-40 to +105	SSOP5
BU7266F	—	2	1.8 to 5.5	0.7	1.0	0.001	2.4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.0024	0.004	-40 to +85	SOP8
BU7266FV	—															SSOP-B8
BU7266FVM	—															MSOP8
BU7266SF	○															SOP8
BU7266SFV	○	2	1.8 to 5.5	0.7	1.0	0.001	2.4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.0024	0.004	-40 to +105	SSOP-B8
BU7266SFVM	○															MSOP8
BU7275HFV	—	1	1.8 to 5.5	40	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +85	HVSOF5
BU7275SHFV	○														-40 to +105	HVSOF5
BU7205HFV	—	1	1.8 to 5.5	0.4	1.0	0.001	1.2	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.0025	0.0025	-40 to +85	HVSOF5
BU7205SHFV	○														-40 to +105	HVSOF5
BU7245HFV	—	1	1.8 to 5.5	5	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.035	0.09	-40 to +85	HVSOF5
BU7245SHFV	○														-40 to +105	HVSOF5
BD7541G	—	1	5 to 14.5	180	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +85	SSOP5
BD7541SG	○														-40 to +105	SSOP5
BD7542F	—	2	5 to 14.5	400	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +85	SOP8
BD7542FVM	—															MSOP8
BD7542SF	○	2	5 to 14.5	400	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +105	SOP8
BD7542SFVM	○															MSOP8
BD12730G	—	1	1.8 to 6.0	320	1.0	50	5	GND to V <sub>+</sub>	0.1 to V <sub>-</sub> -0.1	85	70	85	0.4	1.0	-40 to +85	SSOP5
BD12732F	—															SOP8
<b>New</b> BD12732FJ	—															SOP-J8
<b>New</b> BD12732FV	—	2	1.8 to 6.0	580	1.0	50	5	GND to V <sub>+</sub>	0.1 to V <sub>-</sub> -0.1	85	70	85	0.4	1.0	-40 to +85	SSOP-B8
<b>New</b> BD12732FVT	—															TSSOP-B8
<b>New</b> BD12732FVM	—															MSOP8
<b>New</b> BD12732FVJ	—															TSSOP-B8J
BD12734F	—															SOP14
<b>New</b> BD12734FJ	—	4	1.8 to 6.0	1200	1.0	50	5	GND to V <sub>+</sub>	0.1 to V <sub>-</sub> -0.1	85	70	85	0.4	1.0	-40 to +85	SOP-J14
<b>New</b> BD12734FV	—															SSOP-B14
<b>New</b> BD12734FVJ	—															TSSOP-B14J
LMR931G	—	1	1.8 to 5.0	80	1.0	5	28	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.04 to V <sub>DD</sub> -0.05	100	94	85	0.4	1.4	-40 to +85	SSOP5
LMR932F	—															SOP8
<b>New</b> LMR932FJ	—															SOP-J8
<b>New</b> LMR932FV	—	2	1.8 to 5.0	135	1.0	5	28	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.04 to V <sub>DD</sub> -0.05	100	94	85	0.4	1.4	-40 to +85	SSOP-B8
<b>New</b> LMR932FVT	—															TSSOP-B8
<b>New</b> LMR932FVM	—															MSOP8
<b>New</b> LMR932FVJ	—															TSSOP-B8J
LMR934F	—															SOP14
<b>New</b> LMR934FJ	—	4	1.8 to 5.0	250	1.0	5	28	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.04 to V <sub>DD</sub> -0.05	100	94	85	0.4	1.4	-40 to +85	SOP-J14
<b>New</b> LMR934FV	—															SSOP-B14
<b>New</b> LMR934FVJ	—															TSSOP-B14J
LMR981G	—	1	1.8 to 5.0	80	1.0	5	28	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.04 to V <sub>DD</sub> -0.05	100	94	85	0.4	1.4	-40 to +85	SSOP6
LMR982FVM	—	2	1.8 to 5.0	135	1.0	5	28	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.04 to V <sub>DD</sub> -0.05	100	94	85	0.4	1.4	-40 to +85	MSOP10

Product Grade : —Standard ○High Grade

**Low Power Consumption**
**A**
**Amplifiers & Linear**

Ground Sense Operational Amplifiers																
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BU7441G	—	1	1.7 to 5.5	50	1.0	0.001	6	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +85	SSOP5
BU7441SG	○														-40 to +105	SSOP5
BU7442F	—															SOP8
BU7442FVM	—	2	1.7 to 5.5	100	1.0	0.001	6	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +85	MSOP8
BU7442NUX	—															VSON008X2030
BU7442SF	○															SOP8
BU7442SFVM	○	2	1.7 to 5.5	100	1.0	0.001	6	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +105	MSOP8
BU7442SNUX	○															VSON008X2030
BU7444F	—														-40 to +85	SOP14
BU7444SF	○	4	1.7 to 5.5	200	1.0	0.001	6	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.3	0.6	-40 to +105	SOP14
BU7421G	—														-40 to +85	SSOP5
BU7421SG	○	1	1.7 to 5.5	8.5	1.0	0.001	4	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	0.05	0.09	-40 to +105	SSOP5
BU7411G	—														-40 to +85	SSOP5
BU7411SG	○	1	1.6 to 5.5	0.35	1.0	0.001	2.4	V <sub>SS</sub> to V <sub>DD</sub> -1.0	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	95	60	80	0.0024	0.004	-40 to +105	SSOP5
BU7445HFV	—														-40 to +85	HVSOF5
BU7445SHFV	○	1	1.7 to 5.5	40	1.0	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	0.25	0.4	-40 to +105	HVSOF5
BU7475HFV	—														-40 to +85	HVSOF5
BU7475SHFV	○	1	1.7 to 5.5	9	1.0	0.001	7	V <sub>SS</sub> to V <sub>DD</sub> -1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	60	80	0.05	0.1	-40 to +105	HVSOF5
BD1321G	—	1	2.7 to 5.5	130	0.1	15	70	V <sub>EE</sub> to V <sub>CC</sub> -0.8	V <sub>EE</sub> +0.08 to V <sub>CC</sub> -0.04	110	90	90	1.0	3.0	-40 to +85	SSOP5
LMR321G	—	1	2.7 to 5.5	130	0.1	15	70	V <sub>EE</sub> to V <sub>CC</sub> -0.8	V <sub>EE</sub> +0.08 to V <sub>CC</sub> -0.04	110	90	90	1.0	3.0	-40 to +85	SSOP5
LMR358F	—															SOP8
LMR358FJ	—															SOP-J8
LMR358FV	—														-40 to +85	SSOP-B8
LMR358FVT	—	2	2.7 to 5.5	210	0.1	15	70	V <sub>EE</sub> to V <sub>CC</sub> -0.8	V <sub>EE</sub> +0.08 to V <sub>CC</sub> -0.04	110	90	90	1.0	3.0	-40 to +85	TSSOP-B8
LMR358FVM	—															MSOP8
LMR358FVJ	—															TSSOP-B8J
LMR324F	—															SOP14
LMR324FJ	—														-40 to +85	SOP-J14
LMR324FV	—	4	2.7 to 5.5	410	1.0	15	70	V <sub>EE</sub> to V <sub>CC</sub> -0.8	V <sub>EE</sub> +0.08 to V <sub>CC</sub> -0.04	110	90	90	1.0	3.0	-40 to +85	SSOP-B14
LMR324FVJ	—															TSSOP-B14J
LMR821G	—	1	2.5 to 5.5	280	1.0	30	16	V <sub>SS</sub> to V <sub>DD</sub> -0.9	V <sub>SS</sub> +0.12 to V <sub>DD</sub> -0.1	100	85	85	2.0	5.0	-40 to +85	SSOP5
<b>New</b> LMR822F	—															SOP8
<b>New</b> LMR822FJ	—															SOP-J8
<b>New</b> LMR822FV	—														-40 to +85	SSOP-B8
<b>New</b> LMR822FVT	—	2	2.5 to 5.5	560	1.0	30	16	V <sub>SS</sub> to V <sub>DD</sub> -0.9	V <sub>SS</sub> +0.12 to V <sub>DD</sub> -0.1	100	85	85	2.0	5.0	-40 to +85	TSSOP-B8
<b>New</b> LMR822FVM	—															MSOP8
<b>New</b> LMR822FVJ	—															TSSOP-B8J
<b>New</b> LMR341G	—	1	2.7 to 5.5	100	0.25	0.001	24	V <sub>SS</sub> to V <sub>DD</sub> -1.0	V <sub>SS</sub> +0.06 to V <sub>DD</sub> -0.06	103	80	85	1.0	2.0	-40 to +85	SSOP5
<b>New</b> LMR342F	—															SOP8
<b>New</b> LMR342FJ	—															SOP-J8
<b>New</b> LMR342FV	—														-40 to +85	SSOP-B8
<b>New</b> LMR342FVT	—	2	2.7 to 5.5	200	0.25	0.001	24	V <sub>SS</sub> to V <sub>DD</sub> -1.0	V <sub>SS</sub> +0.06 to V <sub>DD</sub> -0.06	103	80	85	1.0	2.0	-40 to +85	TSSOP-B8
<b>New</b> LMR342FVM	—															MSOP8
<b>New</b> LMR342FVJ	—															TSSOP-B8J

Product Grade : —Standard ○High Grade

## Low Noise

## Output Full Swing Operational Amplifiers

Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage (mV)	Input bias current (nA)	Input referred noise voltage (μV/rms)	Input voltage range (V)	Output voltage range (V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA4510F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4510FV	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SSOP-B8
BA4510FVM	—	2	±1 to ±3.5	5.0	1.0	80	0.7	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +0.1 to V <sub>CC</sub> -0.1	90	80	80	5.0	10.0	-20 to +75	MSOP8
BA4510FVT	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA2107G	—	1	±1 to ±7	1.8	1.0	150	0.9	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -0.3	80	74	80	4.0	12.0	-40 to +85	SSOP5
BA2115F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA2115FJ	—	2	±1 to ±7	3.5	1.0	150	0.9	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +0.3 to V <sub>CC</sub> -0.3	80	74	80	4.0	12.0	-40 to +85	SOP-J8
BA2115FVM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8

## Automotive Operational Amplifier

BA4558YF-M	●	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4558YFV-M	●	2	±4 to ±15	3.0	0.5	60	1.8	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	1.0	2.0	-40 to +105	SSOP-B8
BA4558YFVM-M	●	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4560YF-M	●	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4560YFV-M	●	2	±4 to ±15	3.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	4.0	4.0	-40 to +105	SSOP-B8
BA4560YFVM-M	●	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4580YF-M	●	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4580YFV-M	●	2	±2 to ±16	6.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	110	110	5.0	10.0	-40 to +105	MSOP8
BA4584YFV-M	●	4	±2 to ±16	11.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	110	110	5.0	10.0	-40 to +105	SSOP-B14

## Dual Supply Voltage Operational Amplifiers

BA4558F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4558FJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
BA4558FV	—	2	±4 to ±15	3.0	0.5	60	1.8	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	1.0	2.0	-40 to +85	SSOP-B8
BA4558FVM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4558FVT	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA4558RF	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4558RFJ	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
BA4558RFV	○	2	±4 to ±15	3.0	0.5	60	1.8	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	1.0	2.0	-40 to +105	SSOP-B8
BA4558RFVM	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4558RFVT	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA4560F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4560FJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
BA4560FV	—	2	±4 to ±15	4.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	4.0	10.0	-40 to +85	SSOP-B8
BA4560FVM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4560FVT	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA4560RF	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4560RFJ	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
BA4560RFV	○	2	±4 to ±15	3.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	4.0	4.0	-40 to +105	SSOP-B8
BA4560RFVM	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
BA4560RFVT	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA4564RFV	○	4	±4 to ±15	6.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	4.0	4.0	-40 to +105	SSOP-B14
BA15218F	—	2	±2 to ±16	5.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +2.0 to V <sub>CC</sub> -2.0	110	90	90	3.0	10.0	-40 to +85	SOP8
BA14741F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP14
BA14741FJ	—	4	±2 to ±18	3.0	1.0	60	2.0	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +2.5 to V <sub>CC</sub> -2.5	100	100	100	1.0	2.0	-40 to +85	SOP-J14
BA15532F	—	2	±3 to ±20	8.0	0.5	200	1.5	V <sub>EE</sub> +2.0 to V <sub>CC</sub> -2.0	V <sub>EE</sub> +2.0 to V <sub>CC</sub> -2.0	94	100	100	8.0	20.0	-20 to +75	SOP8
BA4580RF	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
BA4580RFJ	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
BA4580RFV	○	2	±2 to ±16	6.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	110	110	5.0	5.0	-40 to +105	MSOP8
BA4580RFVT	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8
BA4584FV	—	4	±2 to ±16	12.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	110	110	5.0	5.0	-40 to +85	SSOP-B14
BA4584RF	○	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP14
BA4584RFV	○	4	±2 to ±9.5	11.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	110	110	5.0	5.0	-40 to +105	SSOP-B14
LM4559F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
New LM4559FJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
New LM4559FV	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SSOP-B8
New LM4559FVT	—	2	±4 to ±18	3.3	0.5	40	0.7	V <sub>EE</sub> +2.0 to V <sub>CC</sub> -2.0	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	100	100	3.5	4.0	-40 to +85	TSSOP-B8
New LM4559FVM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
New LM4559FVJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8J
LM4565F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP8
New LM4565FJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SOP-J8
New LM4565FV	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	SSOP-B8
New LM4565FVT	—	2	±4 to ±18	4.5	0.5	70	0.6	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	100	100	5.0	10.0	-40 to +85	TSSOP-B8
New LM4565FVM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	MSOP8
New LM4565FVJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	TSSOP-B8J

Product Grade : —Standard ○High Grade ●Automotive



**Low Offset Voltage**
**A**
**Amplifiers & Linear**
**Ground Sense Operational Amplifiers**

Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BU5281G	—	1	1.8 to 5.5	0.75	0.1	0.001	8	V <sub>SS</sub> to V <sub>DD</sub> - 1.2	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	110	60	80	2.0	3.0	-40 to +85	SSOP5
BU5281SG	○														-40 to +105	SSOP5
BA2904WF	○	2	3 to 36	0.5	0.5	20	30	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	80	100	0.2	0.5	-40 to +125	SOP8
BA2904WV	○														-40 to +125	SSOP-B8

**Dual Supply Voltage Operational Amplifiers**

BA4564WV	○	4	± 4 to ± 15	6.0	0.5	50	25	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> -1.0	100	90	90	4.0	4.0	-40 to +105	SSOP-B14
BA8522RF	○	2	± 2 to ± 16	5.5	0.1	50	50	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> -1.5	110	90	90	3.0	6.0	-40 to +105	SOP8
BA8522RFV	○														-40 to +105	SSOP-B8
BA8522RFVM	○														-40 to +105	MSOP8

**Input-Output Full Swing Operational Amplifiers**

BD5291G	—	1	1.7 to 5.5	0.65	0.1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	110	90	90	2.5	3.2	-40 to +85	SSOP5
<b>New</b> LM7101G	—	1	1.8 to 5.0	1.05	0.1	0.001	80	V <sub>SS</sub> to V <sub>DD</sub>	V <sub>SS</sub> +0.1 to V <sub>DD</sub> -0.1	100	90	100	1.2	1.5	-40 to +85	SSOP5

Product Grade : —Standard ○High Grade

# Comparators

**Standard**
**Open-Collector Comparators**

Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BA8391G	—	1	2 to 36	0.3	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +85	SSOP5
BA2903F	○											SOP8
BA2903FV	○	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SSOP-B8
BA2903FVM	○											MSOP8
BA2903SF	○	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +105	SOP8
BA2903SFV	○											SSOP-B8
BA2903SFVM	○											MSOP8
BA2901F	○	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SOP14
BA2901FV	○											SSOP-B14
BA2901SF	○	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +105	SOP14
BA2901SFV	○											SSOP-B14
BA10393F	—	2	2 to 36	0.4	1	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	106	1.3	-40 to +85	SOP8
BA10393F	—	4	3 to 36	0.8	1	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	106	1.3	-40 to +85	SOP14
BA10393FV	—											SSOP-B14

**Universal Standard Series Open-Collector Comparators**

Family	Package	Product Grade	Package					CH	Supply Voltage (V)	Operating Temperature (°C)	ESD (HBM)	Packing Specification
			SO Package8	TSSOP8	Mini SO8	SO Package14	TSSOP14					
LM393x	—	—	LM393DT	LM393PT	LM393ST	—	2	2 to 36	0 to +70	2kV	Reel	
			LM393WDT	LM393WPT	—	—					4kV	Reel
LM2903x	—	—	LM2903DT	LM2903PT	—	—	2	2 to 36	-40 to +125	2kV	Reel	
LM339x	—	—	—	—	—	—	4	2 to 36	0 to +70	2kV	Reel	
LM2901x	—	—	—	—	—	—	4	2 to 36	-40 to +125	2kV	Reel	

**Automotive Open-Collector Comparators**

Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BA2903YF-C	●	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SOP8
BA2903YFV-C	●											SSOP-B8
BA2903YFVM-C	●											MSOP8
BA2901YF-C	●	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SOP14
BA2901YFV-C	●											SSOP-B14
BA2903YF-M	●	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SOP8
BA2903YFV-M	●											SSOP-B8
BA2903YFVM-M	●											MSOP8
BA2901YF-M	●	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	1.3	-40 to +125	SOP14
BA2901YFV-M	●											SSOP-B14

Product Grade : —Standard ○High Grade ●Automotive



## High Speed

Push-Pull Comparators												
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BU7251G	—	1	1.8 to 5.5	15	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	0.55	-40 to +85	SSOP5
BU7251SG	○										-40 to +105	SSOP5
BU7252F	—	2	1.8 to 5.5	35	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	0.55	-40 to +85	SOP8
BU7252FVM	—										-40 to +85	MSOP8
BU7252SF	○	2	1.8 to 5.5	35	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	0.55	-40 to +105	SOP8
BU7252SFVM	○										-40 to +105	MSOP8
BU5265HFV	—	1	1.8 to 5.5	22	1	0.001	3.5	V <sub>SS</sub> to V <sub>DD</sub>	90	0.5	-40 to +85	HVSOP5
BU5265SHFV	○										-40 to +105	HVSOP5

Open-Drain Comparators												
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BU7250G	—	1	1.8 to 5.5	15	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	0.75	-40 to +85	SSOP5
BU7250SG	○										-40 to +105	SSOP5
BU7253F	—	2	1.8 to 5.5	35	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	0.75	-40 to +85	SOP8
BU7253SF	○										-40 to +105	SOP8

Product Grade : —Standard ○High Grade

## Low Power Consumption

Push-Pull Comparators												
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BU7231G	—	1	1.8 to 5.5	5	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	1.7	-40 to +85	SSOP5
BU7231SG	○										-40 to +105	SSOP5
BU7232F	—	2	1.8 to 5.5	10	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	1.7	-40 to +85	SOP8
BU7232FVM	—										-40 to +85	MSOP8
BU7232SF	○	2	1.8 to 5.5	10	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	1.7	-40 to +105	SOP8
BU7232SFVM	○										-40 to +105	MSOP8
BU5255HFV	—	1	1.8 to 5.5	6.5	1	0.001	3.5	V <sub>SS</sub> to V <sub>DD</sub>	90	1.6	-40 to +85	HVSOP5
BU5255SHFV	○										-40 to +105	HVSOP5

Open-Drain Comparators												
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (μA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BU7230G	—	1	1.8 to 5.5	5	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	1.8	-40 to +85	SSOP5
BU7230SG	○										-40 to +105	SSOP5
BU7233F	—	2	1.8 to 5.5	10	1	0.001	6	V <sub>SS</sub> to V <sub>DD</sub>	90	1.8	-40 to +85	SOP8
BU7233SF	○										-40 to +105	SOP8

Product Grade : —Standard ○High Grade

## Low Offset Voltage

Open-Collector Comparator												
Part No.	Product Grade	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage (mV)	Input bias current (nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BA2903WF	○	2	2 to 36	0.6	0.5	50	16	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	1.3	-40 to +125	SOP8
BA2903WFV	○											SSOP-B8

Product Grade : —Standard ○High Grade

# Transistor Arrays

## Darlington Transistor Arrays

**A**
**Amplifiers & Linear**
**Open Collector**

Part No.	Number of bit	Output Withstand Voltage (V)	Output Saturation Voltage (V)	Output Current (mA)	Input Resistance (kΩ)	Input/output relation	Input Active Level	Output Current relation	Circuit Construction	Features	Package
<b>BA12003B</b>	7	60	1.46*	500	2.7	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	DIP16
<b>BA12003BF</b>	7	60	1.46*	500	2.7	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	SOP16
<b>BA12004B</b>	7	60	1.46*	500	10.5	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	DIP16
<b>BA12004BF</b>	7	60	1.46*	500	10.5	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	SOP16

\* Output Current=350mA



ICs

# Clocks & Timers

## CONTENTS

### High-performance Clock Generators ICs ..... P. A22

Clock Generators for Digital Cameras ..... P. A22

DVD-Audio Reference Clock Generators ..... P. A22

DVD-Video Reference Clock Generators for A/V Equipments ..... P. A22

Clock Generator with Built-in VCXO for A/V Equipments ..... P. A22

### Real Time Clocks ICs ..... P. A22

Real Time Clocks with High-precision Oscillation Adjustment ..... P. A22

# High-performance Clock Generators ICs

**A**  
**Clocks & Timers**

Clock Generators for Digital Cameras													
Part No.	Supply voltage (V)	Reference frequency (MHz)	Video clock (The output which can be selected) (MHz)			CCD clock (The output which can be selected) (MHz)			USB clock (MHz)	Jitter 1 $\sigma$ Typ. (ps)	Package		
BU2394KN	3.0 to 3.6	14.318182 (28.636363)	14.318182 17.734450			135.000000 108.000000 98.181818 110.000000			48.008022	30	VQFN20		
BU2396KN	3.0 to 3.6	12.000000	27.000000			24.000000 30.000000 36.000000			12.000000	50	VQFN20		

DVD-Audio Reference Clock Generators														
Part No.	Supply voltage (V)	Reference frequency (MHz)	Output frequency (MHz)								Jitter 1 $\sigma$ Typ. (ps)	C/N Typ. (dB)	Package	
			DVD-video clock			DVD, Audio, CD clock (The output which can be switched)				System clock				
			Video1	Video2	Video3	768fs	512fs	384fs	256fs	768fs				384fs
BU2363FV	3.0 to 3.6	36.8640	54.0000	27.0000	—	36.8640 33.8688	—	18.4320 16.9344	—	33.8688	16.9344	50	— 75 (Video)	SSOP-B16

DVD-Video Reference Clock Generators for A/V Equipments															
Part No.	Supply voltage (V)	Reference frequency (MHz)	Output frequency (MHz)									Jitter 1 $\sigma$ Typ. (ps)	Long-term Jitter P-P Typ. (ns)	Package	
			DVD-video clock			DVD, Audio, CD clock (The output which can be switched)				System clock					
			Video1	Video2	Video3	768fs	512fs	384fs	Other	768fs	384fs				other
BU2280FV	3.0 to 3.6	27.0000	27.0000	—	—	36.8640 33.8688	24.5760 22.5792	18.4320 16.9344	—	33.8688	—	—	70	8 (Audio)	SSOP-B24
BU2360FV	2.7 to 3.6	27.0000	27.0000	—	—	—	24.5760 22.5792	—	—	33.8688	—	—	70	2.5 (Audio)	SSOP-B16
BU2362FV	2.7 to 3.6	27.0000	27.0000	—	—	—	24.5760 22.5792	—	36.8640 16.9344	33.8688	16.9344	36.8640	70	12 (Audio)	SSOP-B16

Clock Generator with Built-in VCXO for A/V Equipments															
Part No.	Supply voltage (V)	VCXO (Reference clock)	Clock Buffer	PLL output frequency (MHz)								Jitter 1 $\sigma$ Typ.(ps)	C/N Typ.(dB)	Package	
				DVD-video clock			DVD, Audio, CD clock (The output which can be switched)			System clock					
				Video1	Video2	Video3	768fs	512fs	384fs	other	768fs				512fs
BU3087FV	3.135 to 3.465	Tuning range 27MHz $\pm$ 105ppm Typ.	—	27.000000	—	74.250000 Modulation $\pm$ 0.25% $\pm$ 0.50% $\pm$ 0.75% $\pm$ 1.00%	—	—	—	—	—	—	30	HD – Video – 70	SSOP-B16

Clock Generators for Digital Cameras : Three types of clocks generated-CCD, USB, and a Video  
 DVD-Audio Reference Clock Generators : DVD/CD-audio, DVD-video clock generation using the DVD-video reference clock  
 DVD-Video Reference Clock Generators for A/V Equipments : DVD/CD-audio, DVD-video clock generation using the DVD-video reference clock  
 Clock Generator with Built-in VCXO for A/V Equipments : VCXO is Built-in with high-precision external synchronization

# Real Time Clocks ICs

Real Time Clocks with High-precision Oscillation Adjustment								
Part No.	I/F	Supply Voltage (V)	Time keeping Voltage (V)	Time keeping current (Typ.)( $\mu$ A)	Time keeping current (Max.)( $\mu$ A)	Operating frequency 1 (Max.)(kHz)	Operating frequency 2 (Max.)(kHz)	Package
<b>New</b> BU9873F	I <sup>2</sup> C	1.8 to 5.5	1.45 to 5.5	0.4 (V <sub>DD</sub> =3V, Ta=25°C)	1.0 (V <sub>DD</sub> =3V, Ta=40°C to 85°C)	100 (V <sub>DD</sub> =1.8V to 2.5V)	400 (V <sub>DD</sub> =2.5V to 5.5V)	SOP8
<b>New</b> BU9873FJ								SOP-J8
<b>New</b> BU9873FVM								MSOP8
<b>New</b> BU9873FVT								TSSOP-B8
<b>New</b> BU9873NUX								VSON008X2030



ICs

# Switch & Multiplexer & Logic

## CONTENTS

<b>Standard Logic</b> .....	<b>P. A24</b>
Analog Switch / Analog Switch (Single type) .....	P. A24
Multiplexer .....	P. A24
Logic Gates .....	P. A24
Logic Gates (Single type) .....	P. A24
Function Logic .....	P. A24
<b>Serial-in / Parallel-out Drivers</b> .....	<b>P. A25</b>
Serial / Parallel 2-input Drivers .....	P. A25
Serial / Parallel 4-input Drivers .....	P. A25
<b>USB Switch ICs</b> .....	<b>P. A25</b>
SP Type (Single Pole) .....	P. A25
DP Type (Double Pole) .....	P. A25
Built-in OVP Micro USB Switch with USB2.0, MHL™ and Audio .....	P. A25

# Standard Logic

**A**
**Switch & Multiplexer & Logic**

Analog Switch / Analog Switch (Single type)													
Type	Part No.				Function	Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	ON resistance (Ω)	Control-output propagation delay time (ns)	In-Out propagation delay time (ns)	Max. propagation Frequency (MHz)	
	DIP16(14)	SOP16(14)	SSOP-B16(14)	SSOP5									
<b>BU4066BC</b>	BU4066BC	BU4066BCF	BU4066BCFV	—	Quad Analog Switch	3 to 18	3.5(Min.)	1.5(Max.)	950(Max.)	60(Typ.)	20(Typ.)	—	
<b>BU4S66</b>	—	—	—	BU4S66G2	Single Analog Switch	3 to 16	3.5(Min.)	1.5(Max.)	950(Max.)	80(Typ.)	15(Typ.)	—	
Multiplexer													
Type	Part No.			Function	Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	ON resistance (Ω)	Control-output propagation delay time (ns)	In-Out propagation delay time (ns)	Max. propagation Frequency (MHz)		
	DIP16(14)	SOP16(14)	SSOP-B16(14)										
<b>BU4051BC</b>	BU4051BC	BU4051BCF	BU4051BCFV	—	Analog Multiplexer/Demultiplexer(8→1)	3 to 18	3.5(Min.)	1.5(Max.)	950(Max.)	170(Typ.)	15(Typ.)	20(Typ.)	
<b>BU4052BC</b>	BU4052BC	BU4052BCF	BU4052BCFV	—	Dual Analog Multiplexer/Demultiplexer(4→1)	3 to 18	3.5(Min.)	1.5(Max.)	950(Max.)	170(Typ.)	15(Typ.)	20(Typ.)	
<b>BU4053BC</b>	BU4053BC	BU4053BCF	BU4053BCFV	—	Triple Analog Multiplexer/Demultiplexer(2→1)	3 to 18	3.5(Min.)	1.5(Max.)	950(Max.)	170(Typ.)	15(Typ.)	20(Typ.)	
<b>BU4551B</b>	BU4551B	BU4551BF	BU4551BFV	—	Quad Analog Multiplexer/Demultiplexer(2→1)	3 to 16	3.5(Min.)	1.5(Max.)	1100(Max.)	360(Typ.)	35(Typ.)	15(Typ.)	
Logic Gates													
Type	Part No.			Function	Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	Hysteresis voltage (V)	H Output voltage I <sub>out</sub> =0mA (V)	L Output voltage I <sub>out</sub> =0mA (V)	Propagation delay time (ns)		
	DIP14	SOP14	SSOP-B14										
<b>BU4001B</b>	BU4001B	BU4001BF	—	Quad 2-Input NOR Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)		
<b>BU4011B</b>	BU4011B	BU4011BF	BU4011BFV	Quad 2-Input NAND Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)		
<b>BU4030B</b>	BU4030B	BU4030BF	—	Quad Exclusive OR Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)		
<b>BU4070B</b>	BU4070B	BU4070BF	—	Quad Exclusive OR Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)		
<b>BU4081B</b>	BU4081B	BU4081BF	BU4081BFV	Quad 2-Input AND Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	160(Typ.)		
<b>BU4093B</b>	BU4093B	BU4093BF	BU4093BFV	Quad 2-Input NAND Schmitt Trigger	3 to 16	3.5(Min.)	1.5(Max.)	0.17 to 0.39	4.95(Min.)	0.05(Max.)	125(Typ.)		
<b>BU4069UB</b>	BU4069UB	BU4069UBF	BU4069UBFV	Hex Unbuffer Inverter	3 to 16	4.0(Min.)	1.0(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)		
<b>BU4584B</b>	BU4584B	BU4584BF	BU4584BFV	Hex Schmitt Trigger	3 to 16	3.5(Min.)	1.5(Max.)	0.15 to 0.6	4.95(Min.)	0.05(Max.)	125(Typ.)		
Logic Gates (Single type)													
Type	Part No.	Function	Supply voltage (V)	H Input voltage (V)	L Input voltage (V)	Hysteresis voltage (V)	H Output voltage I <sub>out</sub> <1μA (V)	L Output voltage I <sub>out</sub> <1μA (V)	Propagation delay time (ns)				
	SSOP5												
<b>BU4S01</b>	BU4S01G2	Single NOR Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	85(Typ.)				
<b>BU4S11</b>	BU4S11G2	Single NAND Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	85(Typ.)				
<b>BU4SU69</b>	BU4SU69G2	Single Unbuffer Inverter	3 to 16	4.0(Min.)	1.0(Max.)	—	4.95(Min.)	0.05(Max.)	55(Typ.)				
<b>BU4S71</b>	BU4S71G2	Single OR Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)				
<b>BU4S81</b>	BU4S81G2	Single AND Gate	3 to 16	3.5(Min.)	1.5(Max.)	—	4.95(Min.)	0.05(Max.)	90(Typ.)				
<b>BU4S584</b>	BU4S584G2	Single Schmitt Trigger	3 to 16	3.5(Min.)	1.5(Max.)	0.15 to 0.6	4.95(Min.)	0.05(Max.)	125(Typ.)				
Function Logic													
Type	Part No.			Function	Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	H Output voltage I <sub>out</sub> =0mA (V)	L Output voltage I <sub>out</sub> =0mA (V)	Propagation delay time (ns)	Max. clock frequency (MHz)	Set up time (ns)	Hold time (ns)
	DIP16	SOP16	SSOP-B16										
<b>BU4015B</b>	BU4015B	BU4015BF	—	Dual 4-bit Static Shift Register	3 to 16	3.5(Min.)	1.5(Max.)	4.95(Min.)	0.05(Max.)	460(Typ.)	2(Typ.)	100(Typ.)	—
<b>BU4021B</b>	—	BU4021BF	—	8-Stage Static Shift Register	3 to 16	3.5(Min.)	1.5(Max.)	4.95(Min.)	0.05(Max.)	400(Typ.)	3(Typ.)	150(Typ.)	—
<b>BU4094BC</b>	BU4094BC	BU4094BCF	BU4094BCFV	8-Stage Shift/Store Register(3-State)	3 to 18	3.5(Min.)	1.5(Max.)	4.95(Min.)	0.05(Max.)	420(Typ.)	2.5(Typ.)	20(Typ.)	10(Typ.)
Type	Part No.	Function		Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	H Output voltage I <sub>out</sub> =0mA (V)	L Output voltage I <sub>out</sub> =0mA (V)	Propagation delay time (ns)	Minimum input pulse width (ns)	Output pulse width (μs)		
	DIP16												
<b>BU4538B</b>	BU4538B	Dual High Precision Monostable Multivibrator		3 to 16	3.5(Min.)	1.5(Max.)	4.95(Min.)	0.05(Max.)	300(Typ.)	50(Typ.)	200(Typ.)		
Type	Part No.	Function		Supply voltage (V)	H Input Voltage (V)	L Input Voltage (V)	H Output voltage I <sub>out</sub> =0mA (V)	L Output voltage I <sub>out</sub> =0mA (V)	L to H Propagation delay time (ns)	H to L Propagation delay time (ns)	Input capacitance (pF)		
	DIP16												
<b>BU4028B</b>	BU4028B	BCD to Decimal Decoder		3 to 16	3.5(Min.)	1.5(Max.)	4.95(Min.)	0.05(Max.)	300(Typ.)	300(Typ.)	5(Typ.)		

## Serial-in / Parallel-out Drivers

Serial / Parallel 2-input Drivers							
Part No.	Number of input	Number of output	Power supply (V)	Maximum output current (mA)	Maximum output voltage (V)	Output type	Package
BU2098F	2	8	2.7 to 5.5	25	15	Open drain	SOP16
BU2090F	2	12	2.7 to 5.5	25	25	Open drain	SOP16
BU2090FS	2	12	2.7 to 5.5	25	25	Open drain	SSOP-A16
Serial / Parallel 4-input Drivers							
BU2050F	4	8	4.5 to 5.5	25	5.5	CMOS	SOP14
BU2092F	4	12	2.7 to 5.5	25	25	Open drain	SOP18
BU2092FV	4	12	2.7 to 5.5	25	25	Open drain	SSOP-B20
BU2099FV	4	12	2.7 to 5.5	25	25	Open drain	SSOP-B20
BD7851FP	4	16	4.5 to 5.5	50	10	Constant current	HSOP25
BU2152FS	4	24	2.7 to 5.5	25	5.5	CMOS	SSOP-A32

Serial / Parallel 2-input Drivers : 2-wires Interface CLOCK, DATA  
 Serial / Parallel 4-input Drivers : 4-wires Interface CLOCK, DATA, LATCH, ENABLE

## USB Switch ICs

SP Type (Single Pole)													
Part No.	Supply voltage (V)			USB switch	UART switch	Circuit current (μA)	USB switch on resistance (Ω)	USB switch on capacitance (pF)	Package				
	USB	UART											
BH6260MWX	2.9 to 3.7	1.7 to 3.6		1ch	1ch	0	5	10	USON016X3315				
DP Type (Double Pole)													
BD11600NUX	2.5 to 5.5	—		1ch	—	18	3	6	VSON010X3020				
BD11603MWX	2.5 to 5.5	—		2ch	—	18	3	7	USON016X3315				
BD11601NUX	2.5 to 5.5	—		1ch	—	18	2.5	6	VSON008X2020				
Built-in OVP Micro USB Switch with USB2.0, MHL™ and Audio													
Part No.	VBAT Voltage (V)			USB/MHL switch	MIC switch	HP switch	VBUS signal path	ID-CBUS signal path	OTG-VBUS voltage path	Stand by current (μA)	USB/MHL switch ON resistance (Ω)	USB/MHL switch ON capacitance (pF)	Package
	VBUS	VBAT	VDDIO										
BD91411GW	3.8 to 28	2.9 to 4.6	1.7 to 3.0	2ch	1ch (mono)	1ch	1ch	1ch	1ch	6	5	6	UCSP75M3







ICs

# Data Converter

## CONTENTS

<b>A/D Converter</b> .....	<b>P. A28</b>
10bit .....	P. A28
<b>D/A Converters</b> .....	<b>P. A28</b>
8bit .....	P. A28
10bit .....	P. A28

# A/D Converter

## 10bit

Part No.	Supply voltage (V)	CH	Analog Input type	Sampling frequency (SPS)	DNL (LSB)	INL (LSB)	Interface	Package
BH2715FV	2.7 to 5.25	8	Single ended	50k to 220k	± 1.2	± 1.5	SPI	SSOP-B16

# D/A Converters

## 8bit

### Standard 8bit resolution

The converter allows the output voltage to be set with 8-bit precision (256 steps). These popular converters offer feature-rich, highly integrated capabilities.

Part No.	Supply voltage (V)	CH	Current consumption (mA)	DNL (LSB)	INL (LSB)	Load current (mA)	Settling time (μs)	Data transfer clock frequency (MHz)	Input type	Data latch method	Package
BH2219FVM	2.7 to 5.5	2	0.4	± 1.0	± 1.5	± 1.0	100	10	CMOS	LD	MSOP8
BH2220FVM	2.7 to 5.5	3	0.4	± 1.0	± 1.5	± 1.0	100	10	CMOS	LD	MSOP8
BH2227FV	2.7 to 5.5	4	0.8	± 1.0	± 1.5	± 1.0	100	10	CMOS	CSB	SSOP-B14
BH2228FV	2.7 to 5.5	6	0.8	± 1.0	± 1.5	± 1.0	100	10	CMOS	CSB	SSOP-B14
BH2226FV	2.7 to 5.5	8	1.1	± 1.0	± 1.5	± 1.0	100	10	CMOS	CSB	SSOP-B16
BH2226F	2.7 to 5.5	8	1.1	± 1.0	± 1.5	± 1.0	100	10	CMOS	CSB	SOP16
BH2223FV	2.7 to 5.5	10	1.6	± 1.0	± 1.5	± 1.0	100	10	CMOS	LD	SSOP-B16
BH2221FV	2.7 to 5.5	12	1.6	± 1.0	± 1.5	± 1.0	100	10	CMOS	LD	SSOP-B20

## 10bit

### 10bit resolution

Part No.	Supply voltage (V)	CH	Current consumption (mA)	DNL (LSB)	INL (LSB)	Load current (mA)	Settling time (μs)	Data transfer clock frequency (MHz)	Input type	Data latch method	Package
BU2508FV	4.5 to 5.5	4	4.5	± 1.0	± 3.5	± 2.0	20	10	TTL	LD	SSOP-B14
BU2507FV	4.5 to 5.5	6	4.5	± 1.0	± 3.5	± 2.0	20	10	TTL	LD	SSOP-B14
BU2506FV	4.5 to 5.5	8	4.5	± 1.0	± 3.5	± 2.0	20	10	TTL	LD	SSOP-B20
BU2505FV	4.5 to 5.5	10	4.5	± 1.0	± 3.5	± 2.0	20	10	TTL	LD	SSOP-B20



ICs

# Interface

## CONTENTS

<b>LVDS Interface ICs</b> .....	<b>P. A30</b>
<b>Sub-LVDS Interface ICs</b> .....	<b>P. A30</b>
<b>Timing Controllers</b> .....	<b>P. A30</b>
<b>GPIO</b> .....	<b>P. A31</b>
Keyencoder .....	P. A31
IO Expander .....	P. A31
<b>IrDA Controllers</b> .....	<b>P. A31</b>
<b>Car Access</b> .....	<b>P. A31</b>
Antenna Drivers .....	P. A31
<b>Isolators</b> .....	<b>P. A31</b>
2.5kVrms Isolators .....	P. A31
<b>Transceiver</b> .....	<b>P. A31</b>
LIN Transceiver .....	P. A31
<b>HD-PLC</b> .....	<b>P. A31</b>
HD-PLC Inside Compliant Baseband IC .....	P. A31

# LVDS Interface ICs

**A**  
**Interface**

27bit LVDS Transmitter 27:4 Serializer									
Part No.	Type	Bits (bit)	Color depth	Input specification	Output specification	Clock frequency (MHz)	Supply voltage (V)	Operating temperature range (°C)	Package
BU90T81	Serializer	27	8	LVC MOS	LVDS Single Link	20 to 112	1.65 to 1.95	-20 to +85	VBGA048W040
27bit LVDS Transmitter 27:8 Serializer									
☆BU90T82	Serializer	27	8	LVC MOS	LVDS Dual Link	10 to 174	1.62 to 1.98 1.62 to 3.6	-40 to +85	SBGA072T070A
35bit LVDS Transmitter 35:5 Serializer									
BU8254KVT	Serializer	35	10	LVC MOS	LVDS Single Link	8 to 112	3.0 to 3.6	-40 to +85	TQFP64V
BU8254GUW	Serializer	35	10	LVC MOS	LVDS Single Link	8 to 112	3.0 to 3.6	-20 to +85	VBGA099W060
56bit LVDS Transmitter 56:8 Serializer									
BU7988KVT	Serializer	56	8	LVC MOS	LVDS Dual Link	8 to 112	3.0 to 3.6	-20 to +85	TQFP100V
35bit LVDS Receiver 5:35 Deserializer									
BU90R104	Deserializer	35	10	LVDS Single Link	LVC MOS	8 to 112	2.3 to 3.6	-40 to +85	TQFP64V
56bit LVDS Receiver 8:56 Deserializer									
BU7985KVT	Deserializer	56	8	LVDS Dual Link	LVC MOS	20 to 112	3.0 to 3.6	-20 to +85	TQFP100V
67bit LVDS Receiver 10:67 Deserializer									
☆BU90R102	Deserializer	67	10	LVDS Dual Link	LVC MOS	8 to 160	2.3 to 3.6	-40 to +85	HQFP144VM
70bit LVDS Distributor									
BU90RT102	Serializer Deserializer	70	10	LVDS	LVDS	20 to 135	3.0 to 3.6	-20 to +85	HTSSOP-C64
4bit LVDS Driver									
BU90LV047A	Driver	4	-	LVC MOS	LVDS	250	3.0 to 3.6	-40 to +85	SSOP-B16
4bit LVDS Receiver									
BU90LV048	Receiver	4	-	LVDS	LVC MOS	250	3.0 to 3.6	-40 to +85	SSOP-B16
4bit LVDS Transceiver									
BU90LV049A	Transceiver	4	-	LVC MOS/LVDS	LVC MOS/LVDS	250	3.0 to 3.6	-40 to +85	SSOP-B16

☆ : Under development

# Sub-LVDS Interface ICs

Data rate 900Mbps RGB Interface							
Part No.	Function	Supply voltage		Interface	Max data rate	No. of MSDL channel	Package
		Core voltage(V)	I/O voltage(V)				
BU7961GUW	Tx	1.65 to 1.95	1.65 to 3.60	RGB24bit, Hsync, Vsync, DE, PCLK	900Mbps	Data×2, Clock×1	VBGA063W050
BU7962GUW	Rx	1.65 to 1.95	1.65 to 3.60	RGB24bit, Hsync, Vsync, DE, PCLK	900Mbps	Data×2, Clock×1	VBGA063W050
Data rate 1350Mbps RGB Interface							
BU7963GUW	Tx	1.65 to 1.95	1.65 to 1.95	RGB24bit, Hsync, Vsync, DE, PCLK	1350Mbps	Data×3, Clock×1	VBGA063W050
BU7964GUW	Rx	1.65 to 1.95	1.65 to 1.95	RGB24bit, Hsync, Vsync, DE, PCLK	1350Mbps	Data×3, Clock×1	VBGA063W050

# Timing Controllers

Timing Controller for FHD, WUXGA									
Part No.	Supply voltage (V)	Input Type	Output Type	Input Bits	Output Bits	Clock frequency (MHz)	Operating Temperature Range (°C)	Resolution	Package
☆BU90AM4-xx series	1.2 / 1.8	MIPI 4lane	iSP 6lane	8/6bit	8/6bit	154	0 to +70	FHD, WUXGA	UQFN50

\*To above Part numbers are basis of Part number. Applicable number is applied to xx individually in fact.

☆ : Under development

## GPIO

Keyencoder									
Part No.	Supply Voltage(V)	Num. of GPIO port	Serial I/F	Power On Reset	Num. of Slave Address	Output	Num. of IO V <sub>DD</sub>	Keancode Func.	Package
BU1851GUW	2.20 to 3.60	—	Original	✓	—	—	1	Max. 64 keys	VBGA035W040
IO Expander									
Part No.	Supply Voltage(V)	Num. of GPIO port	Serial I/F	Power On Reset	Num. of Slave Address	Output	Num. of IO V <sub>DD</sub>	Keancode Func.	Package
BU1850MUV	1.65 to 3.60	8	I <sup>2</sup> C	✓	2	CMOS, Open drain	1	—	VQFN016V3030
BU1852GUW	1.65 to 3.60	Max. 20	I <sup>2</sup> C, Original	✓	2	CMOS, Open drain	2	Max. 96 keys	VBGA035W040
BU1852GXW	1.65 to 3.60	Max. 20	I <sup>2</sup> C, Original	✓	2	CMOS, Open drain	2	Max. 96 keys	UBGA035W030

## IrDA Controllers

IrDA SIR Encoder / Decoder						
Part No.	Supply voltage(V)		Data rate (bps)	Clock frequency (Hz)	Interface	Package
	V <sub>DD</sub>	V <sub>IO</sub>				
BU92001KN	2.50 to 3.50	—	2.4k to 115.2k	24M to 29.5M	UART	VQFN20
IrDA SIR, MIR, FIR, IrSimple Controllers / Remote Control Transmitters						
Part No.	Supply Voltage(V)	Supply Voltage(V)	Data rate (bps)	Clock frequency (Hz)	Interface	Package
BU92747GUW	1.62 to 1.98	1.62 to 3.60	2.4k to 115.2k, 0.576M, 1.152M, 4M	48M	Parallel BUS (16bit)	VBGA048W040
BU92747KV	1.62 to 1.98	1.62 to 3.60	2.4k to 115.2k, 0.576M, 1.152M, 4M	48M	Parallel BUS (16bit)	VQFP48C

## Car Access

Antenna Drivers								
Part No.	Power supply (V)	Circuit current(Standby) (μA)	Circuit current (Operating mode) (mA)	Output ON Duty(%)			Operating Temperature Range (°C)	Package
				V <sub>CC</sub> =3.5V	V <sub>CC</sub> =4V	V <sub>CC</sub> =7V		
BD6934FV	3.5 to 8.0	0	3.5	9.2	15	49	−40 to +85	SSOP-B16
Part No.	Power supply(V)		Channel(ch)		Output current(A)	Operating Temperature Range (°C)	Package	
	V <sub>CC</sub>	VS1,VS2	Full bridge	Half bridge				
BD6933FM-M	4.5 to 5.5	4.5 to 8.0	3	2	1.5	−40 to +85	HSOP-M28	

## Isolators

2.5kVrms Isolators								
Part No.	Supply Voltage (V)	V <sub>CC1</sub> Supply Current 1@DC (mA)	V <sub>CC2</sub> Supply Current 2@DC (mA)	Channel number (ch)	Max. Propagation delay (ns)	Isolation Voltage (Vrms)	Operating Temperature Range (°C)	Package
BM67220FV-C	4.5 to 5.5	0.21	0.21	2	45	2.5k	−40 to +125	SSOP-B20W
BM67221FV-C	4.5 to 5.5	0.21	0.21	2	45	2.5k	−40 to +125	SSOP-B20W

## Transceiver

LIN Transceiver								
Part No.	Supply voltage (V)	Absolute Maximum input (V)	Baud rates (kbps)	Type	Low slope mode	Dominant time-out	Sleep mode	Package
BD41020FJ-C	5.0 to 27.0	−27.0 to +40.0	20	LIN 2.1	✓	✓	✓	SOPJ-8

## HD-PLC

HD-PLC Inside Compliant Baseband IC											
Part No.	Compatible Standard	Operating Frequency Band	Supply voltage (V)	Modulation Method	FEC Mode	Control I/F	Communication Speed	Transmission Output	Receiving Sensitivity	Operating Temperature Range (°C)	Package
BU82204MWV	HD-PLC Inside	2 to 28MHz	1.45 to 1.55 3.0 to 3.6	Wavelet OFDM	AES128	UART or SPI	up to 3Mbps	−10dBm/ 10KHz	−88dBm/ 10KHz	−40 to +85	UQFN88MV0100







ICs

# Power Management

## CONTENTS

<b>Linear Regulators</b> .....	P. A34
78 Series Regulators .....	P. A35
Single-Output LDO Regulators .....	P. A35
LDO Regulators with Voltage Detector and Watchdog Timer .....	P. A48
LDO Regulators with Voltage Detector .....	P. A48
Voltage Tracker .....	P. A48
Multi-Output LDO Regulators .....	P. A49
Linear Regulators for DDR SDRAM .....	P. A49
<b>Switching Regulators</b> .....	P. A50
Integrated MOSFET Switching Regulators .....	P. A51
External Switch Switching Regulators .....	P. A53
For Automotive Switching Regulators .....	P. A54
<b>Switching Regulators (Power Management ICs for System)</b> .....	P. A55
Power Management ICs for LCD Panels .....	P. A56
Programmable Gamma-Voltage Generator/Gamma Buffer Amp. ....	P. A56
Power Management ICs for Mobile Phones .....	P. A57
Power Management ICs for DSC/DVCs .....	P. A57
Power Management ICs for Automotive Camera Modules .....	P. A58
<b>Isolated / No Isolated Power Supply</b> .....	P. A59
AC/DC Converter ICs .....	P. A59
DC/DC Controller .....	P. A59
<b>Gate Drivers</b> .....	P. A60
Isolated Gate Drivers .....	P. A60
Others .....	P. A60
IGBT/MOSFET Low-side Gate Drivers .....	P. A60
<b>High Voltage Monitor</b> .....	P. A60
Isolated High Voltage Monitor .....	P. A60
<b>Temperature Monitor</b> .....	P. A60
Isolated Temperature Monitor .....	P. A60
<b>Earth Leakage Detector ICs</b> .....	P. A60
Earth Leakage Detector ICs .....	P. A60
<b>Power Management Switch</b> .....	P. A60
1 Channel Compact High Side Switch ICs .....	P. A60
1 Channel High Side Switch ICs .....	P. A61
2 Channel High Side Switch ICs .....	P. A62
Load Switch ICs .....	P. A62
1 Channel Compact High Side Load Switch ICs .....	P. A62
Controller IC for High Side NMOSFET .....	P. A62
Power Switch ICs for ExpressCard™ .....	P. A62
<b>Battery Management</b> .....	P. A63
Solar Charge Management IC .....	P. A63
Charge Protection ICs .....	P. A63
Li-ion Battery Monitoring LSI (LAPIS Semiconductor products) .....	P. A63
<b>Voltage Detectors (Reset ICs)</b> .....	P. A64
Standard Voltage Detectors .....	P. A64
Voltage Detectors with Adjustable Delay Time .....	P. A65
Others .....	P. A66
Voltage Detectors with Fixed Delay Time .....	P. A66
Voltage Detectors with Watchdog Timer .....	P. A66

General-purpose ICs

# Linear Regulators

## Linear Regulators

**78 Series Regulators**

▶ P.A35

**Single-Output LDO Regulators**

▶ P.A35

**LDO Regulators with Voltage Detector and Watchdog Timer**

▶ P.A48

**LDO Regulators with Voltage Detector**

▶ P.A48

**Voltage Tracker**

▶ P.A48

**Multi-Output LDO Regulators**

▶ P.A49

**Linear Regulators for DDR SDRAM**

▶ P.A49

**Single-Output LDO Regulators - Product Table**

Output Current Maximum Rating Input Voltage	0.15A	0.2A	0.3A	0.5A	1.0A	1.5A	2.0A	3.0A	4.0A	External MOSFET
45 to 50V		BD7xxL2*1/2 BD3010AFV-M*2/3  BD4xxM2*1/2 BD4xxM2W*1/2 BD4269FJ-C ▶ P.A36,A48		BD7xxL5FP-C*2 BD3570/1/2/3/4/5*1/2 BD3020HFP-M BD3021HFP-M*2 BD4xxM5*1/2 BD4xxM5W*1/2 BD4275*1/2/3 ▶ P.A35,A36,A48						
30 to 36V	BDxxFA1 ▶ P.A38		BD3650FP-M*2 BA3662CP-V5 ▶ P.A36,A38	BA178Mxx*1 BA78Mxx ▶ P.A35	BA178xx*1 BA78xx BDxxC0A*1/2 BDxxC0AW*1/2 BAxxCC0*1 BAxxCC0W*1 BDxxFC0WEFJ ▶ P.A35,A37,A38		BD00D0AWHFP BAxxDD0T*1 BAxxDD0W*1 ▶ P.A36			
18V					BAxxBC0*1 BAxxBC0W*1 ▶ P.A38,A39	BAxxJC5T BA00JC5WT ▶ P.A38				
15V			BDxxGA3*1/2 ▶ P.A40,A41	BDxxGA5*1/2 ▶ P.A40	BA1171FP BDxxGC0*1/2 ▶ P.A35,A39					
10V			BDxxHA3*1/2 ▶ P.A43	BDxxHA5*1/2 ▶ P.A42	BDxxHC0*1/2 ▶ P.A42	BDxxHC5*1/2 ▶ P.A41				
7V/6.5V	BHxxNB1WHFV BHxxRB1WGUT BHxxPB1WHFV BHxxSA3WGUT ▶ P.A47	BUxxSD2MG-M*2 BUxxTD2WNVX BUxxTD3WG BUxxTA2W*1 BUxxSA4WGWL ▶ P.A46,A47	BUxxUB3WG BUxxUA3WNVX BHxxM0AWHFV BHxxMA3WHFV ▶ P.A45	BDxxIA5*1/2 BDxxKA5FP BDxxKA5W*1 BUxxTH5WNVX BUxxSA5WGWZ ▶ P.A44	BDxxIC0*1/2 ▶ P.A43					
Ultra Low Voltage (Dual Supply)				BD3550HFN BD3507HFV  BD3540NUV ▶ P.A48	BD3551HFN  BD35269HFN  BD3541NUV ▶ P.A48		BD3552HFN BD3506F BD3523HFN BD35230HFN BD35231HFN ▶ P.A48	BD3508MUV BD3512MUV ▶ P.A48	BD35221EFV BD35222EFV BD3509MUV ▶ P.A48	BD3504FVM BD3521FVM ▶ P.A48

\*1 : Package lineup \*2 : Automotive Grade \*3 : Multi Function Regulator (Ex. Voltage Detection)

# Linear Regulators

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## 78 Series Regulators

1A Output 78 Series Regulators										
Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Circuit current (mA)	Thermal Shutdown circuit	Area of safety operation circuit	Over current protection circuit	Package Part No.	
									TO220CP-3	TO252-3
BA7805	7.5 to 25.0	5	±4	1	4.5	✓	✓	✓	BA7805CP	BA7805FP
BA7806	8.5 to 21.0	6							BA7806CP	BA7806FP
BA7807	9.5 to 22.0	7							BA7807CP	BA7807FP
BA7808	10.5 to 23.0	8							BA7808CP	BA7808FP
BA7809	11.5 to 26.0	9							BA7809CP	BA7809FP
BA7810	12.5 to 25.0	10							BA7810CP	BA7810FP
BA7812	15.0 to 27.0	12							BA7812CP	BA7812FP
BA7815	17.5 to 30.0	15							BA7815CP	BA7815FP
BA7818	21.0 to 33.0	18							BA7818CP	BA7818FP
BA7820	23.0 to 33.0	20							BA7820CP	BA7820FP
BA7824	27.0 to 33.0	24							BA7824CP	BA7824FP

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Adjustment Pin Current (μA)	Reference Voltage (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package
<b>New</b> BA1117FP	15	Variable	±1	1	60	1.2 (I <sub>o</sub> =1A)	75 (f=120Hz V <sub>i</sub> -V <sub>o</sub> =3V V <sub>ripple</sub> =1Vpp)	10	Over-Current / Temperature	TO252-3

500mA Output 78 Series Regulators										
Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Circuit current (mA)	Thermal Shutdown circuit	Area of safety operation circuit	Over current protection circuit	Package Part No.	
									TO220CP-3	TO252-3
BA78M05	7.5 to 25.0	5	±4	0.5	4.5	✓	✓	✓	BA78M05CP	BA78M05FP
BA78M06	8.5 to 21.0	6							BA78M06CP	BA78M06FP
BA78M07	9.5 to 22.0	7							BA78M07CP	BA78M07FP
BA78M08	10.5 to 23.0	8							BA78M08CP	BA78M08FP
BA78M09	11.5 to 26.0	9							BA78M09CP	BA78M09FP
BA78M10	12.5 to 25.0	10							BA78M10CP	BA78M10FP
BA78M12	15.0 to 27.0	12							BA78M12CP	BA78M12FP
BA78M15	17.5 to 30.0	15							BA78M15CP	BA78M15FP
BA78M18	21.0 to 33.0	18							BA78M18CP	BA78M18FP
BA78M20	23.0 to 33.0	20							BA78M20CP	BA78M20FP
BA78M24	27.0 to 33.0	24							BA78M24CP	BA78M24FP

1A Output 78 Series Regulators : UNIVERSAL STANDARD SPECIFICATION  
500mA Output 78 Series Regulators : UNIVERSAL STANDARD SPECIFICATION

## Single-Output LDO Regulators

50V Resistance Output 500mA LDO Regulators (Automotive grade)												
Part No.		Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage : I <sub>o</sub> =200mA(V)	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package	
Consumer	Automotive grade											
BD3570YFP	<b>New</b> BD3570YFP-M	4.5 to 36.0	3.3	±2 (T <sub>a</sub> = -40 to +125°C)	0.5	—	30	-40 to +125	—	Over-Current / Temperature	TO252-3	
BD3570YHFP	<b>New</b> BD3570YHFP-M										HRP5	
BD3571YFP	<b>New</b> BD3571YFP-M	5.5 to 36.0	5.0								0.25	TO252-3
BD3571YHFP	<b>New</b> BD3571YHFP-M										HRP5	
BD3572YFP	<b>New</b> BD3572YFP-M	4.5 to 36.0	Variable 2.8 to 12.0								0.25	TO252-5
BD3572YHFP	<b>New</b> BD3572YHFP-M										HRP5	
BD3573YFP	<b>New</b> BD3573YFP-M										3.3	0.25
BD3573YHFP	<b>New</b> BD3573YHFP-M	HRP5										
BD3574YFP	<b>New</b> BD3574YFP-M	5.5 to 36.0	5.0								0.25	TO252-5
BD3574YHFP	<b>New</b> BD3574YHFP-M										HRP5	
BD3575YFP	<b>New</b> BD3575YFP-M	4.5 to 36.0	Variable 2.8 to 12.0								0.25	TO252-5
BD3575YHFP	<b>New</b> BD3575YHFP-M			HRP5								

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**50V Resistance Output Low quiescent current 200mA LDO Regulators (Automotive grade)**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage : I <sub>o</sub> =200mA(V)	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package
BD733L2EFJ-C	4.37 to 45.0	3.3	±2 (T <sub>a</sub> =-40 to +125°C)	0.2	0.6	6.0	-40 to +125	—	Over-Current/ Temperature	HTSOP-J8
BD750L2EFJ-C	5.8 to 45.0	5.0			0.4					HTSOP-J8
BD733L2FP-C	4.37 to 45.0	3.3			0.6					TO252-3
☆BD733L2FP3-C					0.4					SOT223-4
BD750L2FP-C	5.8 to 45.0	5.0			0.6					TO252-3
☆BD750L2FP3-C					0.4					SOT223-4

**50V Resistance Output Low quiescent current 500mA LDO Regulators (Automotive grade)**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage : I <sub>o</sub> =500mA(V)	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package
BD733L5FP-C	4.17 to 45.0	3.3	±2 (T <sub>a</sub> =-40 to +125°C)	0.5	0.4	6.0	-40 to +125	—	Over-Current/ Temperature	TO252-3
BD750L5FP-C	5.6 to 45.0	5.0			0.25					TO252-3

**45V Resistance Output Low quiescent current 500mA LDO Regulators (Automotive grade)**

Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference(V)	Circuit current (μA)	Operating temperature (T <sub>J</sub> )	Shutdown Switch	Protection circuit	Package Part No.			
										TO252-3	TO263-3	TO263-5	TO252-J5
BD433M5	4.0 to 42.0	3.3	±2 (T <sub>J</sub> =-40 to +150°C)	0.5	0.25 (I <sub>o</sub> =300mA)	38	-40 to +150°C	—	Over-Current/ Temperature	BD433M5FP-C	BD433M5FP2-C	—	—
BD450M5	5.5 to 42.0	5.0			0.2 (I <sub>o</sub> =300mA)					BD450M5FP-C	BD450M5FP2-C	—	—
BD433M5W	4.0 to 42.0	3.3			0.25 (I <sub>o</sub> =300mA)					—	—	BD433M5WFP2-C	BD433M5WFPJ-C
BD450M5W	5.5 to 42.0	5.0			0.2 (I <sub>o</sub> =300mA)					—	—	BD450M5WFP2-C	BD450M5WFPJ-C

**45V Resistance Output Low quiescent current 200mA LDO Regulators (Automotive grade)**

Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference(V)	Circuit current (μA)	Operating temperature (T <sub>J</sub> )	Shutdown Switch	Protection circuit	Package Part No.			
										HTSOP-J8	SOT223-4		
BD433M2	3.9 to 42.0	3.3	±2 (T <sub>J</sub> =-40 to +150°C)	0.2	0.2 (I <sub>o</sub> =100mA)	40	-40 to +150°C	—	Over-Current/ Temperature	BD433M2EFJ-C	BD433M2FP3-C		
BD450M2	5.5 to 42.0	5.0			0.16 (I <sub>o</sub> =100mA)					BD450M2EFJ-C	BD450M2FP3-C		
BD433M2W	3.9 to 42.0	3.3			0.2 (I <sub>o</sub> =100mA)					—	—	BD433M2WFP2-C	BD433M2WFPJ-C
BD450M2W	5.5 to 42.0	5.0			0.16 (I <sub>o</sub> =100mA)					—	—	BD450M2WFP2-C	BD450M2WFPJ-C

**36V Resistance Output 300mA LDO Regulator (Automotive grade)**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference (V)	Circuit current (mA)	Operating temperature (°C)	Protection circuit	Package
BD3650FP-M	5.6 to 30.0	5.0	±2 (T <sub>a</sub> =-40 to +125°C)	0.3	0.2 (I <sub>o</sub> =200mA)	0.5	-40 to +125	Over-Current/ Temperature	TO252-3

**35V Voltage Resistance 2A LDO Regulators**

Part No.	Input Voltage (V)	Output voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package
BA15DD0T	3 to 25	1.5	±1.0	2.0	0.9	0.45 (I <sub>o</sub> =2A)	55	50 (I <sub>o</sub> =0A to 2A)	Over-Voltage/ Over-Current/ Temperature	TO220FP-3
BA18DD0T		1.8								TO220FP-3
BA25DD0T		2.5								TO220FP-3
BA30DD0T		3.0								TO220FP-3
BA33DD0T		3.3								TO220FP-3
BA50DD0T		5.0								TO220FP-3
BA90DD0T		9.0								TO220FP-3
BAJ2DD0T		12.0								TO220FP-3
BAJ6DD0T		16.0								TO220FP-3

**35V Voltage Resistance 2A LDO Regulators with Shutdown Switch**

Type	Input Voltage (V)	Output voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package Part No.	
										TO220FP-5	HRP5
BA00DD0W	3 to 25	Variable 1.5 to 16.0	±1.0	2.0	0.9	0.45 (I <sub>o</sub> =2A)	55	50 (I <sub>o</sub> =0A to 2A)	Over-Voltage/ Over-Current/ Temperature	BA00DD0WT	BA00DD0WHFP
BA15DD0W		1.5								BA15DD0WT	BA15DD0WHFP
BA18DD0W		1.8								BA18DD0WT	BA18DD0WHFP
BA30DD0W		3.0								BA30DD0WT	BA30DD0WHFP
BA33DD0W		3.3								BA33DD0WT	BA33DD0WHFP
BA50DD0W		5.0								BA50DD0WT	BA50DD0WHFP
BA90DD0W		9.0								BA90DD0WT	BA90DD0WHFP
BAJ2DD0W		12.0								BAJ2DD0WT	BAJ2DD0WHFP
BAJ6DD0W		16.0								BAJ6DD0WT	BAJ6DD0WHFP
Part No.	Input Voltage (V)	Output Voltage (V)	Output Voltage Precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package	
BD00D0AWHFP	4.0 to 26.5	3.0 to 15.0	±1.0	2.0	0.5	0.4(I <sub>o</sub> =1A)	55	V <sub>o</sub> × 0.7% (I <sub>o</sub> =5mA to 1A)	Over-Current/ Temperature	HRP5	

☆ : Under Development

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## 35V Voltage Resistance 1A LDO Regulators

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package Part No.	
										TO220FP-3	TO252-3
BA03CC0	4 to 25	3.0	±2.0	1.0	2.5	0.30 (I <sub>o</sub> =0.5A)	55	50 (I <sub>o</sub> =5mA to 1A)	Over-Voltage/ Over-Current/ Temperature	BA03CC0T	BA03CC0FP
BA033CC0		3.3								BA033CC0T	BA033CC0FP
BA05CC0		5.0								BA05CC0T	BA05CC0FP
BA06CC0		6.0								—	BA06CC0FP
BA07CC0		7.0								BA07CC0T	BA07CC0FP
BA08CC0		8.0								BA08CC0T	BA08CC0FP
BA09CC0		9.0								BA09CC0T	BA09CC0FP
BAJ0CC0		10.0								BAJ0CC0T	BAJ0CC0FP
BAJ2CC0		12.0								BAJ2CC0T	BAJ2CC0FP
BAJ5CC0		15.0								BAJ5CC0T	BAJ5CC0FP
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package	
BD80C0AFPS	9.0 to 26.5	8	±1.0	1.0	0.6	0.30 (I <sub>o</sub> =0.5A)	50	* V <sub>o</sub> × 0.01	Over-Current/ Temperature	TO252S-3	
BD90C0AFPS	10.0 to 26.5	9									

## 35V Voltage Resistance 1A LDO Regulators (Automotive grade)

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package Part No.		
										TO252-3	HRP5	TO263-3
BD33C0A	4.3 to 26.5	3.3	±3.0 (T <sub>a</sub> = -40 to +125°C)	1.0	0.5	0.4 (I <sub>o</sub> =500mA)	55	* V <sub>o</sub> × 0.01 (I <sub>o</sub> =5mA to 1A)	Over-Current/ Temperature	BD33C0AFP-C	BD33C0AHFP-C	BD33C0AFP2-C
BD50C0A	6.0 to 26.5	5.0								BD50C0AFP-C	BD50C0AHFP-C	BD50C0AFP2-C
BD80C0A	9.0 to 26.5	8.0					BD80C0AFP-C			BD80C0AHFP-C	BD80C0AFP2-C	
BD90C0A	10.0 to 26.5	9.0					BD90C0AFP-C			BD90C0AHFP-C	BD90C0AFP2-C	

## 35V Voltage Resistance 1A LDO Regulators with Shutdown Switch

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Load Regulation (%)	Protection circuit	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Package
<b>New</b> BD00FC0WEFJ	35	Variable	±1	1	0.5	0.3 (I <sub>o</sub> =500mA)	2	Over-Current / Temperature	1	1	✓	HTSOP-J8
<b>New</b> BD30FC0WEFJ	35	3										
<b>New</b> BD33FC0WEFJ	35	3.3										
<b>New</b> BD50FC0WEFJ	35	5										
<b>New</b> BD60FC0WEFJ	35	6										
<b>New</b> BD70FC0WEFJ	35	7										
<b>New</b> BD80FC0WEFJ	35	8										
<b>New</b> BD90FC0WEFJ	35	9										
<b>New</b> BDJ0FC0WEFJ	35	10										
<b>New</b> BDJ2FC0WEFJ	35	12										
<b>New</b> BDJ5FC0WEFJ	35	15										

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package Part No.	
										TO220FP-5	TO252-5
BA00CC0W	4 to 25	Variable 3.0 to 15.0	±2.0	1.0	2.5	0.30 (I <sub>o</sub> =0.5A)	55	50 (I <sub>o</sub> =5mA to 1A)	Over-Voltage/ Over-Current/ Temperature	BA00CC0WT	BA00CC0WFP
BA03CC0W		3.0								BA00CC0WCP-V5 (TO220CP-V5)	—
BA033CC0W		3.3								BA033CC0WT	BA033CC0WFP
BA05CC0W		5.0								BA05CC0WT	BA05CC0WFP
BA06CC0W		6.0								—	BA06CC0WFP
BA07CC0W		7.0								BA07CC0WT	BA07CC0WFP
BA08CC0W		8.0								BA08CC0WT	BA08CC0WFP
BA09CC0W		9.0								BA09CC0WT	BA09CC0WFP
BAJ0CC0W		10.0								BAJ0CC0WT	☆BAJ0CC0WFP
BAJ2CC0W		12.0								BAJ2CC0WT	BAJ2CC0WFP
Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package Part No.	
BD00C0AW	4.0 to 26.5	Variable 3.0 to 15.0	±1.0	1.0	0.5	0.30 (I <sub>o</sub> =500mA)	55	V <sub>o</sub> × 0.01 (I <sub>o</sub> =5mA to 1A)	Over-Current/ Temperature	BD00C0AWFP	BD00C0AWCP-V5
BD33C0AW	4.3 to 26.5	3.3				0.40 (I <sub>o</sub> =500mA)				BD33C0AWFP	—
BD50C0AW	6.0 to 26.5	5.0				0.30 (I <sub>o</sub> =500mA)				BD50C0AWFP	—

35V Voltage Resistance 1A LDO Regulators : \* V<sub>o</sub> is Output voltage / Unit : V35V Voltage Resistance 1A LDO Regulators (Automotive grade) : \* V<sub>o</sub> is Output voltage / Unit : V

☆ : Under Development

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**35V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)**

Part No.	Input Voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage (V)	Circuit current (mA)	Operating temperature (°C)	Protection circuit	Package			
<b>BD00C0AWFPS-M</b>	4.0 to 26.5	Variable 3.0 to 15.0	$\pm 3$ (Ta=-40 to +105°C)	1.0	0.3 (Io=500mA)	0.5	-40 to +105	Over-Current/Temperature	TO252S-5			
Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (V)	Protection circuit	Package Part No.		
										TO252-5	HRP5	TO263-5
<b>BD00C0AW</b>	4.0 to 26.5	Variable 1.0 to 15.0	$\pm 3.0$ (Ta=-40 to +125°C)	1.0	0.5	0.3 (Io=500mA)	55	Vo × 0.01 (Io=5mA to 1A)	Over-Current/Temperature	BD00C0AWFP-C	BD00C0AWHFP-C	BD00C0AWFP2-C
<b>BD33C0AW</b>	4.3 to 26.5	3.3								BD33C0AWFP-C	BD33C0AWHFP-C	BD33C0AWFP2-C
<b>BD50C0AW</b>	6.0 to 26.5	5.0								BD50C0AWFP-C	BD50C0AWHFP-C	BD50C0AWFP2-C
<b>BD80C0AW</b>	9.0 to 26.5	8.0								BD80C0AWFP-C	BD80C0AWHFP-C	BD80C0AWFP2-C
<b>BD90C0AW</b>	10.0 to 26.5	9.0								BD90C0AWFP-C	BD90C0AWHFP-C	BD90C0AWFP2-C

**35V Voltage Resistance 300mA LDO Regulator with Shutdown Switch**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation	Protection circuit	Package
<b>BA3662CP-V5</b>	4 to 25	Variable 3.0 to 15.0	$\pm 2.0$	0.3	2.5	0.3 (Io=0.2A)	55	40mV (Io=5mA to 200mA)	Over-Voltage/Over-Current/Temperature	TO220CP-V5

**30V Voltage Resistance 100mA LDO Regulator**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Load Regulation (%)	Protection circuit	Input Capacitor (μF)	Output Capacitor (μF)	Package
<b>BD33FA1FP3</b>	25	3.3	$\pm 1$	0.1	0.5	2 (Io=100mA)	$\pm 1.5$	Over-Current/Temperature	1	1	SOT89-3
<b>BD54FA1FP3</b>	25	5.4									

**18V Voltage Resistance 1.5A LDO Regulators**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Protection circuit	Package
<b>BA15JC5T</b>	3 to 16	1.5	$\pm 1.0$	1.5	0.5	0.3 (Io=500mA)	55	5 (Io=5mA to 1.5A)	0.33	22	Over-Current/Temperature	TO220FP-3
<b>BA18JC5T</b>		1.8										TO220FP-3
<b>BA25JC5T</b>		2.5										TO220FP-3
<b>BA30JC5T</b>		3.0										TO220FP-3
<b>BA33JC5T</b>		3.3										TO220FP-3
<b>BA50JC5T</b>		5.0										TO220FP-3
<b>BA60JC5T</b>		6.0										TO220FP-3
<b>BA63JC5T</b>		6.3										TO220FP-3
<b>BA80JC5T</b>		8.0										TO220FP-3
<b>BA90JC5T</b>		9.0										TO220FP-3

**18V Voltage Resistance 1.5A LDO Regulator with Shutdown Switch**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>BA00JC5WT</b>	3 to 16	Variable 1.5 to 12.0	$\pm 1.0$	1.5	0.5	0.3 (Io=500mA)	55	5 (Io=5mA to 1.5A)	0.33	22	✓	Over-Current/Temperature	TO220FP-5

**18V Voltage Resistance 1A LDO Regulators**

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Protection circuit	Package Part No.	
<b>BA15BC0</b>	3 to 16	1.5	$\pm 2.0$	1.0	0.5	0.3 (Io=200mA)	55	35 (Io=0 to 1A)	0.33	22	Over-Current/Temperature	TO252-3	TO220FP-3
<b>BA18BC0</b>		1.8										BA15BC0FP	BA15BC0T
<b>BA25BC0</b>		2.5										BA18BC0FP	BA18BC0T
<b>BA30BC0</b>		3.0										BA25BC0FP	BA25BC0T
<b>BA33BC0</b>		3.3										BA30BC0FP	BA30BC0T
<b>BA50BC0</b>		5.0										BA33BC0FP	BA33BC0T
<b>BA60BC0</b>		6.0										BA50BC0FP	BA50BC0T
<b>BA70BC0</b>		7.0										BA60BC0FP	BA60BC0T
<b>BA80BC0</b>		8.0										BA70BC0FP	BA70BC0T
<b>BA90BC0</b>		9.0										BA80BC0FP	BA80BC0T
<b>BAJ0BC0</b>	10.0	BA90BC0FP	BA90BC0T										
					0.6							BAJ0BC0FP	BAJ0BC0T



Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## 18V Voltage Resistance 1A LDO Regulators with Shutdown Switch

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package Part No.	
													TO252-5	TO220FP-5
BA00BC0W	3 to 16	Variable 1.5 to 12.0	±2.0	1.0	0.5 (Vo≦6.0)	0.3 (Io=200mA)	55	35 (Io=0 to 1A)	0.33	22	✓	Over-Current/ Temperature	BA00BC0WFP	BA00BC0WT
BA15BC0W		1.5			BA15BC0WFP								BA15BC0WT	
BA18BC0W		1.8			BA18BC0WFP								BA18BC0WT	
BA25BC0W		2.5			BA25BC0WFP								BA25BC0WT	
BA30BC0W		3.0			BA30BC0WFP								BA30BC0WT	
BA33BC0W		3.3			BA33BC0WFP								BA33BC0WT	
BA50BC0W		5.0			BA50BC0WFP								BA50BC0WT	
BA60BC0W		6.0			BA60BC0WFP								BA60BC0WT	
BA70BC0W		7.0			BA70BC0WFP								BA70BC0WT	
BA80BC0W		8.0			BA80BC0WFP								BA80BC0WT	
BA90BC0W		9.0			BA90BC0WFP								BA90BC0WT	
BAJ0BC0W		10.0			BAJ0BC0WFP								BAJ0BC0WT	

## 15V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Consumer / Automotive grade)

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00GC0WEFJ	BD00GC0MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	1.0	0.6	0.6 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15GC0WEFJ	BD15GC0MEFJ-M		1.5											HTSOP-J8
BD18GC0WEFJ	BD18GC0MEFJ-M		1.8											HTSOP-J8
BD25GC0WEFJ	BD25GC0MEFJ-M		2.5											HTSOP-J8
BD30GC0WEFJ	BD30GC0MEFJ-M		3.0											HTSOP-J8
BD33GC0WEFJ	BD33GC0MEFJ-M		3.3											HTSOP-J8
BD50GC0WEFJ	BD50GC0MEFJ-M		5.0											HTSOP-J8
BD60GC0WEFJ	BD60GC0MEFJ-M		6.0											HTSOP-J8
BD70GC0WEFJ	BD70GC0MEFJ-M		7.0											HTSOP-J8
BD80GC0WEFJ	BD80GC0MEFJ-M		8.0											HTSOP-J8
BD90GC0WEFJ	BD90GC0MEFJ-M		9.0											HTSOP-J8
BDJ0GC0WEFJ	BDJ0GC0MEFJ-M		10.0											HTSOP-J8
BDJ2GC0WEFJ	BDJ2GC0MEFJ-M	12.0	HTSOP-J8											

## 15V Voltage Resistance 1A Variable / Fixed Output Industrial LDO Regulators

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00GC0MEFJ-LB	4.5 to 14.0	Variable 1.5 to 13.0	±1.0 / ±3.0 (Ta=-40 to +105°C)	1.0	0.6	0.6 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15GC0MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18GC0MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25GC0MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30GC0MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33GC0MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50GC0MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60GC0MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70GC0MEFJ-LB		7.0											HTSOP-J8
<b>New</b> BD80GC0MEFJ-LB		8.0											HTSOP-J8
<b>New</b> BD90GC0MEFJ-LB		9.0											HTSOP-J8
<b>New</b> BDJ0GC0MEFJ-LB		10.0											HTSOP-J8
<b>New</b> BDJ2GC0MEFJ-LB	12.0	HTSOP-J8											



**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**15V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Consumer / Automotive grade)**

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00GA5WEFJ	BD00GA5MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.5	0.6	0.6 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15GA5WEFJ	BD15GA5MEFJ-M		1.5											HTSOP-J8
BD18GA5WEFJ	BD18GA5MEFJ-M		1.8											HTSOP-J8
BD25GA5WEFJ	BD25GA5MEFJ-M		2.5											HTSOP-J8
BD30GA5WEFJ	BD30GA5MEFJ-M		3.0											HTSOP-J8
BD33GA5WEFJ	BD33GA5MEFJ-M		3.3											HTSOP-J8
BD50GA5WEFJ	BD50GA5MEFJ-M		5.0											HTSOP-J8
BD60GA5WEFJ	BD60GA5MEFJ-M		6.0											HTSOP-J8
BD70GA5WEFJ	BD70GA5MEFJ-M		7.0											HTSOP-J8
BD80GA5WEFJ	BD80GA5MEFJ-M		8.0											HTSOP-J8
BD90GA5WEFJ	BD90GA5MEFJ-M		9.0											HTSOP-J8
BDJ0GA5WEFJ	BDJ0GA5MEFJ-M		10.0											HTSOP-J8
BDJ2GA5WEFJ	BDJ2GA5MEFJ-M	12.0	HTSOP-J8											

**15V Voltage Resistance 500mA Variable / Fixed Output Industrial LDO Regulators**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00GA5MEFJ-LB	4.5 to 14.0	Variable 1.5 to 13.0	±1.0 / ±3.0 (Ta=-40 to +105°C)	0.5	0.6	0.6 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15GA5MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18GA5MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25GA5MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30GA5MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33GA5MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50GA5MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60GA5MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70GA5MEFJ-LB		7.0											HTSOP-J8
<b>New</b> BD80GA5MEFJ-LB		8.0											HTSOP-J8
<b>New</b> BD90GA5MEFJ-LB		9.0											HTSOP-J8
<b>New</b> BDJ0GA5MEFJ-LB		10.0											HTSOP-J8
<b>New</b> BDJ2GA5MEFJ-LB	12.0	HTSOP-J8											

**15V Voltage Resistance 300mA LDO Regulators with Shutdown Switch (Consumer)**

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package Part No.	
													HTSOP-J8	VSON008X2030
BD00GA3W	4.5 to 14.0	Variable 1.5 to 13.0	±1.0	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	BD00GA3WEFJ	BD00GA3WNUX
BD15GA3W		1.5											BD15GA3WEFJ	☆BD15GA3WNUX
BD18GA3W		1.8											BD18GA3WEFJ	☆BD18GA3WNUX
BD25GA3W		2.5											BD25GA3WEFJ	☆BD25GA3WNUX
BD30GA3W		3.0											BD30GA3WEFJ	☆BD30GA3WNUX
BD33GA3W		3.3											BD33GA3WEFJ	☆BD33GA3WNUX
BD50GA3W		5.0											BD50GA3WEFJ	<b>New</b> BD50GA3WNUX
BD60GA3W		6.0											BD60GA3WEFJ	<b>New</b> BD60GA3WNUX
BD70GA3W		7.0											BD70GA3WEFJ	☆BD70GA3WNUX
BD80GA3W		8.0											BD80GA3WEFJ	☆BD80GA3WNUX
BD90GA3W		9.0											BD90GA3WEFJ	☆BD90GA3WNUX
BDJ0GA3W		10.0											BDJ0GA3WEFJ	☆BDJ0GA3WNUX
BDJ2GA3W	12.0	BDJ2GA3WEFJ	☆BDJ2GA3WNUX											

☆ : Under Development

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## 15V Voltage Resistance 300mA LDO Regulators with Shutdown Switch (Automotive grade)

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
BD00GA3MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15GA3MEFJ-M		1.5											HTSOP-J8
BD18GA3MEFJ-M		1.8											HTSOP-J8
BD25GA3MEFJ-M		2.5											HTSOP-J8
BD30GA3MEFJ-M		3.0											HTSOP-J8
BD33GA3MEFJ-M		3.3											HTSOP-J8
BD50GA3MEFJ-M		5.0											HTSOP-J8
BD60GA3MEFJ-M		6.0											HTSOP-J8
BD70GA3MEFJ-M		7.0											HTSOP-J8
BD80GA3MEFJ-M		8.0											HTSOP-J8
BD90GA3MEFJ-M		9.0											HTSOP-J8
BDJ0GA3MEFJ-M		10.0											HTSOP-J8
BDJ2GA3MEFJ-M	12.0	HTSOP-J8											

## 15V Voltage Resistance 300mA Variable / Fixed Output Industrial LDO Regulators

<b>New</b> BD00GA3MEFJ-LB	4.5 to 14.0	Variable 1.5 to 13.0	±3.0 (Ta=-40 to +105°C)	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15GA3MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18GA3MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25GA3MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30GA3MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33GA3MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50GA3MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60GA3MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70GA3MEFJ-LB		7.0											HTSOP-J8
<b>New</b> BD80GA3MEFJ-LB		8.0											HTSOP-J8
<b>New</b> BD90GA3MEFJ-LB		9.0											HTSOP-J8
<b>New</b> BDJ0GA3MEFJ-LB		10.0											HTSOP-J8
<b>New</b> BDJ2GA3MEFJ-LB	12.0	HTSOP-J8											

## 10V Voltage Resistance 1.5A LDO Regulators with Shutdown Switch (Consumer / Automotive grade)

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	1.5	0.6	0.6 (Io=1.5A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1.5A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD00HC5WEFJ	BD00HC5MEFJ-M		1.5											HTSOP-J8
BD15HC5WEFJ	BD15HC5MEFJ-M		1.8											HTSOP-J8
BD18HC5WEFJ	BD18HC5MEFJ-M		2.5											HTSOP-J8
BD25HC5WEFJ	BD25HC5MEFJ-M		3.0											HTSOP-J8
BD30HC5WEFJ	BD30HC5MEFJ-M		3.3											HTSOP-J8
BD33HC5WEFJ	BD33HC5MEFJ-M		5.0											HTSOP-J8
BD50HC5WEFJ	BD50HC5MEFJ-M		6.0											HTSOP-J8
BD60HC5WEFJ	BD60HC5MEFJ-M		7.0											HTSOP-J8

## 10V Voltage Resistance 1.5A Variable / Fixed Output Industrial LDO Regulators

<b>New</b> BD00HC5MEFJ-LB	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C)	1.5	0.6	0.6 (Io=1.5A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1.5A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15HC5MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18HC5MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25HC5MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30HC5MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33HC5MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50HC5MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60HC5MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70HC5MEFJ-LB		7.0											HTSOP-J8

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**10V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Consumer / Automotive grade)**

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00HC0WEFJ	BD00HC0MEFJ-M	4.5 to 8.0	Variable 0.8 to 7.0 (Automotive grade Variable 1.5 to 7.0)	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	1.0	0.6	0.6 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15HC0WEFJ	BD15HC0MEFJ-M		1.5											HTSOP-J8
BD18HC0WEFJ	BD18HC0MEFJ-M		1.8											HTSOP-J8
BD25HC0WEFJ	BD25HC0MEFJ-M		2.5											HTSOP-J8
BD30HC0WEFJ	BD30HC0MEFJ-M		3.0											HTSOP-J8
BD33HC0WEFJ	BD33HC0MEFJ-M		3.3											HTSOP-J8
BD50HC0WEFJ	BD50HC0MEFJ-M		5.0											HTSOP-J8
BD60HC0WEFJ	BD60HC0MEFJ-M		6.0											HTSOP-J8
BD70HC0WEFJ	BD70HC0MEFJ-M		7.0											HTSOP-J8

**10V Voltage Resistance 1A Variable / Fixed Output Industrial LDO Regulators**
**Power Management**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00HC0MEFJ-LB	4.5 to 8.0	Variable 0.8 to 7.0 (Variable 1.5 to 7.0)	±1.0 / ±3.0 (Ta=-40 to +105°C)	1.0	0.6	0.6 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15HC0MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18HC0MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25HC0MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30HC0MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33HC0MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50HC0MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60HC0MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70HC0MEFJ-LB		7.0											HTSOP-J8

**10V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Consumer / Automotive grade)**

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00HA5WEFJ	BD00HA5MEFJ-M	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.5	0.6	0.6 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15HA5WEFJ	BD15HA5MEFJ-M		1.5											HTSOP-J8
BD18HA5WEFJ	BD18HA5MEFJ-M		1.8											HTSOP-J8
BD25HA5WEFJ	BD25HA5MEFJ-M		2.5											HTSOP-J8
BD30HA5WEFJ	BD30HA5MEFJ-M		3.0											HTSOP-J8
BD33HA5WEFJ	BD33HA5MEFJ-M		3.3											HTSOP-J8
BD50HA5WEFJ	BD50HA5MEFJ-M		5.0											HTSOP-J8
BD60HA5WEFJ	BD60HA5MEFJ-M		6.0											HTSOP-J8
BD70HA5WEFJ	BD70HA5MEFJ-M		7.0											HTSOP-J8

**10V Voltage Resistance 500mA Variable / Fixed Output Industrial LDO Regulators**
**Power Management**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00HA5MEFJ-LB	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C)	0.5	0.6	0.6 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15HA5MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18HA5MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25HA5MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30HA5MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33HA5MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50HA5MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60HA5MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70HA5MEFJ-LB		7.0											HTSOP-J8

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## 10V Voltage Resistance 300mA LDO Regulators with Shutdown Switch (Consumer / Automotive grade)

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00HA3WEFJ	BD00HA3MEFJ-M	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15HA3WEFJ	BD15HA3MEFJ-M		1.5											HTSOP-J8
BD18HA3WEFJ	BD18HA3MEFJ-M		1.8											HTSOP-J8
BD25HA3WEFJ	BD25HA3MEFJ-M		2.5											HTSOP-J8
BD30HA3WEFJ	BD30HA3MEFJ-M		3.0											HTSOP-J8
BD33HA3WEFJ	BD33HA3MEFJ-M		3.3											HTSOP-J8
BD50HA3WEFJ	BD50HA3MEFJ-M		5.0											HTSOP-J8
BD60HA3WEFJ	BD60HA3MEFJ-M		6.0											HTSOP-J8
BD70HA3WEFJ	BD70HA3MEFJ-M		7.0											HTSOP-J8

## 10V Voltage Resistance 300mA Variable / Fixed Output Industrial LDO Regulators

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00HA3MEFJ-LB	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C)	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD15HA3MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18HA3MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25HA3MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30HA3MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33HA3MEFJ-LB		3.3											HTSOP-J8
<b>New</b> BD50HA3MEFJ-LB		5.0											HTSOP-J8
<b>New</b> BD60HA3MEFJ-LB		6.0											HTSOP-J8
<b>New</b> BD70HA3MEFJ-LB		7.0											HTSOP-J8

## 7V Voltage Resistance 1A LDO Regulators with Shutdown Switch

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package Part No.	
													HTSOP-J8	HVSOF6
BD00IC0W	2.3 to 5.5	Variable 0.8 to 4.5	±1.0	1.0	0.3	0.4 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	BD00IC0WEFJ	BD00IC0WHFV
BD10IC0W		1.0											BD10IC0WEFJ	BD10IC0WHFV
BD12IC0W		1.2											BD12IC0WEFJ	BD12IC0WHFV
BD1CIC0W		1.25											—	BD1CIC0WHFV
BD15IC0W		1.5											BD15IC0WEFJ	BD15IC0WHFV
BD18IC0W		1.8											BD18IC0WEFJ	BD18IC0WHFV
BD25IC0W		2.5											BD25IC0WEFJ	BD25IC0WHFV
BD26IC0W		2.6											—	BD26IC0WHFV
BD30IC0W		3.0											BD30IC0WEFJ	BD30IC0WHFV
BD33IC0W		3.3											BD33IC0WEFJ	BD33IC0WHFV

## 7V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
BD00IC0MEFJ-M	2.3 to 5.5	Variable 0.8 to 4.5	±3.0 (Ta=-40 to +105°C)	1.0	0.3	0.4 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD10IC0MEFJ-M		1.0											HTSOP-J8
BD12IC0MEFJ-M		1.2											HTSOP-J8
BD15IC0MEFJ-M		1.5											HTSOP-J8
BD18IC0MEFJ-M		1.8											HTSOP-J8
BD25IC0MEFJ-M		2.5											HTSOP-J8
BD30IC0MEFJ-M		3.0											HTSOP-J8
BD33IC0MEFJ-M		3.3											HTSOP-J8

## 7V Voltage Resistance 1A Variable / Fixed Output Industrial LDO Regulators

<b>New</b> BD00IC0MEFJ-LB	2.3 to 5.5	Variable 0.8 to 4.5	±3.0 (Ta=-40 to +105°C)	1.0	0.3	0.4 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD10IC0MEFJ-LB		1.0											HTSOP-J8
<b>New</b> BD12IC0MEFJ-LB		1.2											HTSOP-J8
<b>New</b> BD15IC0MEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18IC0MEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25IC0MEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30IC0MEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33IC0MEFJ-LB		3.3											HTSOP-J8

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**7V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Consumer / Automotive grade)**

Part No.		Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
Consumer	Automotive grade													
BD00IA5WEFJ	BD00IA5MEFJ-M	2.3 to 5.5	Variable 0.8 to 4.5	±1.0 / ±3.0 (Ta= -40 to +105°C) <Automotive grade>	0.5	0.25	0.4 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD10IA5WEFJ	BD10IA5MEFJ-M		1.0											HTSOP-J8
BD12IA5WEFJ	BD12IA5MEFJ-M		1.2											HTSOP-J8
BD15IA5WEFJ	BD15IA5MEFJ-M		1.5											HTSOP-J8
BD18IA5WEFJ	BD18IA5MEFJ-M		1.8											HTSOP-J8
BD25IA5WEFJ	BD25IA5MEFJ-M		2.5											HTSOP-J8
BD30IA5WEFJ	BD30IA5MEFJ-M		3.0											HTSOP-J8
BD33IA5WEFJ	BD33IA5MEFJ-M		3.3											HTSOP-J8

**7V Voltage Resistance 500mA Variable / Fixed Output Industrial LDO Regulators**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
<b>New</b> BD00IA5WEFJ-LB	2.3 to 5.5	Variable 0.8 to 4.5	±1.0 / ±3.0 (Ta= -40 to +105°C)	0.5	0.25	0.4 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
<b>New</b> BD10IA5WEFJ-LB		1.0											HTSOP-J8
<b>New</b> BD12IA5WEFJ-LB		1.2											HTSOP-J8
<b>New</b> BD15IA5WEFJ-LB		1.5											HTSOP-J8
<b>New</b> BD18IA5WEFJ-LB		1.8											HTSOP-J8
<b>New</b> BD25IA5WEFJ-LB		2.5											HTSOP-J8
<b>New</b> BD30IA5WEFJ-LB		3.0											HTSOP-J8
<b>New</b> BD33IA5WEFJ-LB		3.3											HTSOP-J8

**7V Voltage Resistance 500mA LDO Regulators**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Protection circuit	Package
BD10KA5FP	2.3 to 5.5	1.0	±1.0	0.5	0.35	0.12 (Io=200mA)	50	25 (Io=0 to 500mA)	1.0	1.0	Over-Current/ Temperature	TO252-3
BD12KA5FP		1.2										TO252-3
BD15KA5FP		1.5										TO252-3
BD18KA5FP		1.8										TO252-3
BD25KA5FP		2.5										TO252-3
BD30KA5FP		3.0										TO252-3
BD33KA5FP		3.3										TO252-3

**7V Voltage Resistance 500mA LDO Regulators with Shutdown Switch**

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package Part No.	
													TO252-5	SOP8
BD00KA5W	2.3 to 5.5	Variable 1.0 to 4.0	±1.0	0.5	0.35	0.12 (Io=200mA)	50	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	BD00KA5WFP	BD00KA5WF
BD10KA5W		1.0											BD10KA5WFP	BD10KA5WF
BD12KA5W		1.2											BD12KA5WFP	BD12KA5WF
BD15KA5W		1.5											BD15KA5WFP	BD15KA5WF
BD18KA5W		1.8											BD18KA5WFP	BD18KA5WF
BD25KA5W		2.5											BD25KA5WFP	BD25KA5WF
BD30KA5W		3.0											BD30KA5WFP	BD30KA5WF
BD33KA5W		3.3											BD33KA5WFP	BD33KA5WF

**500mA Full CMOS LDO Regulators**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package
BU1ATH5WNVX	1.7 to 6.0	1.05	±1	0.5	0.01	0.01	0.52 (Io=250mA)	21 (Iout=5mA ~250mA)	Over Current	SSON004 X1010
BU12TH5WNVX		1.2					0.44 (Io=250mA)			
BU2JTH5WNVX		2.85					0.16 (Io=250mA)			
BU35TH5WNVX		3.5					0.15 (Io=250mA)			

**500mA Full CMOS LDO Regulators with Shutdown Switch WL-CSP Type**

Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Protection circuit	Package
<b>New</b> BU30SA5GWZ	1.8 to 5.0	3	±1	0.5	0.033	0.08 (Io=100mA)	70dB (f=1kHz)	6 (Iout=0.01mA ~300mA)	Over Current/ Temperature	UCSP30L1
<b>New</b> BU33SA5GWZ		3.3								



Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**360mA Full CMOS LDO Regulators with Shutdown Switch**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output Short current (mA)	Input Capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package
<b>New</b> BU12UB3WG	1.7 to 3.6	1.20	± 1	0.36	470 (Io=300mA)	70	25 (Io=0.01mA to 300mA)	50	150	1.0	1.0	✓	✓	✓	✓	SSOP5
<b>New</b> BU18UB3WG		1.80			250 (Io=300mA)											SSOP5
<b>New</b> BU25UB3WG		2.50			220 (Io=300mA)											SSOP5

**300mA Full CMOS LDO Regulators with Shutdown Switch**

Type	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output Short current (mA)	Input Capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package Part No.
<b>BUxxUA3WNVX</b> series	1.7 to 5.5	1.00	± 25 mV	0.3	470 (Io=300mA)	70	25 (Io=0.01mA to 300 m A)	50	150	1.0	1.0	✓	✓	✓	✓	SSON004X1010
		1.05														BU10UA3WNVX
		1.10														BU11UA3WNVX
		1.15														☆BU1BUA3WNVX
		1.20														BU12UA3WNVX
		1.25														☆BU1CUA3WNVX
		1.30														BU13UA3WNVX
		1.50			BU15UA3WNVX											
		1.80			BU18UA3WNVX											
		1.85			☆BU1JUA3WNVX											
		1.90			BU19UA3WNVX											
		2.00			☆BU20UA3WNVX											
		2.05			☆BU2AUA3WNVX											
		2.10			☆BU21UA3WNVX											
		2.20	BU22UA3WNVX													
		2.30	☆BU23UA3WNVX													
		2.50	BU25UA3WNVX													
		2.60	☆BU26UA3WNVX													
		2.70	☆BU27UA3WNVX													
		2.75	☆BU2HUA3WNVX													
		2.80	BU28UA3WNVX													
		2.85	BU2JUA3WNVX													
		2.90	BU29UA3WNVX													
		2.95	☆BU2KUA3WNVX													
		3.00	BU30UA3WNVX													
		3.10	BU31UA3WNVX													
		3.20	☆BU32UA3WNVX													
		3.30	BU33UA3WNVX													
3.40	BU34UA3WNVX															
3.70	BU37UA3WNVX															

**300mA CMOS LDO Regulators with Shutdown Switch**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output Short current (mA)	Input Capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Soft start function	Package
BH15M0AWHFV	2.5 to 5.5	1.5	±25mV	0.3	-	60	6 (Io=1 to 100mA)	65	100	1.0	1.0	✓	✓	✓	-	-	HVSOF6
BH18M0AWHFV		1.8															HVSOF6
BH20M0AWHFV		2.0															HVSOF6
BH21M0AWHFV		2.1															HVSOF6
BH25M0AWHFV		2.5															HVSOF6
BH26M0AWHFV		2.6															HVSOF6
BH27M0AWHFV		2.7	HVSOF6														
BH28M0AWHFV		2.8	HVSOF6														
BH29M0AWHFV		2.9	HVSOF6														
BH30M0AWHFV		3.0	HVSOF6														
BH31M0AWHFV		3.1	HVSOF6														
BH32M0AWHFV		3.2	HVSOF6														
BH33M0AWHFV		3.3	HVSOF6														
BH34M0AWHFV		3.4	HVSOF6														
BH15MA3WHFV	2.5 to 5.5	1.5	±25mV	0.3	-	60	6 (Io=1 to 100mA)	65	100	1.0	1.0	✓	✓	✓	-	-	HVSOF6
BH18MA3WHFV		1.8															HVSOF6
BH25MA3WHFV		2.5															HVSOF6
BH28MA3WHFV		2.8	HVSOF6														
BH29MA3WHFV		2.9	HVSOF6														
BH30MA3WHFV		3.0	HVSOF6														
BH31MA3WHFV		3.1	HVSOF6														
BH33MA3WHFV	3.3	HVSOF6															

☆ : Under Development

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**200mA CMOS LDO Regulators with Shutdown Switch**

Type	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vs <sub>sat</sub> (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package Part No.	
																SSON004X1010	SSOP5
<b>BUxxTD2WNVX</b> series  <b>BUxxTD3W</b> series	1.7 to 5.5	1.0	±25mV	0.2	-	70	10 (I <sub>o</sub> =1 to 100mA)	35	70	0.47	0.47	✓	✓	✓	✓	BU10TD2WNVX	BU10TD3W
		☆BU1ATD2WNVX														-	
		-														BU11TD3W	
		BU1BD2WNVX														-	
		BU12TD2WNVX														BU12TD3W	
		BU1CTD2WNVX														BU1CTD3W	
		-														BU13TD3W	
		BU15TD2WNVX														BU15TD3W	
		BU18TD2WNVX														BU18TD3W	
		BU1JTD2WNVX														BU1JTD3W	
		BU19TD2WNVX	BU19TD3W														
		BU20TD2WNVX	BU20TD3W														
		BU2ATD2WNVX	-														
		BU21TD2WNVX	BU21TD3W														
		BU23TD2WNVX	-														
		BU25TD2WNVX	BU25TD3W														
		BU26TD2WNVX	BU26TD3W														
		BU27TD2WNVX	BU27TD3W														
		BU2HTD2WNVX	-														
		BU28TD2WNVX	BU28TD3W														
BU2JTD2WNVX	BU2JTD3W																
BU29TD2WNVX	BU29TD3W																
BU30TD2WNVX	BU30TD3W																
BU31TD2WNVX	BU31TD3W																
BU32TD2WNVX	BU32TD3W																
BU33TD2WNVX	BU33TD3W																
BU34TD2WNVX	BU34TD3W																
BU25TD2WNVX	BU25TD3W																
BU26TD2WNVX	BU26TD3W																
BU27TD2WNVX	BU27TD3W																
BU28TD2WNVX	BU28TD3W																
BU29TD2WNVX	BU29TD3W																
BU30TD2WNVX	BU30TD3W																
BU31TD2WNVX	BU31TD3W																
BU32TD2WNVX	BU32TD3W																
BU33TD2WNVX	BU33TD3W																
BU34TD2WNVX	BU34TD3W																

Type	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vs <sub>sat</sub> (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package Part No.	
																SSON004X1216	HVSO5F5
BU15TA2W	2.5 to 5.5	1.5	±25mV	0.2	-	70	10 (I <sub>o</sub> =0.01 to 100mA)	40	70	1.0	1.0	✓	✓	✓	✓	BU15TA2WNVX	BU15TA2WHFV
BU18TA2W		1.8			BU18TA2WNVX											BU18TA2WHFV	
BU25TA2W		2.5			400 (I <sub>o</sub> =200mA)											BU25TA2WNVX	BU25TA2WHFV
BU26TA2W		2.6														BU26TA2WNVX	BU26TA2WHFV
BU27TA2W		2.7														BU27TA2WNVX	BU27TA2WHFV
BU28TA2W		2.8														BU28TA2WNVX	BU28TA2WHFV
BU2JTA2W		2.85			360 (I <sub>o</sub> =200mA)											BU2JTA2WNVX	BU2JTA2WHFV
BU29TA2W		2.9														BU29TA2WNVX	BU29TA2WHFV
BU30TA2W		3.0			330 (I <sub>o</sub> =200mA)											BU30TA2WNVX	BU30TA2WHFV
BU31TA2W		3.1														BU31TA2WNVX	BU31TA2WHFV
BU32TA2W		3.2	BU32TA2WNVX			BU32TA2WHFV											
BU33TA2W		3.3	BU33TA2WNVX			BU33TA2WHFV											
BU34TA2W		3.4	300 (I <sub>o</sub> =200mA)		BU34TA2WNVX	BU34TA2WHFV											

**200mA CMOS LDO Regulators with Shutdown Switch (Automotive Grade)**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vs <sub>sat</sub> (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package
BU12SD2MG-M	1.7 to 6.0	1.20	±2 (T <sub>a</sub> =-40°C to +105°C)	0.2	400 (I <sub>o</sub> =100mA)	68	1 (I <sub>o</sub> =1mA to 200 mA)	33	100	1.0	1.0	✓	✓	✓	-	SSOP5
BU15SD2MG-M		1.50			280 (I <sub>o</sub> =100mA)											SSOP5
BU18SD2MG-M		1.80			150 (I <sub>o</sub> =100mA)											SSOP5
BU25SD2MG-M		2.50			100 (I <sub>o</sub> =100mA)											SSOP5
BU28SD2MG-M		2.80			85 (I <sub>o</sub> =100mA)											SSOP5
BU30SD2MG-M		3.00			SSOP5											
BU33SD2MG-M		3.30			SSOP5											

☆ : Under Development



Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

200mA CMOS LDO Regulators with Shutdown Switch WL-CSP Type																		
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package (mm)		
BU18SA4WGWL	1.7 to 5.5	1.8	±2	0.2	100 (Io=150mA)	70	2 (Io=1 to 100mA)	40	100	0.47	0.47	✓	✓	✓	—	UCSP50L1 (0.8×0.8) H=0.55mm Max.		
BU25SA4WGWL		2.5			UCSP50L1 (0.8×0.8) H=0.55mm Max.													
BU2FSA4WGWL		2.55			UCSP50L1 (0.8×0.8) H=0.55mm Max.													
BU28SA4WGWL		2.8			UCSP50L1 (0.8×0.8) H=0.55mm Max.													
BU30SA4WGWL		3.0			UCSP50L1 (0.8×0.8) H=0.55mm Max.													
BU33SA4WGWL		3.3			UCSP50L1 (0.8×0.8) H=0.55mm Max.													
80 (Io=150mA)	150mA CMOS LDO Regulators with Shutdown Switch																	
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package (mm)		
BH25NB1WHFV	2.5 to 5.5	2.5	±1	0.15	250 (Io=100mA)	80	6 (Io=1 to 100mA)	60	50	0.1	2.2	✓	✓	✓	—	HVSOF5		
BH28NB1WHFV		2.8														HVSOF5		
BH2JNB1WHFV		2.85														HVSOF5		
BH29NB1WHFV		2.9														HVSOF5		
BH30NB1WHFV		3.0														HVSOF5		
BH31NB1WHFV		3.1														HVSOF5		
BH33NB1WHFV		3.3														HVSOF5		
Part No.		Input voltage (V)														Output voltage (V)	Output voltage precision (%)	Output current (A)
BH15RB1WGUT	2.5 to 5.5	1.5	±1	0.15	100 (Io=100mA)	63	2 (Io=1 to 100mA)	34	40	1.0	1.0	✓	✓	✓	—	VCSP60N1 (1.04×1.0) H=0.675Max.		
BH18RB1WGUT		1.8														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH25RB1WGUT		2.5														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH28RB1WGUT		2.8														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH29RB1WGUT		2.9														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH30RB1WGUT		3.0														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH31RB1WGUT		3.1														VCSP60N1 (1.04×1.0) H=0.675Max.		
BH33RB1WGUT		3.3														VCSP60N1 (1.04×1.0) H=0.675Max.		
Part No.		Input voltage (V)														Output voltage (V)	Output voltage precision (%) (High speed mode)	Output voltage precision (%) (Low lcc mode)
BH12PB1WHFV	1.7 to 5.5	1.2	±25mV	-3.3 to +4.3	0.15	60 (High speed mode)	10 (Io=10 to 100mA)	20	2	50	0.47	0.47	✓	✓	✓	—	HVSOF5	
BH15PB1WHFV		1.5															HVSOF5	
BH18PB1WHFV		1.8															HVSOF5	
BH25PB1WHFV		2.5															HVSOF5	
BH28PB1WHFV		2.8															HVSOF5	
BH29PB1WHFV		2.9															HVSOF5	
BH30PB1WHFV		3.0															HVSOF5	
BH31PB1WHFV		3.1															HVSOF5	
BH33PB1WHFV		3.3															HVSOF5	
210 (Io=100mA)	150mA CMOS LDO Regulators with Shutdown Switch																	
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shutdown Switch	Over current protection	Temperature protection	Discharge function	Package (mm)		
BH18SA3WGUT	2.2 to 5.5	1.8	±1	0.15	—	63	2 (Io=1 to 100mA)	40	50	1.0	1.0	✓	✓	✓	—	VCSP60N1		
BH28SA3WGUT		2.8			VCSP60N1													
BH30SA3WGUT		3.0			VCSP60N1													
100 (Io=100mA)	150mA CMOS LDO Regulators with Shutdown Switch																	

A

Power Management

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

**Fast Transient Response**

Part No.	Input voltage(V)		Output voltage (V)	Voltage accuracy (%)	Output current (A)	Over current protection	Soft start	Thermal shut down	UVLO	Package
	Vcc	Vin								
BD3550HFN	4.3 to 5.5	0.95 to Vcc-1	Adjustable 0.65 to 2.7	±1	0.5	Recovery	Adjustable	Recovery	✓	HSO8
BD3551HFN					1.0	Recovery	Adjustable	Recovery	✓	HSO8
BD3506F		1.2 to Vcc-1	Adjustable 0.65 to 2.5		2.5	Recovery	Adjustable	Recovery	✓	SOP8
BD3552HFN		0.95 to Vcc-1	Adjustable 0.65 to 2.7		2.0	Recovery	Adjustable	Recovery	✓	HSO8
BD3508MUV	0.75 to Vcc-1	3.0		Recovery	Adjustable	Recovery	✓	VQFN020V4040		
BD3507HFV	4.5 to 5.5	1.2 to Vcc-1	Adjustable 0.65 to 2.7	±1	0.55	Recovery	Adjustable	Recovery	✓	HVSOF6
BD35269HFN	4.3 to 5.5	1.5 to Vcc-1			1.2	Latch	Adjustable	Latch	✓	HSO8
BD35230HFN		1.3 to Vcc-1	1.0		Latch	Adjustable	Latch	✓	HSO8	
BD35231HFN	1.5 to Vcc-1	1.2	Adjustable 0.65 to 2.7		2.0	Latch	Adjustable	Latch	✓	HSO8
BD3523HFN	0.95 to Vcc-1	Latch		Adjustable		Latch	✓	HSO8		
BD35221EFV	4.3 to 5.5	1.25 to Vcc-1	1.2	4.0	Latch	Adjustable	Latch	✓	HTSSOP-B20	
BD35222EFV		1.55 to Vcc-1	1.5		Latch	Adjustable	Latch	✓	HTSSOP-B20	

**Fast Transient Response with Power Good Output**

Part No.	Input voltage(V)	Output voltage (V)	Voltage accuracy (%)	Output current (A)	Over current protection	Soft start	Thermal shut down	UVLO	Package
BD3540NUV	3.0 to 5.5	0.95 to Vcc-1	Adjustable 0.65 to 2.7	0.5	Recovery	Adjustable	Recovery	✓	VSON010V3030
BD3541NUV				1.0	Recovery	Adjustable	Recovery	✓	VSON010V3030
BD3512MUV	4.3 to 5.5	0.7 to Vcc-1		3.0	Recovery	Adjustable	Recovery	✓	VQFN020V4040
BD3509MUV				4.0	Recovery	Adjustable	Recovery	✓	VQFN020V4040

**Fast Transient Response (External FET)**

Part No.	Input voltage(V)		Output voltage (V)	Voltage accuracy (%)	Output current (A)	Short circuit protection	Soft start	Thermal shut down	UVLO	Package
	Vcc	Vin								
BD3504FVM	4.5 to 5.5	Vo+(IoMax. × Ron)	Adjustable 0.65 to 2.5	±1	Depend on external FET	Latch	Adjustable	Latch	✓	MSOP8
BD3521FVM			1.5		Depend on external FET	Latch	Adjustable	Latch	✓	MSOP8

**LDO Regulators with Voltage Detector and Watchdog Timer**
**500mA Output LDO Regulators with Voltage Detector and Watchdog Timer (Automotive grade)**

Part No.	Input voltage (V)	LDO				Voltage detector			Circuit current (μA)	Operating temperature (°C)	Package
		Output voltage(V)	Output voltage precision(%)	Output current(A)	I/O Voltage Difference(V)	Detection Voltage(V)	Voltage detection precision(%)	Function			
BD3021HFP-M	5.6 to 36.0	5	±2 (Ta=-40 to +125°C)	0.5	0.3 (Io=200mA)	4.5	±2	4.5V Voltage Detector+WDT (Active switch)	80	-40 to +125	HRP7
BD3020HFP-M						Variable (at Vs open: 4.1V)		Adjustable Voltage Detector+WDT			HRP7

**200mA Output LDO Regulators with Voltage Detector and Watchdog Timer (Automotive grade)**

BD3010AFV-M	5.6 to 36.0	5	±2 (Ta=-40 to +125°C)	0.2	0.25 (Io=150mA)	Variable (RADJ open: 4.25V)	±3	Adjustable Voltage Detector+WDT	80	-40 to +125	SSOP-B20
-------------	-------------	---	-----------------------	-----	-----------------	-----------------------------	----	---------------------------------	----	-------------	----------

**LDO Regulators with Voltage Detector**
**500mA Output LDO Regulators with Voltage Detector (Automotive grade)**

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference (V)	Circuit current (μA)	Operating temperature (Tj)	Shutdown Switch	Package
<b>New</b> BD4275-Cseries	5.5 to 45.0	5	±2 (Tj=-40 to +150°C)	0.5	0.25 (Io=300mA)	65	-40 to +150°C	-	TO252-J5 TO263-5

**150mA Output LDO Regulator with Voltage Detector (Automotive grade)**

Part No.	Input voltage (V)	LDO				Voltage detector		Battery Voltage Detector Detection Voltage(V)	Circuit current (μA)	Operating temperature (Tj)	Package
		Output voltage(V)	Output voltage precision(%)	Output current(A)	I/O Voltage Difference(V)	Detection Voltage(V)	Voltage detection precision(%)				
<b>New</b> BD4269FJ-C	5.5 to 45.0	5	±2 (Tj=-40 ~ +150°C)	0.2	0.25 (Io=100mA)	Variable (at RADJ open: 4.62V)	±2.6	Variable	70	-40 to +150°C	SOP-J8

**Voltage Tracker**
**500mA Voltage Tracker (Automotive grade)**

Part No.	Input voltage (V)	Output current (A)	Offset voltage (mV)	Circuit current (μA)	Operating temperature (°C)	Package
BD3925FP-C	4.5 to 36.0	0.5	±10 (Ta=-40 to +125°C, Vcc=6 to 36V, Io=5 to 200mA)	45	-40 to +125	TO252-5
BD3925HFP-C						HRP5

**Multi-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

2ch LDO Regulators															
Part No.	Input Voltage (V)	Output Voltage1 (V)	Output Voltage2 (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package	
BA30E00WHFP	4.1 to 16.0	3.3	Variable 0.8 to 3.3	±2.0	0.6/0.6	0.7	0.3 (Io=300mA)	68 (3.3V output)	30 (Io=0 to 0.6A)	1.0	47	✓	Over-Current/ Temperature	HRP7	
BA3259HFP	4.75 to 14.0				1.0/1.0	3.0	1.1 (Io=1A)	52	5 (Io=5mA to 1A)	3.3	1.0	—		—	HRP5
BA3258HFP		1.5	3.0		0.5/0.5	0.7	0.25 (Io=250mA)	74 (1.5V output)	5 (Io=0 to 500mA)	1.0		—		—	HRP5
BA33D15HFP	4.1 to 16.0	3.3	3.3		0.5/0.5	0.7	0.25 (Io=250mA)	74 (1.5V output)	5 (Io=0 to 500mA)	1.0	—	—		—	HRP5
BA33D18HFP					1.8	—	—	—	—	—	—	—		—	—

2ch High Efficiency CMOS Regulator													
Part No.	Output voltage (V)	Output voltage precision (%)	Output current (A)	Ripple rejection (dB)	Load regulation (%)	Output short current (mA)	Output capacitor (μF)	Shut down Switch	Over current protection	Temperature protection	Discharge function		
BD70511GWL	LDO1	1.200	1.5	0.15	60	10	30	✓	✓	✓	✓		
	LDO2		0.3	65									

2ch Variable Step CMOS LDO Regulators																								
Part No.	Input voltage (V)	Vout	Selectable output voltage (V)								Output voltage precision (%)	Output current (A)	Vsat (mV) (Io=100mA)	Ripple rejection (dB)	Load regulation (%)	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shut down Switch	Over current protection	Temperature protection	Low voltage protection	
			1.5	1.8	1.8	1.8	2.6	2.8	2.9	2.8														
BD7003NUX	2.5 to 5.5	1ch	1.5	1.8	1.8	1.8	2.6	2.8	2.9	2.8	1.8	0.3	90	66	0.2 (Io=1 to 300mA)	55	150	1.0	1.0	✓	✓	✓	✓	
		2ch	2.8	2.6	2.7	2.8	2.9	2.8	2.8	3.0														
BD7004NUX	2.5 to 5.5	1ch	1.2	1.2	1.8	1.8	1.8	1.8	1.8	2.8	1.8	0.3	90	66	0.2 (Io=1 to 300mA)	55	150	1.0	1.0	✓	✓	✓	✓	
		2ch	1.5	1.8	1.5	1.8	3.0	3.3	3.0	3.0														
BD7602GUL	2.7 to 5.5	1ch	3.0								2.0	0.1	—	45	0.7	10	—	1.0	4.7	✓	✓	✓	✓	
		2ch	2.8	2.9	2.95	3.0	3.05	3.1	3.2	3.3														

New

3ch CMOS LDO Regulators																		
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision	Output current (A)	Vsat (mV) (Io=200mA)	Ripple rejection (dB)	Load regulation (%)	ch	Circuit current (μA)	Output short current (mA)	Input capacitor (μF)	Output capacitor (μF)	Shut down Switch	Over current protection	Temperature protection	Discharge function	Package	
BU6650NUX	2.5 to 5.5	2.8	±1%	0.2	360	65	10 (Io=1 to 100mA)	1	120	70	2.2	1.0	✓	✓	✓	✓	VSON008X2030	
		2.8	±1%		360	65		2										
		1.8	±25mV		—	70		3										
BU6651NUX		2.8	±1%		360	65		1	120								VSON008X2030	
		1.8	±25mV		—	70		2										
		1.5	±25mV		—	70		3										
BU6652NUX		2.8	±1%		360	65		1	120								VSON008X2030	
		2.8	±1%		360	65		2										
		1.5	±25mV		—	70		3										
BU6653NUX		2.8	±1%		360	65		1	120								VSON008X2030	
	1.8	±25mV	—	70	2													
	1.8	±25mV	—	70	3													
BU6654NUX	3.3	±1%	300	65	1	120	VSON008X2030											
	1.8	±25mV	—	70	2													
	1.5	±25mV	—	70	3													
BU6655NUX	3.3	±1%	300	65	1	120	VSON008X2030											
	2.8	±1%	360	65	2													
	1.8	±25mV	—	70	3													

**Linear Regulators for DDR SDRAM**

Termination Regulators for DDR SDRAM										
Part No.	Input voltage (V)	Output voltage (V)	Voltage precision (mV)	V <sub>IT</sub> output current (A)	V <sub>REF</sub> output current (mA)	Soft start	Thermal shut down	Output ceramic capacitors	Package	
BD3532F	4.3 to 5.5	0.75 to 1.25	±30	±3.0	±20	✓	Recovery	—	SOP8	
BD3531F	4.5 to 5.5			±1.5	±10	None	Recovery	—	SOP8	
BD3533F	2.7 to 5.5			±1.0	±20	✓	Recovery	—	SOP8	
BD3533FVM				±1.0	±20	✓	Recovery	—	MSOP8	
BD3533HFN				±1.0	±20	✓	Recovery	—	HSOP8	
BD3537F	4.75 to 5.25	0.60 to 1.60	±15	±1.8	None	✓	Recovery	—	SOP8	
BD3538F	2.7 to 5.5	0.75 to 1.25	±15	±1.0	±20	✓	Recovery	—	SOP8	
BD3538FVM						✓	Recovery	—	MSOP8	
BD3538HFN						✓	Recovery	—	HSOP8	
BD3539FVM						✓	Recovery	✓	MSOP8	
BD3539NUX				✓	Recovery	✓	VSON008X2030			
BD35390FJ				None	✓	Recovery	✓	SOP-J8		

New

Termination Regulators for DDR SDRAM (Automotive grade)										
BD35395FJ-M	2.5 to 5.5	0.5 to 1.375	±13.5	±1.0	None	✓	Recovery	✓	SOP-J8	

CMOS LDO Regulator for LP-DDR SDRAM										
Part No.	Input voltage (V)	Output voltage (V)		Output current (mA)		POK (V)		OCP Max. (mA)		Package
		VLD01	VLD02	I out 1 Max.	I out 2 Max.	VPOK1	VPOK2	I OCP 1 Max.	I OCP 2 Max.	
BD8335GWL	2.0 to 5.5	1.226	1.839	10.0	5.0	1.140	1.700	25	12.5	UCSP50L1

# Switching Regulators

## Switching Regulators

### Integrated MOSFET Switching Regulators

Single Output Buck Converters  $V_{IN} \leq 6V$  ▶ P.A51

Single Output Buck Converters  $V_{IN} \leq 20V$  ▶ P.A52

Single Output Buck Converters  $V_{IN} > 20V$  ▶ P.A52

Dual Output Buck Converters ▶ P.A53

Boost and Buck-Boost Converters ▶ P.A53

### External Switch Switching Regulators

Buck Controllers ▶ P.A53

Boost and Buck-Boost Converters ▶ P.A53

### For Automotive Switching Regulators

Switching Regulators (Integrated Switch) Single Output ▶ P.A54

Switching Regulators (Integrated Switch) Ultra Low quiescent current / Synchronous ▶ P.A54

Secondary Switching Regulators (Integrated Switch) Single Output ▶ P.A54

Switching Controllers (External Switch) Single Output Isolated / Boost Converters ▶ P.A54

Switching Controllers (External Switch) Dual Output Buck / Boost Converters ▶ P.A54

Switching Controllers (External Switch) Single Output Buck / Boost Converters ▶ P.A54

# Switching Regulators

## Integrated MOSFET Switching Regulators

Single Output Buck Converters $V_{IN} \leq 6V$													
Part No.	Input Voltage Maximum Rating (V)	Output Current (A)	Input Voltage Range (V)	Output Voltage (V)	Switching Frequency (MHz)	Control Mode	Features						Package (mm)
							Power Good	Adjustable Soft Start	Synchronous Rectifier	Light-Load Efficiency	Over-Current Protection	Thermal Protection	
BD9122GUL	7	0.3	2.5 to 5.5	1.0 to 2.0	1	Current	–	–	✓	✓	Latch	Latch	VCSP50L2 (2.5 × 1.1)
BD9161FVM	7	0.6	2.5 to 4.5	1.0 to 3.3	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
<b>New</b> BD9161FVM-LB	7	0.6	2.5 to 4.5	1.0 to 3.3	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BU9B001G	7	0.6	2.3 to 5.5	2.5	1.2	Hysteresis	–	–	✓	–	Recovery	Recovery	SSOP6
BU9006GUZ	7	0.75	2.5 to 4.5	1.0 to $V_{IN}$	2	Current	–	–	✓	–	Recovery	Recovery	VCSP35L1 (1.8 × 1.6)
BD9109FVM	7	0.8	4.5 to 5.5	3.3	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
<b>New</b> BD9109FVM-LB	7	0.8	4.5 to 5.5	3.3	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BD9102FVM	7	0.8	4.0 to 5.5	1.24	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BD8966FVM	7	0.8	4.0 to 5.5	1.0 to 2.5	1	Current	–	–	✓	–	Latch	Latch	MSOP8
BD9106FVM	7	0.8	4.0 to 5.5	1.0 to 2.5	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
<b>New</b> BD9106FVM-LB	7	0.8	4.0 to 5.5	1.0 to 2.5	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BD9120HFN	7	0.8	2.7 to 5.5	1.0 to 1.5	1	Current	–	–	✓	✓	Latch	Latch	HSOP8
BD8967FVM	7	0.9	4.5 to 5.5	3.3	1	Current	–	–	✓	–	Latch	Latch	MSOP8
BD9104FVM	7	0.9	4.5 to 5.5	3.3	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BU90002GWZ	7	1	4.0 to 5.5	3.3	6	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
BU90003GWZ	7	1	2.3 to 5.5	1.2	4	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
BU90004GWZ	7	1	2.3 to 5.5	1.8	5.4	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
BU90005GWZ	7	1	2.3 to 5.5	2.5	6	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
BU90006GWZ	7	1	2.3 to 5.5	3.0	6	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
BU90007GWZ	7	1	2.3 to 5.5	1.25	4	Hysteresis	–	–	✓	✓	Recovery	Recovery	UCSP35L1 (1.3 × 0.9)
<b>New</b> BD9A100MUV	7	1	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016V3030
<b>New</b> BD9A101MUV-LB	7	1	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016V3030
<b>New</b> BD9B100MUV	7	1	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030
BD8964FVM	7	1.2	4.0 to 5.5	1.0 to 1.8	1	Current	–	–	✓	–	Latch	Latch	MSOP8
BD9107FVM	7	1.2	4.0 to 5.5	1.0 to 1.8	1	Current	–	–	✓	✓	Latch	Latch	MSOP8
BD9123MUV	7	1.2	2.7 to 5.5	0.85 to 1.2	1	Current	✓	–	✓	✓	Latch	Latch	VQFN016V3030
BU90023NUX	7	1.5	2.3 to 5.5	1.23	1	Hysteresis	–	–	✓	✓	Recovery	Recovery	VSON008X2030
BU90028NUX	7	1.5	2.3 to 5.5	1.175	1	Hysteresis	–	–	✓	✓	Recovery	Recovery	VSON008X2030
BD8961NV	7	2	4.5 to 5.5	3.3	1	Current	–	–	✓	–	Latch	Latch	SON008V5060
BD9111NV	7	2	4.5 to 5.5	3.3	1	Current	–	–	✓	✓	Latch	Latch	SON008V5060
BD9110NV	7	2	4.5 to 5.5	1.0 to 2.5	1	Current	–	–	✓	✓	Latch	Latch	SON008V5060
BD89630EFJ	7	2	2.7 to 5.5	1.0 to 2.5 <sup>†</sup>	1	Current	–	–	✓	–	Latch	Latch	HTSOP-J8
BD8960NV	7	2	2.7 to 5.5	1.0 to 2.5 <sup>†</sup>	1	Current	–	–	✓	–	Latch	Latch	SON008V5060
BD9130EFJ	7	2	2.7 to 5.5	1.0 to 2.5 <sup>†</sup>	1	Current	–	–	✓	✓	Latch	Latch	HTSOP-J8
BD9130NV	7	2	2.7 to 5.5	1.0 to 2.5 <sup>†</sup>	1	Current	–	–	✓	✓	Latch	Latch	SON008V5060
BD91370MUV	7	2	2.7 to 5.5	0.8 to 3.3 <sup>†</sup>	1	Current	–	–	✓	✓	Recovery	Recovery	VQFN020V4040
☆BD9B200MUV	7	2	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030
BD8962MUV	7	3	2.7 to 5.5	0.8 to 2.5 <sup>†</sup>	1	Current	–	–	✓	–	Latch	Latch	VQFN020V4040
BD9132MUV	7	3	2.7 to 5.5	0.8 to 3.3 <sup>†</sup>	1	Current	–	–	✓	✓	Latch	Latch	VQFN020V4040
BD8963EFJ	7	3	2.7 to 5.5	1.0 to 2.5 <sup>†</sup>	1	Current	–	–	✓	–	Latch	Latch	HTSOP-J8
BD9134MUV	7	3	4.5 to 5.5	3.3	1	Current	–	–	✓	✓	Latch	Latch	VQFN020V4040
BD9139MUV	7	3	2.7 to 5.5	0.8 to 3.3 <sup>†</sup>	1	Current	–	–	✓	✓	Latch	Latch	VQFN016V3030
<b>New</b> BD9A300MUV	7	3	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016V3030
<b>New</b> BD9A301MUV-LB	7	3	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016V3030
<b>New</b> BD9B300MUV	7	3	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	✓	Latch	Recovery	VQFN016V3030
☆BD9B301MUV-LB	7	3	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030
☆BD9B330GWZ	7	3	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1.7	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	UCSP30L1 (1.98 × 1.8)
BD9137MUV	7	4	2.7 to 5.5	0.8 to 3.3 <sup>†</sup>	1	Current	–	–	✓	✓	Recovery	Recovery	VQFN020V4040
BD91361MUV	7	4	2.7 to 5.5	0.8 to 3.3 <sup>†</sup>	1	Current	–	–	✓	✓	Latch	Latch	VQFN020V4040
<b>New</b> BD9A400MUV	7	4	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016-V3030
☆BD9B400MUV	7	4	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030
BD91363AMUV	7	4.8	2.7 to 5.5	0.9 to 3.3 <sup>†</sup>	1.5	Current	–	–	✓	✓	Latch	Latch	VQFN020V4040
<b>New</b> BD91364AMUU	7	5	2.9 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1.7	Hysteresis	✓	✓	✓	✓	Latch	Recovery	VQFN20U4040M
☆BD9B500MUV	7	5	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1/2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030
<b>New</b> BD9A600MUV	7	6	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.7$ )	1	Current	✓	✓	✓	✓	Recovery	Recovery	VQFN016-V3030
☆BD9B600MUV	7	6	2.7 to 5.5	0.8 to ( $V_{IN} \times 0.8$ )	1 / 2	Hysteresis	✓	✓	✓	Deep	Recovery	Recovery	VQFN016V3030

<sup>†</sup> Restrictions depend on input/output voltage conditions.

☆ Under Development



**Integrated MOSFET Switching Regulators**
**Single Output Buck Converters  $V_{IN} \leq 20V$** 

Part No.	Input Voltage Maximum Rating (V)	Output Current (A)	Input Voltage Range (V)	Output Voltage (V)	Switching Frequency (MHz)	Control Mode	Features							Package
							Power Good	Adjustable Soft Start	Synchronous Rectifier	Light-Load Efficiency	Over-Current Protection	Thermal Protection	Over-Voltage Protection	
BD8312HFN	15	1	3.5 to 14	1.2 to 12 <sup>1</sup>	1.5	Current	-	-	✓	-	-	Recovery	-	HSOP8
BD8313HFN	15	1	3.5 to 14	1.2 to 12 <sup>1</sup>	1	Current	-	-	✓	-	-	Recovery	-	HSOP8
BD1482EFJ	20	2	4.2 to 18	0.923 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD9328EFJ	20	2	4.2 to 18	0.9 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
<b>New</b> BD9328EFJ-LB	20	2	4.2 to 18	0.9 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD9141MUV	15	2	4.5 to 13.2	2.5 to 6.0 <sup>1</sup>	0.5	Current	-	-	✓	✓	Latch	Latch	-	VQFN020V4040
BD95821MUV	15.2	2	7.5 to 15	0.8 ~ ( $V_{IN} \times 0.5$ ) ( $V_{IN} \times 0.5$ ) $\leq$ 5.5V	0.5 to 0.8	H <sup>3</sup> Reg	✓	-	✓	-	Latch	Recovery	✓	VQFN020V4040
BD9325FJ	20	2	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	SOP-J8
<b>New</b> BD9325FJ-LB	20	2	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	SOP-J8
BD93290EFJ	20	3	4.2 to 18	0.9 to ( $V_{IN} \times 0.7$ )	0.3	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD1484EFJ	20	3	4.2 to 18	0.925 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD9329AEFJ	20	3	4.2 to 18	0.9 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
<b>New</b> BD9329AEFJ-LB	20	3	4.2 to 18	0.9 to ( $V_{IN} \times 0.7$ )	0.38	Current	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD9C301FJ	20	3	4.5 to 18	( $V_{IN} \times 0.125$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.125$ ) $\geq$ 0.8	0.5	Current	-	-	✓	-	Latch	Recovery	-	SOP-J8
<b>New</b> BD9C301FJ-LB	20	3	4.5 to 18	( $V_{IN} \times 0.125$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.125$ ) $\geq$ 0.8	0.5	Current	-	-	✓	-	Latch	Recovery	-	SOP-J8
BD95831MUV	15.2	3	7.5 to 15	0.8 to ( $V_{IN} \times 0.5$ ) ( $V_{IN} \times 0.5$ ) $\leq$ 5.5V	0.5 to 0.8	H <sup>3</sup> Reg	✓	-	✓	-	Latch	Recovery	✓	VQFN016V3030
BD95835EFJ	20	3	4.5 to 18	0.9 to ( $V_{IN} \times 0.6$ )	0.2 to 0.8	Hysteresis	-	✓	✓	-	Recovery	Recovery	✓	HTSOP-J8
BD9D320EFJ	20	3	4.5 to 18	0.765 to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.7$ ) $\leq$ 7	0.7	Hysteresis	-	✓	✓	-	Recovery	Recovery	-	HTSOP-J8
BD9D321EFJ	20	3	4.5 to 18	0.9 to 7.0 ( $V_{IN} \times 0.06$ ) to ( $V_{IN} \times 0.65$ )	0.7	Hysteresis	-	✓	✓	✓	Recovery	Recovery	-	HTSOP-J8
BD9859EFJ	15	3	5.0 to 14	1.0 to ( $V_{IN} \times 0.7$ )	0.75	Current	-	-	-	-	Recovery	Recovery	-	HTSOP-J8
BD9326EFJ	20	3	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	HTSOP-J8
<b>New</b> BD9326EFJ-LB	20	3	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	HTSOP-J8
BD9C401EFJ	20	4	4.5 to 18	( $V_{IN} \times 0.125$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.125$ ) $\geq$ 0.8	0.5	Current	-	-	✓	-	Latch	Recovery	-	HTSOP-J8
BD95841MUV	15.2	4	7.5 to 15	0.8 to ( $V_{IN} \times 0.5$ ) ( $V_{IN} \times 0.5$ ) $\leq$ 5.5V	0.5 to 0.8	H <sup>3</sup> Reg	✓	-	✓	-	Latch	Recovery	✓	VQFN016V3030
BD9327EFJ	20	4	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	HTSOP-J8
<b>New</b> BD9327EFJ-LB	20	4	4.75 to 18	0.9 to ( $V_{IN} \times 0.8$ )	0.38	Current	-	✓	-	-	Recovery	Recovery	-	HTSOP-J8
BD9C501EFJ	20	5	4.5 to 18	( $V_{IN} \times 0.075$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.075$ ) $\geq$ 0.8	0.5	Current	-	-	✓	-	Latch	Recovery	-	HTSOP-J8
BD95861MUV	20	6	7.5 to 18	0.8 to ( $V_{IN} \times 0.5$ ) ( $V_{IN} \times 0.5$ ) $\leq$ 5.5V	0.5 to 0.8	H <sup>3</sup> Reg	✓	-	✓	-	Latch	Recovery	✓	VQFN024V4040
BD9C601EFJ	20	6	4.5 to 18	( $V_{IN} \times 0.075$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.075$ ) $\geq$ 0.8	0.5	Current	-	-	✓	-	Latch	Recovery	-	HTSOP-J8
BD95500MUV	24	6	3.0 to 20	0.7 to 5.0	0.2 to 1.0	H <sup>3</sup> Reg	✓	✓	✓	✓	Latch	Recovery	✓	VQFN040V6060

**Single Output Buck Converters  $V_{IN} > 20V$** 

BD9G101G	45	0.5	6.0 to 42	( $V_{IN} \times 0.15$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.15$ ) $\geq$ 1.0	1.5	Current	-	-	-	-	Recovery	Recovery	-	SSOP6
<b>New</b> BD9E100FJ-LB	40	1	7.0 to 36	( $V_{IN} \times 0.15$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.15$ ) $\geq$ 1.0	1	Current	-	-	✓	-	Recovery	Recovery	✓	SOP-J8
<b>New</b> BD9E101FJ-LB	40	1	7.0 to 36	( $V_{IN} \times 0.0855$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.0855$ ) $\geq$ 1.0	0.57	Current	-	-	✓	-	Recovery	Recovery	✓	SOP-J8
BD9E102FJ	30	1	7.0 to 26	( $V_{IN} \times 0.143$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.1425$ ) $\geq$ 1.0	0.57	Current	-	-	✓	✓	Recovery	Recovery	✓	SOP-J8
<b>New</b> BD9E151NMX	30	1.2	6.0 to 28	1.0 to ( $V_{IN} \times 0.7$ )	0.6	Current	-	✓	-	-	Recovery	Recovery	✓	VSON008X2030
BD9701CP-V5	36	1.5	8.0 to 35	1.0 to ( $V_{IN}-3.0$ )	0.1	Voltage	-	-	-	-	Recovery	Recovery	-	TO220CP-V5
BD9701FP	36	1.5	8.0 to 35	1.0 to ( $V_{IN}-3.0$ )	0.1	Voltage	-	-	-	-	Recovery	Recovery	-	TO252-5
BD9703CP-V5	36	1.5	8.0 to 35	1.0 to ( $V_{IN}-3.0$ )	0.3	Voltage	-	-	-	-	Recovery	Recovery	-	TO220CP-V5
BD9703FP	36	1.5	8.0 to 35	1.0 to ( $V_{IN}-3.0$ )	0.3	Voltage	-	-	-	-	Recovery	Recovery	-	TO252-5
BD9870FPS	36	1.5	8.0 to 35	1.0 to ( $0.8 \times (V_{IN}-I_{OL} \times R_{OL})$ )	0.9	Voltage	-	-	-	-	Recovery	Recovery	-	TO252S-5
BD9873CP-V5	36	1.5	8.0 to 35	1.0 to ( $0.8 \times (V_{IN}-I_{OL} \times R_{OL})$ )	0.11	Voltage	-	-	-	-	Recovery	Recovery	-	TO220CP-V5
<b>New</b> BD9E300EFJ-LB	40	2.5	7.0 to 36	( $V_{IN} \times 0.15$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.15$ ) $\geq$ 1.0	1	Current	-	-	✓	-	Recovery	Recovery	✓	HTSOP-J8
<b>New</b> BD9E301EFJ-LB	40	2.5	7.0 to 36	( $V_{IN} \times 0.0855$ ) to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.0855$ ) $\geq$ 1.0	0.57	Current	-	-	✓	-	Recovery	Recovery	✓	HTSOP-J8
BD95513MUV	30	3	4.5 to 28	0.7 to 5.0	0.2 to 1.0	H <sup>3</sup> Reg	✓	✓	✓	✓	Latch	Recovery	✓	VQFN032V5050
BD9702CP-V5	36	3	8.0 to 35	1.0 to ( $V_{IN}-3.0$ )	0.11	Voltage	-	-	-	-	Recovery	Recovery	-	TO220CP-V5
BD9874CP-V5	36	3	8.0 to 35	1.0 to ( $0.8 \times (V_{IN}-I_{OL} \times R_{OL})$ )	0.11	Voltage	-	-	-	-	Recovery	Recovery	-	TO220CP-V5
☆BD9G341EFJ	80	3	12 to 76	1.0 to ( $V_{IN} \times 0.7$ ) <sup>1</sup>	0.05 to 0.75	Current	✓	-	-	-	Recovery	Recovery	✓	HTSOP-J8
BD95514MUV	30	4	4.5 to 28	0.7 to 5.0	0.2 to 1.0	H <sup>3</sup> Reg	✓	✓	✓	✓	Latch	Recovery	✓	VQFN032V5050
☆BD9F800MUV	30	8	4.5 to 28	0.765 to ( $V_{IN} \times 0.7$ ) ( $V_{IN} \times 0.7$ ) $\leq$ 13.5V	0.3/0.6	Hysteresis	✓	-	✓	-	Recovery	Recovery	-	VQFN11V3535M

<sup>1</sup> Restrictions depend on input/output voltage conditions.

☆ : Under Development

Dual Output Buck Converters														
Part No.	Number of Channels	Input Voltage Maximum Rating (V)	Output Current (A)	Input Voltage Range (V)	Output Voltage (V)	Switching Frequency (MHz)	Control Mode	Features					Description	Package
								Synchronous Rectifier	Light-Load Efficiency	Over-Current Protection	Thermal Protection	Over-Voltage Protection		
BD91501MUV	2	7	Io1 : 0.4 Io2 : 0.3	2.55 to 5.5	Vo1 : 2.55 Vo2 : 1.80	1.65	Current	✓	✓	Latch	Recovery	–	100% Duty	VQFN016V3030
BD9151MUV	2	7	Io1 : 0.4 Io2 : 0.8	2.8 to 5.5	Vo1 : 1.8 Vo2 : 1.2	1	Current	✓	✓	Latch	Recovery	–	Voltage Detector, High-side gate controller	VQFN020V4040
BD9150MUV	2	7	Io1 : 1.5 Io2 : 1.5	4.75 to 5.5	Vo1 : 3.3 Vo2 : 0.8 to 2.5	1.5	Current	✓	✓	Latch	Recovery	–	–	VQFN020V4040
BD9152MUV	2	7	Io1 : 1.5 Io2 : 1.5	4.5 to 5.5	Vo1 : 3.3 Vo2 : 0.8 to 2.5	1	Current	✓	✓	Latch	Recovery	–	–	VQFN020V4040
BD9153MUV	2	7	Io1 : 1.5 Io2 : 1.5	4.5 to 5.5	Vo1 : 1.8 to 3.3 Vo2 : 0.8 to 2.5	1	Voltage	✓	✓	Latch	Recovery	–	LDO Controller, Voltage Detector	VQFN024V4040
BD93291EFJ	2	30	Io1 : 2.5 Io2 : 1.5	8.0 to 26	Vo1 : 5.0 Vo2 : 0.8 to 4.0	1.5 to 2.5	H <sup>3</sup> Reg	✓	✓	Recovery	Recovery	–	–	HTSOP-J8
BD91362MUV	2	7	Io1 : 3.0 Io2 : 1.0	2.7 to 5.5	Vo1 : 1.0 to 3.3 Vo2 : 1.0 to 3.3	1	Current	✓	✓	Latch	Recovery	–	8 bit Voltage setting by I <sup>2</sup> C I/F	VQFN024V4040
BD95830MUV	2	15.1	Io1 : 3.0 Io2 : 3.0	7.5 to 15	Vo1 : 0.8 to 5.5 Vo2 : 0.8 to 5.5	0.4 to 0.8	H <sup>3</sup> Reg	✓	–	Latch	Recovery	Latch	–	VQFN032V5050

Boost and Buck-Boost Converters																		
Part No.	Number of Channels	Switch Current Limit (mA)	Input Voltage (V)	Output Voltage (V)	Switching Frequency (kHz)	Control Mode	Features										Package	
							Boost	Buck-Boost	SEPIC	Inverting	Synchronous Rectifier	Light-Load Efficiency	Soft Start	Input Pass through	UVLO	Over-Current Protection		Thermal Protection
BU33DV5G	1	10	1.75 to 4.5	3.3	100	Current	✓	–	–	–	✓	–	–	–	✓	Recovery	✓	SSOP5
BD1603NUV	1	175/190	2.7 to 5.5	4.5/5.0	642/238	Chargepump	–	✓	–	–	–	–	–	–	–	Recovery	✓	VSON010V3030
BU33DV7NUX	1	300	1.8 to 5.5	3.3	600	Current	✓	–	–	–	✓	✓	✓	✓	✓	Recovery	✓	VSON010V3030
BU34DV7NUX	1	300	1.8 to 5.5	3.4	600	Current	✓	–	–	–	✓	✓	✓	✓	✓	Recovery	✓	VSON010V3030
BD8152FVM	1	1400	2.5 to 5.5	V <sub>IN</sub> to 14	600/1200	Current	✓	✓	✓	–	–	–	Adj.	–	✓	Recovery	✓	MSOP8
BD8158FVM	1	1400	2.1 to 4.0	V <sub>IN</sub> to 14	600/1200	Current	✓	✓	✓	–	–	–	Adj.	–	✓	Recovery	✓	MSOP8
BD8306MUV	1	2000	1.8 to 5.5	1.8 to 5.2	500 to 1500	Voltage	✓	✓	–	–	✓	–	✓	–	✓	Latch	✓	VQFN016V3030
BD8314NUV	1	2500	3.0 to 12	4.0 to 12	1200	Voltage	✓	–	–	–	–	–	✓	–	✓	Latch	✓	VSON010V3030
BD8311NUV	1	2500	3.5 to 11	4.0 to 11	1200	Voltage	✓	–	–	–	–	–	✓	–	✓	Latch	✓	VSON010V3030
BD8316GWL	2	200	2.5 to 5.5	Vo1 : –9.0 to –1.0 Vo2 : V <sub>IN</sub> to 18	1600	Current	✓	–	–	✓	–	–	–	–	–	Latch	✓	UCSP50L1

External Switch Switching Regulators

Buck Controllers																			
Part No.	Number of Channels	Input Voltage Maximum Rating (V)	Input Voltage Range (V)	Supply Voltage (V)	Output Voltage (V)	Switching Frequency (MHz)	Control Mode	Features										Package	
								Power Good	Enable	Externally Synchronizable	Adjustable Soft Start	Synchronous Rectifier	Light-Load Efficiency	Over-Current Protection	Thermal Protection	Over-Voltage Protection			
BD9305AFVM	1	20	4.2 to 18	–	1.25 to V <sub>IN</sub> *1	0.1 to 0.8	Voltage	–	✓	–	–	–	–	–	–	–	–	–	MSOP8
BD95601MUV-LB	1	28	4.5 to 25	4.5 to 5.5	0.75 to 2.0	0.2 to 0.5	H <sup>3</sup> Reg	✓	✓	–	✓	✓	✓	Latch	Recovery	Recovery	–	–	VQFN020V4040
BD63536FJ	1	32	3.0 to 30	–	1.25 to V <sub>IN</sub> *1	0.01 to 0.3	Voltage	–	–	–	–	–	–	Recovery	Recovery	Recovery	–	–	SOP-J8
BD9845FV	1	36	3.6 to 35	–	1.0 to V <sub>IN</sub> *1	0.1 to 1.5	Voltage	–	✓	–	✓	–	–	Recovery	Recovery	–	–	–	SSOP-B14
<b>New</b> BD9611MUV	1	60	10 to 56	–	(V <sub>IN</sub> ×0.02) to (V <sub>IN</sub> ×0.97) *1 (V <sub>IN</sub> ×0.02)≥0.8	0.05 to 0.5	Voltage	–	✓	✓	✓	✓	✓	–	Recovery	Recovery	–	–	VQFN020V4040
BD9536FV	2	16	7.5 to 15	–	0.7 to 5.5	0.2 to 0.6	H <sup>3</sup> Reg	–	✓	–	✓	✓	–	Latch	Recovery	Latch	–	–	SSOP-B28
BD9851EFV	2	20	4.0 to 18	–	1.0 to V <sub>IN</sub> *1	0.01 to 3	Voltage	–	–	–	✓	–	–	SCP Latch	Recovery	–	–	–	HTSSOP-B20
BD9535MUV	2	30	3.0 to 28	4.5 to 5.5	0.7 to 2.0	0.2 to 0.6	H <sup>3</sup> Reg	✓	✓	–	✓	✓	✓	Latch	Recovery	Recovery	–	–	VQFN032V5050
BD95602MUV-LB	2	30	5.5 to 28	–	1.0 to 5.5	0.15 to 0.5	H <sup>3</sup> Reg	✓	✓	–	✓	✓	✓	Latch	Recovery	Recovery	–	–	VQFN032V5050
BA9743AFV	2	36	3.6 to 35	–	2.505 to V <sub>IN</sub> *1	0.01 to 0.8	Voltage	–	–	–	✓	–	–	SCP Latch	Recovery	–	–	–	SSOP-B16
BA9744FV	2	36	2.5 to 35	–	1.222 to V <sub>IN</sub> *1	0.01 to 0.8	Voltage	–	–	–	✓	–	–	SCP Latch	Recovery	–	–	–	SSOP-B16
BA9741F	2	36	3.6 to 35	–	2.5 to V <sub>IN</sub> *1	0.01 to 0.8	Voltage	–	–	–	✓	–	–	SCP Latch	Recovery	–	–	–	SOP16
BA9741FS	2	36	3.6 to 35	–	2.5 to V <sub>IN</sub> *1	0.01 to 0.8	Voltage	–	–	–	✓	–	–	SCP Latch	Recovery	–	–	–	SSOP-A16
BD9848FV	2	36	3.6 to 35	–	1.0 to V <sub>IN</sub> *1	0.1 to 1.5	Voltage	–	✓	–	✓	–	–	Recovery	Recovery	–	–	–	SSOP-B20

Boost and Buck-Boost Converters																			
Part No.	Number of Channels	Input Voltage Maximum Rating (V)	Input Voltage (V)	Output Voltage (V)	Switching Frequency (kHz)	Control Mode	Features										Package		
							Boost	Buck-Boost	Inverting	Buck	Enable	Adjustable Soft Start	Synchronous Rectifier	Short Circuit Protection	Over-Voltage Protection				
BD8303MUV	1	15	2.7 to 14	1.0 to 12	200 to 1000	Voltage	–	✓	–	–	✓	–	✓	Latch	Recovery	–	–	–	VQFN016V3030
BD9306AFVM	1	20	4.2 to 18	V <sub>IN</sub> to (V <sub>IN</sub> /0.3)	100 to 800	Voltage	✓	–	–	–	✓	–	–	Latch	Recovery	–	–	–	MSOP8
BD9851EFV	2	20	4.0 to 18	1.0 or more *1	10 to 3000	Voltage	✓	–	✓	✓	–	✓	–	Latch	Recovery	–	–	–	HTSSOP-B20
BA9743AFV	2	36	3.6 to 35	2.505 or more *1	10 to 800	Voltage	✓	–	✓	✓	–	✓	–	Latch	Recovery	–	–	–	SSOP-B16
BA9744FV	2	36	2.5 to 35	1.222 or more *1	10 to 800	Voltage	✓	–	✓	✓	–	✓	–	Latch	Recovery	–	–	–	SSOP-B16
BA9741F	2	36	3.6 to 35	2.5 or more *1	10 to 800	Voltage	✓	–	✓	✓	–	✓	–	Latch	Recovery	–	–	–	SOP16
BA9741FS	2	36	3.6 to 35	2.5 or more *1	10 to 800	Voltage	✓	–	✓	✓	–	✓	–	Latch	Recovery	–	–	–	SSOP-A16

\*1 Restrictions depend on input/output voltage conditions.

**For Automotive**
**Switching Regulators (Integrated Switch) Single Output 1A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
<b>New</b> BD90610EFJ-C	42	3.5 to 36.0	1.25 (Isw)	Variable (0.8 V to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD90201FV-M	36	7.0 to 33.0	1.75 (Isw)	Variable (1.145 to V <sub>CC</sub> ×0.643)	± 2.0	-40 to +105	500 to 2300	± 10	Self-oscillation	PWM	SSOP-B20W

**Switching Regulators (Integrated Switch) Single Output 2A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
<b>New</b> BD90620EFJ-C	42	3.5 to 36.0	2.5 (Isw)	Variable (0.8 V to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD9060HFP-C	36	5.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	HRP7
BD9060F-C	36	5.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	SOP8
BD9006F	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	SOP8
BD9006HFP	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	HRP7
BD9007F	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	SOP8
BD9007HFP	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	HRP7
BD90010F	50	7.0 to 48.0	2.0 (Isw)	Variable (1 to V <sub>IN</sub> )	± 2.0	-40 to +95	50 to 300	± 20	Self-oscillation	PWM	SOP8

**Switching Regulators (Integrated Switch) Single Output 4A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
<b>New</b> BD90640EFJ-C	42	3.5 to 36.0	4.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD9781HFP	36	7.0 to 35.0	4.0 (Isw)	Variable (1 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	HRP7

**Switching Regulators (Integrated Switch) Ultra Low Quiescent Current / Synchronous Rectification**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
BD99010EFV-M	42	3.6 to 35.0	2 (Isw)	3.3	± 2.0	-40 to +105	200 to 500	± 20	Self-oscillation	Light load mode/PWM	HTSSOP-B24
BD99011EFV-M	42	3.6 to 35.0	2 (Isw)	5	± 2.0	-40 to +105	200 to 500	± 20	Self-oscillation	Light load mode/PWM	HTSSOP-B24

**Secondary Switching Regulators (Integrated Switch) Single Output 1A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Output voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
BD90571EFJ-C	7	2.69 to 5.5	1.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Secondary Switching Regulators (Integrated Switch) Single Output 2A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Output voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
BD90522EFJ-C	7	2.69 to 5.5	2.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90525EFJ-C	7	2.69 to 5.5	2.0	1.5	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90528EFJ-C	7	2.69 to 5.5	2.0	1.8	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Secondary Switching Regulators (Integrated Switch) Single Output 3A Output**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Output voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
BD90532EFJ-C	7	2.69 to 5.5	3.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90535EFJ-C	7	2.69 to 5.5	3.0	1.5	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90538EFJ-C	7	2.69 to 5.5	3.0	1.8	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Switching Controllers (External Switch) Single Output Isolated / Boost Converters**

Part No.	Input Voltage Maximum Rating (V)	Power Supply Voltage (V)	Output type	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Package
BD9031FV-C	35	4.5 to 30.0	Push Pull	± 1.5	-40 to +125	20 to 600	SSOP-B16
BD9032FV-C	40	3.5 to 35.0	Push Pull	± 1.5	-40 to +125	20 to 600	SSOP-B16

**Switching Controllers (External Switch) Dual Output Buck / Boost Converters**

Part No.	Input Voltage Maximum Rating (V)	Power Supply Voltage (V)	Output type	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Overvoltage protection is detected	Package
BD9015KV-M	35	3.9 to 30.0	Push Pull	± 1.5 (-40 to +105°C)	-40 to +105	250 to 550	L-side FET OFF	VQFP48C
BD9016KV-M	35	3.9 to 30.0	Push Pull	± 1.5 (-40 to +105°C)	-40 to +105	250 to 550	L-side FET ON	VQFP48C

**Switching Controllers (External Switch) Single Output Buck / Boost Converters**

<b>New</b> BD9035AEFV-C	35	3.8 to 30	Push Pull	± 1.5 (-40 to +125°C)	-40 ~ +125	100 to 600	Automatic switchover	HTSSOP-B24
-------------------------	----	-----------	-----------	-----------------------	------------	------------	----------------------	------------

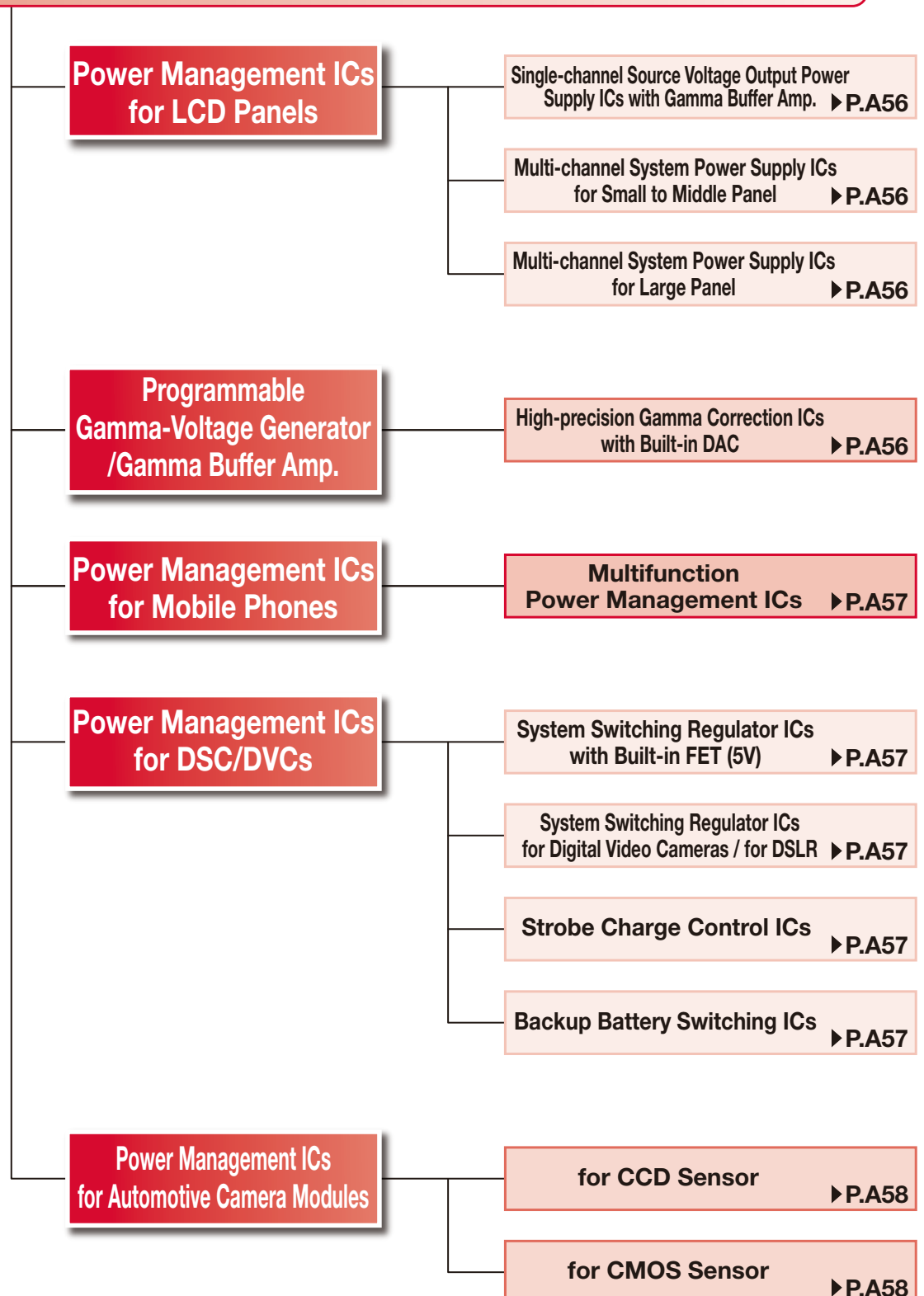
**A Power Management**



General-purpose ICs

# Switching Regulators (Power Management ICs for System)

## Switching Regulators (Power Management ICs for System)



A

Power Management

# Switching Regulators (Power Management ICs for System)

## Power Management ICs for LCD Panels

### Single-channel Source Voltage Output Power Supply ICs with Gamma Buffer Amp.

Part No.	Supply voltage (V)	Operating temperature (°C)	Operating frequency (MHz)	Output for source voltage (V)	V COM (ch)	Buffer for Gamma (ch)	Package
<b>BD8157EFV</b>	2.1 to 4.0	-40 to +125	0.6/1.2	to 14	1	4	HTSSOP-B20

### Multi-channel System Power Supply ICs for Small to Middle Panel

Part No.	Supply voltage (V)	Operating temperature (°C)	Operating frequency (MHz)	Output for source voltage (V)	Output for logic voltage (V)	Output for gate voltage (V)	Start up sequence circuit	V COM (ch)	Package
<b>BD8153EFV</b>	2.1 to 6.0	-40 to +125	1.1	to 18.0	3.3	Variable	✓	—	HTSSOP-B24
<b>BD8163EFV</b>	2.1 to 6.0	-40 to +125	1.1	to 18.0	2.5	Variable	✓	—	HTSSOP-B24
<b>BD8179MUV</b>	2.6 to 5.5	-40 to +85	1.2	to 19.0	—	Variable	✓	1 (Buffer 4ch)	VQFN032V5050
<b>BD9862MUV</b>	1.8 to 5.5	-40 to +85	0.7 to 1.4	to 15.0	—	Variable	✓	—	VQFN024V4040
<b>BD8184MUV</b>	2.0 to 5.5	-40 to +85	1.2	to 18.0	—	Variable	✓	1	VQFN024V4040
<b>BM81028AMWV</b>	2.5 to 5.5	-40 to +85	0.6/1.2	8.0 to 14.5 0.1Vstep	1.1 to 1.3 50mVstep 1.7 to 1.9/2.4 to 2.6 50mVstep	13 to 26 0.2Vstep /-4 to -9.3 0.1V step	✓	1	UQFN28V4040P

### Multi-channel System Power Supply ICs for Large Panel

Part No.	Supply voltage (V)	Operating temperature (°C)	Operating frequency (MHz)	Output for source voltage (V)	Output for logic voltage (V)	Output for logic voltage2 (V)	Output for gate voltage (V)	Start up sequence circuit	V COM (ch)	Package
<b>BD8166EFV</b>	6.0 to 18.0	-40 to +85	0.5	to 18.0	Variable	—	Variable	✓	1	HTSSOP-B40
<b>BD8160AEFV</b>	8.0 to 18.0	-40 to +85	0.5/0.75	to 18.0	Variable	—	Variable	✓	—	HTSSOP-B28
<b>BD8165MUV</b>	4.2 to 14.0	-40 to +85	0.65	to 18.0	Variable	Variable	Variable	✓	1	VQFN048V7070
<b>BD8162EKV</b>	4.2 to 14.0	-40 to +85	0.2 to 0.8	to 18.0	Variable	Variable	Variable	✓	1 (Buffer 4ch)	HTQFP64V
<b>BD8172MUV</b>	4.4 to 14.0	-40 to +105	0.5	15.6	3.3	—	⊕35.2/ ⊖Variable	✓	— (Buffer 4ch)	VQFN040V6060
<b>BD81002MUV</b>	10.0 to 18.0	-25 to +105	0.5	to 18.0	Variable	Variable	Variable	✓	1	VQFN048V7070
<b>BD8174MUV</b>	10.0 to 14.0	-40 to +105	0.7	to 18.0	3.3	1.2/1.5/1.8	+ 35.2 - 6.0	✓	1 (Buffer 4ch)	VQFN048V7070
☆ <b>BM81100MUW</b>	7.6 to 14.0	-40 to +85	0.75	19.8 or less	Variable	—	Variable	✓	1	VQFN40W6060A
☆ <b>BM81110MUW</b>	8.6 to 14.7	-40 to +85	0.75/1.0	19.8 or less	Variable	Variable	Variable	✓	—	VQFN40W6060A
☆ <b>BM81004MUW</b>	8.6 to 14.0	-40 to +105	0.75/1.0	18.0 or less	Variable	Variable	Variable	✓	1	VQFN48V7070A

☆ : Under Development

## Programmable Gamma-Voltage Generator/Gamma Buffer Amp.

### High-precision Gamma Correction ICs with Built-in DAC

Part No.	Supply voltage(V)		Operating temperature (°C)	Clock frequency (MHz)	DAC (bit)	Serial I/F	Auto data read	V COM (ch)	Buffer for Gamma (ch)	Package
	Gamma Collection Input	Logic								
<b>BD8132FV</b>	6 to 18	2.3 to 4.0	-30 to +85	5.0	10	3-wire	✓	1	18	SSOP-B40
<b>BD8139AEFV</b>	6 to 18	2.3 to 4.0	-30 to +85	0.4	10	I <sup>2</sup> C BUS	✓	1	10	HTSSOP-B40
<b>BD8143MUV</b>	8 to 18	2.3 to 5.5	-40 to +105	2.0	10	3-wire	—	—	12	VQFN032V5050
<b>BD81010MUV</b>	8 to 18	2.1 to 3.6	-40 to +85	0.4	10	I <sup>2</sup> C BUS	—	1	14	VQFN032V5050
<b>BD8149MUV</b>	10 to 18	2.1 to 3.6	-25 to +85	0.4	10	I <sup>2</sup> C BUS	✓	—	12	VQFN032V5050
<b>BD81026MUV</b>	8 to 18	2.1 to 3.6	-25 to +85	0.4	10	I <sup>2</sup> C BUS	—	—	12	VQFN024V4040

**Power Management ICs for Mobile Phones**

<b>Multifunction Power Management ICs</b>																
Part No.	Supply voltage (V)	Item	DC/DC		LDO						Input interface	Protection circuit			Package (mm)	
			DC/DC1	DC/DC2	LDO1	LDO2	LDO3	LDO4	LDO5	LDO6		Over current	Temperature	Low voltage		
BH6173GUL	2.2 to 5.2	Output voltage (V)	0.8 to 2.4	-	1.0 to 3.3	1.0 to 3.3	1.2 to 3.3	-	-	-	i <sup>2</sup> C	LDO1-3 is fold back DC/DC is dropping type	✓	✓	VCSP50L2 (2.05 × 2.05) H=0.55Max.	
		Output current (mA)	500	-	300	300	300	-	-	-						
		Ripple Rejection (dB)(at 120Hz)	-	-	60	60	60	-	-	-						
BH6172GU	2.2 to 5.5	Output voltage (V)	0.8 to 2.4	-	1.0 to 3.3	1.0 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	-	i <sup>2</sup> C/Parallel	LDO1-5 is fold back DC/DC is dropping type	✓	✓	VCSP85H2 (2.6 × 2.6) H=1.0Max.	
		Output current (mA)	500	-	150	150	300	300	150	-						
		Ripple Rejection (dB)(at 120Hz)	-	-	60	60	60	60	60	-						
BH6174GUL	2.6 to 5.5	Output voltage (V)	0.8 to 2.4	0.8 to 2.4	1.0 to 3.3	1.0 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	-	i <sup>2</sup> C/Parallel	LDO1-5 is fold back DC/DC is dropping type	✓	✓	VCSP50L2 (2.8 × 2.8) H=0.55Max.	
		Output current (mA)	600	600	300	300	300	300	300	-						
		Ripple Rejection (dB)(at 120Hz)	-	-	60	60	60	60	60	-						
BH6178GUL	2.7 to 4.5	Output voltage (V)	1.8	1.235	1.8	1.8	1.215	1.2	2.7	-	Parallel	LDO1-5 is fold back DC/DC is dropping type	✓	✓	VCSP50L2 (2.8 × 2.8) H=0.55Max.	
		Output current (mA)	400	650	50	50	50	50	50	-						
		Ripple Rejection (dB)(at 120Hz)	-	-	60	60	60	60	60	-						
BH6176GU	2.2 to 5.5	Output voltage (V)	0.8 to 2.35	-	1.0 to 3.3	1.0 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	i <sup>2</sup> C/Parallel	LDO1-6 is fold back. DC/DC is dropping type	✓	✓	VCSP85H2 (2.6 × 2.6) H=1.0Max.	
		Output current (mA)	500	-	150	150	300	300	150	300						
		Ripple Rejection (dB)(at 120Hz)	-	-	60	60	60	60	60	60						
BH6179GU	2.2 to 5.5	Output voltage (V)	0.8 to 2.35	-	1.0 to 3.3	1.0 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	1.2 to 3.3	i <sup>2</sup> C/Parallel	LDO1-6 is fold back. DC/DC is dropping type	✓	✓	VCSP85H2 (2.6 × 2.6) H=1.0Max.	
		Output current (mA)	600	-	150	150	300	300	150	300						
		Ripple Rejection (dB)(at 120Hz)	-	-	50	50	50	50	50	50						

Part No.	Supply voltage (V)	Item	DC/DC Output			LDO Output										Buffer for TCXO	Lithium-ion charging control	USB transceiver	Protection Cincluce	Protection circuit			Package
			DCDC1	DCDC2	DCDC6	LDO1	LDO1-2	LDO2	LDO3	LDO4-5	LDO6-7	LDO8	LDO9	LDO10	Over current					Temperature	Low voltage		
BH6062GW	2.9 to 4.6	Output voltage(V) Output current(mA)	1.175 900	1.825 800	1.920 400	2.8 40	- -	1.175 50	1.835 30	- -	- -	- -	- -	- -	- -	- -	- -	✓	✓	✓	✓	✓	UCSP75M3

Part No.	Supply voltage (V)	Item	DC/DC Output				LDO Output											Buffer for TCXO	SIM I/F	Protection Cincluce	Protection circuit			Package	
			SWREG1	SWREG2	SWREG3	SWREG4	LDO1	LDO2	LDO3	LDO4	LDO5	LDO6	LDO7	LDO8	LDO9	LDO10	LDO11				LDO12	Over current	Temperature		Low voltage
<b>New</b> BD71801GWL	2.6 to 5.5	Output voltage(V) Output current(mA)	1.1 1000	1.8 500	1.2 1000	1.4 500	3.2 1400	2.6/ 1.8	3.3 300	1.8 50	2.8 50	1.2 300	2.8 150	2.8 150	2.8 150	2.8 150	2.8 150	1.2 150	1.2 150	✓	✓	✓	✓	✓	UCSP50L3C

LDOs, detectors and charge control in a single chip

**Power Management ICs for DSC/DVCs**

<b>System Switching Regulator ICs with Built-in FET (5V)</b>														
Part No.	CH	Operating frequency (MHz)	Supply voltage (V)	Reference voltage (V)	Reference voltage precision (%)	Topology					Built-in FET	Synchronous rectifier	Load switch	Package (mm)
						Step up	Step down	Step up/down	Inverting	Buck-Boost				
BD9639MWW	6	0.5 to 2.0	2.5 to 5.5	0.4	±2.5	2ch	2ch	-	-	2ch	6ch	5ch	1ch	UQFN056V7070
BD9361GUL	6	2.0/1.0	2.5 to 5.5	0.8	±1.25	2ch	3ch	-	-	1ch	6ch	5ch	-	VCSP50L3 (3.14 × 3.14) H=0.55 Max.
BD9355MWW	7	2.0/1.0	1.5 to 5.5	0.8 1.0	±1.25 ±1.0	3ch	2ch	-	1ch	1ch	7ch	3ch	1ch	UQFN036V5050
BD9381GUL	7	1.0	2.5 to 5.5	0.8	±1.25	2ch	4ch	-	-	1ch	7ch	6ch	1ch	VCSP50L3 (3.1 × 3.6) H=0.55 Max.
BD9757MWW	8	1.2	1.5 to 5.5	1.0 0.8	±1.0 ±1.25	3ch	4ch	-	1ch	-	7ch	5ch	2ch	UQFN044V6060
BD9634GU	7	0.5 to 1.5	2.5 to 5.5	0.3 to 1.0	±2.5	3ch	1ch	1ch	1ch	1ch	5ch	3ch	1ch	VCSP85H4 (4.26 × 4.26) H=1.0 Max.

<b>System Switching Regulator ICs for Digital Video Cameras / for DSLR</b>													
Part No.	CH	Operating frequency (MHz)	Supply voltage (V)	Reference voltage (V)	Reference voltage precision (%)	Topology				Built-in FET	Synchronous rectifier	Load switch	Package (mm)
						Step up	Step down	Buck-Boost	Inverting/Stepdown				
BD9865MWW	4	0.6 to 1.5	4 to 14	1.0 0.8	±1.0 ±1.25	-	2ch	1ch	1ch	4ch	3ch	-	UQFN040V5050
BD9866GUL	4	0.6 to 1.5	4 to 14	0.6 0.8	±1.66 ±1.25	-	3ch	1ch	-	4ch	4ch	-	VCSP50L3 (3.75 × 3.75) H=0.55 Max.
BD8355MWW	7	0.5 to 1.8	4 to 10	0.8 1.0	±1.25 ±1.0	1ch	6ch	-	-	7ch	6ch	-	UQFN056V7070

<b>Strobe Charge Control ICs</b>									
Part No.	Supply voltage Vcc(V)	Peak current (A)	Full charge detection voltage(V)	100nsec plus AC full charge detection voltage(V)	Full terminal output	Power Tr saturation voltage I <sub>sw</sub> =1A(V)	IGBTOUTN (mA)	IGBTOUTP (mA)	Package
BD4233NUX	2.5 to 5.5	0.5 to 2.0	1 ±1.1%	1.0-1.1% to ±1.6%	Nch Open drain	0.4	60	140	VSON010X3020
BD4234NUX	2.5 to 5.5	0.5 to 2.0	1 ±1.1%	1.0-1.1% to ±1.6%	Nch Open drain	0.4	30	140	VSON010X3020

<b>Backup Battery Switching ICs</b>											
Part No.	Input voltage range(V)	Output voltage(V)	Input detection voltage(V)	Output detection voltage(V)	Switching voltage(V)	Unreg reset voltage(V)		Package			
	V <sub>IN</sub>	V <sub>RO</sub>	V <sub>OUT</sub>	-Vdet1	+Vdet1	-Vdet2	+Vdet2				
BD7212MUV	3.50 to 6.00	3.20	3.20	3.50	3.60	2.10	2.23	3.06	1.50	2.50	VQFN016V3030
BD7213MUV	3.50 to 8.00	3.20	3.20	3.30	3.40	2.05	2.14	2.89	1.50	2.50	VQFN016V3030
BD7214MUV	3.50 to 8.00	3.20	3.20	3.30	3.40	2.05	2.14	2.89	-	-	VQFN016V3030

**Power Management ICs for Automotive Camera Modules**
**for CCD Sensor**

Part No.	Supply Voltage(V)	Functions			Output Voltage(V)	Output Current Capacity(A)	Reset voltage (V)	Operating frequency (kHz)	Standby Current (μA)(Typ.)	Package
<b>BD8671KN</b>	4.5 to 9.0	Step-down DC/DC	ch1	DSP	3.3	0.15	—	500 to 1200	0	VQFN28
		Step-up DC/DC	ch2	sensor	12.0	0.02	—			
		Reverse Charge pump	ch3		—5.0	0.005	—	250 to 600*		
<b>BD8676KN</b>	4.5 to 9.0	Step-down DC/DC	ch1	DSP analog	3.3	0.15	2.7	500 to 1200	0	VQFN36
			ch2	DSP Core	1.2		—			
		Step-up DC/DC+LDO	ch3	sensor	15.0	0.02	—			
		Reverse Charge pump	ch4		—5.5	0.005	—			

**for CMOS Sensor**

<b>BD8674KN</b>	4.5 to 9.0	Step-down DC/DC	ch1	DSP	3.3	0.25	2.75	500 to 1200	0	VQFN28
		Step-up Charge pump+LDO	ch2	sensor	5.0	0.03	—	640		
<b>BD8678AMUV</b>	4.5 to 9.0	LDO	ch1	sensor	2.8	0.06	2.4	800 to 1200	0	VQFN020V4040
		Step-down DC/DC	ch2	DSP	1.5	0.15	—			
<b>BD8682MUV</b>	5.9 to 18.0	High Voltage Step-down DC/DC	ch1	—	Variable	0.5	—	500	0	VQFN32SV5050
		LDO	ch2	sensor	2.8V/3.3V	0.13	$V_o \times 2 \times 0.86$	—		
		LDO	ch3		1.8V/OFF	0.06	—	—		
		Step-down DC/DC	ch4	DSP	1.2V/1.5V/1.8V	0.25	—	1000		

\*1/2 of DC/DC

# Isolated / No Isolated Power Supply

## AC/DC Converter ICs

AC/DC Converter ICs (PWM Driver built in MOSFET)									
Part No.	Supply voltage (V)	MOSFET耐圧	Control method	Switching frequency (kHz)	ON resistance (Ω)	Peak current (A)	Brown out	V <sub>cc</sub> OVP	Package
BM2P011	8.9 to 26.0	650V	PWM	65	1.4	10.4	✓	Latch	DIP7
BM2P012	8.9 to 26.0	650V	PWM	65	1.4	10.4	✓	Self-restart	DIP7
BM2P013	8.9 to 26.0	650V	PWM	65	1.4	10.4	—	Latch	DIP7
BM2P014	8.9 to 26.0	650V	PWM	65	1.4	10.4	—	Self-restart	DIP7
BM2P031	8.9 to 26.0	650V	PWM	65	2.4	5.2	✓	Latch	DIP7
BM2P032	8.9 to 26.0	650V	PWM	65	2.4	5.2	✓	Self-restart	DIP7
BM2P033	8.9 to 26.0	650V	PWM	65	2.4	5.2	—	Latch	DIP7
BM2P034	8.9 to 26.0	650V	PWM	65	2.4	5.2	—	Self-restart	DIP7
BM2P051F	8.9 to 26.0	650V	PWM	65	4	2.6	✓	Latch	SOP8
BM2P051									DIP7
BM2P052F	8.9 to 26.0	650V	PWM	65	4	2.6	✓	Self-restart	SOP8
BM2P052									DIP7
BM2P053F	8.9 to 26.0	650V	PWM	65	4	2.6	—	Latch	SOP8
BM2P053									DIP7
BM2P054F	8.9 to 26.0	650V	PWM	65	4	2.6	—	Self-restart	SOP8
BM2P054									DIP7
BM2P091F	8.9 to 26.0	650V	PWM	65	8.5	1.3	✓	Latch	SOP8
BM2P091									DIP7
BM2P092F	8.9 to 26.0	650V	PWM	65	8.5	1.3	✓	Self-restart	SOP8
BM2P092									DIP7
BM2P093F	8.9 to 26.0	650V	PWM	65	8.5	1.3	—	Latch	SOP8
BM2P093									DIP7
BM2P094F	8.9 to 26.0	650V	PWM	65	8.5	1.3	—	Self-restart	SOP8
BM2P094									DIP7
<b>New</b> BM2P074KF	8.9 to 26.0	800V	PWM	65	6.7	2.0	—	Self-restart	SOP8

AC/DC Converter ICs (PWM controller)									
Part No.	Supply voltage (V)	Control method	START-UP circuit	Switching frequency (kHz)	AC line voltage correction	V <sub>cc</sub> Recharge	Brown out	V <sub>cc</sub> OVP	Package
BM1P061FJ	8.9 to 26.0	PWM	✓	65	✓	✓	✓	Self-restart	SOP-J8
BM1P062FJ	8.9 to 26.0	PWM	✓	65	✓	✓	✓	Latch	SOP-J8
BM1P065FJ	8.9 to 26.0	PWM	✓	65	✓	—	✓	Self-restart	SOP-J8
BM1P066FJ	8.9 to 26.0	PWM	✓	65	✓	—	✓	Latch	SOP-J8
BM1P067FJ	8.9 to 26.0	PWM	✓	65	✓	—	—	Self-restart	SOP-J8
BM1P068FJ	8.9 to 26.0	PWM	✓	65	✓	—	—	Latch	SOP-J8
BM1P101FJ	8.9 to 26.0	PWM	✓	100	✓	✓	✓	Self-restart	SOP-J8
BM1P102FJ	8.9 to 26.0	PWM	✓	100	✓	✓	✓	Latch	SOP-J8
BM1P105FJ	8.9 to 26.0	PWM	✓	100	✓	—	✓	Self-restart	SOP-J8
BM1P107FJ	8.9 to 26.0	PWM	✓	100	✓	—	—	Self-restart	SOP-J8
BD7671FVM	9.5 to 22.0	PWM	—	65	—	—	—	Self-restart	MSOP8
BD7671FJ									SOP-J8
BD7672BG	8.5 to 25.0	PWM	—	65	—	—	—	Latch	SSOP6
BD7673AG	8.5 to 25.0	PWM	—	65	—	—	—	Latch	SSOP6
BD7677FJ	8.5 to 25.5	PWM	—	65	✓	—	✓	Latch	SOP-J8
BD7678FJ	8.5 to 25.5	PWM	—	65	✓	—	✓	Latch	SOP-J8

AC/DC Converter ICs (Quasi-Resonant controller)									
Part No.	Supply voltage (V)	Control method	START-UP circuit	Maximum frequency (kHz)	AC line voltage correction	FBOLP	Brown out	V <sub>cc</sub> OVP/ZTOVP	Package
BM1Q001FJ	8.9 to 26.0	QR	✓	120	✓	Self-restart	—	Self-restart	SOP-J8
BM1Q002FJ	8.9 to 26.0	QR	✓	120	✓	Self-restart	—	Latch	SOP-J8
BD7681FJ	8.5 to 25.5	QR	—	120	✓	Self-restart	✓	Latch	SOP-J8

AC/DC Converter ICs (PFC + Quasi-Resonant controller)									
Part No.	Supply voltage (V)	Control method	START-UP circuit	X-cap discharge	QR Maximum frequency (kHz)	PFC Output level conversion	PFC ON/OFF Setting	V <sub>cc</sub> OVP/ZTOVP	Package
<b>New</b> BM1C001F	8.9 to 26.0	PFC + QR	✓	✓	120	✓	✓	Latch	SOP-18
BM1050AF	8.9 to 26.0	PFC + QR	✓	—	120	—	✓	Selectable Externally	SOP-24
<b>New</b> BM1051F	8.9 to 26.0	PFC + QR	✓	—	120	—	✓	Selectable Externally	SOP-24

## DC/DC Controller

DC/DC Controller									
Part No.	Topology		Primary/Secondary	Supply Voltage (V)	Switching Frequency (kHz)	Frequency Synchronization	I/F	Package	
BD8325FVT-M	Active Clamp Forward		Primary IC	9 to 18	50 to 500	✓	—	TSSOP-B30	

A  
Power Management

# Gate Drivers

## Isolated Gate Drivers

### Isolated Gate Drivers (Automotive grade)

Part No.	Input-side supply voltage (V)	Output-side positive supply voltage (V)	Output-side negative supply voltage (V)	Isolation voltage (Vrms)	I/O delay time (ns)	Minimum input pulse width (ns)	Maximum output current (A)	Operating temperature range (°C)	Function	Package
BM6101FV-C	4.5 to 5.5	14 to 24	-12 to 0	2,500	350	180	3.0	-40 to +125	Miller Clamp/Fail Output/Built-in under voltage lock out circuit/Thermal protection/Short current protection/DESAT/Soft turn-off function for short current protection	SSOP-B20W
BM6102FV-C	4.5 to 5.5	14 to 20	-	2,500	200	100	3.0	-40 to +125	Miller Clamp/Fail Output/Built-in under voltage lock out circuit/Thermal protection/Short current protection/DESAT/Soft turn-off function for short current protection	SSOP-B20W
BM6104FV-C	4.5 to 5.5	10 to 24	-12 to 0	2,500	150	90	3.0	-40 to +125	Miller Clamp/Fail Output/Built-in under voltage lock out circuit/Short current protection/DESAT/Soft turn-off function for short current protection	SSOP-B20W
<b>New</b> BM60014FV-C	4.5 to 5.5	10 to 24	-	2,500	120	70	3.0	-40 to +125	Miller Clamp/Fail Output/Built-in under voltage lock out circuit	SSOP-B20W

### Isolated Gate Drivers (For Industrial Equipment)

<b>New</b> BM6105FW-LB	4.5 to 5.5	13.3 to 20.0	-12 to 0	2,500	95	60	3.0	-40 to +105	Miller Clamp / Fail Output /Ready output / Built-in under voltage lock out circuit / DESAT	SOP16WM
------------------------	------------	--------------	----------	-------	----	----	-----	-------------	--	---------

### Isolated Gate Drivers with Flyback Controller (Automotive grade)

<b>New</b> BM60051FV-C	4.5 to 24 4.5 to 5.5	9 to 24	-	2,500	260	180	5.0	-40 to +125	Miller Clamp / Fail Output /Built-in under voltage lock out circuit/Temperature Monitor/Short current protection/Soft turn-off function for short current protection	SSOP-B28W
------------------------	-------------------------	---------	---	-------	-----	-----	-----	-------------	--	-----------

## Others

### IGBT/MOSFET Low-side Gate Drivers (For Industrial Equipment)

Part No.	Input-side supply voltage (V)	Output-side positive supply voltage (V)	I/O delay time (ns)	Maximum output current (A)	Number of channel	Operating temperature range (°C)	Package
BD6562FV-LB	3.0 to 5.5	10 to 25	380	0.6	2	-25 to +125	SSOP-B16
BD6563FV-LB	3.0 to 5.5	10 to 25	380	0.6	3	-25 to +125	SSOP-B16

# High Voltage Monitor

### Isolated High Voltage Monitor

Part No.	Supply voltage 1 (V)	Supply voltage 2 (V)	Isolation voltage (Vrms)	Circuit current 1 (mA)	Circuit current 2 (mA)	Output Duty accuracy (%)	Operating temperature (°C)	Package
<b>New</b> BM67290FV-C	8.0 to 24.0	3.0 to 5.5	2,500	4.6	0.2	±3.5	-40 to +125	SSOP-B20W

# Temperature Monitor

### Isolated Temperature Monitor

Part No.	Supply voltage 1 (V)	Supply voltage 2 (V)	Isolation voltage (Vrms)	Circuit current 1 (mA)	Circuit current 2 (mA)	Input Voltage Range (V)	Output current accuracy (%)	Output Duty accuracy (%)	Operating temperature (°C)	Package
<b>New</b> BM66002FV-C	9.0 to 24.0	3.0 to 5.5	2,500	3.75	0.2	1.4 to 4.0	±2.0	±2.0	-40 to +125	SSOP-B20W

# Earth Leakage Detector ICs

### Earth Leakage Detector ICs

Part No.	Supply voltage (V)	Supply current (μA)	Trip voltage (mV)	Operating temperature range (°C)	Package
<b>New</b> BD95820F-LB	12 to 22	330	7.5	-20 to +95	SOP8
<b>New</b> BD95820N-LB	12 to 22	330	7.5	-20 to +95	SIP8

# Power Management Switch

### 1 Channel Compact High Side Switch ICs

Part No.	Input voltage (V)	ON resistance (mΩ)	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	OCP	Thermal shut down	Flag output delay/ at over current (ms)	Discharge resistance (Ω)	Package
BD6538G	2.7 to 5.5	150	H Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
BD2220G	2.7 to 5.5	160	H Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
BD2221G	2.7 to 5.5	160	L Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
BD2224G	2.7 to 5.5	150	H Active	0.5	0.55 / 0.78 / 1.0	1.0	Recovery	Recovery	15	-	SSOP5
BD2225G	2.7 to 5.5	150	L Active	0.5	0.55 / 0.78 / 1.0	1.0	Recovery	Recovery	15	-	SSOP5
BD2226G	2.7 to 5.5	150	H Active	0.65	0.75 / 1.0 / 1.35	1.0	Recovery	Recovery	15	-	SSOP5
BD2227G	2.7 to 5.5	150	L Active	0.65	0.75 / 1.0 / 1.35	1.0	Recovery	Recovery	15	-	SSOP5
BD2232G	2.7 to 5.5	100	H Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
BD2233G	2.7 to 5.5	100	L Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
BD2240G	2.7 to 5.5	110	H Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
BD2241G	2.7 to 5.5	110	L Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
BD2246G	2.7 to 5.5	110	H Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
BD2247G	2.7 to 5.5	110	L Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
BD2248G	2.7 to 5.5	110	H Active	0.2	0.2 / 0.3 / 0.4	1.0	Recovery	Recovery	15	60	SSOP5
BD2242G*	2.8 to 5.5	90	H Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6
BD2243G*	2.8 to 5.5	90	L Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6

\* UL approved File No. E243261



### 1 Channel Compact High Side Switch ICs (For Industrial Equipment)

	Part No.	Input voltage (V)	ON resistance (mΩ)	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	OCP	Thermal shut down	Flag output delay/ at over current (ms)	Discharge resistance (Ω)	Package
New	BD6538G-LB	2.7 to 5.5	150	H Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
New	BD2220G-LB	2.7 to 5.5	160	H Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
New	BD2221G-LB	2.7 to 5.5	160	L Active	0.5	0.5 / - / 1.0	1.0	Latch	Recovery	15	-	SSOP5
New	BD2224G-LB	2.7 to 5.5	150	H Active	0.5	0.55 / 0.78 / 1.0	1.0	Recovery	Recovery	15	-	SSOP5
New	BD2225G-LB	2.7 to 5.5	150	L Active	0.5	0.55 / 0.78 / 1.0	1.0	Recovery	Recovery	15	-	SSOP5
New	BD2226G-LB	2.7 to 5.5	150	H Active	0.65	0.75 / 1.0 / 1.35	1.0	Recovery	Recovery	15	-	SSOP5
New	BD2227G-LB	2.7 to 5.5	150	L Active	0.65	0.75 / 1.0 / 1.35	1.0	Recovery	Recovery	15	-	SSOP5

### 1 Channel Compact High Side Switch ICs (For Automotive)

New	BD2262G-M	2.7 to 5.5	120	H Active	0.2	0.2 / 0.3 / 0.4	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2264G-M	2.7 to 5.5	120	H Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2265G-M	2.7 to 5.5	120	L Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2266G-M	2.7 to 5.5	120	H Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2267G-M	2.7 to 5.5	120	L Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2268G-M	2.7 to 5.5	110	H Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2269G-M	2.7 to 5.5	110	L Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
New	BD2244G-M*	2.8 to 5.5	100	H Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6
New	BD2245G-M*	2.8 to 5.5	100	L Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6

\* UL approved File No. E243261

### 1 Channel High Side Switch ICs

	Part No.	Input voltage (V)	ON resistance (mΩ)	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	OCP	Thermal shut down	Flag output delay/ at over current (ms)	Discharge resistance (Ω)	Package
	BD2055AFJ	2.7 to 5.5	80	H Active	0.25	0.3 / 0.5 / 0.8	1.2	Recovery	Recovery	1.3	-	SOP-J8
	BD2045AFJ	2.7 to 5.5	80	L Active	0.25	0.3 / 0.5 / 0.8	1.2	Recovery	Recovery	1.3	-	SOP-J8
	BD6519FJ	3.0 to 5.5	100	L Active	0.5	0.7 / 1.1 / 1.6	1.0	Recovery	Recovery	2.5	-	SOP-J8
	BD2051AFJ	2.7 to 5.5	80	H Active	0.5	0.7 / 1.0 / 1.6	1.2	Recovery	Recovery	1.3	-	SOP-J8
	BD2041AFJ	2.7 to 5.5	80	L Active	0.5	0.7 / 1.0 / 1.6	1.2	Recovery	Recovery	1.3	-	SOP-J8
	BD82001FVJ	2.7 to 5.5	70	H Active	0.9	1.0 / 1.5 / 2.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
	BD82000FVJ	2.7 to 5.5	70	L Active	0.9	1.0 / 1.5 / 2.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
	BD2065AFJ	2.7 to 5.5	80	H Active	1.0	1.1 / 1.5 / 2.3	1.2	Recovery	Recovery	2.5	-	SOP-J8
	BD2061AFJ	2.7 to 5.5	80	L Active	1.0	1.1 / 1.5 / 2.3	1.2	Recovery	Recovery	2.5	-	SOP-J8
	BD82065FVJ	2.7 to 5.5	70	H Active	1.1	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
	BD82061FVJ	2.7 to 5.5	70	L Active	1.1	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
	BD82020FVJ*	2.8 to 5.5	90	H Active	1.1	1.1 / 1.5 / 2.0	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82021FVJ*	2.8 to 5.5	90	L Active	1.1	1.1 / 1.5 / 2.0	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82022FVJ*	2.8 to 5.5	90	H Active	1.5	1.5 / 2.0 / 2.6	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82023FVJ*	2.8 to 5.5	90	L Active	1.5	1.5 / 2.0 / 2.6	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82024FVJ*	2.8 to 5.5	90	H Active	2.1	2.1 / 2.5 / 3.3	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82025FVJ*	2.8 to 5.5	90	L Active	2.1	2.1 / 2.5 / 3.3	0.4	Recovery	Recovery	12	75	TSSOP-B8J
	BD82028FVJ*	4.5 to 5.5	72	H Active	0.5	0.6 / 1.0 / 1.2	0.3	Recovery	Recovery	13	75	TSSOP-B8J
	BD82029FVJ*	4.5 to 5.5	72	L Active	0.5	0.6 / 1.0 / 1.2	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82030FVJ*	4.5 to 5.5	72	H Active	1.0	1.05 / 1.5 / 1.8	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82031FVJ*	4.5 to 5.5	72	L Active	1.0	1.05 / 1.5 / 1.8	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82032FVJ*	4.5 to 5.5	72	H Active	1.5	1.55 / 2.0 / 2.3	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82033FVJ*	4.5 to 5.5	72	L Active	1.5	1.55 / 2.0 / 2.3	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82034FVJ*	4.5 to 5.5	72	H Active	2.0	2.05 / 2.5 / 2.8	0.3	Recovery	Recovery	13	55	TSSOP-B8J
	BD82035FVJ*	4.5 to 5.5	72	L Active	2.0	2.05 / 2.5 / 2.8	0.3	Recovery	Recovery	13	55	TSSOP-B8J

### 1 Channel High Side Switch ICs (For Industrial Equipment)

New	BD82001FVJ-LB	2.7 to 5.5	70	H Active	0.9	1.0 / 1.5 / 2.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
New	BD82000FVJ-LB	2.7 to 5.5	70	L Active	0.9	1.0 / 1.5 / 2.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
New	BD82065FVJ-LB	2.7 to 5.5	70	H Active	1.1	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J
New	BD82061FVJ-LB	2.7 to 5.5	70	L Active	1.1	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	-	TSSOP-B8J

\* UL approved File No. E243261

## 2 Channel High Side Switch ICs

Part No.	Input voltage (V)	ON resistance (mΩ)	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	OCp	Thermal shut down	Flag output delay/ at over current (ms)	Discharge resistance (Ω)	Package
BD2056AFJ	2.7 to 5.5	100	H Active	0.3	0.3 / 0.5 / 0.9	1.8	Recovery	Recovery	1.3	—	SOP-J8
BD2046AFJ	2.7 to 5.5	100	L Active	0.3	0.3 / 0.5 / 0.9	1.8	Recovery	Recovery	1.3	—	SOP-J8
BD6516F*	3.0 to 5.5	110	H Active	1.1	1.2 / 1.65 / 2.5	1.3	Recovery	Recovery	1.0	—	SOP8
BD6517F*	3.0 to 5.5	110	L Active	1.1	1.2 / 1.65 / 2.5	1.3	Recovery	Recovery	1.0	—	SOP8
BD2052AFJ	2.7 to 5.5	100	H Active	0.6	0.7 / 1.0 / 1.8	1.8	Recovery	Recovery	1.3	—	SOP-J8
BD2042AFJ	2.7 to 5.5	100	L Active	0.6	0.7 / 1.0 / 1.8	1.8	Recovery	Recovery	1.3	—	SOP-J8
BD2066FJ*	2.7 to 5.5	80	H Active	1.0	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	—	SOP-J8
BD2062FJ*	2.7 to 5.5	80	L Active	1.0	1.5 / 2.4 / 3.0	0.8	Recovery	Recovery	15	—	SOP-J8

\* UL approved File No. E243261

## Load Switch ICs

Part No.	Supply voltage (V)	Current consumption (μA)	ON resistance (mΩ)	Number of output channel	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	Thermal shut down	Discharge resistance (Ω)	Package (mm)
BD6524HFV	3.0 to 5.5	50	200	1ch	H Active	0.5	—	0.4	—	200	HVSOF6
BD6528HFV	VDD=2.7 to 4.5 VIN=0.0 to 2.7	20	110	1ch	H Active	0.5	—	0.5	—	70	HVSOF6
BD6529GUL	VDD=2.7 to 4.5 VIN=0.0 to 2.7	20	100	1ch	H Active	0.5	—	0.5	—	70	VCSP50L1 (1.0×1.5) H=0.55
BD2200GUL	2.7 to 5.5	20	100	1ch	H Active	0.5	—	1.0	—	70	VCSP50L1 (1.0×1.5) H=0.55
BD2201GUL	2.7 to 5.5	20	100	1ch	H Active	1.0	—	1.0	—	70	VCSP50L1 (1.0×1.5) H=0.55
BD2204GUL	VIN1=2.7 to 4.5 VIN2=1.2 to 2.4	30	120	1ch	H Active	0.5	—	0.06	Recovery	80	VCSP50L1 (1.0×1.5) H=0.55
BD2202G	2.7 to 3.6	70	150	1ch	H Active	0.2	0.25 / — / 1.0	1.2	Recovery	—	SSOP5
BD2206G	2.7 to 3.6	70	150	1ch	H Active	0.5	0.8 / — / 1.6	1.2	Recovery	—	SSOP5
BD6520F	3.0 to 5.5	110	50	1ch	H Active	2.0	—	2.0	Latch type	350	SOP8
BD6522F	3.0 to 5.5	110	50	1ch	H Active	2.0	—	1.0	Latch type	350	SOP8

## 1 Channel Compact High Side Load Switch ICs

Part No.	Input voltage (V)	Current consumption (μA)	ON resistance (mΩ)	Number of output channel	Control input logic	Output current (A)	Over current detection (A)	Output turn on time (ms)	Thermal shut down	Discharge resistance (Ω)	Package (mm)
<b>New</b> BUS1DJC0GWZ	1.1 to 5.0	0.35	63	1ch	H Active	2.0	—	0.012	—	80	UCSP30L1 (0.8×0.8) H=0.35
<b>New</b> BUS1DJC3GWZ	1.1 to 5.0	0.35	63	1ch	H Active	2.0	—	0.190	—	80	UCSP30L1 (0.8×0.8) H=0.35

## Controller IC for High Side NMOSFET

Part No.	Input voltage (V)	Current consumption (μA)	Output voltage(V)		Number of output channel	Control input logic	Output turn on time (ms)	Discharge resistance (Ω)	Package
			Vcc=3.3V	Vcc=5.0V					
BD2270HFV	2.7 to 5.5	50	9.5	13.5	1ch	H Active	0.13	200	HVSOF5

## Controller IC for High Side NMOSFET (For Industrial Equipment)

<b>New</b> BD2270HFV-LB	2.7 to 5.5	50	9.5	13.5	1ch	H Active	0.13	200	HVSOF5
-------------------------	------------	----	-----	------	-----	----------	------	-----	--------

## Power Switch ICs for ExpressCard™

Part No.	Input voltage (V)	Number of output channel	ON resistance (mΩ)	Output current (A)	NRCS (Soft start)	Thermal shut down	UVLO	Package
BD4153FV	3.3	3ch	35	1.3	Variable	Recovery	✓	SSOP-B24
BD4153EFV	3.3	3ch	35	1.3	Variable	Recovery	✓	HTSSOP-B24
BD4154FV	3.3	3ch	42	1.3	Fixed	Recovery	✓	SSOP-B20
BD4155FV	3.3	3ch	42	1.3	Fixed	Recovery	✓	SSOP-B20
BD4157MUV	3.3	3ch	50	1.3	Fixed	Recovery	✓	VQFN020V4040



# Battery Management

Solar Charge Management IC						
Part No.	Supply voltage (V)	Charge current (mA)	Switching Frequency (kHz)	Over current detection level (A)	MPPT	Package (mm)
BU1840AMUV	0.625 to 1.98	400	160, 320	min. 3.0	✓	VQFN024V4040 (4.1×4.1) H=1.0 Max.

## Charge Protection ICs

Standard Protection Type									
Part No.	Absolute maximum ratings(V)	Over voltage detection level(V)	Under voltage detection level(V)	Over current detection level(A)	Ron (mΩ)	OK/FLGB PIN logic			Package (mm)
						<UVLO	Normal	>OVLO	
BD6040GUL	+30	6.4 ± 0.2	2.65 ± 0.12	Min. 1.2	125(Typ.)	H	L	H	VCSP50L1 (1.6×1.6) H=0.55Max.
BD6041GUL	+30	5.85 ± 0.15	2.65 ± 0.12	Min. 1.2	125(Typ.)	H	L	H	VCSP50L1 (1.6×1.6) H=0.55Max.
BD6042GUL	+30	6.2 ± 0.2	2.65 ± 0.12	Min. 1.2	125(Typ.)	H	L	H	VCSP50L1 (1.6×1.6) H=0.55Max.
BD6044GUL	+36	6.4 ± 0.2	2.65 ± 0.12	Min. 1.2	125(Typ.)	H	H	L	VCSP50L1 (1.6×1.6) H=0.55Max.
<b>New</b> BD6049GUL	+30	6.8 ± 0.17	2.65 ± 0.12	Min. 1.2	125(Typ.)	H	H	L	VCSP50L1 (1.6×1.6) H=0.55Max.
BD91409GW	+30	6.25 ± 0.15	3.125 ± 0.1	Min. 2.0	75(Typ.)	—	—	—	UCSP75M2 (2.8×2.8) H=0.85Max.
Negative Voltage Protection Type									
BD6046GUL	± 30	6.7 ± 0.2	3.6 ± 0.18	Min. 1.2	250(Typ.)	H	H	L	VCSP50L2 (2.5×2.5) H=0.55Max.
BD6047AGUL	± 30	5.85 ± 0.15	3.6 ± 0.18	Min. 1.7	125(Typ.)	H	H	L	VCSP50L1 (1.95×1.95) H=0.55 Max.

Standard Protection Type : Charger protection IC provides over voltage protection for charger IC. Built-in circuits include overvoltage lockout, overcurrent limit, undervoltage protection, internal start up delay, and status flag.

Negative Voltage Protection Type : Addition to the conventional standard charge protection IC, it prevents the negative voltage happened by the USB reverse insertion without any additional components.

## Li-ion Battery Monitoring LSI

(LAPIS Semiconductor products)

Stand-alone type												
Part No.	Description	Supply Voltage (V)	Cell Voltage Measurement Error (Typ.)	FET Driver for Charge-Discharge Control	Current Consumption		Overcharge and over-discharge voltage detection	Charge and discharge over-current detection	Short detection	Parameter change	Operation Temperature	Package
					Operating	Power-down (μA)						
ML5203	4 to 7-cells supported battery protection IC for NMOS-FET	+5 to +42	±15mV	N-NOS	30μA	0.1	✓	✓	—	Mask option	-40 to +85	SSOP30
ML5235	5 to 13-cells supported battery protection IC for NMOS-FET	+7 to +80	±15mV	N-NOS	25μA	0.1	✓	✓	—	Mask option	-40 to +85	SSOP30
MCU Control type												
ML5238	16 cells supported battery monitoring IC for NMOS-FET	+7 to +80	±10mV	N-NOS	50μA	0.1	—	—	✓	External EEPROM or Flash memory	-40 to +85	QFP44
<b>New</b> ML5236	14 cells supported battery monitoring IC for High-side NMOS-FET	+8 to +64	±15mV	High-side N-MOS	500μA	0.1	Overcharge voltage detection	—	✓	External EEPROM or Flash memory	-40 to +85	TQFP44
<b>New</b> ML5239	16 cells supported battery monitoring IC with externally cell balancing	+10 to +72	±10mV	—	1.7mA	0.1	—	—	—	External EEPROM or Flash memory	-40 to +85	TQFP64
Dedicated controller												
Part No.	Description	Supply Voltage (V)		AD Converter	Current Consumption			Package				
		V <sub>DD</sub>	AV <sub>DD</sub>		Operating (μA)	Suspended(HALT) (μA)	Shutdown (μA)					
ML610Q486P	nX-U8/100, 32KB Flash, 1KB RAM, Master Clock 500kHz	1.6 to 3.6	2.2 to 3.6	12bit, 4ch	400	15	0.2	TQFP48				
<b>New</b> ML610Q488P	nX-U8/100, 48KB Flash with ECC, 2KB RAM, Master Clock 1MHz	1.8 to 3.6	2.2 to V <sub>DD</sub>	10bit, 3ch	175	1.4	0.2	TQFP48				

Power Management

## General-purpose ICs

# Voltage Detectors (Reset ICs)

## Voltage Detectors (Reset ICs)

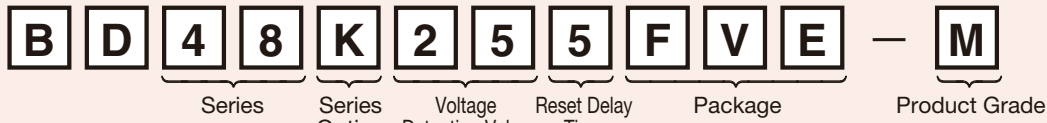
**Standard Voltage Detectors** ▶ P.A64

**Voltage Detectors with Adjustable Delay Time** ▶ P.A65

**Voltage Detectors with Fixed Delay Time** ▶ P.A66

**Voltage Detectors with Watchdog Timer** ▶ P.A66

### Voltage Detectors How to find part number



- Series**
- 48: Without Delay time, Open-Drain Output Type
  - 49: Without Delay time, CMOS Output Type
  - 45: Fixed Delay Time, Open-Drain Output Type
  - 46: Fixed Delay Time, CMOS Output Type
  - 52: Adjustable Delay Time, Open-Drain Output Type
  - 53: Adjustable Delay Time, CMOS Output Type
  - 47: Without Delay time, Open-Collector Output Type (Bipolar)
  - 71: Without Delay time, Open-Drain Output Type

- Series Option**
- E / None: SSOP5 (SOT23-5) / HVSOF5 / SOP4 (SC82)
  - K: SSOP3 (SOT23-3) 1pin:GND
  - L: SSOP3 (SOT23-3) 3pin:GND

- Voltage Detection Value**  
Ex. 23 : 2.3V
- Reset Delay Time**
- None: Without / Adjustable Delay Time
  - 5: 50ms
  - 1: 100ms
  - 2: 200ms
  - 4: 400ms

- Package**
- G: SSOP5 (SOT23-5)
  - SSOP3 (SOT23-3)
  - FVE: VSOF5
  - F: SOP4 (SC82)
  - HFV: HVSOF5

- Product Grade**
- None: For Consumer
  - M: For Car Infotainment

## Voltage Detectors (Reset ICs)

### Standard Voltage Detectors

#### Standard CMOS Voltage Detector ICs

Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	*L*Output current(mA)		Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V	
<b>BD48xxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.60 (Vs=4.8V)	0.85 (Vs=4.8V)	Vs×0.05	1	4	SSOP5
<b>BD48ExxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP5
<b>BD48xxFVE</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							VSOF5
<b>BD48KxxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP3 GND 1pin
<b>BD48LxxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP3 GND 3pin
<b>BD49xxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS	0.60 (Vs=4.8V)	0.85 (Vs=4.8V)	Vs×0.05	1	4	SSOP5
<b>BD49ExxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP5
<b>BD49xxFVE</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							VSOF5
<b>BD49KxxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP3 GND 1pin
<b>BD49LxxG</b> series	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							SSOP3 GND 3pin

\*Detection voltage ( from 2.3V to 6.0V as 0.1V step ) is applied in the xx of part No.. Ex : In case of 2.3V detection voltage in BD48xxG series, part No. is BD4823G.

Low Voltage Standard CMOS Voltage Detector ICs												
Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	"L" Output current(mA)		Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V	
BU48xxG <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1	Open drain	0.40 (V <sub>DET</sub> =4.8V)	0.55 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	3.3	6.5	SSOP5
BU48xxFVE <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							VSO5F5
BU48xxF <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							SOP4
BU49xxG <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1	CMOS	0.40 (V <sub>DET</sub> =4.8V)	0.55 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	3.3	6.5	SSOP5
BU49xxFVE <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							VSO5F5
BU49xxF <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							SOP4

Bipolar Voltage Detector ICs												
Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (mV)	"L" Output current (mA)	Package	
							I <sub>CC</sub> L	I <sub>CC</sub> H				
BD47xxG <sub>series</sub>	0.1V step 28 type	±1	1.9 to 4.6	0.85 to 10.0	0.1	Open collector	1.5	1.6	50	15	SSOP5	

Voltage Detectors for Automotive														
Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	"L" Output current(mA)		RESET Active Timeout Period (ms)	Delay circuit resistance (MΩ)	Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V			
BD48ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.60 (V <sub>S</sub> =4.8V)	0.85 (V <sub>S</sub> =4.8V)	V <sub>S</sub> × 0.05	1.0	4	—	—	SSOP5
BD49ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS	0.60 (V <sub>S</sub> =4.8V)	0.85 (V <sub>S</sub> =4.8V)	V <sub>S</sub> × 0.05	1.0	4	—	—	SSOP5
BD52ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.90 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5	Variable	9	SSOP5
BD53ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS						Variable	9	SSOP5
BD45Exx5G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1	Open drain						0.80 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05
BD45Exx1G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1		100	—	SSOP5					
BD45Exx2G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1		200	—	SSOP5					
BD46Exx5G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1	CMOS	0.80 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5	50	—	SSOP5
BD46Exx1G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							100	—	SSOP5
BD46Exx2G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							200	—	SSOP5

Over Voltage Detector ICs														
<b>New</b> BD71L4Lx-1 <sub>series</sub>	2 type	±0.8	4.05	1.2 to 7.0	—	Open drain	0.6	0.7	0.03	—	4 (V <sub>DD</sub> =2.5V)	—	—	SSOP5 HVSO5F5

Low Voltage Standard CMOS Voltage Detector ICs : \*Detection voltage ( from 0.9V to 4.8V as 0.1V step ) is applied in the xx of part No.. Ex : In case of 2.3V detection voltage in BU48xxG series, part No. is BU4823G.  
 Bipolar Voltage Detector ICs : \*Detection voltage ( from 1.9V to 4.6V as 0.1V step ) is applied in the xx of part No.. Ex : In case of 2.3V detection voltage in BD47xxG series, part No. is BD4723G.  
 Voltage Detectors for Automotive : \*Detection voltage is applied in the "xx" of part No.. Ex : In case of 2.3V detection voltage in BD48ExxG-M series, Part No. is BD48E23G-M.

### Voltage Detectors with Adjustable Delay Time

Free Delay Time Setting CMOS Voltage Detector ICs														
Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	"L" Output current(mA)		RESET Active Timeout Period (ms)	Delay circuit resistance (MΩ)	Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V			
BD52xxG <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.90 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5.0	Variable	9	SSOP5
BD52ExxG <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							Variable	9	SSOP5
BD52xxFVE <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							Variable	9	VSO5F5
BD53xxG <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS	0.90 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5.0	Variable	9	SSOP5
BD53ExxG <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							Variable	9	SSOP5
BD53xxFVE <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1							Variable	9	VSO5F5

Low Voltage Free Delay Time Setting CMOS Voltage Detector ICs														
BU42xxG <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1	Open drain	0.40 (V <sub>DET</sub> =4.8V)	0.55 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	3.3	6.5	Variable	10	SSOP5
BU42xxFVE <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							Variable	10	VSO5F5
BU42xxF <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							Variable	10	SOP4
BU43xxG <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1	CMOS	0.40 (V <sub>DET</sub> =4.8V)	0.55 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	3.3	6.5	Variable	10	SSOP5
BU43xxFVE <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							Variable	10	VSO5F5
BU43xxF <sub>series</sub>	0.1V step 40 type	±1	0.9 to 4.8	0.7 to 7.0	0.1							Variable	10	SOP4

Free Delay Time Setting CMOS Voltage Detector ICs : \*Detection voltage ( from 2.3V to 6.0V as 0.1V step ) is applied in the xx of part No..  
 Ex : In case of 2.3V detection voltage in BD52xxG series, part No. is BD5223G.  
 Low Voltage Free Delay Time Setting CMOS Voltage Detector ICs : \*Detection voltage ( from 0.9V to 4.8V as 0.1V step ) is applied in the xx of part No..  
 Ex : In case of 2.3V detection voltage in BU42xxG series, part No. is BU4223G.

**Others**
**Voltage Detectors with Fixed Delay Time**

Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	"L" Output current(mA)		RESET Active Timeout Period (ms)	Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V		
BD45xx5Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1	Open drain	0.80 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5.0	50	SSOP5
BD45xx1Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							100	SSOP5
BD45xx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							200	SSOP5
BU45Kxx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1							200	SSOP3 (GND 1pin)
BU45Lxx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1							200	SSOP3 (GND 3pin)
BU45Kxx4Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1							400	SSOP3 (GND 1pin)
BU45Lxx4Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1	CMOS	2.3 (V <sub>DET</sub> =4.8V)	2.8 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> × 0.05	1.2	5.0	400	SSOP3 (GND 3pin)
BD46xx5Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							50	SSOP5
BD46xx1Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							100	SSOP5
BD46xx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							200	SSOP5
BU46Kxx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1							200	SSOP3 (GND 1pin)
BU46Lxx2Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1							200	SSOP3 (GND 3pin)
BU46Kxx4Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1	400	SSOP3 (GND 1pin)	V <sub>DET</sub> × 0.05	1.2	5.0	400	SSOP3 (GND 3pin)	
BU46Lxx4Gseries	0.1V step 26 type	±1	2.3 to 4.8	0.6 to 10.0	0.1								

**Voltage Detectors with Watchdog Timer**

Part No.	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	"L" Output current(mA)		RESET Active Timeout Period(ms)	Delay circuit resistance (MΩ)	WDT active voltage range (V)	INH mode (Active)	Package
					ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =0.5V					
BD37A19FVM	±1.5	1.9	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.13	0.7	Variable	10	2.5 to 10.0	H	MSOP8	
BD37A41FVM	±1.5	4.1	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.035	0.7	Variable	10	2.5 to 10.0	H	MSOP8	
BD87A28FVM	±1.5	2.8	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.045	0.7	Variable	10	2.5 to 10.0	L	MSOP8	
BD87A29FVM	±1.5	2.9	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.05	0.7	Variable	10	2.5 to 10.0	L	MSOP8	
BD87A34FVM	±1.5	3.4	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.05	0.7	Variable	10	2.5 to 10.0	L	MSOP8	
BD87A41FVM	±1.5	4.1	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.035	0.7	Variable	10	2.5 to 10.0	L	MSOP8	
BD99A41F	±1.5	4.1	1.0 to 10.0	Open Drain	5		V <sub>DET</sub> × 0.035	0.7	Variable	10	2.5 to 10.0	H	SOP8	

Voltage Detectors with Fixed Delay Time : \*Detection voltage ( from 2.3V to 4.8V as 0.1V step ) is applied in the xx of part No.. Ex : In case of 2.3V detection voltage in BD45xx5G series, part No. is BD45235G.



# Motor / Actuator Drivers

## CONTENTS

### DC Brush Motor Drivers ..... P. A68

- 7V Max. H-Bridge Drivers BD621xseries ..... P. A68
- 18V Max. H-Bridge Drivers BD622xseries ..... P. A68
- 36V Max. H-Bridge Drivers BD623xseries ..... P. A68
- 50V Max. H-Bridge Driver ..... P. A68
- H-Bridge Drivers High-Current Series ..... P. A68
- 36V Max. H-Bridge Drivers Current limit series ..... P. A68
- H-Bridge Drivers High-Speed Series ..... P. A68
- Reversible Motor Drivers with Speed Control ..... P. A68
- 1.0A Reversible Motor Drivers (Single Motor) ..... P. A68
- 2.0A or More Reversible Motor Drivers (Single Motor) ..... P. A68
- 1.0A or More Reversible Motor Drivers (2 Motors) ..... P. A69

### Stepper Motor Drivers ..... P. A69

- High Performance, High Reliability 36V Stepper Motor Drivers ..... P. A69
- Standard 36V Stepper Motor Drivers ..... P. A70
- Microstep 36V Stepper Motor Drivers ..... P. A70
- Low Voltage Stepper Motor Drivers ..... P. A70
- 45V Stepper Motor Drivers ..... P. A70

### 3-Phase Brushless Motor Drivers ..... P. A71

- 3-Phase Brushless Motor Pre-Drivers with Speed Control ..... P. A71
- 3-Phase Brushless Motor Driver with Speed Control ..... P. A71
- 3-Phase Brushless Motor Pre-Drivers ..... P. A71
- 3-Phase Brushless Motor Pre-Driver (for Automotive) ..... P. A71
- 3-Phase Brushless Motor Drivers ..... P. A71

### Fan Motor Drivers ..... P. A72

- 5V Single-Phase Full-wave Fan Motor Drivers ..... P. A72
- Standard Single-Phase Full-wave Fan Motor Drivers ..... P. A72
- Multifunction Single-Phase Full-wave Fan Motor Drivers ..... P. A73
- 2-Phase Half-wave Fan Motor Drivers ..... P. A73
- 3-Phase Full-wave Fan Motor Drivers ..... P. A73
- 3-Phase Brushless Fan Motor Drivers ..... P. A74
- 3-Phase Brushless Fan Motor Controllers ..... P. A74

### Driver for ODD ..... P. A74

- 1ch System Motor Driver ICs ..... P. A74
- 2ch to 3ch System Motor Driver IC ..... P. A74
- 4ch System Motor Driver ICs ..... P. A74
- 5ch System Motor Driver ICs ..... P. A74
- 6ch to 9ch System Motor Driver ICs ..... P. A74
- System Motor Driver ICs for Half Height Drives (3 sensors) ..... P. A75
- System Motor Driver ICs for Half Height Drives (Sensorless) ..... P. A75
- System Motor Driver ICs for Slim Drives (3 sensors) ..... P. A75

### Driver for Printer ..... P. A75

- 3-Phase Brushless Motor Driver for Polygonal Mirrors ..... P. A75
- Motor Drivers with Brush for Printers ..... P. A75
- Bipolar Stepper Motor Drivers for Paper Feed / Carriage ..... P. A75
- 3-Phase Brushless Motor Pre-Drivers for Paper Feed ..... P. A75
- System Drivers for Inkjet Printers ..... P. A75

### Driver for Digital Still Camera ..... P. A76

- 5ch System Lens Drivers for Digital Cameras ..... P. A76
- 6ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex) ..... P. A76
- 7ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex) ..... P. A76
- 1ch to 2ch Lens Drivers for SLRs (Single Lens Reflex) ..... P. A76
- Microstep system Lens Drivers for Digital Cameras ..... P. A77

### Mobile Phone Module Driver ..... P. A78

- Parallel Interface Lens Driver for Voice Coil Motors ..... P. A78
- 2-wire Serial (I<sup>2</sup>C-compatible) Interface Lens Drivers for Voice Coil Motors ..... P. A78
- Parallel Interface Lens Driver for Stepping Motors ..... P. A78
- 2-wire Serial (I<sup>2</sup>C-compatible) Interface Lens Driver for Piezo Actuators ..... P. A78
- Bi-directional VCM Drivers ..... P. A78

# DC Brush Motor Drivers

**A Motor / Actuator Drivers**

7V Max. H-Bridge Drivers BD621xseries									
Part No.	CH	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output ON Resistance(Ω Typ.)	Output Modes	Package	
				H Level(V)	L Level(V)				
BD6210F	1	3.0 to 5.5	0.5	2.0 or more	0.8 or less	1.0	Forward/Reverse/Standby(Idle)/Brake		SOP8
BD6210HFP									HRP7
BD6211F			1.0						SOP8
BD6211HFP									HRP7
BD6212FP			2.0						HSOP25
BD6212HFP			HRP7						
18V Max. H-Bridge Drivers BD622xseries									
BD6220F	1	6.0 to 15.0	0.5	2.0 or more	0.8 or less	1.5	Forward/Reverse/Standby(Idle)/Brake		SOP8
BD6221F			1.0						SOP8
BD6222FP			2.0						HSOP25
BD6222HFP									HRP7
BD6225FP			0.5						HSOP25
BD6226FP	2		1.0		HSOP25				
36V Max. H-Bridge Drivers BD623xseries									
BD6230F	1	6.0 to 32.0	0.5	2.0 or more	0.8 or less	1.5	Forward/Reverse/Standby(Idle)/Brake		SOP8
BD6231F			1.0						SOP8
BD6231HFP			2.0						HRP7
BD6232FP									HSOP25
BD6232HFP									HRP7
BD6236FP	2		1.0		HSOP25				
BD6236FM			HSOP-M28						
BD6237FM		2.0	HSOP-M28						
50V Max. H-Bridge Driver									
Part No.	Maximum Voltage (V)	Supply Voltage (V)	Output Current (A)	Number of Channel	Output ON Resistance (upper + lower)(Ω Typ.)	Output Modes	Operating Temperature Range(°C)	Package	
BD6941FM	50	8.0 to 16.0	1.25	1	1.68	Forward / Reverse / Standby / Brake	-40 to +105	HSOP-M36	
H-Bridge Drivers High-Current Series									
Part No.	CH	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output ON Resistance(Ω Typ.)	Output Modes	Package	
				H Level(V)	L Level(V)				
BD62222HFP	1	6.0 to 27.0	2.5	2.0 or more	0.8 or less	1.0	Forward/Reverse/Standby(Idle)/Brake	HRP7	
BD62321HFP		6.0 to 32.0	3.0						
36V Max. H-Bridge Drivers Current limit series									
<b>New</b> BD62220EFV	2	8.0 to 28.0	2.0	2.0 or more	0.8 or less	0.65	Forward/Reverse/Standby(Idle)/Brake	HTSSOP-B28	
<b>New</b> BD62210EFV			1.0			1.9			HTSSOP-B28
H-Bridge Drivers High-Speed Series									
Part No.	CH	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output ON Resistance (Ω Typ.)	Output Modes	SR CONT	Package
				H Level(V)	L Level(V)				
BD65491FV	1	1.8 to 16.0	1.2 peak4.0	1.45 or more	0.5 or less	0.35	Forward/Reverse/Standby(Idle)/Brake	✓	SSOP-B16
BD65492MUV	2	1.8 to 16.0	1.0	1.45 or more	0.5 or less	0.9	Forward/Reverse/Standby(Idle)/Brake	-	VQFN024V4040
BD65494MUV	1	2.0 to 9.0	1.0 peak2.5	2.0 or more	0.7 or less	0.55	Forward/Reverse/Standby(Idle)/Brake	-	VQFN016V3030
BD65496MUV	1	1.8 to 16.0	1.2 peak5.0	1.45 or more	0.5 or less	0.35	Forward/Reverse/Standby(Idle)/Brake	✓	VQFN024V4040
Reversible Motor Drivers with Speed Control									
Part No.	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output Saturation Voltage (V Typ.)	Output Modes	保護回路	Package	
			H Level(V)	L Level(V)					
BA6950FS	3 to 16	0.4	2.0 or more	0.8 or less	0.16 (I <sub>o</sub> =0.05A)	Forward/Reverse/Idle/Brake	TSD	SSOP-A16	
BA6951FS	3 to 16	0.8	2.0 or more	0.8 or less	0.6 (I <sub>o</sub> =0.3A)	Forward/Reverse/Idle/Brake	TSD/OCF	SSOP-A16	
1.0A Reversible Motor Drivers (Single Motor)									
Part No.	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output Saturation Voltage (V Typ.)	Output Modes	Package		
			H Level(V)	L Level(V)					
BA6956AN	6.5 to 15	1.0	2.0 or more	0.8 or less	1.7 (I <sub>o</sub> =0.2A)	Forward/Reverse/Idle/Brake	SIP9		
BA6287F	4.5 to 15	1.0	2.0 or more	0.8 or less	1.0 (I <sub>o</sub> =0.2A)	Forward/Reverse/Idle/Brake	SOP8		
BA6285FS	4.5 to 15	1.0	2.0 or more	0.8 or less	1.0 (I <sub>o</sub> =0.2A)	Forward/Reverse/Idle/Brake	SSOP-A16		
BA6285AFP-Y	4.5 to 24	1.0	2.0 or more	0.8 or less	1.0 (I <sub>o</sub> =0.2A)	Forward/Reverse/Idle/Brake	HSOP25		
BA6920FP-Y	6.5 to 34	1.0	3.0 or more	0.8 or less	2.2 (I <sub>o</sub> =0.02A)	Forward/Reverse/Idle/Brake	HSOP25		
2.0A or More Reversible Motor Drivers (Single Motor)									
BA6219BFP-Y	8 to 18	2.2	3.0 or more	1.0 or less	2.4 (I <sub>o</sub> =0.4A)	Forward/Reverse/Idle/Brake	HSOP25		
BA6222	8 to 18	2.2	3.0 or more	1.0 or less	2.4 (I <sub>o</sub> =0.4A)	Forward/Reverse/Idle/Brake	HSIP10		



1.0A or More Reversible Motor Drivers (2 Motors)							
Part No.	Supply Voltage (V)	Output Current (A)	Input Threshold Voltage		Output Saturation Voltage (V typ.)	Output Modes	Package
			H Level(V)	L Level(V)			
BA6247FP-Y	8 to 18	1.0	3.5 or more	1.0 or less	2.4 (I <sub>o</sub> =0.5A)	Forward/Reverse/Brake	HSOP25
BA6238A	8 to 18	1.6	4.0 or more	1.0 or less	2.3 (I <sub>o</sub> =0.5A)	Forward/Reverse/Brake	HSIP10

# Stepper Motor Drivers

High Performance, High Reliability 36V Stepper Motor Drivers For PPCs, MFPs, Industrial equipments etc.

<b>BD63730EFV</b>																		
<b>BD6387EFV</b>																		
<b>BD6385EFV</b>																		
<b>BD6383EFV</b>																		
<b>BD6389FM</b>																		
<b>BD63876EFV</b>																		
<b>BD63874EFV</b>																		
<b>BD63872EFV</b>																		
<b>BD63720AEFV</b>																		
<b>BD63715AEFV</b>																		
<b>BD63710AEFV</b>																		

\* 1 The BD6387EFV, BD6385EFV, BD6383EFV, and BD6389FM are all function-compatible. \* 2 The BD6387EFV, BD6385EFV, and BD6383EFV are all pin-compatible.  
 \* 3 The BD63876EFV, BD63874EFV, and BD63872EFV are all function-compatible. \* 4 The BD63876EFV, BD63874EFV, and BD63872EFV are all pin-compatible.  
 \* 5 The BD63720AEFV, BD63715AEFV, and BD63710AEFV are all function-compatible. \* 6 The BD63720AEFV, BD63715AEFV, and BD63710AEFV are all pin-compatible.

Part No.	Supply Voltage(V)	Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package
	V <sub>CC</sub>			High Level Voltage(V)	Low Level Voltage(V)		
<b>BD63730EFV</b>	19 to 28	3.0	2.0	2.0	0.8	0.4	HTSSOP-B54
<b>BD6387EFV</b>	10 to 28	2.0	4.5	2.0	0.8	0.8	HTSSOP-B40
<b>BD6385EFV</b>	10 to 28	1.5	4.5	2.0	0.8	1.0	HTSSOP-B40
<b>BD6383EFV</b>	10 to 28	1.0	4.5	2.0	0.8	1.5	HTSSOP-B40
<b>BD6389FM</b>	10 to 28	2.2	4.5	2.0	0.8	0.7	HSOP-M36
<b>BD63876EFV</b>	19 to 28	2.0	2.0	2.0	0.8	0.65	HTSSOP-B28
<b>BD63874EFV</b>	19 to 28	1.5	2.0	2.0	0.8	1.0	HTSSOP-B28
<b>BD63872EFV</b>	19 to 28	1.0	2.0	2.0	0.8	1.9	HTSSOP-B28
<b>New</b> <b>BD63720AEFV</b>	19 to 28	2.0	2.0	2.0	0.8	0.65	HTSSOP-B28
<b>New</b> <b>BD63715AEFV</b>	19 to 28	1.5	2.0	2.0	0.8	0.95	HTSSOP-B28
<b>New</b> <b>BD63710AEFV</b>	19 to 28	1.0	2.0	2.0	0.8	1.2	HTSSOP-B28

<b>Symbol Key</b>	Control signal input CLK-IN type	Control signal input PARALLEL-IN type	Iomax 1.0A	Iomax 1.5A	Iomax 2.0A	Iomax 2.2A	Iomax 3.0A	Maximum output current	Number of step	Constant-current PWM	Switch able between forward and reverse	SLOW/FAST/MIX DECA switching function	Thin package	Small power package	Function-compatible	Easy replacement pin compatible with competitor's	1 power supply system due to built-in regulator	Built-in thermal shut-down circuit
	Built-in over current protection circuit	Built-in under voltage lock out circuit	Built-in over voltage lock out circuit	4kV	6kV	8kV	ESD resistance	Adjacent pin short protection	Inverse mounting protection									



## Standard 36V Stepper Motor Drivers

<b>BD6395FP</b>	PARAMETER: I <sub>max</sub> 1.5A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, FUNCTION COMPATIBLE, EPINE
<b>BD6393FP</b>	PARAMETER: I <sub>max</sub> 1.2A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, FUNCTION COMPATIBLE, EPINE
<b>BD6290EFV</b>	PARAMETER: I <sub>max</sub> 0.8A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, FUNCTION COMPATIBLE, EPINE
<b>BD63960EFV</b>	PARAMETER: I <sub>max</sub> 1.5A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE
<b>BD63940EFV</b>	PARAMETER: I <sub>max</sub> 1.2A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE
<b>BD63801EFV</b>	CLK IN: I <sub>max</sub> 0.8A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE

\*1 The BD6395FP, BD6393FP, and BD6290EFV are all function-compatible. \*2 The BD6395FP and BD6393FP are all pin-compatible.  
 \*3 The BD63960EFV, BD63940EFV, and BD63801EFV are all function-compatible. \*4 The BD63960EFV and BD63940EFV are all pin-compatible.

Part No.	Supply Voltage(V)		Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package
	V <sub>cc</sub>	V <sub>m</sub>			High Level Voltage(V)	Low Level Voltage(V)		
BD6395FP	16 to 28		1.5	3.0	2.0	0.8	1.2	HSOP25
BD6393FP	16 to 28		1.2	3.0	2.0	0.8	1.5	HSOP25
BD6290EFV	19 to 28		0.8	3.0	2.0	0.8	2.8	HTSSOP-B24
BD63960EFV	19 to 28		1.5	2.7	2.0	0.8	1.1	HTSSOP-B24
BD63940EFV	19 to 28		1.2	2.7	2.0	0.8	1.4	HTSSOP-B24
BD63801EFV	19 to 28		0.8	2.7	2.0	0.8	2.8	HTSSOP-B24

## Microstep 36V Stepper Motor Drivers

<b>BD63860EFV</b>	CLK IN: I <sub>max</sub> 2.5A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, FUNCTION COMPATIBLE, EPINE
<b>BD63847EFV</b>	CLK IN: I <sub>max</sub> 2.0A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 8kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE
<b>BD63843EFV</b>	CLK IN: I <sub>max</sub> 1.0A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 8kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE

\*1 The BD63847EFV and BD63843EFV are all function-compatible.

Part No.	Supply Voltage(V)		Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package
	V <sub>cc</sub>	V <sub>m</sub>			High Level Voltage(V)	Low Level Voltage(V)		
BD63860EFV	16 to 28		2.5	4.0	2.0	0.8	0.8	HTSSOP-B28
BD63847EFV	19 to 28		2.0	2.5	2.0	0.8	0.85	HTSSOP-B28
BD63843EFV	19 to 28		1.0	2.5	2.0	0.8	1.9	HTSSOP-B28

## Low Voltage Stepper Motor Drivers for Mini and Handheld Printers

<b>BD6382EFV</b>	PARAMETER: I <sub>max</sub> 0.8A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, STAND-BY CURRENT, FUNCTION COMPATIBLE, EPINE, -40~+85°C
<b>BD6381EFV</b>	PARAMETER: I <sub>max</sub> 1.2A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, STAND-BY CURRENT, FUNCTION COMPATIBLE, EPINE, -40~+85°C
<b>BD6380EFV</b>	PARAMETER: I <sub>max</sub> 0.8A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, STAND-BY CURRENT, FUNCTION COMPATIBLE, EPINE, -40~+85°C
<b>BD67776FV-LB</b>	PARAMETER: I <sub>max</sub> 0.4A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 4kV, SHORT PROTECTION, STAND-BY CURRENT, FUNCTION COMPATIBLE, EPINE, -40~+85°C

Part No.	Supply Voltage(V)		Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package
	V <sub>cc</sub>	V <sub>m</sub>			High Level Voltage(V)	Low Level Voltage(V)		
BD6382EFV	3.0 to 5.5	5.5 to 13.5	0.8	1.6	2.0	0.8	1.2	HTSSOP-B24
BD6381EFV	2.5 to 5.5	6.0 to 13.5	1.2	1.6	2.0	0.8	1.0	HTSSOP-B24
BD6380EFV	2.5 to 5.5	4.0 to 13.5	0.8	1.6	2.0	0.8	1.2	HTSSOP-B24
BD67776FV-LB	—	1.4 to 4.0	0.5	0	0.8	—	0.68	SSOP-B16

## 45V Stepper Motor Drivers

<b>BD6425EFV</b>	CLK IN: I <sub>max</sub> 1.5A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 8kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE
<b>BD6423EFV</b>	CLK IN: I <sub>max</sub> 1.0A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 8kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE
<b>BD6422EFV</b>	PARAMETER: I <sub>max</sub> 1.0A, 1/2STEP	FUNCTIONS: FWRW, DECA SW, THIN PKG, SMALL SIZE PACKAGE, ONE POWER, T.S.D., O.C.P., UV, OVLO, 8kV, SHORT PROTECTION, FUNCTION COMPATIBLE, EPINE

Part No.	Supply Voltage(V)		Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package
	V <sub>cc</sub>	V <sub>m</sub>			High Level Voltage(V)	Low Level Voltage(V)		
BD6425EFV	19 to 42		1.5	2.0	2.0	0.8	1.1	HTSSOP-B28
BD6423EFV	19 to 42		1.0	2.0	2.0	0.8	2.0	HTSSOP-B24
BD6422EFV	19 to 42		1.0	2.0	2.0	0.8	2.0	HTSSOP-B24

**Symbol Key**

- CLK IN**: Control signal input CLK-IN type
- PARAMETER**: Control signal input PARALLEL-IN type
- I<sub>max</sub> 0.4A, 0.8A, 1.0A, 1.2A, 1.3A, 1.5A, 2.0A, 2.5A**: Maximum output current
- 1/2STEP, 1/4STEP, 1/8STEP, 1/16STEP**: Number of step
- 60V MIN**: Voltage resistance
- SILENT**: Pseudo liner silent drive
- SILENT**: PWM silent drive
- SERVO**: Built-in servo circuit
- 120° PWM, 120° PWM, 180° PWM**: Output power system
- High power package**: High power package
- Constant-current PWM**: Constant-current PWM
- Thin package**: Thin package
- FWRW**: Switch able between forward and reverse
- SMALL SIZE PACKAGE**: Small power package
- DECA SW**: SLOW/FAST/MIX DECA switching function
- ONE POWER**: 1 power supply system due to built-in regulator
- T.S.D.**: Built-in thermal shut-down circuit
- O.C.P.**: Built-in over current protection circuit
- FUNCTION COMPATIBLE**: Function-compatible
- UV**: Built-in under voltage lock out circuit

# 3-Phase Brushless Motor Drivers

## 3-Phase Brushless Motor Pre-Drivers with Speed Control

### BD6762FV



### BD62491MUV



Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External FET Drive Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD6762FV	36	16.0 to 28.0	-25 to +75	17.0	2.2	0.8	V <sub>CC</sub> +6.8	10.8	16	SSOP-B40
BD62491MUV	7	4.5 to 5.5	-40 to +85	6.5	2.0	0.8	V <sub>CC</sub> -0.2	V <sub>CC</sub> -0.2	20	VQFN032V5050

## 3-Phase Brushless Motor Driver with Speed Control

### BD67929EFV



Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External FET Drive Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD67929EFV	36	19 to 28	-25 to +85	4.0	3.0	1.5	-	-	200	HTSSOP-B28

## 3-Phase Brushless Motor Pre-Drivers

### BD6761FS



### BD63000MUV



### BD63005MUV



Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External FET Drive Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD6761FS	36	16.0 to 28.0	-35 to +75	15.0	2.2	0.8	V <sub>CC</sub> +6	10.5	15	SSOP-A32
BD63000MUV	30	8.0 to 26.4	-40 to +85	2.5	2.0	0.8	V <sub>G</sub> -0.2	4.8	External input	VQFN028V5050
<b>New</b> BD63005MUV	33	10.0 to 28.0	-25 to +85	3.9	2.0	0.8	-	-	External input	VQFN040V6060

## 3-Phase Brushless Motor Pre-Driver (for Automotive)

### BD16805FV-M



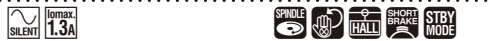
Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External FET Drive Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD16805FV-M	60	8 to 18	-40 to +110	15.2	3.0	1.0	2×V <sub>CC</sub> -0.5	11.5	25	SSOP-B40

## 3-Phase Brushless Motor Drivers

### BA6664FM



### BA6859AFP-Y



### BD6671FM



Part No.	Power Supply Voltage(V)		Max. Output Current(mA)	Current Drive Type	Reverse Protection	Servo Input	Rotating direction	FG Output	Hall Bias	Standby Circuit	Gain switching	Temp. Protection	Short Brake	Brake Mode Switching	Package
	Control	Output													
BA6664FM	4.5 to 5.5	3.0 to 14.0	1300	Pseudo linear	✓	R/F	✓	✓	✓	✓	✓	✓	✓	✓	HSOP-M28
BA6859AFP-Y	4.5 to 5.5	3.0 to 14.0	1300	Pseudo linear	✓	R/F	✓	✓	✓	✓	-	✓	✓	✓	HSOP25
BD6671FM	4.5 to 5.5	4.0 to 13.2	2500	PWM drive	✓	R/F	-	✓	✓	✓	✓	✓	✓	✓	HSOP-M28

Built-in over voltage lock out circuit	Easy replacement pin compatible with competitor's	ESD resistance	Standby current 0µA	Adjacent pin short protection	-40°C to +85°C operating temperature range	Inverse mounting protection
External output FET H-side:Nch/L-side:Nch	External output FET H-side:Pch/L-side:Nch	DMOS output	Spindle drive	Built-in FG Amp	Built-in reverse protection function	Built-in hysteresis Amp
High RPM-compatible	Built-in short brake	No-CLOCK input detection function	Standby mode	Built-in I/O gain switch function	Built-in motor lock-up protection circuit	Built-in over voltage protection circuit
						Built-in under voltage protection circuit

# Fan Motor Drivers

## 5V Single-Phase Full-wave Fan Motor Drivers

<b>BH6766FVM</b>						
<b>BH6789FVM</b>						
<b>BH6799FVM</b>						
<b>BU6906AGF</b>						
<b>BD6965NUX</b>						
<b>BD6966NUX</b>						
<b>BD6980NUX</b>						

Part No.	Supply Voltage (V)	Iomax. (mA)	Power Tr.	Output Saturation Voltage (V)	Speed Control	Hall Bias Voltage (V)	Lock Time Ratio	Package
BH6766FVM	2.0 to 6.0	630	CMOS	Upper and Lower 0.6(Io=250mA)	—	1.3	—	MSOP8
BH6789FVM	2.0 to 6.0	1000	CMOS	Upper and Lower 0.32 (Io=250mA)	—	1.3	1:10	MSOP8
BH6799FVM	2.0 to 6.0	1000	CMOS	Upper and Lower 0.32 (Io=250mA)	—	1.3	1:10	MSOP8
BU6906AGF	1.8 to 5.5	800	CMOS	Upper and Lower 0.16 (Io=200mA)	Direct PWM	Include Hall sensor	1:10	SSOF6
BD6965NUX	2.0 to 5.5	800	CMOS	Upper and Lower 0.4(Io=250mA)	Direct PWM	—	1:10	VSON008X2030
BD6966NUX	1.8 to 5.5	1000	CMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	1.0	1:10	VSON010X3030
BD6980NUX	1.8 to 5.5	1000	CMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	1.0	1:10	VSON010X3030

## Standard Single-Phase Full-wave Fan Motor Drivers

<b>BD6981FVM</b>						
<b>BD6982FVM</b>						
<b>BD6967FVM</b>						
<b>BD6968FVM</b>						
<b>BD6962FVM</b>						
<b>BD6964FVM</b>						
<b>BD6961F</b>						
<b>BD6964F</b>						
<b>BA6423AF</b>						
<b>BA6424AFS</b>						

Part No.	Supply Voltage (V)	Iomax. (mA)	Power Tr.	Output Saturation Voltage (V)	Speed Control	Hall Bias Voltage (V)	Lock Time Ratio	Package
BD6981FVM	2.8 to 16.0	800	DMOS	Upper and Lower 0.45(Io=200mA)	—	1.2	1:6	MSOP8
BD6982FVM	2.8 to 16.0	800	DMOS	Upper and Lower 0.45(Io=200mA)	—	1.2	1:6	MSOP8
BD6967FVM	3.3 to 14.0	800	DMOS	Upper and Lower 0.45(Io=200mA)	DC/Direct PWM	1.2	1:10	MSOP10
BD6968FVM	3.3 to 14.0	800	DMOS	Upper and Lower 0.45(Io=200mA)	DC/Direct PWM	1.2	1:10	MSOP10
BD6962FVM	3.3 to 14.0	800	DMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	—	1:10	MSOP8
BD6964FVM	3.3 to 14.0	800	DMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	—	1:10	MSOP8
BD6961F	3.3 to 14.0	1000	DMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	—	1:10	SOP8
BD6964F	3.3 to 14.0	1000	DMOS	Upper and Lower 0.4(Io=300mA)	Direct PWM	—	1:10	SOP8
BA6423AF	6.0 to 28.0	1000	Bipolar	Upper 0.9/Lower 0.8 (Io=200mA)	—	—	1:4.7	SOP8
BA6424AFS	6.0 to 28.0	1000	Bipolar	Upper 0.9/Lower 0.8 (Io=200mA)	—	—	1:4.7	SSOP-A16

<b>Symbol Key</b>	5V Power supply compatible	12V Power supply compatible	24V Power supply compatible	100mA current class	250mA current class	300mA current class	350mA current class	400mA current class	450mA current class	800mA current class	Pre-driver	This is an indication for the amount of current that can flow into a motor running at fixed speed.			
	Include Hall Sensor		Small mount type		RPM pulse signal output		Soft switching		Built-in hall element power supply voltage		Rotational speed control possible		External capacitor for detecting motor lock not necessary		Lock alarm signal output

**Multifunction Single-Phase Full-wave Fan Motor Drivers**

<b>BD6971FS</b>		
<b>BD6971FV</b>		
<b>BD6721FS</b>		
<b>BD6975FV</b>		
<b>BD6722FS</b>		
<b>BD6973FV</b>		
<b>BD6974FV</b>		
<b>BD6726FU</b>		

Part No.	Supply Voltage (V)	Iomax. (mA)	Power Tr.	Output Saturation Voltage (V)	Speed Control	Hall Bias Voltage (V)	Lock Time Ratio	Package
<b>BD6971FS</b>	3.5 to 17.0	1000	DMOS	Upper and Lower 0.6 (Io=200mA)	DC/Direct PWM	1.3	1:10	SSOP-A16
<b>BD6971FV</b>	3.5 to 17.0	1000	DMOS	Upper and Lower 0.6 (Io=200mA)	DC/Direct PWM	1.3	1:10	SSOP-B14
<b>BD6721FS</b>	4.5 to 17.0	1000	DMOS	Upper and Lower 0.6 (Io=300mA)	DC/Direct PWM	—	1:10	SSOP-A16
<b>BD6975FV</b>	3.5 to 17.0	1200	DMOS	Upper and Lower 0.4 (Io=400mA)	DC/Direct PWM	1.25	1:10	SSOP-B14
<b>BD6722FS</b>	4.5 to 17.0	1500	Half pre-driver (Lower Tr. incorporated)	Lower 0.3 (Io=600mA)	DC/Direct PWM	—	1:20	SSOP-A16
<b>BD6973FV</b>	4.3 to 17.0	10	Pre-driver	—	DC/Direct PWM	1.26	1:20	SSOP-B16
<b>BD6974FV</b>	4.3 to 17.0	10	Pre-driver	—	DC/Direct PWM	1.26	1:20	SSOP-B16
<b>BD6726FU</b>	5.0 to 17.0	10	Pre-driver	—	Feedback	1.5	1:20	SSOP-C20

**2-Phase Half-wave Fan Motor Drivers**

<b>BD6701F</b>		
<b>BA6406F</b>		
<b>BA6506F</b>		
<b>BA6901F</b>		

Part No.	Supply Voltage (V)	Iomax. (mA)	Power Tr.	Output Saturation Voltage (V)	Speed Control	Hall Bias Voltage (V)	Zener Diode Clamp Voltage (V)	Output Clamp Voltage (V)	Lock Time Ratio	Package
<b>BD6701F</b>	6.0 to 28.0	800	DMOS	0.3 (Io=200mA)	—	—	—	54	1:10	SOP8
<b>BA6406F</b>	4.0 to 28.0	70	Pre-driver	—	—	—	—	—	1:4.5	SOP8
<b>BA6506F</b>	4.0 to 28.0	70	Pre-driver	—	—	—	—	—	1:4.5	SOP8
<b>BA6901F</b>	3.5 to 28.0	70	Pre-driver	—	PWM	—	—	—	1:10	SOP16

**3-Phase Full-wave Fan Motor Drivers**

<b>BH67172NUX</b>		
<b>BD6346FV</b>		
<b>BD63441AFU</b>		

Part No.	Supply Voltage (V)	Iomax. (mA)	Power Tr.	Output Saturation Voltage (V)	Speed Control	Hall Bias Voltage (V)	Lock Time Ratio	Package
<b>BH67172NUX</b>	1.8 to 5.5	700	CMOS	Upper and Lower 0.25(Io=250mA)	Direct PWM	—	1 : 10	VSON010X3030
<b>BD6346FV</b>	5.5 to 17.0	1200	DMOS	Upper and Lower 0.24(Io=200mA)	DC/Direct PWM	—	1 : 10	SSOP-B20
<b>BD63441AFU</b>	5.5 to 16.0	10	Pre-Drive	—	DC/Direct PWM	—	1 : 10	SSOP-C20

Motor lock detection function  
 Motor startup possible low-duty  
 Built-in thermal shut-down circuit  
 Drive method with hall sensor for detecting the rotor position  
 Soft start  
 Output power system  
 Minimum rotational speed setting  
 Output current limit can be set  
 Built-in diode for preventing damage due to backward connection  
 Detect the speed of motor rotation, control it to follow the setting.



## 3-Phase Brushless Fan Motor Drivers For Household Appliances (White goods)

### BM6202FS



### BM6203FS



Part No.	Control	Output Device	Voltage Ratings (V)	Output Current (A)	Output On Resistance (Ω)	Diode Forward Voltage (V)	Package
BM6202FS	6 inputs	PrestoMOS™	600	1.5	2.7	1.1	SSOP-A54_23
BM6203FS	6 inputs	PrestoMOS™	600	2.5	1.7	1.1	SSOP-A54_23

## 3-Phase Brushless Fan Motor Controllers For Household Appliances (White goods)

### BD62011FS



### BD62012FS



### BD62013FS



### BD62014FS



Part No.	Supply Voltage (V)	Commutation Logic	Control Voltage Range (V)	Phase Control Range (deg)	FG Pulse Number	Hall Bias Switch	Package
BD62011FS	10.0 to 18.0	180°	2.1 to 5.4	0 to +40	4 / 12	—	SSOP-A24
BD62012FS	10.0 to 18.0	150°	2.1 to 5.4	0 to +30	4 / 12	—	SSOP-A24
BD62013FS	10.0 to 18.0	150°	2.1 to 5.4	0 to +30	12	✓	SSOP-A24
BD62014FS	10.0 to 18.0	180°	1.1 to 4.4	0 to +40	4 / 12	—	SSOP-A24

## Driver for ODD

### 1ch System Motor Driver ICs Wide application

Part No.	Power Supply (V)		Max. Output Current (mA)	Current Drive Type	Reverse Protection	Servo Input	Rotating Direction	FG Output	Hall Bias	Standby Circuit	Gain Switching	Temp. Protection	Short Brake	Brake Mode Switching	Package
	Control	Output													
BA6664FM	4.5 to 5.5	3.0 to 14.0	1300	Pseudo linear	✓	R/F	✓	✓	✓	✓	✓	✓	✓	✓	HSOP-M28
BA6859AFP-Y	4.5 to 5.5	3.0 to 14.0	1300	Pseudo linear	✓	R/F	✓	✓	✓	✓	—	✓	✓	✓	HSOP25
BD6671FM	4.5 to 5.5	4.0 to 13.2	2500	PWM drive	✓	R/F	—	✓	✓	✓	✓	✓	✓	✓	HSOP-M28

Part No.	Power Supply (V)	Dynamic Range of Driver Output (V)	I/F AMP.	Mute of Driver Output	Regulator for DSP (V)	Protect Circuit for Low Power Supply	Protect for Abnormal Input	Temp. Protection	Standby Circuit	Package
BA5961FV	4.3 to 13.5	4.2(V <sub>CC</sub> =5V, R <sub>L</sub> =8 Ω)	3 circuits	—	—	—	✓	✓	✓	SSOP-B20W
BA5962FVM	3.0 to 10.0	4.1(V <sub>CC</sub> =5V, R <sub>L</sub> =50 Ω)	—	—	—	✓	✓	✓	✓	MSOP8
BD7931F	4.5 to 14.0	7.5(V <sub>CC</sub> =8V, R <sub>L</sub> =500mA)	—	—	—	—	—	✓	✓	SOP8
BH6578FVM	4.5 to 5.5	4.5(V <sub>CC</sub> =5V, R <sub>L</sub> =500mA)	—	—	—	—	—	✓	—	MSOP8

### 2ch to 3ch System Motor Driver IC Actuator applicable

Part No.	Power Supply (V)	I/F	FOCUS TILT	TRACKING	SLED	LOADING	SPINDLE	Short Circuit Protection Loading	Protect for Pickup	Package
BD8271EFV	4.5 to 14.0	Analog & PWM	1ch	—	2ch STTEPING	—	—	—	—	HTSSOP-B24

### 4ch System Motor Driver ICs Basic type for CD player

Part No.	Power Supply (V)	I/F	FOCUS TILT	TRACKING	SLED	LOADING	SPINDLE	Short Circuit Protection for Loading	Protect for Pickup	Regulator	Reset	Package
BD8201FM	4.5 to 14.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	✓	—	—	—	HSOP-M28
BD8223EFV	5.5 to 14.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	✓	Self off	—	—	HTSSOP-B28
BD8224EFV	4.5 to 14.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	—	—	—	2 input 1 output	HTSSOP-B24
BD8226EFV	5.5 to 14.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	—	—	Variable voltage × 1	—	HTSSOP-B24
BD8229EFV	4.5 to 14.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	—	—	—	1 input 1 output	HTSSOP-B24
BD8231EFV	6.0 to 10.0	Analog & PWM	1ch	1ch	DC Select input	3-Phase Brushless	DC	—	—	—	—	HTSSOP-B40
<b>New</b> BD8266EFV	4.5 to 10.0	Analog & PWM	1ch	1ch	DC Select input	DC	DC	—	Self off	—	—	HTSSOP-B24

### 5ch System Motor Driver ICs Loading channel added

Part No.	Power Supply (V)	I/F	FOCUS TILT	TRACKING	SLED	LOADING	SPINDLE	Short Circuit Protection for Loading	Protect for Pickup	Regulator	Package
BA5814FM	4.3 to 13.2	Analog & PWM	1ch	1ch	DC	DC	DC	—	—	Variable voltage × 2	HSOP-M28
BD8203EFV	4.5 to 14.0	Analog & PWM	1ch	1ch	DC	DC	DC	—	—	Variable voltage × 1 5V Fixed × 1	HTSSOP-B40

### 6ch to 9ch System Motor Driver ICs Basic type for DVD player, Blu-ray

Part No.	Power Supply (V)	I/F	FOCUS TILT	TRACKING	SLED	LOADING	SPINDLE	LVDS for SA	Short Circuit Protection for Loading	Protect for Pickup	Package
BD8210EFV	6.0 to 10.0	Analog & PWM	1ch	1ch	2ch STTEPING	DC	3-Phase Brushless	—	✓	Self off	HTSSOP-B54
BD8215EFV	6.0 to 10.0	Analog & PWM	1ch	1ch	2ch STTEPING	DC	3-Phase Brushless	—	✓	Flag only	HTSSOP-B54
BD8217EFV	6.0 to 10.0	Analog & PWM	1ch	1ch	2ch STTEPING	DC	3-Phase Brushless	—	✓	Flag only	HTSSOP-B54
<b>New</b> BD8255MUV	4.5 to 5.5	SPI	1ch	1ch	2ch STTEPING	DC	3-Phase Brushless	—	✓	—	VQFN48SV7070
<b>New</b> BD8256EFV	4.5 to 10.5	SPI	2ch	1ch	2ch STTEPING	DC	3-Phase Brushless	2ch	✓	Self off	HTSSOP-B54

<b>Symbol Key</b>	Voltage resistance	Output power system	Output power system	Maximum output current	Maximum output current	Built-in thermal shut-down circuit	Built-in under voltage lock out circuit	Built-in over current protection circuit	Output current limit can be set
	External capacitor for detecting motor lock not necessary	RPM pulse signal output	Built-in hall element power supply voltage						

System Motor Driver ICs for Half Height Drives (3 sensors) Basic type										
Part No.	Supply Voltage (V)	CH	Output System	Output	Output Gain	Under Voltage Protection	Overvoltage Protection	Input Abnormality Protection	Temperature Protection	Package
BD7959EFV	4.3 to 5.5	ch1 to 3	BTL	4.1V	17.5dB	✓	-	✓	✓	HTSSOP-B54
		ch4	BTL	9.8V	17.5dB					
	10.8 to 13.2	ch5 · 6	PWM	2.2Ω	1.25A/V					
		ch7	PWM	1.5Ω	1.15A/V					
		ch8 · 9	PWM	2.2Ω	0.17A/V					
System Motor Driver ICs for Half Height Drives (Sensorless) Space saving type										
BD7755RFV	4.3 to 5.5	ch1 to 3	BTL	4.1V	21.6dB or 15.6dB	✓	-	✓	✓	HTSSOP-B54R
		ch4 · 5	PWM	1.3Ω	0.2A/V					
	10.8 to 13.2	ch6 · 7	PWM	2.2Ω	1.0A/V					
		ch8	PWM	1.0Ω	3.5A/V					
		ch9	BTL	4.3V/9.9V	17.5dB					
System Motor Driver ICs for Slim Drives (3 sensors) Basic type										
BH5510KV/ BH5510KVT	4.0 to 5.5	ch1 to 3	PWM	1.3Ω	14dB	✓	✓	✓	✓	VQFP48C/ TQFP48V
		ch4 · 5	PWM	1.5Ω	14dB					
		ch6	PWM	0.6Ω	1A/V or 0.2A/V					
BH5511KV	4.0 to 5.5	ch1 to 3	PWM	1.3Ω	17.5dB/8.0dB	✓	✓	✓	✓	VQFP48C
		ch4 · 5	PWM	1.5Ω	17.5dB					
		ch6	PWM	0.6Ω	0.5A/V or 0.33A/V or 0.17A/V					

## Driver for Printer

3-Phase Brushless Motor Driver for Polygonal Mirrors For LBP, PPC										
Part No.	Supply Voltage (V)	Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Current Limit Detect Voltage (V)	ON Resistance (Ω)	Circuit Current When Motor Stop (mA)	Pwm Frequency (kHz)	Package
				H Level(V)	L Level(V)					
BD67929EFV	19 to 28	2.5	4.0	3.0	1.5	0.5	1.35 (Io=1.0A)	1.0	200	HTSSOP-B28
Motor Drivers with Brush for Printers										
Part No.	Supply Voltage (V)	Output Current (A)	Output Current Peak(A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package		
					H Level(V)	L Level(V)				
BD63821EFV	19 to 28	1.0	1.5	2.5	2.0	0.8	1.9(Io=0.5A)	HTSSOP-B28		
BD63823EFV	19 to 28	2.0	2.8	2.5	2.0	0.8	0.65(Io=1.5A)	HTSSOP-B28		
<b>New</b> BD62210EFV	8 to 28	1.0	1.5	2.5	2.0	0.8	1.9	HTSSOP-B28		
<b>New</b> BD62220EFV	8 to 28	2.0	2.8	2.5	2.0	0.8	0.65	HTSSOP-B28		
Bipolar Stepper Motor Drivers for Paper Feed / Carriage For LBP, PPC, Scanner, Photo, Printer, FAX, IJP Please refer to page A69, A70 General Purpose ICs for the other new Stepper Motor Driver lineup.										
Part No.	Supply Voltage(V)		Output Current (A)	Circuit Current (mA)	Input Threshold Voltage		Output ON Resistance (Ω)	Package		
	Vcc				High Level Voltage(V)	Low Level Voltage(V)				
BD63801EFV	19 to 28		0.8	2.7	2.0	0.8	2.8	HTSSOP-B24		
BD63874EFV	19 to 28		1.5	2.0	2.0	0.8	1.0	HTSSOP-B28		
<b>New</b> BD63715AEFV	19 to 28		1.5	2.0	2.0	0.8	0.95	HTSSOP-B28		
3-Phase Brushless Motor Pre-Drivers for Paper Feed For LBP, PPC										
Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External Threshold Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD6761FS	36	16 to 28	-35 to +75	15.0	2.2	0.8	Vcc+6	10.5	15	SSOP-A32
BD6762FV	36	16 to 28	-25 to +75	17.0	2.2	0.8	Vcc+6.8	10.8	16	SSOP-B40
BD62491MUV	7	4.5 to 5.5	-40 to +85	6.5	2.0	0.8	Vcc-0.2	Vcc-0.2	20	VQFN032V0500
System Drivers for Inkjet Printers										
Part No.	Supply Voltage (V)	H-bridge Output Current (A)	SW-REG Output Current (A)	H-bridge1 ON Resistance (Ω)	H-bridge2 ON Resistance (Ω)	SW-REG ON Resistance (Ω)	SW-REG Output Voltage (V)	SERIES REG Output Voltage (V)	Package	
BD64550EFV	18 to 36	2.5	0.5	1.0 (Io=1.0A)	1.2 (Io=1.0A)	0.8 (Io=0.25A)	3.0 to 5.0	1.5	HTSSOP-B40	
BD64532EKV	9 to 45	2.0	2.5	1.8 (Io=1.0A)	1.8 (Io=1.0A)	0.55 (Io=1.0A)	1 to Vbb × 0.5 (Max. 13.5V)	-	HTQFP64V	
<b>New</b> BD64538EFV	9 to 45	1.5	1.5	1.75 (Io=1.0A)	1.75 (Io=1.0A)	0.75 (Io=1.0A)	3 to Vbb × 0.6 (Max. 5.5V)	1.0 to 2.5	HTSSOP-B28	

3-Phase Brushless Motor Driver for Polygonal Mirrors For LBP, PPC : Current limit value is calculated by dividing current limit voltage by RNF resistance which is to detect the output current.  
 Motor Drivers with Brush for Printers: The BD63821EFV and BD63823EFV are all pin-compatible. The BD62210EFV and BD62220EFV are all pin-compatible.

# Driver for Digital Still Camera

## 5ch System Lens Drivers for Digital Cameras

Part No.	Supply Voltage (V)	Driver Output Max. Current (A)	Drive Method	Examples of Actuator (Driven Motor, Driving System, and Output ON Resistance(Ω))				Input Interface	Reference Voltage Output for Output Setting Current (V)	Package (mm)
				AF	Zoom	Iris	Shutter			
BD6370GUL	2.7 to 5.5	0.5	ex. 1	STM(ch1, 2) Constant voltage/ FULL ON 1.4	DCM(ch3) Constant voltage/ FULL ON 1.4	DCM or VCM(ch4) Constant voltage/ Constant current/FULL ON 1.4	VCM(ch5) Constant current 1.4	Parallel + Serial	Output current control using built-in D/A converter	VCSP50L2 (2.6 × 2.6) H=0.55Max.
			ex. 2	STM(ch1, 2) Constant voltage/ FULL ON 1.4	STM(ch1, 2, 3) Constant voltage/ FULL ON 1.4	DCM or VCM(ch4) Constant voltage/ Constant current/FULL ON 1.4	VCM(ch5) Constant current 1.4			
BD6758MWW	2.5 to 5.5	0.8	ex.	STM(ch1, 2) FULL ON 1.2	DCM(ch3) FULL ON 1.2	DCM or VCM(ch4) FULL ON 1.2	VCM(ch5) Constant current 1.0	Parallel	1.2 (±3%)	UQFN36V5050 (5.0 × 5.0) H=1.0Max.
BD6758KN	2.5 to 5.5	0.8	ex.	STM(ch1, 2) FULL ON 1.2	DCM(ch3) FULL ON 1.2	DCM or VCM(ch4) FULL ON 1.2	VCM(ch5) Constant current 1.0	Parallel	1.2 (±3%)	VQFN36 (6.2 × 6.2) H=0.95Max.

## 6ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex)

Part No.	Supply Voltage (V)	Driver Output Max. Current (A)	Drive Method	Examples of Actuator (Driven Motor, Driving System, and Output ON Resistance(Ω))				Input Interface	Reference Voltage Output for Output Setting Current (V)	Package (mm)
				AF	Zoom	Iris	Shutter			
BD6373GW	2.5 to 5.5	0.8	ex.	STM(ch1, 2) FULL ON 1.2	STM(ch3, 4) FULL ON 1.2	DCM or VCM(ch5) FULL ON 1.2	VCM(ch6) FULL ON 1.2	Parallel	—	UCSP75M2 (2.6 × 2.6) H=0.85Max.
BD6753KV	4.5 to 10.5 (ch1, 2) 2.0 to 10.5 (ch3 to 6)	0.8	ex.	STM(ch1, 2) FULL ON 1.2	STM(ch3, 4) FULL ON 1.2	DCM or VCM(ch5) PWM(±3%) 1.2	VCM(ch6) PWM(±3%) 1.2	Parallel + Serial	0.9 (±10%)	VQFN48C (8.2 × 9.0) H=1.60Max.

## 7ch System Lens Drivers for Digital Cameras and SLRs (Single Lens Reflex)

Part No.	Supply Voltage (V)	Driver Output Max. Current (A)	Drive Method	Examples of Actuator (Driven Motor, Driving System, and Output ON Resistance(Ω))					Input Interface	Reference Voltage Output for Output Setting Current (V)	Package (mm)
				AF	Zoom	Iris	Shutter	Anti Shock			
BD6889GU	2.5 to 5.5	0.8	ex. 1	STM(ch1, 2) FULL ON 1.3	STM(ch3, 4) FULL ON 1.3	STM(ch5, 6) FULL ON 1.3	VCM(ch7) Constant current(±3%) 0.9	—	Parallel	0.9 (±2%)	VBGA063T050 (5.0 × 5.0) H=1.20Max.
			ex. 2	STM(ch1, 2) FULL ON 1.3	DCM(ch3) FULL ON 1.3	DCM(ch4) FULL ON 1.3	VCM(ch7) Constant current(±3%) 0.9	STM(ch5, 6) FULL ON 1.3			

## 1ch to 2ch Lens Drivers for SLRs (Single Lens Reflex)

Part No.	Channel	Supply Voltage (V)	Driver Output Max. Current (A)	Drive Method	Examples of Actuator (Driven Motor, Driving System, and Output ON Resistance(Ω))					Turn on Time	Turn off Time	Control Frequency	Package (mm)
					Cleaner	AF	Zoom	Iris	Shutter				
BD65492MUV	2	1.8 to 16.0	1.0	ex.	—	STM(ch.2) Full-ON 0.9	—	—	—	200ns (Including 80ns to Prevent from overlap current.)	80ns	500kHz(Max.)	VQFN024V4040 (4.0 × 4.0)
BD6735FV	2	2.0 to 8.0	1.0	ex.	—	—	—	STM(ch.2) Full-On 1.0	—	300ns (Including 90ns to Prevent from overlap current.)	100ns	100kHz(Max.)	SSOP-B20 (6.5 × 6.4)
BD6376GUL	1	2.0 to 9.0	1.0	ex.	—	—	DCM(ch.1) Full-On 0.45	—	—	200ns (Including 80ns to Prevent from overlap current.)	60ns	200kHz(Max.)	VCSP50L1 (1.6 × 1.6) H=0.55Max.
BD65491FV	1	1.8 to 16.0	1.2 Peak 4.0	ex.	—	—	—	—	Plunger(ch.1) Full-On 0.35	150ns (Including 80ns to Prevent from overlap current.)	50ns	500kHz(Max.)	SSOP-B16 (6.5 × 5.0)
BD6736FV	1	2.0 to 9.0	1.0 Peak 3.2	ex.	—	—	—	—	Plunger(ch.1) Full-On 0.35	1000ns (Including 800ns to Prevent from overlap current.)	100ns	100kHz(Max.)	SSOP-B20 (6.5 × 6.4)
BD65499MUV	1	4.0 to 27.0	0.5 Peak 2.0	ex.	Piezo(ch.1) Full-On 0.6	—	—	—	—	150ns (Including 80ns to Prevent from overlap current.)	50ns	300kHz(Max.)	VQFN028V5050
BD65494MUV	1	2.0 to 9.0	1.0 Peak 2.5	ex.	—	—	—	—	Plunger(ch.1) Full-On 0.55	200ns (Including 80ns to Prevent from overlap current.)	60ns	200kHz(Max.)	VQFN016V3030
BD65496MUV	1	1.8 to 16.0	1.2 Peak 5.0	ex.	—	—	—	—	Plunger(ch.1) Full-On 0.35	150ns (Including 80ns to Prevent from overlap current.)	50ns	500kHz(Max.)	VQFN024V4040

STM : Stepping motor, DCM : DC motor, VCM : Voice coil motor ("Drive method examples of actuator" are recommendation. Another types may be evaluated.)



Microstep system Lens Drivers for Digital Cameras												
Part No.	Supply Voltage (V)	Driver Output Max. Current (A)	Drive Method Examples of Actuator (Driven Motor, Driving System, and Output ON Resistance(Ω))					Input Interface	Microstep Resolution	Package (mm)		
			AF	Zoom	Iris	Shutter	Others					
BU24020GU	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	—	—	—	3-wire serial	1024	VCSP85H2 (2.6×2.6) H=1.0Max.	
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch3) Full ON(PWM) 1.5	VCM(ch4) Full ON(PWM) 1.5	—	—				
BU24031GW	1.62 to 3.6 (Lo) 2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex	STM(ch1, 2) μ-step (class-D) 2.0	DCM(ch4) Full ON(PWM+Speed Control) 2.0	VCM(ch3) Full ON(PWM) 2.0	VCM(ch5) constant current 1.0	—	3-wire serial	1024	UCSP75M2 (2.5×2.5) H=0.85Max.	
BU24032GW	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex	STM(ch1, 2) μ-step (class-D) 2.0	DCM(ch5) Full ON(PWM+Speed Control) 2.0	VCM(ch3) Full ON(PWM) 2.0	VCM(ch6) constant current 1.0	DCM or VCM(ch4) FULL ON(PWM) 2.0	3-wire serial	1024	UCSP75M2 (2.5×2.5) H=0.85Max.	
BU24033GW	1.62 to 3.6 (Lo) 2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5/0.6	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	VCM(ch5) Full ON(PWM) 1.0	VCM(ch6) constant current 1.0	—	3-wire serial	1024	UCSP75M3 (3.0×3.0) H=0.85Max.	
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch5) Full ON(PWM+Speed Control) 1.0	VCM(ch3) Full ON(PWM) 1.5	VCM(ch6) constant current 1.0	DCM(ch4) Full ON(PWM) 1.5				
BU24035GW	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5/0.6	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch5) Full ON(PWM+Speed Control) 1.0	STM(ch3, 4) Full ON(PWM)/constant current 1.5	VCM(ch6) constant current 1.0	—	3-wire serial	1024	UCSP75M3 (3.1×3.1) H=0.85Max.	
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch3) Full ON(PWM+Speed Control) 1.5	VCM(ch5) Full ON(PWM)/constant current 1.0	VCM(ch6) constant current 1.0	VCM(ch4) Full ON(PWM) 1.5				
BU24024GU	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.4/0.6	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	VCM(ch6) constant current 1.0	VCM(ch7) constant current 1.0	DCM or VCM(ch5) FULL ON(PWM) 1.0	3-wire serial	1024	VCSP85H3 (3.5×3.5) H=1.0Max.	
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch5) FULL ON(PWM) 1.0	STM(ch3, 4) μ-step (class-D) 1.5	VCM(ch7) constant current 1.0	DCM or VCM(ch6) constant current 1.0				
BU24025MWV	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	VCM(ch6) constant current 1.0	VCM(ch7) constant current 1.0	DCM or VCM(ch5) FULL ON(PWM) 1.0	3-wire serial	1024	UQFN044V6060 (6.0×6.0) H=1.0Max.	
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	DCM(ch5) FULL ON(PWM) 1.0	STM(ch3, 4) μ-step (class-D) 1.5	VCM(ch7) constant current 1.0	DCM or VCM(ch6) constant current 1.0				
BU24026GU	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	STM(ch5, 6) μ-step (class-D) 1.5	VCM(ch7) constant current 1.0	—	3-wire serial	1024	VCSP85H3 (3.8×3.8) H=1.0Max.	
BU24038GW	2.7 to 3.6 (Logic) 2.7 to 5.5 (Driver)	0.5	ex. 1	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch3, 4) μ-step (class-D) 1.5	STM(ch5, 6) μ-step (class-D) 1.5	VCM(ch8) Full ON(PWM) 1.5	VCM(ch9) constant current 1.0	DCM(ch7) Full ON(PWM) 1.5	3-wire serial	1024	UCSP75M3 (3.8×3.8) H=0.85Max.
			ex. 2	STM(ch1, 2) μ-step (class-D) 1.5	STM(ch5, 6) μ-step (class-D) 1.5	VCM(ch3) Full ON(PWM) 1.5	VCM(ch4) Full ON(PWM) 1.5	VCM(ch9) constant current 1.0	DCM(ch7) Full ON(PWM) 1.5			

STM : Stepping motor, DCM : DC motor, VCM : Voice coil motor ("Drive method examples of actuator" are recommendation. Another types may be evaluated.)

# Mobile Phone Module Driver

## Parallel Interface Lens Driver for Voice Coil Motors

Part No.	Supply Voltage (V)	Applications	ch	Drive System	Driver Output Max. Current (A)	Driver Output ON Resistance (Ω)	Input Interface	Input Mode Selection Terminal	Current Sense Resistor	UVLO	Temperature Protection	Power Save Function	Package (mm)
BD6369GUL	2.5 to 5.5	<b>AF</b> Drive AF using voice coil motor.	1	Constant voltage (±5%)	0.5	0.8 (V <sub>CC</sub> =5V, I <sub>O</sub> =0.4A)	Parallel	✓	—	✓	✓	✓	VCSP50L2 (2.1 × 2.1) H=0.55Max.

## 2-wire Serial (I<sup>2</sup>C-compatible) Interface Lens Drivers for Voice Coil Motors

Part No.	Supply Voltage (V)	Applications	ch	Drive System	Driver Output Max. Current (A)	Driver Output Low Voltage (V)	Input Interface	Ring Compensation	UVLO	Temperature Protection	Power Save Function	Package (mm)
BU64241GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	0.25	Constant current (±10%)	0.130	0.15 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	✓	✓	✓	UCSP30L1 (1.3 × 0.77) H=0.33Max.
BU64243GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	0.25	Constant current (±10%)	0.130	0.15 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	✓	✓	✓	UCSP35L1 (0.77 × 1.3) H=0.40Max.
<b>New</b> BU64244GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	0.25	Constant current (±10%)	0.130	0.15 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	✓	✓	✓	UCSP35L1 (0.77 × 1.3) H=0.36Max.
BU64291GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	0.5	Constant current (±5%)	0.100	0.25 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	✓	✓	✓	UCSP30L1 (0.77 × 1.37) H=0.33Max.

## Parallel Interface Lens Driver for Stepping Motors

Part No.	Supply Voltage (V)	Applications	ch	Drive System	Driver Output Max. Current (A)	Driver Output ON Resistance (Ω)	Input Interface	Input Mode Selection Terminal	Built-In Wave Sloping Comparator	UVLO	Temperature Protection	Power Save Function	Package (mm)
BD6360GUL	2.3 to 5.5	ex.1 <b>AF</b> Drive AF using piezo actuator. ex.2 <b>ZOOM</b> Drive ZOOM using stepping motor.	2	FULL ON	0.5	1.0 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.4A)	Parallel	✓	✓	✓	✓	✓	VCSP50L2 (2.1 × 2.1) H=0.55Max.

## 2-wire Serial (I<sup>2</sup>C-compatible) Interface Lens Driver for Piezo Actuators

Part No.	Supply Voltage (V)	Applications	ch	Drive System	Driver Output Max. Current (A)	Driver Output ON Resistance (Ω)	Input Interface	Base Clock	UVLO	Temperature Protection	Power Save Function	Package (mm)
BU64562GWZ	V <sub>CC</sub> : 2.3 to 4.8	ex.1 <b>AF</b> Drive AF using piezo actuator. ex.2 <b>ZOOM</b> Drive ZOOM using piezo actuator.	1	FULL ON	0.5	1.4 (V <sub>CC</sub> =3V)	I <sup>2</sup> C compatible	Built-in 15MHz	✓	✓	✓	UCSP30L1 (1.90 × 0.77) H=0.33Max.

## Bi-directional VCM Drivers

Part No.	Supply Voltage (V)	Applications	ch	Drive System	Driver Output Max. Current (A)	Driver Output Low Voltage (V)	Input Interface	Ring Compensation	UVLO	Temperature Protection	Power Save Function	Package (mm)
BU64295GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	1	Constant current (±5%)	±0.100	0.20 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	—	✓	✓	UCSP30L1 (0.77 × 1.2) H=0.33Max.
BU64296GWX	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	1	Constant current (±5%)	±0.100	0.20 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	—	✓	✓	UCSP16X1 (0.77 × 1.2) H=0.20Max.
<b>New</b> BU64297GWZ	2.3 to 4.8	<b>AF</b> Drive AF using voice coil motor.	1	Constant current (±5%)	±0.100	0.20 (V <sub>CC</sub> =3V, I <sub>O</sub> =0.1A)	I <sup>2</sup> C compatible	ISRC	—	✓	✓	UCSP35L1 (0.77 × 1.2) H=0.36Max.

**AF**=Auto Focus **ZOOM**=Zoom



ICs

# LED Drivers

## CONTENTS

<b>LED Drivers</b> .....	<b>P. A80</b>
<b>Boost Converter LED Drivers</b> .....	P. A80
<b>Buck Converter LED Drivers</b> .....	P. A80
<b>Buck-Boost LED Drivers</b> .....	P. A80
<b>LED Drivers for Lighting</b> .....	P. A81
<b>Inductorless (Charge Pump) LED Drivers</b> .....	P. A81
<b>Constant Current / Serial-in Parallel-out LED Drivers</b> .....	P. A81
<b>LED Driver Support Function</b> .....	P. A81

# LED Drivers

## Boost Converter LED Drivers

### White LED Drivers with External FET

Part No.	Supply Voltage (V)	No. of LEDs	Output Voltage (V)	Output Current (mA)	Switching Frequency (MHz)	Primary Brightness Control Method	Control interface	Package (mm)
<b>BD6583MUV-A</b>	2.7 to 22.0	72 Max. (12 LEDs×6 rows) Vf restrictions exist	43.0 Max.	25 (Per row)	1.0	PWM signal from the PWMPOW/PWMDRV terminal Resistance switching at the ISET terminal	Pin logic setting	VQFN024V4040
<b>BD9285F</b>	9.0 to 18.0	80 Max. (80 LEDs×1 row)	250 Max.	400 Max.	0.05 to 0.8	PWM signal Analog signal	Pin logic setting	SOP18
<b>BD9479FV</b>	9.0 to 35.0	96 Max. (12 LEDs×8 rows)	43.0 Max.	500 Max.	0.1 to 0.8	PWM signal Analog signal	Pin logic setting	SSOP-B40
<b>BD9488F</b>	9.0 to 18.0	120 Max. (120 LEDs×1 row)	400 Max.	400 Max.	0.05 to 0.8	PWM signal Analog signal	Pin logic setting	SOP18
<b>New</b> <b>BD9397EFV</b>	9.0 to 35.0	84 Max. (14 LEDs×6 rows)	50.0 Max.	400 Max.	0.1 to 1.25	PWM signal Analog signal	Pin logic setting	HTSSOP-B40
<b>New</b> <b>BD9486F</b>	9.0 to 18.0	120 Max. (120 LEDs×1 row)	400 Max.	400 Max.	0.05 to 0.8	PWM signal Analog signal	Pin logic setting	SOP16

### White LED Drivers with Integrated FET

<b>BD60A00NUX</b>	2.7 to 5.5	3 to 10 (10 LEDs×1 row)	40.0 Max.	30	0.6	PWM signal from the PWM terminal Resistance switching at the ISET terminal	Pin logic setting	VSON008X2030
<b>BD60A60NUX</b>	2.7 to 5.5	3 to 6 (6 LEDs×1 row)	26.0 Max.	30	0.6	PWM signal from the PWM terminal Resistance switching at the ISET terminal	Pin logic setting	VSON008X2030
<b>BD65B60GWL</b>	2.7 to 5.5	16 Max. (8 LEDs×2 rows)	28.5 Max.	25 (Per row)	1.1/0.6	I <sup>2</sup> C BUS PWM signal from the PWM terminal Resistance switching at the ISET terminal	I <sup>2</sup> C BUS + PWM	UCSP50L1 (1.4×1.8)H=0.55Max.
<b>BD6586MUV</b>	2.7 to 5.5	24 Max. (6 LEDs×4 rows)	24.0 Max.	25 (Per row)	1.0	PWM signal from the PWM terminal Resistance switching at the ISET terminal	Pin logic setting	VQFN024V4040
<b>BD65D00MUV</b>	6.0 to 27.0	40 Max. (10 LEDs×4 rows)	Internal FET 40.0Max. External FET 80.0Max.	100	0.6 to 1.5	PWM signal from the PWM terminal Resistance switching at the ISET terminal Analog voltage control	Pin logic setting	VQFN028V5050
<b>BD6142AMUV</b>	4.2 to 27.0	80 Max. (10 LEDs×8 rows)	41.0 Max.	30 (Per row)	0.6 to 1.5	PWM signal from the PWM terminal Resistance switching at the ISET terminal Analog voltage control	Pin logic setting	VQFN024V4040

### Synchronous White LED Drivers with Integrated FET

<b>BD6071HFN</b>	3.1 to 5.5	2/3 (3 LEDs×1 row)	14.0 Max.	35 (10V output)	1.0	PWM signal from EN terminal	—	HSO8
<b>BD6072HFN</b>	3.1 to 5.5	3/4 (4 LEDs×1 row)	18.0 Max.	35 (14V output)	1.0	PWM signal from EN terminal	—	HSO8
<b>BD6079GWL</b>	2.5 to 5.5	10 Max. (2 LEDs×5 rows)	8.1 Max.	30	2.0	PWM signal from EN terminal	—	UCSP50L1 (1.4×1.8)H=0.55Max.

### LED Camera Flash Drivers

Part No.	Supply Voltage (V)	Number of LED	Output voltage (V)	Output current	Switching frequency	Interface	Package (mm)
<b>BD6164GUT</b>	2.7 to 4.5	1 (High power LED)	Max. 4.7	52,72mA(Torch mode) 260,280,300,320mA(Flash mode)	4MHz	I <sup>2</sup> C BUS	VCSP60N1 (1.5×1.0)H=0.675Max.
<b>New</b> <b>BD7710GWL</b>	2.7 to 5.5	3CH · 1 to 2 serial (large current LED)	Max. 5.5	CH1=0 to 400mA CH2=0 to 800mA CH3=0 to 400mA CH1,2,3 short=0 to 1.6A	2MHz	I <sup>2</sup> C BUS	UCSP50L2
<b>New</b> <b>BD7757MWX</b>	2.7 to 5.0	1CH · 1 to 2 serial (large current LED)	Max. 5.1	0 to 1.5A	2MHz	UPIC*	VSON014X3020

LED Camera Flash Drivers : \* UPIC : Uni-Port Interface Control

## Buck Converter LED Drivers

### Buck Converter LED Lighting Driver for DC/DC Converter type

Part No.	Supply Voltage(V)	Maximum output current(A)	Ron(Ω)	Operating frequency(kHz)	Over current protection	Thermal shut down protection	Package
<b>BD9207FPS</b>	8.0 to 35.0	1.5	1.0(Typ.)	900	✓	✓	TO252S-5

### Buck Converter LED Lighting Driver for Non Electrolytic Capacitor

Part No.	Supply Voltage(V)	Input AC Voltage(Vac)	Dimming Method	LED Average Current(mA)	Switching Frequency(kHz)	Package
<b>BD555A1AFV</b>	10 to 38	80 to 275	—	100 to 800	20 to 300	SSOP-B14

## Buck-Boost LED Drivers

### White LED Drivers (For Automotive)

Part No.	Power supply (V)	Boost FET	Number of channel(ch)	Output voltage(V)	Output current(mA)	Switching frequency(MHz)	Brightness control	Operating temperature(°C)	Package
<b>BD81A04AMUV-M</b>	4.5 to 35.0	Integrated	4	35Max.	120Max./ch	0.2 to 2.2	PWM	−40 to +125	VQFN28SV5050
<b>New</b> <b>BD81A34EFV-M</b>	4.5 to 35.0	External	4	35Max.	120Max./ch	0.2 to 2.2	PWM	−40 to +125	HTSSOP-B28
<b>New</b> <b>BD81A34MUV-M</b>	4.5 to 35.0	External	4	35Max.	120Max./ch	0.2 to 2.2	PWM	−40 to +125	VQFN28SV5050

### White LED Drivers for Head Light (For Automotive)

Part No.	Power supply (V)	Application	Number of channel(ch)	Maximum Input Voltage(V)	Drive Current	Dimmer Mode	DC/DC	Operation Temperature(°C)	Package
<b>BD8381AEFV-M</b>	5.0 to 30.0	Head Lamp/DRL	1	50	Depend on Extra parts	PWM/DC	Buck-Boost, Boost, Buck	−40 to +125	HTSSOP-B28

## LED Drivers for Lighting

Buck Converter LED Lighting Driver							
Part No.	Supply Voltage(V)	Maximum output current(A)	Ron(Ω)	Operating frequency(kHz)	Over current protection	Thermal shut down protection	Package
BD9207FPS	8.0 to 35.0	1.5	1.0(Typ.)	900	✓	✓	TO252S-5

AC/DC Controller IC for Mains Dimmable LED Lighting						
Part No.	Supply Voltage(V)	Input AC Voltage(Vac)	Dimming Method	LED Average Current(mA)	Switching Frequency(kHz)	Package
BD555A1AFV	10 to 38	80 to 275	—	100 to 800	20 to 300	SSOP-B14
BD555BKVF	15 to 39	80 to 275	TRIAC PWM, LINEAR	100 to 800	40 to 400	SSOP-B14

## Inductorless (Charge Pump) LED Drivers

White LED Drivers								
Part No.	Power Supply Voltage (V)	No. of LEDs	Charge Pump Step-up Circuit			Primary Brightness Control Method	Control Interface	Package (mm)
			Output Voltage (V)	Output Current (mA)	Pump Frequency			
BD1604MUV	2.7 to 5.5	1 to 4	4.5 Max.	120	1.0MHz	PWM control via EN terminal Resistance switching at ISET terminal	Pin logic setting	VQFN016V3030
BD2606MVV	2.7 to 5.5	1 to 6	4.7 Max.	120	250kHz/ 1.0kHz	Built-in 64-step current DAC (0.5 to 32mA)	I <sup>2</sup> C BUS	SQFN016V4040
BU90030G	2.0 to 4.0	1 to 2 (parallel connection)	4.2 Max.	80	1.5MHz	SHD control via PWM terminal	Pin logic setting	SSOP6

## Constant Current / Serial-in Parallel-out LED Drivers

Parallel-out LED Drivers									
Part No.	Power Supply Voltage (V)	No. of LEDs	Constant Current Driver				Control interface	Package	
			Max. Current Setting Method	Max. Current	Channel-to-Channel Matching	Brightness Control			
BD1754HFN	2.7 to 5.5	1 to 4 (parallel connection)	Resistance change at ISET terminal	32mA (at an ISET resistance of 120kΩ)	3% Max. (at 1V LED pin voltage)	Built-in 64-step current DAC	UPIC*	HSO8	
BD9206EFV	8.0 to 30.0	36 Max.	VSET Pin voltage setting	32mA (at VSET=3V)	5% Max. (at 1V LED pin voltage)	—	Pin logic setting	HTSSOP-B20	
☆BD9271KUT	9.0 to 35.0	192 Max.	Resistance change at S terminal	100mA (Sx=1.0V)	3% Max. (at 0.3V S pin voltage)	Built-in 4096-step	3-Wire Serial	TQFP64UM	

Parallel-out LED Drivers (For Automotive)										
Part No.	Supply Voltage (V)	Output Voltage (V)	No. of Output (ch)	Output Method	Max. LED Current	Each Output Format	Other	Control Method	Max. Clock Frequency	Package
<b>New</b> BD8378FV-M	3.0 to 5.5	35	8	Open Drain	50mA/ch	ON/OFF	—	Shift Resistor Latch	1.25MHz	SSOP-B16
<b>New</b> BD8379FV-M	3.0 to 5.5	35	12	Open Drain	50mA/ch	ON/OFF	—	Shift Resistor Latch	1.25MHz	SSOP-B20
BD18377EFV-M	3.0 to 5.5	10	12	Constant Current	50mA/ch	Built-in 64-step current DAC	PWM control for all channel	SPI	1.25MHz	HTSSOP-B20
☆BD2808MUV-M	3.0 to 5.5	20	RGB × 8 (24ch)	Constant Current	50mA/ch	Built-in 64-step current DAC for RGB	Built-in 256-step PWM control for all channel	2-Wire Serial	1.0MHz	VQFN48MCV070

Dot Matrix LED Drivers												
Part No.	Supply Voltage(V)	LED Matrix	Max. LED Current	Built-in pattern		Matrix Data RAM	Mobile Light	PWM Dimming	Current Setting	Interface	Max. Clock Frequency	Package (mm)
				Scroll	Slope							
BU26507GUL	2.7 to 5.5	5 × 6 30dots	42.5mA/Line	✓	✓	2pages	—	64 step	16 step	I <sup>2</sup> C BUS/SPI (2 address/ —)	400kHz/13MHz	VCSP50L2 (2.5 × 2.5)H=0.55Max.
BU16501KS2	2.7 to 5.5	8 × 16 128dots	42.5mA/Line	—	—	1page	—	64 step	16 step	I <sup>2</sup> C BUS/SPI (2 address/ —)	400kHz/13MHz	SQFP-T52

LED Source Drivers (For Automotive)										
Part No.	Power supply (V)	Application	Number of channel(ch)	Maximum Input Voltage(V)	Maximum Current (mA)	Dimmer Mode	Accuracy of Current	Operating temperature (°C)	Package	
BD8372EFJ-M	5.5 to 40.0	DRL/Turn/Rear	1	50	200	High Current/ Low Current	±3% (Ta=25°C)	−40 to +125	HTSOP-J8	
BD8372HFP-M	5.5 to 40.0	DRL/Turn/Rear	1	50	200	High Current/ Low Current	±3% (Ta=25°C)	−40 to +125	HRP7	
BD8374EFJ-M	4.5 to 42.0	DRL/Turn/Rear	1	50	500	PWM	±3% (Ta=25°C)	−40 to +125	HTSOP-J8	
BD8374HFP-M	4.5 to 42.0	DRL/Turn/Rear	1	50	500	PWM	±3% (Ta=25°C)	−40 to +125	HRP7	

Parallel-out LED Drivers : \* UPIC : Uni-Port Interface Control

☆ : Under development

## LED Driver Support Function

PWM Signal Generator with Ambient Light Control for LED Driver IC					
Part No.	Supply Voltage(V)	ALC* (Sensor)	Other	Control Interface	Package
BD9478F	4.5 to 5.5	—	PWM signal Synchronous signal output	PWM input	SOP8

\* ALC : Auto Luminous Control





ICs

# Display Drivers

## CONTENTS

<b>TFT Driver Series</b> .....	<b>P. A84</b>
Drivers for Large LCD Panels .....	P. A84
Drivers for small to medium LCD Panels(LAPIS Semiconductor products) .....	P. A84
<b>TN/STN LCD Driver Series</b> .....	<b>P. A84</b>
<b>LCD Segment Drivers</b> .....	P. A84
Common/Segment driver for dot matrix LCD (LAPIS Semiconductor products) .....	P. A85
Controller driver for graphic LCD (LAPIS Semiconductor products) .....	P. A85
Controller driver for character LCD (LAPIS Semiconductor products) .....	P. A85
Controller driver for low duty LCD (LAPIS Semiconductor products) .....	P. A85
<b>VFD Driver Series</b> .....	<b>P. A86</b>
Anode/ Grid driver for VFD (LAPIS Semiconductor products) .....	P. A86
Controller driver for character VFD (LAPIS Semiconductor products) .....	P. A86
Controller driver for low duty VFD (LAPIS Semiconductor products) .....	P. A86
<b>Car Clock Drivers</b> (LAPIS Semiconductor products) .....	<b>P. A86</b>



# TFT Driver Series

## Drivers for Large LCD Panels

6bit RSDS™ Source Drivers							
Part No.	Function	Gray scale	Number of outputs	Driver output voltage (V) Max.	Max. clock frequency (MHz) Max.	Logic power supply voltage (V)	Package
BU95303	RSDS™ I/F R-DAC Type	6bit	384/414/420/432	13.5	85	2.7 to 3.6	COF
BU95306	RSDS™ I/F R-DAC Type	6bit	600/618/630/642	13.5	85	2.7 to 3.6	COF
BU95408	RSDS™ I/F R-DAC Type	6bit	684/690/702/720	13.5	85	2.7 to 3.6	COF

Note: RSDS™ is the trademark of signal interface technology proposal by National Semiconductor Corporation of the U.S.A

## Drivers for small to medium LCD Panels

(LAPIS Semiconductor products)

TFT-LCD driver							
Part No.	Logic Supply Voltage (V)	LCD Voltage (V)	Number of Driver Outputs	I/F	Operating Temperature (°C)	for Automotive	Package
ML9860B	2.1 to 3.6	10.0 to 14.6	480	RSDS	-40 to +95	Yes	Au bump chip
ML9863A	2.4 to 3.6	8.0 to 14.6	960/804/792/768	CMOS/RSDS	-40 to +95	Yes	Au bump chip
ML9872	2.7 to 3.6	Less than 40	540/480/400/384/360/300/240	CMOS	-40 to +95	Yes	Au bump chip
<b>New</b> ML9881	2.7 to 3.6	8.0 to 14.6	1440/1284/1278/1260/1200/1080/1026/1020	RSDS/mini-LVDS	-40 to +95	Yes	Au bump chip

# TN/STN LCD Driver Series

## LCD Segment Drivers

Standard Segment Drivers															
Part No.	Display (dots)	Outputs		Operating Voltage (V)		Duty	Bias	Interface	EVR	GPO	Independent blink	LED Dr	PWM Gen.	Keyscan	Package
		SEG	COM	I/F Power Supply (V <sub>DD</sub> )	LCD Power Supply (V <sub>LCD</sub> )										
BU9796AMUV	48	12	4	2.5 to 5.5		1/4	1/2,1/3	2wire serial	—	—	—	—	—	—	VQFN024V4040
BU9796AFS	80	20	4	2.5 to 5.5		1/4	1/2,1/3	2wire serial	—	—	—	—	—	—	SSOP-A32
BU9795AFV	108	27	4	2.5 to 5.5		1/4	1/2,1/3	3wire serial	—	—	—	—	—	—	SSOP-B40
BU9795AGUW	124	31	4	2.5 to 5.5		1/4	1/2,1/3	3wire serial	—	—	—	—	—	—	VBGA048W040
BU9795AKV	140	35	4	2.5 to 5.5		1/4	1/2,1/3	3wire serial	—	—	—	—	—	—	VQFP48C
BU9795AKS2	140	35	4	2.5 to 5.5		1/4	1/2,1/3	3wire serial	—	—	—	—	—	—	SQFP-T52
BU9797FUV	144	36	4	2.5 to 5.5		1/4	1/2,1/3	2wire serial	—	—	—	—	—	—	TSSOP-C48V
BU9794AKV	200	50	4	2.5 to 5.5	2.5 to 5.5	1/4	1/2,1/3	3wire serial	—	—	—	—	—	—	VQFP64
BU9799KV	200	50	4	2.5 to 5.5	2.5 to 5.5	1/4	1/2,1/3	2wire serial	✓	—	—	—	—	—	VQFP64
BU97950FUV	280	35	8	2.5 to 5.5	2.5 to 5.5	1/8	1/4	2wire serial	✓	—	—	—	—	—	TSSOP-C48V
Multifunction Segment Drivers															
BU97941FV	104	26	4	1.8 to 3.6	2.7 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	—	—	4port	—	—	SSOP-B40
BU97930MUV	108	27	4	1.8 to 3.6	2.7 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	4port	✓	1port	1ch 8bit	—	VQFN040V6060
BU97931FV	112	28	4	1.8 to 3.6	2.7 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	5port	✓	1port	1ch 8bit	—	SSOP-B40
BU97981MUV	168	42	4	1.8 to 3.6	3.3 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	27port	✓	3port	2ch 12bit	—	VQFN56AV8080
BU97981KV	196	49	4	1.8 to 3.6	3.3 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	31port	✓	3port	2ch 12bit	—	VQFP64
BU97981GUW	196	49	4	1.8 to 3.6	3.3 to 5.5	1/4,1/3 Static	1/3 Static	3wire serial	—	31port	✓	3port	2ch 12bit	—	VBGA063W050
BU97501KV	204	51	4	2.7 to 6.0	4.5 to 6.0	1/4,1/3	1/2,1/3	4wire serial	—	4port	—	—	—	5×6 Max. 30Key	VQFP64
BU97510CKV	216	54	4	2.7 to 6.0		1/4,1/3	1/2,1/3	3wire serial	—	6port (6ch PWM)	—	—	6ch 6bit	—	VQFP64
BU97520AKV	276	69	4	2.7 to 6.0		1/4,1/3	1/2,1/3	4wire serial	—	6port (6ch PWM)	—	—	6ch 8bit	5×6 Max. 30Key	VQFP80
<b>New</b> BU97530KVT	445	89	5	2.7 to 6.0		1/5,1/4,1/3 Static	1/2,1/3 Static	4wire serial	✓	9port (9ch PWM)	—	—	9ch 8bit	5×6 Max. 30Key	TQFP100V

**Common/Segment driver for dot matrix LCD**

(LAPIS Semiconductor products)

LCD driver								
Part No.	No. of driver output	Max. Driving Display size	Logic Supply Voltage(V)	Driver Supply Voltage (V)	Operating Temperature (°C)	Feature	for Automotive	Package
ML9460	240	320 × 240 (QVGA)	2.5 to 5.5	Less than 43	-30 to +75	Output change 240/200/160/120	—	Au bump chip
ML9461B	320		2.5 to 5.5	2.6 to 5.5	-30 to +75	Output change 320/240/200	—	Au bump chip

**Controller driver for graphic LCD**

(LAPIS Semiconductor products)

LCD controller driver								
Part No.	Max. No. of Segment Outputs	Max. Driving Display size	Logic Supply Voltage (V)	Driver Supply Voltage (V)	Operating Temperature (°C)	Feature	for Automotive	Package
ML9058E	132	132 × 65 dots	3.7 to 5.5	6 to 18	-40 to +85	Integrated RAM/ Boost circuit	Yes	Au bump chip
ML9059E	132	132 × 49 dots	3.7 to 5.5	6 to 18	-40 to +85	Integrated RAM/ Boost circuit	Yes	Au bump chip
ML9445	180	180 × 65 dots	2.7 to 5.5	6 to 18.5	-40 to +105	Integrated RAM/ Boost circuit	Yes	Au bump chip
ML9092-01	56	56 × 10 dots	4.5 to 5.5	4.5 to 16.5	-40 to +85	Integrated RAM/ Boost circuit/PWM	Yes	TQFP100
ML9092-02	60	60 × 10 dots	4.5 to 5.5	4.5 to 16.5	-40 to +85	Integrated RAM/ Boost circuit	Yes	TQFP100
ML9092-03						Integrated RAM		
ML9092-04						Integrated RAM/PWM		

**Controller driver for character LCD**

(LAPIS Semiconductor products)

LCD controller driver								
Part No.	Max. No. of Segment Outputs	Digits/Lines	Logic Supply Voltage (V)	Driver Supply Voltage (V)	Operating Temperature (°C)	Feature	for Automotive	Package
ML9042-0x	100	5 × 8 dots, 20 characters × 2 lines	2.7 to 5.5	2.7 to 5.5	-40 to +85	Built-in bias register 2K Ω / Supports custom fonts	—	Au bump chip
ML9042-1x	100	5 × 8 dots, 20 characters × 2 lines	2.7 to 5.5	2.7 to 5.5	-40 to +85	Built-in bias register 4K Ω / Supports custom fonts	—	Au bump chip
ML9042-2x	100	5 × 8 dots, 20 characters × 2 lines	2.7 to 5.5	2.7 to 5.5	-40 to +85	Built-in bias register 10K Ω / Supports custom fonts	—	Au bump chip

**Controller driver for low duty LCD**

(LAPIS Semiconductor products)

LCD controller driver (Package product)													
Part No.	Max. No. of Segment Outputs	Max. No. of Driving Segments					Internal Oscillation Frame Frequency (Hz)	Logic Supply Voltage (V)	Driver Supply Voltage (V)	Operating Temperature (°C)	Feature	for Automotive	Package
		static	1/2	1/3	1/4	1/5							
ML9470-12	80	80	160	—	—	—	3.0 to 5.5 (single)	3.5 to 5.5	-40 to +105	Supports external clock input	Yes	QFP100	
ML9471	80	—	—	240	320	400	3.0 to 5.5 (single)	3.5 to 5.5	-40 to +105	Supports external clock input	Yes	TQFP100	
ML9472	60	60	120	—	—	—	3.0 to 5.5 (single)	3.5 to 5.5	-40 to +105	Supports external clock input	Yes	P-TQFP80-1212-0.50	
ML9473	60	—	—	180	240	300	3.0 to 5.5 (single)	3.5 to 5.5	-40 to +105	Supports external clock input	Yes	P-TQFP80-1212-0.50	
ML9475	40	—	—	120	160	—	3V ± 10%/ 5V ± 10%	3.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in	Yes	QFP56	
ML9476	16	—	—	48	64	—	3V ± 10%/ 5V ± 10%	3.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in	Yes	TQFP48	
ML9477	32	—	—	96	128	—	3V ± 10%/ 5V ± 10%	3.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in	Yes	TQFP48	
<b>New</b> ML9484	50	50	100	150	200	—	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in	Yes	TQFP64	
LCD controller driver (Gold bump product)													
ML9480	40	40	80	120	160	—	65/75/85/95/ 130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in/ No external parts	Yes	Au bump chip
ML9478C	80	80	160	240	320	—	65/75/85/95 command switching	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in/ No external parts	Yes	Au bump chip
ML9479E	160	160	320	480	640	—	65/75/85/95 command switching	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in/ EMS countermeasure built in/ No external parts	Yes	Au bump chip
ML9488	80	80	160	240	320	—	130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in	Yes	Au bump chip
ML9489	160	160	320	480	640	—	130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	-40 to +105	Supports external clock input/ Bias generator built in	Yes	Au bump chip

# VFD Driver Series

**Anode/ Grid driver for VFD**

(LAPIS Semiconductor products)

VFD driver								
Part No.	No. of driver output	Driving target	VFD Driving Voltage (V)	Power Supply Type	Operating Temperature (°C)	Feature	for Automotive	Package
ML9271	48	Anode/Grid	18	Positive supply	-40 to +105	Cascade connection	Yes	QFP64-P-1414-0.80
ML9272	40	Anode/Grid	65	Positive supply	-40 to +105	Cascade connection	Yes	SSOP60

**Controller driver for character VFD**

(LAPIS Semiconductor products)

VFD controller driver							
Part No.	Display pixels	VFD Driving Voltage (V)	Power Supply Type	Operating Temperature (°C)	Feature	for Automotive	Package
ML9208-xxGA	5 × 7 dots	VDD-42	Negative supply	-40 to +85	3-bit gradation	—	P-QFP64-1414-0.80, SSOP64
ML9208-xxMB	5 × 7 dots	VDD-42	Negative supply	-40 to +85	3-bit gradation	—	SSOP64
ML9208A-xxGA	5 × 7 dots	VDD-42	Negative supply	-40 to +85	4-bit gradation	—	QFP64
ML9208A-xxTB	5 × 7 dots	VDD-42	Negative supply	-40 to +85	4-bit gradation	—	TQFP64
ML9209-xxGA	16 segs	VDD-42	Negative supply	-40 to +85	4-bit gradation	—	QFP44
ML9289-xxGA	16 segs	42	Positive supply	-40 to +85	4-bit gradation	—	QFP44
ML9289-xxTB	16 segs	42	Positive supply	-40 to +85	4-bit gradation	—	TQFP48
ML9286-xxGA	5 × 7 dots	80	Positive supply	-40 to +105	Multigrad function/ 8-bit gradation/ Cascade connection	—	TQFP80
ML9286-xxTB	5 × 7 dots	80	Positive supply	-40 to +105	Multigrad function/ 8-bit gradation/ Cascade connection	Yes	QFP80

**Controller driver for low duty VFD**

(LAPIS Semiconductor products)

VFD controller driver							
Part No.	Max. No. of Driving Segments	VFD Driving Voltage (V)	Power Supply Type	Operating Temperature (°C)	Feature	for Automotive	Package
ML9212GA	64 (1/2Duty) 96 (1/3Duty)	18	Positive supply	-40 to +85	10-bit gradation/ Cascade connection	Yes	QFP56
ML9213GP	112 (1/2Duty) 168 (1/3Duty)	18	Positive supply	-40 to +85	10-bit gradation/ Cascade connection	Yes	P-QFP80-1414-0.65

# Car Clock Drivers

(LAPIS Semiconductor products)

Car clock								
Part No.	Display Duty	VFD Driving Voltage (V)	Logic Supply Voltage (V)	Operating Temperature (°C)	Supply Current (Max.)	No. of Digit	for Automotive	Package
ML9298	1/2	4.0 to 18	No need	-40 to +85	0.6mA	4digits × 1line and col.	Yes	SSOP32
ML9098B	Static, 1/2	3.0 to 5.5	3.0 to 5.5	-40 to +105	0.6mA	4digits × 1line and col., AM, PM	Yes	TQFP48



# Sensors & MEMS

## CONTENTS

<b>Hall ICs</b> .....	<b>P. A88</b>
Omnipolar Detection Hall ICs .....	P. A88
Unipolar Detection Hall ICs .....	P. A88
Omnipolar Detection Hall ICs with Polarity Discrimination (Polarity detection for both S and N features dual outputs) .....	P. A88
Bipolar Latch Hall ICs .....	P. A88
<b>Ambient Light Sensor</b> .....	<b>P. A88</b>
Analog Current Output Type Ambient Light Sensor ICs .....	P. A88
Digital 16bit Serial Output Type Ambient Light Sensor ICs .....	P. A88
<b>Color Sensor</b> .....	<b>P. A89</b>
Digital 16bit Serial Output Type Color Sensor IC .....	P. A89
<b>Pressure Sensor IC</b> .....	<b>P. A89</b>
Digital Pressure sensor IC with built-in temperature compensation function .....	P. A89
<b>Temperature Sensor</b> .....	<b>P. A89</b>
Analog Output Temperature Sensor IC .....	P. A89
Low Power Thermostat Output Temperature Sensor ICs .....	P. A89
<b>Amplifier for Human Body Detector</b> ..	<b>P. A89</b>
Pyroelectric Infrared Sensor Amplifier .....	P. A89
<b>Capacitive Switch Controller</b> .....	<b>P. A89</b>
Capacitive Switch Controller ICs .....	P. A89
<b>Touch Screen Controller</b> .....	<b>P. A89</b>
Resistive type .....	P. A89
Touch Screen I/F LSI supporting SPI/I <sup>2</sup> C (LAPIS Semiconductor products) .....	P. A89
<b>Accelerometer</b> .....	<b>P. A90</b>
3-Axis Accelerometer (Kionix products) .....	P. A90
<b>6-Axis Combo Sensor</b> .....	<b>P. A90</b>
6-Axis Accelerometer/Magnetometer (Kionix products) .....	P. A90
<b>Infrared Image Sensor</b> .....	<b>P. A90</b>
Infrared (IR) sensor (LAPIS Semiconductor products) .....	P. A90
<b>Ultraviolet Sensor</b> .....	<b>P. A90</b>
Ultraviolet (UV) sensor (LAPIS Semiconductor products) .....	P. A90

# Hall ICs

## Omnipolar Detection Hall ICs Detects S- or N-pole magnetic fields and turns the output ON (active Low).

Part No.	Supply Voltage (V)	Operate Point (mT)		Hysteresis (mT)	Period (ms)	Supply Current (Avg.) (μA)	Output	Operating Temperature Range (°C)	Package (mm)
		S-pole	N-pole						
BU52011HFV	1.65 to 3.3	+3.0	-3.0	0.9	50	5	CMOS	-40 to +85	HVSOF5
BU52015GUL	1.65 to 3.3	+3.0	-3.0	0.9	50	5	CMOS (2 Outputs : Active L, H)	-40 to +85	VCSP50L1 (1.1 × 1.1)H=0.5
BU52061NVX	1.65 to 3.6	+3.3	-3.3	0.9	50	4	CMOS	-40 to +85	SSON004X1216
BD7411G	4.5 to 5.5	+3.4	-3.4	0.4	—	2.0(mA)	CMOS	-40 to +85	SSOP5
BU52025G	2.4 to 3.6	+3.7	-3.7	0.8	50	8	CMOS	-40 to +85	SSOP5
BU52055GWZ	1.65 to 3.6	+4.1	-4.1	0.8	50	5	CMOS	-40 to +85	UCSP35L1 (0.8 × 0.8)H=0.35
BU52054GWZ	1.65 to 3.6	+6.3	-6.3	0.9	50	5	CMOS	-40 to +85	UCSP35L1 (0.8 × 0.8)H=0.35

## Unipolar Detection Hall ICs Detects either N- or S-pole

BU52012HFV	1.65 to 3.3	+3.0	—	0.9	50	3.5	CMOS	-40 to +85	HVSOF5
BU52012NVX	1.65 to 3.6	+3.0	—	0.9	50	3.5	CMOS	-40 to +85	SSON004X1216
BU52002GUL	2.4 to 3.3	+3.7	—	0.8	50	6.5	CMOS	-40 to +85	VCSP50L1 (1.1 × 1.1)H=0.5
BU52013HFV	1.65 to 3.3	—	-3.0	0.9	50	3.5	CMOS	-40 to +85	HVSOF5
BU52003GUL	2.4 to 3.3	—	-3.7	0.8	50	6.5	CMOS	-40 to +85	VCSP50L1 (1.1 × 1.1)H=0.5

## Omnipolar Detection Hall ICs with Polarity Discrimination (Polarity detection for both S and N features dual outputs) Features 2 outputs to discriminate between N- and S-pole detection.

BU52014HFV	1.65 to 3.3	+3.0	-3.0	0.9	50	5	CMOS (2 Outputs : S, N pole)	-40 to +85	HVSOF5
<b>New</b> BU52058GWZ	1.65 to 3.6	+3.0	-3.0	0.9	50	5	CMOS (2 Outputs : S, N pole)	-40 to +85	UCSP35L1 (0.8 × 0.8)H=0.35
BU52004GUL	2.4 to 3.3	+3.7	-3.7	0.8	50	8	CMOS (2 Outputs : S, N pole)	-40 to +85	VCSP50L1 (1.1 × 1.1)H=0.5
<b>New</b> BU52075GWZ	1.65 to 3.6	+9.5	-9.5	0.9	50	5	CMOS (2 Outputs : S, N pole)	-40 to +85	UCSP35L1 (0.8 × 0.8)H=0.35
<b>New</b> BU52077GWZ	1.65 to 3.6	+15	-15	0.9	50	5	CMOS (2 Outputs : S, N pole)	-40 to +85	UCSP35L1 (0.8 × 0.8)H=0.35

## Bipolar Latch Hall ICs Detects turn of pole (S→N or N→S)(N-pole→S-pole : Out put High→Low S-pole→N-pole : Out put Low→High)

Part No.	Supply Voltage (V)	Operate Point(mT)		Hysteresis (mT)	Period (ms)	Frequency (kHz)	Supply Current (Avg.) (μA)	Number of sensor	Output	Operating Temperature Range (°C)	Package (mm)
		S-pole	N-pole								
BU52040HFV	1.65 to 3.3	+3.0	-3.0	6	0.5	—	200	1	CMOS	-40 to +85	HVSOF5
BU52742GUL	2.4 to 3.6	+10	-10	20	—	250	7.5(mA)	2	CMOS	-25 to +85	VCSP50L1(6Pin) (1.0 × 1.5)H=0.5

# Ambient Light Sensor

## Analog Current Output Type Ambient Light Sensor ICs

Part No.	Output Type	Supply Voltage (V)	Sensitivity Variations (%)	Output Sensitivity Gain	Illuminance Measurement Range (lx)	High Sensitivity	IR Cut	Operating Temperature Range (°C)	Package
BH1603FVC	Current(Source)	2.4 to 5.5	± 15	3 step	0 to 100,000	—	—	-40 to +85	WSOF6
BH1620FVC	Current(Source)	2.4 to 5.5	± 15	3 step	0 to 100,000	—	—	-40 to +85	WSOF5
BH1680FVC	Current(Source)	2.4 to 5.5	± 15	3 step	0 to 50,000	✓	✓	-40 to +85	WSOF5

## Digital 16bit Serial Output Type Ambient Light Sensor ICs

Part No.	I/F	Supply Voltage (V)	Sensitivity Variations (%)	I/O Voltage (V)	Illuminance Measurement Range (lx)	High Sensitivity	IR Cut	Operating Temperature Range (°C)	Package
BH1715FVC	I <sup>2</sup> C	2.4 to 3.6	± 15	1.65 to V <sub>CC</sub>	0 to 65,000	—	—	-40 to +85	WSOF6
BH1721FVC	I <sup>2</sup> C	2.4 to 3.6	± 15	1.65 to V <sub>CC</sub>	0 to 65,000	—	—	-40 to +85	WSOF5
BH1751FVI	I <sup>2</sup> C	2.4 to 3.6	± 20	1.65 to V <sub>CC</sub>	0 to 65,000	—	✓	-40 to +85	WSOF6I
BH1780GLI	I <sup>2</sup> C	2.3 to 3.0	± 20	—	0 to 65,000	—	✓	-40 to +85	WLG04IW02
BH1730FVC	I <sup>2</sup> C	2.4 to 3.6	± 15	1.65 to V <sub>CC</sub>	0 to 65,000 (1/128 lx step)	✓	—	-40 to +70	WSOF6

## Color Sensor

### Digital 16bit Serial Output Type Color Sensor IC

Part No.	I/F	Supply Voltage (V)	$\lambda p$ (nm)				Illuminance Measurement Range (lx)	High Sensitivity	IR Cut	Operating Temperature Range (°C)	Package
			Red	Green	Blue	Clear					
<b>BH1745NUC</b>	I <sup>2</sup> C	2.3 to 3.6	620	540	460	585	0 to 40,000	✓	✓	-40 to +85	WSON008X2120

## Pressure Sensor IC

### Digital Pressure sensor IC with built-in temperature compensation function

Part No.	Supply Voltage (V)	Pressure Range (hPa)	Relative Pressure Accuracy (hPa)	Absolute Pressure Accuracy (hPa)	Average Current Consumption ( $\mu$ A)	Operating Temperature Range (°C)	I/F	Package (mm)
☆ <b>BM1383GLV</b>	1.71 to 3.6	300 to 1100	$\pm 0.12$	$\pm 1$	3.7	-40 to +85	I <sup>2</sup> C	CLGA12V025M (2.5 × 2.5) <sub>H=0.95</sub>

☆ : Under Development

## Temperature Sensor

### Analog Output Temperature Sensor IC

Part No.	Supply voltage (V)	Supply current ( $\mu$ A)	Temperature sensitivity (mV/°C)	Temperature accuracy (°C)		Output voltage (V) (Ta=30°C, V <sub>DD</sub> =3V)	Operating Temperature Range (°C)	Package
				Ta=30°C	Ta=-30, 100°C			
<b>BD1020HFV</b>	2.4 to 5.5	4.0	-8.2	$\pm 1.5$	$\pm 2.5$	1.3	-30 to +100	HVSOF5

### Low Power Thermostat Output Temperature Sensor ICs

Part No.	Detect temperature (°C)	Output type		Supply voltage (V)	Supply current (Operation/Power down) ( $\mu$ A)	Detect temperature accuracy (°C)	Operating Temperature Range (°C)	Package
		Type	Active					
<b>BDJxxx1HFV</b> series	60, 70, 75, 80, 85, 90	Open Drain	H	2.4 to 5.5	7.5/0.3	$\pm 2.5$	-30 to +100	HVSOF5
<b>BDJxxx0HFV</b> series	55, 60, 65, 70, 80		L					

Low Power Thermostat Output Temperature Sensor ICs : \* Detection temperature (xxx : 055, 060, 065, 070, 080) is applied in the BDJxxx0HFV of part No.  
 Detection temperature (xxx : 060, 070, 075, 080, 085, 090) is applied in the BDJxxx1HFV of part No.

## Amplifier for Human Body Detector

### Pyroelectric Infrared Sensor Amplifier

Part No.	Supply Voltage (V)	DRAIN Voltage (V)	AMP1/AMP2 Gain (dB)	Output type	Package
<b>BD9251FV</b>	2.97 to 6.00	2.3	Max. 46	Analog / CMOS	SSOP-B14

## Capacitive Switch Controller

### Capacitive Switch Controller ICs

Part No.	Supply voltage (V)	Cap switch	LED_Driver	LED_PWM control	Matrix control	Interface	MCU	Program memory	Intermittent motion	Package
<b>BU21170MUV</b>	3.0 to 5.5	5ch	5ch	✓	—	I <sup>2</sup> C	32 bit	ROM	—	VQFN020V4040
<b>BU21072MUV</b>	3.0 to 5.5	10ch	6ch	✓	4 × 4	I <sup>2</sup> C	32 bit	ROM	—	VQFN024V4040
<b>BU21078MUV</b>	3.0 to 5.5	12ch	8ch	✓	6 × 6	I <sup>2</sup> C	32 bit	ROM	—	VQFN028V5050
<b>BU21079F</b>	3.0 to 5.5	8ch	—	—	4 × 4	I <sup>2</sup> C	32 bit	ROM	✓	SOP16
<b>BU21077MUV</b>	2.7 to 5.5	8ch	—	—	Adjustable	I <sup>2</sup> C	32 bit	RAM	✓	VQFN020V4040

## Touch Screen Controller

### Resistive type

Part No.	Supply voltage (V)	MCU	Resolution	Touch detection	Stand-by current ( $\mu$ A)	Active current (mA)	Host I/F	Operating Temperature Range (°C)	Package (mm)
<b>BU21021GUL</b>	2.7 to 3.6	32bit	4096 × 4096	2 point/Single	60	4.0	I <sup>2</sup> C/SPI	-20 to +85	VCSP50L2 2.65 × 2.70, t=0.55
<b>BU21029GUL</b>	1.65 to 3.6	—	4096 × 4096	2 point/Single	100	0.8	I <sup>2</sup> C	-20 to +85	VCSP50L2 2.0 × 2.0, t=0.55
<b>BU21029MUV</b>	1.65 to 3.6	—	4096 × 4096	2 point/Single	100	0.8	I <sup>2</sup> C	-20 to +85	VQFN020V4040
<b>BU21024FV-M</b>	2.7 to 3.6	8bit	1024 × 1024	2 point/Single	60	4.0	I <sup>2</sup> C/SPI	-40 to +85	SSOP-B28
<b>BU21023GUL</b>	2.7 to 3.6	8bit	1024 × 1024	2 point/Single	60	4.0	I <sup>2</sup> C/SPI	-20 to +85	VCSP50L2 2.6 × 2.6, t=0.55
<b>BU21023MUV</b>	2.7 to 3.6	8bit	1024 × 1024	2 point/Single	60	4.0	I <sup>2</sup> C/SPI	-20 to +85	VQFN028V5050
<b>BU21025GUL</b>	1.65 to 3.6	—	4096 × 4096	Single	0.8	0.12	I <sup>2</sup> C	-30 to +85	VCSP50L2 2.0 × 1.5, t=0.55

### Touch Screen I/F LSI supporting SPI/I<sup>2</sup>C

(LAPIS Semiconductor products)

<b>ML26700CGD</b>	2.7 to 3.6	—	4096 × 4096	Single	30	0.42	I <sup>2</sup> C	-40 to +85	WQFN12 3.0 × 3.0, t=0.55
<b>ML26700SGD</b>	2.7 to 3.6	—	4096 × 4096	Single	30	0.56	SPI	-40 to +85	WQFN12 3.0 × 3.0, t=0.55



# Accelerometer

(Kionix products)

3-Axis Accelerometer						
Part No.	Axis	Full Scale G Range	Interface Output	Current Consumption (μA)	Size, Pins, and Package Type	Features
KX022-1020	3	User-selectable 2g, 4g, 8g	Digital SPI/I <sup>2</sup> C	10 to 130	2×2×0.9mm, 12-pin, LGA	Small Footprint, Directional Tap/Double-Tap™, Excellent Temperature Performance, Embedded FIFO/FILO buffer, Digital High-Pass Filter Outputs, User-configurable wake-up function
KX023-1025	3	User-selectable 2g, 4g, 8g	Digital SPI/I <sup>2</sup> C	10 to 130	3×3×0.9mm, 16-pin, LGA	Directional Tap/Double-Tap™, Device Orientation Detection, Excellent Temperature Performance, Low Current Consumption, Embedded FIFO/ FILO buffer, Digital High-Pass Filter Outputs, User-configurable wake-up function
☆KX23H-1035	3	User-selectable 2g, 4g, 8g	Digital SPI/I <sup>2</sup> C	10 to 135	3×3×0.9mm, 16-pin, LGA	An integrated sensor hub device, combining a high performance, very low power 3-axis accelerometer with a 32 bit ARM cortex microcontroller
☆KX122-1037	3	User-selectable 2g, 4g, 8g	Digital SPI/I <sup>2</sup> C	10 to 145	2×2×0.9mm, 12-pin, LGA	2KB FIFO/FILO, Wide range of ODRs from 0.781 Hz to 25.6kHz, Directional Tap/Double-Tap™, Free Fall, Orientation Detection
KXCNL-1010	3	User-selectable 2g, 4g, 6g, 8g	Digital (I <sup>2</sup> C)	8 to 250	3×3×0.9mm, 16-pin, LGA	Dual User-programmable State Machines, Low Power, Low Noise, Unmatched User Flexibility and Programmability
KXCJA-1019	3	User-selectable 2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 135	3×3×0.7mm, 10-pin, LGA	High Stability, Low Power, Low Noise, Wakeup Interrupt, Excellent Temperature Performance, Ultra Thin
KXCJK-1013	3	User-selectable 2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 135	3×3×0.9mm, 16-pin, LGA	High Stability, Wakeup Interrupt, Excellent Temperature Performance, Low Current Consumption
KXTJ2-1009	3	User-selectable 2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 135	2×2×0.9mm, 12-pin, LGA	High Stability, Low Power, Low Noise, Wakeup Interrupt, Small Footprint
KXCJ9-1008	3	User-selectable 2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 135	3×3×0.9mm, 10-pin, LGA	High Stability, Low Power, Low Noise, Wakeup Interrupt, Excellent Temperature Performance
KXTC9 series	3	1.5g to 6g	Analog	170 to 310	3×3×0.9mm, 10-pin, LGA	Low Power, Factory Programmable Internal Low Pass Filter
KXR94 series	3	1.0g to 4g	Multiplexed Analog or Digital (SPI)	500 to 1400	5×5×1.2mm, 14-pin, DFN	Excellent Temperature Performance, Low Noise Density
KXRB5 series	3	1.5g to 6g	Multiplexed Analog or Digital (SPI)	300 to 700	3×5×0.9mm, 14-pin, LGA	Auxiliary Input to Multiplexer or ADC, Low Noise Density
KXD94 series	3	5g to 15g	Multiplexed Analog	700 to 1500	5×5×1.2mm, 14-pin, DFN	Internal 1kHz Filter or User-definable Bandwidth, Mid-range acceleration measurements

☆ : Under Development

# 6-Axis Combo Sensor

(Kionix products)

6-Axis Accelerometer/Magnetometer									
Part No.	Axis	Accelerometer G-Range	Interface (Output)	Current (μA)	Magnetometer Range	Angular Velocity Range	Operating temperature Range (°C)	Size, Pins, and Package Type	Features
KMX61-1021	6	2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 450	± 1200 μT	N/A	- 40 to + 85	3×3×0.9mm, 16-pin, LGA	E-compass Solution
KMX61G-1030	6	2g, 4g, 8g	Digital (I <sup>2</sup> C)	10 to 450	± 1200 μT	2000 DPS Max.	- 40 to + 85	3×3×0.9mm, 16-pin, LGA	9 Axis Solution with Magnetic Gyro
☆KMX62-1031	6	User-selectable 2g, 4g, 8g, 16g	Digital (I <sup>2</sup> C)	10 to 395	± 1200 μT	N/A	- 40 to + 85	3×3×0.9mm, 16-pin, LGA	E-compass Solution, Magnetic field change, Freefall Communications down to 1.2V
☆KMX62G-1033	6	User-selectable 2g, 4g, 8g, 16g	Digital (I <sup>2</sup> C)	10 to 395	± 1200 μT	2000 DPS Max.	- 40 to + 85	3×3×0.9mm, 16-pin, LGA	9 Axis Solution with Magnetic Gyro

☆ : Under Development

# Infrared Image Sensor

(LAPIS Semiconductor products)

Infrared (IR) sensor										
Part No.	Feature	Pixel	Measurement Range (°C)	Temperature precision (°C)	Output Type	Read Speed	Supply Voltage (V)	Operating temperature Range (°C)	Package	
ML8540WD	2K pixels thermopile type IR image sensor	48row × 47column 2256 pixels	- 30 to 300 (Variable)	0.5	Analog	6FPS	4.5 to 5.5	- 30 to + 85	Wafer	
☆ML8540	2K pixels thermopile type IR image sensor PKG	48row × 47column 2256 pixels	- 30 to 300 (Variable)	0.5	Analog	6FPS	4.5 to 5.5	- 30 to + 85	C-QFN24	

☆ : Under Development

# Ultraviolet Sensor

(LAPIS Semiconductor products)

Ultraviolet (UV) sensor										
Part No.	Feature	Maximum Sensitive Wave (nm)	Length Sensitive Range	Supply Voltage (V)	Output Type	Current Consumption (Operation) (μA)	Current Consumption (Stand-by) (μA)	Operating temperature Range (°C)	Package	
ML8511-00FC	UV sensor with built-in amplifier	365	UV-A and B	2.7 to 3.6	Analog	300	0.1	- 20 to + 70	C-TQFB12	
☆ML8511-00NA	UV sensor with built-in amplifier CSP small package	365	UV-A and B	2.7 to 3.6	Analog	300	0.1	- 20 to + 70	S-WFBGA6	

☆ : Under Development





# Communication LSI

## CONTENTS

<b>Digital terrestrial broadcasting reception LSI</b> .. P. A92
Japanese System (ISDB-T) (LAPIS Semiconductor products) ..... P. A92
Chinese System (DTMB) (LAPIS Semiconductor products) ..... P. A92
<b>Wireless communication LSI</b> ..... P. A92
IEEE802.15.4/ZigBee® LSI (LAPIS Semiconductor products) ..... P. A92
Bluetooth® Low Energy LSI (LAPIS Semiconductor products) ..... P. A92
Specified low power radio(Sub-GHz band radio) (LAPIS Semiconductor products) ..... P. A92
<b>VoIP LSI</b> ..... P. A93
VoIP CODEC (LAPIS Semiconductor products) ..... P. A93
VoIP Processor (LAPIS Semiconductor products) ..... P. A93
<b>Echo Canceller LSI</b> ..... P. A93
Echo Canceller (LAPIS Semiconductor products) ..... P. A93
Echo Canceller / Noise Canceller (LAPIS Semiconductor products) ..... P. A93
<b>CODEC LSI</b> ..... P. A93
PCM CODEC (LAPIS Semiconductor products) ..... P. A93
ADPCM CODEC (LAPIS Semiconductor products) ..... P. A94
<b>Modem LSI</b> ..... P. A94
Tele-control IC (LAPIS Semiconductor products) ..... P. A94
<b>PHS LSI</b> ..... P. A94
Baseband IC for PHS (LAPIS Semiconductor products) ..... P. A94
PHS modem transcoder (LAPIS Semiconductor products) ..... P. A94
<b>Car communication LSI</b> ..... P. A94
FM data broadcast reception LSI (LAPIS Semiconductor products) ..... P. A94

# Digital terrestrial broadcasting reception LSI

**Japanese System (ISDB-T)**

(LAPIS Semiconductor products)

RF tuner + OFDM demodulator for 1 segment digital terrestrial broadcasting						
Part No.	Transmission Standard	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (°C)	Package
ML7147	ISDB-T	Compliant to One-Seg broadcasting of ISDB-T (ARIB STD-B31) digital terrestrial television broadcasting. RF tuner, OFDM demodulate, error correction function. Serial, parallel TS output.	2.7 to 3.0 1.5 to 3.6 1.1 to 1.3	70mW (at 1seg reception, include RF)	-40 to +90	WQFN80
4 diversity/Full segment OFDM demodulation digital terrestrial broadcasting						
ML7138	ISDB-T	Compliant to Full-Seg and One-Seg broadcasting of ISDB-T (ARIB STD-B31) digital terrestrial television broadcasting. 4 diversity x 1CH or 2 diversity x 2CH reception. OFDM demodulate, error correction function. Serial, parallel TS output.	3.0 to 3.6 2.7 to 3.6 1.1 to 1.3	234mW (4 diversity full segment reception)	-40 to +85	TFBGA144

**Chinese System (DTMB)**

(LAPIS Semiconductor products)

Demodulator for Chinese						
Part No.	Transmission Standard	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (°C)	Package
ML7109S	GB20600-2006	China's national digital terrestrial broadcasting standard GB20600-2006 (DTMB) compliant demodulation. Built-in SDRAM for de-interleave. MPEG-2 serial/parallel TS output.	3.0 to 3.6 1.1 to 1.3	270mW (at reception)	-20 to +85	WQFN64

# Wireless communication LSI

**IEEE802.15.4/ZigBee® LSI**

(LAPIS Semiconductor products)

USB interface transceiver LSI											
Part No.	Support Standard	Frequency Band	Supply Voltage (V)	Modulation Method	Encryption	Control I/F	Transmission Rate (Kbps)	Transmission Output (dBm)	Reception Sensitivity (dBm)	Operating Temperature (°C)	Package
ML7246	IEEE802.15.4	2.4GHz ISM Band	3.0 to 3.6 (Connect USB)	O-QPSK	—	USB2.0	250	0	-92 <sup>1</sup>	-40 to +85	WQFN48
Serial interface transceiver LSI (Support AES function)											
ML7266	IEEE802.15.4	2.4GHz ISM Band	2.1 to 3.6	O-QPSK	AES128	Synchronous serial	250	-45 to 0 (4 step)	-92 <sup>1</sup>	-40 to +85	WQFN48
Serial interface transceiver LSI (Supports RF4CE)											
ML7275	IEEE802.15.4 ZigBee®RF4CE	2.4GHz ISM Band	1.8 to 3.6	O-QPSK	AES128	Synchronous serial or UART	250	-45 to 0 (3 step)	-92 <sup>1</sup>	-40 to +85	WQFN40

\*ZigBee® is a registered trademark of ZigBee®Alliance.

\*1: PER(Packet Error Rate)&lt;1%

**Bluetooth® Low Energy LSI**

(LAPIS Semiconductor products)

Bluetooth® Low Energy LSI											
Part No.	Support Standard	Frequency Band	Supply Voltage (V)	Modulation Method	Encryption	Control I/F	Transmission Rate (Kbps)	Transmission Output (dBm)	Reception Sensitivity (dBm)	Operating Temperature (°C)	Package
ML7105-00x	Bluetooth® Core Spec v4.0 (Single mode)	2.4GHz ISM band	1.6 to 3.6	GFSK	AES128	Synchronous serial or UART	1	0/-6/ -12/-18	-86	-20 to +70	WQFN32
☆ML7125	Bluetooth® Core Spec v4.1 (Single mode)	2.4GHz ISM band	1.6 to 3.6	GFSK	AES128	Synchronous serial or UART	1	0/-6/ -12/-18	TBD	-20 to +70	WCSP

\*Bluetooth® is a registered trademark of Bluetooth®SIG.

☆: Under development

**Specified low power radio(Sub-GHz band radio)**

(LAPIS Semiconductor products)

UHF Transmitter LSI											
Part No.	Support Standard	Frequency Band	Supply Voltage (V)	Modulation Method	FEC Mode	Control I/F	Transmission Rate	Transmission Output (dBm)	Reception Sensitivity	Operating Temperature (°C)	Package
ML7386	—	200 to 972MHz	1.8 to 3.6	2-FSK MSK	—	Synchronous serial (Control) DIO(DATA)	to 100kbps	10mW	—	-25 to +85	WQFN28
ML7386B								1mW/10mW			
UHF Transceiver LSI											
ML7066[J]	ARIB STD-T67, RCR STD-30	426MHz band 429MHz band	2.1 to 3.6	2-FSK	—	Synchronous serial (Control) DIO(DATA)	1.2kbps, 2.4kbps 4.8kbps [NRZ] (3-step setting function)	1mW/ 10mW	-116dBm [BER<1%] <sup>2</sup>	-25 to +85	WQFN48
ML7396B	ARIB STD-T108	750 to 960MHz	1.8 to 3.6	2-(G)FSK (G)MSK	IEEE 802.15.4g compliant	Synchronous serial (Control)·DATA DIO(DATA)	to 50kbps 100kbps 150kbps 200kbps 400kbps	1mW/ 10mW/ 20mW	-106dBm [4.8kbps BER=0.1%] <sup>2</sup>	-40 to +85	WQFN40
ML7396A	FCC part15.247/249										
ML7396E	EN300-220										
ML7344J	ARIB STD-T67, RCR STD-30	160 to 510MHz	1.8 to 3.6	2-(G)FSK (G)MSK	—	Synchronous serial (Control) DIO(DATA)	to 15kbps	1mW/ 10mW/ 20mW	-117dBm [4.8kbps BER=0.1%] <sup>2</sup>	-40 to +85	WQFN32
<b>New</b> ML7344C	Q/GDW347.3	750 to 960MHz	1.8 to 3.6	2-(G)FSK (G)MSK	—	Synchronous serial (Control) DIO(DATA)	to 500kbps	20mW/ 100mW	-106dBm [100kbps BER=0.1%] <sup>2</sup>	-40 to +85	WQFN32
ML7406	EN300-220 EN1357-4										
☆ML7345	EN300-220 EN1357-4	160 to 510MHz	1.8 to 3.6	2-(G)FSK (G)MSK 4 (G)FSK	—	Synchronous serial (Control) DIO(DATA)	to 100kbps	1mW/ 10mW/ 20mW	-123dBm [2.4kbps BER=1%] <sup>2</sup>	-40 to +85	WQFN32

[J]: This LSI is limited to the market in Japan. \*2: BER means Bit Error Rate.

☆: Under development

# VoIP LSI

## VoIP CODEC

(LAPIS Semiconductor products)

VoIP Codec							
Part No.	Speech Compression Method	Channel number	Operating Frequency (MHz)	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)	Package
ML7074-003	G.729.A/G.726/G.711	1	4.096	3.0 to 3.6	65mA	- 20 to + 60	QFP64
ML7074-004	G.729.A/G.711		4.096	3.0 to 3.6	65mA		QFP64
ML7204-003	G.729.A/G.711		12.288	3.0 to 3.6	65mA		QFP64
2ch VoIP Codec							
ML7214A-001	G.711	2	12.288	3.0 to 3.6	65mA	- 20 to + 60	TQFP100
4ch VoIP Codec							
ML7224A-001	G.711	4	12.288	3.0 to 3.6	125mA	- 20 to + 60	LQFP176
2ch VoIP Codec							
ML7234-021	G.711/G.722	2	12.288	3.0 to 3.6	120mA	- 20 to + 60	TQFP100

## VoIP Processor

(LAPIS Semiconductor products)

VoIP Processor						
Part No.	Speech Compression Method	Operating Frequency (MHz)	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)	Package
ML7304-0x2	G.729.A/G.711/G.722	12.288	3.0 to 3.6	210mA	- 20 to + 60	QFP208

# Echo Canceller LSI

## Echo Canceller

(LAPIS Semiconductor products)

Dual echo canceller + ADPCM transcoder						
Part No.	Cancelable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency (MHz)	Notes	Package
ML7202-001	64ms/channel	$\mu$ -law, A-law	3.0 to 3.6	19.2	Dual echo canceller + ADPCM transcoder Tone Gen/Det., VOX, Gain Control, Time Slot Assignment, etc.	TQFP64

## Echo Canceller / Noise Canceller

(LAPIS Semiconductor products)

Dual echo canceller/noise canceller with dual Codec						
Part No.	Cancelable Echo Delay Time	Voice Signal Interface	Supply Voltage (V)	Operating Frequency (MHz)	Notes	Package
ML7037-003	Acoustic side 64ms, Line side 20ms	Acoustic side : analog, Line side : analog, 16-bit linear, $\mu$ -law PCM	3.0 to 3.6	12.288	Dual echo canceller/noise canceller with dual Codec Noise cancellation = 6 to 18dB	TQFP64
Echo canceller/Noise canceller with dual wide-band codec						
ML7247-001	Acoustic side 64ms	Acoustic side : analog, Line side : analog, 16-bit linear	3.0 to 3.6	12.288	Echo canceller/Noise canceller with dual wide-band codec Noise cancellation = 1 to 45dB Sampling frequency = 8kHz or 16kHz	TQFP64

# CODEC LSI

## PCM CODEC

(LAPIS Semiconductor products)

Multifunction 2ch PCM CODEC												
Part No.	PCM sign			Channel Number	Supply Voltage (V)	PCM Synchronous Type		Analog Output			Notes	Package
	$\mu$ -law	A-law	14-bit linear			long	short	full swing	output load	differential		
ML7033-01	Yes	Yes	Yes	2	4.75 to 5.25	Yes	Yes	3.4Vpp	20k $\Omega$	No	Multifunction 2ch PCM CODEC	QFP64
3V linear PCM Codec												
ML7041	Yes	Yes	Yes	1	2.4 to 3.3	Yes	Yes	2.6Vpp	8 $\Omega$	Yes	3V linear PCM Codec With tone generators regulators and I/C I/F	TQFP48
MSM7732A	Yes	Yes	Yes	1	2.4 to 3.3	Yes	Yes	3.0Vpp	32 $\Omega$	Yes	3V linear PCM Codec With tone generators	TQFP48/ BGA48
3V 1ch PCM CODEC												
MSM7717-01	Yes	Yes	No	1	2.7 to 3.8	Yes	No	2.0Vpp	600 $\Omega$	Yes	3V 1ch PCM CODEC	SSOP20
3V 2ch PCM CODEC												
MSM7704-01	Yes	Yes	No	2	2.7 to 3.8	Yes	No	2.0Vpp	1.2k $\Omega$	No	3V 2ch PCM CODEC	SOP24
5V 1ch PCM CODEC												
MSM7578V	Yes	Yes	No	1	4.75 to 5.25	Yes	No	2.4Vpp	600 $\Omega$	No	5V 1ch PCM CODEC	SOP24/ SSOP20
5V 2ch PCM CODEC												
MSM7533V	Yes	Yes	No	2	4.75 to 5.25	Yes	No	3.4Vpp	600 $\Omega$	No	5V 2ch PCM CODEC	SOP24

**ADPCM CODEC**

(LAPIS Semiconductor products)

**ADPCM Codec compliant with G.726**

Part No.	PCM Interface	Operating Frequency (MHz)	Supply Voltage (V)	Analog Output	Supply Current (Max.)	Operating Temperature (°C)	Note	Package
ML7029	μ-Law	10.368	2.7 to 3.6	1.3Vpp, 20kΩ	12mA	- 25 to + 70	ADPCM Codec compliant with G.726	SSOP30

# Modem LSI

**Tele-control IC**

(LAPIS Semiconductor products)

**1200bps, HDX modem,DTMF transceiver, CPT**

Part No.	Standard	Supply Voltage (V)	Supply Current (Typ.)	Operating Temperature (°C)	Note	Package
ML7020	ITU-T V.23	4.5 to 5.5	5mA	- 40 to + 85	1200bps, HDX modem,DTMF transceiver, CPT	SSOP32

**DTMF transceiver**

ML7005	—	2.7 to 5.5	5mA	- 30 to + 85	DTMF transceiver	SSOP32
--------	---	------------	-----	--------------	------------------	--------

**2400bps single chip full duplex data modem with protocol**

ML7012-06	ITU-T V.22bis, V.22, V.21	2.7 to 3.6	35mA	- 20 to + 70	2400bps single chip full duplex data modem with protocol	QFP64
-----------	---------------------------	------------	------	--------------	--	-------

# PHS LSI

**Baseband IC for PHS**

(LAPIS Semiconductor products)

**Baseband for PHS**

Part No.	CPU Performance (MHz)	SLOT	Built-in Memory (KB)	Supply Voltage (V)	Note	Package
ML7098C-01	19.2	2	16	3.0/2.5	Baseband for PHS	BGA208
ML7207-01		4	128			BGA208

**Baseband for PHS supporting W-OAM**

ML7257-01	57.6	4	32	3.0/1.5	Baseband for PHS supporting W-OAM	BGA208
-----------	------	---	----	---------	-----------------------------------	--------

\*The products are limited for the user who has the development experience in the PHS devices. For details, please inquire to the sales (ROHM Co., Ltd.).

**PHS modem transcoder**

(LAPIS Semiconductor products)

**π/4 shift QPSK modem**

Part No.	Feature	Supply Voltage (V)	Supply Current (Typ.)	Operating Temperature (°C)	Package
MSM7582B	π /4 shift QPSK modem	2.7 to 3.6	14mA	- 25 to + 70	TSOP(I)32

**4ch ADPCM transcoder**

MSM7581	4ch ADPCM transcoder	2.7 to 5.5	5mA	- 30 to + 80	TQFP100
---------	----------------------	------------	-----	--------------	---------

# Car communication LSI

**FM data broadcast reception LSI**

(LAPIS Semiconductor products)

**FM data reception tuner**

Part No.	Feature	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)	Package
☆ML7174	FM VICS®/DARC® tuner,FM multiplexing demodulate LSI for VICS®(DARC®), Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,SPI slave	3.0 to 3.6	TBD	- 40 to + 85	WQFN64
☆ML7183	FM VICS®/DARC® tuner & Filter LSI, BPF, I²C slave	3.0 to 3.6	TBD	- 40 to + 85	WQFN64

**FM multiplexing demodulate for VICS®**
**New**

ML7154	VICS®(DARC®) compliant FM multiplexing demodulate LSI for VICS®(DARC®), Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,SPI slave	3.0 to 3.6	28mA	- 40 to + 85	WQFN64
MSM9565[J]	FM multiplexing demodulate LSI for VICS®(DARC®),BPF&frame memory built-in VICS® descrambler,Frames A,B,C,8bit bus interface	3.0 to 3.6	28mA	- 40 to + 85	QFP44
ML9574[J]	FM multiplexing demodulate LSI for VICS®(DARC®),BPF&frame memory built-in VICS® descrambler,Frames A,B,C,16bit bus interface	3.0 to 3.6	35mA	- 40 to + 85	TQFP64

**FM multiplexing demodulate for DARC®**

MSM9563	FM multiplexing demodulate LSI for DARC®,BPF&frame memory built-in, Frames A,B,C,8bit bus interface	3.0 to 3.6	28mA	- 40 to + 85	QFP44
---------	---	------------	------	--------------	-------

[J]: This LSI is limited to the market in Japan.

VICS® is a registered trademark of Vehicle Information and Communication System Center. DARC® is a registered trademark of NHK System, Inc.

☆ : Under development



# Audio & Video

## CONTENTS

<b>Audio Amplifiers</b> .....	<b>P. A96</b>
Speaker Amplifiers (Includes LAPIS Semiconductor products) .....	P. A96
Headphone Amplifiers .....	P. A97
Others .....	P. A98
Audio Subsystems .....	P. A98
Line Amplifiers .....	P. A98
Isolation Amplifiers .....	P. A98
<b>Audio Processors</b> .....	<b>P. A98</b>
Digital Audio Processors .....	P. A98
Analog Audio Processors .....	P. A98
Media Decoders (Includes LAPIS Semiconductor products) .....	P. A101
<b>Beamforming</b> .....	<b>P. A102</b>
Beamforming .....	P. A102
<b>Video Amplifiers</b> .....	<b>P. A102</b>
Composite Video Amplifiers .....	P. A102
Video Switches .....	P. A103
Others .....	P. A103
Isolation Amplifier .....	P. A103
<b>Audio Converters</b> .....	<b>P. A103</b>
High performance audio CODEC (LAPIS Semiconductor products) .....	P. A103
<b>Image Correction</b> .....	<b>P. A104</b>
Image Correction ICs for Panel .....	P. A104
Video Encoders built-in Image Correction .....	P. A104
<b>Video LSIs</b> .....	<b>P. A104</b>
Video Decoder Series (LAPIS Semiconductor products) .....	P. A104
Video Encoder Series (LAPIS Semiconductor products) .....	P. A104
Video Interface Series (LAPIS Semiconductor products) .....	P. A104
Display Controller Series for Small to Medium-Sized TFT LCD (LAPIS Semiconductor products) .....	P. A105

# Audio Amplifiers

## Speaker Amplifiers

### Portable Amplifiers 1.9W+1.9W Stereo Speaker Amplifier

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Standby current (μA)	Voltage gain (dB)	Output power (W)	Distortion (%)	Output noise voltage (μVrms)	Package
BD7836EFV	4.5 to 5.5	1.0	5	0	6/10/15.6/21.6	1.9 (V <sub>DD</sub> =5V, 4Ω THD+N=1%)	0.1	16	HTSSOP-B20

### Portable Amplifiers 1.1W to 1.5W Monaural Speaker Amplifiers

Part No.	Supply voltage (V)	Power dissipation (mW)	Quiescent current (μA)	Standby current (μA)	Voltage gain (dB)	Output power (R <sub>L</sub> =8Ω, THD=10%)		Distortion (%)	Output noise voltage (dBV)	Package
						V <sub>CC</sub> =3.6V	V <sub>CC</sub> =5.0V			
BH7824FVM	2.4 to 5.5	470	3.5	0	0 to 20	0.60W	1.1W	0.07	-94	MSOP8
BH7826FVM	2.6 to 5.5	470	3.5	0	0 to 20	0.60W	1.1W	0.20	-94	MSOP8
BD7830NUV	2.4 to 5.5	530	3.2	0	0 to 20	0.77W	1.5W	0.10	-100	VSON008V2030

### Portable Amplifiers Analog Input Monaural Class-D Speaker Amplifiers

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Voltage gain (dB)	Output power (W)		Distortion (%)	Output noise voltage (μVrms)	ALC Circuit	Package (mm)
					(V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	(V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)				
BD5460GUL	2.5 to 5.5	0.69	2.0 (V <sub>DD</sub> =3.6V)	6	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.3 (V <sub>DD</sub> =3.6V)	30	—	VCSP50L1 (1.6×1.6)
BD5461GUL	2.5 to 5.5	0.69	2.0 (V <sub>DD</sub> =3.6V)	12	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.3 (V <sub>DD</sub> =3.6V)	40	—	VCSP50L1 (1.6×1.6)
BD27400GUL	2.5 to 5.5	0.69	2.9 (V <sub>DD</sub> =3.6V)	External Variable	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.3 (V <sub>DD</sub> =3.6V)	40	—	VCSP50L1 (1.5×1.5)
BD5632NUX	2.5 to 5.5	0.52	2.7 (V <sub>DD</sub> =3.6V)	6	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.1 (V <sub>DD</sub> =3.6V)	40	—	VSON008X2030
BD5634NUX	2.5 to 5.5	0.52	2.7 (V <sub>DD</sub> =3.6V)	12	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.1 (V <sub>DD</sub> =3.6V)	40	—	VSON008X2030
BD5638NUX	2.5 to 5.5	0.52	2.7 (V <sub>DD</sub> =3.6V)	18	2.5 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	0.85 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N=10%)	0.1 (V <sub>DD</sub> =3.6V)	40	—	VSON008X2030
BD5465GUL	2.5 to 5.5	0.69	3.3 (V <sub>DD</sub> =3.6V)	12	0.6 (V <sub>DD</sub> =3.6 to 5.5V)		0.1 (V <sub>DD</sub> =3.6V)	40	✓	VCSP50L1 (1.8×1.8)
BD5466GUL	2.5 to 5.5	0.69	3.0 (V <sub>DD</sub> =3.6V)	18	1.0 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N≤1%)	0.5 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N≤1%)	0.1 (V <sub>DD</sub> =3.6V)	40	✓	VCSP50L1 (1.7×1.7)
BD5467GUL	2.5 to 5.5	0.69	3.0 (V <sub>DD</sub> =3.6V)	13	1.0 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N≤1%)	0.5 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N≤1%)	0.1 (V <sub>DD</sub> =3.6V)	40	✓	VCSP50L1 (1.7×1.7)
BD5468GUL	2.5 to 5.5	0.69	3.0 (V <sub>DD</sub> =3.6V)	13	1.0 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N≤1%)	0.5 (V <sub>DD</sub> =3.6V, R <sub>L</sub> =8Ω, THD+N≤1%)	0.1 (V <sub>DD</sub> =3.6V)	40	✓	VCSP50L1 (1.7×1.7)

### Portable Amplifier Analog Input Stereo Class-D Speaker Amplifier (Includes LAPIS Semiconductor products)

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Voltage gain (dB)	Output power (W)		Distortion (%)	Output noise voltage (μVrms)	Max. LDO current (mA)	Package
					(V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	(V <sub>DD</sub> =1.5V, R <sub>L</sub> =8Ω, THD+N=10%)				
BD5471MUV	4.5 to 5.5	2.2	5.5 (V <sub>DD</sub> =5V)	6/12/18/24	2.3 (V <sub>DD</sub> =5V, R <sub>L</sub> =4Ω, THD+N=10%)	1.5 (V <sub>DD</sub> =1.5V, R <sub>L</sub> =8Ω, THD+N=10%)	0.2 (V <sub>DD</sub> =5V)	35	200	VQFN024V4040

Part No.	Supply Voltage (V)	ADC		DAC		Full/Half Duplex	Microphone Input		Speaker Output		Maximum Output (W)	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect				Other Function	Operating Temperature (°C)	Size (mm×mm)	Package
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural/Stereo						Loud Sound™	EQ	Notch	ALC				
ML26211EGD	SPVDD 2.7 to 5.5 IOVDD 1.65 to 3.6 Other 2.25 to 2.75	—	—	1	95	—	—	—	Class D	Monaural	2	—	—	I <sup>2</sup> C/SPI	I <sup>2</sup> S, DSP, L, R, J	✓	✓	—	✓	—	-20 to +85	4.0×4.0	WQFN24

### Portable Amplifiers Digital Input AB Amplifiers (LAPIS Semiconductor products)

Part No.	Supply Voltage (V)	ADC		DAC		Full/Half Duplex	Microphone Input		Speaker Output		Maximum Output (mW)	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect				Other Function	Operating Temperature (°C)	Size (mm×mm)	Package
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural/Stereo						Loud Sound™	EQ	Notch	ALC				
ML2611GD	SPVDD 2.7 to 4.5 HVDD 2.7 to 3.6 LVDD 2.25 to 2.75	—	—	2	90	—	—	—	Class AB	Stereo	800	Stereo	Stereo	I <sup>2</sup> C	I <sup>2</sup> S, DSP, L, R, J	—	✓	—	—	SRS	-20 to +75	6.0×6.0	WQFN36
ML2611HB	SPVDD 2.7 to 4.5 HVDD 2.7 to 3.6 LVDD 2.25 to 2.75	—	—	—	—	—	—	—	Class AB	Stereo	800	—	—	I <sup>2</sup> C/SPI	—	✓	✓	—	✓	—	-20 to +85	3.16×2.96	WCSP36
ML2620GD	SPVDD 2.7 to 5.5 IOVDD 1.65 to 3.6 Other 2.25 to 2.75	—	—	—	—	—	—	—	Class AB	Monaural	800	—	—	I <sup>2</sup> C/SPI	—	✓	✓	—	✓	—	-20 to +85	4.0×4.0	WQFN20
ML2620HP	SPVDD 2.7 to 5.5 IOVDD 1.65 to 3.6 Other 2.25 to 2.75	—	—	—	—	—	—	—	Class AB	Monaural	800	—	—	I <sup>2</sup> C/SPI	—	✓	✓	—	✓	—	-20 to +85	2.42×2.54	WCSP20

### Mid / High-Power Amplifiers Class-D Speaker Amplifiers for Digital Input with Built-in DSP

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Output power (W)		Distortion (%)	Output noise voltage (μVrms)	DSP	Package
					(V <sub>CC</sub> =13V, R <sub>L</sub> =8Ω)				
BM5446EFV	10 to 26	6.2 (four layer board) 4.5 (two layer board)	60 (V <sub>CC</sub> =13V)	10 (V <sub>CC</sub> =13V, R <sub>L</sub> =8Ω)	20 (V <sub>CC</sub> =18V, R <sub>L</sub> =8Ω)	0.07	140	P <sup>3</sup> Volume, P <sup>2</sup> Bass, P <sup>2</sup> Treble, Volume, 7band EQ, 3band tone, Surround	HTSSOP-B54
BM5480MUV	10 to 26	4.30 (four layer board)	65 (V <sub>CC</sub> =18V)	10 (V <sub>CC</sub> =13.5V, R <sub>L</sub> =8Ω)	20 (V <sub>CC</sub> =19V, R <sub>L</sub> =8Ω)	0.07	80	P <sup>2</sup> Bass+, 16band EQ, Level DRC, 2band DRC, Surround, Fine Master Volume	VQFN048V7070
BM5481MUV	10 to 26	4.30 (four layer board)	65 (V <sub>CC</sub> =18V)	10 (V <sub>CC</sub> =13.5V, R <sub>L</sub> =8Ω)	20 (V <sub>CC</sub> =19V, R <sub>L</sub> =8Ω)	0.07 (Audio AMP)	80 (Audio AMP)	P <sup>2</sup> Bass+, 16band EQ, Level DRC, 2band DRC, Surround, Fine Master Volume	VQFN048V7070
BM5449MWV	10 to 26	4.29 (four layer board)	85 (V <sub>CC</sub> =18V)	10 (V <sub>CC</sub> =13V, R <sub>L</sub> =8Ω)	25 (V <sub>CC</sub> =22V, R <sub>L</sub> =8Ω)	0.05	80	P <sup>3</sup> Volume, P <sup>2</sup> Bass+, 8band EQ, 512TapFIR, 2band DRC, Surround, Fine Master Volume	UQFN056V7070
BM28720MUV	10 to 24	4.56 (four layer board)	45 (V <sub>CC</sub> =18V)	20 (V <sub>CC</sub> =18.5V, R <sub>L</sub> =8Ω)	30 (V <sub>CC</sub> =24V, R <sub>L</sub> =8Ω) Heatsink	0.07	80	12Band/ch P-El/ch, 3band DRC, Pre-scaler, Channel mixer, Fine Master Volume, Hard Clipper, Level Meter	VQFN032V5050

New



**Mid / High-Power Amplifiers Class-D Speaker Amplifiers for Digital Input**

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Output power (W)		Distortion (%)	Output noise voltage (μVrms)	Power limiter function	Package
<b>BD5446EFV</b>	10 to 26	6.2 (four layer board) 4.5 (two layer board)	45 (V <sub>CC</sub> =13V)	—	20 (V <sub>CC</sub> =18V R <sub>L</sub> =8Ω)	0.07	140	✓ (Soft clipping)	HTSSOP-B54
<b>BD5451EFV</b>	10 to 18	3.3 (two layer board) 4.7 (four layer board)	50 (V <sub>CC</sub> =12V)	—	15 (V <sub>CC</sub> =18V R <sub>L</sub> =8Ω)	0.07	100	—	HTSSOP-B28
<b>BD5452AMUV</b>	10 to 18	3.26 (two layer board) 4.56 (four layer board)	50 (V <sub>CC</sub> =12V)	—	15 (V <sub>CC</sub> =18V R <sub>L</sub> =8Ω)	0.16	100	✓ (GAIN)	VQFN032V5050
<b>New</b> <b>BD28620MUV</b>	8.5 to 24	3.56 (four layer board)	40 (V <sub>CC</sub> =18V)	17 (V <sub>CC</sub> =18V R <sub>L</sub> =8Ω)	30 (V <sub>CC</sub> =24V R <sub>L</sub> =8Ω) Heatsink	0.08	150	Limiter (OFF,10W,5W)	VQFN024V4040

**Mid / High-Power Amplifiers Analog Input / BTL Output Class-D Speaker Amplifiers**

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Voltage gain (dB)	Output power (W)		Distortion (%)	Output noise voltage (μVrms)	Power limiter function	Package
<b>BD5424EFS</b>	10 to 18	4.5 (two layer board)	30 (V <sub>CC</sub> =12V)	28	10 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	20 (V <sub>CC</sub> =17V R <sub>L</sub> =8Ω)	0.1	80	✓ (Soft clipping)	HTSSOP-A44
<b>BD5423AEFS</b>	10 to 16.5	4.5 (two layer board)	25 (V <sub>CC</sub> =12V)	28	10 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	17 (V <sub>CC</sub> =12V R <sub>L</sub> =4Ω)	0.1	80	✓ (Soft clipping)	HTSSOP-A44
<b>BD5423MUV</b>	10 to 16.5	3.28 (two layer board)	25 (V <sub>CC</sub> =12V)	28	10 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	17 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	0.1	80	✓ (Soft clipping)	VQFN048V7070
<b>BD5426EFS</b>	10 to 16.5	4.5 (two layer board)	25 (V <sub>CC</sub> =12V)	28	9 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	10 (V <sub>CC</sub> =13V R <sub>L</sub> =8Ω)	0.1	80	✓ (Soft clipping)	HTSSOP-A44
<b>BD5426MUV</b>	10 to 16.5	3.28 (two layer board)	25 (V <sub>CC</sub> =12V)	28	9 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	10 (V <sub>CC</sub> =13V R <sub>L</sub> =8Ω)	0.1	80	✓ (Soft clipping)	VQFN048V7070
<b>BD5413EFV</b>	6 to 10.5	2.8 (two layer board)	12 (V <sub>CC</sub> =9V)	30	4 (V <sub>CC</sub> =9V R <sub>L</sub> =8Ω)	5 (V <sub>CC</sub> =9V R <sub>L</sub> =6Ω)	0.2	90	—	HTSSOP-B24
<b>New</b> <b>BD28411MUV</b>	4.5 to 13	4.56 (four layer board)	16 (V <sub>CC</sub> =12V)	9 (V <sub>CC</sub> =12V R <sub>L</sub> =8Ω)	14 (V <sub>CC</sub> =13V R <sub>L</sub> =6Ω) Heatsink	0.02	100	AM avoidance	VQFN032V5050	

**Mid / High-Power Amplifiers 5W+5W Stereo Speaker Amplifiers**

Part No.	Supply voltage (V)	Power dissipation (W)	Quiescent current (mA)	Standby current (μA)	Rated output power (V <sub>CC</sub> =12V, R <sub>L</sub> =8Ω)	Closed loop voltage gain (dB)	Output noise voltage (mVrms)	Distortion (%)	Ripple rejection (dB)	Package
<b>BA5406</b>	5 to 15	20	40	—	5.0W	46	0.6	0.3	—	SIP-M12
<b>BA5417</b>	6 to 15	15	22	0	5.0W	45	0.3	0.1	55	HSIP15

**Headphone Amplifiers**

**Ultra-Compact Coupling Capacitorless Headphone Amplifiers**

Part No.	Supply voltage (V)	Quiescent supply current (mA)	Gain (V/V)	Maximum output power (mW)	Noise harmonic distortion (%)	Output noise voltage (μVrms)	PSRR (dB)	Note	Package (mm)
<b>BD88200GUL</b>	2.4 to 5.5	2.0	Variable Gain with external resistor	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Virtual ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88210GUL</b>	2.4 to 5.5	2.0	— 1.0	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Virtual ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88215GUL</b>	2.4 to 5.5	2.0	— 1.5	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Virtual ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88220GUL</b>	2.4 to 5.5	2.0	— 2.0	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Virtual ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88400GUL</b>	2.4 to 5.5	2.0	Variable Gain with external resistor	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88410GUL</b>	2.4 to 5.5	2.0	— 1.0	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88415GUL</b>	2.4 to 5.5	2.0	— 1.5	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Ground based	VCSP50L2 (2.1 × 2.1)
<b>BD88420GUL</b>	2.4 to 5.5	2.0	— 2.0	80 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	0.006 (V <sub>DD</sub> = 3.3V, R <sub>L</sub> = 16Ω)	10	— 80 (f = 217Hz)	Ground based	VCSP50L2 (2.1 × 2.1)

**Headphone Amplifier Designed for 0.93V Low Voltage Operation**

Part No.	Supply voltage (V)	Quiescent supply current (mA)	Maximum output power (mW)		Noise harmonic distortion (%)		Output noise voltage (μVrms)	Package
			Single-ended (16Ω)	BTL (8Ω)	Single-ended (16Ω)	BTL (8Ω)		
<b>BU7150NUV</b>	0.93 to 3.5 (at Temp 0°C or more)	1.0	14 (V <sub>DD</sub> = 1.5V)	85 (V <sub>DD</sub> = 1.5V)	0.1 (P <sub>O</sub> = 5mW)	0.2 (P <sub>O</sub> = 25mW)	10	VSON010V3030

**Standard Headphone Amplifiers**

Part No.	Supply voltage (V)	Quiescent supply current (mA)	Voltage gain (dB)	Maximum Output power (mW) R <sub>L</sub> =16Ω	Noise harmonic distortion (%)	Ripple rejection (dB)	Package
<b>BH3544F</b>	2.8 to 6.5	7.0	6	62	0.02	57	SOP8
<b>BH3547F</b>	4.5 to 6.5	3.7	6	77	0.05	57	SOP8
<b>BH3548F</b>	4.0 to 5.5	6.5	6	62/120 (R <sub>L</sub> =8Ω)	0.02	57	SOP8



**Others**

Audio Subsystems														
Part No.	Supply voltage (V)	Power dissipation (mW)	Quiescent current (mA)	Standby current (μA)	SP AMP			HP AMP			Package			
					Voltage gain (dB)	Distortion (%)	Output power(W) V <sub>CC</sub> =5V	Voltage gain (dB)	Distortion (%)	Maximum output voltage V <sub>CC</sub> =3.3V				
BH7881EFV	3.3 to 5.5	1100	18	0	11(SE)/ 17(BTL)	0.04	2.0	5.5	0.02	1.4dBV	HTSSOP-B24			
BH7884EFV	3.0 to 5.5	1100	9	0.2	12(SE)/ 18.2(BTL)	0.1	1.0	5.6	0.025	1dBV	HTSSOP-B24			

Line Amplifiers															
Part No.	Supply voltage (V)	Circuit current (mA)	Open loop gain (dB)	Inputs	CMRR (dB)	Supply voltage rejection ratio (dB)	Common-mode input voltage range(V) V <sub>CC</sub> =5V	Offset voltage (mV)	Offset current (nA)	Input bias current (nA)	THD (%)	Channel separation (dB)	Gain bandwidth product (MHz)	Slew rate (V/μs)	Package
BA3131FS	6.0 to 16.0	4.9	110	3	72	90	6	0.5	5.0	50	0.0025	115	2.6	1.2	SSOP-A20

Part No.	Supply voltage (V)	Circuit current (mA)	CH	Gain (dB)	Max. output voltage (Vrms)	THD+N (%)	Output noise voltage (μVrms)	Channel separation (dB)	Ripple rejection (dB)	Package
BD8876FV	3.0 to 5.5	3.2	2	6 or 9	3.5	0.003	8	80	65	SSOP-B14
BD8878FV	3.0 to 5.5	3.2	2	6.7	3	0.003	10	65	65	SSOP-B14

Part No.	Supply voltage (V)	Consumption current (mA)	Open loop gain (dB)	THD (%)	Input resistance (kΩ)	Maximum output voltage (Vrms)	Equivalent input noise voltage (μVrms)	ALC range(dB)	Channel balance (dB)	Channel separation (dB)	Package
BA3308F	4.5 to 14.0	3.5	80	0.1	25	1.2	1.0	45	0	75	SOP14
BA3308FV	4.5 to 14.0	3.5	80	0.1	25	1.2	1.0	45	0	75	SSOP-B14

Isolation Amplifiers													
Part No.	Supply voltage (V)	Operating temperature (°C)	Circuits	Circuit current (mA)	Voltage gain (dB)	CMRR (dB)	Common-mode input voltage range (V) V <sub>CC</sub> =5V	THD (%)	Output noise voltage (μVrms)	Channel separation (dB)	Slew rate (V/μs)	Input resistance (kΩ)	Package
BA3121F	4.0 to 18.0	-30 to +85	2	9.0	-0.04	57	3.75	0.002	3.5	82	2.0	55	SOP8
BA3123F	4.0 to 18.0	-40 to +85	2	9.0	-0.04	57	3.75	0.002	3.5	82	2.0	55	SOP8

# Audio Processors

**Digital Audio Processors**

28bit Audio DSP with Built-in 2ch ADC, 6ch DAC and ASRC															
Part No.	Supply voltage (V)	Data width (bit)	DataRAM (bit)	Coefficient RAM (bit)	Digital Input Select	Digital Output	ASRC	ADC	DAC	P <sup>2</sup> Volume	P <sup>2</sup> Bass	P <sup>2</sup> Treble	P-EQ	Tone control	Package
BU9406KS2	3.0 to 3.6	28	256 × 28	128 × 24	Stereo 4	Stereo 4	1	Stereo 1	Stereo 3	—	✓	✓	12Band	P-EQ use	SQFP-T80C

32bit Audio DSP with Built-in 4ch DAC and ASRC															
Part No.	Supply voltage (V)	Data width (bit)	DataRAM (bit)	Coefficient RAM (bit)	Digital Input Select	Digital Output	ASRC	ADC	DAC	P <sup>2</sup> Volume	P <sup>2</sup> Bass	P <sup>2</sup> Treble	P-EQ	Tone control	Package
BU9408KS2	3.0 to 3.6	32	256 × 32	128 × 24	Stereo 4	Stereo 3	1	—	Stereo 2	✓	✓	✓	7Band 3Band	Bass Middle Treble	SQFP-T52

32bit Audio DSP															
Part No.	Supply voltage (V)	Data width (bit)	DataRAM (bit)	Coefficient RAM (bit)	Digital Input Select	Digital Output	ASRC	ADC	DAC	P <sup>2</sup> Volume	P <sup>2</sup> Bass	P <sup>2</sup> Treble	P-EQ	Tone control	Package
BU9409FV	3.0 to 3.6	32	256 × 32	128 × 24	Stereo 2	Stereo 3	—	—	—	✓	✓	✓	7Band 3Band	Bass Middle Treble	SSOP-B40
BU9414FV	3.0 to 3.6	32	256 × 32	128 × 24	Stereo 2	Stereo 3	—	—	—	✓	Plus harmonics	✓	7Band	Bass Middle Treble	SSOP-B40

**Analog Audio Processors**

5.1ch / 7.1ch Sound Processors with Built-in Micro-step Volume														
Part No.	Supply voltage (V)	Circuit current (mA)	Output noise voltage (μVrms)	Distortion (%)	Selector	Input gain	Output gain	Volume	Number of volume	Tone	Bass boost	Serial control	Package	
BD3471KS2	±6.5 to ±7.5	±30	1.5	0.0004	12	—	—	+24 to -95dB 0.5dB/step	8	—	—	2-wire	SQFP-T80C	
BD3473KS2	±6.5 to ±7.5	±30	1.5	0.0004	12	—	—	+24 to -95dB 0.5dB/step	8	BASS, TREBLE	—	2-wire	SQFP-T80C	
BD3474KS2	±6.5 to ±7.5	±30	1.5	0.0004	12	—	—	+32 to -95dB 0.5dB/step	6	BASS, TREBLE	—	2-wire	SQFP-T80C	
<b>New</b> BD34701KS2	±6.5 to ±7.5	±22	1.5	0.0004	8	—	—	+32 to -95dB 0.5dB/step	8	—	—	2-wire	SQFP-T52	
<b>New</b> BD34700FV	±6.5 to ±7.5	±22	1.5	0.0004	3	—	—	+32 ~ -95dB 0.5dB/step	4	—	—	2-wire	SSOP-B40	

2ch / 6ch Electronic Volume														
Part No.	Supply voltage (V)	Circuit current (mA)	Output noise voltage (μVrms)	Distortion (%)	Selector	Input gain	Output gain	Volume	Number of volume	Tone	Bass boost	Serial control	Package	
BD3812F	±5.0 to ±7.3	±2	1.2	0.005	—	—	—	0,6 to 18dB 2dB/step	2	—	—	2-wire	SOP14	
BD3814FV	±5.0 to ±7.3	±7	1.0	0.001	—	—	—	0 to -95dB 1dB/step	6	BASS, TREBLE	—	2-wire	SSOP-B40	

5.1ch Sound Processors													
Part No.	Supply voltage (V)	Circuit current (mA)	Output noise voltage (μVrms)	Distortion (%)	Selector	Input gain	Output gain	Volume	Number of volume	Tone	Bass boost	Serial control	Package
BD3813KS	±5.0 to ±7.3	±10	1.5	0.004	—	0,6,12dB	—	0 to -95dB 1dB/step	6	BASS, TREBLE	—	2-wire	SQFP56
BD3815KS	±5.0 to ±7.3	±10	1.5	0.004	—	0,6,18dB	—	0 to -95dB 1dB/step	6	BASS, TREBLE	—	2-wire	SQFP56
BD3811K1	±5.0 to ±7.3	±15	2.0	0.005	8	0,6dB	0,6 to 18dB 2dB/step	0 to -103dB 1dB/step	6	BASS, TREBLE	✓	2-wire	QFP80
BD3818KS	±5.0 to ±7.4	±28	1.0	0.002	5	0,3,6,9dB	—	0 to -95dB 1dB/step	6	BASS, TREBLE	(Dynamic)	2-wire	SQFP80

6.1ch / 7.1ch Sound Processors													
Part No.	Supply voltage (V)	Current consumption (mA)	Output noise voltage (μVrms)	Distortion (%)	Selector	Input gain	Output gain	Volume	Number of volume	Tone	Bass boost	Serial control	Package
BD3816K1	±5.0 to ±7.3	±24	1.2	0.001	7	0 to 7dB 1dB/step	0 to 17dB 1dB/step	0 to -95dB 1dB/step	7	Bass, Treble	—	2-wire	QFP80
BD3817KS	±5.0 to ±7.3	±24	1.2	0.001	10	0 to 7dB 1dB/step	0 to 17dB 1dB/step	0 to -95dB 1dB/step	7	Bass, Treble	—	2-wire	SQFP100
BD3452KS	±6.5 to ±7.3	±20	1.4	0.0006	9	0,6,12dB	0 to 15dB 1dB/step	0 to -99dB 1dB/step	8	—	—	2-wire	SQFP100

6ch / 9ch Stereo Input Selector ICs Maximum input voltage : 4.2V							
Part No.	Supply voltage (V)	Current consumption (mA)	Output noise voltage (μVrms)	Distortion (%)	Selector	Serial control	Package
BD3843FS	±4.0 to ±7.3	±3	1.0	0.004	6	2-wire	SSOP-A24
BD3841FS	±5.0 to ±7.3	±3	1.0	0.004	9	2-wire	SSOP-A32

Sound Processor with Built-in Loudness Function											
Part No.	Supply voltage (V)	Current consumption (mA)	Volume	Rear volume	Equalizer	Loudness	Serial control	Output noise voltage (μVrms)	Distortion (%)	Package	
BD3869AF	5.3 to 9.5	3	0 to -89, -∞ (1dB/step)	0 to -20(1dB/step) -25, -30, -35, -45, -60, -∞	Bass Treble	✓	I <sup>2</sup> C BUS	2.3	0.005	SOP18	

Sound Processors with Built-in Surround Sound Function														
Part No.	Supply voltage (V)	Current consumption (mA)	Input selector	Volume	Rear volume	Equalizer	Bass Boost	BBE	Surround	AGC	Serial control	Output noise voltage (μVrms)	Distortion (%)	Package
BD3491FS	4.75 to 9.5	6.4	6	0 to -87, -∞ (1dB/step)	—	Bass Treble	✓	—	✓	—	I <sup>2</sup> C BUS	5	0.002	SSOP-A32
BD3490FV	4.75 to 9.5	6.4	4	0 to -87, -∞ (1dB/step)	—	Bass Treble	✓	—	✓	—	I <sup>2</sup> C BUS	5	0.002	SSOP-B28
BD3884FS	7.0 to 9.5	8	—	0 to -87, -∞ (1dB/step)	0 to -20(2dB/step) -25, -30, -45, -60, -∞	Bass Treble	—	—	✓	✓	I <sup>2</sup> C BUS	6	0.008	SSOP-A24
BD3886FS	7.0 to 9.5	8	3	0 to -87, -∞ (1dB/step)	0 to -20(2dB/step) -25, -30, -45, -60, -∞	Bass Treble	—	✓	✓	✓	I <sup>2</sup> C BUS	6	0.008	SSOP-A32

Sound Processors with Built-in 2-band Equalizer																
Part No.	Supply voltage (V)	Current consumption (mA)	INPUT Selector		INPUT GAIN (dB)	VOLUME (dB)	FADER		Parametric EQ	LOUDNESS	LPF for SUB WOOFER	OPTION	Serial interface	Output noise voltage (μVrms)	Distortion (%)	Package
			Single	ISO			(dB)	Outputs								
BD37503FV	7 to 9.5	20	3	1	0 to +20	0 to -36, -∞	0 to -63, -∞	4	—	✓	—	Anti-aliasing Filter*	I <sup>2</sup> C BUS	5.8	0.001	SSOP-B20
BD37511FS	7 to 9.5	15	3	0	0 to +20	0 to -40	0 to -62, -∞	4	—	—	—	—	I <sup>2</sup> C BUS	6	0.005	SSOP-A20
BD37512FS	7 to 9.5	15	3	1	0 to +20	0 to -40	0 to -62, -∞	4	—	—	—	—	I <sup>2</sup> C BUS	6	0.005	SSOP-A20
BD37513FS	7 to 9.5	38	3	1	0 to +20	+15 to -79, -∞	0 to -79, -∞	4	—	✓	—	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A20
BD37514FS	7 to 9.5	38	3	1	0 to +20	+15 to -79, -∞	0 to -79, -∞	5	✓	✓	—	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A20
BD37515FS	7 to 9.5	38	3	1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	5	✓	✓	✓	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A20
BD37521FS	7 to 9.5	38	3	1	0 to +20	+15 to -79, -∞	0 to -79, -∞	4	—	EXT	—	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A24
BD37522FS	7 to 9.5	38	4	1	0 to +20	+15 to -79, -∞	0 to -79, -∞	4	✓	✓	—	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A24
BD37523FS	7 to 9.5	38	4	1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	5	✓	✓	✓	—	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A24
BD3870FS	4.5 to 9.5	8	3	—	0/6/12/18	0 to -87, -∞	—	2	EXT	—	—	Surround	2 WIRE	4.5	0.01	SSOP-A24
BD3871FS	4.5 to 9.5	8	3	—	24/26/28	0 to -87, -∞	—	2	EXT	—	—	Surround	2 WIRE	40 (Gv=24dB)	0.01	SSOP-A24
BD3873FS	4.5 to 9.5	8	3	—	18/21/24/27	0 to -87, -∞	—	2	EXT	—	—	Surround	2 WIRE	40 (Gv=24dB)	0.01	SSOP-A24
BD3872FS	4.5 to 9.5	8	5	—	0/5/10/19/23/26/28	0 to -87, -∞	—	2	EXT	—	—	Surround	2 WIRE	4.5	0.01	SSOP-A32
BD3490FV	4.75 to 9.5	7	4	—	0/2/4/6/8/12/16/20	0 to -87 (2ch Independent control), -∞	—	2	EXT	—	—	Bass boost Surround	I <sup>2</sup> C BUS	5	0.002	SSOP-B28
BD3491FS	4.75 to 9.5	7	6	—	0/2/4/6/8/12/16/20	0 to -87 (2ch Independent control), -∞	—	2	EXT	—	—	Bass boost Surround	I <sup>2</sup> C BUS	5	0.002	SSOP-A32

Sound Processors with Built-in 2-band Equalizer : \*Loudness and Anti-aliasing Filter can be used exclusively. EXT : Set by external components

Sound Processors with Built-in Surround Sound Function : **BBE** BBE technology built in for clearer sound BBE is registered trademark of BBE Sound Inc  
 Sound Processors with Built-in 2-band Equalizer : BD37511FS and BD37512FS are all function-compatible. BD37513FS, BD37514FS and BD37515FS are all function-compatible.  
 BD37522FS, BD37523FS and BD37524FS are all function-compatible.

**Analog Audio Processors**
**Sound Processors with Built-in 3-band Equalizer**

Part No.	Supply voltage (V)	Current consumption (mA)	Input Selector		Input Gain (dB)	Volume (dB)	Fader (Rear)		Parametric EQ	LOUDNESS	LPF/HPF for SUB WOOFER	MIXING		LEVEL METER	OPTION	Serial interface	Output noise voltage (μVrms)	Distortion (%)	Package
			Single	ISO			(dB)	Outputs				ATT							
BD37524FS	7 to 9.5	38	4	1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF	-	-	✓	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A24
BD37531FV	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	-	-	-	-	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-B28
BD37532FV	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF	-	-	-	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-B28
BD37533FV	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF	✓	✓	-	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-B28
BD37534FV	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF	✓	✓	✓	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-B28
BD37541FS	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	0 to -79, -∞	6	✓	EXT	-	✓	-	-	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-B28
BD37542FS	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	EXT	LPF	✓	✓	-	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A32
BD37543FS	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	EXT	LPF + HPF	✓	✓	✓	-	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A32
BD37544FS	7 to 9.5	38	1/3/4	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	-	LPF + HPF	✓	✓	-	SUPER BASS	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A32
BD37545FS	7 to 9.5	38	2/3/5	3/2/1	0 to +20	+15 to -79, -∞	+15 to -79, -∞	6	✓	-	LPF + HPF	✓	✓	✓	External I/O	I <sup>2</sup> C BUS	3.8	0.001	SSOP-A32
<b>New</b> BD37033FV	7 to 9.5	31	3/5	2/1	0 to +16	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF	✓	✓	✓	-	I <sup>2</sup> C	5.5	0.002	SSOP-B28
<b>New</b> BD37034FV	7 to 9.5 V <sub>CC</sub> L-13	36	3/5	2/1	0 to +16	+15 to -79, -∞	+15 to -79, -∞	6	✓	✓	LPF + HPF	✓	✓	✓	High Voltage output	I <sup>2</sup> C	6	0.002	SSOP-B28
BD3883FS	6.5 to 9.5	8	5	-	0/6/12/16/20/23/26/29	0 to -87, -∞	0/-10	2	EXT	-	-	-	-	-	Surround	2 Wire	4	0.01	SSOP-A32
BD3861FS	6.5 to 9.5	13	5	-	0 to +26 (2dB/step)	0 to -50 (2dB step), -50 to -70 (4dB step), -∞	0 to -59, -∞	2	EXT	-	-	-	-	-	-	2 Wire	8	0.02	SSOP-A32
BD3403FV	6.5 to 9.5	16	5	-	0 to +26 (2dB/step)	0 to -30 (2dB/step)	0 to -59, -∞	2	EXT	-	-	-	-	-	Surround	2 Wire	8	0.02	SSOP-B40

**General-Purpose Electronic Volume with Built-in Advanced Switch**

Part No.	Supply voltage (V)	Current consumption (mA)	Input Selector		Input Gain (dB)	Fader Volume (dB)	Outputs	Mixing	Post filter	OPTION	Serial Control	Output noise voltage (μVrms)	Distortion (%)	Package
			Single	ISO										
BD3464FV	7.0 to 9.5	25	-	-	-	+23 to -79, -∞ (1dB/step)	4	-	-	-	I <sup>2</sup> C	1.9	0.0004	SSOP-B20
BD3465FV	7.0 to 9.5	25	-	-	-	+23 to -79, -∞ (1dB/step)	4	3ch	-	-	I <sup>2</sup> C	1.9	0.0004	SSOP-B20
BD3460FS	7.0 to 9.5	25	-	-	-	+23 to -79, -∞ (1dB/step)	6	-	-	-	I <sup>2</sup> C	1.9	0.0004	SSOP-A24
BD3461FS	7.0 to 9.5	25	-	-	-	+23 to -79, -∞ (1dB/step)	6	3ch	-	-	I <sup>2</sup> C	1.9	0.0004	SSOP-A24
<b>New</b> BD37067FV	7.0 to 9.5	37	2/3/4/5	4/3/2/1	+23 to -15 (1dB/step)	+23 to -79, -∞ (1dB/step)	6	1ch	✓	-	I <sup>2</sup> C	8	0.003	SSOP-B40
<b>New</b> BD37068FV	7.0 to 9.5 V <sub>CC</sub> L to 17.8	30 7	2/3/4/5	4/3/2/1	+23 to -15 (1dB/step)	+23 to -79, -∞ (1dB/step)	6	1ch	✓	High-Voltage output	I <sup>2</sup> C	23 (High-Voltage mode)	0.003	SSOP-B40

**6ch Electronic Volume for 5.1ch Car Theater System**

Part No.	Supply voltage (V)	Current consumption (mA)	Input selector		Input Gain (dB)	Volume (dB)	Fader Volume (dB)	Output Gain (dB)	Mix Car NAVI Cell Phone	Output for spectrum analyzer	Interface	Output noise voltage (μVrms)	Distortion (%)	Package
			Single Input	Monaural Differential Amplifier Input										
BD3433K	±7.0 to ±9.5	12	5.1ch × 2	1	0, 6, 12 (Each F,R)	+23 to -79, -∞ (1dB/step)	+15 to -63, -∞ (1dB/step)	0, +2.5(A) 0, -4.5(B)	✓	✓	3 Wire	3	0.001	QFP44

**Plus/Minus Power Supply Sound Processors with Built-in Pre Amplifier for Tape Recording and Playback**

Part No.	Supply voltage (V)	Current consumption (mA)	Input selector	Input gain (dB)	Volume (dB)	Rear Volume (dB)	Equalizer	REC/PB Amp	Serial control	Output noise voltage (μVrms)	Distortion (%)	Package		
													BD3881FV	±3.5 to ±4.75
BD3882FV	±3.5 to ±4.75	±4.5	3	10	0 to -36 (2dB/step)	-36 to -76 (4dB/step)	-∞	0/-2/-4/-6/-8/-12/-16/-18	Bass, Middle, Treble	✓	2-Wire	22	0.01	SSOP-B40

Sound Processors with Built-in 3-band Equalizer : EXT : Set by external components

Sound Processors with Built-in 3-band Equalizer : BD37522FS, BD37523FS and BD37524FS are all function-compatible. BD37541FS, BD37542FS and BD37543FS are all function-compatible. BD37033FV, BD37034FV are all function-compatible.

General-Purpose Electronic Volume with Built-in Advanced Switch : BD3460FS and BD3461FS are all function-compatible. BD3464FS and BD3465FS are all function-compatible. BD37067FV and BD37068FV are all function-compatible.

**Single Power Supply Sound Processors with Built-in Pre Amplifier for Tape Recording and Playback**

Part No.	Supply voltage (V)	Current consumption (mA)	Input selector	Input gain (dB)	Volume (dB)	Equalizer	Dynamic bass	Surround	REC/PB Amp	Vocal cut	Spectrum Analyzer	Serial control	Output noise voltage (μVrms)	Max. output (Vrms)	Distortion (%)	Package
<b>BD3401KS2</b>	8.0 to 9.5	35	5	-5/0/3.5	0 to -76/-∞ (2/4/step)	Bass, Middle, Treble	✓	✓	✓	✓	✓	2-Wire	3	2.5	0.005	SQFP-T64
<b>BD3402KS2</b>	8.0 to 9.5	28	5	-5/0/3.5	0 to -76/-∞ (2/4/step)	Bass, Treble	-	-	✓	-	-	2-Wire	2.5	2.5	0.005	SQFP-T64

**Bandpass Filter ICs for Spectrum Analyzer Display**

Part No.	Supply voltage (V)	Circuit current (mA)	Band	Input mix amplifier	REC level display	Standard output	Maximum output (V)	B.P.F center frequency (Hz)	Package
<b>BA3835F</b>	4.5 to 6.5	8.5	5	✓	-	1.35	4.8	105,340,1k, 3.4k,10.5k	SOP18
<b>BA3834F</b>	4.5 to 6.5	10.0	7	✓	-	1.35	4.8	68,170,420,1k, 2.4k,5.9k,14.4k	SOP18

**Media Decoders**

**MP3 + SD Memory Card**

Part No.	Supply voltage(V)	USB	SD	iPod	Serial interface	Display information	MP3	WMA	AAC	CD-ROM Mode	CD-ROM File System	MP3 Recording Format	Audio output		Package
													Analog	Digital	
<b>BU94601KV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	-	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	-	-	-	-	-	Line	i2S SPDIF	VQFP64

**AAC / WMA / MP3 + SD Memory Card**

<b>BU94603KV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	-	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	-	-	-	Line	i2S SPDIF	VQFP64
------------------	------------	-------------------	----------------------------	---	---------	--	------------------------	---------------	--------------	---	---	---	------	-----------	--------

**AAC / WMA / MP3 + SD Memory Card / iPod**

<b>BU94604BKV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	iPod5G-iPod nano-iPod Classic-iPod touch-iPhone-iPad	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	-	-	-	Line	i2S SPDIF	VQFP64
-------------------	------------	-------------------	----------------------------	--	---------	--	------------------------	---------------	--------------	---	---	---	------	-----------	--------

**AAC / WMA / MP3 / WAV + SD Memory Card**

<b>BU94501AMUV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	-	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	-	-	-	Line	i2S SPDIF	VQFN40
<b>BU94501AKS2</b>															SQFP-T52

**AAC / WMA / MP3 / WAV + SD Memory Card + iPod**

<b>BU94502AMUV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	iPod5G-iPod nano-iPod Classic-iPod touch-iPhone-iPad	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	-	-	-	Line	i2S SPDIF	VQFN40
<b>BU94502AKS2</b>															SQFP-T52

**AAC / WMA / MP3 / WAV + SD Memory Card + CD-ROM**

<b>BU94605AKV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	-	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	Mode1, Mode2, form1/2, Romeo, Joliet	ISO9660 Level1,2	-	Line	i2S SPDIF	VQFP80
-------------------	------------	-------------------	----------------------------	---	---------	--	------------------------	---------------	--------------	--------------------------------------	------------------	---	------	-----------	--------

**AAC / WMA / MP3 / WAV + SD Memory Card + iPod + CD-ROM**

<b>BU94607AKV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	iPod5G-iPod nano-iPod Classic-iPod touch-iPhone-iPad	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	Mode1, Mode2, form1/2, Romeo, Joliet	ISO9660 Level1,2	-	Line	i2S SPDIF	VQFP80
-------------------	------------	-------------------	----------------------------	--	---------	--	------------------------	---------------	--------------	--------------------------------------	------------------	---	------	-----------	--------

**AAC / WMA / MP3 / WAV + SD Memory Card + CD-ROM + MP3 Record**

<b>BU94702AKV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	-	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	Mode1, Mode2, form1/2, Romeo, Joliet	ISO9660 Level1,2	MPEG1 Layer3 Sample Rate : 32,44,1,48kHz Bit Rate : 32,64,128, 192,256,320kHz	Line	i2S SPDIF	VQFP80
-------------------	------------	-------------------	----------------------------	---	---------	--	------------------------	---------------	--------------	--------------------------------------	------------------	---	------	-----------	--------

**AAC / WMA / MP3 / WAV + SD Memory Card + iPod + CD-ROM + MP3 Record**

<b>BU94705AKV</b>	3.0 to 3.6	USB2.0 Full Speed	MMC SD miniSD microSD SDHC	iPod5G-iPod nano-iPod Classic-iPod touch-iPhone-iPad	i2C BUS	Folder number, File number, Play time, Folder name, File name, TAG(Artist, Album, Title)	MPEG1,2,2.5 LAYER1,2,3	WMA9 Standard	MPEG4 AAC-LC	Mode1, Mode2, form1/2, Romeo, Joliet	ISO9660 Level1,2	MPEG1 Layer3 Sample Rate : 32,44,1,48kHz Bit Rate : 32,64,128, 192,256,320kHz	Line	i2S SPDIF	VQFP80
-------------------	------------	-------------------	----------------------------	--	---------	--	------------------------	---------------	--------------	--------------------------------------	------------------	---	------	-----------	--------

Media Decoders : iPod and iPhone are registered trademarks of Apple Inc. in the U.S. and other countries. iPad is a trademark of Apple Inc.

**Media Decoders**

(LAPIS Semiconductor products)

Audio MP3 decoder Low power MP3 decoder																							
Part No.	Supply Voltage (V)	ADC		DAC		Full/Half Duplex	Microphone Input		Speaker Output		Maximum Output (mW)	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect				Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural/Stereo						Loud Sound™	EQ	Notch	ALC				
ML2011GD	SPVDD 2.7 to 4.5 Other 2.7 to 3.6	—	—	2	90	—	—	—	Class AB	Monaural	800	Stereo	—	SPI/8bit	—	—	—	—	—	Low power 2KB FIFO	-20 to +85	VQFN32	5.0×6.0

Audio MP3 decoder Low power MP3 decoder WCSP type																							
ML2011HB	SPVDD 2.7 to 4.5 Other 2.7 to 3.6	—	—	2	90	—	—	—	Class AB	Monaural	800	Stereo	—	SPI/8bit	—	—	—	—	—	Low power 2KB FIFO	-20 to +85	WCSP35	3.56×4.17

# Beamforming

**Beamforming**

Super unidirectional microphone signal processing IC									
Part No.	Supply Voltage (V)	Operating Temperature (°C)	Circuit current (mA)	Sampling frequency (kHz)	Number of mic (pcs.)	Mic pitch (mm)	Volume	Pattern	Package
BU8332KV-M	3.0 to 3.6	-40 to +85	15	16	2	10	Input volume : -20 to 30dB (2dB Step) Output volume : -25 to 16dB (1dB Step)	Cardioid Bi-directional Hyper-Cardioid	VQFP48

# Video Amplifiers

**Composite Video Amplifiers**

Ultra-compact (Waferlevel chip size package) Output Capacitorless Video Drivers 1.6mm×1.6mm×1.0mmMax.													
Part No.	Supply voltage (V)	Output Circuit	Circuit current (mA)	Amplifier gain (dB)	Freq.chara.1 (dB)	Freq.chara.2 (dB)	Input Type	LPF	Mute (Standby)	Output Capa-less	Max. Output level (Vpp)	Input mode	Package (mm)
BH76906GU	2.5 to 3.45	1ch	15	6	-0.2 (4.5MHz)	-44 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	—	VCSP85H1 (1.6×1.6) H=1.0Max.
BH76909GU	2.5 to 3.45	1ch	15	9	-0.2 (4.5MHz)	-44 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	—	VCSP85H1 (1.6×1.6) H=1.0Max.
BH76912GU	2.5 to 3.45	1ch	15	12	-0.2 (4.5MHz)	-44 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	—	VCSP85H1 (1.6×1.6) H=1.0Max.
BH76916GU	2.5 to 3.45	1ch	15	16.5	-0.2 (4.5MHz)	-44 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	—	VCSP85H1 (1.6×1.6) H=1.0Max.
BH76706GU	2.5 to 3.45	1ch	15	6	-0.45 (4.5MHz)	-46 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	✓	VCSP85H1 (1.6×1.6) H=1.0Max.

Output Capacitorless Video Drivers Compact, with no capacitor required												
Part No.	Supply voltage (V)	Circuit current (mA)	Amplifier gain (dB)	Freq.chara.1 (dB)	Freq.chara.2 (dB)	Input Type	LPF	Mute (Standby)	Output Capa-less	Max. Output level (Vpp)	Package	
BH76806FVM	2.5 to 3.45	16	6	-0.45 (4.5MHz)	-51 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	MSOP8	
BH76809FVM	2.5 to 3.45	16	9	-0.45 (4.5MHz)	-51 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	MSOP8	
BH76812FVM	2.5 to 3.45	15	12	-0.45 (4.5MHz)	-51 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	MSOP8	
BH76816FVM	2.5 to 3.45	15	16.5	-0.45 (4.5MHz)	-51 (23.5MHz)	Bias (150kΩ)	8th order 4.5MHz	0μA	✓	5.2	MSOP8	

Compact Low Current Single Output Video Drivers Compatible with a broad range of applications, from portable devices to standard equipment													
Part No.	Supply voltage (V)	Circuit current (mA)	Amplifier gain (dB)	Freq.chara.1 (dB)	Freq.chara.2 (dB)	Input Type	LPF	Mute (Standby)	Standby logic	Output Capa-less	Input mode	Max. Output level (Vpp)	Package
BH76106HFV	2.6 to 5.5	7	6	0.1 (4.5MHz)	-45 (19MHz)	Clamp	8th order 4.5MHz	0μA	Low-STBY	✓	—	2.6	HVSOF6
BH76109HFV	2.6 to 5.5	7	9	0.1 (4.5MHz)	-45 (19MHz)	Clamp	8th order 4.5MHz	0μA	Low-STBY	✓	—	2.6	HVSOF6
BH76112HFV	2.6 to 5.5	7	12	0.1 (4.5MHz)	-45 (19MHz)	Clamp	8th order 4.5MHz	0μA	Low-STBY	✓	—	2.6	HVSOF6
BH76206HFV	2.6 to 5.5	8	6	-0.3 (6MHz)	-40 (27MHz)	Clamp	8th order 6MHz	0μA	Low-STBY	✓	—	2.6	HVSOF6
BH7616HFV	2.6 to 5.5	7	6	0.1 (4.5MHz)	-45 (19MHz)	Clamp	8th order 4.5MHz	0μA	High-STBY	✓	✓	2.6	HVSOF6

Video Drivers with Built-in Low Voltage Single-circuit Video Switchers High reliable design suitable for CAR AV applications													
Part No.	Supply voltage (V)	Circuit current (mA)	Built-in circuit	Input type	Amp.gain (dB)	Max.output level(Vpp)		Video driver	Mute (Standby)	Output capacitor less	Freq.chara (dB)	Package	
						(Vcc=3V)	(Vcc=5V)						
BH76330FVM	2.8 to 5.5	10.0	3 in 1 Circuit	Clamp	6.0	2.7 Vcc=3V	4.6 Vcc=5V	✓	✓ (Standby)	✓	0 (f=10MHz)	MSOP8	
BH76331FVM	2.8 to 5.5	10.0	3 in 1 Circuit	Bias	6.0	2.8 Vcc=3V	4.6 Vcc=5V	✓	✓ (Standby)	—	0 (f=10MHz)	MSOP8	
BH76360FV	2.8 to 5.5	12.0	6 in 1 Circuit	Clamp	6.0	2.7 Vcc=3V	4.6 Vcc=5V	✓	✓ (Standby)	✓	0 (f=10MHz)	SSOP-B16	
BH76361FV	2.8 to 5.5	12.0	6 in 1 Circuit	Bias	6.0	2.8 Vcc=3V	4.6 Vcc=5V	✓	✓ (Standby)	—	0 (f=10MHz)	SSOP-B16	



## Video Switches

Broadband Low Voltage Single-circuit Video Switchers High reliable design suitable for CAR AV applications											
Part No.	Supply voltage (V)	Circuit current (mA)	Built-in circuit	Input type	Amp. gain (dB)	Max.output level(Vpp)		Mute	Cross talk (dB)	Freq.chara (dB)	Package
						(V <sub>CC</sub> =3V)	(V <sub>CC</sub> =5V)				
BH76332FVM	2.8 to 5.5	9.0	3 in 1 Circuit	Clamp	0	1.8 V <sub>CC</sub> =3V	3.8 V <sub>CC</sub> =5V	✓ (Standby)	-65 (f=4.43MHz)	0 (f=30MHz)	MSOP8
BH76333FVM	2.8 to 5.5	8.0	3 in 1 Circuit	Bias	0	1.9 V <sub>CC</sub> =3V	3.4 V <sub>CC</sub> =5V	✓ (Standby)	-65 (f=4.43MHz)	0 (f=30MHz)	MSOP8
BH76362FV	2.8 to 5.5	11.0	6 in 1 Circuit	Clamp	0	1.8 V <sub>CC</sub> =3V	3.8 V <sub>CC</sub> =5V	✓ (Standby)	-65 (f=4.43MHz)	0 (f=30MHz)	SSOP-B16
BH76363FV	2.8 to 5.5	11.0	6 in 1 Circuit	Bias	0	1.9 V <sub>CC</sub> =3V	3.4 V <sub>CC</sub> =5V	✓ (Standby)	-65 (f=4.43MHz)	0 (f=30MHz)	SSOP-B16

Video. Audio Signal Switchers for Car Navigation Car DVD Player Built-in video switch, audio switch and isolation amplifier in a single chip											
Part No.	Supply voltage (V)	Video Circuit current (mA)	Audio Circuit current (mA)	Video Freq.chara 1 (dB)	Video Freq.chara 2 (dB)	Video Amp.gain (dB)	Audio Freq.chara 1 (dB)	Audio Freq.chara 2 (dB)	Audio Amp.gain (dB)	Residual noise (uVrms)	Package
BH7649KS2	7.5 to 9.5	34	23	0.0(6.75MHz)	-30(27MHz)	-6, -3, 0, 3	-0.5(24kHz)	-26(96kHz)	-6, 0	20	SQFP-T52

## Others

Isolation Amplifier											
Part No.	Supply voltage (V)	Circuits	Circuit current (mA)	Input type	voltage gain (dB)	CMRR (dB)	Common-mode input voltage range (V) V <sub>CC</sub> =5V	Max. output level (V <sub>PP</sub> )	Freq.chara (dB)	Input register (k.Ω)	Package
BH7673G	4.5 to 5.5	1	4.8	Bias	0.0	60	5.2	3.8	0.0(f=10MHz)	150	SSOP5

# Audio Converters

## High performance audio CODEC

(LAPIS Semiconductor products)

Stereo CODEC WCSP type with automatic wind noise reduction filter and LoudSound™																								
Part No.	Supply Voltage (V)	ADC		DAC		Full/ Half Duplex	Microphone Input		Speaker Output			Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect					Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural/Stereo	Maximum Output					Loud Sound™	EQ	Wind Cut	Notch	ALC				
ML26128HB	2.7 to 3.6	2	92	2	95	Full	Single Differential	6	Class AB	Monaural	500mW	Stereo	Stereo	I <sup>2</sup> C/ SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	✓	✓	✓ (Auto)	✓	✓ (Fast)	VIDEO LDO	-20 to +85	WCSP34	2.96×2.96
Ultra compact stereo CODEC WCSP type																								
ML26121AHB	HVDD 2.7 to 3.6 LVDD 1.65 to 2.75	2	92	2	95	Full	Single Differential	4	Class AB	Monaural	500mW	Stereo	Stereo	I <sup>2</sup> C/ SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	✓	✓	✓	✓	✓	—	-20 to +85	WCSP34	2.96×2.96
Monaural CODEC WCSP type with automatic wind noise reduction filter and LoudSound™																								
ML26127HB	2.7 to 3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	✓	✓	✓ (Auto)	✓	✓ (Fast)	VIDEO LDO	-20 to +85	WCSP34	2.48×2.48
Monaural CODEC WCSP type with noise tolerance/LoudSound™																								
ML26125HB	2.7 to 3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	✓	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WCSP25	2.58×2.48
Monaural CODEC WCSP type with noise tolerance																								
ML26124-00HB	2.7 to 3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	—	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WCSP25	2.56×2.46
Monaural CODEC with noise tolerance																								
ML26124-02GD	2.7 to 3.6	1	92	1	95	Full	Single Differential Digital	2	Class AB	Monaural	500mW	Monaural	—	I <sup>2</sup> C/ SPI	I <sup>2</sup> S, DSP, LJ, RJ, a-low, μ-low	—	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WQFN32	5.0×5.0
Ultra compact monaural CODEC																								
ML2612GD	HVDD 2.7 to 3.6 LVDD 1.65 to 2.75	1	92	1	95	Half	Single Differential	1	Class AB	Monaural	500mW	—	—	I <sup>2</sup> C/ SPI	I <sup>2</sup> S, DSP, LJ, RJ	—	✓	✓	✓	✓	—	-20 to +85	WQFN24	4.0×4.0
Ultra compact monaural CODEC WCSP type																								
ML2614HB	HVDD 2.7 to 3.6 LVDD 1.65 to 2.75	1	92	1	95	Half	Single	1	Class AB	Monaural	500mW	—	—	SPI	I <sup>2</sup> S, DSP, LJ, RJ	—	✓	✓	✓	✓	—	-20 to +85	WCSP20	2.46×1.96

A  
Audio & Video

# Image Correction

Image Correction ICs for Panel										
Part No.	Power Supply Voltage(V)			Image Data size	Control Interface	Input/Output Digital Interface	Image Adjustment	PWM Output	LVDS Transmitter	Package
	V <sub>DD</sub> Core	V <sub>DD</sub> I/O	V <sub>DD</sub> LVDS							
<b>BU1573KV</b>	1.40 to 1.60	2.7 to 3.6	—	Supports up to WVGA + (864 × 480)	I <sup>2</sup> C BUS	18bitRGB Interface BUS Interface	—	✓	—	VQFP64
<b>BU1523KV</b>	1.65 to 1.95	3.0 to 3.6	3.0 to 3.6	Supports up to WVGA + (864 × 480)	I <sup>2</sup> C BUS	24bitRGB Interface 8bit YUV = 4 : 2 : 2 ITU-R BT.656	✓	—	✓	VQFP100

Video Encoders built-in Image Correction										
Part No.	Power Supply Voltage(V)			Image Data size	Control Interface	Input/Output Digital Interface	Fog Reduction	Video Encoder	Package	
	V <sub>DD</sub> Core	V <sub>DD</sub> I/O	AV <sub>DD</sub>							
<b>BU6521KV</b>	1.40 to 1.60	2.7 to 3.6	2.7 to 3.6	ITU-R BT.656	I <sup>2</sup> C BUS Serial EEPROM interface	8bit YUV = 4 : 2 : 2 ITU-R BT.656	✓	✓	VQFP48C	

# Video LSIs

## Video Decoder Series

(LAPIS Semiconductor products)

CVBS										
Part No.	Supply Voltage(V)	Input (Analog)		Output (LVTTTL)	Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Operating Temperature (°C)	Package
		Terminal	Type							
<b>ML86V76655</b>	3.3/1.8	CVBS×2	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8bit	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz	27MHz, 24.545454MHz, 29.5MHz, 28.6363MHz	—	CVBS detection function	-40 to +85	WCSP36
CVBS/S-video										
<b>ML86101A</b>	3.3/1.5	CVBS×4 or CVBS×2 + S-video x1 or S-video×2	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8bit	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz	27MHz, 24.545454MHz, 29.5MHz, 28.6363MHz	✓	Simple, small	-40 to +85	TQFP48
<b>ML86V7668A</b>	3.3/2.5	CVBS×4 or CVBS×1 + S-video×3	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16bit RGB 18bit	13.5MHz, 12.272727MHz	27MHz, 24.545454MHz	—	CVBS4 input S-video3 input	-40 to +85	TQFP100
CVBS/S-video/Component/RGB										
<b>ML86V7675</b>	3.3/1.5	CVBS×4 (+Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8bit	7.99300MHz to 33.333MHz	7.99300MHz to 33.333MHz	✓	WVGA, EGA analog RGB supported	-40 to +85	TQFP64

## Video Encoder Series

(LAPIS Semiconductor products)

CVBS										
Part No.	Supply Voltage(V)	Input (LVTTTL)	Output (Analog)		Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Operating Temperature (°C)	Package
			Terminal	Type						
<b>ML86V76580</b>	3.3/1.8	ITU-R.BT.656 YCbCr 8bit	CVBS	NTSC PAL	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz	54MHz, 49.090908MHz, 59MHz, 57.272728MHz	—	No need of LPF	-40 to +85	TQFP48 WCSP25
CVBS/S-video/Component/RGB										
<b>ML86V7655</b>	3.3/2.5	ITU-R.BT.656 YCbCr 8/16/24bit RGB 24bit	CVBS S-video Component	NTSC PAL	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz, 18MHz	27MHz, 24.545454MHz, 29.5MHz, 28.6363MHz, 36MHz	—	I/P, P/I conversion	-40 to +85	TQFP100

## Video Interface Series

(LAPIS Semiconductor products)

MIPI→MIPI/LVTTTL Video Interface							
Part No.	Supply Voltage(V)	Input (MIPI)	Output (LVTTTL)	Output (MIPI)	Feature	Operating Temperature (°C)	Package
<b>ML86790</b>	1.7 to 3.4 1.5	MIPI/CSI-2(2Lane) YUV422 8bit,JPEG 650Mbps/Lane Max.	YCbCr 16bit(4:2:2) 81MHz(typ)	MIPI/CSI-2(2Lane) YUV422 8bit,JPEG 650Mbps/Lane Max.	MIPI/CSI-2 receiver/transmitter, MIPI to LVTTTL translate	-20 to +85	WCSP63



## Display Controller Series for Small to Medium-Sized TFT LCD

(LAPIS Semiconductor products)

T-CON, Video decoder included											
Part No.	Supply Voltage (V)	Input (Analog)		Input (LVTTTL/LVDS)	Output (LVTTTL/LVDS)	Resolution	OSD	MCU	Feature	Operating Temperature (°C)	Package
		Terminal	Type								
ML86V8201	3.3/1.5	CVBS×2 or S-video×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 YCbCr 8bit RGB 18/24bit	QVGA to WVGA	Line	—	Rear camera function Image quality adjustment	−40 to +85	TQFP100
<b>New</b> ML86203	3.3/1.5	CVBS×1	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 YCbCr 8bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	—	—	Rear camera function WXGA panel support Image quality adjustment	−40 to +85	TQFP80
☆ML86206	3.3/1.5	CVBS×2	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	ITU-R BT.656 YCbCr 8bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	Text Line	—	LVTTTL/LVDS I/F WXGA panel support Image quality adjustment	−40 to +85	TQFP100
☆ML86286	3.3/1.5	CVBS×2	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	ITU-R BT.656 YCbCr 8bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	Text Line	—	LVTTTL/LVDS I/F WXGA panel support Picture in Picture Image quality adjustment	−40 to +85	TQFP128
ML86V8202C	3.3/1.8	CVBS×2 +(Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 style YCbCr 8/16/24bit RGB 18/24bit	QVGA to WVGA	—	—	Component video support Image quality adjustment	−40 to +85	TQFP100
ML86V8207	3.3/2.5	CVBS×4 or CVBS×3 +(Comp or S-video)×1 or CVBS×2+S-video×1 +(Comp or S-video)×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16bit RGB 18/24bit	RGB 18/24bit	QVGA to WVGA	Text Line	—	OSD function	−40 to +85	LQFP144
☆ML86240	3.3/1.5	CVBS×4 or CVBS×2 +(Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit 2ch	ITU-R BT.656 YCbCr 8bit RGB 18/24bit	QVGA to WVGA	Text Line	—	Component video support Digital video input ×2 Rear camera function Image quality adjustment	−40 to +85	BGA144
TCON, Image adjustment functions included											
Part No.	Supply Voltage (V)	Input (Analog)		Input (LVTTTL)	Output (LVTTTL)	Resolution	OSD	MCU	Feature	Operating Temperature (°C)	Package
		Terminal	Type								
ML86V8101	3.3	—	—	RGB 18bit	RGB 18bit	QVGA to QHD	—	—	image quality adjustment function	−40 to +85	TQFP64
ML86V8102	3.3	—	—	RGB 18/24bit	RGB 18/24bit	QVGA to QHD	—	—	RGB 24 bits supported image quality adjustment function	−40 to +85	TQFP80
Video decoder, 8051MCU included											
ML86V8401	3.3/1.8	CVBS×3 or CVBS×2 +S-video×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16bit RGB 18/24bit	ITU-R BT.656 RGB 18/24bit	QVGA to WVGA	Text	8051 (8bit)	System control MCU installed	−40 to +85	TQFP100

☆ : Under development





ICs

# Speech Synthesis LSI

## CONTENTS

- Speech synthesis LSI with built-in large-capacity P2ROM™** (LAPIS Semiconductor products) ..... P. A108
- Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM** (LAPIS Semiconductor products) ..... P. A108
- Speech synthesis LSI with external memory** (LAPIS Semiconductor products) ..... P. A109
- Speech synthesis LSI for automotive** (LAPIS Semiconductor products) ..... P. A109

A

Speech Synthesis LSI

## Speech synthesis LSI with built-in large-capacity P2ROM™ (LAPIS Semiconductor products)

I <sup>2</sup> C interface 2ch simultaneous playback/speaker amplifier installed												
Part No.	Operating Voltage (V)	Operating Frequency	Operating Temperature (°C)	ROM Capacity (bit)	Number of Phrases	Maximum Playback Time(sec) <sup>*1</sup>	CPU I/F	SP Amp Output (W) /Class	Number of Mixing (Internal)	DAC	Others	Package
ML22863	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 4M	4096 <sup>*2</sup>	258	I <sup>2</sup> C	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22864	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 8M	4096 <sup>*2</sup>	520	I <sup>2</sup> C	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22865	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 16M	4096 <sup>*2</sup>	1044	I <sup>2</sup> C	0.7/ AB-class	2ch	16bit	—	SSOP30
I <sup>2</sup> C interface Speech-speed and pitch conversion function installed/speaker amplifier installed												
ML22763	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 4M	4096 <sup>*2</sup>	258	I <sup>2</sup> C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22764	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 8M	4096 <sup>*2</sup>	520	I <sup>2</sup> C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22765	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 16M	4096 <sup>*2</sup>	1044	I <sup>2</sup> C	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
Clock synchronous serial interface 2ch simultaneous playback/speaker amplifier installed												
ML22823	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 4M	4096 <sup>*2</sup>	258	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22824	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 8M	4096 <sup>*2</sup>	520	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
ML22825	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 16M	4096 <sup>*2</sup>	1044	Clock synchronous serial	0.7/ AB-class	2ch	16bit	—	SSOP30
Clock synchronous serial interface Speech-speed and pitch conversion function installed/speaker amplifier installed												
ML22723	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 4M	4096 <sup>*2</sup>	258	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22724	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 8M	4096 <sup>*2</sup>	520	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
ML22725	2.7 to 3.6 or 4.5 to 5.5	4.096MHz	-40 to +85	P2ROM™ 16M	4096 <sup>*2</sup>	1044	Clock synchronous serial	0.7/ AB-class	1ch	16bit	Speech-speed and pitch conversion	SSOP30
Clock synchronous interface Built-in P2ROM™/OTP												
ML22802/ ML22P802	2.7 to 3.6	4.096MHz	-20 to +85	P2ROM™ /OTP 2M	512 <sup>*3</sup>	131	Clock synchronous serial	—	1ch	12bit	—	SSOP30
ML22804/ ML22P804	2.7 to 3.6	4.096MHz	-20 to +85	P2ROM™ /OTP 4M	1024 <sup>*4</sup>	262	Clock synchronous serial	—	1ch	12bit	—	SSOP30
ML22808/ ML22P808	2.7 to 3.6	4.096MHz	-20 to +85	P2ROM™ /OTP 8M	1024 <sup>*4</sup>	524	Clock synchronous serial	—	1ch	12bit	—	SSOP30

\*1: Maximum playback time when the sampling frequency is 4kHz in ADPCM2. \*2: 1024 phrases (1 bank) × 4 banks \*3: 256 phrases (1 bank) × 2 banks \*4: 256 phrases (1 bank) × 4 banks

## Speech synthesis LSI with built-in medium/small-capacity Flash/Mask ROM (LAPIS Semiconductor products)

Clock synchronous serial interface type Built-in Mask ROM												
Part No.	Operating Voltage (V)	Operating Frequency	Operating Temperature (°C)	ROM Capacity(bit)	Number of Phrases	Maximum Playback Time(sec)	CPU I/F	SP Amp Output (W) /Class	Number of Mixing (Internal)	DAC	Others	Package
ML22562	2.7 to 5.5	4.096MHz	-40 to +85	Mask 2M	1024	98 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
Clock synchronous serial interface type Built-in Flash/Mask ROM												
ML22563/ ML22Q563	2.7 to 5.5	4.096MHz	-40 to +85	Mask/ Flash 4M	1024	201 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
ML22331/ ML22Q331	2.3 to 5.5	4.096MHz	-40 to +85	Mask/ Flash 896K	30	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30
ML22321/ ML22Q321	2.3 to 5.5	4.096MHz	-40 to +85	Mask/ Flash 896K	62	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit / Analog volume control	SSOP30
Clock synchronous serial interface type Built-in Flash ROM												
ML22Q374	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	Clock synchronization Serial	1.0/ D-class	1ch	—	Disconnection/Short circuit detection Built-in oscillator	SSOP16
I <sup>2</sup> C interface type Built-in Flash ROM												
ML22Q394	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	I <sup>2</sup> C	1.0/ D-class	1ch	—	Disconnection/Short circuit detection Built-in oscillator	SSOP16
Stand alone type Built-in Flash/Mask ROM												
ML22341/ ML22Q341	2.3 to 5.5	4.096MHz	-40 to +85	Mask/ Flash 896K	30	43 <sup>*1</sup>	Stand alone	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30

\*1: Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM. \*2: Maximum playback time when the sampling frequency is 6.4kHz in ADPCM2.

# Speech synthesis LSI with external memory (LAPIS Semiconductor products)

4ch simultaneous playback Serial external memory											
Part No.	Operating Voltage (V)	Operating Temperature (°C)	ROM Capacity (bit)	Number of Phrase	Maximum Playback Time	CPU I/F	SP Amp Output (W) /Class	Number of Mixing (Internal)	DAC	Others	Package
ML22460	2.7 to 5.5	-40 to +85	External maximum 128M	1024	139min <sup>*1</sup>	I <sup>2</sup> C	0.7/ AB-class	4ch	16bit	—	SSOP30
ML22420	2.7 to 5.5	-40 to +85	External maximum 128M	1024	139min <sup>*1</sup>	Clock synchronization Serial	0.7/ AB-class	4ch	16bit	—	SSOP30
ML22594	4.5 to 5.5	-40 to +105	Mask 6M <sup>*4</sup> External maximum 128M	1024 <sup>*5</sup> (Built-in 512/ External 512)	Built-in 303sec <sup>*2</sup> External 109min <sup>*3</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30

\*1 : Maximum playback time when the sampling frequency is 4kHz in ADPCM2. \*2 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.  
\*3 : With an external memory module (Max. 128Mbit). Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.  
\*4 : Mask's built-in ROM is 6Mbit and an external memory module (Max. 128Mbit) can be connected.  
\*5 : Total of mask's internal 512 phrases and external memory's 512 phrases.

# Speech synthesis LSI for automotive (LAPIS Semiconductor products)

Support for 105°C/4ch simultaneous playback/ML22594 Built-in Mask ROM+serial external memory												
Part No.	Operating Voltage (V)	Operating Frequency	Operating Temperature (°C)	ROM Capacity (bit)	Number of Phrases	Maximum Playback Time(sec)	CPU I/F	SP Amp Output (W) /Class	Number of Mixing (Internal)	DAC	Others	Package
ML22594	4.5 to 5.5	4.096MHz	-40 to +105	Mask 6M <sup>*4</sup> External maximum 128M	1024 <sup>*5</sup> (Built-in 512, External 512)	Built-in 303sec <sup>*1</sup> External 109min <sup>*3</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Mask ROM												
ML22572	2.7 to 5.5	4.096MHz	-40 to +105	Mask 2M	1024	98 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Flash/Mask ROM												
ML22573/ ML22Q573	2.7 to 5.5	4.096MHz	-40 to +105	Mask/Flash 4M	1024	201 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Flash ROM												
ML22Q553	4.5 to 5.5	4.096MHz	-40 to +105	Flash 4M	1024	201 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
Support for 85°C built-in Flash/Mask ROM												
ML22331/ ML22Q331	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	30	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30
ML22321/ ML22Q321	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	62	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit/ Analog volume control	SSOP30
ML22341/ ML22Q341	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	30	43 <sup>*1</sup>	Stand alone	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30
Support for 85°C built-in Flash ROM												
ML22Q374	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	Clock synchronization Serial	1.0/ D-class	1ch	—	Disconnection/ Short circuit detection Built-in oscillator	SSOP16
ML22Q394	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	I <sup>2</sup> C	1.0/ D-class	1ch	—	Disconnection/ Short circuit detection Built-in oscillator	SSOP16

\*1 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM. \*2 : Maximum playback time when the sampling frequency is 6.4kHz in ADPCM2.  
\*3 : With an external memory module (Max. 128Mbit). Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.  
\*4 : Mask's built-in ROM is 6Mbit and an external memory module (Max. 128Mbit) can be connected.  
\*5 : Total of mask's internal 512 phrases and external memory's 512 phrases.

A  
Speech Synthesis LSI





ICs

# Microcontroller

A

Microcontroller

## CONTENTS

<b>High Performance &amp; Ultra Low Power MCU</b> .....	<b>P. A112</b>
16bit ML620500 Series (LAPIS Semiconductor products) .....	P. A112
<b>Ultra Low Operating Voltage &amp; Ultra Low Power MCU</b> .....	<b>P. A112</b>
8bit ML610400 Series (LAPIS Semiconductor products) .....	P. A112
<b>High Noise Immunity MCU</b> .....	<b>P. A118</b>
8bit ML610100 Series (LAPIS Semiconductor products) .....	P. A118
16bit ML620100 Series (LAPIS Semiconductor products) .....	P. A118
<b>Built-in Speech Output Function MCU</b> .....	<b>P. A120</b>
8bit ML610300 Series (LAPIS Semiconductor products) .....	P. A120
<b>Sensor Hub MCU</b> .....	<b>P. A120</b>
8bit ML610790 Family (LAPIS Semiconductor products) .....	P. A120
32bit ML630790 Family (LAPIS Semiconductor products) .....	P. A120
<b>ARM-Based MCU</b> .....	<b>P. A120</b>
32bit ML674xxx/ML675xxx (LAPIS Semiconductor products) .....	P. A120
<b>Power-Saving Solar Power Supply Control LSI</b> .....	<b>P. A122</b>
Secondary battery control LSI (LAPIS Semiconductor products) .....	P. A122
Primary battery control LSI (LAPIS Semiconductor products) .....	P. A122



# High Performance & Ultra Low Power MCU

## 16bit ML620500 Series

Standard Type 16bit Low power MCU																		
Part No.	Operating Conditions					ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			PWM				
		Low speed	High speed								Input	Output	Input/Output					
☆ ML620Q503	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)		16MHz	62.5 ns / 30.5µs	0.45µA	-40 to +85	Flash	32K	2K	2K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)
<b>New</b> ML620Q504	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)		16MHz	62.5 ns / 30.5µs	0.45µA	-40 to +85	Flash	64K	2K	6K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)
☆ ML620Q506	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)		16MHz	62.5 ns / 30.5µs	0.45µA	-40 to +85	Flash	128K	2K	12K	✓	2	—	36	8 (16bit×4)	4	16bit×4 (use 16bit timer)
☆ ML620Q546	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)		16MHz	62.5 ns / 30.5µs	0.45µA	-40 to +85	Flash	128K	2K	10K	✓	—	—	70	12 (16bit×6)	8	16bit×8 (use 16bit timer) 3 phase motor PWM×1
☆ ML620Q558	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation/ External input)		16MHz	62.5 ns / 30.5µs	0.45µA	-40 to +85	Flash	256K	2K	20K	✓	—	—	90	12 (16bit×6)	8	16bit×8 (use 16bit timer) 3 phase motor PWM×1

# Ultra Low Operating Voltage & Ultra Low Power MCU

## 8bit ML610400 Series

Standard Type 8bit Low power MCU																		
Part No.	Operating Conditions					ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			PWM	Capture	WDT		
		Low speed	High speed								Input	Output	Input/Output					
ML610482	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Mask	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1
ML610482P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Mask	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1
ML610Q482	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1
ML610Q482P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Flash	64K	—	4K	6	4	22	4 (16bit×2)	—	16bit×1	—	1
<b>New</b> ML610Q485	1.25 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.25µs/2µs/30.5µs	0.35µA	-20 to +70	Flash	32K	—	2K	4	6	16	6 (16bit×3)	—	16bit×1	2	1
<b>New</b> ML610Q485P	1.25 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.25µs/2µs/30.5µs	0.35µA	-40 to +85	Flash	32K	—	2K	4	6	16	6 (16bit×3)	—	16bit×1	2	1

Built-in LCD driver Dot Matrix Type 8bit Low power MCU																		
Part No.	Operating Conditions					ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			PWM	Capture	WDT		
		Low speed	High speed								Input	Output	Input/Output					
ML610421	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Mask	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610421P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Mask	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q421	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q421P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Flash	32K	—	2K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q422	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q422P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q422B	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q422PB	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Flash	32K	—	2K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610426	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1µs/30.5µs	0.5µA	-20 to +70	Mask	40K	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1
ML610Q426	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1µs/30.5µs	0.5µA	-20 to +70	Flash	40K	—	2K	5	—	7	4 (16bit×2)	1	16bit×1	—	1
ML610Q426C	1.1 to 3.6	32.768kHz (Crystal oscillation)	1MHz	1µs/30.5µs	0.5µA	-20 to +70	Flash	40K	—	2K	7	—	13	4 (16bit×2)	1	16bit×1	—	1
ML610Q428	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-20 to +70	Flash	48K	—	4K	6	3	14	2 (16bit×1)	1	16bit×3	—	1
ML610429	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-20 to +70	Mask	48K	—	4K	10	3	20	2 (16bit×1)	1	16bit×3	—	1
ML610Q429	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-20 to +70	Flash	48K	—	4K	10	3	20	2 (16bit×1)	1	16bit×3	—	1
ML610Q431	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q431A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q431PA	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-40 to +85	Flash	64K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q432	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	64K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q432A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	64K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q435	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	96K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q435A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	96K	—	3K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q436	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	96K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q436A	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/2µs/30.5µs	0.5µA	-20 to +70	Flash	96K	—	3K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q438	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-20 to +70	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1
ML610Q438P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-40 to +85	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1
ML610Q439	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-20 to +70	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1
ML610Q439P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 2MHz	0.244µs/0.5µs/30.5µs	0.5µA	-40 to +85	Flash	128K	—	7K	10	3	20	4 (16bit×2)	1	16bit×3	2	1

(LAPIS Semiconductor products)

Functions / Features													
Capture	WDT	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
			FC	SSIO (Spi)	UART								
16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
16bit×4 (use 16bit timer)	1	2 (RC type) 12bit×12 (SA type)	2	2	2	VLS×1 LLD×1	—	8	Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP48-0707-0.50	✓
16bit×8 (use 16bit timer)	1	2 (RC type) 10bit×20 (SA type)	2	2	5	VLS×1	—	8	RTC/Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP80-1212-0.50	—
16bit×8 (use 16bit timer)	1	2 (RC type) 10bit×20 (SA type)	2	2	5	VLS×1	—	8	RTC/Low speed frequency correction/ Analog comparator×2/Melody : Buzzer	✓	—	P-TQFP100-1414-0.50	—

☆ : Under development

(LAPIS Semiconductor products)

Functions / Features												
ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support	
	FC	SSIO	UART									
2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	—	—	—	✓	
2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	✓	—	—	✓	
2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	—	—	P-TQFP48-0707-0.50	✓	
2 (RC type)	1	1	1	BLD×1	—	5	Low speed frequency correction /Buzzer	✓	—	P-TQFP48-0707-0.50	✓	
—	—	1	1	—	—	12 (include 8bit-OR input)	Low speed frequency correction / Analog comparator / Melody : Buzzer / RTC / RNG (Random Number Generator)	—	—	—	✓	
—	—	1	1	—	—	12 (include 8bit-OR input)	Low speed frequency correction / Analog comparator / Melody : Buzzer / RTC / RNG (Random Number Generator)	✓	—	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	—	—	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	✓	—	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	—	—	P-TQFP120-1414-0.40	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.400dot 50seg.×8com.	5	Low speed frequency correction/ Melody : Buzzer	✓	—	P-TQFP120-1414-0.40	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : enable	P-TQFP120-1414-0.40	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disable	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : disable	—	✓	
1 (RC type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detection	—	—	—	✓	
1 (RC type)	1	1	1	BLD×1	Max.800dot 50seg.×16com.	5	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detection	—	—	—	✓	
1 (RC type)	1	1	1	BLD×1	Max.672dot 42seg.×16com.	8	Low speed frequency correction/Melody : Buzzer/ EL Driver/External input voltage detection	—	—	—	✓	
2 (RC type)	1	1	1	BLD×1	Max.1392dot 58seg.×24com.	5	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	TQFP128-P-1414-0.40	✓	
2 (RC type)	1	1	1	BLD×1	Max.512dot 64seg.×8com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	—	✓	
2 (RC type)	1	1	1	BLD×1	Max.512dot 64seg.×8com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	✓	Low-speed scillation stop detect reset : disable	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : enable	—	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1536dot 64seg.×24com.	5	RTC/Low speed frequency correction/ Melody : Buzzer	—	Low-speed scillation stop detect reset : disable	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1344dot 56seg.×24com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1344dot 56seg.×24com.	9	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	—	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	9	Low speed frequency correction/ Melody : Buzzer	—	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓	
2 (RC type) 12bit×2 (SA type)	1	1	1	BLD×1	Max.1024dot 64seg.×16com.	9	Low speed frequency correction/ Melody : Buzzer	✓	Selectable oscillation stop detection reset : function enable/disable according to mask option	P-LQFP144-2020-0.50	✓	

A  
Microcontroller

## 8bit ML610400 Series

### Built-in LCD driver Segments type Low power 8bit MCU

Part No.	Operating Conditions					ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			8bit timer	1kHz timer	PWM	Capture	WDT
		Low speed	High speed								Input	Output	Input/Output					
ML610401	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-20 to +70	Mask	6K	—	192	4	12	18	2 (16bit×1)	—	—	2	1
ML610401P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-40 to +85	Mask	6K	—	192	4	12	18	2 (16bit×1)	—	—	2	1
ML610402	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-20 to +70	Mask	6K	—	192	4	8	18	2 (16bit×1)	—	—	2	1
ML610402P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-40 to +85	Mask	6K	—	192	4	8	18	2 (16bit×1)	—	—	2	1
ML610403	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-20 to +70	Mask	6K	—	192	4	4	18	2 (16bit×1)	—	—	2	1
ML610403P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.9μA	-40 to +85	Mask	6K	—	192	4	4	18	2 (16bit×1)	—	—	2	1
ML610404	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	8K	—	256	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610404P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	8K	—	256	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610405	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	8K	—	256	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610405P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	8K	—	256	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610406	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	8K	—	256	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610406P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	8K	—	256	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610407	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610407P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q407	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q407P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Flash	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q407A	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q407PA	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Flash	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q407D	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	12	22	4 (16bit×2)	—	16bit×1	2	1
ML610408	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	16K	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610408P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	16K	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q408	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q408P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Flash	16K	—	1K	5	8	22	4 (16bit×2)	—	16bit×1	2	1
ML610409	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Mask	16K	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610409P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Mask	16K	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q409	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q409P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-40 to +85	Flash	16K	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q409A	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz	0.5μs/30.5μs	0.9μA	-20 to +70	Flash	16K	—	1K	5	4	22	4 (16bit×2)	—	16bit×1	2	1
ML610Q411	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.5μA	-20 to +70	Flash	16K	—	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q411P	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.5μA	-40 to +85	Flash	16K	—	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q411PA	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.5μA	-40 to +85	Flash	16K	—	1K	6	3	22	4 (16bit×2)	1	16bit×1	2	1
ML610Q412	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.5μA	-20 to +70	Flash	16K	—	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q412P	1.1 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2μs/30.5μs	0.5μA	-40 to +85	Flash	16K	—	1K	6	3	14	4 (16bit×2)	1	16bit×1	2	1
ML610Q419	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/30.5μs	0.9μA	-20 to +70	Flash	64K	4K	2K	6	3	18	4 (16bit×2)	—	16bit×1	2	1
ML610Q419P	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244μs/2μs/30.5μs	0.9μA	-40 to +85	Flash	64K	4K	2K	6	3	18	4 (16bit×2)	—	16bit×1	2	1

A  
Microcontroller





**8bit ML610400 Series**
**Built-in LCD driver Segments type Low power 8bit MCU**

Part No.	Operating Conditions					ROM/RAM				Functions / Features								
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port			8bit timer	1kHz timer	PWM	Capture	WDT
		Low speed	High speed								Input	Output	Input/Output					
ML610Q419C	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.9µA	-20 to +70	Flash	64K	4K	2K	6	3	26	4 (16bit×2)	-	16bit×1	2	1
ML610Q419PC	1.1 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz 500kHz	0.244µs/ 2µs/ 30.5µs	0.9µA	-40 to +85	Flash	64K	4K	2K	6	3	26	4 (16bit×2)	-	16bit×1	2	1
ML610Q461	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	-20 to +70	Flash	16K	-	1K	5	10	14	4 (16bit×2)	-	16bit×1	2	1
ML610Q462	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	-20 to +70	Flash	16K	-	1K	5	6	14	4 (16bit×2)	-	16bit×1	2	1
ML610Q463	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.9µA	-20 to +70	Flash	16K	-	1K	5	2	14	4 (16bit×2)	-	16bit×1	2	1
ML610471	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Mask	8K	-	512	4	10	7	2 (16bit×1)	-	-	2	1
ML610Q471	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Flash	8K	-	512	4	10	7	2 (16bit×1)	-	-	2	1
ML610Q471P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-40 to +85	Flash	8K	-	512	4	10	7	2 (16bit×1)	-	-	2	1
ML610472	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Mask	8K	-	512	4	6	7	2 (16bit×1)	-	-	2	1
ML610Q472	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Flash	8K	-	512	4	6	7	2 (16bit×1)	-	-	2	1
ML610Q472P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-40 to +85	Flash	8K	-	512	4	6	7	2 (16bit×1)	-	-	2	1
ML610473	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Mask	8K	-	512	4	2	7	2 (16bit×1)	-	-	2	1
ML610Q473	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-20 to +70	Flash	8K	-	512	4	2	7	2 (16bit×1)	-	-	2	1
ML610Q473P	1.25 to 3.6	32.768kHz (Crystal oscillation)	500kHz	2µs/ 30.5µs	0.8µA	-40 to +85	Flash	8K	-	512	4	2	7	2 (16bit×1)	-	-	2	1
ML610474	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Mask	16K	-	1K	4	10	10	6 (16bit×3)	-	-	2	1
ML610Q474	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Flash	16K	-	1K	4	10	10	6 (16bit×3)	-	-	2	1
ML610475	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Mask	16K	-	1K	4	6	10	6 (16bit×3)	-	-	2	1
ML610Q475	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Flash	16K	-	1K	4	6	10	6 (16bit×3)	-	-	2	1
ML610476	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Mask	16K	-	1K	4	2	10	6 (16bit×3)	-	-	2	1
ML610Q476	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.25µA	-20 to +70	Flash	16K	-	1K	4	2	10	6 (16bit×3)	-	-	2	1
ML610477	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	-20 to +70	Mask	24K	-	2K	4	10	15	6 (16bit×3)	-	-	2	1
ML610Q477	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-20 to +70	Flash	24K	-	2K	4	10	15	6 (16bit×3)	-	-	2	1
ML610Q477P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-40 to +85	Flash	24K	-	2K	4	10	15	6 (16bit×3)	-	-	2	1
ML610478	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	-20 to +70	Mask	24K	-	2K	4	6	15	6 (16bit×3)	-	-	2	1
ML610Q478	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-20 to +70	Flash	24K	-	2K	4	6	15	6 (16bit×3)	-	-	2	1
ML610Q478P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-40 to +85	Flash	24K	-	2K	4	6	15	6 (16bit×3)	-	-	2	1
ML610479	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.51µA	-20 to +70	Mask	24K	-	2K	4	2	15	6 (16bit×3)	-	-	2	1
ML610Q479	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-20 to +70	Flash	24K	-	2K	4	2	15	6 (16bit×3)	-	-	2	1
ML610Q479P	1.25 to 3.6	32.768kHz (Crystal oscillation)	2MHz 500kHz	0.5µs/ 2µs/ 30.5µs	0.8µA	-40 to +85	Flash	24K	-	2K	4	2	15	6 (16bit×3)	-	-	2	1

**A**  
**Microcontroller**

	Functions / Features								Industrial Equipment	Notes	Package	Chip Support
	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others				
		FC	SSIO	UART								
2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.160dot 40seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	—	—	P-TQFP100-1414-0.50	✓	
2 (RC type) 12bit×4 (SA type)	1	2	1	BLD×1	Max.160dot 40seg.×4com.	5	Low speed frequency correction/ Melody : Buzzer	✓	—	P-TQFP100-1414-0.50	✓	
2 (RC type)	—	1	1	—	Max.64dot 16seg.×4com.	5	Low speed frequency correction	—	—	P-TQFP64-1010-0.50	—	
2 (RC type)	—	1	1	—	Max.80dot 20seg.×4com.	5	Low speed frequency correction	—	—	P-TQFP64-1010-0.50	—	
2 (RC type)	—	1	1	—	Max.96dot 24seg.×4com.	5	Low speed frequency correction	—	—	P-TQFP64-1010-0.50	—	
1 (RC type)	—	—	1	—	Max.55dot 11seg.×5com.	4	Low speed frequency correction	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.55dot 11seg.×5com.	4	Low speed frequency correction/ No debugging function	—	—	P-TQFP48-0707-0.50	✓	
1 (RC type)	—	—	1	—	Max.55dot 11seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	—	P-TQFP48-0707-0.50	✓	
1 (RC type)	—	—	1	—	Max.75dot 15seg.×5com.	4	Low speed frequency correction	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.75dot 15seg.×5com.	4	Low speed frequency correction/ No debugging function	—	—	P-TQFP48-0707-0.50	✓	
1 (RC type)	—	—	1	—	Max.75dot 15seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	—	P-TQFP48-0707-0.50	✓	
1 (RC type)	—	—	1	—	Max.95dot 19seg.×5com.	4	Low speed frequency correction	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.95dot 19seg.×5com.	4	Low speed frequency correction/ No debugging function	—	—	P-TQFP48-0707-0.50	✓	
1 (RC type)	—	—	1	—	Max.95dot 19seg.×5com.	4	Low speed frequency correction/ No debugging function	✓	—	P-TQFP48-0707-0.50	✓	
—	—	—	1	—	Max.135dot 27seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
—	—	—	1	—	Max.135dot 27seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
—	—	—	1	—	Max.155dot 31seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
—	—	—	1	—	Max.155dot 31seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
—	—	—	1	—	Max.175dot 35seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
—	—	—	1	—	Max.175dot 35seg.×5com.	10 (include 6bit-OR input)	Low speed frequency correction/ Melody : Buzzer/ Analog comparator	—	Selectable oscillation stop detection reset : function enable according to software	—	✓	
1 (RC type)	—	—	1	—	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.135dot 27seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	—	—	✓	
1 (RC type)	—	—	1	—	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.155dot 31seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	—	—	✓	
1 (RC type)	—	—	1	—	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	—	—	—	✓	
1 (RC type)	—	—	1	—	Max.175dot 35seg.×5com.	12 (include 8bit-OR input)	Low speed frequency correction/Analog comparator	✓	—	—	✓	

A  
Microcontroller

# High Noise Immunity MCU

## 8bit ML610100 Series

Standard Type 8bit Low power MCU													
Part No.	Operating Conditions					ROM/RAM				Functions / Features			
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
<b>ML610Q101</b>	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/30.5µs	—	-40 to +85	Flash	4K	—	256	—	—	11
<b>ML610Q102</b>	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/30.5µs	—	-40 to +85	Flash	6K	—	256	—	—	11
<b>ML610Q111</b>	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/30.5µs	—	-40 to +105	Flash	24K	4K	2K	—	—	15
<b>ML610Q112</b>	2.7 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/30.5µs	—	-40 to +105	Flash	32K	4K	4K	—	—	25

Built-in LCD driver Segments type Low power 8bit MCU													
<b>ML610Q172</b>	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.0µA	-40 to +85	Flash	128K	2K	4K	6	2	37
<b>ML610Q173</b>	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.0µA	-40 to +85	Flash	128K	2K	4K	6	2	37
<b>ML610Q174</b>	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.0µA	-40 to +85	Flash	128K	2K	4K	6	6	49
<b>ML610Q178</b>	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.0µA	-40 to +85	Flash	128K	—	4K	7	8	59

## 16bit ML620100 Series

Standard Type 16bit Low power MCU													
Part No.	Operating Conditions					ROM/RAM				Functions / Features			
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
☆ <b>ML620Q131</b>	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/30.5µs	3.5 (T.B.D)	-40 to +105	Flash	8K	4K	2K	—	—	11
☆ <b>ML620Q132</b>	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/30.5µs	3.5 (T.B.D)	-40 to +105	Flash	16K	4K	2K	—	—	11
☆ <b>ML620Q133</b>	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/30.5µs	3.5 (T.B.D)	-40 to +105	Flash	20K	4K	2K	—	—	11
☆ <b>ML620Q134</b>	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/30.5µs	3.5 (T.B.D)	-40 to +105	Flash	16K	4K	2K	—	—	15
☆ <b>ML620Q135</b>	1.6 to 5.5	32.768kHz (Internal RC oscillation)	16.384MHz	61.0 ns/30.5µs	3.5 (T.B.D)	-40 to +105	Flash	20K	4K	2K	—	—	15
<b>New</b> <b>ML620Q151</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	32K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
<b>New</b> <b>ML620Q152</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	48K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
<b>New</b> <b>ML620Q153</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	64K	2K	2K	5 (Use crystal oscillation) 6 (Not use crystal oscillation)	4	30 (Use crystal oscillation) 31 (Not use crystal oscillation)
<b>New</b> <b>ML620Q154</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	32K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
<b>New</b> <b>ML620Q155</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	48K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
<b>New</b> <b>ML620Q156</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	64K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	33 (Use crystal oscillation) 34 (Not use crystal oscillation)
<b>New</b> <b>ML620Q157</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	32K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)
<b>New</b> <b>ML620Q158</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	48K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)
<b>New</b> <b>ML620Q159</b>	1.8 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.5 (Crystal oscillation)(T.B.D) 3.5 (Internal RC oscillation)(T.B.D)	-40 to +105	Flash	64K	2K	2K	6 (Use crystal oscillation) 7 (Not use crystal oscillation)	4	45 (Use crystal oscillation) 46 (Not use crystal oscillation)

A  
Microcontroller



(LAPIS Semiconductor products)

Functions / Features															
8bit timer	16bit timer	PWM	WDT	ADC(method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
					PC	SSIO	UART								
6 (16bit×3)	—	16bit×1 (with dead time)	1	10bit×6 (SA type)	—	—	1	VLS×2	—	5	Analog comparator×2	✓	—	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	—
6 (16bit×3)	—	16bit×1 (with dead time)	1	10bit×6 (SA type)	—	—	1	VLS×2	—	5	Analog comparator×2	✓	—	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	—
6 (16bit×3)	—	16bit×4 (Complementary type)	1	10bit×6 (SA type)	1	1	2	VLS×2	—	7	Analog comparator×2	✓	—	P-TSSOP20-0225-0.65	—
6 (16bit×3)	—	16bit×4 (Complementary type)	1	10bit×8 (SA type)	1	1	2	VLS×2	—	7	Analog comparator×2	✓	—	P-LQFP32-0707-0.80	—
6 (16bit×3)	—	16bit×3 (Supports IGBT control)	1	10bit×12 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	4	Low speed frequency correction	—	—	QFP64-P-1414-0.80	—
6 (16bit×3)	—	16bit×3 (Supports IGBT control)	1	10bit×8 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	4	Low speed frequency correction/ Analog comparator	—	—	QFP64-P-1414-0.80	—
6 (16bit×3)	—	16bit×3 (Supports IGBT control)	1	10bit×12 (SA type)	1	2	2	BLD×1	Max. 128dot 32seg. ×4com.	4	Low speed frequency correction/ Analog comparator	—	—	QFP80-P-1420-0.80	—
6 (16bit×3)	—	16bit×2 (Supports IGBT control)	1	10bit×16 (SA type)	1	2	2	BLD×1	Max. 160dot 40seg. ×4com.	5	Low speed frequency correction/ Analog comparator	—	—	P-QFP100-1420-0.65	—

(LAPIS Semiconductor products)

Functions / Features															
8bit timer	16bit timer	PWM	WDT	ADC(method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	Others	Industrial Equipment	Notes	Package	Chip Support
					PC	SSIO	UART								
8 (16bit×4)	—	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	—	5	Analog comparator×2	✓	—	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	—
8 (16bit×4)	—	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	—	5	Analog comparator×2	✓	—	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	—
8 (16bit×4)	—	16bit×1 (Complementary type)	1	10bit×6 (SA type)	1	1	1	LLD×1 VLS×1	—	5	Analog comparator×2	✓	—	P-SSOP16-0225-0.65 P-WQFN16-0404-0.50	—
8 (16bit×4)	—	16bit×1 (Complementary type)	1	10bit×8 (SA type)	1	1	1	LLD×1 VLS×1	—	5	Analog comparator×2	✓	—	P-TSSOP20-0225-0.65	—
8 (16bit×4)	—	16bit×1 (Complementary type)	1	10bit×8 (SA type)	1	1	1	LLD×1 VLS×1	—	5	Analog comparator×2	✓	—	P-TSSOP20-0225-0.65	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	7	Analog comparator	—	—	P-TQFP48-0707-0.50	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	7	Analog comparator	—	—	P-TQFP48-0707-0.50	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	7	Analog comparator	—	—	P-TQFP48-0707-0.50	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-TQFP52-1010-0.65	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-TQFP52-1010-0.65	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-TQFP52-1010-0.65	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-QFP64-1414-0.80	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-QFP64-1414-0.80	—
2 (16bit×1)	4	16bit×4 (Complementary type)	1	10bit×12 (SA type)	1	1	1	LLD×1	—	8	Analog comparator	—	—	P-QFP64-1414-0.80	—

☆ : Under development

A  
Microcontroller

# Built-in Speech Output Function MCU

## 8bit ML610300 Series

### Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features			
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	Memory for sound	RAM capacity (Byte)	port		
		Low speed	High speed									Input	Output	Input/Output
<b>New</b> ML610Q304	2.0 to 5.5	32.768kHz (Internal RC oscillation)	8.192MHz	0.122µs/30.5µs	2.7µA	-40 to +85	Flash	96K	2K	Flash ROM	1K	1	3	11
ML610Q359	2.2 to 3.6	32.768kHz (Crystal oscillation)	8.192MHz	0.122µs/30.5µs	1.7µA	-40 to +85	Flash	160K	3K	Flash ROM	2K	8	3	29
ML610Q360	2.2 to 3.6	32.768kHz (Crystal oscillation)	8.192MHz	0.122µs/30.5µs	1.7µA	-40 to +85	Flash P2ROM	160K	3K	P2ROM: 16M bit	2K	8	3	29

### Built-in LCD driver Segments type Low power 8bit MCU

ML610Q380	2.2 to 5.5	32.768kHz (Internal RC oscillation/ Crystal oscillation)	8.192MHz	0.122µs/30.5µs	2.0µA	-40 to +70	Flash	128K	—	Flash ROM	2K	7	4	34
-----------	------------	--	----------	----------------	-------	------------	-------	------	---	-----------	----	---	---	----

# Sensor Hub MCU

## 8bit ML610790 Family

### U8 Core Based Standard Type 8bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@HALT)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
ML610Q793	VDD:1.7 to 1.9 AVDD:2.5 to 3.6	32.768kHz (External clock)	4.096MHz	0.25µs/30.5µs	0.6µA	-30 to +85	Flash	64K	—	4K	—	—	21
ML610Q794G	2.5 to 3.6	32.768kHz (Crystal oscillation)	4.096MHz	0.25µs/30.5µs	1.1µA	-30 to +85	Flash	64K	—	4K	—	—	21

## 32bit ML630790 Family

### ARM Cortex-M0 Based Standard Type 32bit Low power MCU

Part No.	Operating Conditions						ROM/RAM				Functions / Features		
	Operating voltage (V)	Operating frequency (Max.)		Minimum instruction execution time	Current consumption (Typ.@SLEEPDEEP)	Operating temperature (°C)	ROM Type	ROM capacity (Byte)	Data Flash capacity (Byte)	RAM capacity (Byte)	port		
		Low speed	High speed								Input	Output	Input/Output
<b>New</b> ML630Q791	VDD:1.7 to 1.9	32.768kHz (External clock)	32MHz	—	2.5µA	-40 to +85	Flash	128K	—	16K	—	—	7

# ARM-Based MCU

## 32bit MCU ML674xxx/ML675xxx

### For General-purpose Applications

Part No.	Built-in Memory			CPU Core	Operating Frequency (Max.)	Operating Condition		
	ROM/Flash	RAM	Cash			Supply Voltage (V)	Operating Temperature (°C)	Supply Current (Typ.)
ML674001	—	32KByte	—	ARM7TDMI	33MHz	I/O:3.0 to 3.6 core:2.25 to 2.75	-40 to 85	52mA (33MHz, when using external ROM)
ML675001			8KByte unified		60MHz			92mA (60MHz, when using external ROM)

(LAPIS Semiconductor products)

Functions / Features														Industrial Equipment	Notes	Package	Chip Support
8bit timer	PWM	WDT	ADC (method)	Serial port			Supply voltage detection	LCD driver	External interrupt sources	SP Amp Output(W)/Class	Others						
				I <sup>2</sup> C	SSIO	UART											
4 (16bit×2)	—	1	10bit×3 (SA type)	1	2	1	—	—	9	1.0 (@5V) /D class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-QFN28-0505-0.50	—		
8 (16bit×4)	—	1	12bit×4 (SA type)	—	2	2	VLS×1	—	7	0.5 (@3V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-TQFP64-1010-0.50	—		
8 (16bit×4)	—	1	12bit×4 (SA type)	—	2	2	VLS×1	—	7	0.5 (@3V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	✓	—	P-TQFP64-1010-0.50	—		
6 (16bit×3)	16bit×2	1	10bit×8 (SA type)	1	2	2	BLD×1	Max. 96dot 24seg. ×4com.	5	0.6 (@5V) /AB class	Speech function/ ADPCM decoder/ Built-in speaker amp	—	—	P-QFP80-1414-0.65	—		

(LAPIS Semiconductor products)

Functions / Features											Industrial Equipment	Notes	Package	Chip Support
8bit timer	PWM	WDT	ADC (method)	Serial port				External interrupt sources	Others					
				I <sup>2</sup> C	SSIO	UART	I <sup>2</sup> C/SPI (for Host Communication)							
6 (16bit×3)	—	1	12bit×3 (SA type)	1	1	2	1	16	16bit Square Root, Multiply, Divider, Host I/F (SPI/I <sup>2</sup> C/Logging RAM:8KB)	—	—	S-UFLGA48-3.06×2.96-0.40 (WCSP48)	—	
6 (16bit×3)	—	1	12bit×2 (SA type)	1	1	2	1	16	16bit Square Root, Multiply, Divider, Host I/F (SPI/I <sup>2</sup> C/Logging RAM:8KB)	—	—	TQFP-48-P-0707-0.50	—	

(LAPIS Semiconductor products)

Functions / Features										Industrial Equipment	Notes	Package	Chip Support
8bit timer	PWM	WDT	ADC (method)	Serial port				External interrupt sources	Others				
				I <sup>2</sup> C	SSIO	UART	I <sup>2</sup> C/SPI (for Host Communication)						
8 (16bit×4)	1	1	—	2	—	1	1	7	Square Root, Division operations, Host I/F (Built-in 512 byte communication register)	—	—	(WCSP)	—

(LAPIS Semiconductor products)

Peripherals									Package
General-purpose Ports	Timer	PWM	WDT	A/D	Serial Ports	Interrupt Internal/ External	Additional Peripheral Functions		
42	7	16bit×2	16bit×1	10bit A/D 4ch	UART 2ch SSIO 2ch I <sup>2</sup> C 1ch	23/5	DMA controller 2ch External memory controller [ROM (Flash), SRAM, DRAM (EDO/SDRAM), IO] STOP mode		LQFP144-P-2020-0.50 P-LFBGA144-1111-0.8

A

Microcontroller

# Power-Saving Solar Power Supply Control LSI (LAPIS Semiconductor products)

## Secondary battery control LSI

Part No.	Operating Conditions				Functions/Features			
	Operating voltage VBAT (V)	Operating voltage VSC (V)	VBAT side Current consumption (A)	Operating temperature (°C)	VBAT-VDO Output Impedance	VSC-VBAT Input Impedance	OCP (Overcharge prevention) voltage (V)	BOD (Brown out detection) voltage (V)
ML9077	0.0 to 3.2	0.0 to 3.6	80n	-20 to +70	2.5Ω or less/20mA @VBAT ≥1.8V	100Ω or less /1mA @VSC ≥2V	2.6/3.1	1.15/1.8

## Primary battery control LSI

Part No.	Operating Conditions				Functions/Features		
	Operating voltage VBAT (V)	Operating voltage VSC (V)	VBAT side Current consumption (A)	Operating temperature (°C)	VBAT-VDO Output Impedance	VSC-VDO Output Impedance	Regulator voltage solar limiter voltage (V)
ML9078-001	1.1 to 3.6	0.0 to 4.0	80n	-20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	3.3/1.65
ML9078-002	1.1 to 3.6	0.0 to 4.0	80n	-20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	3.0/1.5
ML9078-003	1.1 to 3.6	0.0 to 4.0	80n	-20 to +70	75Ω or less/2mA @VBAT ≥2V	65Ω or less/2mA @VBAT ≥2V	VBAT



# Automotive

## CONTENTS

### Linear Regulators

- Single-Output LDO Regulators ..... P. A124
- LDO Regulators with Voltage Detector and Watchdog Timer ..... P. A127
- LDO Regulators with Voltage Detector ..... P. A127
- Voltage Tracker ..... P. A127
- Linear Regulators DDR SDRAM ..... P. A127

### Switching Regulators

- For Automotive Switching Regulators ..... P. A128

### Switching Regulators (Power Management IC for System)

- Power Management ICs for Automotive Camera Modules ..... P. A129

### High Voltage Monitor

- Isolated High Voltage Monitor ..... P. A129

### Temperature Monitor

- Isolated Temperature Monitor ..... P. A129

### Gate Drivers

- Isolated Gate Drivers ..... P. A129

### Power Management Switch

- 1 Channel Compact High Side Switch ICs ..... P. A130

### Isolated / No Isolated Power Supply

- DC/DC Controller ..... P. A130

### LED Drivers

- Buck-Boost LED Drivers ..... P. A130
- Constant Current / Serial-in Parallel-out LED Drivers ..... P. A130

### 3-Phase Brushless Motor Drivers

- 3-Phase Brushless Motor Pre-Driver ..... P. A131

### Car Access

- Antenna Drivers ..... P. A131

### Isolators

- 2.5kVrms Isolators ..... P. A131

### Transceiver

- LIN Transceiver ..... P. A131

### Car communication LSI

- FM data broadcast reception LSI (LAPIS Semiconductor products) ..... P. A132

### Digital terrestrial broadcasting reception LSI

- Japanese System (ISDB-T) (LAPIS Semiconductor products) ..... P. A132
- Chinese System (DTMB) (LAPIS Semiconductor products) ..... P. A132

### TFT Driver Series

- Drivers for small to medium LCD Panels (LAPIS Semiconductor products) ..... P. A132

### TN/STN LCD Driver Series

- LCD Segment Drivers ..... P. A133
- Controller driver for low duty LCD (LAPIS Semiconductor products) ..... P. A133

### Car Clock Drivers

- Car Clock (LAPIS Semiconductor products) ..... P. A133

### Speech synthesis LSI

- Speech synthesis LSI (LAPIS Semiconductor products) ..... P. A134

### Audio Processors

- Analog Audio Processors ..... P. A134

### Audio Amplifiers

- Speaker Amplifiers ..... P. A134

### Video Amplifiers

- Isolation Amplifier ..... P. A134

### Beamforming

- Beamforming ..... P. A135

### Audio Converters

- High performance audio CODEC (LAPIS Semiconductor products) ..... P. A135

### Image Correction

- Image Correction ICs for Panel ..... P. A135
- Video Encoders built-in Image Correction ..... P. A135

### Video LSIs

- Video Decoder Series (LAPIS Semiconductor products) ..... P. A135
- Video Encoder Series (LAPIS Semiconductor products) ..... P. A136
- Display Controller Series for Small to Medium-Sized TFT LCD (LAPIS Semiconductor products) ..... P. A136

### Touch Screen Controller

- Resistive type ..... P. A136

### Memory

- Legacy DRAM FP/EDO (LAPIS Semiconductor products) ..... P. A137
- Legacy DRAM SDRAM (LAPIS Semiconductor products) ..... P. A137
- Video Memory (LAPIS Semiconductor products) ..... P. A137
- EEPROM ..... P. A138
- FeRAM (LAPIS Semiconductor products) ..... P. A139

### Operational Amplifiers

- Standard Ground Sense Operational Amplifiers ..... P. A139
- High Speed Ground Sense Operational Amplifiers ..... P. A139
- Low Noise Operational Amplifiers ..... P. A139

### Comparators

- Standard Open-Collector Comparators ..... P. A140

### Voltage Detectors (Reset ICs)

- Standard Voltage Detectors ..... P. A140

# Linear Regulators

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

## Single-Output LDO Regulators

### 50V Resistance Output 500mA LDO Regulators (Automotive grade)

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage (Io=200mA(V))	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package							
<b>New</b> BD3570YFP-M	4.5 to 36.0	3.3			—					TO252-3							
<b>New</b> BD3570YHFP-M										HRP5							
<b>New</b> BD3571YFP-M	5.5 to 36.0	5.0			0.25					TO252-3							
<b>New</b> BD3571YHFP-M										HRP5							
<b>New</b> BD3572YFP-M	4.5 to 36.0	Variable 2.8 to 12.0	$\pm 2$ (Ta= -40 to +125°C)	0.5			-40 to +125		Over-Current / Temperature	TO252-5							
<b>New</b> BD3572YHFP-M										HRP5							
<b>New</b> BD3573YFP-M		3.3										—					TO252-5
<b>New</b> BD3573YHFP-M																	HRP5
<b>New</b> BD3574YFP-M	5.5 to 36.0	5.0			0.25					TO252-5							
<b>New</b> BD3574YHFP-M								✓		HRP5							
<b>New</b> BD3575YFP-M	4.5 to 36.0	Variable 2.8 to 12.0								TO252-5							
<b>New</b> BD3575YHFP-M										HRP5							

### 50V Resistance Output Low quiescent current 200mA LDO Regulators (Automotive grade)

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage (Io=200mA(V))	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package
BD733L2EFJ-C	4.37 to 45.0	3.3	$\pm 2$ (Ta= -40 to +125°C)	0.2		6.0	-40 to +125		Over-Current/ Temperature	HTSOP-J8
BD750L2EFJ-C	5.8 to 45.0	5.0								HTSOP-J8
BD733L2FP-C	4.37 to 45.0	3.3								TO252-3
☆BD733L2FP3-C										SOT223-4
BD750L2FP-C	5.8 to 45.0	5.0								TO252-3
☆BD750L2FP3-C										SOT223-4

### 50V Resistance Output Low quiescent current 500mA LDO Regulators (Automotive grade)

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage (Io=200mA(V))	Circuit current (μA)	Operating temperature (°C)	Shutdown Switch	Protection circuit	Package
BD733L5FP-C	4.17 to 45.0	3.3	$\pm 2$ (Ta= -40 to +125°C)	0.5		6.0	-40 to +125		Over-Current/ Temperature	TO252-3
BD750L5FP-C	5.6 to 45.0	5.0								TO252-3

### 45V Resistance Output Low quiescent current 500mA LDO Regulators (Automotive grade)

Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference(V)	Circuit current (μA)	Operating temperature (Tj)	Shutdown Switch	Protection circuit	Package Part No.			
										TO252-3	TO263-3	TO263-5	TO252-J5
BD433M5	4.0 to 42.0	3.3	$\pm 2$ (Tj= -40 to +150°C)	0.5	0.25 (Io=300mA)	38	-40 to +150°C		Over-Current/ Temperature	BD433M5FP-C	BD433M5FP2-C	—	—
BD450M5	5.5 to 42.0	5.0			0.2 (Io=300mA)					BD450M5FP-C	BD450M5FP2-C	—	—
BD433M5W	4.0 to 42.0	3.3			0.25 (Io=300mA)					—	—	BD433M5WFP2-C	BD433M5WFPJ-C
BD450M5W	5.5 to 42.0	5.0			0.2 (Io=300mA)					—	—	BD450M5WFP2-C	BD450M5WFPJ-C

### 45V Resistance Output Low quiescent current 200mA LDO Regulators (Automotive grade)

Type	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference(V)	Circuit current (μA)	Operating temperature (Tj)	Shutdown Switch	Protection circuit	Package Part No.	
										HTSOP-J8	SOT223-4
BD433M2	3.9 to 42.0	3.3	$\pm 2$ (Tj= -40 to +150°C)	0.2	0.2 (Io=100mA)	40	-40 to +150°C		Over-Current/ Temperature	BD433M2EFJ-C	BD433M2FP3-C
BD450M2	5.5 to 42.0	5.0			0.16 (Io=100mA)					BD450M2EFJ-C	BD450M2FP3-C
BD433M2W	3.9 to 42.0	3.3			0.2 (Io=100mA)					BD433M2WEFJ-C	BD433M2WFP3-C
BD450M2W	5.5 to 42.0	5.0			0.16 (Io=100mA)					BD450M2WEFJ-C	BD450M2WFP3-C

### 36V Resistance Output 300mA LDO Regulator (Automotive grade)

Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	I/O Voltage Difference (V)	Circuit current (mA)	Operating temperature (°C)	Protection circuit	Package
BD3650FP-M	5.6 to 30.0	5.0	$\pm 2$ (Ta= -40 to +125°C)	0.3	0.2 (Io=200mA)	0.5	-40 to +125	Over-Current/ Temperature	TO252-3

### 35V Voltage Resistance 1A LDO Regulators (Automotive grade)

Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (V)	Protection circuit	Package Part No.		
										TO252-3	HRP5	TO263-3
BD33C0A	4.3 to 26.5	3.3	$\pm 3.0$ (Ta= -40 to +125°C)	1.0	0.5	0.4 (Io=500mA)	55	* Vo × 0.01 (Io=5mA to 1A)	Over-Current/ Temperature	BD33C0AFP-C	BD33C0AHFP-C	BD33C0AFP2-C
BD50C0A	6.0 to 26.5	5.0				50				BD50C0AFP-C	BD50C0AHFP-C	BD50C0AFP2-C
BD80C0A	9.0 to 26.5	8.0				0.3 (Io=500mA)	50			BD80C0AFP-C	BD80C0AHFP-C	BD80C0AFP2-C
BD90C0A	10.0 to 26.5	9.0				50				BD90C0AFP-C	BD90C0AHFP-C	BD90C0AFP2-C

35V Voltage Resistance 1A LDO Regulators (Automotive grade) : \* Vo is Output voltage / Unit : V

☆ : Under Development



Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

35V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)													
Part No.	Input Voltage (V)	Output voltage (V)	Output voltage precision(%)	Output current (A)	Saturation voltage (V)	Circuit current (mA)	Operating temperature (°C)	Protection circuit	Package				
BD00C0AWFPS-M	4.0 to 26.5	Variable 3.0 to 15.0	$\pm 3$ ( $T_a = -40$ to $+105^\circ\text{C}$ )	1.0	0.3 ( $I_o = 500\text{mA}$ )	0.5	-40 to +105	Over-Current/ Temperature	TO252S-5				
Type	Input Voltage (V)	Output Voltage (V)	Output voltage precision(%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (V)	Protection circuit	Package Part No.			
										TO252-5	HRP5	TO263-5	
BD00C0AW	4.0 to 26.5	Variable 1.0 to 15.0	$\pm 3.0$ ( $T_a = -40$ to $+125^\circ\text{C}$ )	1.0	0.5	0.3 ( $I_o = 500\text{mA}$ )	55	$V_o \times 0.01$ ( $I_o = 5\text{mA}$ to $1\text{A}$ )	Over-Current/ Temperature	BD00C0AWFP-C	BD00C0AWHFP-C	BD00C0AWFP2-C	
BD33C0AW	4.3 to 26.5	3.3								—	BD33C0AWFP-C	BD33C0AWHFP-C	BD33C0AWFP2-C
BD50C0AW	6.0 to 26.5	5.0								0.3 ( $I_o = 500\text{mA}$ )	BD50C0AWFP-C	BD50C0AWHFP-C	BD50C0AWFP2-C
BD80C0AW	9.0 to 26.5	8.0								50	BD80C0AWFP-C	BD80C0AWHFP-C	BD80C0AWFP2-C
BD90C0AW	10.0 to 26.5	9.0									BD90C0AWFP-C	BD90C0AWHFP-C	BD90C0AWFP2-C
15V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)													
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor ( $\mu\text{F}$ )	Output Capacitor ( $\mu\text{F}$ )	Shutdown Switch	Protection circuit	Package
BD00G0MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	$\pm 1.0$ / $\pm 3.0$ ( $T_a = -40$ to $+105^\circ\text{C}$ ) <Automotive grade>	1.0	0.6	0.6 ( $I_o = 1\text{A}$ )	60 ( $f = 100\text{Hz}$ , $50\text{mVpp}$ , $I_o = 0\text{A}$ )	25 ( $I_o = 0$ to $1\text{A}$ )	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15G0MEFJ-M		1.5											HTSOP-J8
BD18G0MEFJ-M		1.8											HTSOP-J8
BD25G0MEFJ-M		2.5											HTSOP-J8
BD30G0MEFJ-M		3.0											HTSOP-J8
BD33G0MEFJ-M		3.3											HTSOP-J8
BD50G0MEFJ-M		5.0											HTSOP-J8
BD60G0MEFJ-M		6.0											HTSOP-J8
BD70G0MEFJ-M		7.0											HTSOP-J8
BD80G0MEFJ-M		8.0											HTSOP-J8
BD90G0MEFJ-M		9.0											HTSOP-J8
BDJ0G0MEFJ-M		10.0											HTSOP-J8
BDJ2G0MEFJ-M		12.0											HTSOP-J8
15V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Automotive grade)													
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor ( $\mu\text{F}$ )	Output Capacitor ( $\mu\text{F}$ )	Shutdown Switch	Protection circuit	Package
BD00GA5MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	$\pm 1.0$ / $\pm 3.0$ ( $T_a = -40$ to $+105^\circ\text{C}$ ) <Automotive grade>	0.5	0.6	0.6 ( $I_o = 500\text{mA}$ )	60 ( $f = 100\text{Hz}$ , $50\text{mVpp}$ , $I_o = 0\text{A}$ )	25 ( $I_o = 0$ to $500\text{mA}$ )	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15GA5MEFJ-M		1.5											HTSOP-J8
BD18GA5MEFJ-M		1.8											HTSOP-J8
BD25GA5MEFJ-M		2.5											HTSOP-J8
BD30GA5MEFJ-M		3.0											HTSOP-J8
BD33GA5MEFJ-M		3.3											HTSOP-J8
BD50GA5MEFJ-M		5.0											HTSOP-J8
BD60GA5MEFJ-M		6.0											HTSOP-J8
BD70GA5MEFJ-M		7.0											HTSOP-J8
BD80GA5MEFJ-M		8.0											HTSOP-J8
BD90GA5MEFJ-M		9.0											HTSOP-J8
BDJ0GA5MEFJ-M		10.0											HTSOP-J8
BDJ2GA5MEFJ-M		12.0											HTSOP-J8
15V Voltage Resistance 300mA LDO Regulators with Shutdown Switch (Automotive grade)													
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor ( $\mu\text{F}$ )	Output Capacitor ( $\mu\text{F}$ )	Shutdown Switch	Protection circuit	Package
BD00GA3MEFJ-M	4.5 to 14.0	Variable 1.5 to 13.0	$\pm 3.0$ ( $T_a = -40$ to $+105^\circ\text{C}$ ) <Automotive grade>	0.3	0.6	0.6 ( $I_o = 300\text{mA}$ )	60 ( $f = 100\text{Hz}$ , $50\text{mVpp}$ , $I_o = 0\text{A}$ )	25 ( $I_o = 0$ to $300\text{mA}$ )	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD15GA3MEFJ-M		1.5											HTSOP-J8
BD18GA3MEFJ-M		1.8											HTSOP-J8
BD25GA3MEFJ-M		2.5											HTSOP-J8
BD30GA3MEFJ-M		3.0											HTSOP-J8
BD33GA3MEFJ-M		3.3											HTSOP-J8
BD50GA3MEFJ-M		5.0											HTSOP-J8
BD60GA3MEFJ-M		6.0											HTSOP-J8
BD70GA3MEFJ-M		7.0											HTSOP-J8
BD80GA3MEFJ-M		8.0											HTSOP-J8
BD90GA3MEFJ-M		9.0											HTSOP-J8
BDJ0GA3MEFJ-M		10.0											HTSOP-J8
BDJ2GA3MEFJ-M		12.0											HTSOP-J8

**Single-Output LDO Regulators**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

10V Voltage Resistance 1.5A LDO Regulators with Shutdown Switch (Automotive grade)														
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package	
BD00HC5MEFJ-M	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	1.5	0.6	0.6 (Io=1.5A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1.5A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8	
BD15HC5MEFJ-M		1.5											HTSOP-J8	
BD18HC5MEFJ-M		1.8											HTSOP-J8	
BD25HC5MEFJ-M		2.5											HTSOP-J8	
BD30HC5MEFJ-M		3.0											HTSOP-J8	
BD33HC5MEFJ-M		3.3											HTSOP-J8	
BD50HC5MEFJ-M		5.0											HTSOP-J8	
BD60HC5MEFJ-M		6.0											HTSOP-J8	
BD70HC5MEFJ-M		7.0											HTSOP-J8	
10V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)														
BD00HC0MEFJ-M	4.5 to 8.0	Variable 0.8 to 7.0 (Automotive grade Variable 1.5 to 7.0)	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	1.0	0.6	0.6 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8	
BD15HC0MEFJ-M		1.5											HTSOP-J8	
BD18HC0MEFJ-M		1.8											HTSOP-J8	
BD25HC0MEFJ-M		2.5											HTSOP-J8	
BD30HC0MEFJ-M		3.0											HTSOP-J8	
BD33HC0MEFJ-M		3.3											HTSOP-J8	
BD50HC0MEFJ-M		5.0											HTSOP-J8	
BD60HC0MEFJ-M		6.0											HTSOP-J8	
BD70HC0MEFJ-M		7.0											HTSOP-J8	
10V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Automotive grade)														
BD00HA5MEFJ-M	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.5	0.6	0.6 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8	
BD15HA5MEFJ-M		1.5											HTSOP-J8	
BD18HA5MEFJ-M		1.8											HTSOP-J8	
BD25HA5MEFJ-M		2.5											HTSOP-J8	
BD30HA5MEFJ-M		3.0											HTSOP-J8	
BD33HA5MEFJ-M		3.3											HTSOP-J8	
BD50HA5MEFJ-M		5.0											HTSOP-J8	
BD60HA5MEFJ-M		6.0											HTSOP-J8	
BD70HA5MEFJ-M		7.0											HTSOP-J8	
10V Voltage Resistance 300mA LDO Regulators with Shutdown Switch (Automotive grade)														
BD00HA3MEFJ-M	4.5 to 8.0	Variable 1.5 to 7.0	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.3	0.6	0.6 (Io=300mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 300mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8	
BD15HA3MEFJ-M		1.5											HTSOP-J8	
BD18HA3MEFJ-M		1.8											HTSOP-J8	
BD25HA3MEFJ-M		2.5											HTSOP-J8	
BD30HA3MEFJ-M		3.0											HTSOP-J8	
BD33HA3MEFJ-M		3.3											HTSOP-J8	
BD50HA3MEFJ-M		5.0											HTSOP-J8	
BD60HA3MEFJ-M		6.0											HTSOP-J8	
BD70HA3MEFJ-M		7.0											HTSOP-J8	
7V Voltage Resistance 1A LDO Regulators with Shutdown Switch (Automotive grade)														
BD00IC0MEFJ-M	2.3 to 5.5	Variable 0.8 to 4.5	±3.0 (Ta=-40 to +105°C)	1.0	0.3	0.4 (Io=1A)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 1A)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8	
BD10IC0MEFJ-M	2.4 to 5.5	1.0											HTSOP-J8	
BD12IC0MEFJ-M		1.2											HTSOP-J8	
BD15IC0MEFJ-M		1.5											HTSOP-J8	
BD18IC0MEFJ-M		1.8											HTSOP-J8	
BD25IC0MEFJ-M		2.5											HTSOP-J8	
BD30IC0MEFJ-M		3.0											HTSOP-J8	
BD33IC0MEFJ-M		3.3											HTSOP-J8	

**A**  
**Automotive**

Please ensure that minimum input voltage always exceeds the sum of output voltage and drop out voltage for the device.

7V Voltage Resistance 500mA LDO Regulators with Shutdown Switch (Automotive grade)													
Part No.	Input Voltage (V)	Output Voltage (V)	Output voltage precision (%)	Output Current (A)	Bias Current (mA)	I/O Voltage Difference (V)	Ripple Rejection (dB)	Load Regulation (mV)	Input Capacitor (μF)	Output Capacitor (μF)	Shutdown Switch	Protection circuit	Package
BD00IA5MEFJ-M	2.3 to 5.5	Variable 0.8 to 4.5	±1.0 / ±3.0 (Ta=-40 to +105°C) <Automotive grade>	0.5	0.25	0.4 (Io=500mA)	60 (f=100Hz, 50mVpp, Io=0A)	25 (Io=0 to 500mA)	1.0	1.0	✓	Over-Current/ Temperature	HTSOP-J8
BD10IA5MEFJ-M		1.0											HTSOP-J8
BD12IA5MEFJ-M		1.2											HTSOP-J8
BD15IA5MEFJ-M		1.5											HTSOP-J8
BD18IA5MEFJ-M		1.8											HTSOP-J8
BD25IA5MEFJ-M		2.5											HTSOP-J8
BD30IA5MEFJ-M		3.0											HTSOP-J8
BD33IA5MEFJ-M		3.3											HTSOP-J8

200mA CMOS LDO Regulators with Shutdown Switch (Automotive Grade)																
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	Vsat (mV)	Ripple rejection (dB)	Load regulation (mV)	Circuit current (μA)	Output Short current (mA)	Input Capacitor (μF)	Output capacitor (μF)	Shut down Switch	Over current protection	Temperature protection	Discharge function	Package
BU12SD2MG-M	1.7 to 6.0	1.20	±2 (Ta=-40°C to +105°C)	0.2	400 (Io=100mA)	68	1 (Io=1mA to 200 mA)	33	100	1.0	1.0	✓	✓	✓	-	SSOP5
BU15SD2MG-M		1.50			280 (Io=100mA)											SSOP5
BU18SD2MG-M		1.80			150 (Io=100mA)											SSOP5
BU25SD2MG-M		2.50			100 (Io=100mA)											SSOP5
BU28SD2MG-M		2.80			85 (Io=100mA)											SSOP5
BU30SD2MG-M		3.00														SSOP5
BU33SD2MG-M		3.30														SSOP5

### LDO Regulators with Voltage Detector and Watchdog Timer

500mA Output LDO Regulators with Voltage Detector and Watchdog Timer (Automotive grade)											
Part No.	Input voltage (V)	LDO				Voltage detector			Circuit current (μA)	Operating temperature (°C)	Package
		Output voltage (V)	Output voltage precision (%)	Output current (A)	I/O Voltage Difference (V)	Detection Voltage (V)	Voltage detector precision (%)	Function			
BD3021HFP-M	5.6 to 36.0	5	±2 (Ta=-40 to +125°C)	0.5	0.3 (Io=200mA)	4.5	±2	4.5V Voltage Detector+WDT (Active switch)	80	-40 to +125	HRP7
BD3020HFP-M						Variable (at Vs open: 4.1V)		Adjustable Voltage Detector+WDT			HRP7

200mA Output LDO Regulators with Voltage Detector and Watchdog Timer (Automotive grade)											
BD3010AFV-M	5.6 to 36.0	5	±2 (Ta=-40 to +125°C)	0.2	0.25 (Io=150mA)	Variable (RADJ open: 4.25V)	±3	Adjustable Voltage Detector+WDT	80	-40 to +125	SSOP-B20

### LDO Regulators with Voltage Detector

500mA Output LDO Regulators with Voltage Detector (Automotive grade)										
Part No.	Input voltage (V)	Output voltage (V)	Output voltage precision (%)	Output current (A)	I/O Voltage Difference (V)	Circuit current (μA)	Operating temperature (Tj)	Shutdown Switch	Package	
<b>New</b> BD4275-Cseries	5.5 to 45.0	5	±2 (Tj=-40 to +150°C)	0.5	0.25 (Io=300mA)	65	-40 to +150°C	-	TO252-J5 TO263-5	

150mA Output LDO Regulator with Voltage Detector (Automotive grade)											
Part No.	Input voltage (V)	LDO				Voltage detector		Battery Voltage Detector	Circuit current (μA)	Operating temperature (Tj)	Package
		Output voltage (V)	Output voltage precision (%)	Output current (A)	I/O Voltage Difference (V)	Detection Voltage (V)	Voltage detector precision (%)	Detection Voltage (V)			
<b>New</b> BD4269FJ-C	5.5 to 45.0	5	±2 (Tj=-40 to +150°C)	0.2	0.25 (Io=100mA)	Variable (at RADJ open: 4.62V)	±2.6	Variable	70	-40 to +150°C	SOP-J8

### Voltage Tracker

500mA Voltage Tracker (Automotive grade)								
Part No.	Input voltage (V)	Output current (A)	Offset voltage (mV)			Circuit current (μA)	Operating temperature (°C)	Package
BD3925FP-C	4.5 to 36.0	0.5	±10 (Ta=-40 to +125°C, Vcc=6 to 36V, Io=5 to 200mA)			45	-40 to +125	TO252-5
BD3925HFP-C								HRP5

### Linear Regulators for DDR SDRAM

Termination Regulators for DDR SDRAM (Automotive grade)										
Part No.	Input voltage (V)	Output voltage (V)	Voltage precision (mV)	V <sub>TT</sub> output current (A)	V <sub>REF</sub> output current (mA)	Soft start	Thermal shut down	Output ceramic capacitors	Package	
<b>New</b> BD35395FJ-M	2.5 to 5.5	0.5 to 1.375	±13.5	±1.0	None	✓	Recovery	✓	SOP-J8	

# Switching Regulators

**For Automotive**
**Switching Regulators (Integrated Switch) Single Output 1A Output (Automotive grade)**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
<b>New</b> BD90610EFJ-C	42	3.5 to 36.0	1.25 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD90201FV-M	36	7.0 to 33.0	1.75 (Isw)	Variable (1.145 to V <sub>CC</sub> ×0.643)	± 2.0	-40 to +105	500 to 2300	± 10	Self-oscillation	PWM	SSOP-B20W

**Switching Regulators (Integrated Switch) Single Output 2A Output (Automotive grade)**

<b>New</b> BD90620EFJ-C	42	3.5 to 36.0	2.5 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD9060HFP-C	36	5.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	HRP7
BD9060F-C	36	5.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	SOP8
BD9006F	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	SOP8
BD9006HFP	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 5	Self-oscillation/ External synchronization	PWM	HRP7
BD9007F	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	SOP8
BD9007HFP	36	7.0 to 35.0	2.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +105	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	HRP7
BD90010F	50	7.0 to 48.0	2.0 (Isw)	Variable (1 to V <sub>IN</sub> )	± 2.0	-40 to +95	50 to 300	± 20	Self-oscillation	PWM	SOP8

**Switching Regulators (Integrated Switch) Single Output 4A Output (Automotive grade)**

<b>New</b> BD90640EFJ-C	42	3.5 to 36.0	4.0 (Isw)	Variable (0.8 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 600	± 10	Self-oscillation/ External synchronization	PWM	HTSOP-J8
BD9781HFP	36	7.0 to 35.0	4.0 (Isw)	Variable (1 to V <sub>IN</sub> )	± 2.0	-40 to +125	50 to 500	± 20	Self-oscillation/ External synchronization	PWM	HRP7

**Switching Regulators (Integrated Switch) Ultra Low Quiescent Current / Synchronous Rectification (Automotive grade)**

BD99010EFV-M	42	3.6 to 35.0	2 (Isw)	3.3	± 2.0	-40 to +105	200 to 500	± 20	Self-oscillation	Light load mode/PWM	HTSSOP-B24
BD99011EFV-M	42	3.6 to 35.0	2 (Isw)	5	± 2.0	-40 to +105	200 to 500	± 20	Self-oscillation	Light load mode/PWM	HTSSOP-B24

**Secondary Switching Regulators (Integrated Switch) Single Output 1A Output (Automotive grade)**

Part No.	Input Voltage Maximum Rating (V)	Supply Voltage (V)	Output current (A)	Output Voltage (V)	Output voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Frequency accuracy (%)	Oscillation circuit	Control mode	Package
BD90571EFJ-C	7	2.69 to 5.5	1.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Secondary Switching Regulators (Integrated Switch) Single Output 2A Output (Automotive grade)**

BD90522EFJ-C	7	2.69 to 5.5	2.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90525EFJ-C	7	2.69 to 5.5	2.0	1.5	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90528EFJ-C	7	2.69 to 5.5	2.0	1.8	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Secondary Switching Regulators (Integrated Switch) Single Output 3A Output (Automotive grade)**

BD90532EFJ-C	7	2.69 to 5.5	3.0	1.2	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90535EFJ-C	7	2.69 to 5.5	3.0	1.5	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8
BD90538EFJ-C	7	2.69 to 5.5	3.0	1.8	± 2.0	-40 to +125	2250	± 20	Self-oscillation	Light load mode/PWM	HTSOP-J8

**Switching Controllers (External Switch) Single Output Isolated / Boost Converters (Automotive grade)**

Part No.	Input Voltage Maximum Rating (V)	Power Supply Voltage (V)	Output type	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Package
BD9031FV-C	35	4.5 to 30.0	Push Pull	± 1.5	-40 to +125	20 to 600	SSOP-B16
BD9032FV-C	40	3.5 to 35.0	Push Pull	± 1.5	-40 to +125	20 to 600	SSOP-B16

**Switching Controllers (External Switch) Dual Output Buck / Boost Converters (Automotive grade)**

Part No.	Input Voltage Maximum Rating (V)	Power Supply Voltage (V)	Output type	Reference voltage accuracy (%)	Operating temperature (°C)	Operating frequency (kHz)	Overvoltage protection is detected	Package
BD9015KV-M	35	3.9 to 30.0	Push Pull	± 1.5 (-40 to +105°C)	-40 to +105	250 to 550	L-side FET OFF	VQFP48C
BD9016KV-M	35	3.9 to 30.0	Push Pull	± 1.5 (-40 to +105°C)	-40 to +105	250 to 550	L-side FET ON	VQFP48C

**Switching Controllers (External Switch) Single Output Buck / Boost (Automotive grade)**

<b>New</b> BD9035AEFV-C	35	3.8 to 30	Push Pull	± 1.5 (-40 to +125°C)	-40 ~ +125	100 to 600	Automatic switchover	HTSSOP-B24
-------------------------	----	-----------	-----------	-----------------------	------------	------------	----------------------	------------

# Switching Regulators (Power Management IC for System)

## Power Management ICs for Automotive Camera Modules

for CCD Sensor										
Part No.	Supply Voltage(V)	Functions			Output Voltage(V)	Output Current Capacity(A)	Reset voltage (V)	Operating frequency (kHz)	Standby Current (μA)(Typ.)	Package
BD8671KN	4.5 to 9.0	Step-down DC/DC	ch1	DSP sensor	3.3	0.15	—	500 to 1200	0	VQFN28
		Step-up DC/DC	ch2		12.0	0.02	—			
		Reverse Charge pump	ch3		—5.0	0.005	—	250 to 600 <sup>*2</sup>		
BD8676KN	4.5 to 9.0	Step-down DC/DC	ch1	DSP analog	3.3	0.15	2.7	500 to 1200	0	VQFN36
			ch2	DSP Core	1.2		—			
		Step-up DC/DC+LDO	ch3	sensor	15.0	0.02	—			
		Reverse Charge pump	ch4		—5.5	0.005	—			

for CMOS Sensor										
Part No.	Supply Voltage(V)	Functions			Output Voltage(V)	Output Current Capacity(A)	Reset voltage (V)	Operating frequency (kHz)	Standby Current (μA)(Typ.)	Package
BD8674KN	4.5 to 9.0	Step-down DC/DC	ch1	DSP	3.3	0.25	2.75	500 to 1200	0	VQFN28
		Step-up Charge pump+LDO	ch2	sensor	5.0	0.03	—	640		
BD8678AMUV	4.5 to 9.0	LDO	ch1	sensor	2.8	0.06	2.4	800 to 1200	0	VQFN020V4040
		Step-down DC/DC	ch2	DSP	1.5	0.15	—			
BD8682MUV <sup>†</sup>	5.9 to 18.0	High Voltage Step-down DC/DC	ch1	—	Variable	0.5	—	500	0	VQFN32SV5050
		LDO	ch2	sensor	2.8V/3.3V	0.13	V <sub>o2</sub> × 0.86	—		
		LDO	ch3		1.8V/OFF	0.06	—	—		
		Step-down DC/DC	ch4	DSP	1.2V/1.5V/1.8V	0.25	—	1000		

<sup>†</sup> : Automotive grade \*2 : 1/2 of DC/DC

## High Voltage Monitor

Isolated High Voltage Monitor (Automotive grade)									
Part No.	Supply voltage 1 (V)	Supply voltage 2 (V)	Isolation voltage (Vrms)	Circuit current 1 (mA)	Circuit current 2 (mA)	Output Duty accuracy (%)	Operating temperature (°C)	Package	
<b>New</b> BM67290FV-C	8.0 to 24.0	3.0 to 5.5	2,500	4.6	0.2	±3.5	-40 to +125	SSOP-B20W	

## Temperature Monitor

Isolated Temperature Monitor (Automotive grade)										
Part No.	Supply voltage 1 (V)	Supply voltage 2 (V)	Isolation voltage (Vrms)	Circuit current 1 (mA)	Circuit current 2 (mA)	Input Voltage Range (V)	Output current accuracy (%)	Output Duty accuracy (%)	Operating temperature (°C)	Package
<b>New</b> BM66002FV-C	9.0 to 24.0	3.0 to 5.5	2,500	3.75	0.2	1.4 to 4.0	±2.0	±2.0	-40 to +125	SSOP-B20W

## Gate Drivers

### Isolated Gate Drivers

Isolated Gate Drivers (Automotive grade)										
Part No.	Input-side supply voltage (V)	Output-side positive supply voltage (V)	Output-side negative supply voltage (V)	Isolation voltage (Vrms)	I/O delay time (ns)	Minimum input pulse width (ns)	Maximum output current (A)	Operating temperature range (°C)	Function	Package
BM6101FV-C	4.5 to 5.5	14 to 24	-12 to 0	2,500	350	180	3.0	-40 to +125	Miller Clamp / Fail Output / Built-in under voltage lock out circuit/ Thermal protection/ Short current protection /DESAT/ Soft turn-off function for short current protection	SSOP-B20W
BM6102FV-C	4.5 to 5.5	14 to 20	—	2,500	200	100	3.0	-40 to +125	Miller Clamp / Fail Output / Built-in under voltage lock out circuit/ Thermal protection/ Short current protection /DESAT/Soft turn-off function for short current protection	SSOP-B20W
BM6104FV-C	4.5 to 5.5	10 to 24	-12 to 0	2,500	150	90	3.0	-40 to +125	Miller Clamp / Fail Output / Built-in under voltage lock out circuit/ Short current protection /DESAT/Soft turn-off function for short current protection	SSOP-B20W
<b>New</b> BM60014FV-C	4.5 to 5.5	10 to 24	—	2,500	120	70	3.0	-40 to +125	Miller Clamp / Fail Output / Built-in under voltage lock out circuit	SSOP-B20W

Isolated Gate Drivers with Flyback Controller (Automotive grade)										
Part No.	Input-side supply voltage (V)	Output-side positive supply voltage (V)	Output-side negative supply voltage (V)	Isolation voltage (Vrms)	I/O delay time (ns)	Minimum input pulse width (ns)	Maximum output current (A)	Operating temperature range (°C)	Function	Package
<b>New</b> BM60051FV-C	4.5 ~ 24 4.5 ~ 5.5	9 to 24	—	2,500	260	180	5.0	-40 to +125	Miller Clamp / Fail Output / Built-in under voltage lock out circuit/ Temperature Monitor/ Short current protection/Soft turn-off function for short current protection	SSOP-B28W



# Power Management Switch

## 1 Channel Compact High Side Switch ICs (Automotive grade)

Part No.	Input voltage (V)	ON resistance (mΩ)	Control input logic	Output current (A)	Over current detection (A) Min. / Typ. / Max.	Output turn on time (ms)	OCF	Thermal shut down	Flag output delay/ at over current (ms)	Discharge resistance (Ω)	Package
<b>New</b> BD2262G-M	2.7 to 5.5	120	H Active	0.2	0.2 / 0.3 / 0.4	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2264G-M	2.7 to 5.5	120	H Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2265G-M	2.7 to 5.5	120	L Active	0.5	0.63 / 0.765 / 0.9	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2266G-M	2.7 to 5.5	120	H Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2267G-M	2.7 to 5.5	120	L Active	0.75	0.82 / 0.97 / 1.12	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2268G-M	2.7 to 5.5	110	H Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2269G-M	2.7 to 5.5	110	L Active	1.0	1.15 / 1.275 / 1.4	1.0	Recovery	Recovery	15	60	SSOP5
<b>New</b> BD2244G-M*	2.8 to 5.5	100	H Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6
<b>New</b> BD2245G-M*	2.8 to 5.5	100	L Active	1.5	0.2 to 1.7 (adjustable)	0.6	Recovery	Recovery	7	60	SSOP6

\* UL approved File No. E243261

# Isolated / No Isolated Power Supply

## DC/DC Controller (Automotive grade)

Part No.	Topology	Primary/Secondary	Supply Voltage (V)	Switching Frequency (kHz)	Frequency Synchronization	I/F	Package
BD8325FVT-M	Active Clamp Forward	Primary IC	9 to 18	50 to 500	✓	—	TSSOP-B30

# LED Drivers

## Buck-Boost LED Drivers

### White LED Drivers (Automotive grade)

Part No.	Power supply (V)	Boost FET	Number of channel(ch)	Output voltage(V)	Output current(mA)	Switching frequency(MHz)	Brightness control	Operating temperature(°C)	Package
BD81A04AMUV-M	4.5 to 35.0	Integrated	4	35Max.	120Max./ch	0.2 to 2.2	PWM	-40 to +125	VQFN28SV5050
<b>New</b> BD81A34EFV-M	4.5 to 35.0	External	4	35Max.	120Max./ch	0.2 to 2.2	PWM	-40 to +125	HTSSOP-B28
<b>New</b> BD81A34MUV-M	4.5 to 35.0	External	4	35Max.	120Max./ch	0.2 to 2.2	PWM	-40 to +125	VQFN28SV5050

### White LED Drivers for Head Light (Automotive grade)

Part No.	Power supply (V)	Application	Number of channel(ch)	Maximum Input Voltage(V)	Drive Current	Dimmer Mode	DC/DC	Operation Temperature(°C)	Package
BD8381AEFV-M	5.0 to 30.0	Head Lamp/DRL	1	50	Depend on Extra parts	PWM/DC	Buck-Boost, Boost, Buck	-40 to +125	HTSSOP-B28

## Constant Current / Serial-in Parallel-out LED Drivers

### Parallel-out LED Drivers (Automotive grade)

Part No.	Supply Voltage (V)	Output Voltage (V)	No. of Output (ch)	Output Method	Max. LED Current	Each Output Format	other	Control Method	Max. Clock Frequency	Package
<b>New</b> BD8378FV-M	3.0 to 5.5	35	8	Open Drain	50mA/ch	ON/OFF	—	Shift Resister Latch	1.25MHz	SSOP-B16
<b>New</b> BD8379FV-M	3.0 to 5.5	35	12	Open Drain	50mA/ch	ON/OFF	—	Shift Resister Latch	1.25MHz	SSOP-B20
BD18377EFV-M	3.0 to 5.5	10	12	Constant Current	50mA/ch	Built-in 64-step current DAC	PWM control for all channel	SPI	1.25MHz	HTSSOP-B20
☆BD2808MUV-M	3.0 to 5.5	20	RGB × 8 (24ch)	Constant Current	50mA/ch	Built-in 64-step current DAC for RGB	Built-in 256-step PWM control for all channel	2-Wire Serial	1.0MHz	VQFN48MCV070

### LED Source Drivers (Automotive grade)

Part No.	Power supply (V)	Application	Number of channel(ch)	Maximum Input Voltage(V)	Maximum Current (mA)	Dimmer Mode	Accuracy of Current	Operating temperature (°C)	Package
BD8372EFJ-M	5.5 to 40.0	DRL/Turn/Rear	1	50	200	High Current/ Low Current	±3% (Ta=25°C)	-40 to +125	HTSOP-J8
BD8372HFP-M	5.5 to 40.0	DRL/Turn/Rear	1	50	200	High Current/ Low Current	±3% (Ta=25°C)	-40 to +125	HRP7
BD8374EFJ-M	4.5 to 42.0	DRL/Turn/Rear	1	50	500	PWM	±3% (Ta=25°C)	-40 to +125	HTSOP-J8
BD8374HFP-M	4.5 to 42.0	DRL/Turn/Rear	1	50	500	PWM	±3% (Ta=25°C)	-40 to +125	HRP7

☆ : Under development



# 3-Phase Brushless Motor Drivers

## 3-Phase Brushless Motor Pre-Driver (Automotive grade)

### BD16805FV-M



Part No.	Max. Voltage (V)	Supply Voltage (V)	Operating Temperature (°C)	Circuit Current (mA)	Input Threshold Voltage		External FET Drive Voltage		PWM Frequency (kHz)	Package
					H Level(V)	L Level(V)	Upper(V)	Lower(V)		
BD16805FV-M	60	8 to 18	-40 to +110	15.2	3.0	1.0	2×V <sub>cc</sub> -0.5	11.5	25	SSOP-B40

## Car Access

### Antenna Drivers (Automotive grade)

Part No.	Power supply (V)	Circuit current(Standby) (μA)	Circuit current (Operating mode) (mA)	Output ON Duty(%)			Operating Temperature Range (°C)	Package
				V <sub>cc</sub> =3.5V	V <sub>cc</sub> =4V	V <sub>cc</sub> =7V		
BD6934FV	3.5 to 8.0	0	3.5	9.2	15	49	-40 to +85	SSOP-B16

Part No.	Power supply(V)		Channel(ch)		Output current(A)	Operating Temperature Range (°C)	Package
	V <sub>cc</sub>	VS1,VS2	Full bridge	Half bridge			
BD6933FM-M	4.5 to 5.5	4.5 to 8.0	3	2	1.5	-40 to +85	HSOP-M28

## Isolators

### 2.5kVrms Isolators (Automotive grade)













Part No.	Supply Voltage (V)	V <sub>cc</sub> 1 Supply Current 1@DC (mA)	V <sub>cc</sub> 2 Supply Current 2@DC (mA)	Channel number (ch)	Max. Propagation delay (ns)	Isolation Voltage (Vrms)	Operating Temperature Range (°C)	Package
BM67220FV-C	4.5 to 5.5	0.21	0.21	2	45	2.5k	-40 to +125	SSOP-B20W
BM67221FV-C	4.5 to 5.5	0.21	0.21	2	45	2.5k	-40 to +125	SSOP-B20W

## Transceiver

### LIN Transceiver (Automotive grade)

Part No.	Supply voltage (V)	Absolute Maximum input (V)	Baud rates (kbps)	Type	Low slope mode	Dominant time-out	Sleep mode	Package
BD41020FJ-C	5.0 to 27.0	-27.0 to +40.0	20	LIN 2.1	✓	✓	✓	SOPJ-8

Automotive

 Symbol Key	 60V MAX Voltage resistance	 180° PWM Output power system	 External output FET H-side:Nch/L-side:Nch	 FG AMP Built-in FG Amp	 HYS AMP Built-in hysteresis Amp	 T.S.D. Built-in thermal shut-down circuit	 PWRW Switch able between forward and reverse	 Motor lock protection Built-in motor lock-up protection circuit
	 O.C.P. Built-in over current protection circuit	 O.V.P. Built-in over voltage protection circuit	 U.V.P. Built-in under voltage protection circuit					

# Car communication LSI

## FM data broadcast reception LSI

(LAPIS Semiconductor products)

FM data reception tuner						
Part No.	Feature	Supply Voltage (V)	Supply Current (Max.)	Operating Temperature (°C)	Package	
☆ML7174	FM VICS®/DARC® tuner, FM multiplexing demodulate LSI for VICS®(DARC®), Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,SPI slave	3.0 to 3.6	TBD	- 40 to + 85	WQFN64	
☆ML7183	FM VICS®/DARC® tuner & Filter LSI, BPF, I²C slave	3.0 to 3.6	TBD	- 40 to + 85	WQFN64	
FM multiplexing demodulate for VICS®						
<b>New</b> ML7154	VICS®(DARC®) compliant FM multiplexing demodulate LSI for VICS®(DARC®), Built-in BPF, frame memory, and VICS® descrambler, Frames A,B,C,SPI slave	3.0 to 3.6	28mA	- 40 to + 85	WQFN64	
MSM9565[J]	FM multiplexing demodulate LSI for VICS®(DARC®), BPF&frame memory built-in VICS® descrambler, Frames A,B,C, 8bit bus interface	3.0 to 3.6	28mA	- 40 to + 85	QFP44	
ML9574[J]	FM multiplexing demodulate LSI for VICS®(DARC®), BPF&frame memory built-in VICS® descrambler, Frames A,B,C, 16bit bus interface	3.0 to 3.6	35mA	- 40 to + 85	TQFP64	
FM multiplexing demodulate for DARC®						
MSM9563	FM multiplexing demodulate LSI for DARC®, BPF&frame memory built-in, Frames A,B,C, 8bit bus interface	3.0 to 3.6	28mA	- 40 to + 85	QFP44	

[J]: This LSI is limited to the market in Japan.

VICS® is a registered trademark of Vehicle Information and Communication System Center. DARC® is a registered trademark of NHK System, Inc.

☆ : Under development

# Digital terrestrial broadcasting reception LSI

## Japanese System (ISDB-T)

(LAPIS Semiconductor products)

RF tuner + OFDM demodulator for 1 segment digital terrestrial broadcasting						
Part No.	Transmission Standard	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (°C)	Package
ML7147	ISDB-T	Compliant to One-Seg broadcasting of ISDB-T (ARIB STD-B31) digital terrestrial television broadcasting. RF tuner, OFDM demodulate, error correction function. Serial, parallel TS output.	2.7 to 3.0 1.5 to 3.6 1.1 to 1.3	70mW (at 1seg reception, include RF)	- 40 to + 90	WQFN80
4 diversity/Full segment OFDM demodulation digital terrestrial broadcasting						
ML7138	ISDB-T	Compliant to Full-Seg and One-Seg broadcasting of ISDB-T (ARIB STD-B31) digital terrestrial television broadcasting. 4 diversity x 1CH or 2 diversity x 2CH reception. OFDM demodulate, error correction function. Serial, parallel TS output.	3.0 to 3.6 2.7 to 3.6 1.1 to 1.3	234mW (4 diversity full segment reception)	- 40 to + 85	TFBGA144

## Chinese System (DTMB)

(LAPIS Semiconductor products)

Demodulator for Chinese						
Part No.	Transmission Standard	Feature	Supply Voltage (V)	Power Consumption	Operating Temperature (°C)	Package
ML7109S	GB20600-2006	China's national digital terrestrial broadcasting standard GB20600-2006 (DTMB) compliant demodulation. Built-in SDRAM for de-interleave. MPEG-2 serial/parallel TS output.	3.0 to 3.6 1.1 to 1.3	270mW (at reception)	- 20 to + 85	WQFN64

# TFT Driver Series

## Drivers for small to medium LCD Panels

(LAPIS Semiconductor products)

TFT-LCD driver						
Part No.	Logic Supply Voltage (V)	LCD Voltage (V)	Number of Driver Outputs	I/F	Operating Temperature (°C)	Package
ML9860B	2.1 to 3.6	10.0 to 14.6	480	RSDS	-40 to +95	Au bump chip
ML9863A	2.4 to 3.6	8.0 to 14.6	960/804/792/768	CMOS/RSDS	-40 to +95	Au bump chip
ML9872	2.7 to 3.6	Less than 40	540/480/400/384/360/300/240	CMOS	-40 to +95	Au bump chip
<b>New</b> ML9881	2.7 to 3.6	8.0 to 14.6	1440/1284/1278/1260/1200/1080/1026/1020	RSDS/mini-LVDS	-40 to +95	Au bump chip

# TN/STN LCD Driver Series

## LCD Segment Drivers

Standard Segment Drivers															
Part No.	Display (dots)	Outputs		Operating Voltage (V)		Duty	Bias	Interface	EVR	GPO	Independent blink	LED Dr	PWM Gen.	Keyscan	Package
		SEG	COM	I/F Power Supply (VDD)	LCD Power Supply (VLCD)										
BU9797FUV-M	144	36	4	2.5 to 5.5		1/4	1/2,1/3	2wire serial	—	—	—	—	—	—	TSSOP-C48V
Multifunction Segment Drivers															
BU97510CKV-M	216	54	4	2.7 to 6.0		1/4,1/3	1/2,1/3	3wire serial	—	6port (6ch PWM)	—	—	6ch 6bit	—	VQFP64
BU97520AKV-M	276	69	4	2.7 to 6.0		1/4,1/3	1/2,1/3	4wire serial	—	6port (6ch PWM)	—	—	6ch 8bit	5×6 Max. 30Key	VQFP80
<b>New</b> BU97530KVT-M	445	89	5	2.7 to 6.0		1/5,1/4,1/3 Static	1/2,1/3 Static	4wire serial	✓	9port (9ch PWM)	—	—	9ch 8bit	5×6 Max. 30Key	TQFP100V

## Controller driver for low duty LCD

(LAPIS Semiconductor products)

LCD controller driver (Package product)												
Part No.	Max. No. of Segment Outputs	Max. No. of Driving Segments					Internal Oscillation Frame Frequency (Hz)	Logic Supply Voltage (V)	Driver Supply Voltage (V)	Operating Temperature (°C)	Feature	Package
		static	1/2	1/3	1/4	1/5						
ML9470-12	80	80	160	—	—	—	3.0 to 5.5 (single)	3.5 to 5.5	−40 to +105	Supports external clock input	QFP100	
ML9471	80	—	—	240	320	400	3.0 to 5.5 (single)	3.5 to 5.5	−40 to +105	Supports external clock input	TQFP100	
ML9472	60	60	120	—	—	—	3.0 to 5.5 (single)	3.5 to 5.5	−40 to +105	Supports external clock input	P-TQFP80-1212-0.50	
ML9473	60	—	—	180	240	300	3.0 to 5.5 (single)	3.5 to 5.5	−40 to +105	Supports external clock input	P-TQFP80-1212-0.50	
ML9475	40	—	—	120	160	—	3V ± 10% / 5V ± 10%	3.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in	QFP56	
ML9476	16	—	—	48	64	—	3V ± 10% / 5V ± 10%	3.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in	TQFP48	
ML9477	32	—	—	96	128	—	3V ± 10% / 5V ± 10%	3.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in	TQFP48	
<b>New</b> ML9484	50	50	100	150	200	—	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in	TQFP64	
LCD controller driver (Gold bump product)												
ML9480	40	40	80	120	160	—	65/75/85/95/130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in / No external parts	Au bump chip
ML9478C	80	80	160	240	320	—	65/75/85/95 command switching	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in / No external parts	Au bump chip
ML9479E	160	160	320	480	640	—	65/75/85/95 command switching	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in / EMS countermeasure built in / No external parts	Au bump chip
ML9488	80	80	160	240	320	—	130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in	Au bump chip
ML9489	160	160	320	480	640	—	130/150/170/190 command switching	2.7 to 5.5	4.5 to 5.5	−40 to +105	Supports external clock input / Bias generator built in	Au bump chip

## Car Clock Drivers

(LAPIS Semiconductor products)

Car clock							
Part No.	Display Duty	VFD Driving Voltage (V)	Logic Supply Voltage (V)	Operating Temperature (°C)	Supply Current (Max.)	No. of Digit	Package
ML9298	1/2	4.0 to 18	No need	−40 to +85	0.6mA	4digits × 1line and col.	SSOP32
ML9098B	Static, 1/2	3.0 to 5.5	3.0 to 5.5	−40 to +105	0.6mA	4digits × 1line and col., AM, PM	TQFP48

# Speech synthesis LSI for automotive

(LAPIS Semiconductor products)

Support for 105°C/4ch simultaneous playback/ML22594 Built-in Mask ROM+serial external memory												
Part No.	Operating Voltage (V)	Operating Frequency	Operating Temperature (°C)	ROM Capacity (bit)	Number of Phrases	Maximum Playback Time(sec)	CPU I/F	SP Amp Output (W)/Class	Number of Mixing (Internal)	DAC	Others	Package
ML22594	4.5 to 5.5	4.096MHz	-40 to +105	Mask 6M <sup>*4</sup> External maximum 128M	1024 <sup>*5</sup> (Built-in 512, External 512)	Built-in 303sec <sup>*1</sup> External 109min <sup>*3</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Mask ROM												
ML22572	2.7 to 5.5	4.096MHz	-40 to +105	Mask 2M	1024	98 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Flash/Mask ROM												
ML22573/ ML22Q573	2.7 to 5.5	4.096MHz	-40 to +105	Mask/Flash 4M	1024	201 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Fail safe	SSOP30
Support for 105°C/4ch simultaneous playback/built-in Flash ROM												
ML22Q553	4.5 to 5.5	4.096MHz	-40 to +105	Flash 4M	1024	201 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	4ch	16bit	Speaker terminal short circuit detection function	SSOP30
Support for 85°C built-in Flash/Mask ROM												
ML22331/ ML22Q331	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	30	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30
ML22321/ ML22Q321	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	62	43 <sup>*1</sup>	Clock synchronization Serial	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit/ Analog volume control	SSOP30
ML22341/ ML22Q341	2.3 to 5.5	4.096MHz	-40 to +85	Mask/Flash 896K	30	43 <sup>*1</sup>	Stand alone	1.0/ AB-class	1ch	16bit	Disconnection detection/ Temperature protection circuit	SSOP30
Support for 85°C built-in Flash ROM												
ML22Q374	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	Clock synchronization Serial	1.0/ D-class	1ch	—	Disconnection/ Short circuit detection Built-in oscillator	SSOP16
ML22Q394	2.0 to 5.5	4.096MHz (Built-in)	-40 to +85	Flash 692K	30	27 <sup>*2</sup>	I <sup>2</sup> C	1.0/ D-class	1ch	—	Disconnection/ Short circuit detection Built-in oscillator	SSOP16

\*1 : Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM. \*2 : Maximum playback time when the sampling frequency is 6.4kHz in ADPCM2.  
 \*3 : With an external memory module (Max. 128Mbit). Maximum playback time when the sampling frequency is 6.4kHz in HQ-ADPCM.  
 \*4 : Mask's built-in ROM is 6Mbit and an external memory module (Max. 128Mbit) can be connected.  
 \*5 : Total of mask's internal 512 phrases and external memory's 512 phrases.

## Audio Processors

### Analog Audio Processors

Sound Processors with Built-in 3-band Equalizer																			
Part No.	Supply voltage (V)	Current consumption (mA)	INPUT Selector		Input Gain (dB)	Volume (dB)	Fader (Rear)		Parametric EQ	LOUDNESS	LPF/HPF for SUB WOOFER	MIXING		LEVEL METER	OPTION	Serial interface	Output noise voltage (µVrms)	Distortion (%)	Package
			Single	ISO			(dB)	Outputs				ATT	ATT						
<b>New</b> BD37033FV	7 to 9.5	31	3/5	2/1	0 to +16	+15 to -79 -∞	+15 to -79, -∞	6	✓	✓	LPF	✓	✓	✓	—	I <sup>2</sup> C	5.5	0.002	SSOP-B28
<b>New</b> BD37034FV	7 to 9.5 VccL to 13	36	3/5	2/1	0 to +16	+15 to -79 -∞	+15 to -79, -∞	6	✓	✓	LPF + HPF	✓	✓	✓	High Voltage output	I <sup>2</sup> C	6	0.002	SSOP-B28

## Audio Amplifiers

### Speaker Amplifiers

Portable Amplifiers 1.1W to 1.5W Monaural Speaker Amplifiers										
Part No.	Supply voltage (V)	Power dissipation (mW)	Quiescent current (mA)	Standby current (µA)	Voltage gain (dB)	Output power (R <sub>L</sub> =8Ω, THD=10%)		Distortion (%)	Output noise voltage (dBV)	Package
						V <sub>CC</sub> =3.6V	V <sub>CC</sub> =5.0V			
BH7824FVM	2.4 to 5.5	470	3.5	0	0 to 20	0.60W	1.1W	0.07	-94	MSOP8

## Video Amplifiers

Isolation Amplifier											
Part No.	Supply voltage (V)	Circuits	Circuit current (mA)	Input type	voltage gain (dB)	CMRR (dB)	Common-mode input voltage range (V) V <sub>CC</sub> =5V	Max. output level (V <sub>PP</sub> )	Freq.chara (dB)	Input register (kΩ)	Package
BH7673G	4.5 to 5.5	1	4.8	Bias	0.0	60	5.2	3.8	0.0(f=10MHz)	150	SSOP5

# Beamforming

## Beamforming

Super unidirectional microphone signal processing IC									
Part No.	Supply Voltage (V)	Operating Temperature (°C)	Circuit current (mA)	Sampling frequency (kHz)	Number of mic (pcs.)	Mic pitch (mm)	Volume	Pattern	Package
BU8332KV-M	3.0 to 3.6	-40 to +85	15	16	2	10	Input volume : -20 to 30dB (2dB Step) Output volume : -25 to 16dB (1dB Step)	Cardioid Bi-directional Hyper-Cardioid	VQFP48

# Audio Converters

## High performance audio CODEC

(LAPIS Semiconductor products)

Monaural CODEC WCSP type with noise tolerance/LoudSound™																								
Part No.	Supply Voltage (V)	ADC		DAC		Full/ Half Duplex	Microphone Input		Speaker Output		Maximum Output	Line Output	Head phone Output	CPU I/F	Serial Audio I/F	Effect					Other Function	Operating Temperature (°C)	Package	Size (mm×mm)
		Number of Channels	S/N (dB)	Number of Channels	S/N (dB)		Type	Number of Inputs	Type	Monaural/Stereo						Loud Sound™	EQ	Wind Cut	Notch	ALC				
ML26125HB	2.7 to 3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I <sup>2</sup> S, DSP, Lj, Rj, a-low, μ-low	✓	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WCSP25	2.58×2.48
ML26124-00HB	2.7 to 3.6	1	92	1	95	Full	Single	1	Class AB	Monaural	500mW	Monaural	—	SPI	I <sup>2</sup> S, DSP, Lj, Rj, a-low, μ-low	—	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WCSP25	2.56×2.46
ML26124-02GD	2.7 to 3.6	1	92	1	95	Full	Single Differential Digital	2	Class AB	Monaural	500mW	Monaural	—	I <sup>2</sup> C/SPI	I <sup>2</sup> S, DSP, Lj, Rj, a-low, μ-low	—	✓	✓	✓	✓	VIDEO LDO	-20 to +85	WQFN32	5.0×5.0
ML2612GD	HVDD 2.7 to 3.6 LVDD 1.65 to 2.75	1	92	1	95	Half	Single Differential	1	Class AB	Monaural	500mW	—	—	I <sup>2</sup> C/SPI	I <sup>2</sup> S, DSP, Lj, Rj	—	✓	✓	✓	✓	—	-20 to +85	WQFN24	4.0×4.0
ML2614HB	HVDD 2.7 to 3.6 LVDD 1.65 to 2.75	1	92	1	95	Half	Single	1	Class AB	Monaural	500mW	—	—	SPI	I <sup>2</sup> S, DSP, Lj, Rj	—	✓	✓	✓	✓	—	-20 to +85	WCSP20	2.46×1.96

# Image Correction

Image Correction ICs for Panel										
Part No.	Power Supply Voltage(V)			Image Data size	Control Interface	Input/Output Digital Interface	Image Adjustment	PWM Output	LVDS Transmitter	Package
	V <sub>DD</sub> Core	V <sub>DD</sub> I/O	V <sub>DD</sub> LVDS							
BU1573KV	1.40 to 1.60	2.7 to 3.6	—	Supports up to WVGA + (864 × 480)	I <sup>2</sup> C BUS	18bitRGB Interface BUS Interface	—	✓	—	VQFP64
BU1523KV	1.65 to 1.95	3.0 to 3.6	3.0 to 3.6	Supports up to WVGA + (864 × 480)	I <sup>2</sup> C BUS	24bitRGB Interface 8bit YUV = 4 : 2 : 2 ITU-R BT.656	✓	—	✓	VQFP100
Video Encoders built-in Image Correction										
Part No.	Power Supply Voltage(V)			Image Data size	Control Interface	Input/Output Digital Interface	Fog Reduction	Video Encoder	Package	
	V <sub>DD</sub> Core	V <sub>DD</sub> I/O	AV <sub>DD</sub>							
BU6521KV	1.40 to 1.60	2.7 to 3.6	2.7 to 3.6	ITU-R BT.656	I <sup>2</sup> C BUS Serial EEPROM interface	8bit YUV = 4 : 2 : 2 ITU-R BT.656	✓	✓	VQFP48C	

# Video LSIs

## Video Decoder Series

(LAPIS Semiconductor products)

CVBS/S-video										
Part No.	Supply Voltage(V)	Input (Analog)		Output (LVTTTL)	Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Operating Temperature (°C)	Package
		Terminal	Type							
ML86101A	3.3/1.5	CVBS×4 or CVBS×2 + S-video ×1 or S-video×2	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8bit	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz	27MHz, 24.545454MHz, 29.5MHz, 28.6363MHz	✓	Simple, small	-40 to +85	TQFP48
ML86V7668A	3.3/2.5	CVBS×4 or CVBS×1 + S-video×3	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16bit RGB 18bit	13.5MHz, 12.272727MHz	27MHz, 24.545454MHz	—	CVBS4 input S-video3 input	-40 to +85	TQFP100
CVBS/S-video/Component/RGB										
ML86V7675	3.3/1.5	CVBS×4 +(Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8bit	7.99300MHz to 33.333MHz	7.99300MHz to 33.333MHz	✓	WGA, EGA analog RGB supported	-40 to +85	TQFP64

**Video Encoder Series**

(LAPIS Semiconductor products)

CVBS										
Part No.	Supply Voltage(V)	Input (LVTTTL)	Output (Analog)		Pixel Frequency	Sampling Frequency	Crystal Oscillator supported	Feature	Operating Temperature (°C)	Package
			Terminal	Type						
<b>ML86V76580</b>	3.3/1.8	ITU-R.BT.656 YCbCr 8bit	CVBS	NTSC PAL	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz	54MHz, 49.090908MHz, 59MHz, 57.272728MHz	—	No need of LPF	-40 to +85	TQFP48 W CSP25
CVBS/S-video/Component/RGB										
<b>ML86V7655</b>	3.3/2.5	ITU-R.BT.656 YCbCr 8/16/24bit RGB 24bit	CVBS S-video Component	NTSC PAL	13.5MHz, 12.272727MHz, 14.75MHz, 14.318182MHz, 18MHz	27MHz, 24.545454MHz, 29.5MHz, 28.6363MHz, 36MHz	—	I/P, P/I conversion	-40 to +85	TQFP100

**Display Controller Series for Small to Medium-Sized TFT LCD**

(LAPIS Semiconductor products)

T-CON, Video decoder included											
Part No.	Supply Voltage (V)	Input (Analog)		Input (LVTTTL/LVDS)	Output (LVTTTL/LVDS)	Resolution	OSD	MCU	Feature	Operating Temperature (°C)	Package
		Terminal	Type								
<b>ML86V8201</b>	3.3/1.5	CVBS×2 or S-video×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 YCbCr 8bit RGB 18/24bit	QVGA to WVGA	Line	—	Rear camera function Image quality adjustment	-40 to +85	TQFP100
<b>New</b> <b>ML86203</b>	3.3/1.5	CVBS×1	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 YCbCr 8bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	—	—	Rear camera function WXGA panel support Image quality adjustment	-40 to +85	TQFP80
☆ <b>ML86206</b>	3.3/1.5	CVBS×2	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	ITU-R BT.656 YCbCr 8bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	Text Line	—	LVTTTL/LVDS I/F WXGA panel support Image quality adjustment	-40 to +85	TQFP100
☆ <b>ML86286</b>	3.3/1.5	CVBS×2	NTSC PAL	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	ITU-R BT.656 YCbCr 8bit RGB 18/24bit LVDS 4Lane (RGB 18/24bit)	VGA to WXGA	Text Line	—	LVTTTL/LVDS I/F WXGA panel support Picture in Picture Image quality adjustment	-40 to +85	TQFP128
<b>ML86V8202C</b>	3.3/1.8	CVBS×2 +(Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit	ITU-R BT.656 style YCbCr 8/16/24bit RGB 18/24bit	QVGA to WVGA	—	—	Component video support Image quality adjustment	-40 to +85	TQFP100
☆ <b>ML86240</b>	3.3/1.5	CVBS×4 or CVBS×2 +(Comp or S-video)×1 +Comp×1	NTSC PAL SECAM	ITU-R BT.656 YCbCr 8/16/24bit RGB 18/24bit 2ch	ITU-R BT.656 YCbCr 8bit RGB 18/24bit	QVGA to WVGA	Text Line	—	Component video support Digital video input ×2 Rear camera function Image quality adjustment	-40 to +85	BGA144
TCON, Image adjustment functions included											
Part No.	Supply Voltage (V)	Input (Analog)		Input (LVTTTL)	Output (LVTTTL)	Resolution	OSD	MCU	Feature	Operating Temperature (°C)	Package
		Terminal	Type								
<b>ML86V8101</b>	3.3	—	—	RGB 18bit	RGB 18bit	QVGA to QHD	—	—	Built-in image quality adjustment function	-40 to +85	TQFP64
<b>ML86V8102</b>	3.3	—	—	RGB 18/24bit	RGB 18/24bit	QVGA to QHD	—	—	RGB 24 bits supported image quality adjustment function	-40 to +85	TQFP80

☆ : Under Development

**Touch Screen Controller**

Resistive type										
Part No.	Supply voltage (V)	MCU	Resolution	Touch detection	Stand-by current (μA)	Active current (mA)	Host I/F	Operating temperature (°C)	Package	
<b>BU21024FV-M</b>	2.7 to 3.6	8bit	1024 × 1024	2 point/Single	60	4.0	I²C/SPI	-40 to +85	SSOP-B28	



# DRAM

## Legacy DRAM FP/EDO for Automotive

(LAPIS Semiconductor products)

Automotive										
Part No.	Supply Voltage (V)	Density (bit)	Number of Data bits	Configuration (word × bit)	Circuit function	Access Time (ns)	Refresh cycle (cycles/ms)	Operating Temperature Ta (°C)	Package	
MSM514400DP	5.0 ± 0.5	4M	× 4	1M × 4	Fast Page Mode	60/70	1024/16	-40 to +85	TSOP(II)26/24Cu	
MSM514400EP				256K × 16		60/70	512/8		TSOP(II)44/40	
MSM514260EP			16M	× 16	1M × 16	EDO	60		1024/16	TSOP(II)50/44
MSM5118160FP		Fast Page Mode			70/100		1024/16		TSOP(II)26/24Cu	
MSM5118165FP		EDO		40/45/50	512/64	TSOP(II)44/40				
MSM51V4400EP	3.3 ± 0.3	4M	× 4	1M × 4	Fast Page Mode	60/70	512/8		-40 to +85	TSOP(II)26/24Cu
MSM54V16258BP				256K × 16		60/70	512/8			TSOP(II)44/40
MSM51V4265EP		16M	× 4	4M × 4	Fast Page Mode	60	2048/32			TSOP(II)26/24Cu
MSM51V17400FP				EDO		60	1024/16			
MSM51V18165FP			× 16	1M × 16	EDO	60	1024/16			

## Legacy DRAM SDRAM for Automotive

(LAPIS Semiconductor products)

Automotive												
Part No.	Data Rate Type	Supply Voltage (V)	Density (bit)	Number of Data bits	Configuration (bank × word × bit)	Max. Operating Frequency (MHz)	Refresh Cycle (cycles/ms)	Cycle Time (ns)	Features	Operating Temperature Ta (°C)	Package	
MSM56V16160FP	SDR	3.3 ± 0.3	16M	× 16	2 × 512K × 16	100	4096/64	10	—	-40 to +85	TSOP(II)50	
MSM56V16160KP						125		8/10	Drivability control		TSOP(II)50Cu	
☆MSM56V16161NP						166		6/7/7.5/8/10	Drivability control		TSOP(II)50Cu	
MD56V62160E-xxTAP			64M		4 × 1M × 16	100		10	—	-40 to +85	TSOP(II)54	
MD56V62160M-xxTAP						143		7/7.5/10	Drivability control		TSOP(II)54Cu	
<b>New</b> MD56V72160C-xxTAP						166		6/7/7.5/10	Drivability control		-40 to +85	TSOP(II)54Cu
<b>New</b> MD56V82160A-xxTAP						166		8192/64	6/7/7.5/10		Drivability control	-40 to +85

SDR : Single Data Rate Synchronous DRAM

☆ : Under Development

## Video Memory for Automotive

(LAPIS Semiconductor products)

Automotive												
Part No.	Supply Voltage (V)	Density (bit)	Configuration (word × bit) × port	Number of Data bits	Max. Operating Frequency (MHz)	Access Time (ns)	Cycle Time (ns)	Power Consumption (mW)		Operating Temperature Ta (°C)	Package	Notes
								Operating	Standby			
MS81V04160AP	3.3 ± 0.3	4M	(262,214 × 8) × 2	× 16	50	18/23	20/25	288	10.8	-40 to +85	QFP100	Asynchronous serial read/write, Write mask function, Output data control, Cascade, Two-port, 2 common WCLK ports.
MS81V26000-25TPZP3		26M	1,114,112 × 24	× 24	40	12	25	576	18		TQFP100Cu	Asynchronous serial read/write, Write mask function, Output data control, Cascade, The top address can be specified

# Serial EEPROM

## Automotive EEPROM

105°C Operation I <sup>2</sup> C BUS EEPROM (2-Wire) BR24Axxxxx-WM series (Automotive grade)													
Part No.	Package and suffix			Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)	
	SOP8	SOP-J8	MSOP8				Operating(mA)	Standby(µA)					
BR24A01A	F-WM	FJ-WM	—	1K	128×8	2.5 to 5.5	2	2	5	-40 to +105	10 <sup>6</sup>	40	
BR24A02	F-WM	FJ-WM	FVM-WM	2K	256×8	2.5 to 5.5	2	2	5				
BR24A04	F-WM	FJ-WM	—	4K	512×8	2.5 to 5.5	2	2	5				
BR24A08	F-WM	FJ-WM	—	8K	1K×8	2.5 to 5.5	2	2	5				
BR24A16	F-WM	FJ-WM	—	16K	2K×8	2.5 to 5.5	2	2	5				
BR24A32	F-WM	—	—	32K	4K×8	2.5 to 5.5	3	2	5				
BR24A64	F-WM	—	—	64K	8K×8	2.5 to 5.5	3	2	5				
125°C Operation Microwire BUS EEPROM (3-Wire) BR93Hxxxxx-2C series (Automotive grade)													
Part No.	Package and suffix				Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)
	SOP8	SOP-J8	TSSOP-B8	MSOP8				Operating(mA)	Standby(µA)				
BR93H46	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	1K	64×16	2.5 to 5.5	3	10	4	-40 to +125	10 <sup>6</sup>	100
BR93H56	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	2K	128×16	2.5 to 5.5	3	10	4			
BR93H66	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	4K	256×16	2.5 to 5.5	3	10	4			
BR93H76	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	8K	512×16	2.5 to 5.5	3	10	4			
BR93H86	RF-2C	RFJ-2C	RFVT-2C	RFVM-2C	16K	1K×16	2.5 to 5.5	3	10	4			
125°C Operation SPI BUS EEPROM BR25Hxxxxx-2C series (Automotive grade)													
Part No.	Package and suffix				Density (bit)	Bit format (word×bit)	Supply voltage range(V)	Current consumption(Max.)		Write cycle time (Max.)(ms)	Operating temperature range(°C)	Endurance (times)	Data retention (years)
	SOP8	SOP-J8	TSSOP-B8	MSOP8				Operating(mA)	Standby(µA)				
BR25H010	F-2C	FJ-2C	FVT-2C	FVM-2C	1K	128×8	2.5 to 5.5	4	10	4	-40 to +125	10 <sup>6</sup>	100
BR25H020	F-2C	FJ-2C	FVT-2C	FVM-2C	2K	256×8	2.5 to 5.5	4	10	4			
BR25H040	F-2C	FJ-2C	FVT-2C	FVM-2C	4K	512×8	2.5 to 5.5	4	10	4			
BR25H080	F-2C	FJ-2C	FVT-2C	FVM-2C	8K	1K×8	2.5 to 5.5	4	10	4			
BR25H160	F-2C	FJ-2C	FVT-2C	FVM-2C	16K	2K×8	2.5 to 5.5	4	10	4			
BR25H320	F-2C	FJ-2C	FVT-2C	FVM-2C	32K	4K×8	2.5 to 5.5	4	10	4			
BR25H640	F-2C	FJ-2C	FVT-2C	—	64K	8K×8	2.5 to 5.5	5.5	10	4			
BR25H128	F-2C	FJ-2C	—	—	128K	16K×8	2.5 to 5.5	5.5	10	4			
125°C Operation SPI BUS EEPROM BR35Hxxxxx-WC series (Automotive grade)													
BR35H160	F-WC	FJ-WC	FVT-WC	FVM-WC	16K	2K×8	2.5 to 5.5	3	10	5	-40 to +125	10 <sup>6</sup>	40
BR35H320	F-WC	FJ-WC	FVT-WC	FVM-WC	32K	4K×8	2.5 to 5.5	3	10	5			
BR35H640	F-WC	FJ-WC	FVT-WC	—	64K	8K×8	2.5 to 5.5	5.5	10	5			
BR35H128	F-WC	FJ-WC	—	—	128K	16K×8	2.5 to 5.5	5.5	10	5			

**A**  
**Automotive**

# FeRAM

## Ferroelectric Memory

(LAPIS Semiconductor products)

Parallel BUS FeRAM MR48Vxxxx Series								
Part No.	Memory Density (bit)	Configuration (word×bit)	Supply Voltage (V)	Operating speed	Read/Write Endurance	Data Retention	Operating Temperature Ta (°C)	Package
<b>New</b> MR48V256C	256K	32K × 8	2.7 to 3.6	t <sub>nc</sub> = 150ns	10 <sup>12</sup> Times	10 years	-40 to +85	TSOP(I)28
I <sup>2</sup> C BUS FeRAM MR44Vxxxx Series								
MR44V064A	64K	8K × 8	2.5 to 3.6	f <sub>clk</sub> = 3.4MHz	10 <sup>12</sup> Times	10 years	-40 to +85	SOP8
SPI BUS FeRAM MR45Vxxxx Series								
MR45V032A	32K	4K × 8	2.7 to 3.6	f <sub>clk</sub> = 15MHz	10 <sup>12</sup> Times	10 years	-40 to +85	SOP8
MR45V256A	256K	32K × 8	3.0 to 3.6	f <sub>clk</sub> = 15MHz				
<b>New</b> MR45V200A	2M	256K × 8	2.7 to 3.6	f <sub>clk</sub> = 34MHz				

# Operational Amplifiers

## Standard

Ground Sense Operational Amplifiers (Automotive grade)															
Part No.	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA2904YF-C	2	3 to 36	0.5	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	80	100	0.2	0.5	-40 to +125	SOP8
BA2904YFV-C															SSOP-B8
BA2904YFVM-C															MSOP8
BA2902YF-C	4	3 to 36	0.7	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	80	100	0.2	0.5	-40 to +125	SOP14
BA2902YFV-C															SSOP-B14
BA2904YF-M	2	3 to 36	0.5	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	80	100	0.2	0.5	-40 to +125	SOP8
BA2904YFV-M															SSOP-B8
BA2904YFVM-M															MSOP8
BA2902YF-M	4	3 to 36	0.7	2.0	20	30	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	V <sub>EE</sub> to V <sub>CC</sub> - 1.5	100	80	100	0.2	0.5	-40 to +125	SOP14
BA2902YFV-M															SSOP-B14

## High Speed

Ground Sense Operational Amplifiers (Automotive grade)															
Part No.	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA3472YF-C	2	3 to 36	4.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> - 1.0	100	97	97	10	4.0	-40 to +125	SOP8
BA3472YFV-C															SSOP-B8
BA3472YFVM-C															MSOP8
BA3474YFV-C	4	3 to 36	8.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> - 1.0	100	97	97	10	4.0	-40 to +125	SSOP-B14
BA3472WFV-C	2	3 to 36	4.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> - 1.0	100	97	97	10	4.0	-40 to +125	SSOP-B8
BA3474WFV-C	4	3 to 36	8.0	1.0	100	30	V <sub>EE</sub> to V <sub>CC</sub> - 2.0	V <sub>EE</sub> +0.3 to V <sub>CC</sub> - 1.0	100	97	97	10	4.0	-40 to +125	SSOP-B14

## Low Noise

Operational Amplifier (Automotive grade)															
Part No.	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Input referred noise voltage(μVrms)	Input voltage range (V)	Output voltage range(V)	Voltage gain (dB)	CMRR (dB)	PSRR (dB)	Slew rate (V/μs)	Gain bandwidth product (MHz)	Operating temperature (°C)	Package
BA4558YF-M	2	± 4 to ± 15	3.0	0.5	60	1.8	V <sub>EE</sub> +1.0 to V <sub>CC</sub> - 1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> - 1.0	100	90	90	1.0	2.0	-40 to +105	SOP8
BA4558YFV-M															SSOP-B8
BA4558YFVM-M															MSOP8
BA4560YF-M	2	± 4 to ± 15	3.0	0.5	50	1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> - 1.0	V <sub>EE</sub> +1.0 to V <sub>CC</sub> - 1.0	100	90	90	4.0	4.0	-40 to +105	SOP8
BA4560YFV-M															SSOP-B8
BA4560YFVM-M															MSOP8
BA4580YF-M	2	± 2 to ± 16	6.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> - 1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> - 1.5	110	110	110	5.0	10.0	-40 to +105	SOP8
BA4580YFVM-M															MSOP8
BA4584YFV-M	4	± 2 to ± 16	11.0	0.3	100	0.8	V <sub>EE</sub> +1.5 to V <sub>CC</sub> - 1.5	V <sub>EE</sub> +1.5 to V <sub>CC</sub> - 1.5	110	110	110	5.0	10.0	-40 to +105	SSOP-B14

Automotive A

# Comparators

## Standard

Open-Collector Comparators (Automotive grade)											
Part No.	CH	Supply Voltage (V)	Circuit current (mA)	Input offset voltage(mV)	Input bias current(nA)	Output current (mA)	Input voltage range (V)	Voltage gain (dB)	Response time (μs)	Operating temperature (°C)	Package
BA2903YF-C	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	1.3	-40 to +125	SOP8
BA2903YFV-C											SSOP-B8
BA2903YFVM-C											MSOP8
BA2901YF-C	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	1.3	-40 to +125	SOP14
BA2901YFV-C											SSOP-B14
BA2903YF-M	2	2 to 36	0.6	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	1.3	-40 to +125	SOP8
BA2903YFV-M											SSOP-B8
BA2903YFVM-M											MSOP8
BA2901YF-M	4	2 to 36	0.8	2	50	16	V <sub>EE</sub> to V <sub>CC</sub> -1.5	100	1.3	-40 to +125	SOP14
BA2901YFV-M											SSOP-B14

# Voltage Detectors (Reset ICs)

## Standard Voltage Detectors

Voltage Detectors (Automotive grade)														
Part No.	Types	Voltage detection precision (%)	Voltage detection (V)	RESET Active Voltage Range (V)	Detection step (V)	Output type	Circuit current(μA)		Hysteresis Voltage (V)	*L*Output current(mA)		RESET Active Timeout Period (ms)	Delay circuit resistance (MΩ)	Package
							ON	OFF		V <sub>DD</sub> =1.2V	V <sub>DD</sub> =2.4V			
BD48ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.60 (V <sub>S</sub> =4.8V)	0.85 (V <sub>S</sub> =4.8V)	V <sub>S</sub> ×0.05	1.0	4	—	—	SSOP5
BD49ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS	0.60 (V <sub>S</sub> =4.8V)	0.85 (V <sub>S</sub> =4.8V)	V <sub>S</sub> ×0.05	1.0	4	—	—	SSOP5
BD52ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	Open drain	0.90 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> ×0.05	1.2	5	Variable	9	SSOP5
BD53ExxG-M <sub>series</sub>	0.1V step 38 type	±1	2.3 to 6.0	0.95 to 10.0	0.1	CMOS	0.90 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> ×0.05	1.2	5	Variable	9	SSOP5
BD45Exx5G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1	Open drain	0.80 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> ×0.05	1.2	5	50	—	SSOP5
BD45Exx1G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							100	—	SSOP5
BD45Exx2G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							200	—	SSOP5
BD46Exx5G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1	CMOS	0.80 (V <sub>DET</sub> =4.8V)	0.85 (V <sub>DET</sub> =4.8V)	V <sub>DET</sub> ×0.05	1.2	5	50	—	SSOP5
BD46Exx1G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							100	—	SSOP5
BD46Exx2G-M <sub>series</sub>	0.1V step 26 type	±1	2.3 to 4.8	0.95 to 10.0	0.1							200	—	SSOP5

\*Detection voltage is applied in the "xx" of part No.. Ex. : In case of 2.3V detection voltage in BD48ExxG-M series, Part No. is BD48E23G-M.



ICs

# IC Packages

## CONTENTS

A

IC Packages

### ROHM Packages

<b>QFP Packages</b> .....	<b>P. A144</b>
<b>SON / QFN Packages</b> .....	<b>P. A147</b>
<b>SOP Packages</b> .....	<b>P. A150</b>
<b>HSOP Packages</b> .....	<b>P. A152</b>
<b>Small Packages</b> .....	<b>P. A154</b>
<b>Non-Lead Packages</b> .....	<b>P. A154</b>
<b>Power Packages</b> .....	<b>P. A155</b>
<b>BGA Packages</b> .....	<b>P. A157</b>
<b>WL-CSP Packages</b> .....	<b>P. A159</b>

### LAPIS Semiconductor Packages

<b>SOP Packages</b> .....	<b>P. A161</b>
<b>QFP Packages</b> .....	<b>P. A164</b>
<b>QFN Packages</b> .....	<b>P. A166</b>
<b>BGA Packages</b> .....	<b>P. A169</b>

\*Please check the dimensions of each products in detail.

LAPIS Semiconductor products and ROHM Semiconductor dimensions products have different although they have a same package name.

Please refer packages from page, A160 for LAPIS Semiconductor products.

## Part No. Explanation

- When ordering, specify the part number.
- Check each code against the tables shown below.
- Fill in from the left, leaving any extra boxes empty on the right.



Part No.

Custom Specification code

Packaging and forming specification

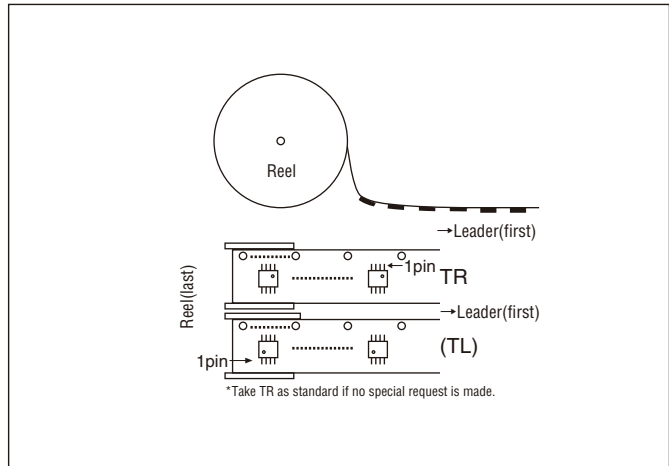
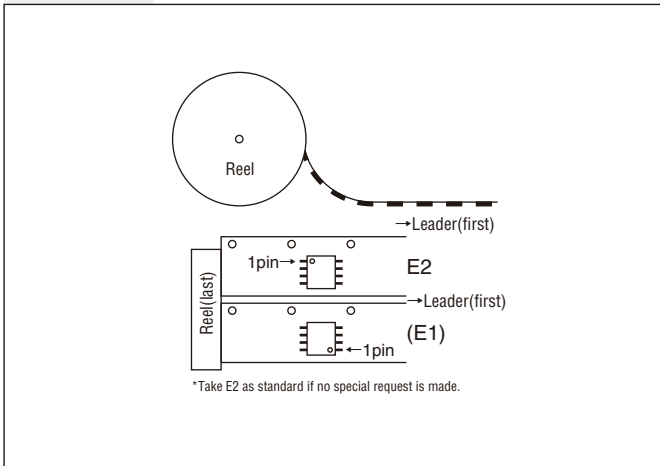
Alphabetical symbols specify custom product. Standard product has no symbols.

E2	Embossed tape and reel	Pin 1 fed last
(E1)	Embossed tape and reel	Pin 1 fed first
TR	Embossed tape and reel	Pin 1 fed last
(TL)	Embossed tape and reel	Pin 1 fed first

### Ordering information

1. A packaging specification is not required for packaging other than taping. (Ex.) BA4558F or BA4558F-DX
2. A packaging specification is required for tape packaging. (Ex.) Example of E2-oriented embossed taping: BA4558F-E2 or BA4558F-DXE2

### For example





Please refer packages from page, A160 for LAPIS Semiconductor products.

## Package Ordering Units

### ● Embossed tape packaging <Package specification name : E2(E1)>

Package ordering unit quantity	Non - Lead Gull Wing Packages	SOP Packages	Power Packages	QFP Packages	BGA / QFN
5,000	*SSON004X1216 SSON004X1010	-	-	-	-
4,000	USON016X3315, WSON008X2120	-	-	-	-
3,000	*SOP4, *SSOP5/6, *VSOF5, *HVSOF5/6, *MSOP8, MSOP10, *WSOF5/6/6I, *HSOP8, *VSON008V2030, VSON008X2030, VSON010X3020, VSON010X3030, VSON010V3030, USON014X3020, VQFN016X3030, VQFN016V3030, WL-CSP (2.8mm <sup>□</sup> and under)	TSSOP-B8	-	-	3×3mm
2,500	VQFN020V4040, VQFN024V4040, VQFN028V5050, VQFN032V5050, UQFN036V5050, UQFN040V5050, WL-CSP (over 2.81mm <sup>□</sup> )	SOP8/14/16, SSOP-A16, TSSOP-C10J, TSSOP-B14J SSOP-B8/14/16/20, SOP-J8/14, HTSSOP-B20/28, HTSOP-J8, TSSOP-B8J, HTSSOP-B8J, TSSOP-C30	-	-	4×4mm, 5×5mm
2,000	VQFN040V6060, UQFN044V6060, UQFN046V4565, UQFN048V6060	SOP18/20/22/24, HTSSOP-B30, SSOP-A20/24/32, SSOP-B24/28/40, HTSSOP-C48, HTSSOP-B24/40, HSOP25, TSSOP-C44	*HRP5/7, TO252S-3/5, SOT223-4	-	6×6mm
1,500	VQFN048V7070, UQFN048V7070, UQFN056V7070	SOP28, SSOP-A44, HTSSOP-A44/B54/A44R/B54R HSOP28/M28/M36	-	QFP32, VQFP48C, HTQFP48V UQFP64, TQFP64U	7×7mm
1,000	VQFN056V8080, UQFN064V8080, UQFN068V8080, UQFN088V0100	-	-	QFP44, VQFP64, VQFP80, UQFP100, TQFP64U	8×8mm, 9×9mm, 10×10mm
500	-	-	TO220CP-3/V5, TO263-3/5	VQFP100	-

1) \*: Package specification : TR(TL)

2) Specification differ by package size of WL-CSP

3) WL-CSP Package Specification : E2 (standard)

### ● Tray packaging

Pin pitch: 0.8 mm	Pin pitch: 0.65 mm	Pin pitch: 0.5 mm	Pin pitch: 0.4 mm	Dimensions (mm) d x e	Individual package quantity	Tray quantity	Package ordering unit quantity	Tomson Case dimensions (mm) A x B x C
QFP32	-	VQFP48C	-	175×166	100	10	1,000	60×200×200
QFP44	SQFP56, SQFP-T52M, SQFP-T64	VQFP64, VQFP64M, VQFP80, TQFP64V, TQFP80V, HTQFP64V, TQFP48V	UQFP64M, UQFP80, UQFP100, TQFP64U	216×116	50	20	1,000	70×130×510
QFP-A64, QFP80/T80	SQFP80, SQFP-T80C, SQFP100/T100	VQFP100, VQFP128, TQFP100V, HTQFP100V	UQFP120, TQFP128U	256×166	50	10	500	75×200×290
QFP120	SQFP160C	VQFP208	-	322.6×135.9	24	10	240	75×140×338
-	-	VQFP176	-	322.6×135.9	40	10	400	75×140×338
-	-	-	TQFP176U	201.1×141.05	20	10	200	75×200×290
-	-	VQFP144 / T144	UQFP160/184	322.6×135.9	60	10	600	75×140×338

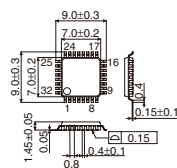
Please refer packages from page, A160 for LAPIS Semiconductor products.

QFP Packages

(Unit: mm)

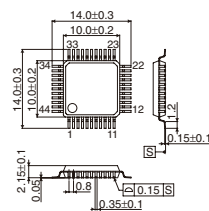
QFP <Pin Pitch : 0.8mm>

QFP32



Tray:1,000pcs  
 Embossed carrier tape:1,500pcs

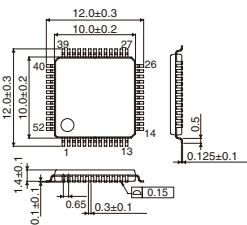
QFP44



Tray:1,000pcs  
 Embossed carrier tape:1,000pcs

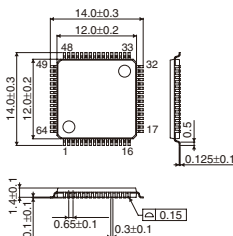
SQFP <Pin Pitch : 0.65mm>

SQFP-T52



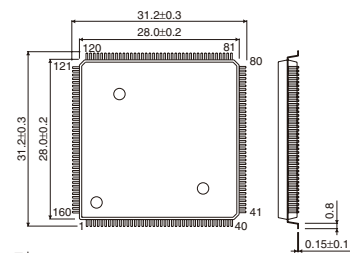
Tray:1,000pcs  
 Embossed carrier tape:1,000pcs

SQFP-T64



Tray:1,000pcs

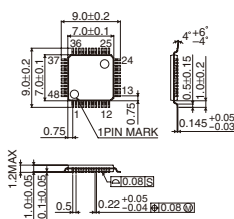
SQFP160C



Tray:240pcs

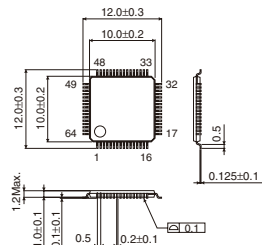
TQFPV <Pin Pitch : 0.5mm>

TQFP48V



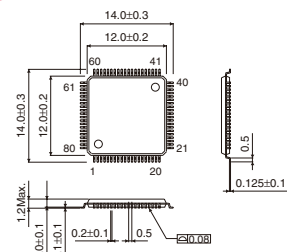
Tray:1,000pcs  
 Embossed carrier tape:1,500pcs

TQFP64V



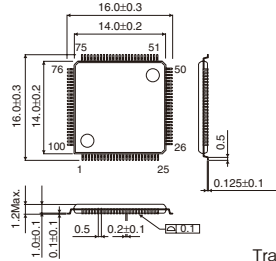
Tray:1,000pcs  
 Embossed carrier tape:1,000pcs

TQFP80V



Tray:1,000pcs

TQFP100V



Tray:500pcs  
 Embossed carrier tape:500pcs

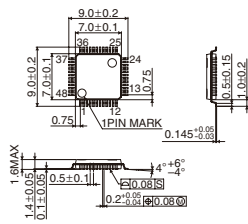
Please refer packages from page, A160 for LAPIS Semiconductor products.

## QFP Packages

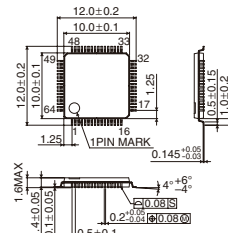
(Unit: mm)

## VQFP &lt;Pin Pitch : 0.5mm&gt;

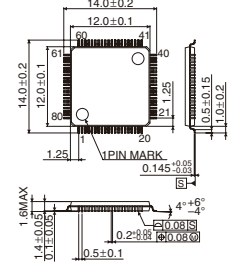
VQFP48C

Tray:1,000pcs  
Embossed carrier tape:1,500pcs

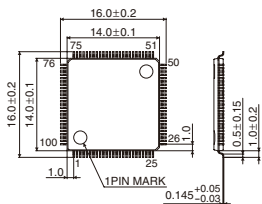
VQFP64

Tray:1,000pcs  
Embossed carrier tape:1,000pcs

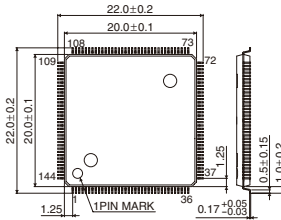
VQFP80

Tray:1,000pcs  
Embossed carrier tape:1,000pcs

VQFP100

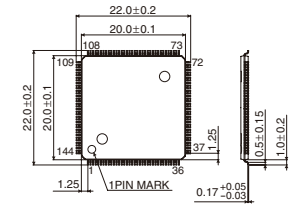
Tray:500pcs  
Embossed carrier tape:500pcs

VQFP144



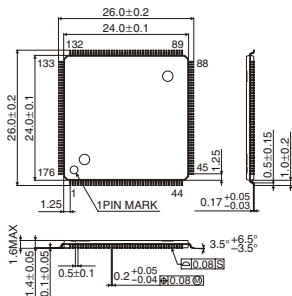
Tray:600pcs

VQFP-T144



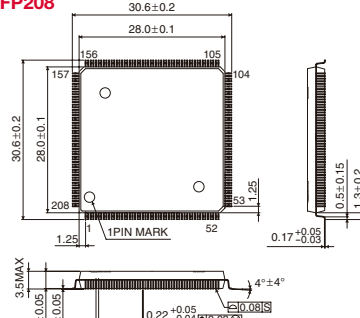
Tray:600pcs

VQFP176



Tray:400pcs

VQFP208



Tray:240pcs

A

IC Packages

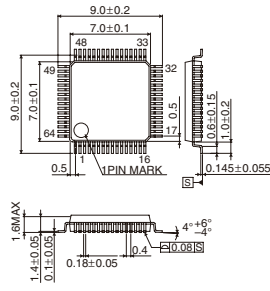
Please refer packages from page, A160 for LAPIS Semiconductor products.

QFP Packages

(Unit: mm)

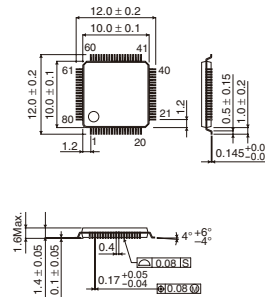
UQFP <Pin Pitch : 0.4mm>

UQFP64M



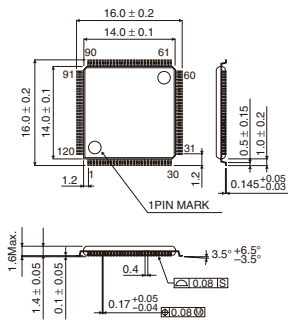
Tray:1,000pcs  
 Embossed carrier tape:1,500pcs

UQFP80



Tray:1,000pcs  
 Embossed carrier tape:1,000pcs

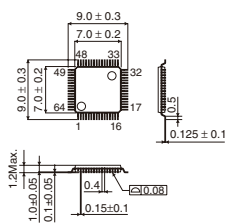
UQFP120



Tray:500pcs

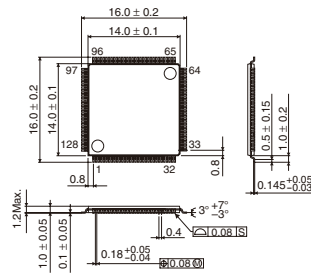
TQFPU <Pin Pitch : 0.4mm>

TQFP64U



Tray:1,000pcs  
 Embossed carrier tape:1,500pcs

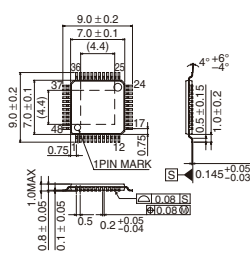
TQFP128U



Tray:500pcs

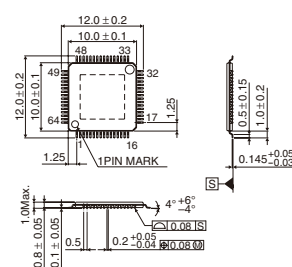
HTQFPV <Pin Pitch : 0.5mm>

HTQFP48V



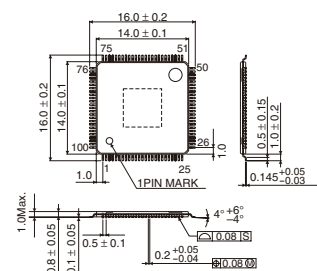
Tray:1,000pcs  
 Embossed carrier tape:1,500pcs

HTQFP64V



Tray:1,000pcs  
 Embossed carrier tape:1,000pcs

HTQFP100V



Tray:500pcs

Please refer packages from page, A160 for LAPIS Semiconductor products.

## SON / QFN Packages (Unit: mm)

### SSON-X <Pin Pitch : 0.65mm>

### VSON-V <Pin Pitch : 0.5mm>

<p><b>SSON004X1010</b></p> <p>Embossed carrier tape:5,000pcs</p>	<p><b>SSON004X1216</b></p> <p>Embossed carrier tape:5,000pcs</p>	<p><b>VSON008V2030</b></p> <p>Embossed carrier tape:3,000pcs</p>	<p><b>VSON010V3030</b></p> <p>Embossed carrier tape:3,000pcs</p>
--	--	--	--

### VSON-X <Pin Pitch : 0.5mm> / USON-X <Pin Pitch : 0.4mm>

<p><b>VSON008X2020</b></p> <p>Embossed carrier tape:4,000pcs</p>	<p><b>VSON008X2030</b></p> <p>Embossed carrier tape:3,000pcs</p>	<p><b>VSON010X3020</b></p> <p>Embossed carrier tape:3,000pcs</p>
<p><b>VSON010X3030</b></p> <p>Embossed carrier tape:3,000pcs</p>	<p><b>USON014X3020</b></p> <p>Embossed carrier tape:3,000pcs</p>	<p><b>USON016X3315</b></p> <p>Embossed carrier tape:4,000pcs</p>

A  
IC Packages

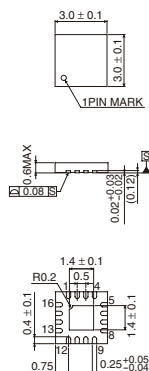
Please refer packages from page, A160 for LAPIS Semiconductor products.

SON / QFN Packages

(Unit: mm)

VQFN-X <Pin Pitch : 0.5mm>

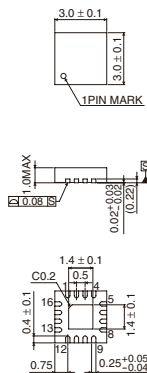
VQFN016X3030



Embossed carrier tape:3,000pcs

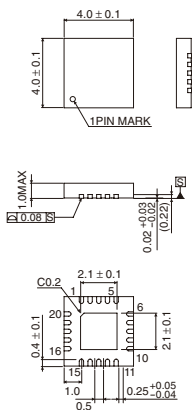
VQFN-V <Pin Pitch : 0.5mm>

VQFN016V3030



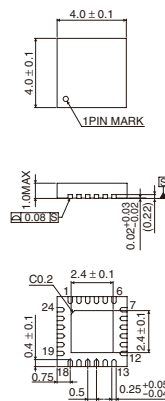
Embossed carrier tape:3,000pcs

VQFN020V4040



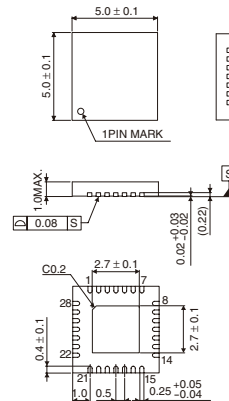
Embossed carrier tape:2,500pcs

VQFN024V4040



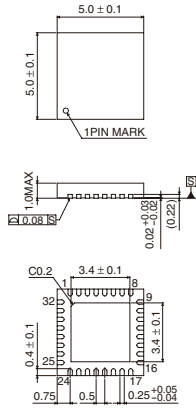
Embossed carrier tape:2,500pcs

VQFN028V5050



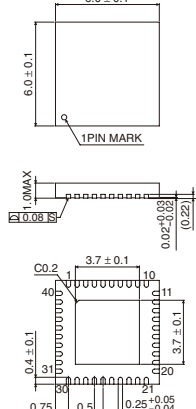
Embossed carrier tape:2,500pcs

VQFN032V5050



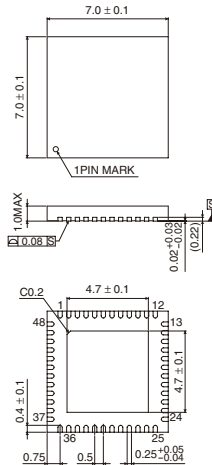
Embossed carrier tape:2,500pcs

VQFN040V6060



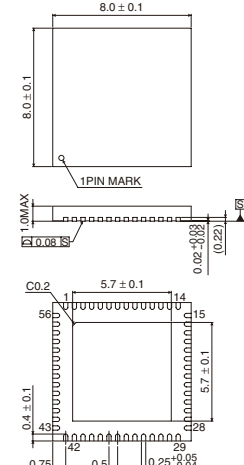
Embossed carrier tape:2,000pcs

VQFN048V7070



Embossed carrier tape:1,500pcs

VQFN056V8080



Under Development  
Embossed carrier tape:1,000pcs



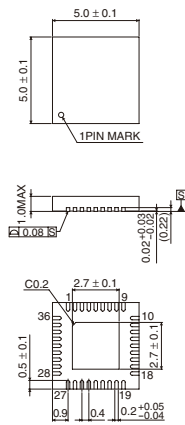
Please refer packages from page, A160 for LAPIS Semiconductor products.

SON / QFN Packages

(Unit: mm)

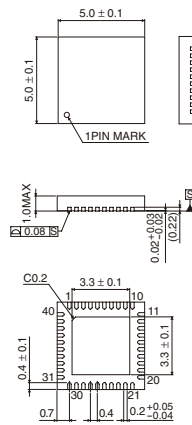
UQFN-V <Pin Pitch : 0.4mm>

UQFN036V5050



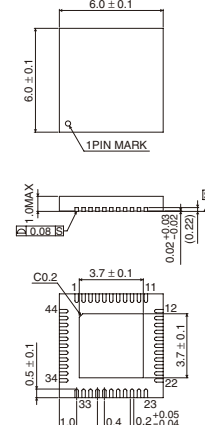
Embossed carrier tape:2,500pcs

UQFN040V5050



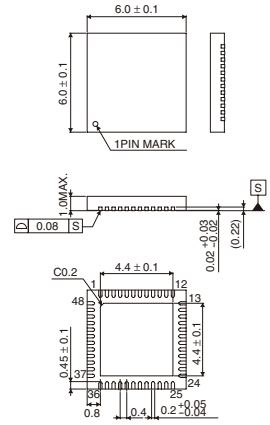
Embossed carrier tape:2,500pcs

UQFN044V6060



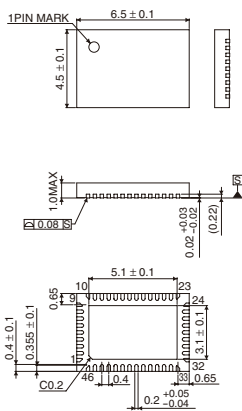
Embossed carrier tape:2,000pcs

UQFN048V6060



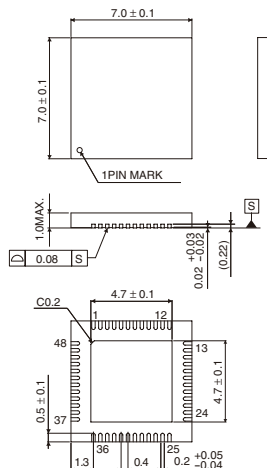
Embossed carrier tape:2,000pcs

UQFN046V4565



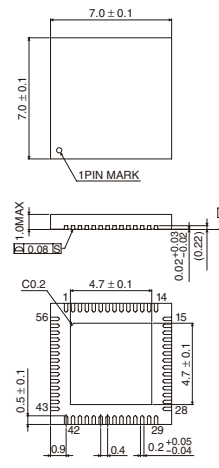
Embossed carrier tape:2,000pcs

UQFN048V7070



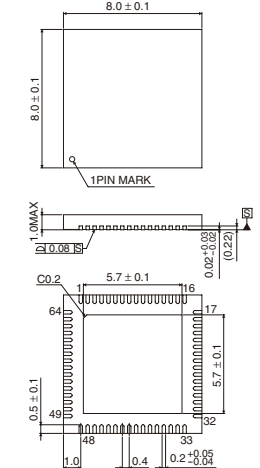
Embossed carrier tape:1,500pcs

UQFN056V7070



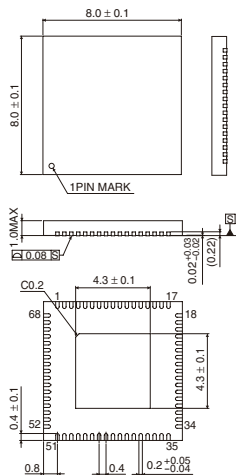
Embossed carrier tape:1,500pcs

UQFN064V8080



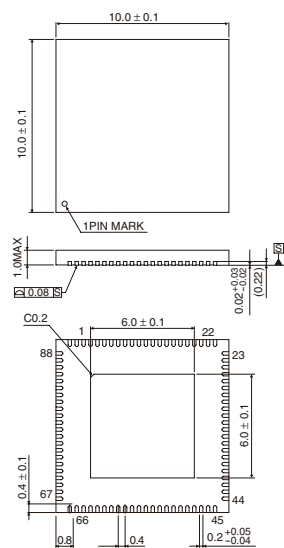
Embossed carrier tape:1,000pcs

UQFN068V8080



Embossed carrier tape:1,000pcs

UQFN088V0100



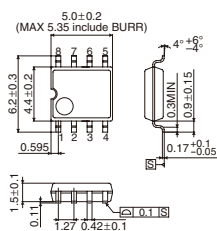
Under Development  
Embossed carrier tape:1,000pcs

A  
IC Packages

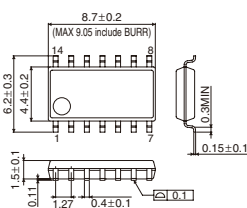
Please refer packages from page, A160 for LAPIS Semiconductor products.

**SOP Packages**

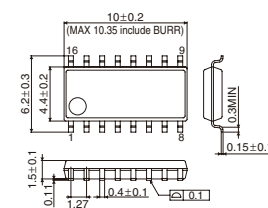
(Unit: mm)

**SOP <Pin Pitch : 1.27mm>**
**SOP8**


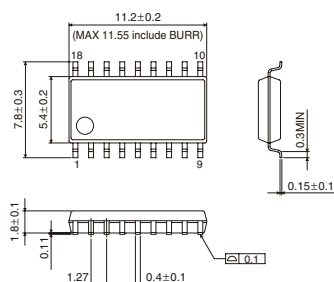
Embossed carrier tape:2,500pcs

**SOP14**


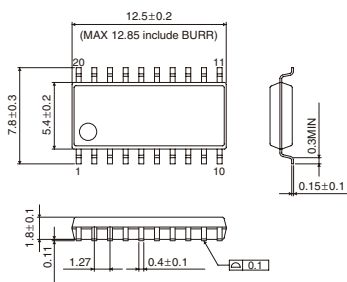
Embossed carrier tape:2,500pcs

**SOP16**


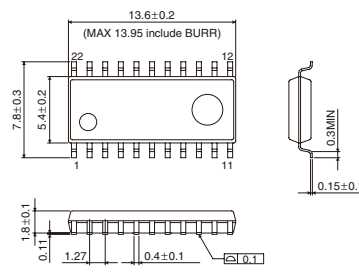
Embossed carrier tape:2,500pcs

**SOP18**


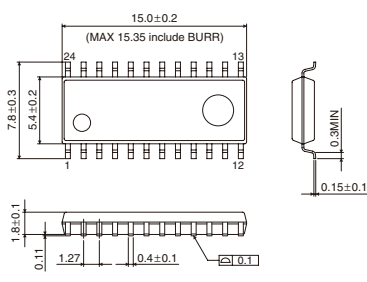
Embossed carrier tape:2,000pcs

**SOP20**


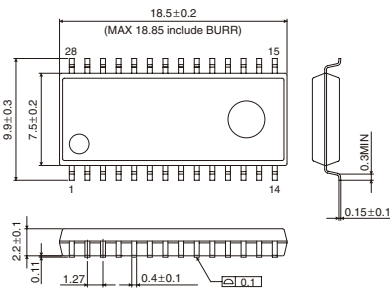
Embossed carrier tape:2,000pcs

**SOP22**


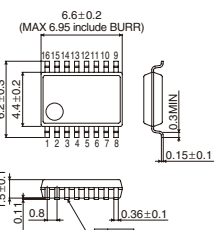
Embossed carrier tape:2,000pcs

**SOP24**


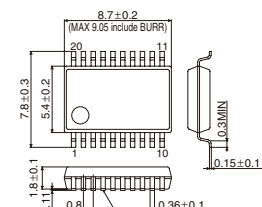
Embossed carrier tape:2,000pcs

**SOP28**


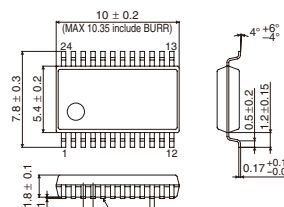
Embossed carrier tape:1,500pcs

**SSOP-A <Pin Pitch : 0.8mm>**
**SSOP-A16**


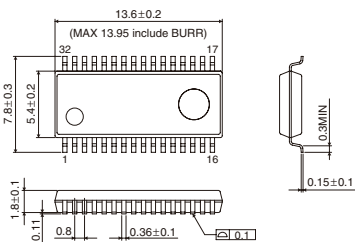
Embossed carrier tape:2,500pcs

**SSOP-A20**


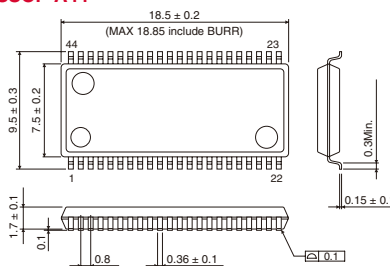
Embossed carrier tape:2,000pcs

**SSOP-A24**


Embossed carrier tape:2,000pcs

**SSOP-A32**


Embossed carrier tape:2,000pcs

**SSOP-A44**


Embossed carrier tape:1,500pcs

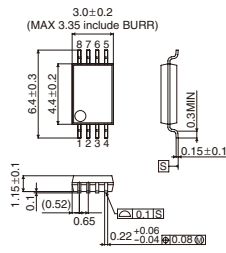
Please refer packages from page, A160 for LAPIS Semiconductor products.

SOP Packages

(Unit: mm)

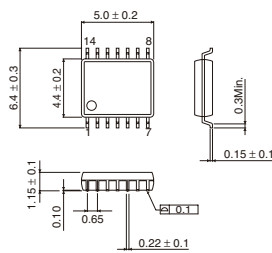
SSOP-B <Pin Pitch : 0.65mm>

SSOP-B8



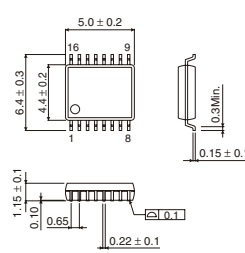
Embossed carrier tape:2,500pcs

SSOP-B14



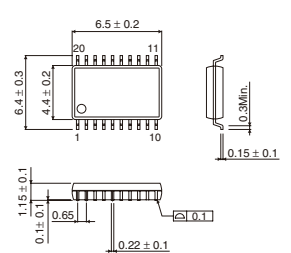
Embossed carrier tape:2,500pcs

SSOP-B16



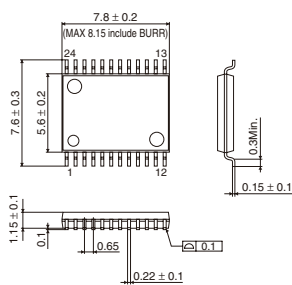
Embossed carrier tape:2,500pcs

SSOP-B20



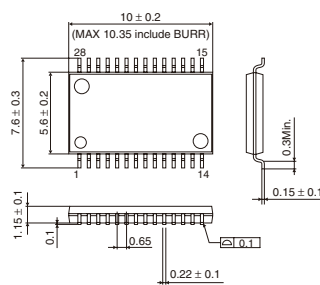
Embossed carrier tape:2,500pcs

SSOP-B24



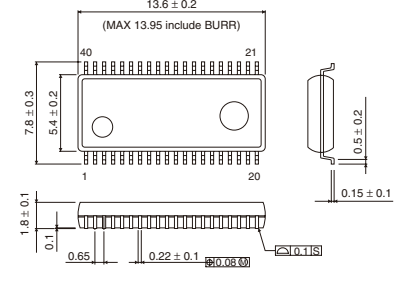
Embossed carrier tape:2,000pcs

SSOP-B28



Embossed carrier tape:2,000pcs

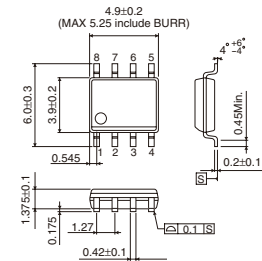
SSOP-B40



Embossed carrier tape:2,000pcs

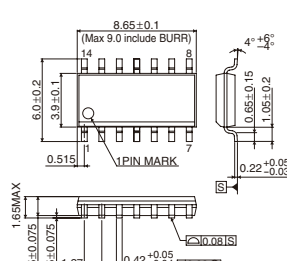
JEDEC <Pin Pitch : 1.27mm/0.65mm/0.5mm>

SOP-J8



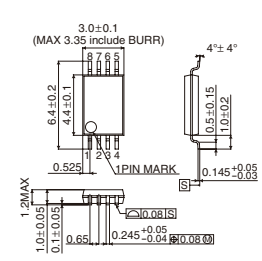
Embossed carrier tape:2,500pcs

SOP-J14



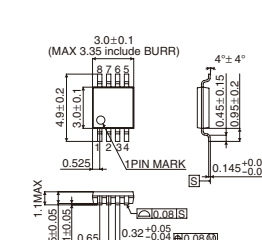
Embossed carrier tape:2,500pcs

TSSOP-B8



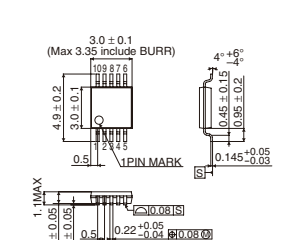
Embossed carrier tape:3,000pcs

TSSOP-B8J



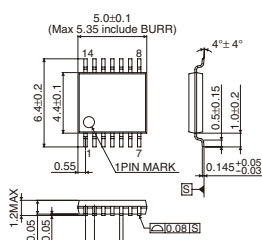
Embossed carrier tape:2,500pcs

TSSOP-C10J



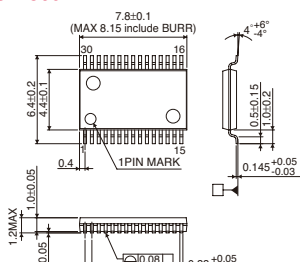
Embossed carrier tape:2,500pcs

TSSOP-B14J



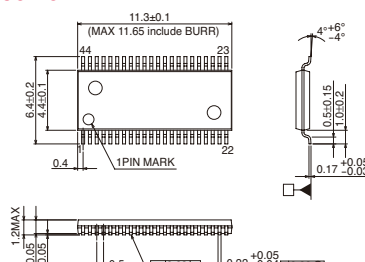
Embossed carrier tape:2,500pcs

TSSOP-C30



Embossed carrier tape:2,500pcs

TSSOP-C44



Embossed carrier tape:2,000pcs

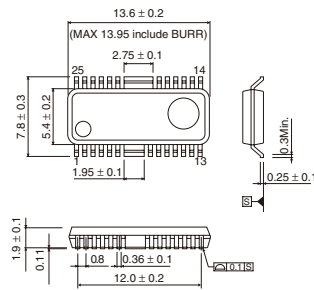
Please refer packages from page, A160 for LAPIS Semiconductor products.

# HSOP Packages

(Unit: mm)

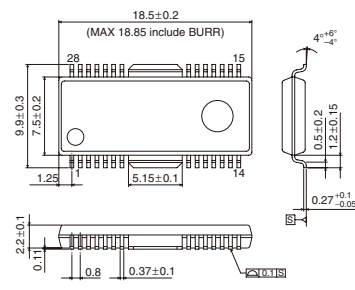
## HSOP <Pin Pitch : 0.8mm>

### HSOP25



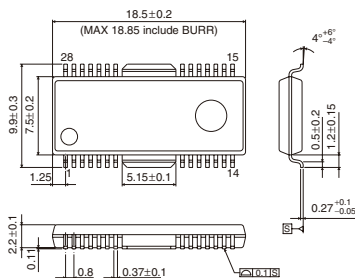
Embossed carrier tape:2,000pcs

### HSOP28



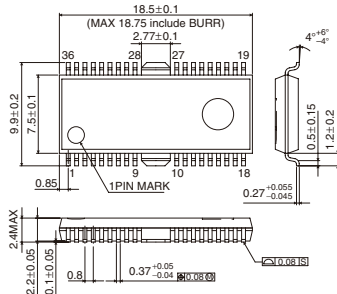
Embossed carrier tape:1,500pcs

### HSOP-M28



Embossed carrier tape:1,500pcs

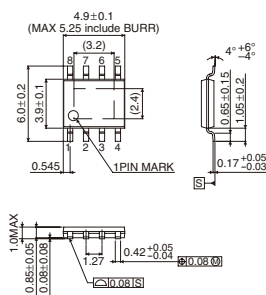
### HSOP-M36



Embossed carrier tape:1,500pcs

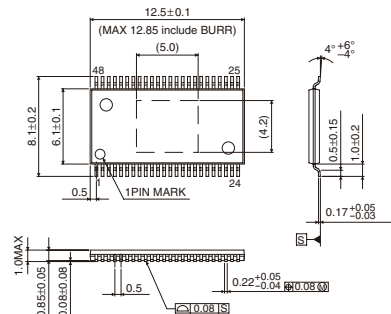
## HTSOP-J <Pin Pitch : 1.27mm>

### HTSOP-J8



Embossed carrier tape:2,500pcs

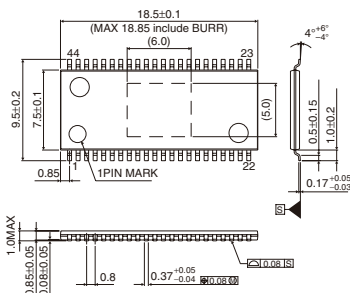
### HTSSOP-C48



Embossed carrier tape:2,000pcs

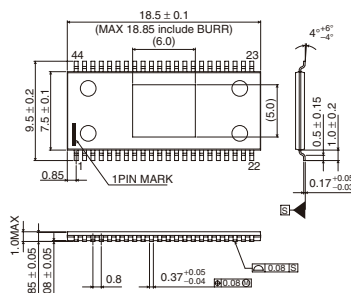
## HTSSOP-A <Pin Pitch : 0.8mm>

### HTSSOP-A44



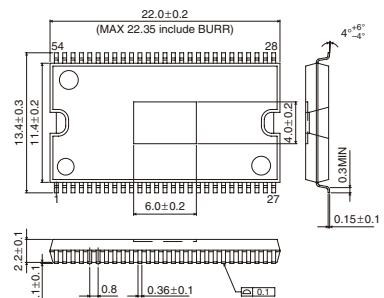
Embossed carrier tape:1,500pcs

### HTSSOP-A44R



Embossed carrier tape:1,500pcs

### HSSOP-A54



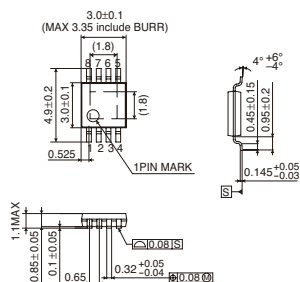
Please refer packages from page, A160 for LAPIS Semiconductor products.

## HSOP Packages

(Unit: mm)

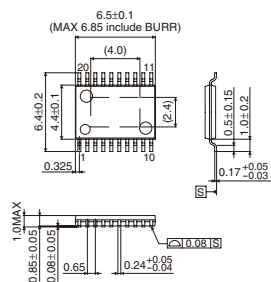
## HTSSOP-B &lt;Pin Pitch : 0.65mm&gt;

## HTSSOP-B8J



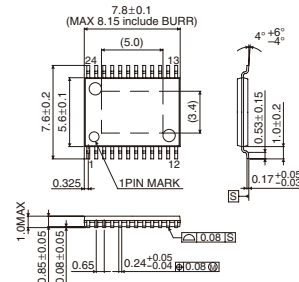
Embossed carrier tape:2,500pcs

## HTSSOP-B20



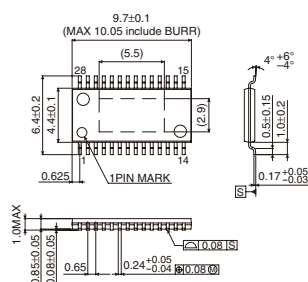
Embossed carrier tape:2,500pcs

## HTSSOP-B24



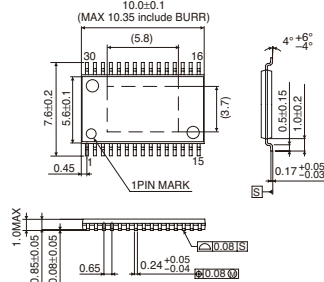
Embossed carrier tape:2,000pcs

## HTSSOP-B28



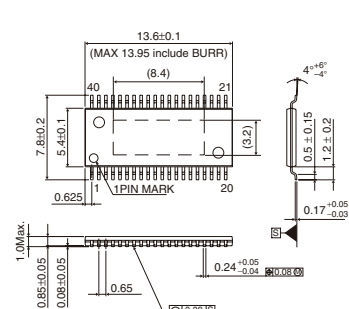
Embossed carrier tape:2,500pcs

## HTSSOP-B30



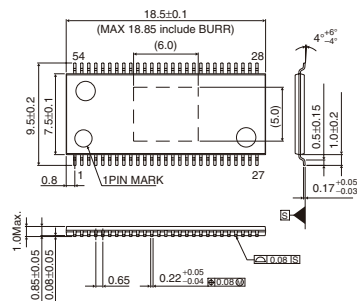
Embossed carrier tape:2,000pcs

## HTSSOP-B40



Embossed carrier tape:2,000pcs

## HTSSOP-B54



Embossed carrier tape:1,500pcs

A

IC Packages

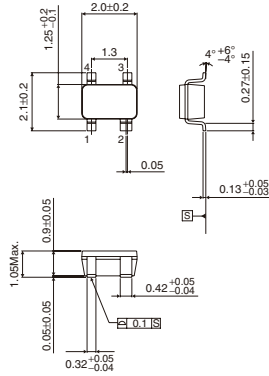
Please refer packages from page, A160 for LAPIS Semiconductor products.

**Small Packages**

(Unit: mm)

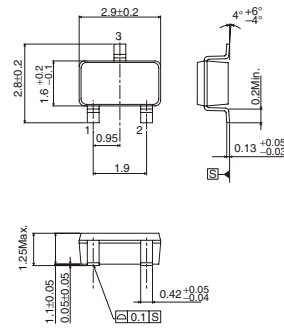
**SOP Type**

**SOP4**

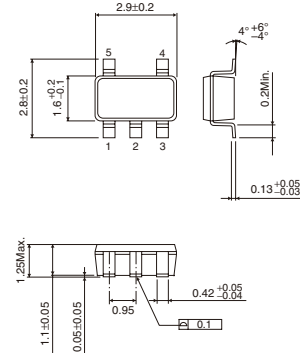


Embossed carrier tape:3,000pcs

**SSOP3**

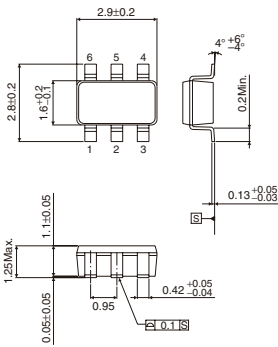


**SSOP5**



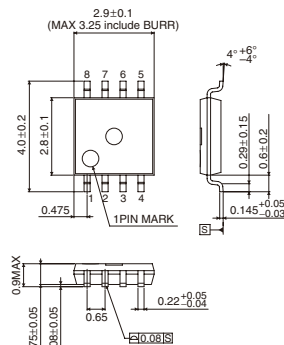
Embossed carrier tape:3,000pcs

**SSOP6**



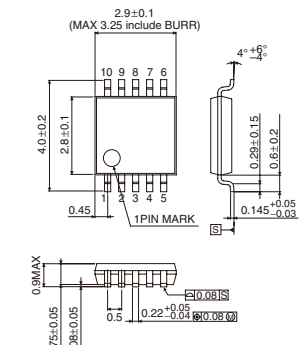
Embossed carrier tape:3,000pcs

**MSOP8**



Embossed carrier tape:3,000pcs

**MSOP10**



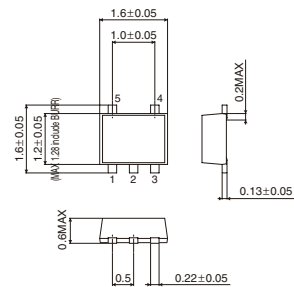
Embossed carrier tape:3,000pcs

**Non-Lead Packages**

(Unit: mm)

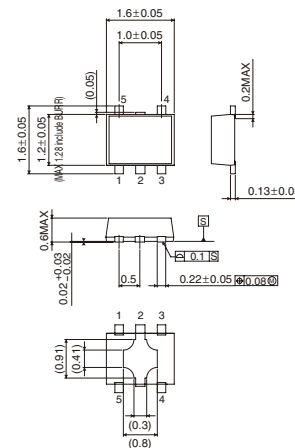
**Non-Lead**

**VSO5F**



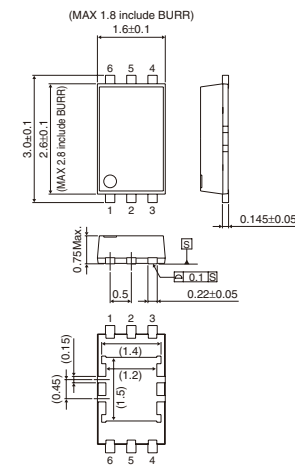
Embossed carrier tape:3,000pcs

**HVSO5F**



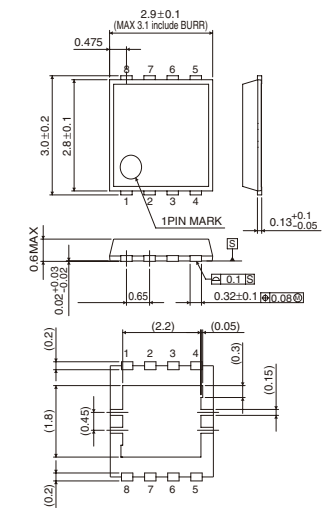
Embossed carrier tape:3,000pcs

**HVSO6F**



Embossed carrier tape:3,000pcs

**HSO8**



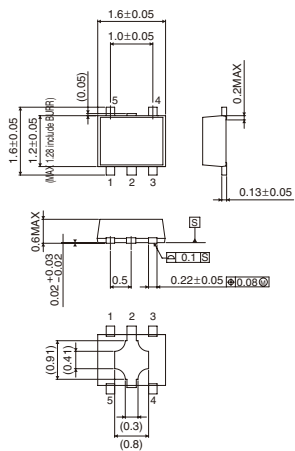
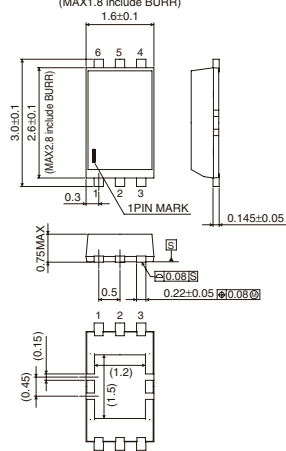
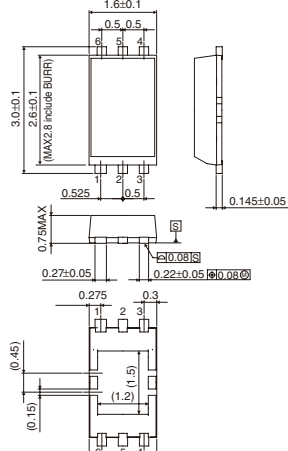
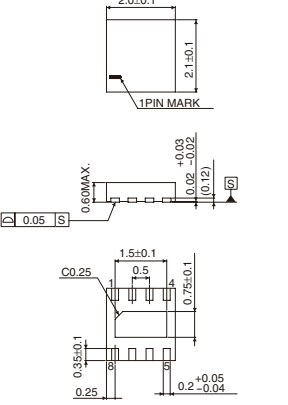
Embossed carrier tape:3,000pcs

Please refer packages from page, A160 for LAPIS Semiconductor products.

# Non-Lead Packages

(Unit: mm)

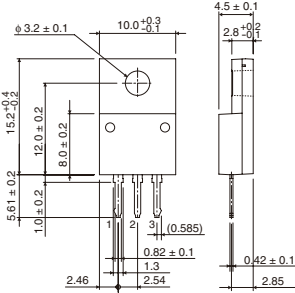
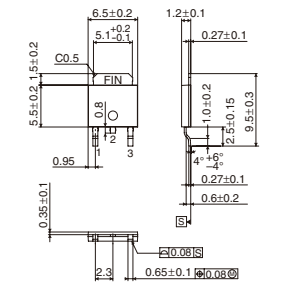
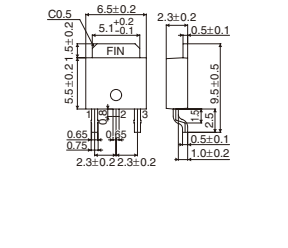
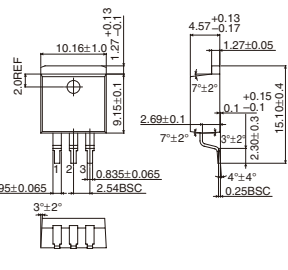
## Optical Non-Lead

<p><b>WSOF5(Clear Type)</b></p>  <p>Embossed carrier tape:3,000pcs</p>	<p><b>WSOF6 (Clear Type)</b></p>  <p>Embossed carrier tape:3,000pcs</p>	<p><b>WSOF6I</b></p>  <p>Embossed carrier tape:3,000pcs</p>	<p><b>WSON008X2120 (Clear Type)</b></p>  <p>Embossed carrier tape:4,000pcs</p>
---	--	---	---

# Power Packages

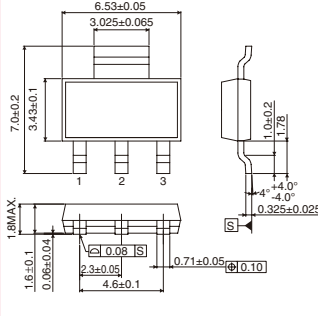
(Unit: mm)

## POWER-3PIN

<p><b>TO220CP-3</b></p>  <p>Embossed carrier tape:500pcs</p>	<p><b>TO252S-3</b></p>  <p>Embossed carrier tape:2,000pcs</p>	<p><b>TO252-3</b></p>  <p>Embossed carrier tape:2,000pcs</p>	<p><b>TO263-3</b></p>  <p>Embossed carrier tape:500pcs</p>
---	--	--	---

## POWER-4PIN

**SOT223-4**



Embossed carrier tape:2,000pcs

A  
IC Packages



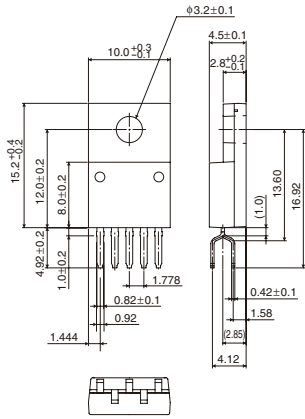
Please refer packages from page, A160 for LAPIS Semiconductor products.

Power Packages

(Unit: mm)

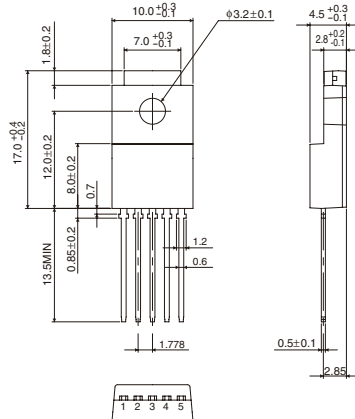
POWER-5PIN

TO220CP-V5



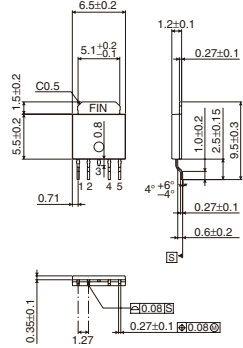
Embossed carrier tape:500pcs

TO220FP-5



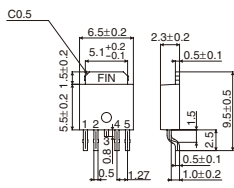
Container tube:500pcs

TO252S-5



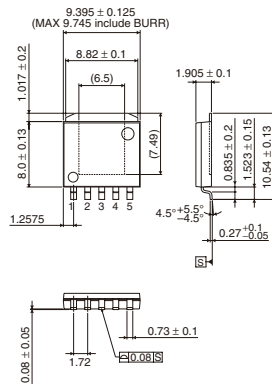
Embossed carrier tape:2,000pcs

TO252-5



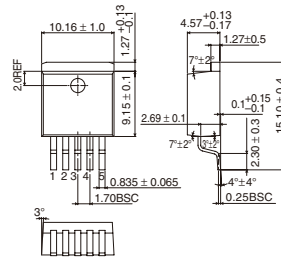
Embossed carrier tape:2,000pcs

HRP5



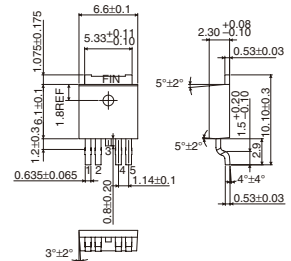
Embossed carrier tape:2,600pcs

TO263-5



Embossed carrier tape:500pcs

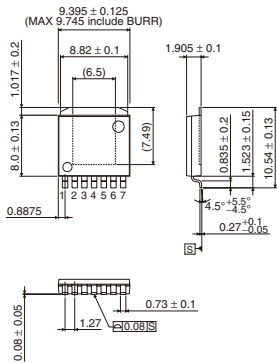
TO252-J5



Embossed carrier tape:2,000pcs

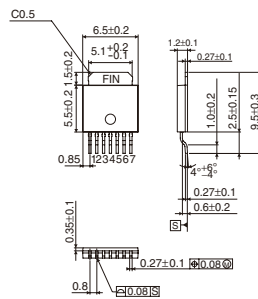
POWER-7PIN

HRP7



Embossed carrier tape:2,000pcs

TO252S-7+



Embossed carrier tape:2,000pcs

Please refer packages from page, A160 for LAPIS Semiconductor products.

# BGA Packages

(Unit: mm)

## VBGA-T <Pin Pitch : 0.5mm>

<p><b>VBGA035T040</b></p>	<p><b>VBGA048T050</b></p>	<p><b>VBGA063T050</b></p> <p>Embossed carrier tape:2,500pcs</p>	<p><b>VBGA099T060</b></p> <p>Embossed carrier tape:2,000pcs</p>
<p><b>VBGA120T060</b></p>	<p><b>VBGA131T070</b></p>	<p><b>VBGA143T070</b></p>	<p><b>VBGA161T080</b></p>
<p><b>VBGA195T080</b></p>	<p><b>VBGA256T100</b></p>		

A IC Packages

## VBGA-B <Pin Pitch : 0.5mm>

**VBGA145B070**

## UBGA-W <Pin Pitch : 0.4mm>

**UBGA035W030**

Embossed carrier tape:3,000pcs

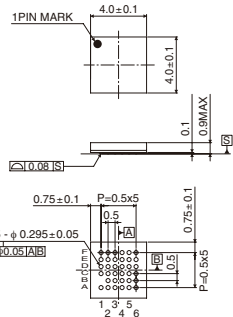
Please refer packages from page, A160 for LAPIS Semiconductor products.

BGA Packages

(Unit: mm)

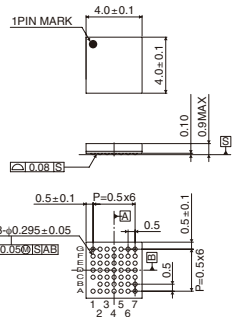
VBGA-W <Pin Pitch : 0.5mm>

VBGA035W040



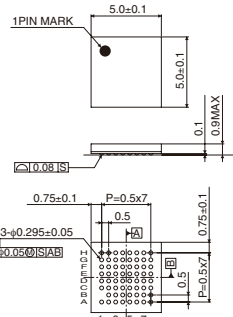
Embossed carrier tape: 2,500pcs

VBGA048W040



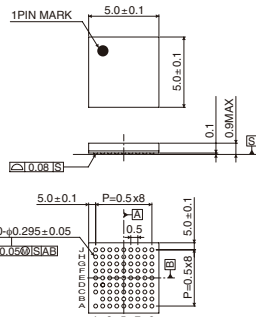
Embossed carrier tape: 2,500pcs

VBGA063W050



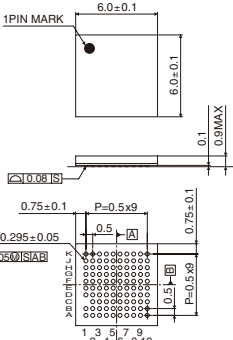
Embossed carrier tape: 2,500pcs

VBGA080W050



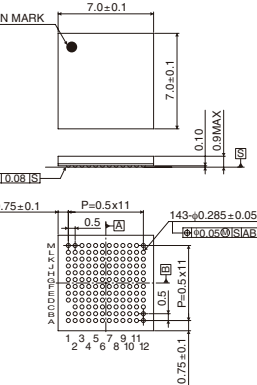
Embossed carrier tape: 2,500pcs

VBGA099W060



Embossed carrier tape: 2,000pcs

VBGA143W070

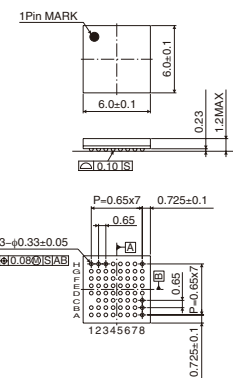


A

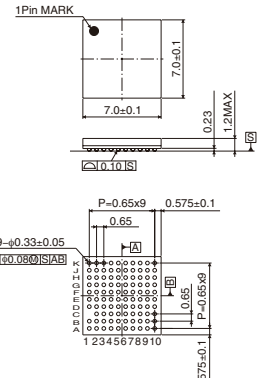
IC Packages

SBGA-T <Pin Pitch : 0.65mm>

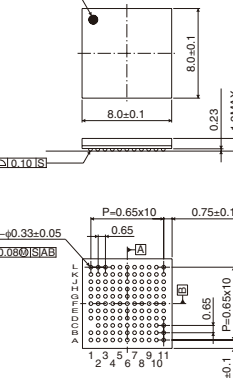
SBGA063T060



SBGA099T070



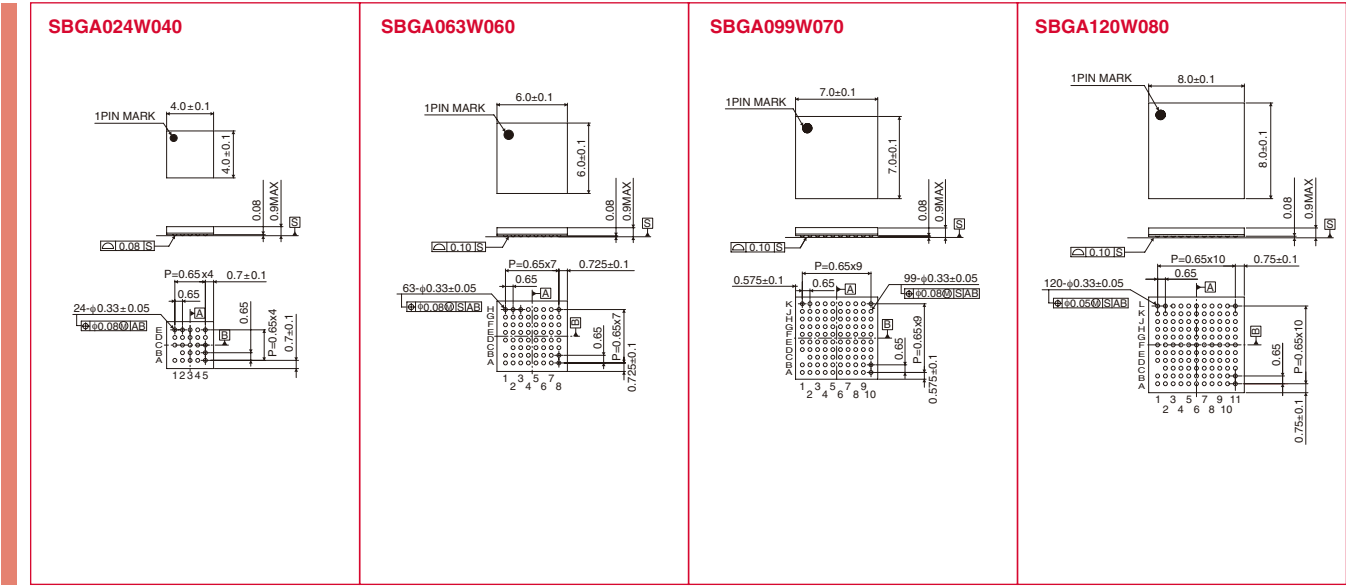
SBGA120T080



Please refer packages from page, A160 for LAPIS Semiconductor products.

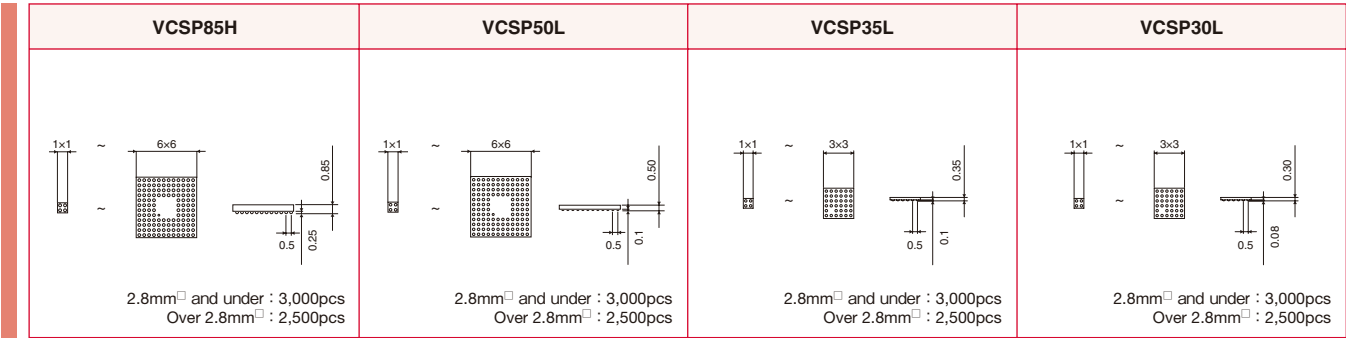
## BGA Packages (Unit: mm)

### SBGA-W <Pin Pitch : 0.65mm>

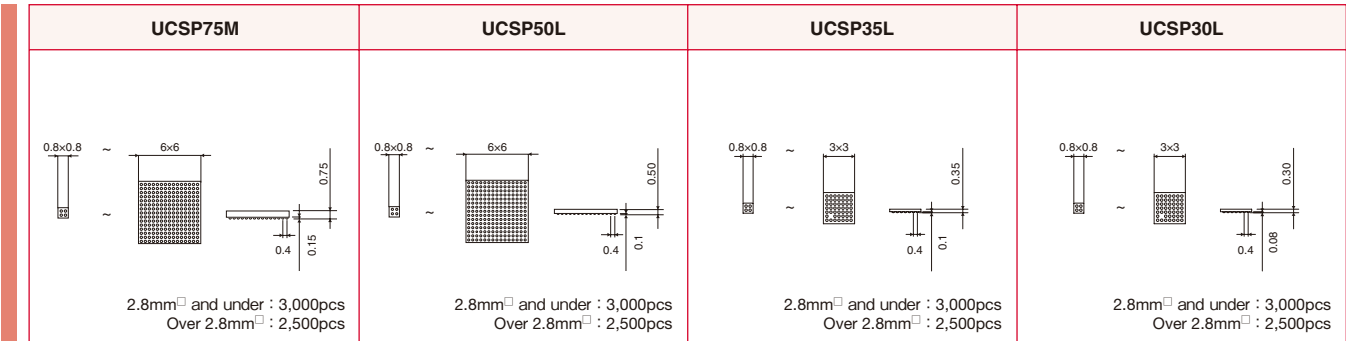


## WL-CSP Packages (Unit: mm)

### VCSP <Pin Pitch : 0.5mm>



### UCSP <Pin Pitch : 0.4mm>



These package size are an example. For details, please inquire to the sales.

## LAPIS Semiconductor LSI package list

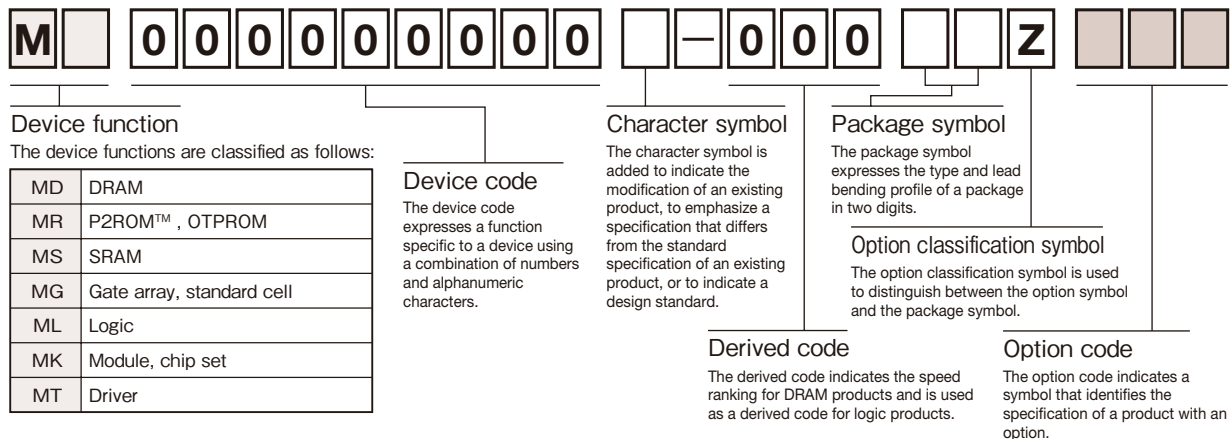
No	PKG type	Title	TRAY	T&R	TUBE
1	SOP	SOP8		2500	
2	SOP	SOP16	1600	1000	
3	SOP	SOP24	1280	1000	3000
4	SOP	SOP44	400	600	1700
5	SSOP	SSOP16	4760	2500	
6	SSOP	SSOP20	3600	2500	
7	SSOP	SSOP30-56-0.65	2000	2000	
8	SSOP	SSOP32	1280	1000	3000
9	SSOP	SSOP60	600	600	
10	SSOP	SSOP70	630	600	
11	SSOP	TSSOP20	4160		
12	TSOP	TSOP (I) 28	1950		
13	TSOP	TSOP (I) 32	800	1000	
14	TSOP	TSOP (I) 48	960	1000	
15	TSOP	TSOP (I) 56	960	1000	
16	TSOP	TSOP (II) 26/20	1600	1600	
17	TSOP	TSOP (II) 26/24	1600	1000	
18	TSOP	TSOP (II) 28	800	1000	
19	TSOP	TSOP (II) 44/40	1350	1000	
20	TSOP	TSOP (II) 44	1350	1000	
21	TSOP	TSOP (II) 50/44	1170	1000	
22	TSOP	TSOP (II) 50	1170	1000	
23	TSOP	TSOP (II) 54	1080	1000	
24	TSOP	TSOP (II) 70	1350	1000	
25	TSOP	TSOP (II) 86	1080	1000	
26	QFP	QFP44	1440	1000	
27	QFP	QFP56	1440	1000	
28	QFP	QFP64-1420-1.00	600		
29	QFP	QFP64-1414-0.80	840		
30	QFP	P-QFP80-1414-0.65	840		
31	QFP	QFP80-1420-0.80	600		
32	QFP	QFP100-1420-0.65	600		
33	QFP	QFP100-1414-0.50	750		
34	QFP	QFP128-1420-0.50	420		
35	QFP	QFP128-2828-0.80	240		

No	PKG type	Title	TRAY	T&R	TUBE
36	QFP	QFP208	240		
37	QFP	LQFP144	600		
38	QFP	LQFP176	400		
39	QFP	TQFP44	1600		
40	QFP	TQFP52	1600	1000	
41	QFP	TQFP80-1414-0.65	900		
42	QFP	TQFP100	900		
43	QFP	TQFP120	750		
44	QFP	TQFP128	900	1500	
45	QFN	WQFN12	6240	1000	
46	QFN	WQFN16-0303-0.50	6240	1000	
47	QFN	WQFN16-0404-0.50	4900	1000	
48	QFN	WQFN20	4900	1000	
49	QFN	WQFN24	4900	1000	
50	QFN	WQFN28-0404-0.40	4900	1000	
51	QFN	WQFN28-0404-0.50	4900	1000	
52	QFN	WQFN32-0505-0.50	4030	1000	
53	QFN	WQFN36	4900	2000	
54	QFN	WQFN40-0505-0.40	4030	1000	
55	QFN	WQFN40-0606-0.50	4900	2500	
56	QFN	WQFN48	2500	2000	
57	QFN	WQFN52	2500	2000	
58	QFN	WQFN64	2600	3000	
59	QFN	WQFN80	2600	3000	
60	QFN	C-TQFN18	4030	1000	
61	BGA	LFPGA48	4160		
62	BGA	LFPGA84	2600		
63	BGA	LFPGA144	1760		
64	BGA	LFPGA324	840		
65	BGA	TFBGA60	3360		
66	BGA	TFBGA64	4160		
67	BGA	TFBGA90	1710		
68	BGA	P-TFBGA144	1760		
69	BGA	TFBGA208-0909-0.50	2600		
70	BGA	TFBGA208-1212-0.65	1680		

\*Regarding an unstated package, please inquire to the sales.

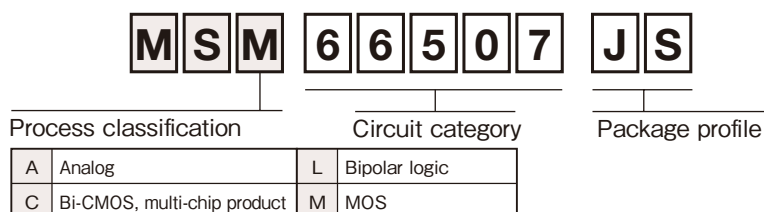
## LAPIS Semiconductor LSI Part No. Explanation

Product names are assigned to our semiconductor devices using the following convention, starting with the character "M".



The following shows the convention of item name assignment for conventional products.

• The actual package profile is not shown here.

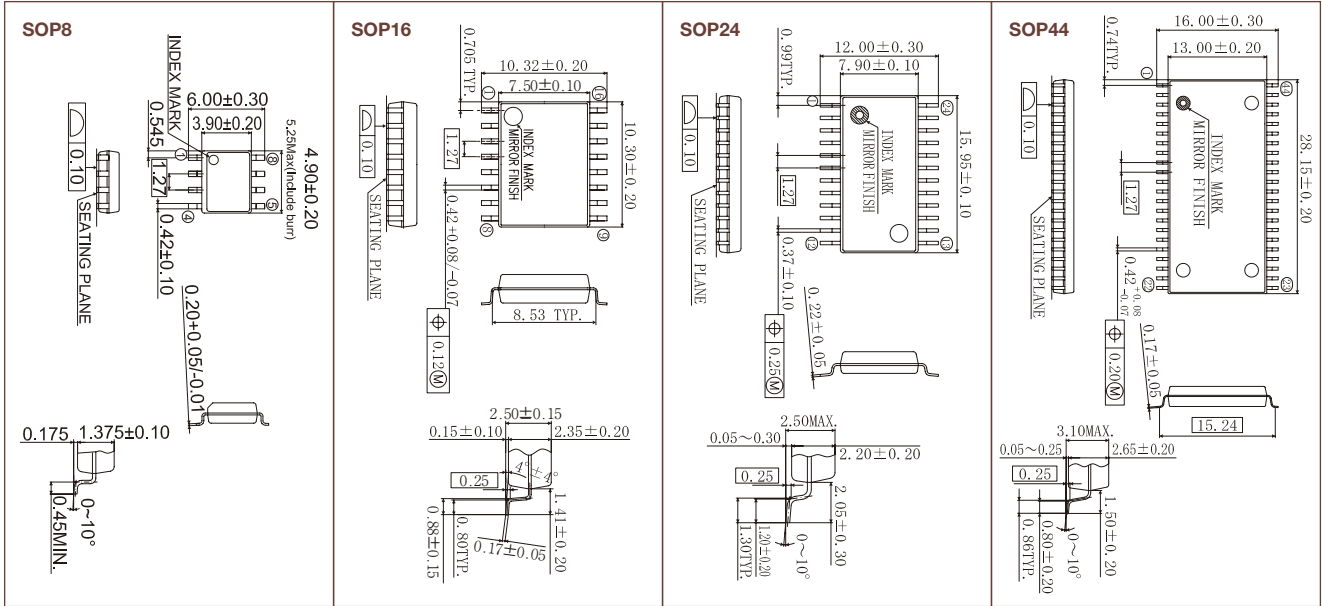


These package size are an example. For details, please inquire to the sales.

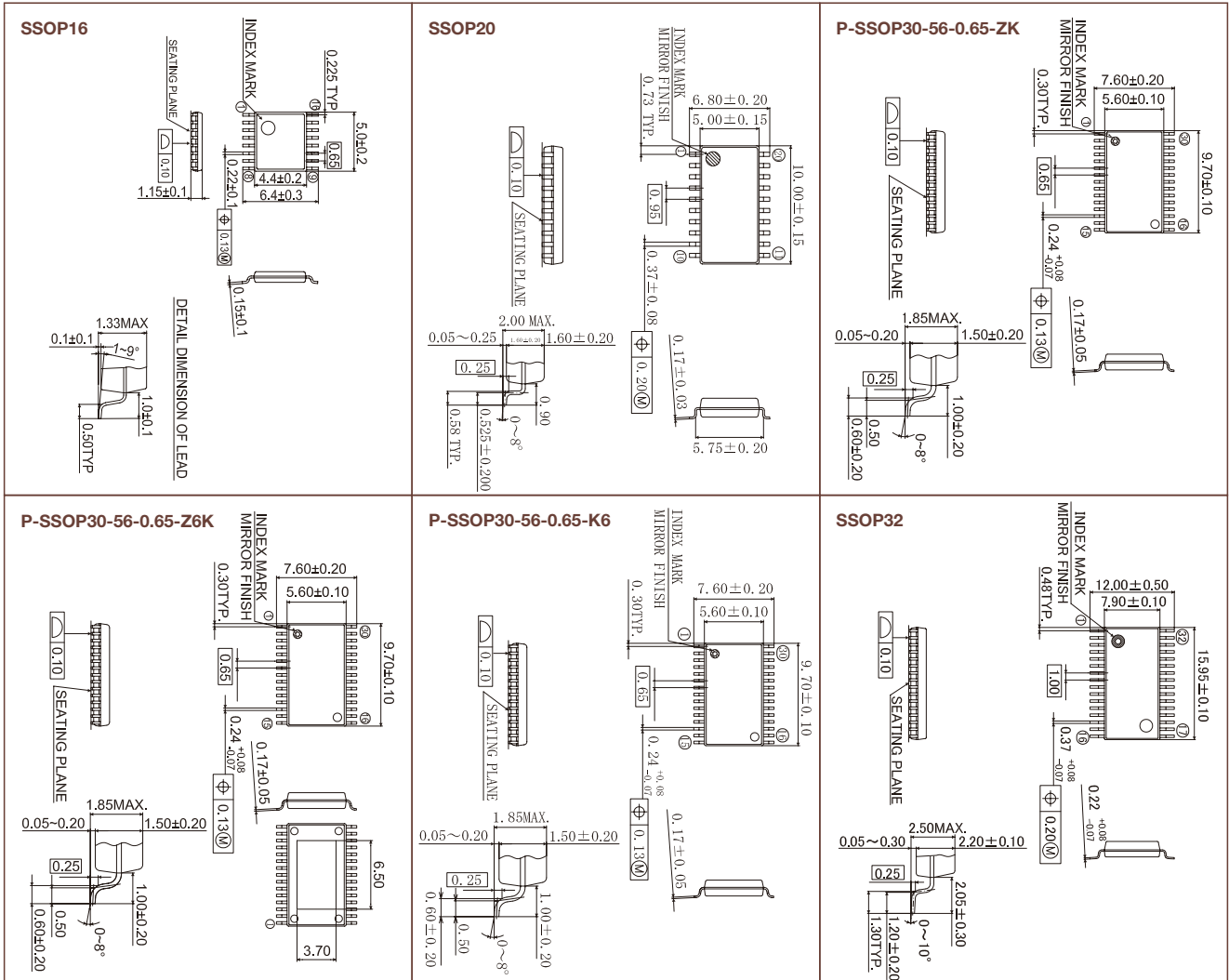
SOP Packages

(Unit: mm)

SOP



SSOP



A

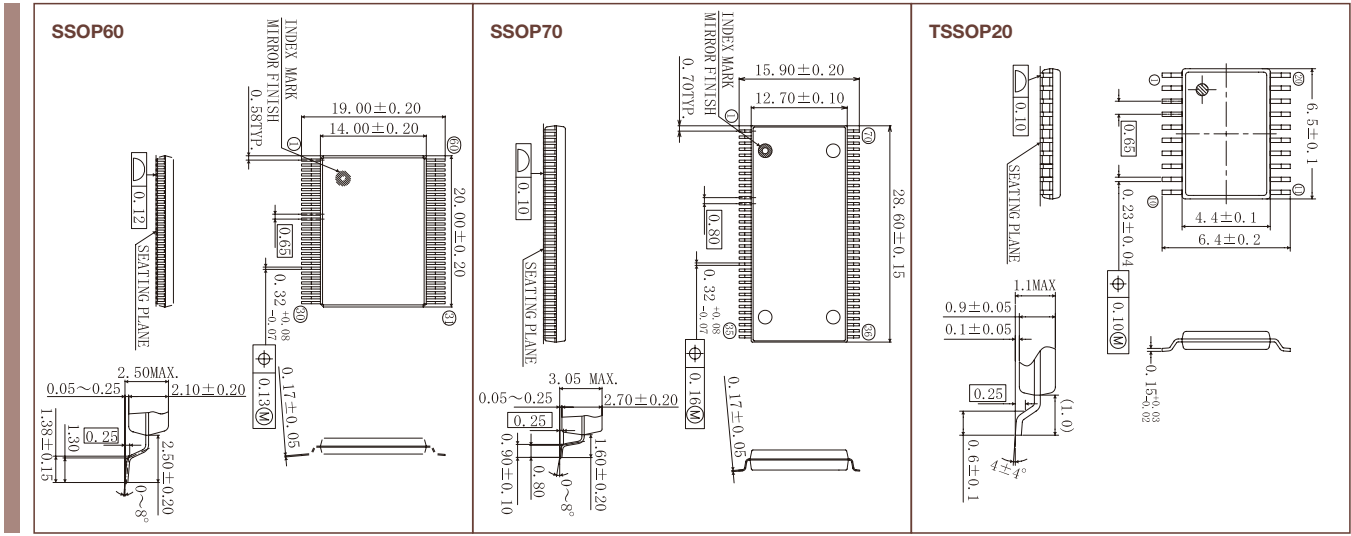
IC Packages

These package size are an example. For details, please inquire to the sales.

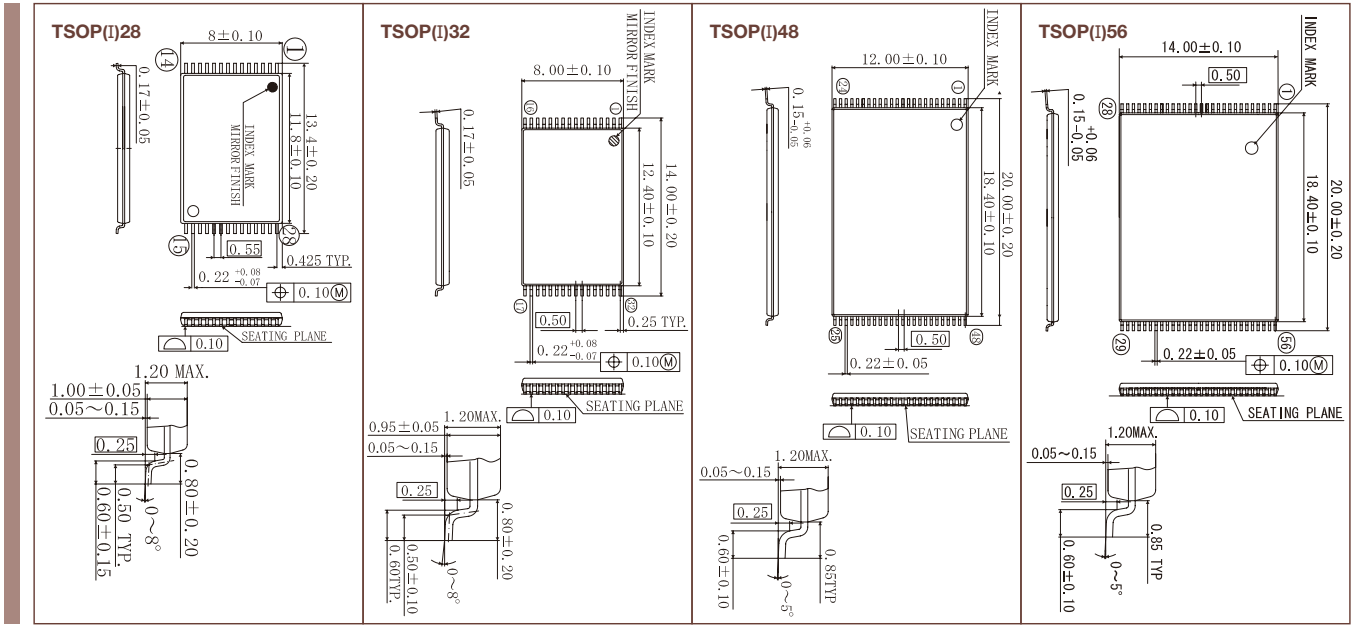
# SOP Packages

(Unit: mm)

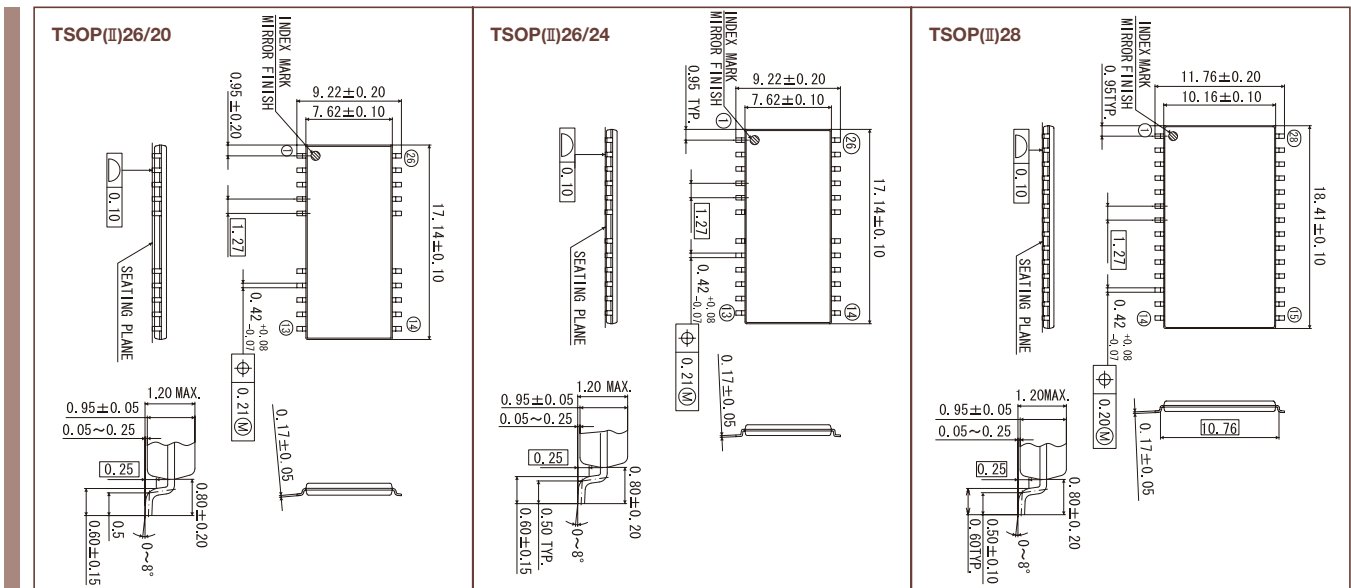
## SSOP



## TSOP (Type I)



## TSOP (Type II)





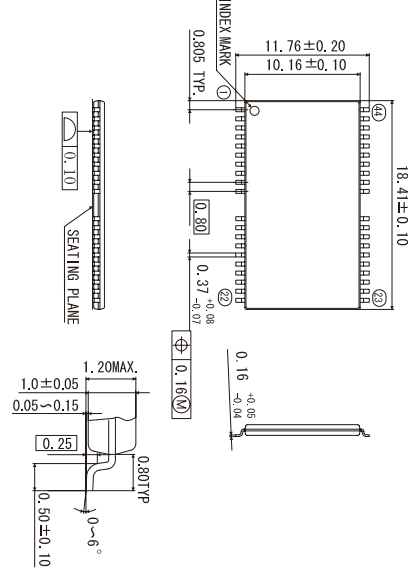
These package size are an example. For details, please inquire to the sales.

## TSOP Packages

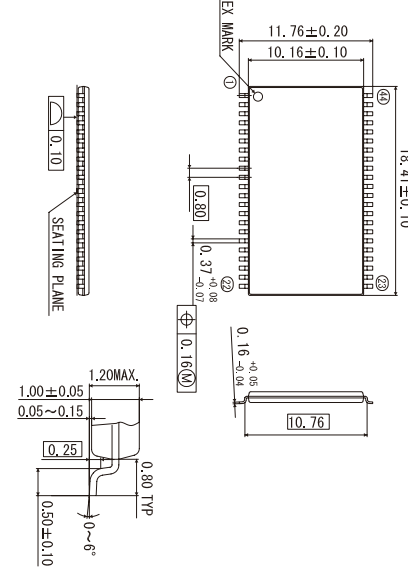
(Unit: mm)

### TSOP (Type II)

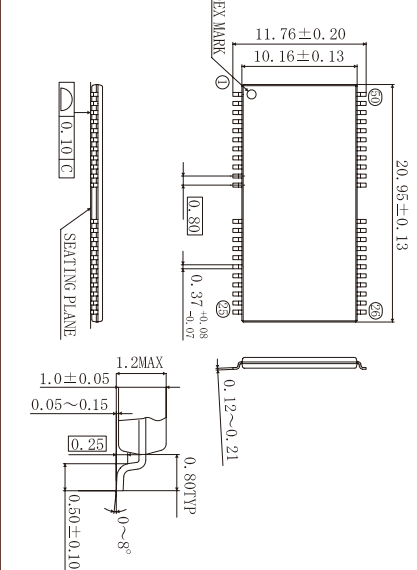
TSOP (II)44/40



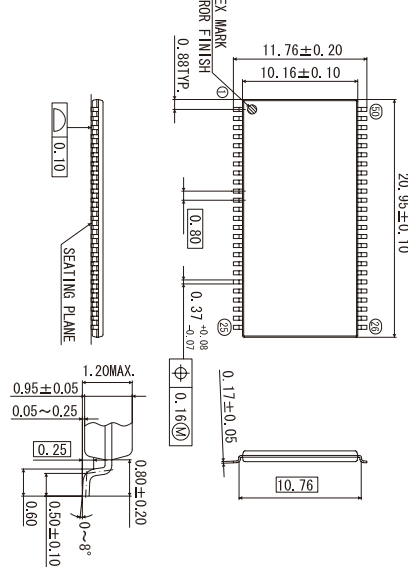
TSOP (II)44



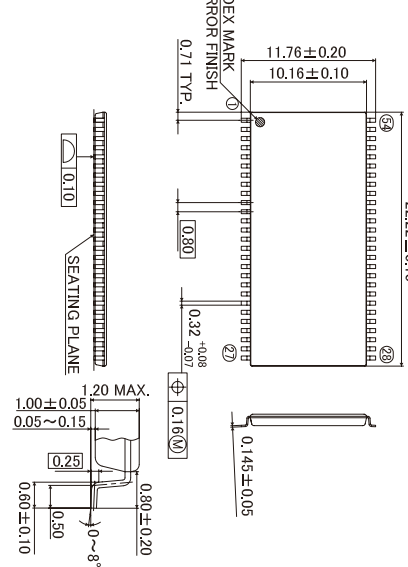
TSOP (II)50/44



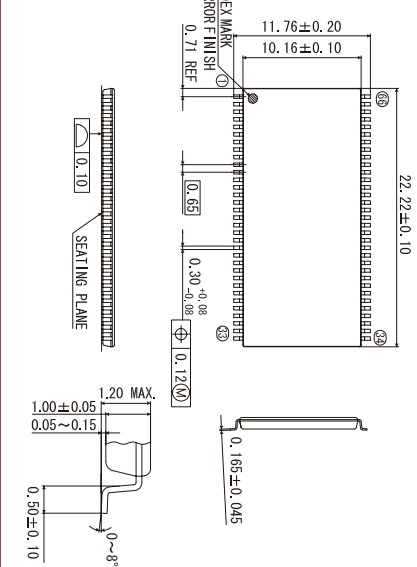
TSOP (II)50



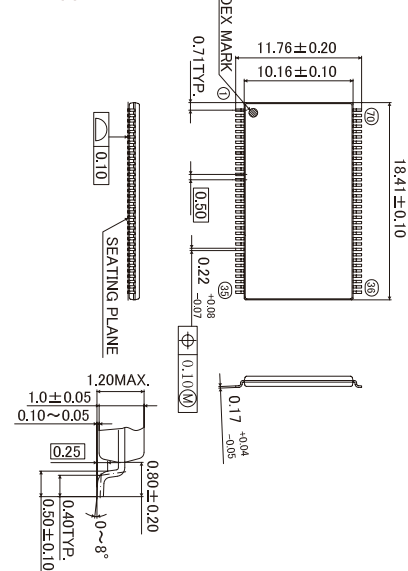
TSOP (II)54



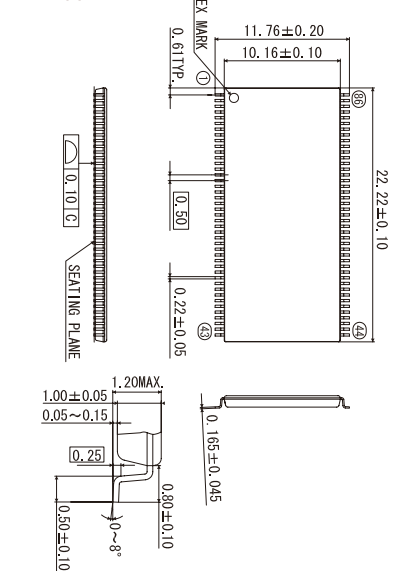
TSOP (II)66



TSOP (II)70



TSOP (II)86



A

IC Packages

These package size are an example. For details, please inquire to the sales.

# QFP Packages

(Unit: mm)

## QFP

<p><b>QFP44</b></p>	<p><b>QFP56</b></p>	<p><b>QFP64-P-1420-1.00</b></p>	<p><b>P-QFP64-1414-0.80</b></p>
<p><b>P-QFP80-1414-0.65</b></p>	<p><b>QFP80-P-1420-0.80</b></p>	<p><b>P-QFP100-1420-0.65-TK</b></p>	<p><b>QFP100-P-1420-0.65-BK</b></p>
<p><b>P-QFP100-1414-0.50-K</b></p>	<p><b>P-QFP128-1420-0.50</b></p>	<p><b>QFP128-P-2828-0.80</b></p>	<p><b>QFP208</b></p>

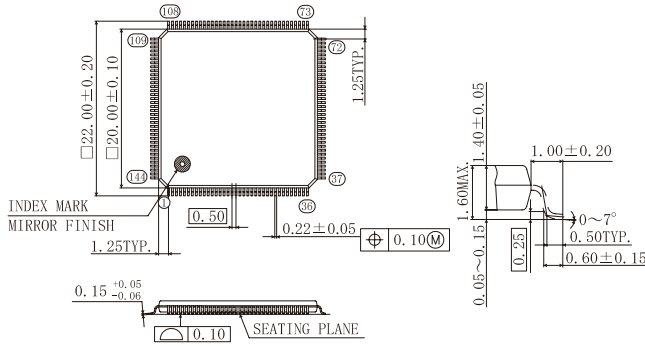
These package size are an example. For details, please inquire to the sales.

# QFP Packages

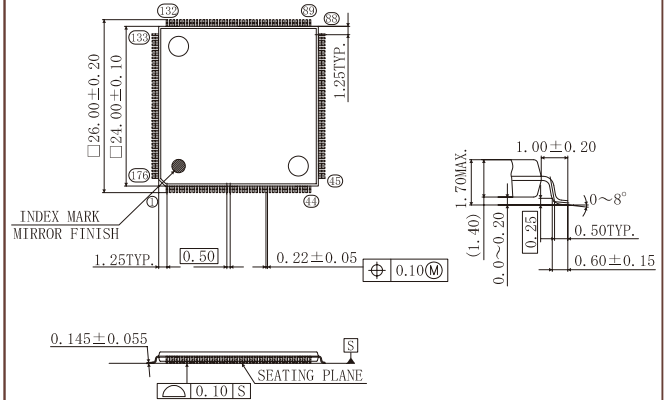
(Unit: mm)

## LQFP

LQFP144

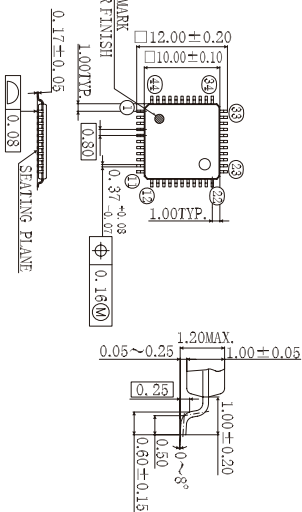


LQFP176

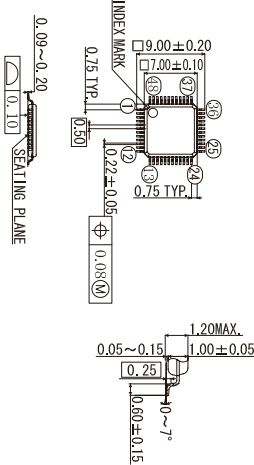


## TQFP

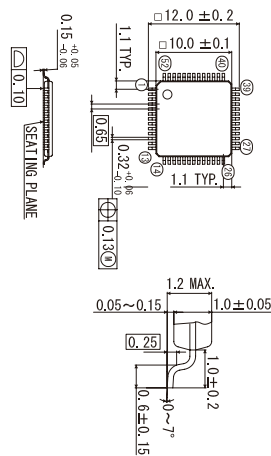
TQFP44



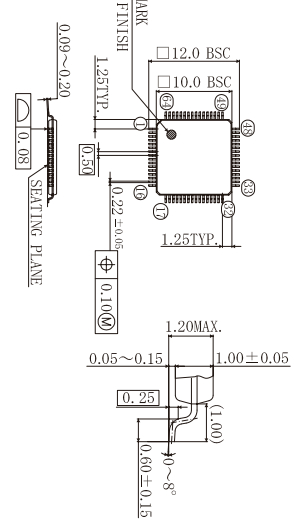
TQFP48



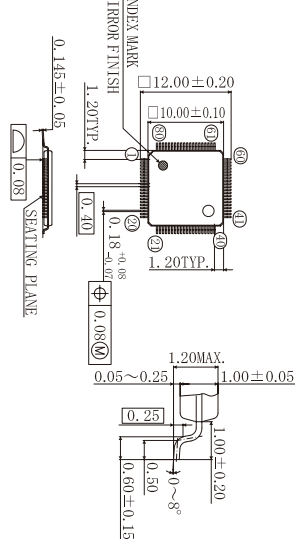
TQFP52



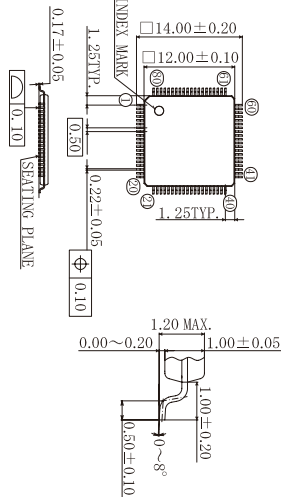
TQFP64



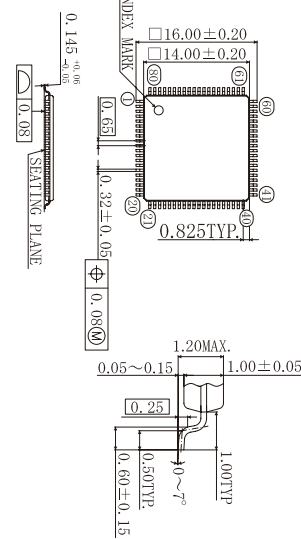
P-TQFP80-1010-0.40



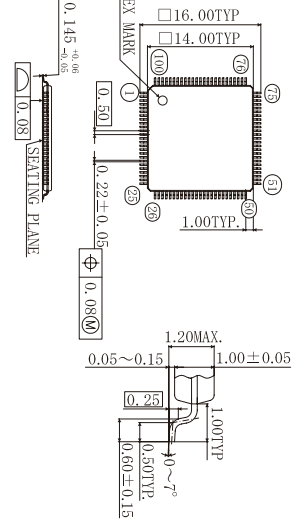
P-TQFP80-1212-0.50



P-TQFP80-1414-0.65



TQFP100

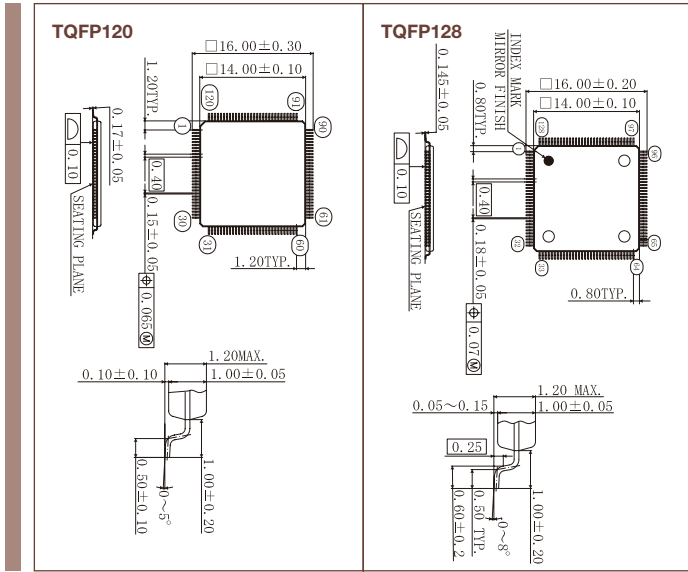


These package size are an example. For details, please inquire to the sales.

## QFP Packages

(Unit: mm)

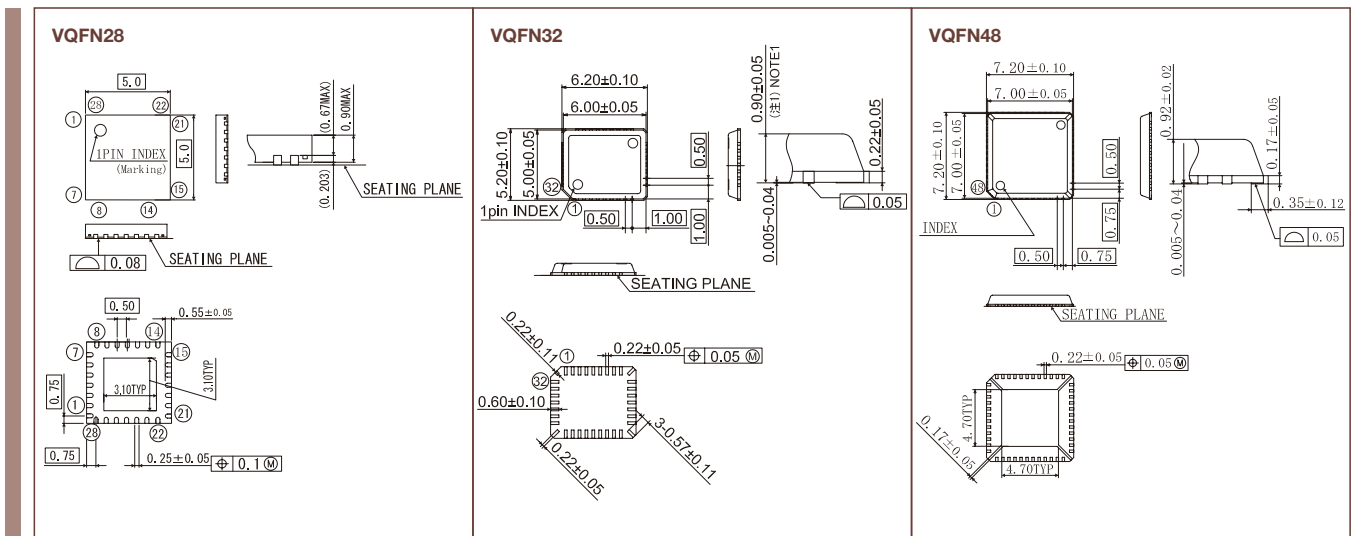
### TQFP



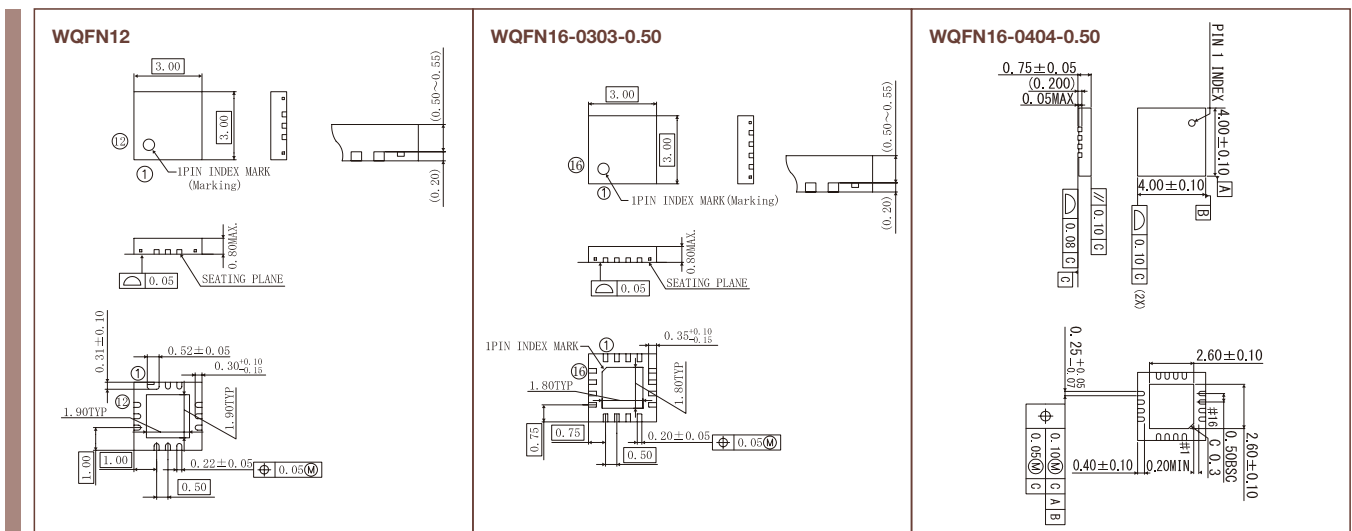
## QFN Packages

(Unit: mm)

### VQFN



### WQFN



A

IC Packages

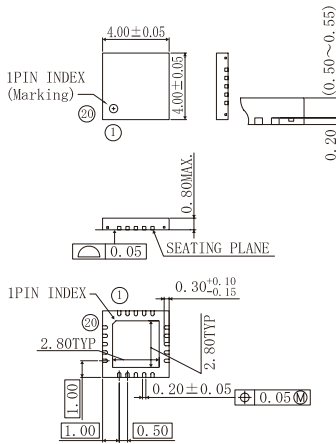
These package size are an example. For details, please inquire to the sales.

# QFN Packages

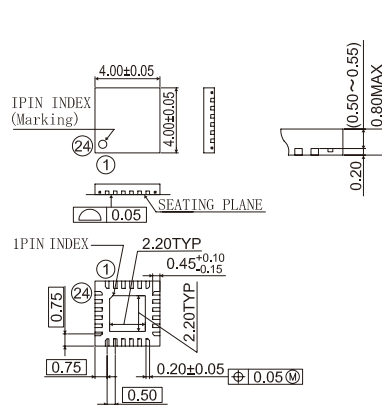
(Unit: mm)

## WQFN

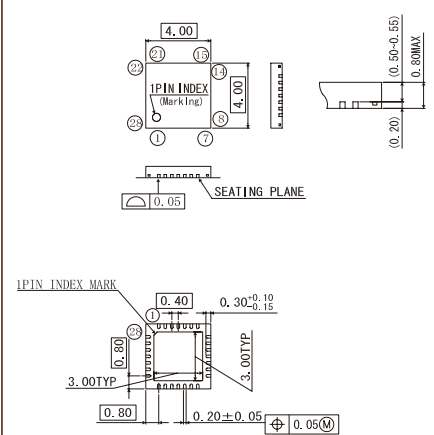
**WQFN20**



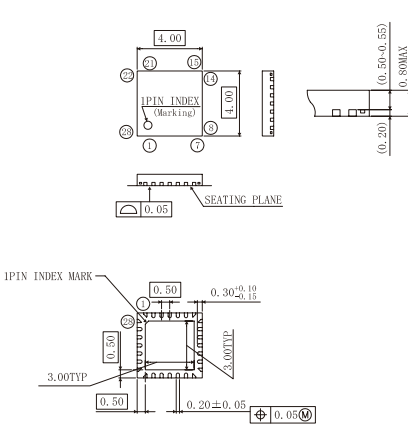
**WQFN24**



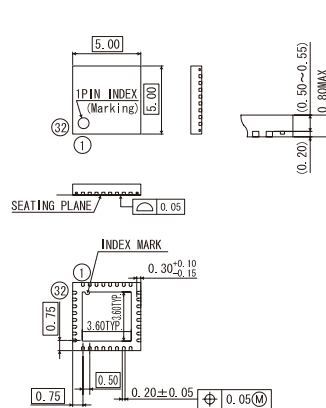
**P-WQFN28-0404-0.40-63**



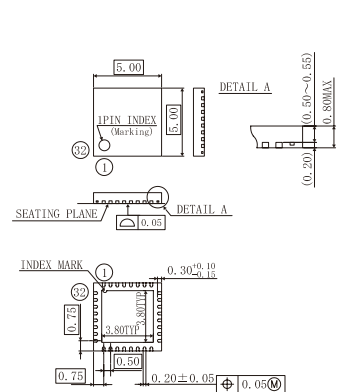
**P-WQFN28-0404-0.50-63**



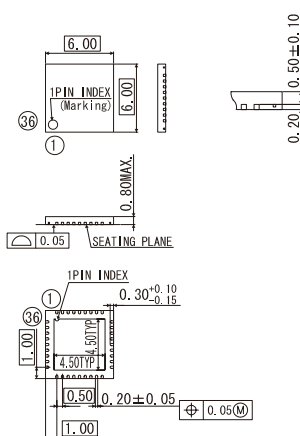
**P-WQFN32-0505-0.50-63**



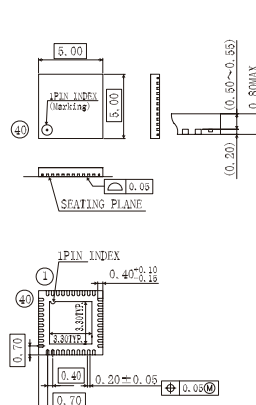
**P-WQFN32-0505-0.50-A63**



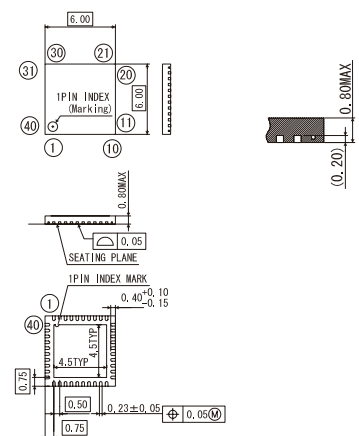
**WQFN36**



**P-WQFN40-0505-0.40**



**P-WQFN40-0606-0.50**



A  
IC Packages

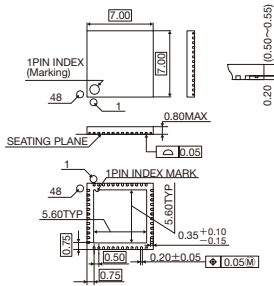
These package size are an example. For details, please inquire to the sales.

# QFN Packages

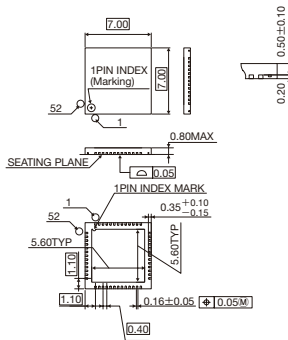
(Unit: mm)

## WQFN

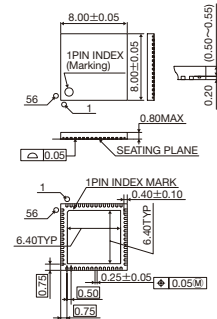
WQFN48



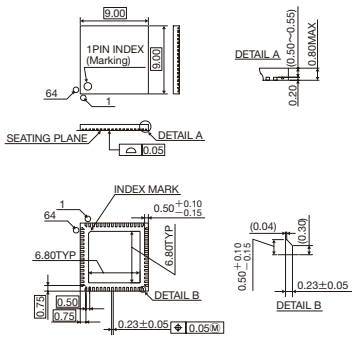
WQFN52



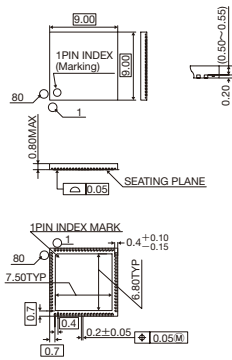
WQFN56



WQFN64

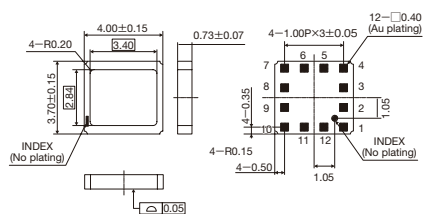


WQFN80

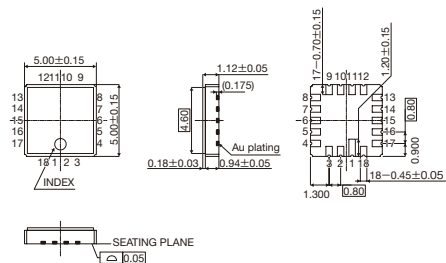


## C-TQFN

C-TQFN12



C-TQFN18



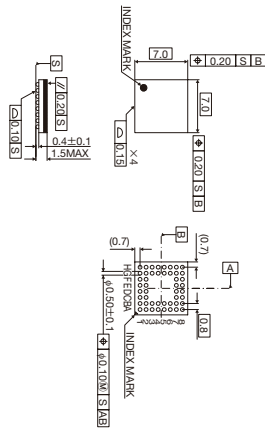
These package size are an example. For details, please inquire to the sales.

# BGA Packages

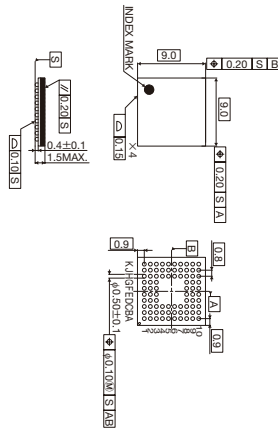
(Unit: mm)

## LFBGA

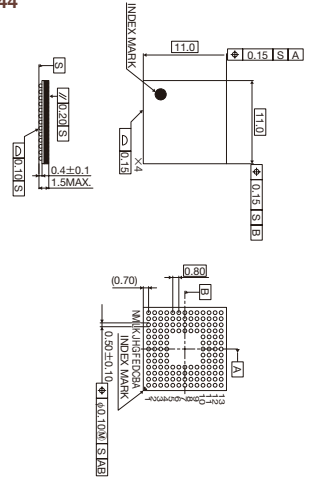
LFBGA48



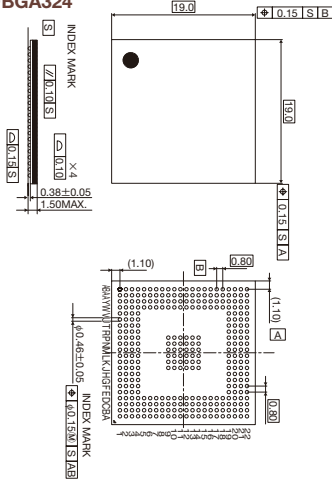
LFBGA84



LFBGA144

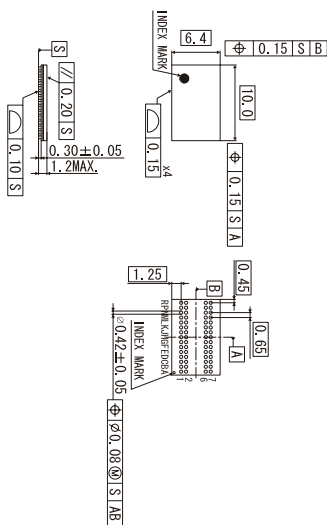


LFBGA324

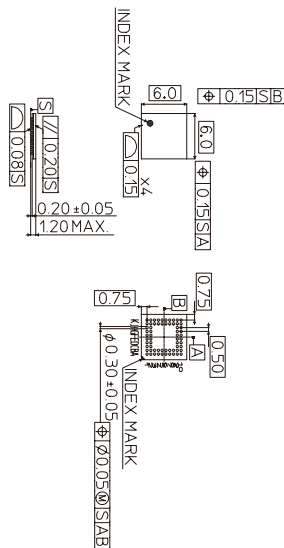


## TFBGA

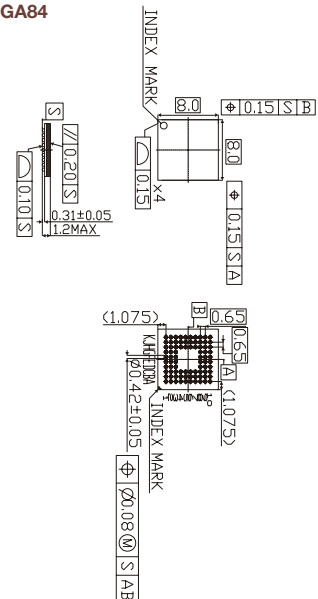
TFBGA60



TFBGA64



TFBGA84





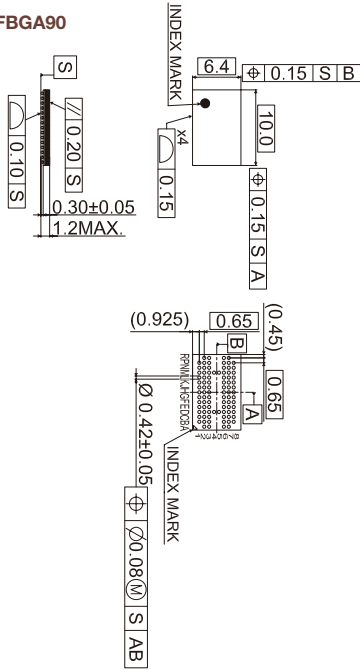
These package size are an example. For details, please inquire to the sales.

## BGA Packages

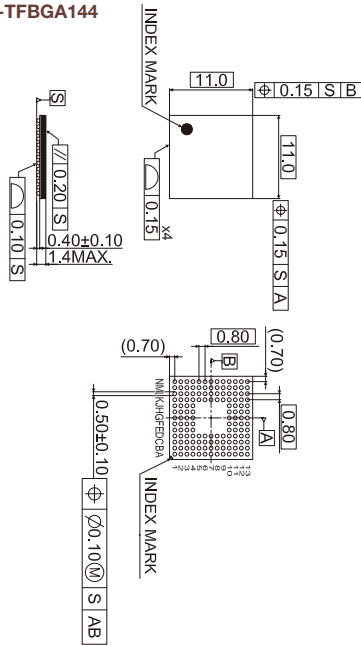
(Unit: mm)

## TFBGA

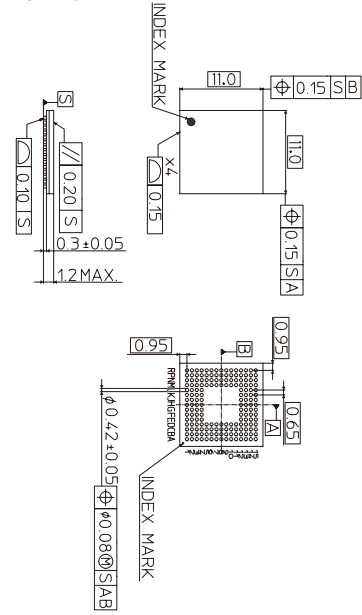
TFBGA90



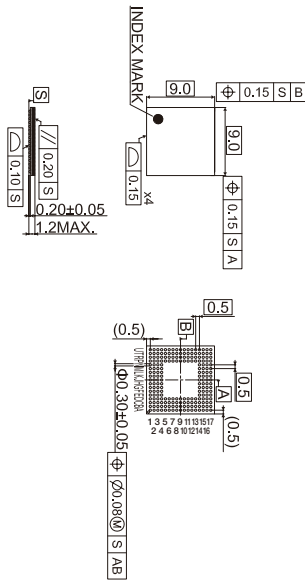
P-TFBGA144



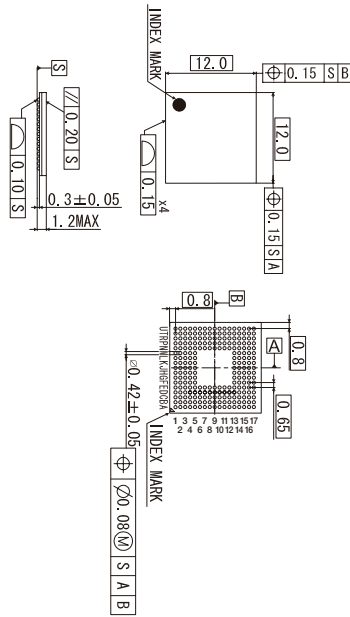
TFBGA176



P-TFBGA208-0909-0.50



P-TFBGA208-1212-0.65





*Power Devices*

# SiC Power Devices

## CONTENTS

■ SiC-Schottky Barrier Diodes .....	P. B2
■ SiC-MOSFET .....	P. B5
■ Full SiC Power Modules .....	P. B6


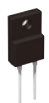


B

SiC Power Devices







ISO9001- / ISO / TS 16949-approved

# SiC-Schottky Barrier Diodes

## ● Quick Reference for SiC-Schottky Barrier Diodes

V <sub>RM</sub> (V)	I <sub>F</sub> (A)	Leaded Type			Surface Mounted Type				
		 TO-220AC [2pin]	 TO-220FM [2pin]	 TO-247 [3pin]	 LPTL [4pin]				
650	6	SCS206AG SCS206AGHR	13 19	SCS206AM	25		SCS206AJ ☆SCS206AJHR	1 7	
	8	SCS208AG SCS208AGHR	14 20	SCS208AM	26		SCS208AJ ☆SCS208AJHR	2 8	
	10	SCS210AG SCS210AGHR	15 21	SCS210AM	27		SCS210AJ ☆SCS210AJHR	3 9	
	12	SCS212AG SCS212AGHR	16 22	SCS212AM	28		SCS212AJ ☆SCS212AJHR	4 10	
	15	SCS215AG SCS215AGHR	17 23	SCS215AM	29	<b>New</b> SCS215AE	31	SCS215AJ ☆SCS215AJHR	5 11
	20	SCS220AG SCS220AGHR	18 24	SCS220AM	30	<b>New</b> SCS220AE SCS220AE2 SCS220AE2HR	32 33 36	SCS220AJ ☆SCS220AJHR	6 12
	30					<b>New</b> SCS230AE2 SCS230AE2HR	34 37		
	40					<b>New</b> SCS240AE2 SCS240AE2HR	35 38		
1,200	5	SCS205KG SCS205KGHR	39 43						
	10	SCS210KG SCS210KGHR	40 44			<b>New</b> SCS210KE2 SCS210KE2HR	47 51		
	15	<b>New</b> SCS215KG SCS215KGHR	41 45						
	20	<b>New</b> SCS220KG SCS220KGHR	42 46			<b>New</b> SCS220KE2 SCS220KE2HR	48 52		
	30					SCS230KE2	49		
	40					SCS240KE2	50		

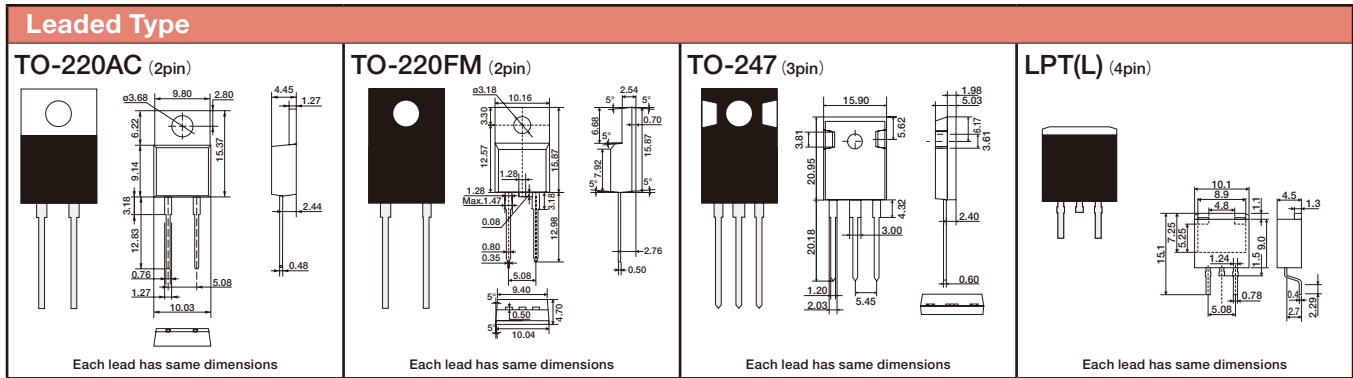
☆ : Under development

SiC-Schottky Barrier Diodes												Equivalent Circuit Diagram
No.	Part No.	Automotive Grade Available	Absolute Maximum Ratings (Ta=25°C)				Electrical Characteristics (Ta=25°C)				Package	
			V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>F</sub> (A)	I <sub>FSM</sub> (A) 60Hz.1	V <sub>F</sub> (V) Typ.	I <sub>F</sub> (A)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)		
1	SCS206AJ	—	650	650	6	24	1.35	6	120	600	LPTL (4pin)	
2	SCS208AJ	—	650	650	8	31	1.35	8	160	600		
3	SCS210AJ	—	650	650	10	40	1.35	10	200	600		
4	SCS212AJ	—	650	650	12	45	1.35	12	240	600		
5	SCS215AJ	—	650	650	15	55	1.35	15	300	600		
6	SCS220AJ	—	650	650	20	71	1.35	20	400	600		
7	☆SCS206AJHR	Yes	650	650	6	24	1.35	6	120	600		
8	☆SCS208AJHR	Yes	650	650	8	31	1.35	8	160	600		
9	☆SCS210AJHR	Yes	650	650	10	40	1.35	10	200	600		
10	☆SCS212AJHR	Yes	650	650	12	45	1.35	12	240	600		
11	☆SCS215AJHR	Yes	650	650	15	55	1.35	15	300	600		
12	☆SCS220AJHR	Yes	650	650	20	71	1.35	20	400	600		
13	SCS206AG	—	650	650	6	24	1.35	6	120	600	TO-220AC (2pin)	
14	SCS208AG	—	650	650	8	31	1.35	8	160	600		
15	SCS210AG	—	650	650	10	40	1.35	10	200	600		
16	SCS212AG	—	650	650	12	45	1.35	12	240	600		
17	SCS215AG	—	650	650	15	55	1.35	15	300	600		
18	SCS220AG	—	650	650	20	71	1.35	20	400	600		
19	SCS206AGHR	Yes	650	650	6	24	1.35	6	120	600		
20	SCS208AGHR	Yes	650	650	8	31	1.35	8	160	600		
21	SCS210AGHR	Yes	650	650	10	40	1.35	10	200	600		
22	SCS212AGHR	Yes	650	650	12	45	1.35	12	240	600		
23	SCS215AGHR	Yes	650	650	15	55	1.35	15	300	600		
24	SCS220AGHR	Yes	650	650	20	71	1.35	20	400	600		
25	SCS206AM	—	650	650	6	24	1.35	6	120	600	TO-220FM (2pin)	
26	SCS208AM	—	650	650	8	31	1.35	8	160	600		
27	SCS210AM	—	650	650	10	40	1.35	10	200	600		
28	SCS212AM	—	650	650	12	45	1.35	12	240	600		
29	SCS215AM	—	650	650	15	55	1.35	15	300	600		
30	SCS220AM	—	650	650	20	71	1.35	20	400	600		
31	<b>New</b> SCS215AE	—	650	650	15	55	1.35	15	300	600	TO-247 (3pin)	
32	<b>New</b> SCS220AE	—	650	650	20	71	1.35	20	400	600		
33	SCS220AE2	—	650	650	10/20*	40/80*	1.35	10	200	600		
34	SCS230AE2	—	650	650	15/30*	55/110*	1.35	15	300	600		
35	SCS240AE2	—	650	650	20/40*	71/140*	1.35	20	400	600		
36	SCS220AE2HR	Yes	650	650	10/20*	40/80*	1.35	10	200	600		
37	<b>New</b> SCS230AE2HR	Yes	650	650	15/30*	55/110*	1.35	15	300	600		
38	<b>New</b> SCS240AE2HR	Yes	650	650	20/40*	71/140*	1.35	20	400	600		
39	SCS205KG	—	1,200	1,200	5	23	1.4	5	100	1,200	TO-220AC (2pin)	
40	SCS210KG	—	1,200	1,200	10	45	1.4	10	200	1,200		
41	SCS215KG	—	1,200	1,200	15	65	1.4	15	300	1,200		
42	SCS220KG	—	1,200	1,200	20	82	1.4	20	400	1,200		
43	SCS205KGHR	Yes	1,200	1,200	5	23	1.4	5	100	1,200		
44	SCS210KGHR	Yes	1,200	1,200	10	45	1.4	10	200	1,200		
45	<b>New</b> SCS215KGHR	Yes	1,200	1,200	15	65	1.4	15	300	1,200		
46	<b>New</b> SCS220KGHR	Yes	1,200	1,200	20	82	1.4	20	400	1,200		
47	SCS210KE2	—	1,200	1,200	5/10*	23/46*	1.4	5	100	1,200	TO-247 (3pin)	
48	SCS220KE2	—	1,200	1,200	10/20*	44/88*	1.4	10	200	1,200		
49	SCS230KE2	—	1,200	1,200	15/30*	65/130*	1.4	15	300	1,200		
50	SCS240KE2	—	1,200	1,200	20/40*	83/160*	1.4	20	400	1,200		
51	<b>New</b> SCS210KE2HR	Yes	1,200	1,200	5/10*	23/46*	1.4	5	100	1,200		
52	<b>New</b> SCS220KE2HR	Yes	1,200	1,200	10/20*	44/88*	1.4	10	200	1,200		

☆ : Under development \* (Per Leg / Device)

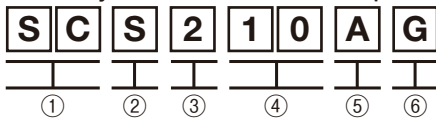
# SiC-Schottky Barrier Diodes

## ●Dimensions (Unit : mm)



## ●Part No. Explanation

### ●Schottky Barrier Diode Part No.Explanation



- ① SiC
- ② SBD
- ③ Generation
- ④ Current (A)  
Example 05 → 5A  
10 → 10A

- ⑤ Voltage  
Example A → 650V  
K → 1200V
- ⑥ Package  
Example E → TO-247(3pin)  
E2 → TO-247(3pin) (Dual Chip)  
G → TO-220AC (2pin)  
M → TO-220FM (2pin)  
J → LPT(L) (4pin)

## ●Packaging type

Package	Code	Packaging style	Basic ordering unit (pcs)
TO-220AC	C	Tube	50
TO-220FM	C	Tube	50
TO-247	C	Tube	30
LPT(L)	TLL	Embossed Tape	1000

# SiC-MOSFET

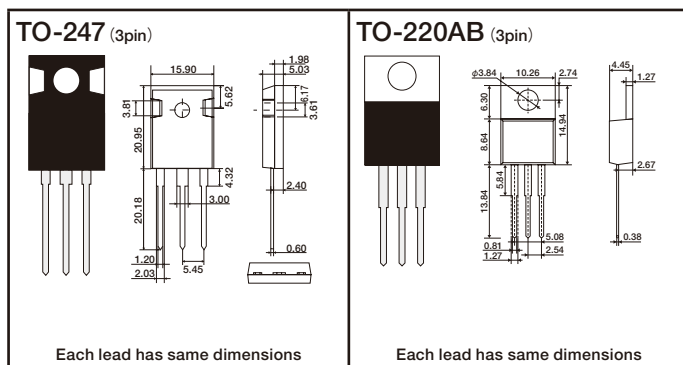
## Quick Reference for SiC-MOSFET

V <sub>DSS</sub> (V)	R <sub>DS(ON)</sub> (mΩ)	Leaded Type		SiC SBD
		TO-220AB (3pin)	TO-247 (3pin)	
400	120	<b>SCTMU001F (MUSIC SERIES)</b>	7	-
650	120	<b>SCT2120AF</b>	1	-
1,200	80		<b>SCH2080KE</b>	2 Co-packed
			<b>SCT2080KE</b>	3 -
	160		<b>SCT2160KE</b>	4 -
	280		<b>SCT2280KE</b>	5 -
	450		<b>SCT2450KE</b>	6 -

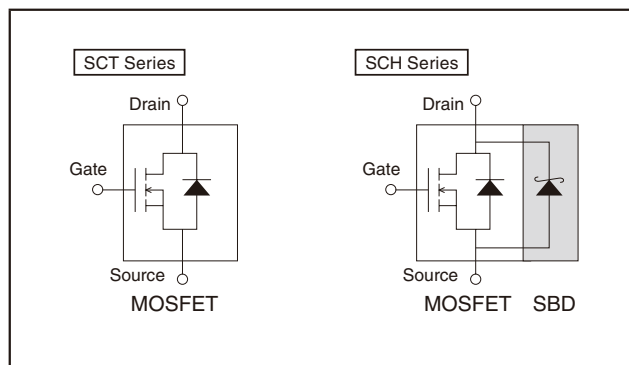
## SiC-MOSFET

SWITCHING SERIES									
No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Tc=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)	Q <sub>g</sub> Typ. (nC)		Package
						V <sub>GS</sub> =18V	V <sub>GS</sub> =18V	Drive Voltage (V)	
1	<b>SCT2120AF</b> [No avalanche guarantee]	N	650	29	165	120	61	18	TO-220AB
2	<b>SCH2080KE</b> [No avalanche guarantee]	N	1,200	40	262	80	106	18	TO-247
3	<b>SCT2080KE</b> [No avalanche guarantee]	N	1,200	40	262	80	106	18	
4	<b>SCT2160KE</b> [No avalanche guarantee]	N	1,200	22	165	160	62	18	
5	<b>SCT2280KE</b> [No avalanche guarantee]	N	1,200	14	108	280	36	18	
6	<b>SCT2450KE</b> [No avalanche guarantee]	N	1,200	10	85	450	27	18	
MUSIC SERIES									
7	<b>SCTMU001F</b> [No avalanche guarantee]	N	400	20	132	120	59	18	TO-220AB

## Dimensions (Unit : mm)

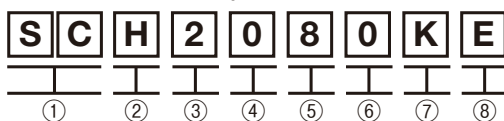


## Internal circuit



## Part No. Explanation

### MOSFET Part No. Explanation



- ① SiC
- ② H → MOSFET+SBD  
T → MOSFET
- ③ Generation
- ④ } ON-resistance [mΩ]
- ⑤ }
- ⑥ }
- ⑦ Voltage A → 650V K → 1200V
- ⑧ Package E → TO-247  
F → TO-220AB (3pin)

## Packaging type

Package	Code	Packaging style	Basic ordering unit (pcs)
TO-220AB	C	Tube	50
TO-247	C	Tube	30

# Full SiC Power Modules

## Quick Reference for Full SiC Power Modules

V <sub>DSS</sub> (V)	R <sub>Ds (ON)</sub> (mΩ)	Case Type	
		C type	E type
1,200	20	BSM120D12P2C005	—
	12.8	BSM180D12P2C101	—
	6.7	—	☆BSM300D12P2E001

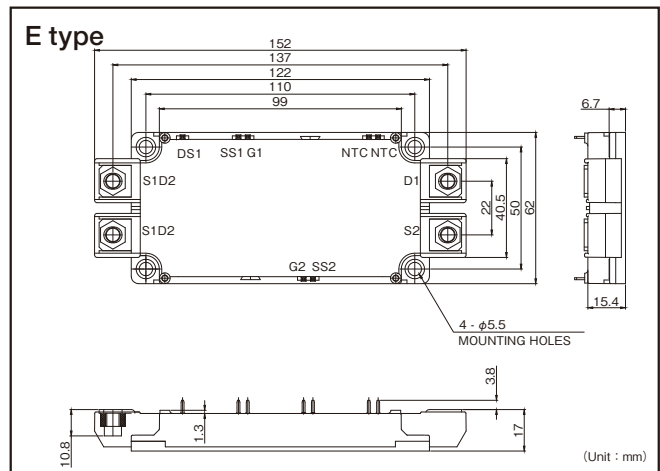
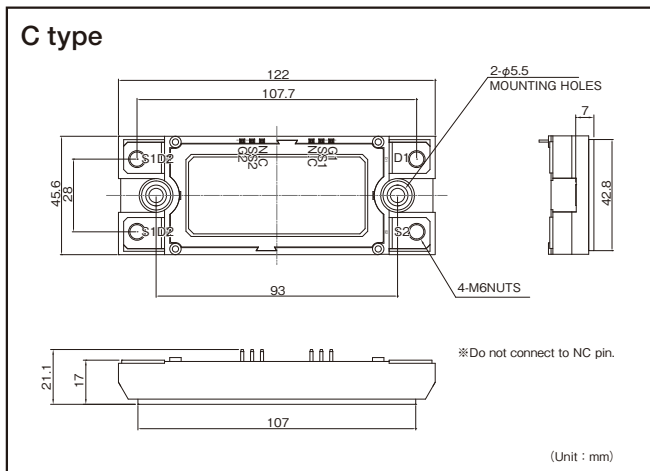
☆ : Under development

## Full SiC Power Modules

Part No.	Absolute Maximum Ratings (Ta=25°C)						Package	Internal circuit
	V <sub>DS</sub> (V)	V <sub>GS</sub> (V)	I <sub>D</sub> (A) [T <sub>C</sub> =60°C]	T <sub>J</sub> (°C)	T <sub>stg</sub> (°C)	Visol (V) AC 1min.		
BSM120D12P2C005	1,200	-6 to +22	120	-40 to +150	-40 to +125	2,500	C type	
BSM180D12P2C101	1,200	-6 to +22	180	-40 to +150	-40 to +125	2,500		
☆BSM300D12P2E001	1,200	-6 to +22	300	-40 to +150	-40 to +125	2,500	E type	

☆ : Under development

## Dimensions



## Part No. Explanation

B	S	M	1	2	0	D	1	2	P	2	C	0	0	5
①	②	③	④	⑤	⑥	⑦								

- ① SiC Power Module
- ② Rated Current
- ③ 2 in 1
- ④ Breakdown Voltage  
Example 12 → 1200V
- ⑤ Device type
- ⑥ Case Type
- ⑦ Additional Number





## *Power Devices*

# IGBT

### CONTENTS

■ Field Stop Trench IGBT .....	P. B8
■ Ignition IGBT .....	P. B9

# Field Stop Trench IGBT

## ●Quick Reference for Field Stop Trench IGBT

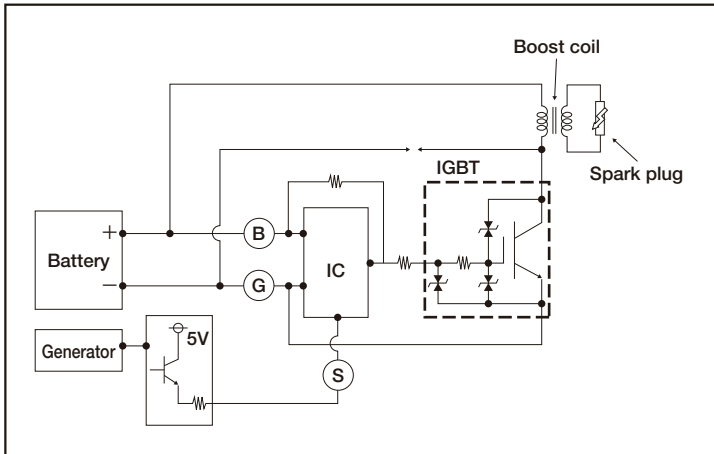
V <sub>CES</sub> (V) (T <sub>C</sub> =25°C)	I <sub>C</sub> (A) (T <sub>C</sub> =100°C)	Surface Mounted type			Leaded type						
		TO-252 (D-PAK)		LPDS (D2-PAK)	TO-247N						
		SCSOA guaranteed			High Speed Switching						
Built in FRD			—				Built in FRD				
650V	4	<b>RGT8BM65D</b>	1	<b>RGT8NS65D</b>	2						
	8			<b>RGT16NS65D</b>	3						
	15			<b>RGT30NS65D</b>	4						
	20			<b>RGT40NS65D</b>	5	<b>RGT40TS65D</b>	6	<b>RGTH40TS65</b>	11	<b>RGTH40TS65D</b>	16
	25					<b>RGT50TS65D</b>	7	<b>RGTH50TS65</b>	12	<b>RGTH50TS65D</b>	17
	30					<b>RGT60TS65D</b>	8	<b>RGTH60TS65</b>	13	<b>RGTH60TS65D</b>	18
	40					<b>RGT80TS65D</b>	9	<b>RGTH80TS65</b>	14	<b>RGTH80TS65D</b>	19
	50					<b>RGT00TS65D</b>	10	<b>RGTH00TS65</b>	15	<b>RGTH00TS65D</b>	20

Field Stop Trench IGBT												
No.	Part No.	V <sub>CES</sub> (V)	I <sub>C</sub> (A)		P <sub>D</sub> (W)	V <sub>CE(sat)</sub> typ. (V)	t <sub>sc</sub> min. (μsec)	I <sub>F(Diode)</sub> (A)		V <sub>F(Diode)</sub> typ. (V)	Package	Equivalent Circuit Diagram
			T <sub>C</sub> =25°C	T <sub>C</sub> =100°C				T <sub>C</sub> =25°C	T <sub>C</sub> =100°C			
1	<b>RGT8BM65D</b>	650	8	4	62	1.65	5	7	4	1.45	TO-252	
2	<b>RGT8NS65D</b>	650	8	4	65	1.65	5	7	4	1.45	LPDS	
3	<b>RGT16NS65D</b>	650	16	8	94	1.65	5	16	8	1.4		
4	<b>RGT30NS65D</b>	650	30	15	133	1.65	5	26	15	1.5		
5	<b>RGT40NS65D</b>	650	40	20	161	1.65	5	35	20	1.45		
6	<b>RGT40TS65D</b>	650	40	20	144	1.65	5	35	20	1.45		
7	<b>RGT50TS65D</b>	650	48	25	174	1.65	5	35	20	1.45		
8	<b>RGT60TS65D</b>	650	55	30	194	1.65	5	40	20	1.35		
9	<b>RGT80TS65D</b>	650	70	40	234	1.65	5	40	20	1.35		
10	<b>RGT00TS65D</b>	650	85	50	277	1.65	5	50	30	1.45		
11	<b>RGTH40TS65</b>	650	40	20	144	1.6	—	—	—	—		TO-247N
12	<b>RGTH50TS65</b>	650	50	25	174	1.6	—	—	—	—		
13	<b>RGTH60TS65</b>	650	58	30	194	1.6	—	—	—	—		
14	<b>RGTH80TS65</b>	650	70	40	234	1.6	—	—	—	—		
15	<b>RGTH00TS65</b>	650	85	50	277	1.6	—	—	—	—		
16	<b>RGTH40TS65D</b>	650	40	20	144	1.6	—	35	20	1.45		
17	<b>RGTH50TS65D</b>	650	50	25	174	1.6	—	35	20	1.45		
18	<b>RGTH60TS65D</b>	650	58	30	194	1.6	—	40	20	1.35		
19	<b>RGTH80TS65D</b>	650	70	40	234	1.6	—	40	20	1.35		
20	<b>RGTH00TS65D</b>	650	85	50	277	1.6	—	50	30	1.45		

\*Built in FRD

# Ignition IGBT

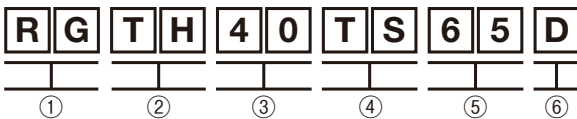
## ●Circuit Example for Ignition IGBT



Ignition IGBT								
Part No.	V <sub>CEs</sub> (V)	V <sub>GE</sub> (V)	I <sub>c</sub> (A)	P <sub>D</sub> (W)	E <sub>as</sub> (mJ)	V <sub>CE</sub> (sat) typ. (V)	Package	Equivalent Circuit Diagram
☆RGPZ10BM40	430±30	±10	10	107	250	1.6	TO-252	
☆RGPR10BM40	430±30	±10	10	107	250	1.6		

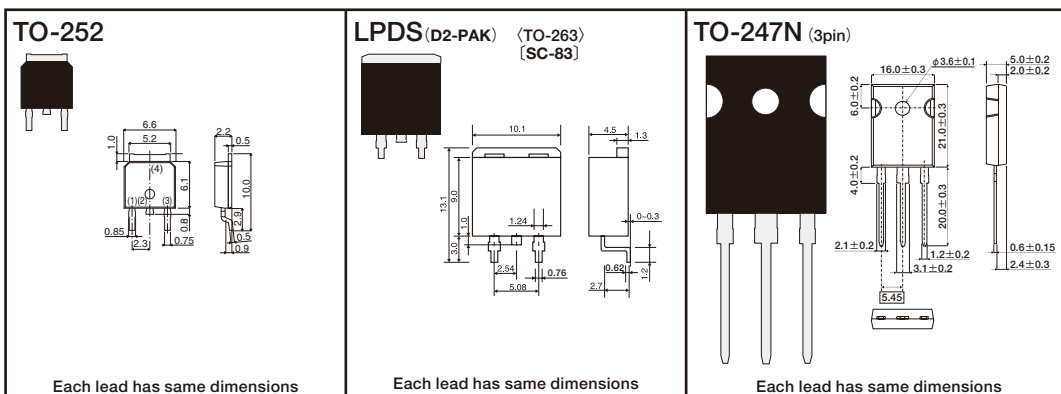
☆ : Under development

## ●Part No. Explanation



- ① IGBT
- ② Series Name
- ③ I<sub>c</sub> <T<sub>c</sub>=100°C >  
ex. 8 → 4A  
16 → 8A  
30 → 15A  
40 → 20A  
00 → 50A
- ④ Package  
ex. BM → TO-252  
NS → LPDS  
TS → TO-247N
- ⑤ V<sub>CEs</sub>  
ex. 65 → 650V
- ⑥ FRD  
ex. D → Built in FRD

## ●Dimensions (Unit : mm)







*Power Devices*

# Intelligent Power Modules

## CONTENTS

■ IGBT-IPM .....	P. B12
■ MOS-IPM .....	P. B12

B

Intelligent Power Modules

# Intelligent Power Modules

## Quick Reference for Intelligent Power Modules

V <sub>BSS</sub> / V <sub>CES</sub> (V)	I <sub>D</sub> / I <sub>C</sub> (A)	IGBT-IPM		MOS-IPM
		Low Speed Switching Type less than 6kHz	High Speed Switching Type less than 20kHz	
		HSDIP25	HSDIP25-VC	
600	10	☆BM63363S-VA	☆BM63763S-VA	—
	15	☆BM63364S-VA ☆BM63364S-VC	☆BM63764S-VA	☆BM65364S-VA
	20	—	BM63165S-VA	—

☆ : Under development

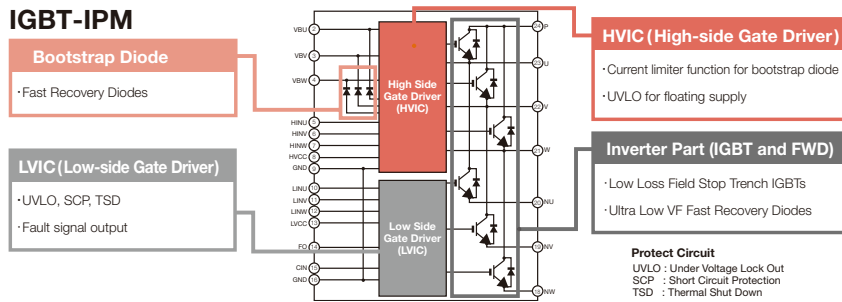
## Intelligent Power Modules

IGBT-IPM							
Part no.	Power Device	V <sub>CES</sub> (V)	I <sub>C</sub> (A)	V <sub>ce(sat)</sub> (V)	Recommended Switching Frequency (kHz)	Isolation Voltage* (V <sub>rms</sub> )	Package
BM63165S-VA	IGBT	600	20	1.6	less than 20	1500	HSDIP25
☆BM63363S-VA	IGBT	600	10	1.5	less than 6	1500	HSDIP25
☆BM63763S-VA	IGBT	600	10	1.7	less than 20	1500	HSDIP25
☆BM63364S-VA	IGBT	600	15	1.5	less than 6	1500	HSDIP25
☆BM63364S-VC	IGBT	600	15	1.5	less than 6	1500	HSDIP25VC
☆BM63764S-VA	IGBT	600	15	1.7	less than 20	1500	HSDIP25
MOS-IPM							
Part no.	Power Device	V <sub>CES</sub> (V)	I <sub>C</sub> (A)	R <sub>on</sub> (mΩ)	Recommended Switching Frequency (kHz)	Isolation Voltage* (V <sub>rms</sub> )	Package
☆BM65364S-VA	MOSFET	600	15	120	less than 20	1500	HSDIP25

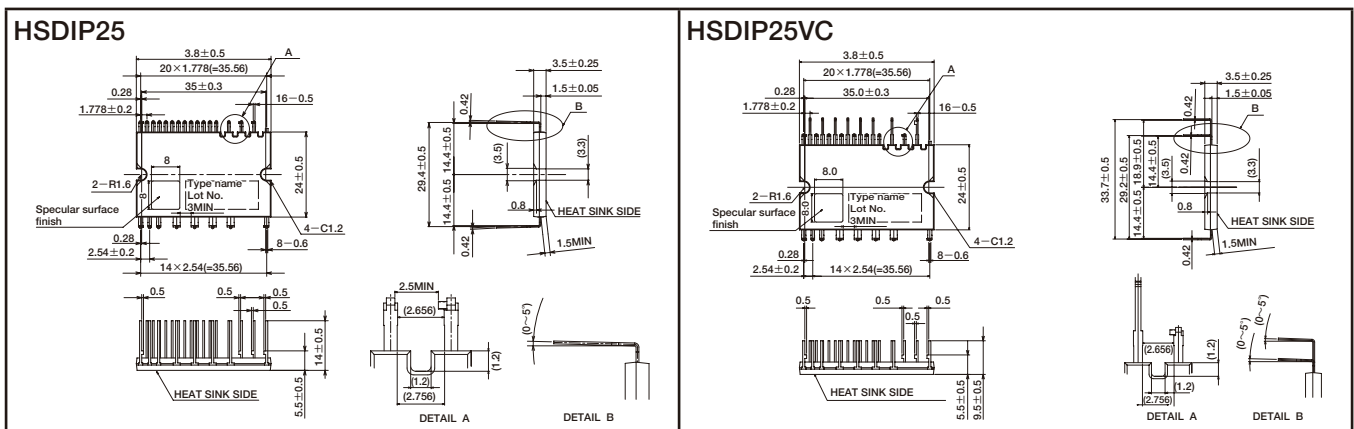
\* : AC 60Hz, 1 minutes, Corresponds to isolation voltage 2500Vrms in the case the convex-shaped heat sink.

☆ : Under development

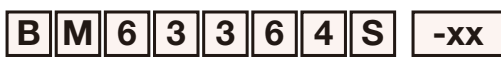
## Block Diagram



## Packages



## Part No. Explanation



Part No.

Package

Packaging and forming specification

S	HSDIP25 HSDIP25VC
---	----------------------

VA	Tube, Long pin type (HSDIP25)
VC	Tube, Staggered type (control side)(HSDIP25VC)



## *Power Devices*

# Power Transistors

### CONTENTS

■ Power MOSFETs .....	P. B14
Power MOSFET Series .....	P. B14
■ Selector Guide for Automotive Power MOSFETs (AEC-Q101) .....	P. B19
■ Power Packages .....	P. B19
■ Part No. Explanation .....	P. B20



# Power MOSFETs

## ● Quick Reference for Power MOSFETs <HSOP8> (Single Type)

Single Type	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)										Package					
			12/13		14/15		17/18		20/22		24/26			28		30/32		35
4.5	30	RS1E130GN(N)	15	RS1E150GN(N)	14	RS1E170GN(N) RS1E180BN(N)	13 5	RS1E200BN(N) RS1E200GN(N)	4 12	RS1E240BN(N) RS1E240GN(N) ☆ RS1E240AT(P)	3 11 6	RS1E280BN(N) RS1E280GN(N)	2 10	RS1E300GN(N) RS1E320GN(N)	9 8	RS1E350BN(N) RS1E350GN(N)	1 7	HSOP8
	40	RS1G120MN(N)	21	RS1G150MN(N)	20	RS1G180MN(N)	19			New RS1G240GN(N) RS1G260MN(N)	18 17			RS1G300GN(N)	16			

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development

<HSOP8> (Single Type)											
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)		Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)
								V <sub>GS</sub> (V)			
HSOP8 	Load switch	1	RS1E350BN	N	30	35	3	4.5	10	95	4.5
		2	RS1E280BN		30	28		1.8	1.2	50	
		3	RS1E240BN		30	24		2.3	1.7	35	
		4	RS1E200BN		30	20		3.3	2.3	29	
		5	RS1E180BN		30	18		3.8	2.8	23	
		6	☆ RS1E240AT	P	-30	-24		4.9	3.5	84	
	DC-DC Converter Switching	7	RS1E350GN	N	30	35		1.5	1.2	28.6	
		8	RS1E320GN		30	32		1.8	1.4	19.6	
		9	RS1E300GN		30	30		2.2	1.7	18.5	
		10	RS1E280GN		30	28		2.6	2	17.1	
		11	RS1E240GN		30	24		3.3	2.6	11.2	
		12	RS1E200GN		30	20		4.7	3.6	7.8	
		13	RS1E170GN		30	17		6.7	5.1	5.9	
		14	RS1E150GN		30	15		8.8	6.7	4.8	
		15	RS1E130GN		30	13		11.7	8.9	3.9	
		16	RS1G300GN		40	30		2.7	2.1	26	
		17	RS1G260MN		40	26		3.2	2.4	54.3*	
		18	New RS1G240GN		40	24		3.9	3.1	16	
		19	RS1G180MN		40	18		6.7	5	24.4*	
		20	RS1G150MN		40	15		10.2	7.6	15.8*	
		21	RS1G120MN		40	12		15.6	11.6	10.1*	

 \* : V<sub>GS</sub>=10V

☆ : Under development

## ● Quick Reference for Power MOSFETs <HSOP8> (Dual Type)

Dual Type	Polarity	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)				Package						
				14/14		20/12			24/12		32/12			
	Nch+Nch	4.5	30	New HP8KA1(N+N)		5 New HP8K22(N+N)		1 ☆ HP8K23(N+N)		2 ☆ HP8K24(N+N) New HP8S36(N+N+SBD)		3 4		HSOP8

Character "N", "SBD" in parentheses indicates "N-channel", "Schottky Barrier Diodes" respectively.

☆ : Under development

<HSOP8> (Dual Type)											
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)		Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)
								V <sub>GS</sub> (V)			
HSOP8 	DC-DC Converter Switching	1	New HP8K22	N+N	30	20	3	4.5	10	7.8	4.5
		2	☆ HP8K23		N+N	30		12	4.7	3.6	
		3	☆ HP8K24	N+N	30	24		3.3	2.6	11.2	
		4	New HP8S36	N+SBD	30	12		9.1	6.7	4.8	
		5	New HP8KA1		N+N	30		32	2.4	1.9	
		6		N	30	12		9.1	6.7	4.8	
		7		N	30	32		2.3	2	47	
		8		N+SBD	30	12		9.1	6.7	4.8	
		9									
	10	Load switch	5	New HP8KA1	N+N	30		14	5.0	3.5	

☆ : Under development




Quick Reference for Power MOSFET Series

Drive Voltage (V)	V <sub>oss</sub> (V)	Feature	ID (A)										Package			
			0.5 to 5	6 to 9	10 / 11	12 / 13 / 14	15 to 19	20 to 25	30/ 33 / 35 / 40	45 to 120						
4	45		RSD046P05 (P) 19	RSD080P05 (P) 20			RSD160P05 (P) 21	RSD200N05 (N) 1					CPT3			
	60		RSD050N06 (N) 2	RSD080N06 (N) 3			RSD140P06 (P) 22	RSD150N06 (N) 4	RSD221N06 (N) 5				CPT3			
	100		RSD050N10 (N) 6		RSD100N10 (N) 7	RSD131P10 (P) 23	RSD175N10 (N) 8	RSD201N10 (N) 9					CPT3			
							RSJ151P10 (P) 79	RSJ250P10 (P) 80	RSJ300N10 (N) 75	RSJ400N10 (N) 76	RSJ550N10 (N) 77	RSJ650N10 (N) 78	LPT			
4.5	190		RCD075N19 (N) 10	RCD100N19 (N) 11									CPT3			
	40									RD3G400GN (N) 24	RD3G450GN (N) 25	RD3G500GN (N) 26	RD3G600GN (N) 27	RD3G800GN (N) 28	TO-252	
												RX1G09BGN (N) 59	RX1G11BGN (N) 58	RX1G12BGN (N) 57	RX1G18BGN (N) 56	TO-220AB
												RGJ650N04 (N) 70	RGJ80CN04 (N) 69	RGJ80BN04 (N) 68	RGJ12BN04 (N) 67	LPT
60							RD3L150GN (N) 29	RD3L200GN (N) 30	RD3L350GN (N) 31	RD3L500GN (N) 32	RX2L600GN (N) 35	RX2L750GN (N) 34	RX2L800GN (N) 33		TO-252	
															TO-220FM	
											RX1L03BGN (N) 66	RX1L05BGN (N) 65	RX1L06BGN (N) 64	RX1L09BGN (N) 63	TO-220AB	
												RX1L14BGN (N) 62	RX1L18BGN (N) 61	RGJ450N06 (N) 74	LPT	
10	200		RND030N20 (N) 12	RCD075N20 (N) 14	RCD100N20 (N) 15										CPT3	
			RCD051N20 (N) 13													LPT
				RCJ081N20 (N) 81			RCJ120N20 (N) 82	RCJ160N20 (N) 83	RCJ200N20 (N) 84	RCJ300N20 (N) 85	RCJ450N20 (N) 86	RCJ700N20 (N) 87				
	250			RCX081N20 (N) 36			RCX120N20 (N) 37	RCX160N20 (N) 38	RCX200N20 (N) 39	RCX300N20 (N) 40	RCX450N20 (N) 41	RCX700N20 (N) 42				TO-220FM
			RCD041N25 (N) 16	RCD080N25 (N) 17	RCD080N25 (N) 18											CPT3
			RCJ050N25 (N) 88	RCJ080N25 (N) 89	RCJ100N25 (N) 90	RCJ120N25 (N) 91			RCJ220N25 (N) 92	RCJ330N25 (N) 93	RCJ510N25 (N) 94					LPT
	500		RCX051N25 (N) 43	RCX080N25 (N) 44	RCX100N25 (N) 45	RCX120N25 (N) 46			RCX220N25 (N) 47	RCX330N25 (N) 48	RCX511N25 (N) 49					TO-220FM
		Low noise		RX2W090AB (N) 50			RX2W130AB (N) 51	RX2W150AB (N) 52								TO-220FM
		Fast Recovery Body Diode		R5009FNX (N) 125	R5011FNX (N) 126			R5016FNX (N) 127								
	600	Low noise	New R6002END (N) 95	R6004END (N) 96												CPT3
			R6004ENJ (N) 97	R6007ENJ (N) 98	R6009ENJ (N) 99	R6011ENJ (N) 100			R6015ENJ (N) 101	R6020ENJ (N) 102	R6024ENJ (N) 103					LPT
			R6004ENX (N) 104	RX2X060AB (N) 53	RX2X100AB (N) 54	RX2X120AB (N) 55	R6015ENX (N) 108	R6020ENX (N) 109	R6024ENX (N) 110	R6030ENX (N) 111						TO-220FM
800			R6007ENX (N) 105	R6011ENX (N) 107												
			R6009ENX (N) 106					R6015ENZ (N) 112	R6020ENZ (N) 113	R6024ENZ (N) 114	R6030ENZ (N) 115	R6035ENZ (N) 116			TO-3PF	
									R6020ENZ1 (N) 117	R6030ENZ1 (N) 119	R6047ENZ1 (N) 121	R6076ENZ1 (N) 122			TO-247	
Dual Type	500	Fast Recovery Body Diode		R6008FNJ (N) 123		R6012FNJ (N) 124									LPT	
				R6008FNX (N) 128		R6012FNX (N) 129	R6015FNX (N) 130	R6020FNX (N) 131	R6025FNZ (N) 132		R6046FNZ (N) 133			TO-220FM		
								R6025FNZ1 (N) 134			R6046FNZ1 (N) 135			TO-247		
		New R8001CND (N) 137												CPT3		
		R8002ANX (N) 138	R8005ANX (N) 139	R8008ANX (N) 140	R8010ANX (N) 141									TO-220FM		

# Power MOSFETs

Power MOSFET Series 1												
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>c</sub> =25°C)	R <sub>DS(on)</sub> Typ. (mΩ)			Q <sub>g</sub> (nC) (V <sub>GS</sub> =10V)	Drive Voltage (V)
								V <sub>GS</sub> (V)				
								4	4.5	10		
CPT3 (SC-63) (SOT-428)	Switching	1	RSD200N05	N	45	20	20	28	25	20	12 <sup>-1</sup>	4
		2	RSD050N06		60	5	15	100	—	78	—	
		3	RSD080N06		60	8	20	78	70	57	9.5	
		4	RSD150N06		60	15	20	48	—	37	—	
		5	RSD221N06		60	22	20	23	21	18	16	
		6	RSD050N10		100	5	15	145	—	135	—	
		7	RSD100N10		100	10	20	105	100	95	18	
		8	RSD175N10		100	17.5	20	85	80	75	24	
		9	RSD201N10		100	20	20	36	—	33	20	
		10	RCD075N19		190	7.5	20	248	245	240	30 <sup>-2</sup>	
		11	RCD100N19		190	10	20	136	135	130	52 <sup>-2</sup>	
		12	RND030N20		200	3	20	—	—	740	7 <sup>-2</sup>	10
		13	RCD051N20		200	5	20	—	—	470	9 <sup>-2</sup>	
		14	RCD075N20		200	7.5	20	—	—	250	15 <sup>-2</sup>	
		15	RCD100N20		200	10	20	—	—	140	26 <sup>-2</sup>	
		16	RCD041N25		250	4	20	—	—	780	9 <sup>-2</sup>	
		17	RCD060N25		250	6	20	—	—	410	15 <sup>-2</sup>	
		18	RCD080N25		250	8	20	—	—	225	25 <sup>-2</sup>	
		TO-252			19	RSD046P05	P	-45	-4.5	15	185	160
20	RSD080P05			-45	-8	15		105	95	65	9 <sup>-1</sup>	
21	RSD160P05			-45	-16	20		50	45	35	16 <sup>-1</sup>	
22	RSD140P06			-60	-14	20		77	73	60	27	
23	RSD131P10			-100	-13	20		155	150	135	18	
24	RD3G400GN			N	40	40	40	—	6.8	5.5	19	4.5
25	RD3G450GN				40	45	50	—	5.8	4.7	23	
26	RD3G500GN				40	50	55	—	4.5	3.7	31	
27	RD3G600GN				40	60	65	—	3.2	2.7	46	
28	RD3G800GN				40	80	100	—	2.5	2.1	65	
29	RD3L150GN	60	15		15	—	50	39	6.3			
30	RD3L200GN	60	20		30	—	23	18	14			
31	RD3L350GN	60	35		55	—	9.9	7.9	34			
32	RD3L500GN	60	50		100	—	5.1	4.1	71			

 \*1: V<sub>GS</sub>=5V \*2: V<sub>GS</sub>=10V

Power MOSFET Series 2															
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>C</sub> =25°C)	R <sub>DS(on)</sub> Typ. (mΩ)			Q <sub>g</sub> (nC) (V <sub>GS</sub> =10V)	Drive Voltage (V)			
								V <sub>GS</sub> (V)							
								4	4.5	10					
	Switching	33	RX2L800GN	N	60	80	50	—	3.3	2.7	163	4.5			
		34	RX2L750GN		60	75	50	—	6.6	5.3	71				
		35	RX2L600GN		60	60	50	—	7.8	6.2	59				
		36	RCX081N20		200	8	40	—	—	470	9				
		37	RCX120N20		200	12	40	—	—	250	15				
		38	RCX160N20		200	16	40	—	—	135	26				
		39	RCX200N20		200	20	40	—	—	100	40				
		40	RCX300N20		200	30	40	—	—	60	60				
		41	RCX450N20		200	45	40	—	—	42	80				
		42	RCX700N20		200	70	40	—	—	30.5	125				
		43	RCX051N25		250	5	30	—	—	850	9				
		44	RCX080N25		250	8	35	—	—	460	15				
		45	RCX100N25		250	10	40	—	—	245	26.5				
		46	RCX120N25		250	12	40	—	—	180	35				
		47	RCX220N25		250	22	40	—	—	105	60				
		48	RCX330N25		250	33	40	—	—	77	80				
		49	RCX511N25		250	51	40	—	—	48	120				
		50	RX2W090AB		500	9	35	—	—	750	22				
		51	RX2W130AB		500	13	40	—	—	450	34				
		52	RX2W150AB		500	15	45	—	—	290	46				
		53	RX2X060AB		600	6	35	—	—	1Ω	22				
		54	RX2X100AB		600	10	40	—	—	600	31				
		55	RX2X120AB		600	12	45	—	—	450	46				
			Switching		56	RX1G18BGN	N	40	180	250	—	1.3	1.1	167	4.5
					57	RX1G12BGN		40	120	130	—	3.5	3.0	46	
58	RX1G11BGN			40	110	80		—	4.7	3.9	31				
59	RX1G09BGN			40	90	70		—	6.0	4.9	23				
60	RX1L18CGN			60	180	210		—	2.8	2.3	182				
61	RX1L18BGN			60	180	180		—	3.5	2.9	138				
62	RX1L14BGN			60	140	140		—	5.8	4.7	87				
63	RX1L09BGN			60	90	90		—	8.1	6.5	59				
64	RX1L06BGN			60	60	70		—	13.2	10.5	34				
65	RX1L05BGN			60	50	60		—	18.2	14.4	24				
66	RX1L03BGN			60	30	50		—	29.5	23.2	14				
	Switching	67	RGJ12BN04	N	40	120	170	—	1.4	1.2	161	4.5			
		68	RGJ80BN04		40	80	100	—	2.6	2.2	65				
		69	RGJ80CN04		40	80	60	—	4.6	3.8	31				
		70	RGJ650N04		40	65	50	—	5.9	4.8	23				
		71	RGJ12BN06		60	120	170	—	2.5	2.1	175				
		72	RGJ10BN06		60	100	100	—	4.3	3.4	87				
		73	RGJ700N06		60	70	60	—	6.2	5.0	59				
		74	RGJ450N06		60	45	30	—	14	12	24				
		75	RSJ300N10		100	30	50	38	36	33	50				
		76	RSJ400N10		100	40	50	21	—	19	90				
		77	RSJ550N10		100	55	50	13.5	—	12	143				
		78	RSJ650N10		100	65	50	7	—	6.5	260				
		79	RSJ151P10		P	-100	-15	50	100	95	85		64		
		80	RSJ250P10			-100	-25	50	50	48	48		60 <sup>*1</sup>		
		81	RCJ081N20	N	200	8	40	—	—	470	9	10			
		82	RCJ120N20		200	12	40	—	—	250	15				
		83	RCJ160N20		200	16	40	—	—	135	26				
		84	RCJ200N20		200	20	40	—	—	100	40				
		85	RCJ300N20		200	30	40	—	—	60	60				
		86	RCJ450N20		200	45	40	—	—	42	80				
		87	RCJ700N20		200	70	40	—	—	30.5	125				
		88	RCJ050N25		250	5	30	—	—	850	9				
		89	RCJ080N25		250	8	35	—	—	460	15				
		90	RCJ100N25		250	10	40	—	—	245	26.5				
		91	RCJ120N25		250	12	40	—	—	180	35				
		92	RCJ220N25		250	22	40	—	—	105	60				
		93	RCJ330N25		250	33	40	—	—	77	80				
		94	RCJ510N25		250	51	40	—	—	48	120				


\*1 : V<sub>GS</sub>=4.5V

# Power MOSFETs

Low noise type													
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>C</sub> =25°C)	R <sub>DS(on)</sub> Typ. (Ω) V <sub>GS</sub> =10V	Q <sub>g</sub> Typ. (nC) V <sub>GS</sub> =10V	Drive Voltage (V)			
CPT3		95	<b>New</b> R6002END	N	600	1.7	20	2.8	6.5	10			
		96	R6004END			4	20	0.9	15				
LPT		97	R6004ENJ			4	40	0.9	15				
		98	R6007ENJ			600	7	40	0.57		20		
		99	R6009ENJ			600	9	40	0.5		23		
		100	R6011ENJ			600	11	40	0.34		32		
		101	R6015ENJ			600	15	40	0.26		40		
		102	R6020ENJ			600	20	40	0.17		60		
		103	R6024ENJ			600	24	40	0.15		70		
TO-220FM	Switching	104	R6004ENX			600	4	40	0.9		15		
		105	R6007ENX			600	7	40	0.57		20		
		106	R6009ENX			600	9	40	0.5		23		
		107	R6011ENX			600	11	40	0.34		32		
		108	R6015ENX			600	15	40	0.26		40		
TO-3PF		109	R6020ENX			600	20	50	0.17		60		
		110	R6024ENX			600	24	40	0.15		70		
		111	R6030ENX			600	30	40	0.115		85		
		112	R6015ENZ			600	15	120	0.26		40		
TO-247		113	R6020ENZ			600	20	120	0.17		60		
		114	R6024ENZ			600	24	120	0.15		70		
		115	R6030ENZ			600	30	120	0.115		85		
		116	R6035ENZ			600	35	120	0.095		110		
TO-247		117	R6020ENZ1	600	20	120	0.17	60					
		118	R6024ENZ1	600	24	120	0.15	70					
		119	R6030ENZ1	600	30	120	0.115	85					
		120	R6035ENZ1	600	35	120	0.095	110					
		121	R6047ENZ1	600	47	120	0.07	145					
		122	R6076ENZ1	600	76	120	0.04	260					
Fast Recovery Body Diode type (PrestoMOS™)													
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>C</sub> =25°C)	R <sub>DS(on)</sub> Typ. (Ω) V <sub>GS</sub> =10V	Q <sub>g</sub> Typ. (nC) V <sub>GS</sub> =10V	t <sub>rr</sub> (Typ.) (ns)	Drive Voltage (V)		
LPT		123	R6008FNJ	N	600	8	50	0.73	20	67	10		
		124	R6012FNJ			12	50	0.39	35	75			
TO-220FM	Switching	125	R5009FNX			500	9	50	0.65	18		78	
		126	R5011FNX			500	11	50	0.4	30		85	
		127	R5016FNX			500	16	50	0.22	45		100	
		128	R6008FNX			600	8	50	0.73	20		67	
		129	R6012FNX			600	12	50	0.39	35		75	
		130	R6015FNX			600	15	50	0.27	42		90	
		131	R6020FNX			600	20	50	0.19	65		105	
TO-3PF		132	R6025FNZ			600	25	150	0.14	85		120	
		133	R6046FNZ			600	46	120	0.075	150		145	
TO-247		134	R6025FNZ1			600	25	150	0.14	85		120	
		135	R6046FNZ1			600	46	120	0.075	150		143	
High speed switching type													
Package	Application	No.	Part No.			Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>C</sub> =25°C)	R <sub>DS(on)</sub> Typ. (Ω) V <sub>GS</sub> =10V		Q <sub>g</sub> Typ. (nC) V <sub>GS</sub> =10V	Drive Voltage (V)
SOP8	Switching	136	SP8K80	N+N	500	0.5	2	9	3.8	10			
CPT3		137	<b>New</b> R8001CND	N	800	1	20	6.7	7.2				
TO-220FM		138	R8002ANX		800	2	35	3.3	12.7				
		139	R8005ANX		800	5	40	1.6	21				
		140	R8008ANX		800	8	50	0.79	39				
		141	R8010ANX	800	10	40	0.43	62					

**B**  
**Power Transistors**

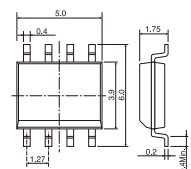
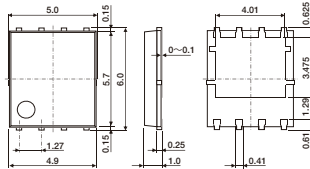
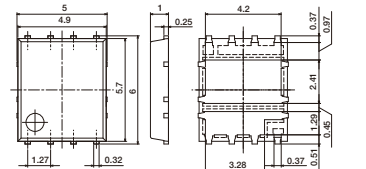
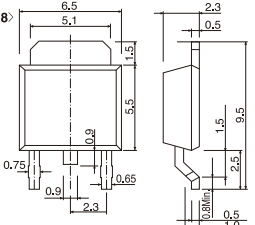
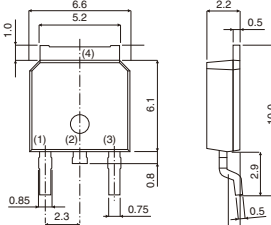
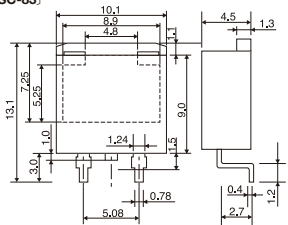
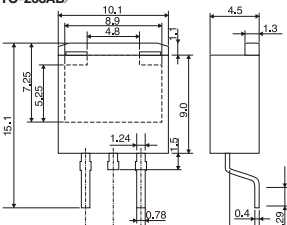
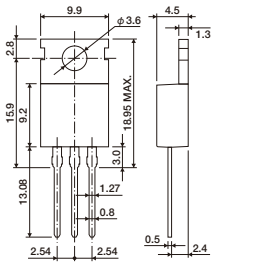
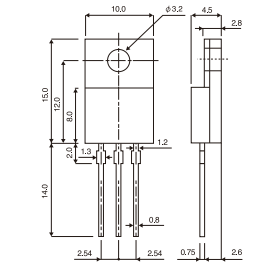
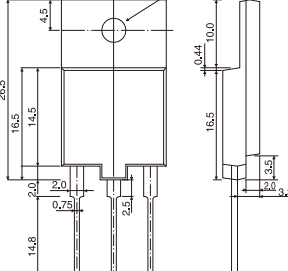
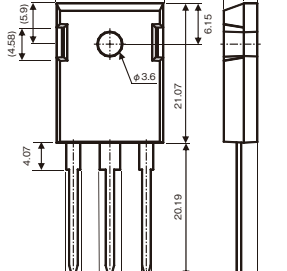
# Selector Guide for Automotive Power MOSFETs (AEC-Q101)

Selector Guide for Automotive Power MOSFETs (AEC-Q101)															
Package (Dimension:mm)	Part No.		Single/ Dual	Polarity	Maximum Rating			R <sub>DS</sub> (on) typ. (mΩ)				V <sub>GS</sub> (th)(V)		QG typ. V <sub>GS</sub> =10V (nC)	C <sub>iss</sub> typ. V <sub>GS</sub> =10V (pF)
					V <sub>DS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS</sub> (V)	V <sub>GS</sub> =10V	V <sub>GS</sub> =4.5V	V <sub>GS</sub> =2.5V	V <sub>GS</sub> =1.5V	min.	max.		
 CPT3 (SC-63 / SOT-428) 9.5 × 6.5 × 2.3	RSD200N05	FRA TL	Single	N	45	20	±20	20	25	—	—	1	2.5	12 <sup>-1</sup>	950
	RSD050N06	FRA TL	Single	N	60	5	±20	78	94	—	—	1	3	8	290
	RSD080N06	FRA TL	Single	N	60	8	±20	57	70	—	—	1	2.5	9.4	380
	RSD150N06	FRA TL	Single	N	60	15	±20	28	33	—	—	1	3	18	930
	RSD221N06	FRA TL	Single	N	60	22	±20	18	21	—	—	1	3	30	1500
	RSD050N10	FRA TL	Single	N	100	5	±20	135	142	—	—	1	2.5	14	530 <sup>-2</sup>
	RSD100N10	FRA TL	Single	N	100	10	±20	95	100	—	—	1	2.5	18	700 <sup>-2</sup>
	RSD175N10	FRA TL	Single	N	100	17.5	±20	75	80	—	—	1	2.5	24	950
	RSD201N10	FRA TL	Single	N	100	20	±20	33	36	—	—	1	2.5	55	2100
	<b>New</b> R5205PND	FRA TL	Single	N	525	5	±30	1300	—	—	—	2.5	4.5	10.8	320 <sup>-2</sup>
<b>New</b> R6006PND	FRA TL	Single	N	600	6	±30	900	—	—	—	2.5	4.5	15	460 <sup>-2</sup>	
<b>New</b> R6004PND	FRA TL	Single	N	600	4	±30	1400	—	—	—	2.5	4.5	11	280 <sup>-2</sup>	
RSD046P05	FRA TL	Single	P	-45	-4.5	±20	110	160	—	—	-1	-3	12 <sup>-1</sup>	550	
RSD080P05	FRA TL	Single	P	-45	-8	±20	65	95	—	—	-1	-3	9 <sup>-1</sup>	1000	
RSD160P05	FRA TL	Single	P	-45	-16	±20	35	45	—	—	-1	-3	16 <sup>-1</sup>	2000	
RSD140P06	FRA TL	Single	P	-60	-14	±20	60	73	—	—	-1	-3	27	1900	
RSD131P10	FRA TL	Single	P	-100	-13	±20	135	150	—	—	-1	-2.5	40	2400	
RSJ451N04	FRA TL	Single	N	45	45	±20	9.5	—	—	—	1.2	3	43	2400 <sup>-2</sup>	
RSJ400N06	FRA TL	Single	N	60	40	±20	11	—	—	—	1	3	52	2400	
RSJ800N06	FRA TL	Single	N	60	80	±20	4.5	5	—	—	1	2.5	130	6000	
RSJ400N10	FRA TL	Single	N	100	40	±20	19	21 <sup>-4</sup>	—	—	1	2.5	90	3600 <sup>-2</sup>	
RSJ550N10	FRA TL	Single	N	100	55	±20	12	13.5	—	—	1	2.5	143	6150 <sup>-2</sup>	
RSJ650N10	FRA TL	Single	N	100	65	±20	6.5	7	—	—	1	2.5	260	10780	
<b>New</b> RJ1U330AA	FRG TL	Single	N	250	33	±30	77	—	—	—	3.0	5.0	80	4500 <sup>-2</sup>	
<b>New</b> RSJ250P10	FRA TL	Single	P	-100	-25	±20	45	48	—	—	-1	-2.5	60 <sup>-1</sup>	8000 <sup>-2</sup>	

\*1 V<sub>GS</sub>=5V \*2 V<sub>GS</sub>=25V

## Power Packages

### ● Dimensions (Unit : mm)

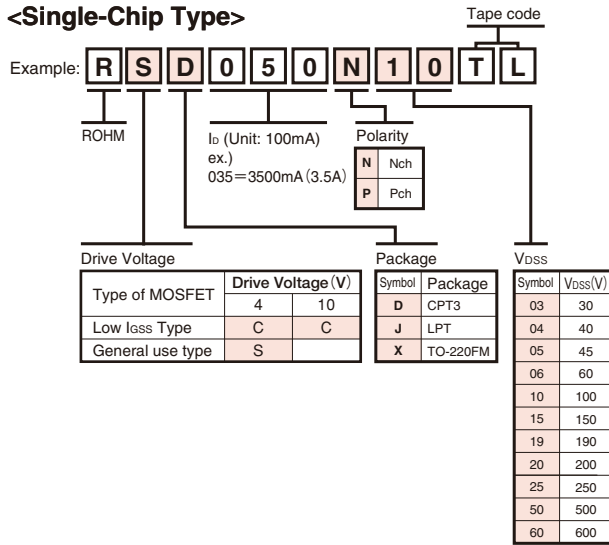
<p><b>SOP8</b></p> 	<p><b>HSOP8 (Single)</b></p> 	<p><b>HSOP8 (Dual)</b></p> 	
<p><b>CPT3 (D-PAK)</b> (SC-63) (SOT-428)</p> 	<p><b>TO-252</b></p> 	<p><b>LPT(S) (D2-PAK)</b> (SC-83)</p> 	<p><b>LPT(L)</b> (TO-263AB)</p> 
<p><b>TO-220AB</b></p> 	<p><b>TO-220FM</b></p> 	<p><b>TO-3PF</b></p> 	<p><b>TO-247</b></p> 

Notes: 1. Characters in ( ) under package designation denotes JEITA No. Characters in < > under package designation denotes Code No. 2. For details of dimensions, please refer to the technical specifications.

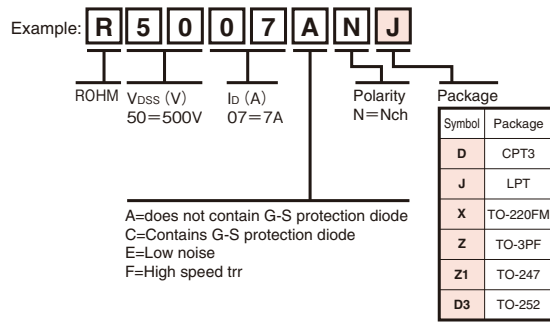
## Part No. Explanation

### • Power MOSFET Part No. Explanation

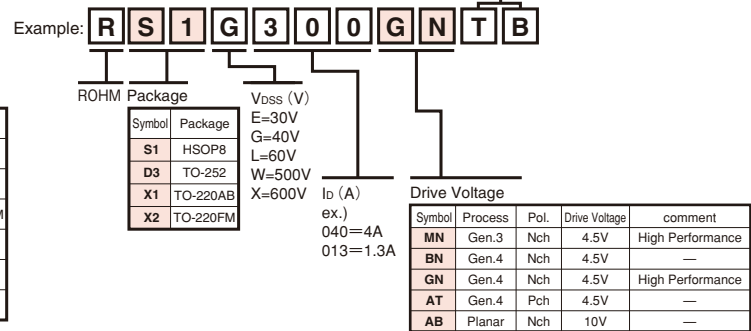
#### <Single-Chip Type>



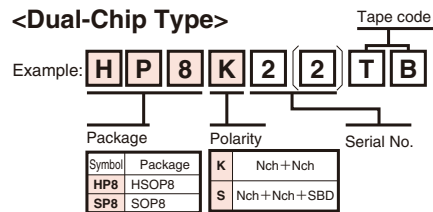
#### <Single-Chip Type>



#### <Single-Chip Type>



#### <Dual-Chip Type>



### • Packaging type

Package	Code	Packaging style	Direction	Basic ordering unit (pcs)
HSOP8	TB	Embossed tape	Three terminals on sprocket hole side	3,000
CPT3	TL	Embossed tape	Fin on sprocket hole side	2,500
TO-252	TL	Embossed tape	Fin on sprocket hole side	2,500
LPT	TL	Embossed tape	Fin on sprocket hole side	1,000
TO-220FM	—	bulk	Box	500
TO-220AB	C10	bulk	Tube	500
TO-3PF	C8	bulk	Tube	360
TO-247	C9	bulk	Tube	450





*Power Devices*

# Power Diodes

## CONTENTS

■ Power Schottky Barrier Diodes .....	P. B22
■ Power Fast Recovery Diodes .....	P. B25
■ Power Packages .....	P. B27
■ Part No. Explanation .....	P. B27



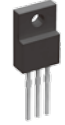

B

Power Diodes



ISO/TS 16949-approved

# Power Schottky Barrier Diodes

## ● Quick Reference for Power Schottky Barrier Diodes

V <sub>R</sub> (V)	I <sub>o</sub> (A)	Package						
		 TO-252 (D-PAK)	 LPDS (D2-PAK)	 TO-220FN (3 pin)	 TO-220FN (2 pin)			
30	5	RB078BM30S	112					
	6	RB095BM-30	1					
		<b>New</b> RB098BM-30	2					
	10	RB085BM-30	3					
		<b>New</b> RBR10BM30A	4	<b>New</b> RBR10NS30A	31	<b>New</b> RBR10T30A	65	
		<b>New</b> RB088BM-30	5	<b>New</b> RB088NS-30	34	<b>New</b> RB088T-30	66	
	15	<b>New</b> RBR15BM30A	6					
20	<b>New</b> RBR20BM30A	7	<b>New</b> RBR20NS30A	32	<b>New</b> RBR20T30A	67		
			<b>New</b> RB218NS-30	35	<b>New</b> RB218T-30	68		
30			<b>New</b> RBR30NS30A	33	<b>New</b> RBR30T30A	69		
			<b>New</b> RB228NS-30	36	<b>New</b> RB228T-30	70		
40			<b>New</b> RB238NS-30	37	<b>New</b> RB238T-30	71		
40/45	5	RB075BM40S	113					
	6	RB095BM-40	8			RB095T-40	72	
		<b>New</b> RB098BM-40	9					
	10	RB085BM-40	10			RB085T-40	73	
		RBQ10BM45A	15	RBQ10NS45A	46	RBQ10T45A	84	
		<b>New</b> RBR10BM40A	11	<b>New</b> RB088NS-40	38	<b>New</b> RBR10T40A	74	
		<b>New</b> RB088BM-40	12	<b>New</b> RBR10NS40A	39	<b>New</b> RB088T-40	75	
	15	RBQ15BM45A	16			RB205T-40	76	
		<b>New</b> RBR15BM40A	13					
	20	RBQ20BM45A	17	RBQ20NS45A	47	RB215T-40	77	
<b>New</b> RBR20BM40A		14	<b>New</b> RBR20NS40A	40	RBQ20T45A	85		
			<b>New</b> RB218NS-40	41	<b>New</b> RBR20T40A	78		
30			RB225NS-40	42	RB225T-40	80		
			RBQ30NS45A	48	RBQ30T45A	86		
			RBQ30NS45B	114	<b>New</b> RBR30T40A	81		
			<b>New</b> RBR30NS40A	43	<b>New</b> RB228T-40	82		
40			<b>New</b> RB228NS-40	44				
			<b>New</b> RB238NS-40	45	<b>New</b> RB238T-40	83		
60/65	6	RB095BM-60	18			RB095T-60	87	
		<b>New</b> RB098BM-60	19					
	10	RBQ10BM65A	22	RBQ10NS65A	53	RB085T-60	88	
		<b>New</b> RB088BM-60	20	<b>New</b> RB088NS-60	49	RBQ10T65A	96	
	15	RBQ15BM65A	23			<b>New</b> RB088T-60	89	
		<b>New</b> RB208BM-60	21			RB205T-60	90	
	20	RBQ20BM65A	24	RBQ20NS65A	54	RB215T-60	92	
			<b>New</b> RB218NS-60	50	RBQ20T65A	97		
30			RB225T-60		<b>New</b> RB218T-60	91		
			RBQ30NS65A	55	RB225T-60	94		
			<b>New</b> RB228NS-60	51	RBQ30T65A	98		
			<b>New</b> RB238NS-60	52	<b>New</b> RB228T-60	93		
					<b>New</b> RB238T-60	95		
90	6	RB095BM-90	25			RB095T-90	99	
	10	RB085BM-90	26			RB085T-90	100	
	15					RB205T-90	101	
	20					RB215T-90	102	
100	6	<b>New</b> RB098BM100	27					
	10	RB088BM100	28	<b>New</b> RB088NS100	56	<b>New</b> RB088T100	103	
	20			<b>New</b> RB218NS100	57	<b>New</b> RB218T100	104	
	30			RB228NS100	58	RB228T100	105	
				<b>New</b> RB298NS100	59	<b>New</b> RB298T100	106	
40			RB238NS100	60	<b>New</b> RB238T100	107		
150	6	<b>New</b> RB098BM150	29					
	10	RB088BM150	30	RB088NS150	61	RB088T150	108	
	20			<b>New</b> RB218NS150	62	<b>New</b> RB218T150	109	
				<b>New</b> RB228NS150	63	<b>New</b> RB228T150	110	
	40			RB238NS150	64	<b>New</b> RB238T150	111	

B Power Diodes

Power Schottky Barrier Diodes 1														
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>j</sub> =25°C) *2				Package	Equivalent Circuit Diagram	Automotive Grade Available		
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O1</sub> (A)	I <sub>FSM(A)</sub> <sup>2</sup> 60Hz, 1ms	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>F</sub> (mA) Max.	V <sub>F</sub> (V)					
1	RB095BM-30	35	30	6	50	0.425	3	0.2	30	TO-252 (D-PAK)		Yes		
2	New RB098BM-30	35	30	6	50	0.77	3	0.001	30			Yes		
3	RB085BM-30	35	30	10	50	0.48	4	0.3	30			Yes		
4	New RBR10BM30A	30	30	10	50	0.55	5	0.1	30			Yes		
5	New RB088BM-30	35	30	10	100	0.77	5	0.0015	30			Yes		
6	New RBR15BM30A	30	30	15	100	0.51	7.5	0.2	30			Yes		
7	New RBR20BM30A	30	30	20	100	0.51	10	0.3	30			Yes		
8	RB095BM-40	45	40	6	50	0.55	3	0.1	40			Yes		
9	New RB098BM-40	45	40	6	50	0.77	3	0.001	40			Yes		
10	RB085BM-40	45	40	10	50	0.55	5	0.2	40			Yes		
11	New RBR10BM40A	40	40	10	50	0.62	5	0.12	40			Yes		
12	New RB088BM-40	45	40	10	100	0.77	5	0.002	40			Yes		
13	New RBR15BM40A	40	40	15	100	0.58	7.5	0.24	40			Yes		
14	New RBR20BM40A	40	40	20	100	0.58	10	0.36	40			Yes		
15	RBQ10BM45A	45	45	10	50	0.65	5	0.15	45			Yes		
16	RBQ15BM45A	45	45	15	100	0.59	7.5	0.3	45			Yes		
17	RBQ20BM45A	45	45	20	100	0.59	10	0.45	45			Yes		
18	RB095BM-60	60	60	6	50	0.58	3	0.3	60			Yes		
19	New RB098BM-60	60	60	6	50	0.78	3	0.0015	60			Yes		
20	New RB088BM-60	60	60	10	100	0.78	5	0.003	60			Yes		
21	New RB208BM-60	60	60	15	100	0.78	3	0.0035	60			Yes		
22	RBQ10BM65A	65	65	10	50	0.69	5	0.15	65			Yes		
23	RBQ15BM65A	65	65	15	100	0.63	7.5	0.3	65			Yes		
24	RBQ20BM65A	65	65	20	100	0.63	10	0.45	65			Yes		
25	RB095BM-90	90	90	6	50	0.75	3	0.15	90			Yes		
26	RB085BM-90	90	90	10	50	0.83	5	0.15	90			Yes		
27	New RB098BM100	110	100	6	100	0.79	3	0.004	100			Yes		
28	RB088BM100	100	100	10	50	0.87	5	0.005	100			Yes		
29	New RB098BM150	150	150	6	100	0.88	3	0.007	150			Yes		
30	RB088BM150	150	150	10	50	0.88	5	0.015	150			Yes		
31	New RBR10NS30A	30	30	10	50	0.55	5	0.1	40			LPDS (D2-PAK)		Yes
32	New RBR20NS30A	30	30	20	100	0.55	10	0.2	40					Yes
33	New RBR30NS30A	30	30	30	100	0.55	15	0.3	40					Yes
34	New RB088NS-30	35	30	10	100	0.77	5	0.0015	30	Yes				
35	New RB218NS-30	35	30	20	100	0.77	10	0.003	30	Yes				
36	New RB228NS-30	35	30	30	100	0.77	15	0.0035	30	Yes				
37	New RB238NS-30	35	30	40	100	0.77	20	0.005	30	Yes				
38	New RB088NS-40	45	40	10	100	0.77	5	0.002	40	Yes				
39	New RBR10NS40A	40	40	10	50	0.62	5	0.12	40	Yes				
40	New RBR20NS40A	40	40	20	100	0.62	10	0.24	40	Yes				
41	New RB218NS-40	45	40	20	100	0.77	10	0.004	40	Yes				
42	RB225NS-40	40	40	30	50	0.55	15	0.5	40	Yes				
43	New RBR30NS40A	40	40	30	100	0.62	15	0.36	40	Yes				
44	New RB228NS-40	45	40	30	100	0.77	15	0.005	40	Yes				
45	New RB238NS-40	45	40	40	100	0.77	20	0.007	40	Yes				
46	RBQ10NS45A	45	45	10	100	0.65	5	0.15	45	Yes				
47	RBQ20NS45A	45	45	20	100	0.65	10	0.3	45	Yes				
48	RBQ30NS45A	45	45	30	100	0.65	15	0.45	45	Yes				
49	New RB088NS-60	60	60	10	100	0.78	5	0.003	60	Yes				
50	New RB218NS-60	60	60	20	100	0.78	10	0.006	60	Yes				
51	New RB228NS-60	60	60	30	100	0.78	15	0.01	60	Yes				
52	New RB238NS-60	60	60	40	100	0.78	20	0.012	60	Yes				
53	RBQ10NS65A	65	65	10	100	0.69	5	0.15	65	Yes				
54	RBQ20NS65A	65	65	20	100	0.69	10	0.3	65	Yes				
55	RBQ30NS65A	65	65	30	100	0.69	15	0.45	65	Yes				
56	New RB088NS100	100	100	10	100	0.87	5	0.005	100	Yes				
57	New RB218NS100	100	100	20	100	0.87	10	0.007	100	Yes				
58	RB228NS100	110	100	30	100	0.87	5	0.005	100	Yes				
59	New RB298NS100	100	100	30	100	0.87	15	0.01	100	Yes				
60	RB238NS100	100	100	40	100	0.86	20	0.02	100	Yes				
61	RB088NS150	150	150	10	50	0.88	5	0.015	150	Yes				

\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes, I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip

# Power Schottky Barrier Diodes









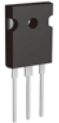
Power Schottky Barrier Diodes 2												
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>J</sub> =25°C) *2				Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O1</sub> (A)	I <sub>FSM(A)</sub> <sup>2</sup> 60Hz, 1ms	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>F</sub> (mA) Max.	V <sub>R</sub> (V)			
62	New RB218NS150	150	150	20	100	0.88	20	0.02	150	LPDS (D2-PAK)		Yes
63	New RB228NS150	150	150	30	100	0.88	15	0.025	150			Yes
64	RB238NS150	150	150	40	100	0.88	20	0.03	150			Yes
65	New RBR10T30A	30	30	10	50	0.55	5	0.1	30			Yes
66	New RB088T-30	35	30	10	100	0.77	5	0.0015	30			Yes
67	New RBR20T30A	30	30	20	100	0.55	10	0.2	30			Yes
68	New RB218T-30	35	30	20	100	0.77	10	0.003	30			Yes
69	New RBR30T30A	30	30	30	100	0.55	15	0.3	30			Yes
70	New RB228T-30	35	30	30	100	0.77	15	0.0035	30			Yes
71	New RB238T-30	35	30	40	100	0.77	20	0.005	30			Yes
72	RB095T-40	45	40	6	100	0.55	3	0.1	40			Yes
73	RB085T-40	45	40	10	100	0.55	5	0.2	40	Yes		
74	New RBR10T40A	40	45	10	50	0.62	5	0.12	40	Yes		
75	New RB088T-40	45	40	10	100	0.77	5	0.002	40	Yes		
76	RB205T-40	45	40	15	100	0.55	7.5	0.3	40	Yes		
77	RB215T-40	45	40	20	100	0.55	10	0.5	40	Yes		
78	New RBR20T40A	40	45	20	100	0.62	10	0.24	40	Yes		
79	New RB218T-40	45	40	20	100	0.77	10	0.004	40	Yes		
80	RB225T-40	40	40	30	100	0.63	15	0.5	40	Yes		
81	New RBR30T40A	40	45	30	100	0.62	15	0.36	40	Yes		
82	New RB228T-40	45	40	30	100	0.77	15	0.005	40	Yes		
83	New RB238T-40	45	40	40	100	0.77	20	0.007	40	Yes		
84	RBQ10T45A	45	45	10	100	0.65	5	0.15	45	Yes		
85	RBQ20T45A	45	45	20	100	0.65	10	0.3	45	Yes		
86	RBQ30T45A	45	45	30	100	0.65	15	0.45	45	Yes		
87	RB095T-60	60	60	6	100	0.58	3	0.1	60	TO-220FN (3 pin)		Yes
88	RB085T-60	60	60	10	100	0.58	5	0.3	60			Yes
89	New RB088T-60	60	60	10	100	0.78	5	0.003	60			Yes
90	RB205T-60	60	60	15	100	0.58	7.5	0.6	60			Yes
91	New RB218T-60	60	60	20	100	0.78	10	0.006	60			Yes
92	RB215T-60	60	60	20	100	0.58	10	0.6	60			Yes
93	New RB228T-60	60	60	30	100	0.78	15	0.01	60			Yes
94	RB225T-60	60	60	30	100	0.63	15	0.6	60			Yes
95	New RB238T-60	60	60	40	100	0.78	20	0.012	60			Yes
96	RBQ10T65A	65	65	10	100	0.69	5	0.15	65			Yes
97	RBQ20T65A	65	65	20	100	0.69	10	0.3	65			Yes
98	RBQ30T65A	65	65	30	100	0.69	15	0.45	65	Yes		
99	RB095T-90	90	90	6	100	0.75	3	0.15	90	Yes		
100	RB085T-90	90	90	10	100	0.83	5	0.15	90	Yes		
101	RB205T-90	90	90	15	100	0.78	7.5	0.3	90	Yes		
102	RB215T-90	90	90	20	100	0.75	10	0.4	90	Yes		
103	New RB088T100	110	100	10	100	0.87	5	0.005	100	Yes		
104	New RB218T100	110	100	20	100	0.87	10	0.007	100	Yes		
105	RB228T100	110	100	30	100	0.87	5	0.005	100	Yes		
106	New RB298T100	110	100	30	100	0.87	15	0.01	100	Yes		
107	New RB238T100	110	100	40	100	0.86	20	0.02	100	Yes		
108	RB088T150	150	150	10	50	0.88	5	0.015	150	Yes		
109	New RB218T150	150	150	20	100	0.88	10	0.02	150	Yes		
110	New RB228T150	150	150	30	100	0.88	15	0.025	150	Yes		
111	New RB238T150	150	150	40	100	0.88	20	0.03	150	Yes		
112	RB078BM30S	35	30	5	50	0.72	5	0.005	30	TO-252 (D-PAK)		Yes
113	RB075BM40S	40	40	5	50	0.75	5	0.005	40	LPDS (D2-PAK)		Yes
114	RBQ30NS45B	45	45	30	100	0.59	30	0.7	45	TO-220FN (2pin)		Yes
115	RBQ30TB45B	45	45	30	100	0.59	30	0.7	45			Yes

\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes, I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip

B Power Diodes

# Power Fast Recovery Diodes

## ● Quick Reference for Power Fast Recovery Diodes

V <sub>R</sub> (V)	I <sub>o</sub> (A)	Surface Mount Type				Leaded Type					
											
		TO-252 (D-PAK)	LPDS (D2-PAK)	TO-220FN (2pin)	TO-220FN (3pin)	TO-220NFM (2pin)	TO-220NFM (3pin)	TO-220AC	TO-220ACFP	TO-247 (3pin)	
200	3	RF301BM2S RFN3BM2S	22 23								
	5	RF501BM2S RFN5BM2S	24 25								
	6	RF601BM2D RFN6BM2D	1 2			RF601T2D RFN6T2D	7 8				
	10		RF1001NS2D	3		RF1001T2D RFN10T2D	9 10				
	16		RF1601NS2D	4		RF1601T2D RFN16T2D	11 12				
	20		RF2001NS2D	5		RF2001T2D RFN20T2D	13 14				
300	20		RF2001NS3D RF1501NS3S	6 34		RF2001T3D	15	RF1501TF3S	61		
	30									☆RFN30TS2D	
	30									☆RFN30TS3D	
350	5	RFN5BM3S	26								
	10	RFN10BM3S	32	RFN10NS3S	35						
430	20		RFN20NS3S RFUH20NS3S RFUH25NS3S	36 37 38	RFUH20TB3S RFUH25TB3S	55 56					
	10		RFN10NS4S RFUH10NS4S	39 40	RFN10TB4S RFUH10TB4S	57 58		RFUS10TF4S	62		
530	20		RFN20NS4S RFUS20NS4S RFUH20NS4S	41 42 43	RFN20TB4S RFUH20TB4S	59 60	RF2001T4S	49	RFUS20TM4S	50	
	20								RFU20TM5S	51	
600	3	RF305BM6S RFN3BM6S	27 28								
	5	RF505BM6S RFN5BM6S New RFNL5BM6S	29 30 31				New RF505TF6S New RFN5TF6S RFU5TF6S New RFUH5TF6S	63 64 66 65			
	8								New RFVS8TG6S New RFV8TG6S	81 82	
	10	RFN10BM6S	33	RFN10NS6S RFUH10NS6S	44 45			RF1005TF6S RFN10TF6S RFX10TF6S RFUH10TF6S RFU10TF6S	67 68 69 70 71		
	12								New RFV12TG6S	83	
	15								New RFV15TG6S	84	
	20			RFN20NS6S RFUH20NS6S RFUS20NS6S	46 47 48			RFN20TF6S RFUH20TF6S RFUS20TF6S	72 73 74	RFUS20TM6S	52
	30										RFN30TS6S RFUH30TS6S RFN30TS6D RFUH30TS6D
	60										RFN60TS6D RFUH60TS6D
	800	5									

☆ : Under Development

# Power Fast Recovery Diodes

Power Fast Recovery Diodes																
Quick Reference No.	Product No.	Absolute Maximum Ratings (Tc=25°C)					Electrical Characteristics (Tj=25°C) *2							Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O</sub> (A)	I <sub>FSM</sub> (A) 60Hz.1~	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (A)				
1	RF601BM2D	200	200	6*1	60	0.93	3	10	200	25	0.5	1	TO-252 (D-PAK)		Yes	
2	RFN6BM2D	200	200	6*1	40	0.98	3	10	200	25	0.5	1			Yes	
3	RF1001NS2D	200	200	10*1	80	0.93	5	10	200	25	0.5	1	LPDS (D2-PAK)		Yes	
4	RF1601NS2D	200	200	16*1	100	0.93	8	10	200	30	0.5	1			Yes	
5	RF2001NS2D	200	200	20*1	100	0.93	10	10	200	30	0.5	1	Yes			
6	RF2001NS3D	350	300	20*1	100	1.3	10	10	300	25	0.5	1	Yes			
7	RF601T2D	200	200	6*1	60	0.93	3	10	200	25	0.5	1	Yes			
8	RFN6T2D	200	200	6*1	40	0.98	3	10	200	25	0.5	1	Yes			
9	RF1001T2D	200	200	10*1	80	0.93	5	10	200	30	0.5	1	Yes			
10	RFN10T2D	200	200	10*1	80	0.98	5	10	200	25	0.5	1	TO-220FN (3pin)		Yes	
11	RF1601T2D	200	200	16*1	100	0.93	8	10	200	30	0.5	1		Yes		
12	RFN16T2D	200	200	16*1	100	0.98	8	10	200	30	0.5	1	Yes			
13	RF2001T2D	200	200	20*1	100	0.93	10	10	200	30	0.5	1	Yes			
14	RFN20T2D	200	200	20*1	100	0.98	10	10	200	30	0.5	1	Yes			
15	RF2001T3D	350	300	20*1	100	1.3	10	10	300	25	0.5	1	Yes			
16	☆RFN30TS2D	200	200	30*1	150	0.98	15	10	200	30	0.5	1	Yes			
17	☆RFN30TS3D	300	300	30*1	180	1.2	15	10	300	35	0.5	1	Yes			
18	RFN30TS6D	600	600	30*1	120	1.55	15	10	600	55	0.5	1	TO-247	Yes		
19	RFUH30TS6D	600	600	30*1	80	2.8	15	10	600	30	0.5	1		Yes		
20	RFN60TS6D	600	600	60*1	180	1.55	30	10	600	60	0.5	1	Yes			
21	RFUH60TS6D	600	600	60*1	120	2.8	30	10	600	35	0.5	1	Yes			
22	RF301BM2S	200	200	3	40	0.93	3	10	200	25	0.5	1	TO-252 (D-PAK)	Yes		
23	RFN3BM2S	200	200	3	40	0.98	3	10	200	25	0.5	1		Yes		
24	RF501BM2S	200	200	5	40	0.92	5	10	200	25	0.5	1	Yes			
25	RFN5BM2S	200	200	5	40	0.98	5	10	200	25	0.5	1	Yes			
26	RFN5BM3S	350	350	5	50	1.5	5	10	350	30	0.5	1	Yes			
27	RF305BM6S	600	600	3	50	1.7	3	10	600	30	0.5	1	TO-252 (D-PAK)	Yes		
28	RFN3BM6S	600	600	3	20	1.55	3	10	600	30	0.5	1		Yes		
29	RF505BM6S	600	600	5	50	1.7	5	10	600	30	0.5	1	Yes			
30	RFN5BM6S	600	600	5	30	1.55	5	10	600	50	0.5	1	Yes			
31	New RFNL5BM6S	600	600	5	50	1.3	5	10	600	60	0.5	1	Yes			
32	RFN10BM3S	350	350	10	80	1.5	10	10	350	30	0.5	1	Yes			
33	RFN10BM6S	600	600	10	100	1.55	10	10	600	50	0.5	1	Yes			
34	RF1501NS3S	350	300	20	100	1.5	20	10	300	30	0.5	1	LPDS (D2-PAK)	Yes		
35	RFN10NS3S	350	350	10	100	1.5	10	10	350	30	0.5	1		Yes		
36	RFN20NS3S	350	350	20	100	1.35	20	10	350	35	0.5	1	Yes			
37	RFUH20NS3S	350	350	20	100	1.5	20	10	350	25	0.5	1	Yes			
38	RFUH25NS3S	350	350	20	100	1.45	20	10	350	30	0.5	1	Yes			
39	RFN10NS4S	430	430	10	80	1.55	10	10	430	30	0.5	1	LPDS (D2-PAK)	Yes		
40	RFUH10NS4S	430	430	10	80	1.7	10	10	430	25	0.5	1		Yes		
41	RFN20NS4S	430	430	20	100	1.55	20	10	430	30	0.5	1	Yes			
42	RFUS20NS4S	430	430	20	100	1.6	20	10	430	35	0.5	1	Yes			
43	RFUH20NS4S	430	430	20	100	1.7	20	10	430	25	0.5	1	Yes			
44	RFN10NS6S	600	600	10	100	1.55	10	10	600	50	0.5	1	TO-220FN (3pin)	Yes		
45	RFUH10NS6S	600	600	10	60	2.8	10	10	600	25	0.5	1		Yes		
46	RFN20NS6S	600	600	20	100	1.55	20	10	600	60	0.5	1	Yes			
47	RFUH20NS6S	600	600	20	100	2.8	20	10	600	35	0.5	1	Yes			
48	RFUS20NS6S	600	600	20	100	2.8	20	10	600	35	0.5	1	TO-220FN (3pin)	Yes		
49	RF2001T4S	430	400	20	100	1.6	20	10	400	30	0.5	1		Yes		
50	RFUS20TM4S	430	430	20	100	1.6	20	10	430	35	0.5	1	Yes			
51	RFU20TM5S	530	530	20	100	2	20	10	530	30	0.5	1	TO-220NFM (3pin)	Yes		
52	RFUS20TM6S	600	600	20	100	2.8	20	10	600	35	0.5	1		Yes		
53	RFN30TS6S	600	600	30	200	1.55	30	10	600	60	0.5	1	TO-247	Yes		
54	RFUH30TS6S	600	600	30	150	2.8	30	10	600	35	0.5	1		Yes		
55	RFUH20TB3S	350	350	20	100	1.5	20	10	350	25	0.5	1	Yes			
56	RFUH25TB3S	350	350	20	100	1.45	20	10	350	30	0.5	1	TO-220FN (2pin)	Yes		
57	RFN10TB4S	430	430	10	80	1.55	10	10	430	30	0.5	1		Yes		
58	RFUH10TB4S	430	430	10	80	1.7	10	10	430	25	0.5	1	Yes			
59	RFN20TB4S	430	430	20	100	1.55	20	10	430	30	0.5	1	Yes			
60	RFUH20TB4S	430	430	20	100	1.7	20	10	430	25	0.5	1	TO-220NFM (2pin)	Yes		
61	RF1501TF3S	350	300	20	100	1.5	20	10	300	30	0.5	1		Yes		
62	RFUS10TF4S	430	430	10	80	1.7	10	10	430	30	0.5	1	Yes			
63	RF505TF6S	600	600	5	80	1.7	5	10	600	30	0.5	1	Yes			
64	RFN5TF6S	600	600	5	30	1.55	5	10	600	50	0.5	1	TO-220NFM (2pin)	Yes		
65	New RFUH5TF6S	600	600	5	30	2.8	5	10	600	25	0.5	1		Yes		
66	RFU5TF6S	600	600	5	60	2.8	5	10	600	25	0.5	1	Yes			
67	RF1005TF6S	600	600	10	100	1.7	10	10	600	40	0.5	1	TO-220NFM (2pin)	Yes		
68	RFN10TF6S	600	600	10	100	1.55	10	10	600	50	0.5	1		Yes		
69	RFX10TF6S	600	600	10	100	2.5	10	10	600	30	0.5	1	Yes			
70	RFUH10TF6S	600	600	10	60	2.8	10	10	600	25	0.5	1	TO-220NFM (2pin)	Yes		
71	RFU10TF6S	600	600	10	100	2.8	10	10	600	25	0.5	1		Yes		
72	RFN20TF6S	600	600	20	100	1.55	20	10	600	60	0.5	1	Yes			
73	RFUH20TF6S	600	600	20	100	2.8	20	10	600	35	0.5	1	Yes			
74	RFUS20TF6S	600	600	20	100	2.8	20	10	600	35	0.5	1	TO-220ACFP	Yes		
75	RFN5TF8S	800	800	5	60	2.1	5	10	800	40	0.5	1		Yes		
76	New RFNL10TJ6S	600	600	10	120	1.25	8	10	600	65	0.5	1	—			
77	New RFV8TJ6S	600	600	8	60	3	8	10	600	20	0.5	1	—			
78	New RFV8TJ6S	600	600	8	100	2.8	8	10	600	25	0.5	1	—			
79	New RFV12TJ6S	600	600	12	120	2.8	12	10	600	25	0.5	1	—			
80	New RFV15TJ6S	600	600	15	150	2.8	15	10	600	30	0.5	1	—			
81	New RFV8TG6S	600	600	8	60	3	8	10	600	20	0.5	1	—			
82	New RFV8TG6S	600	600	8	100	2.8	8	10	600	25	0.5	1	—			
83	New RFV12TG6S	600	600	12	120	2.8	12	10	600	25	0.5	1	—			
84	New RFV15TG6S	600	600	15	150	2.8	15	10	600	30	0.5	1	—			

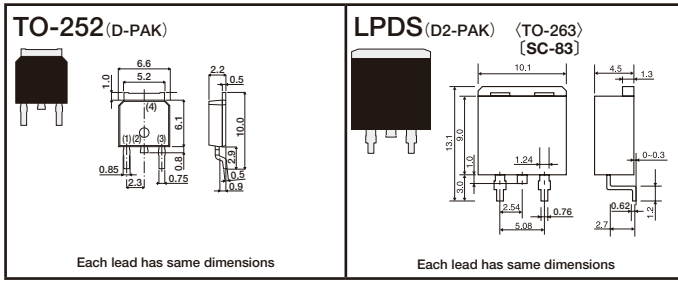
\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes. I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip

☆ : Under Development

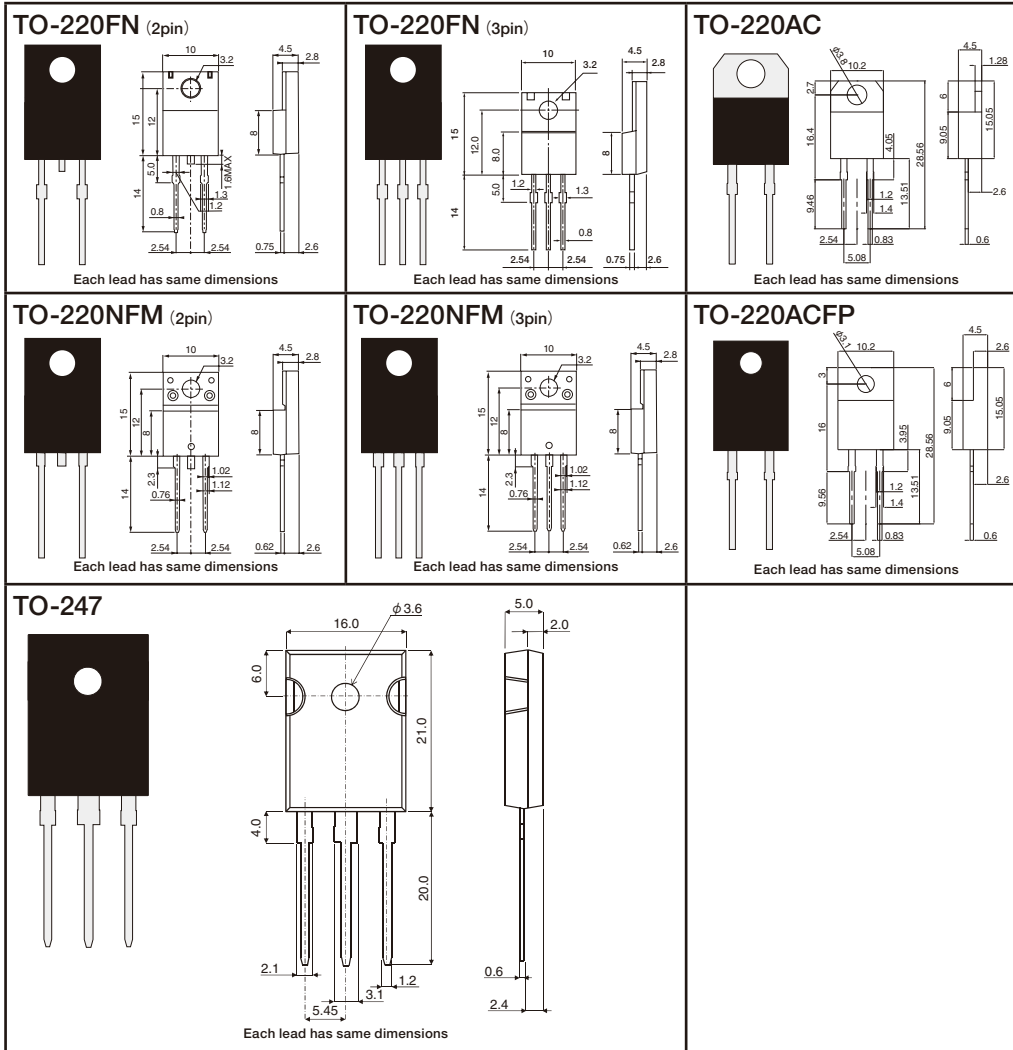
# Power Packages

## ● Dimensions (Unit : mm)

### Surface Mount Type



### Leaded Type

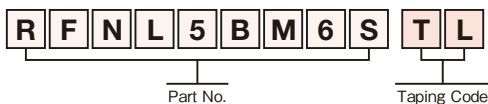


< > : JEDEC Code, ( ) : JEITA Code

## Part No. Explanation

- When ordering, specify the part number.
- Check each code against the tables shown below.
- Fill in from the left, leaving any extra boxes empty on the right.

Example:



### ● Packaging type

Package	Code	Package style	Direction	Basic ordering unit (pcs)
TO-252	TL	Embossed tape	Fin on sprocket hole side	2,500
LPDS	TL	Embossed tape	Fin on sprocket hole side	1,000
TO-220FN(3pin)	—	Bulk	box	500
TO-220FN(2pin)	—	Stick	box	1,000
TO-247	C11	Stick	box	450
TO-220NFM	—	Stick	box	1,000
HMD8	TE61	Embossed tape	Cathode on sprocket hole side	3,000
TO-220AC	C9	Stick	box	1,000
TO-220ACFP	C9	Stick	box	1,000







*Power Devices*

# High Power Chip Resistors

## CONTENTS

■ **Chip Resistors for Current Detection (Metal plate type)**

High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series) ..... P. B30

High Power Low Ohmic Chip Shunt Resistors (GMR series) ..... P. B30

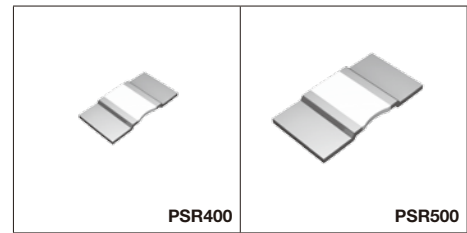
B

High Power Chip Resistors

ISO9001- / ISO / TS 16949-approved

# Chip Resistors for Current Detection (Metal plate type) High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series)

- High power 4W to 5W
- Ultra low resistance range (0.2mΩ-).
- Excellent TCR characteristics
- Ideal replacing current sensor and current trans

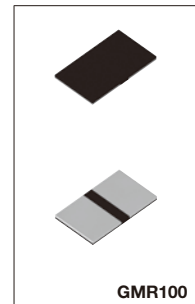


PSR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient <sup>-1</sup> (ppm / °C)	Resistance range (mΩ)	Operating temperature range (°C)	Automotive Grade Available
<b>New</b> PSR400	10×5.2 (3921)	4W	J (±5%) G (±2%) F (±1%)	±175	0.3, 0.5	-55 to +170	Yes
				±75	1.0, 2.0, 3.0		
<b>New</b> PSR500	15×7.75 (5931)	5W	J (±5%) G (±2%) F (±1%)	±225	0.2, 0.3		-55 to +170
				±175	0.4, 0.5		
				±75	1.0, 2.0		

\*1 (+20°C to +125°C)

# Chip Resistors for Current Detection (Metal plate type) High Power Low Ohmic Chip Shunt Resistors (GMR series)

- High power (3W)
- High heat dissipation
- Low ohmic (10mΩ to 220mΩ)
- Ideal for the replacement from ceramic resistors.



GMR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient <sup>-1</sup> (ppm / °C)	Resistance range (mΩ)	Operating temperature range (°C)	Automotive Grade Available
☆GMR100	6432 (2512)	3W	J (±5%) F (±1%)	±25	10mΩ to 220mΩ (E6 series <sup>-2</sup> )	-55 to +170	Under development

\*1 (+25°C to +60°C)

\*2 Please contact us for another standard nominal resistance values.

☆ : Under development (Development schedule will vary depending on resistance value, please contact us.)



## Small Signal Devices

# Transistors

### CONTENTS

■ <b>MOSFETs</b> .....	P. C2
Small Signal MOSFET Series .....	P. C2
Middle Power MOSFET Series .....	P. C4
■ <b>Selector Guide for Automotive MOSFETs (AEC-Q101)</b> .....	P. C14
■ <b>Bipolar Transistors (Surface mount type)</b> .....	P. C16
■ <b>Transistor Array</b> .....	P. C18
■ <b>Complex Bipolar Transistors</b> .....	P. C19
■ <b>Digital Transistors</b> .....	P. C21
■ <b>Complex Digital Transistors</b> .....	P. C22
■ <b>Packages</b> .....	P. C24
■ <b>Part No. Explanation</b> .....	P. C25

# MOSFETs

## ● Quick Reference for Small Signal MOSFET Series

Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)							Package		
		0.1 / 0.15	0.2	0.25	0.3	0.6	0.7	1			
0.9	50		RYM002N05 (N)	11						VMT3	
			RE1J002YN (N)	24						EMT3F	
			RU1J002YN (N)	38						UMT3F	
			RYC002N05 (N)	49						SST3	
1.2	20	☆RV3C002UN(N)	1							VML0604	
		☆RV3C001ZP(P)	2							VML0604	
		RV1C002UN (N)	5							VML0806	
		RV1C001ZP (P)	6							VML0806	
		RV2C001ZP(P)	9	RV2C002UN(N)	8				RV2C010UN (N)	7	VML1006
		RUM001L02 (N)	12	RUM002N02 (N)	13						VMT3
	50	RZM001P02 (P)	15	RZM002P02 (P)	16						VMT3
		RE1C001UN (N)	22	RE1C002UN (N)	23						EMT3F
		RE1C001ZP (P)	26	RE1C002ZP (P)	27						EMT3F
		RU1C001UN (N)	36	RU1C002UN (N)	37						UMT3F
		RU1C001ZP (P)	40	RU1C002ZP (P)	41						UMT3F
		RUM002N05 (N)	14								VMT3
1.8	20						☆RV3C006BC (P)	4		VML0604	
									☆RV2C012BC(P)	10	VML1006
2.5	60								☆RV3E007AJ (N)	3	VML0604
				RSM002N06 (N)	17						VMT3
				RE1L002SN (N)	25						EMT3F
				RU1L002SN (N)	39						UMT3F
4	30										SST3
			RSM002P03 (P)	18							VMT3
			RE1E002SP (P)	28							EMT3F
			RU1E002SP (P)	42							UMT3F
0.9	50		RSC002P03 (P)	50							SST3
			EM6K34 (N+N)	29							EMT6
	20		UM6K34N (N+N)	43							UMT6
		VT6K1 (N+N)	19								VMT6
		VT6J1 (P+P)	20								VMT6
		VT6M1 (N+P)	21								VMT6
			EM6K7 (N+N)	30							EMT6
			EM6J1 (P+P)	32							EMT6
			EM6M2 (N+P)	33							EMT6
			EM6K33 (N+N)	31							EMT6
1.8	20		UM6K33N (N+N)	44						UMT6	
						EM6K6 (N+N)	34			EMT6	
2.5	60					EM6K31 (N+N)	35			EMT6	
						UM6K31N (N+N)	45			UMT6	
4	30		UM6J1N (P+P)	46						UMT6	

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development

Small Signal MOSFET Series																
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (Ω)							Drive Voltage (V)	
								V <sub>GS</sub> (V)								
								0.9	1.2	1.5 (1.8)	2.5	4	4.5	10		
VML0604 (0604)		1	☆RV3C002UN	N	20	0.15	0.1	—	3.8	2.7	1.7	—	1.4	—	1.2	
		2	☆RV3C001ZP	P	-20	-0.1	0.1	—	10	6	3.4	—	2.5	—		
		3	☆RV3E007AJ	N	30	0.7	0.1	—	—	—	0.375	—	0.275	—	2.5	
		4	☆RV3C006BC	P	-20	-0.6	0.1	—	—	(0.61)	0.5	—	0.39	—	1.8	
VML0806 (0806)		5	RV1C002UN	N	20	0.15	0.1	—	3.8	2.7	1.7	—	1.4	—		
		6	RV1C001ZP	P	-20	-0.1	0.1	—	10	6	3.4	—	2.5	—		
VML1006 (1006)		7	New RV2C010UN	N	20	1	0.1	—	0.7	0.54	0.4	—	0.34	—	1.2	
		8	New RV2C002UN	N	20	0.18	0.1	—	3.8	2.7	1.7	—	1.4	—		
		9	New RV2C001ZP	P	-20	-0.1	0.1	—	10	6	3.4	—	2.5	—		
		10	☆RV2C012BC	P	-20	1.2	0.1	—	—	(0.37)	0.3	—	0.23	—	1.8	
VMT3 (1212)		11	RYM002N05	N	50	0.2	0.15	3	2.2	2	1.7	—	1.6	—	0.9	
		12	RUM001L02		20	0.1	0.15	—	6	4.5	3.8	3	2.5	—		
		13	RUM002N02		20	0.2	0.15	—	1.6	—	0.8	—	—	—		
		14	RUM002N05		50	0.2	0.15	—	2.4	—	1.7	—	1.6	—	1.2	
		15	RZM001P02	P	-20	-0.1	0.15	—	10	6	4.8	3.4	2.5	—		
		16	RZM002P02		-20	-0.2	0.15	—	2.4	—	1	—	0.8	—		
		17	RSM002N06	N	60	0.25	0.15	—	—	—	3	2.3	2.1	1.7	2.5	
		18	RSM002P03	P	-30	-0.2	0.15	—	—	—	—	1.6	1.4	0.9	4	
VMT6 (1212)		19	VT6K1	N+N	20	0.1	0.15	—	6	4.5	3.8	3	2.5	—		
		20	VT6J1	P+P	-20	-0.1	0.15	—	10	6	4.8	3.4	2.5	—	1.2	
		21	VT6M1	N	20	0.1	0.15	—	6	4.5	3.8	3	2.5	—		
EMT3F (1616) (SC-89)		22	RE1C001UN	N	20	0.1	0.15	—	6	4.5	3.8	3	2.5	—	1.2	
		23	RE1C002UN		20	0.2	0.15	—	1.6	—	0.8	—	—	—		
		24	RE1J002YN		50	0.2	0.15	3	2.2	2	1.7	—	1.6	—	0.9	
		25	RE1L002SN		60	0.25	0.2	—	—	—	3	2.3	2.1	1.7	2.5	
		26	RE1C001ZP	P	-20	-0.1	0.15	—	10	6	4.8	3.4	2.5	—	1.2	
		27	RE1C002ZP		-20	-0.2	0.15	—	2.4	—	1	—	0.8	—		
		28	RE1E002SP		-30	-0.2	0.15	—	—	—	—	1.6	1.4	0.9	4	
		29	EM6K34		N+N	50	0.2	0.15	3	2.2	2	1.7	—	1.6	—	0.9
30	EM6K7	20	0.2	0.15		—	1.6	—	0.8	—	—	—				
31	EM6K33	50	0.2	0.15		—	2.4	—	1.7	—	1.6	—				
32	EM6J1	P+P	-20	-0.2		0.15	—	2.4	—	1	—	0.8	—	1.2		
EMT6 (1616) (SC-107C)		33	EM6M2	N	20	0.2	0.15	—	1.6	—	0.8	0.7	—	—		
		34	EM6K6	P	-20	-0.2	0.15	—	2.4	—	1	—	0.8	—		
		35	EM6K31	N+N	20	0.3	0.15	—	—	(1)	0.8	0.7	—	—	1.8	
UMT3F (2021) (SC-85)		36	RU1C001UN	N	20	0.1	0.2	—	6	4.5	3.8	3	2.5	—	1.2	
		37	RU1C002UN		20	0.2	0.2	—	1.6	—	0.8	—	—	—		
		38	RU1J002YN		50	0.2	0.2	3	2.2	2	1.7	—	1.6	—	0.9	
		39	RU1L002SN		60	0.25	0.2	—	—	—	3	2.3	2.1	1.7	2.5	
		40	RU1C001ZP	P	-20	-0.1	0.15	—	10	6	4.8	3.4	2.5	—	1.2	
		41	RU1C002ZP		-20	-0.2	0.15	—	2.4	—	1	—	0.8	—		
		42	RU1E002SP		-30	-0.2	0.2	—	—	—	—	1.6	1.4	0.9	4	
		43	UM6K34N		N+N	50	0.2	0.15	3	2.2	2	1.7	—	1.6	—	0.9
44	UM6K33N	50	0.2	0.15		—	2.4	—	1.7	—	1.6	—	1.2			
45	UM6K31N	60	0.25	0.15		—	—	—	3	2.3	2.1	1.7	2.5			
UMT6 (2021) (SC-88) (SOT-363)		46	UM6J1N	P+P	-30	-0.2	0.15	—	—	—	—	1.6	1.4	0.9	4	
		47	RUC002N05	N	50	0.2	0.2	—	2.4	—	1.7	—	1.6	—	1.2	
48	RK7002BM	60	0.25		0.2	—	—	—	3	2.3	2.1	1.7	2.5			
49	RYC002N05	50	0.2		0.2	3	2.2	2	1.7	—	1.6	—	0.9			
SST3 (2924) (SOT-23)		50	RSC002P03	P	-30	-0.2	0.2	—	—	—	—	1.6	1.4	0.9	4	

☆ : Under development

# MOSFETs

## ● Quick Reference for Middle Power MOSFET Series 1

Drive Voltage (V)	V <sub>DS</sub> (V)	I <sub>D</sub> (A)									Package		
		0.5 to 1.6	2 / 2.5	3 / 3.5	4 / 4.5	5 / 5.5	6 / 6.5	7 / 7.5	8 / 8.5	9 to 15			
1.5	12	RW1A013ZP (P) 6	RW1A020ZP (P) 4 RW1A025AP (P) 4	RW1A030AP (P) 3								WEMT6	
		RZF013P01 (P) 16	RZF020P01 (P) 15 RAL025P01 (P) 28	RZF030P01 (P) 14 RAL035P01 (P) 27	RAF040P01 (P) 13 RAL045P01 (P) 26	RT1A045AP (P) 48	RT1A050ZP (P) 47	RT1A060AP (P) 46				TUMT3 TUMT6 TSST8	
			RZR020P01 (P) 66 RZR025P01 (P) 65		RZR040P01 (P) 64								TSMT3
					RAQ045P01 (P) 89	RZQ050P01 (P) 88							TSMT6
								RQ1A060ZP (P) 115	RQ1A070ZP (P) 114 RQ1A070AP (P) 121				TSMT8
	20	RW1C015UN (N) 2	RW1C020UN (N) 1 RW1C025ZP (P) 7										WEMT6
			RUF020N02 (N) 12 RUF025N02 (N) 11										TUMT3
				RUL035N02 (N) 25									TUMT6
								RT1C060UN (N) 41					TSST8
			RUR020N02 (N) 61		RUR040N02 (N) 60								TSMT3
								<b>NEW</b> RQ6C050UN (N) 87					TSMT6
1.8	20	RUF015N02 (N) 17										TSMT8	
2.5	30	☆RF1E015AJ (N) 19	RTF025N03 (N) 18									TUMT3	
				RTL035N03 (N) 32	☆RF6E045AJ (N) 33							TUMT6	
			RTR025N03 (N) 68	☆RQ5E030AJ (N) 63	☆RQ5E040AJ (N) 62 RTR040N03 (N) 67							TSMT3	
	45	RTQ020N03 (N) 93	RTQ035N03 (N) 92	RTQ045N03 (N) 91								TSMT6	
		RTF016N05 (N) 20										TUMT3	
			RTR020N05 (N) 72 RTR025N05 (N) 71	RTR030N05 (N) 70								TSMT3	
	4	30	RW1E014SN (N) 8 RW1E015RP (P) 10	RW1E025RP (P) 9									WEMT6
			RSF014N03 (N) 21 RRF015P03 (P) 23										TUMT3
				RRL025P03 (P) 37	RRL035P03 (P) 36								TUMT6
			RRR015P03 (P) 80	RSR025N03 (N) 74	RRR030P03 (P) 79 RXR035N03 (N) 73	RRR040P03 (P) 78							TSMT3
				RSQ020N03 (N) 102 ☆RRQ020P03 (P) 107	RRQ030P03 (P) 106	RXQ040N03 (N) 100 RSQ045N03 (N) 101 RRQ045P03 (P) 105							TSMT6
						RT1E040RP (P) 50	RT1E050RP (P) 49	RT1E060XN (N) 42					
45		RSF010P05 (P) 24											TSMT8
			<b>NEW</b> RQ5H020SP (P) 83 RSR025N05 (N) 75										TSMT3
													TSMT6
													TUMT3
			RSF015N06 (N) 22										TSMT3
			<b>NEW</b> RQ5L015SP (P) 84 RSQ015N06 (N) 104	RSR020N06 (N) 77	RSR030N06 (N) 76								TSMT6
100	RSR010N10 (N) 85											TSMT3	
	<b>NEW</b> RQ6P015SP (P) 111											TSMT6	
4.5	30	☆RQ5E025AT (P) 82	<b>NEW</b> RQ5E035BN (N) 69 <b>NEW</b> RQ5E035AT (P) 81									TSMT3	
			☆RQ6E030AT (P) 110 <b>NEW</b> RQ6E035AT (P) 109	☆RQ6E045BN (N) 95	☆RQ6E055BN (P) 94 <b>NEW</b> RQ6E050AT (P) 108						TSMT6		
					☆RQ7E055AT (P) 136							TSMT8	

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development



● Quick Reference for Middle Power MOSFET Series 2

Dual Type	Drive Voltage (V)	V <sub>DS</sub> (V)	I <sub>D</sub> (A)										Package							
			0.5 to 1.6	2 / 2.5		3 / 3.5		4 / 4.5		5 / 5.5		6 / 6.5		7 / 7.5		8 / 8.5		9 to 15		
Dual Type	1.5	12	US6J11 (P+P)	30	US6J12 (P+P)	29													TUMT6	
					TT8J13 (P+P)	52	TT8J11 (P+P)	51												TSST8
					QS6J11 (P+P)	90														
						QS8J11 (P+P)	118	QS8J2 (P+P)	119	QS8J13 (P+P)	116									TSMT8
						QS8J12 (P+P)	117													
		20			TT8K1 (N+N)	43														TSST8
					TT8J21 (P+P)	53														
					TT8M1 (N+P)	54														
				TT8M3 (N+P)	55															
		12 / 20	US6M11 (N+P)	40															TUMT6	
		1.5 / 2.5	20 / 30		TT8M2 (N+P)	56													TSST8	
		1.8	20	US6K4 (N+N)	31														TUMT6	
		2.5	20 / 30	US6M2 (N+P)	35														TUMT6	
				QS6M4 (N+P)	99															TSMT6
				QS6K1 (N+N)	97															TSMT6
			30				QS8K2 (N+N)	132										QH8KA4 (N+N)	133	TSMT8
					US6K1 (N+N)	34														TUMT6
					TT8K2 (N+N)	44													TSST8	
					QS5K2 (N+N)	86													TSMT5	
	45		QS6K21 (N+N)	98															TSMT6	
	4		30	US6M1 (N+P)	39															TUMT6
					US6K2 (N+N)	38														
					TT8J2 (P+P)	58	TT8K11 (N+N)	45												
				TT8J3 (P+P)	59															
					TT8M11 (N+P)	57														
						QS8K11 (N+N)	127	QS8J4 (P+P)	124	QS8J5 (P+P)	123	QS8K13 (N+N)	125							
								QS8K12 (N+N)	126			QS8M13 (N+P)	137							
		45																	TSMT8	
	60				QS8M31 (N+P)	142														
	100				QS8K51 (N+N)	131														
					QS8M51 (N+P)	143														
	4.5	30			☆QH8KA1 (N+N)	129	QH8MA2 (N+P)	141	☆QH8KA2 (N+N)	128	☆QH8MA3 (N+P)	140	☆QH8MA4 (N+P)	139					TSMT8	

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development




# MOSFETs

Middle Power MOSFET Series 1																
Package	Application	No.	Part No.	Polarity (ch)	V <sub>bss</sub> (V)	I <sub>b</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)					Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)		
								V <sub>GS</sub> (V)								
								1.5	2.5	4	4.5	10				
WEMT6 (1616)		1	RW1C020UN	N	20	2	0.7	170	95	—	75	—	2	1.5		
		2	RW1C015UN		20	1.5	0.7	300	170	—	130	—	1.8			
		3	RW1A030AP	P	-12	-3	0.7	75	40	—	30	—	22		1.5	
		4	RW1A025AP		-12	-2.5	0.7	90	55	—	44	—	16			
		5	RW1A020ZP		-12	-2	0.7	200	105	—	75	—	6.5			
		6	RW1A013ZP		-12	-1.3	0.7	530	280	—	190	—	2.4			
		7	RW1C025ZP	N	-20	-2.5	0.7	120	65	—	48	—	21		4	
		8	RW1E014SN		30	1.4	0.7	—	—	270	250	170	1.4 <sup>-2</sup>			
		9	RW1E025RP	P	-30	-2.5	0.7	—	—	95	85	55	5.2 <sup>-2</sup>		4	
		10	RW1E015RP		-30	-1.5	0.7	—	—	190	170	115	3.2 <sup>-2</sup>			
TUMT3 (2021)	Load switch Switching	11	RUF025N02	N	20	2.5	0.8	80	49	—	39	—	5	1.5		
		12	RUF020N02		20	2	0.8	170	95	—	75	—	2			
		13	RAF040P01	P	-12	-4	0.8	40	27	—	22	—	37		1.5	
		14	RZF030P01		-12	-3	0.8	72	39	—	28	—	18			
		15	RZF020P01		-12	-2	0.8	200	105	—	75	—	6.5			
		16	RZF013P01		-12	-1.3	0.8	530	280	—	190	—	2.4			
		17	RUF015N02	N	20	1.5	0.8	220 <sup>-1</sup>	170	—	130	—	1.8		1.8	
		18	RTF025N03		30	2.5	0.8	—	70	50	48	—	3.7			
		19	☆RF1E015AJ	N	30	1.5	0.8	—	240	—	170	—	0.7		2.5	
		20	RTF016N05		45	1.6	0.8	—	200	150	140	—	2.3			
		21	RSF014N03		30	1.4	0.8	—	—	270	250	170	1.4 <sup>-2</sup>			
		22	RSF015N06		60	1.5	0.8	—	—	255	240	210	2 <sup>-2</sup>			
		23	RRF015P03	P	-30	-1.5	0.8	—	—	190	170	115	3.2 <sup>-2</sup>		4	
		24	RSF010P05		-45	-1	0.8	—	—	490	450	325	2.4 <sup>-2</sup>			
TUMT6 (2021)	Load switch Switching	25	RUL035N02	N	20	3.5	1	66	38	—	31	—	5.7	1.5		
		26	RAL045P01		-12	-4.5	1	50	28	—	22	—	40			
		27	RAL035P01	P	-12	-3.5	1	75	40	—	30	—	22		1.5	
		28	RAL025P01		-12	-2.5	1	90	55	—	44	—	16			
		29	US6J12	P+P	-12	-2	1	200	105	—	75	—	7.6		1.8	
		30	US6J11		-12	-1.3	1	530	280	—	190	—	2.4			
		31	US6K4	N+N	20	1.5	1	220 <sup>-1</sup>	170	—	130	—	1.8		1.8	
		32	RTL035N03		30	3.5	1	—	56	42	40	—	4.6			
		33	☆RF6E045AJ	N	30	4.5	1	—	21	—	15	—	5.3		2.5	
		34	US6K1		N+N	30	1.5	1	—	240	180	170	—			1.6
		35	US6M2	P	N	30	1.5	1	—	240	180	170	—		1.6	4
		36	RRL035P03		-20	-1	1	—	570	310	280	—	2.1			
		37	RRL025P03	P	-30	-3.5	1	—	—	60	55	40	8.0 <sup>-2</sup>		4	
		38	US6K2		-30	-2.5	1	—	—	95	85	55	5.2 <sup>-2</sup>			
		39	US6M1	N+N	30	1.4	1	—	—	270	250	170	1.4 <sup>-2</sup>		4	
		40	US6M11		-20	-1	1	—	570	310	280	—	2.1			
TSST8 (3019)		41	RT1C060UN	N	20	6	1.25	33	24	—	20	—	11	1.5		
		42	RT1E060XN		30	6	1.25	—	—	23	21	16	6.8 <sup>-2</sup>			
		43	TT8K1	N+N	20	2.5	1.25	100	65	—	52	—	3.6		1.5	
		44	TT8K2		30	2.5	1.25	—	95	70	65	—	3.2			
		45	TT8K11		30	3	1.25	—	—	78	67	51	2.5 <sup>-2</sup>			
		46	RT1A060AP		-12	-6	1.25	27	17	—	14	—	80			
		47	RT1A050ZP	P	-12	-5	1.25	48	26	—	19	—	34		1.5	
		48	RT1A045AP		-12	-4.5	1.25	50	28	—	22	—	40			
		49	RT1E050RP		-30	-5	1.25	—	—	40	36	26	13 <sup>-2</sup>			
		50	RT1E040RP		-30	-4	1.25	—	—	52	45	32	10.5			
		51	TT8J11	P+P	-12	-3.5	1.25	75	41	—	31	—	22		4	
		52	TT8J13		-12	-2.5	1.25	90	55	—	44	—	16			
		53	TT8J21	N	-20	-2.5	1.25	140	68	—	49	—	12		1.5	
		54	TT8M1		20	2.5	1.25	100	65	—	52	—	3.6			
		55	TT8M3	P	-20	-2.5	1.25	140	68	—	49	—	12		1.5	
		56	TT8M2		20	2.5	1.25	100	65	—	52	—	3.6			
		57	TT8M11	N	-20	-2.4	1.25	180	105	—	80	—	6.7		2.5	
		58	TT8J2		30	2.5	1.25	—	95	70	65	—	3.2			
		59	TT8J3	P+P	-20	-2.5	1.25	140	68	—	49	—	12		1.5	
		59	TT8J3		30	3	1.25	—	—	78	67	51	2.5 <sup>-2</sup>			
													4			
														4		
														4		

\*1 : V<sub>GS</sub>=1.8V \*2 : V<sub>GS</sub>=5V

☆ : Under development



Middle Power MOSFET Series 2														
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (T <sub>a</sub> =25°C)	R <sub>DS(on)</sub> Typ. (mΩ)					Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)
								V <sub>GS</sub> (V)						
								1.5	2.5	4	4.5	10		
TSMT3 (2928) (SC-96) 	Load switch Switching	60	RUR040N02	N	20	4	1	55	33	—	25	—	8	1.5
		61	RUR020N02		20	2	1	170	95	—	75	—	2	
		62	☆RQ5E040AJ	30	4	1	—	39	—	27	—	2.9	2.5	
		63	☆RQ5E030AJ	30	3	1	—	77	—	59	—	2.2		
		64	RZR040P01	-12	-4	1	55	30	—	22	—	30	1.5	
		65	RZR025P01	-12	-2.5	1	110	60	—	44	—	13		
		66	RZR020P01	-12	-2	1	200	105	—	75	—	6.5	2.5	
		67	RTR040N03	30	4	1	—	47	36	34	—	5.9		
		68	RTR025N03	30	2.5	1	—	95	70	66	—	3.3	4.5	
		69	New RQ5E035BN	30	3.5	1	—	—	46	38	1.5	6.5		
		70	RTR030N05	45	3	1	—	68	53	48	—	6.2	2.5	
		71	RTR025N05	45	2.5	1	—	125	100	95	—	3.2		
		72	RTR020N05	45	2	1	—	180	135	130	—	2.9	4	
		73	RXR035N03	30	3.5	1	—	—	50	45	35	3.3*		
		74	RSR025N03	30	2.5	1	—	—	83	74	50	2.9*	4	
		75	RSR025N05	45	2.5	1	—	—	105	95	70	3.6		
		76	RSR030N06	60	3	1	—	—	75	70	60	5*	4	
		77	RSR020N06	60	2	1	—	—	150	140	120	2.7*		
		78	RRR040P03	-30	-4	1	—	—	52	45	32	10.5*	4	
		79	RRR030P03	-30	-3	1	—	—	95	85	55	5.2*		
		80	RRR015P03	-30	-1.5	1	—	—	190	170	115	3.2*	4.5	
		81	New RQ5E035AT	-30	-3.5	1	—	—	—	54	38	5.2		
		82	☆RQ5E025AT	-30	-2.5	1	—	—	—	116	76	2.5	4	
		83	New RQ5H020SP	-45	-2	1	—	—	200	180	130	5		
		84	New RQ5L015SP	-60	-1.5	1	—	—	255	240	200	5	4	
85	RSR010N10	100	1	1	—	—	470	460	440	34*				
TSMT5 (2928) 	Load switch Switching	86	QS5K2	N+N	30	2	1.25	—	110	76	71	—	2.8	2.5
TSMT6 (2928) (SC-95) 	Load switch Switching	87	New RQ6C050UN	N	20	5	1.25	40	27	—	22	—	12	1.5
		88	RZQ050P01	P	-12	-5	1.25	44	26	—	19	—	35	
		89	RAQ045P01	-12	-4.5	1.25	50	28	—	22	—	40	2.5	
		90	QS6J11	P+P	-12	-2	1.25	200	105	—	75	—		6.5
		91	RTQ045N03	30	4.5	1.25	—	42	32	30	—	7.6	4.5	
		92	RTQ035N03	30	3.5	1.25	—	55	40	38	—	4.6		
		93	RTQ020N03	30	2	1.25	—	138	94	89	—	2.4	2.5	
		94	☆RQ6E055BN	30	5.5	1.25	—	—	30	19	4.4	4.7		
		95	New RQ6E045BN	30	4.5	1.25	—	—	35	21	4.7	4		
		96	RTQ020N05	45	2	1.25	—	200	150	140	—		2.3	
		97	QS6K1	30	1	1.25	—	260	180	170	—	1.7	2.5	
		98	QS6K21	45	1	1.25	—	415	—	310	300	1.5		
		99	QS6M4	30	1.5	1.25	—	260	180	170	—	1.6	4	
		100	RXQ040N03	30	4	1.25	—	—	50	45	35	3.3*		
		101	RSQ045N03	30	4.5	1.25	—	—	40	36	27	6.8*	4.5	
		102	RSQ020N03	30	2	1.25	—	—	168	148	96	2.2*		
		103	RVQ040N05	45	4	1.25	—	—	53	47	38	6.3	4	
		104	RSQ015N06	60	1.5	1.25	—	—	255	240	210	2*		
		105	RRQ045P03	-30	-4.5	1.25	—	—	38	34	25	14*	4.5	
		106	RRQ030P03	-30	-3	1.25	—	—	95	85	55	5.2*		
		107	☆RRQ020P03	-30	-2	1.25	—	—	190	170	115	3.2*	4	
		108	New RQ6E050AT	-30	-5	1.25	—	—	—	30	20	10		
		109	New RQ6E035AT	-30	-3.5	1.25	—	—	—	54	38	5.2	4	
		110	☆RQ6E030AT	-30	-3	1.25	—	—	—	116	76	2.5		
		111	New RQ6P015SP	-100	-1.5	1.25	—	—	400	380	350	17*	4	

\* : V<sub>GS</sub>=5V

☆ : Under development

# MOSFETs

Middle Power MOSFET Series 3															
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)					Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)	
								V <sub>GS</sub> (V)							
								1.5	2.5	4	4.5	10			
TSMT8 (3028)	Load switch Moter Drive	112	RQ1C075UN	N	20	7.5	1.5	20	14	—	11	—	18	1.5	
		113	RQ1C065UN		20	6.5	1.5	29	19	—	16	—	11		
		114	RQ1A070ZP	P	-12	-7	1.5	19	11	—	8	—	58		
		115	RQ1A060ZP		-12	-6	1.5	39	22	—	16	—	34		
		116	QS8J13	P+P	-12	-5.5	1.5	29	19	—	15	—	60		
		117	QS8J12		-12	-4.5	1.5	49	27	—	21	—	40		
		118	QS8J11		-12	-3.5	1.5	75	41	—	31	—	22		
		119	QS8J2		-12	-4	1.5	66	36	—	26	—	20		
		120	RQ1E100XN	N	30	10	1.5	—	—	10	9.5	7.5	12.7*		4
		121	RQ1A070AP	P	-12	-7	1.5	24	13	—	10	—	80		1.5
		122	RQ1E075XN	N	30	7.5	1.5	—	—	19	17	12	6.8*	4	
		123	QS8J5	P+P	-30	-5	1.5	—	—	45	40	28	10*	4	
		124	QS8J4		-30	-4	1.5	—	—	60	55	40	8.4*		
		125	QS8K13	N+N	30	6	1.5	—	—	28	25	20	5.5*	4	
		126	QS8K12		30	4	1.5	—	—	45	40	30	3.4*		
		127	QS8K11		30	3.5	1.5	—	—	50	45	35	3.3*		
		128	☆QH8KA2		30	5	1.5	—	—	—	40	25	2	4.5	
		129	☆QH8KA1		30	3	1.5	—	—	—	86	56	1.5		
		130	QS8K21		45	4	1.5	—	—	53	48	38	5.4*	4	
		131	QS8K51		100	2	1.5	—	—	260	250	240	4.7*		
		132	QS8K2	30	3.5	1.5	—	—	55	40	38	—	4.6		
		133	☆QH8KA4	30	8	1.5	—	—	17	—	13	—	6.2	2.5	
		134	RQ1E050RP	P	-30	-5	1.5	—	—	36	32	22	13*	4	
		135	RQ1E070RP		-30	-7	1.5	—	—	19	17	12	26*		
		136	☆RQ7E055AT		-30	-5.5	1.5	—	—	—	30	20	10		
		137	QS8M13	N	30	6	1.5	—	—	28	25	20	5.5*	4	
				P	-30	-5	1.5	—	—	45	40	28	10*		
				N	30	4	1.5	—	—	45	40	30	3.4*		
		138	QS8M12	P	-30	-3.5	1.5	—	—	60	55	40	8.4*	4.5	
				N	30	9	1.5	—	—	—	18	12	2		
139	☆QH8MA4	P	-30	-7.5	1.5	—	—	—	30	20	4.3	4.5			
		N	30	6	1.5	—	—	—	34.2	28.6	2				
140	☆QH8MA3	P	-30	-5.5	1.5	—	—	—	60	40	3.7	4.5			
		N	30	4.5	1.5	—	—	—	35	21	4.7				
141	QH8MA2	P	-30	-3	1.5	—	—	—	80	55	4.3	4			
		N	60	3	1.5	—	—	98	93	80	4*				
142	QS8M31	P	-60	-2	1.5	—	—	190	180	150	7.2*	4			
		N	100	2	1.5	—	—	260	250	240	4.6*				
143	QS8M51	P	-100	-1.5	1.5	—	—	400	380	350	17*				

\* : V<sub>GS</sub>=5V

☆ : Under development

● Quick Reference for Multiple Schottky Barrier Diodes Middle Power MOSFET Series  
 <WEMT • TUMT • TSST • TSMT Package>

	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)					Package		
			0.7	1	1.3 / 1.4 / 1.5	2	2.4 / 2.5			
Built-in Diode	1.5	12			ES6U1(P)	3			WEMT6	
					ES6U2(N)	1			WEMT6	
		20						TT8U1(P) TT8U2(P)	13 14	TSST8
							QS5U36(N)	15	TSMT5	
	1.8	20			QS5U34(N)	16			TSMT5	
				ES6U42(P)	5				WEMT6	
	2.5	20		US5U30(P) US5U38(P)	8 9				TUMT5	
						QS5U21(P) QS5U23(P) QS5U26(P) QS5U27(P)	23 25 22 24			TSMT5
						QS5U28(P)	21			
						QS6U22(P)	27			TSMT6
						ES6U41(N)	4			WEMT6
		30					US5U1(N) US5U3(N)	6 7		TUMT5
							US6U37(N)	12		TUMT6
							QS5U12(N) QS5U13(N) QS5U16(N) QS5U17(N)	19 17 18 20		TSMT5
							ES6U3(N)	2		WEMT6
							US5U2(N)	10		TUMT5
	4	30					QS5U33(P)	26	TSMT5	
									TSMT6	
					QS6U24(P)	28			TSMT6	
		45		US5U35(P)	11				TUMT5	

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

Multiple Schottky Barrier Diodes Middle Power MOSFET Series														
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)				Q <sub>g</sub> (nC) (V <sub>GS</sub> =4.5V)	Drive Voltage (V)	
								V <sub>GS</sub> (V)						
								1.5	2.5	4	4.5	10		
WEMT6 (1616)	Load switch	1	ES6U2	N+SBD (0.5A)	20	1.5	0.8	300	170	—	130	—	1.8	1.5
		2	ES6U3	N+SBD (0.5A)	30	1.4	0.8	—	—	270	250	170	1.4 <sup>*1</sup>	4
		3	ES6U1	P+SBD (0.5A)	-12	-1.3	0.8	530	280	—	190	—	2.4	1.5
		4	ES6U41	N+SBD (0.5A)	30	1.5	0.8	—	240	180	170	—	1.6	2.5
		5	ES6U42	P+SBD (0.5A)	-20	-1	0.8	—	570	310	280	—	2.1	
TUMT5 (2021)	Load switch	6	US5U1	N+SBD (0.5A)	30	1.5	1	—	240	180	170	—	1.6	2.5
		7	US5U3	N+SBD (0.7A)	30	1.5	1	—	240	180	170	—	1.6	
		8	US5U30	P+SBD (0.5A)	-20	-1	1	—	570	310	280	—	2.1	4
		9	US5U38	P+SBD (0.7A)	-20	-1	1	—	570	310	280	—	2.1	
		10	US5U2	N+SBD (0.5A)	30	1.4	1	—	—	270	250	170	1.4 <sup>*1</sup>	
11	US5U35	P+SBD (0.1A)	-45	-0.7	1	—	—	1000	900	600	1.7			
TUMT6 (2021)	Load switch	12	US6U37	N+SBD (0.7A)	30	1.5	1	—	240	180	170	—	1.6	2.5
TSST8 (3019)		13	TT8U1	P+SBD (1A)	-20	-2.4	1.25	180	105	—	80	—	6.7	1.5
		14	TT8U2		-20	-2.4	1.25	180	105	—	80	—	6.7	
TSMT5 (2928)		15	QS5U36	N+SBD (0.7A)	20	2.5	1.25	120	74	—	58	—	3.5	2.5
		16	QS5U34	N+SBD (0.5A)	20	1.5	1.25	220 <sup>*6</sup>	170	—	130	—	1.8	
		17	QS5U13 <sup>-2</sup>	N+SBD (0.5A)	30	2	1.25	—	110	76	71	—	2.8	
		18	QS5U16 <sup>-2</sup>		30	2	1.25	—	110	76	71	—	2.8	
		19	QS5U12 <sup>-3</sup>	N+SBD (1A)	30	2	1.25	—	110	76	71	—	2.8	
		20	QS5U17 <sup>-3</sup>		30	2	1.25	—	110	76	71	—	2.8	
		21	QS5U28		P+SBD (1A)	-20	-2	1.25	—	175	97	90	—	
		22	QS5U26 <sup>-5</sup>	P+SBD (0.5A)	-20	-1.5	1.25	—	260	180	160	—	4.2	
		23	QS5U21 <sup>-4</sup>	P+SBD (1A)	-20	-1.5	1.25	—	260	180	160	—	4.2	
		24	QS5U27 <sup>-4</sup>		-20	-1.5	1.25	—	260	180	160	—	4.2	
25		QS5U23 <sup>-5</sup>	P+SBD (0.5A)	-20	-1.5	1.25	—	260	180	160	—	4.2		
26		QS5U33	P+SBD (1A)	-30	-2	1.25	—	—	160	145	95	3.4 <sup>*1</sup>	4	
TSMT6 (2928) (SC-95)		27	QS6U22	P+SBD (0.7A)	-20	-1.5	1.25	—	310	170	155	—	3	2.5
		28	QS6U24	P+SBD (0.7A)	-30	-1	1.25	—	—	600	500	300	1.7 <sup>*1</sup>	4

\*1 : V<sub>GS</sub>=5V \*2,\*3,\*4,\*5 : Please note that, although the internal circuit configuration may differ between part numbers, the electrical specifications remain the same. \*6 : V<sub>GS</sub>=1.8V

# MOSFETs

## ● Quick Reference for Middle Power MOSFET Series

### <MPT3 Package>

Single Type	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)		Package		
			2	3			
	2.5	60	RJP020N06 (N)	1	MPT3		
	4	30				RHP030N03 (N)	2
		60	RHP020N06 (N)	3			

Character "N" in parentheses indicates "N-channel" respectively.

### <HUML2020L8 Package>

Single Type	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)								Package			
			3/3.5	4/4.5	5/5.5	7	8	9	11					
	1.5	20			RF4C050AP (P)	9							HUML2020L8	
	2.5	30							☆RF4E100AJ (N)	8				
	4.5	30				☆RF4E075AT (P)	10	RF4E080BN (N)	6			RF4E110BN (N)		5
		40				RF4E070BN (N)	7	RF4E080GN (N)	12			RF4E110GN (N)		11
Dual Type	1.5	20	☆UT6J3 (P+P)	14										
		30		☆UT6K1 (N+N)	15	☆UT6K3 (N+N)	16							
	2.5	30		☆UT6MA3 (N+P)	17									
		40		☆UT6MA2 (N+P)	18									

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development

### <HSMT8 Package>

Single Type	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)							Package					
			7	8/8.5	10	12	13	15/16	18						
	1.5	12	☆RQ3A070AP (P)	29	☆RQ3A085AP (P)	28							HSMT8		
	2.5	30									☆RQ3E180AJ (N)	27			
	4.5	30	RQ3E070BN (N)	26	RQ3E080BN (N)	25	RQ3E100BN (N)	24	RQ3E120BN (N)	23	RQ3E130BN (N)	22		☆RQ3E160AD (N)	19
		40		RQ3E080GN (N)	35	RQ3E100GN (N)	34	RQ3E120GN (N)	33	☆RQ3E120AT (P)	30	☆RQ3E150BN (N)		21	RQ3E180BN (N)
					☆RQ3G100GN (N)	37				RQ3G130MN (N)	36	☆RQ3E180GN (N)	31		

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development

### <HSML3030L10 Package>

Dual Type	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)		Package	
			9	11		
	4.5	30		HS8K11 (N+N)	39	HSML3030L10
		40	☆HS8K21 (N+N)	40	☆HS8K1 (N+N)	
	40					

Character "N" in parentheses indicates "N-channel" respectively.

☆ : Under development



Middle Power MOSFET Series <MPT3 · HUML2020L8 · HSMT8 · HSML3030L10 Package>															
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)					Q <sub>g</sub> (nC) (V <sub>GS</sub> =5V)	Drive Voltage (V)	
								V <sub>GS</sub> (V)							1.5
MPT3 (4540) (SC-62) (SOT-89)	DC-DC Converter Motor Drive	1	RJP020N06	N	60	2	2	—	210	170	165	—	—	2.5	
		2	RHP030N03		30	3	2	—	—	160	—	90	—	4	
		3	RHP020N06		60	2	2	—	—	240	200	150	—		
HUML2020L8 (Single) (2020)	DC-DC Converter	4	☆RF4G090GN	N	40	9	2	—	—	—	17	14	3.7	4.5	
	Load switch Switching	5	RF4E110BN		30	11	2	—	—	—	11.8	8.5	12 <sup>*1</sup>		4.5
		6	RF4E080BN		30	8	2	—	—	—	18.9	13.5	7.2 <sup>*1</sup>		
		7	RF4E070BN	30	7	2	—	—	—	30.8	22	4.6 <sup>*1</sup>	2.5		
		8	☆RF4E100AJ	30	10	2	—	15	—	11	—	13 <sup>*1</sup>			
		9	RF4C050AP	-20	-5	2	32	22	18	—	—	22	1.5		
		10	☆RF4E075AT	-30	-7.5	2	—	—	—	28	19	11	4.5		
	DC-DC Converter	11	RF4E110GN	30	11	2	—	—	—	11.7	8.7	4.8 <sup>*1</sup>	4.5		
		12	RF4E080GN	30	8	2	—	—	—	17.6	13.5	2.8 <sup>*1</sup>			
		13	RF4E070GN	30	7	2	—	—	—	23	16.4	2.3 <sup>*1</sup>			
	HUML2020L8 (Dual) (2020)	DC-DC Converter Switching	14	☆UT6J3	P+P	-20	-3	2	130	70	—	50	—	6.7	1.5
			15	☆UT6K1	N+N	30	4	2	—	80	—	60	—	1.3	2.5
			16	New UT6K3	N+N	30	5.5	2	—	45	—	32	—	2.5	
17			☆UT6MA3	N	30	5.5	2	—	45	—	32	—	2.5		
				P	-20	-4.5	2	—	65	—	49	—	5.0	4.5	
18			☆UT6MA2	N	30	5.5	2	—	—	—	35	21	2		
HSMT8 (3333)	Load switch Switching	19	☆RQ3E160AD	N	30	16	2	—	—	—	5	3.5	26	4.5	
		20	RQ3E180BN	30	18	2	—	—	—	3.7	2.8	37 <sup>*1</sup>			
		21	RQ3E150BN	30	15	2	—	—	—	5.3	3.8	23 <sup>*1</sup>			
		22	RQ3E130BN	30	13	2	—	—	—	6.7	4.4	16 <sup>*1</sup>			
		23	RQ3E120BN	30	12	2	—	—	—	8.6	6.6	14 <sup>*1</sup>			
		24	RQ3E100BN	30	10	2	—	—	—	11	7.7	10.5 <sup>*1</sup>			
		25	RQ3E080BN	30	8	2	—	—	—	16	11	7.2 <sup>*1</sup>			
		26	RQ3E070BN	30	7	2	—	—	—	29	20	4.6 <sup>*1</sup>			
		27	☆RQ3E180AJ	30	18	2	—	4.5	—	3.5	—	39	2.5		
		28	☆RQ3A085AP	-12	-8.5	2	13	10	—	—	—	40	1.5		
	29	☆RQ3A070AP	-12	-7	2	19	15	—	—	—	27				
	30	New RQ3E120AT	-30	-12	2	—	—	—	8.7	6.1	33 <sup>*1</sup>	4.5			
	31	RQ3E180GN	30	18	2	—	—	—	4.3	3.3	11.6 <sup>*1</sup>				
	32	RQ3E150GN	30	15	2	—	—	—	6.2	4.7	7.4 <sup>*1</sup>				
	33	RQ3E120GN	30	12	2	—	—	—	9.1	6.7	4.8 <sup>*1</sup>				
	34	RQ3E100GN	30	10	2	—	—	—	12	8.9	3.9 <sup>*1</sup>				
	35	RQ3E080GN	30	8	2	—	—	—	17.5	12.9	2.8 <sup>*1</sup>				
36	RQ3G130MN	40	13	2	—	—	—	7.9	6	8.5 <sup>*1</sup>					
37	New RQ3G100GN	40	10	2	—	—	—	14.1	11	5.6 <sup>*1</sup>					
HSML3030L10 (3030)	DC-DC	38	New HS8K1	N+N	30	10	2	—	—	—	14.7	11.2	2.7	4.5	
					30	11	2	—	—	—	11.9	9.1	3.3		
		39	HS8K11		30	7	2	—	—	—	20.8	12.8	5.7		
					30	11	2	—	—	—	13.3	10.2	9		
					40	8	2	—	—	—	22.1	17.3	3.1		
		40	☆HS8K21		40	9	2	—	—	—	18.0	14.1	3.8		

\*1 : V<sub>GS</sub>=4.5V

☆ : Under development

C

Transistors



# MOSFETs

## ● Quick Reference for Middle Power MOSFET Series

### <SOP8 Package> (Single Type)

	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)								Package							
			4 / 5		6.5		7 / 7.5		9			10		12.5 / 13		14		
Single Type	1.5	20									RUS100N02 (N)	1						
		30	RRH040P03 (P)	13					RRH075P03 (P)	11	RRH090P03 (P)	10	RRH100P03 (P)	9	RXH125N03 (N)	2	RRH140P03 (P)	8
			RRH050P03 (P)	12					RXH070N03 (N)	5	RXH090N03 (N)	4	RXH100N03 (N)	3				
		45						RSH070N05 (N)	6									
	60			RSH065N06 (N)	7													
	4	45						RSH070P05 (P)	15									
4.5	30						RS3E075AT (P)	14										

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

### <SOP8 Package> (Dual Type)

	Polarity	Drive Voltage (V)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)								Package											
				2.5 / 2.6		3 / 3.4 / 3.5		4 / 4.5		5 / 5.5			6		7		9						
Dual Type	Nch + Nch or Pch + Pch	4	30			SH8K11 (N+N)	20	SH8J62 (P+P)	31	SH8K12 (N+N)	19	SH8K13 (N+N)	18	SH8K14 (N+N)	17	SH8K15 (N+N)	16	SH8J65 (P+P)	30	SH8J66 (P+P)	29		
								SH8K25 (N+N)	25			SH8K26 (N+N)	24										
										SH8K22 (N+N)	26												
										SH8K32 (N+N)	27												
										SH8J31 (P+P)	32												
										SH8K41 (N+N)	28												
	Nch + Pch	4.5	30			☆SH8KA1 (N+N)	23			☆SH8KA2 (N+N)	22			☆SH8KA4 (N+N)	21								
				4	30			SH8M11 (N+P)	36		SH8M12 (N+P)	35		SH8M13 (N+P)	34			SH8M14 (N+P)	33				
					45					SH8M24 (N+P)	37												
				10	80	SH8M41 (N+P)	38																
100	SP8M51 (N+P)	39																					

Character "N", "P" in parentheses indicates "N-channel", "P-channel" respectively.

☆ : Under development



Middle Power MOSFET Series

<b>&lt;SOP8 Package&gt; (Single Type)</b>																
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)					Q <sub>g</sub> (nC) (V <sub>GS</sub> =5V)	Drive Voltage (V)		
								V <sub>GS</sub> (V)								
								1.5	2.5	4	4.5	10				
	Switching	1	RUS100N02	N	20	10	2	13	11	9	8	—	24 <sup>*1</sup>	1.5		
		2	RXH125N03		30	12.5	2	—	—	10	9.5	7.5	12.7			
	DC-DC Converter	3	RXH100N03		30	10	2	—	—	13	12	9.5	11	4		
		4	RXH090N03		30	9	2	—	—	19	17	12	6.8			
		5	RXH070N03		30	7	2	—	—	28	25	20	5.8			
		6	RSH070N05		45	7	2	—	—	25	23	18	12			
		7	RSH065N06		60	6.5	2	—	—	31	28	24	11			
	Load switch	Switching	8	RRH140P03	P	-30	-14	2	—	—	7.3	6.7	5	80	4	
			9	RRH100P03		-30	-10	2	—	—	14	12.5	9	39		
			10	RRH090P03		-30	-9	2	—	—	17	15	11	30		
			11	RRH075P03		-30	-7.5	2	—	—	25	22	15	21		
			12	RRH050P03		-30	-5	2	—	—	58	52	36	9.2		
			13	RRH040P03		-30	-4	2	—	—	95	85	55	5.2		
			14	<i>New</i> RS3E075AT		-30	-7.5	2	—	—	—	23.3	15.4	5.4 <sup>*1</sup>		4.5
			15	RSH070P05		-45	-7	2	—	—	28	25	19	34		4
<b>&lt;SOP8 Package&gt; (Dual Type)</b>																
Package	Application	No.	Part No.	Polarity (ch)	V <sub>DSS</sub> (V)	I <sub>D</sub> (A)	P <sub>D</sub> (W) (Ta=25°C)	R <sub>DS(on)</sub> Typ. (mΩ)			Q <sub>g</sub> (nC) (V <sub>GS</sub> =5V)	Drive Voltage (V)				
								V <sub>GS</sub> (V)								
								4	4.5	10						
	DC-DC Converter Switching Moter Drive	16	SH8K15	N+N	30	9	2	19	18	15	8.5	4				
		17	SH8K14		30	7	2	28	25	20	5.8					
		18	SH8K13		30	6	2	35	30	22	5					
		19	SH8K12		30	5	2	45	40	30	4					
		20	SH8K11		30	3.5	2	100	90	70	1.9					
		21	☆SH8KA4		30	7	2	—	19.5	16.7	8					
		22	☆SH8KA2		30	5.5	2	—	40	32	4.5					
		23	☆SH8KA1		30	3.5	2	—	85	70	0.8 <sup>*1</sup>					
		24	SH8K26		40	6	2	—	35	27	2.9					
		25	SH8K25		40	4	2	—	80	60	1.7					
		26	SH8K22		45	4.5	2	46	41	33	6.8					
		27	SH8K32		60	4.5	2	55	52	46	7					
		28	SH8K41	80	3.4	2	120	110	90	6.6						
		29	SH8J66	-30	-9	2	19	17.5	13.5	35						
		30	SH8J65	-30	-7	2	31	29	21.5	18						
		31	SH8J62	-30	-4.5	2	60	55	40	8						
		32	SH8J31	-60	-4.5	2	60	55	50	21						
		33	SH8M14	N	30	9	2	19	18	15	8.5					
		P		-30	-7	31		29	21.5	18						
		34	SH8M13	N	30	6	2	35	30	22	5					
		P		-30	-7	31		29	21.5	18						
		35	SH8M12	N	30	5	2	45	40	30	4					
		P		-30	-4.5	60		55	40	8						
		36	SH8M11	N	30	3.5	2	100	90	70	1.9					
		P		-30	-3.5	120		100	65	4.2						
		Load switch	Switching Moter Drive	37	SH8M24	N	45	4.5	2	46	41	33	6.8	4		
				P		-45	-3.5	66		60	45	13				
				38	SH8M41	N	80	3.4	2	120	110	90	6.6	4		
				P		-80	-2.6	230		220	165	8.2				
				39	SP8M51	N	100	3	2	135	130	120	8.5 <sup>*2</sup>	4		
		P	-100	-2.5	240	230	210	12.5 <sup>*2</sup>								

\*1 : V<sub>GS</sub>=4.5V \*2 : V<sub>GS</sub>=10V

☆ : Under development

# Selector Guide for Automotive MOSFETs (AEC-Q101)

Selector Guide for Automotive MOSFETs (AEC-Q101) 1																	
Package (Dimension:mm)	Part No.			Single/ Dual	Polarity	Maximum Rating			R <sub>DS(on)</sub> mΩ typ.				V <sub>GS(th)</sub> (V)		Q <sub>g</sub> typ. V <sub>GS</sub> =5V (nC)	Ciss typ. V <sub>GS</sub> =10V (pF)	
						V <sub>DS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS</sub> (V)	V <sub>GS</sub> =10V	V <sub>GS</sub> =4.5V	V <sub>GS</sub> =2.5V	V <sub>GS</sub> =1.5V	min.	max.			
 UMT3 (2021) (SC-70) (SOT-323)	RJU003N03	FRA	T106	Single	N	30	0.3	±12	—	800	1400	—	0.8	1.5	—	24	
	RJU002N06	FRA	T106	Single	N	60	0.2	±12	—	1600	2200	—	0.5	1.5	—	18	
	RHU003N03	FRA	T106	Single	N	30	0.3	±20	800	1200	—	—	1	2.5	—	20	
	RHU002N06	FRA	T106	Single	N	60	0.25	±20	1700	2800	—	—	1	2.3	2.2 <sup>-1</sup>	15	
 SMT3 (2928) (SC-59) (SOT-346)	RJK005N03	FRA	T146	Single	N	30	0.5	±12	—	400	650	—	0.8	1.5	2 <sup>-2</sup>	60	
	RHK005N03	FRA	T146	Single	N	30	0.5	±20	350	510	—	—	1	2.5	—	45	
	RHK003N06	FRA	T146	Single	N	60	0.3	±20	700	—	—	—	1	2.5	3 <sup>-1</sup>	33	
 SST3 (2924) (SOT-23)	RK7002A	FRA	T116	Single	N	60	0.3	±20	700	1100 <sup>*4</sup>	—	—	1	2.5	3 <sup>-1</sup>	33	
 TUMT3 (2021)	RUF025N02	FRA	TL	Single	N	20	2.5	±10	—	39	49	1.5	0.3	1.3	5 <sup>-2</sup>	370	
	RTF025N03	FRA	TL	Single	N	30	2.5	±12	—	48	70	—	0.5	1.5	3.7 <sup>-2</sup>	270	
	RTF016N05	FRA	TL	Single	N	45	1.6	±12	—	140	200	—	0.5	1.5	2.3 <sup>-2</sup>	150	
	RSF015N06	FRA	TL	Single	N	60	1.5	±20	210	240	—	—	1	2.5	2	110	
 TUMT6 (2021)	RUL035N02	FRA	TR	Single	N	20	3.5	±10	—	31	38	66	0.3	1	5.7 <sup>-2</sup>	460	
	RTL035N03	FRA	TR	Single	N	30	3.5	±12	—	40	56	—	0.5	1.5	4.6 <sup>-2</sup>	350	
	RTL020P02	FRA	TR	Single	P	20	2	±12	—	100	180	—	-0.7	-2	4.9 <sup>-2</sup>	430	
	RSL020P03	FRA	TR	Single	P	30	2	±20	80	125	—	—	-1	-2.5	3.9	350	
 TSMT3 (2928) (SC-96)	RRL035P03	FRA	TR	Single	P	30	3.5	±20	36	52	—	—	-1	-2.5	8	800	
	RUR040N02	FRA	TL	Single	N	20	4	±10	—	25	33	55	0.3	1.3	8 <sup>-2</sup>	680	
	RTR025N03	FRA	TL	Single	N	30	2.5	±12	—	66	95	—	0.5	1.5	3.3 <sup>-2</sup>	220	
	RTR040N03	FRA	TL	Single	N	30	4	±12	—	34	47	—	0.5	1.5	5.9 <sup>-2</sup>	475	
	RTR020N05	FRA	TL	Single	N	45	2	±12	—	130	180	—	0.5	1.5	2.9 <sup>-2</sup>	200	
	RTR025N05	FRA	TL	Single	N	45	2.5	±12	—	95	125	—	0.5	1.5	3.2 <sup>-2</sup>	250	
	RTR030N05	FRA	TL	Single	N	45	3	±12	—	48	68	—	0.5	1.5	6.2 <sup>-2</sup>	510	
	RSR025N03	FRA	TL	Single	N	30	2.5	±20	50	74	—	—	1	2.5	2.9	165	
	RSR025N05	FRA	TL	Single	N	45	2.5	±20	70	95	—	—	1	3	3.6	260	
	RSR020N06	FRA	TL	Single	N	60	2	±20	120	140	—	—	1	2.5	2.7	180	
	RSR030N06	FRA	TL	Single	N	60	3	±20	60	70	—	—	1	2.5	5	380	
	RSR010N10	FRA	TL	Single	N	100	1	±20	370	400	—	—	1	2.5	3.5	140	
	RTR020P02	FRA	TL	Single	P	-20	-2	±12	—	100	180	—	-0.7	-2	4.9 <sup>-2</sup>	430	
	RTR025P02	FRA	TL	Single	P	-20	-2.5	±12	—	70	115	—	-0.7	-2	7 <sup>-2</sup>	630	
	RTR030P02	FRA	TL	Single	P	-20	-3	±12	—	55	90	—	-0.7	-2	9.3 <sup>-2</sup>	840	
	RSR025P03	FRA	TL	Single	P	-30	-2.5	±20	70	100	—	—	-1	-2.5	5.4	460	
	RRR030P03	FRA	TL	Single	P	-30	-3	±20	55	85	—	—	-1	-2.5	5.2	480	
	RRR040P03	FRA	TL	Single	P	-30	-4	±20	32	45	—	—	-1	-2.5	10.5	1000	
	RSR020P05	FRA	TL	Single	P	-45	-2	±20	130	180	—	—	-1	-3	9.5 <sup>-1</sup>	500	
	RSR015P06	FRA	TL	Single	P	-60	-1.5	±20	200	240	—	—	-1	-3	10 <sup>*1</sup>	500	
 TSMT6 (2928) (SC-95)	RUQ050N02	FRA	TR	Single	N	20	5	±10	—	22	27	40	0.3	1	12 <sup>-2</sup>	900	
	RTQ035N03	FRA	TR	Single	N	30	3.5	±12	—	38	55	—	0.5	1.5	4.6 <sup>-2</sup>	285	
	RTQ045N03	FRA	TR	Single	N	30	4.5	±12	—	30	42	—	0.5	1.5	7.6 <sup>-2</sup>	540	
	RTQ020N05	FRA	TR	Single	N	45	2	±12	—	140	200	—	0.5	1.5	2.3 <sup>-2</sup>	150	
	RSQ020N03	FRA	TR	Single	N	30	2	±20	96	148	—	—	1	2.5	2.2	110	
	RSQ035N03	FRA	TR	Single	N	30	3.5	±20	44	60	—	—	1	2.5	5.3	290	
	RSQ045N03	FRA	TR	Single	N	30	4.5	±20	27	36	—	—	1	2.5	6.8	520	
	RVQ040N05	FRA	TR	Single	N	45	4	±21	38	47	—	—	1	2.5	6.3	530	
	RSQ015N06	FRA	TR	Single	N	60	1.5	±20	210	240	—	—	1	2.5	2	110	
	RSQ035N06	FRA	TR	Single	N	60	3.5	±20	50	58	—	—	1	3	6.5	430	
	RTQ025P02	FRA	TR	Single	P	-20	-2.5	±12	—	72	140	—	-0.7	-2	6.4 <sup>-2</sup>	580	
	RTQ035P02	FRA	TR	Single	P	-20	-3.5	±12	—	50	80	—	-0.7	-2	10.5 <sup>-2</sup>	1200	
	RSQ025P03	FRA	TR	Single	P	-30	-2.5	±20	80	120	—	—	-1	-2.5	4.4	320	
	RRQ030P03	FRA	TR	Single	P	-30	-3	±20	55	85	—	—	-1	-2.5	5.2	480	
	RSQ035P03	FRA	TR	Single	P	-30	-3.5	±20	45	65	—	—	-1	-2.5	9.2	780	
	RRQ045P03	FRA	TR	Single	P	-30	-4.5	±20	25	34	—	—	-1	-2.5	14	1350	
	RSQ015P10	FRA	TR	Single	P	-100	-1.5	±20	350	380	—	—	-1	-2.5	17	950	
	QS6K1	FRA	TR	Dual	N+N	30	1	±12	—	170	260	—	0.5	1.5	1.7 <sup>-2</sup>	77	
	QS6K21	FRA	TR	Dual	N+N	45	1	±12	—	300	415	—	0.5	1.5	1.5 <sup>-2</sup>	95	
	 TSMT8 (3028)	RQ1C075UN	FRA	TR	Single	N	20	7.5	±10	—	11	14	20	0.3	1	18 <sup>-2</sup>	1400
RQ1A070ZP		FRA	TR	Single	P	-12	-7	±10	—	8	11	19	-0.3	-1	58 <sup>-2</sup>	7400 <sup>-4</sup>	
RQ1E050RP		FRA	TR	Single	P	-30	-5	±20	22	32	—	—	-1	-2.5	13	1300	
RQ1E070RP		FRA	TR	Single	P	-30	-7	±20	12	17	—	—	-1	-2.5	26	2700	
QS8K2		FRA	TR	Dual	N+N	30	3.5	±12	—	38	55	—	0.5	1.5	4.6 <sup>-2</sup>	285	
QS8J4		FRA	TR	Dual	P+P	-30	-4	±20	40	55	—	—	-1	-2.5	8.4	800	
QS8M51	FRA	TR	Dual	N+P	100	2	±20	240	250	—	—	1	2.5	4.7	290 <sup>-3</sup>		
						-100	-1.5	±20	350	380	—	—	-1	-2.5	17	950 <sup>-3</sup>	

 \*1 V<sub>GS</sub>=10V \*2 V<sub>GS</sub>=4.5V \*3 V<sub>GS</sub>=25V \*4 V<sub>GS</sub>=6V

Selector Guide for Automotive MOSFETs (AEC-Q101) 2

Package (Dimension:mm)	Part No.			Single/ Dual	Polarity	Maximum Rating			R <sub>DS(on)</sub> mΩ typ.				V <sub>GS(th)</sub> (V)		Qg typ.	Ciss typ.
						V <sub>DS</sub> (V)	I <sub>D</sub> (A)	V <sub>GS</sub> (V)	V <sub>GS</sub> =10V	V <sub>GS</sub> =4.5V	V <sub>GS</sub> =2.5V	V <sub>GS</sub> =1.5V	min.	max.	V <sub>GS</sub> =5V (nC)	V <sub>GS</sub> =10V (pF)
<p>MPT3 (4540) (SC-62) (SOT-89)</p>	RJP020N06	FRA	T100	Single	N	60	2	±12	—	165	210	—	0.8	1.5	5 <sup>-2</sup>	160
	RHP030N03	FRA	T100	Single	N	30	3	±20	90	160 <sup>*4</sup>	—	—	1	2.5	6.5 <sup>-1</sup>	160
	RHP020N06	FRA	T100	Single	N	60	2	±20	150	200	—	—	1	2.5	7 <sup>-1</sup>	140
<p>SOP8 (5060)</p>	RSS090N03	FRA	TB	Single	N	30	9	±20	11	15	—	—	1	2.5	11	810
	RSS100N03	FRA	TB	Single	N	30	10	±20	9.5	12.5	—	—	1	2.5	14	1070
	RSS130N03	FRA	TB	Single	N	30	13	±20	5.9	7.4	—	—	1	2.5	25	2000
	RSS070N05	FRA	TB	Single	N	45	7	±20	18	23	—	—	1	2.5	12	1000
	RSS085N05	FRA	TB	Single	N	45	8.5	±20	13	16	—	—	1	2.5	15.3	1500
	RSS095N05	FRA	TB	Single	N	45	9.5	±20	11	14	—	—	1	2.5	18.9	1830
	RSS065N06	FRA	TB	Single	N	60	6.5	±20	24	28	—	—	1	2.5	11	900
	RRS040P03	FRA	TB	Single	P	-30	-4	±20	55	85	—	—	-1	-2.5	5.2	480
	RRS050P03	FRA	TB	Single	P	-30	-5	±20	36	52	—	—	-1	-2.5	9.2	850
	RRS075P03	FRA	TB	Single	P	-30	-7.5	±20	15	22	—	—	-1	-2.5	21	1900
	RRS090P03	FRA	TB	Single	P	-30	-9	±20	11	15	—	—	-1	-2.5	30	3000
	RRS100P03	FRA	TB	Single	P	-30	-10	±20	9	12.5	—	—	-1	-2.5	39	3600
	RRS140P03	FRA	TB	Single	P	-30	-14	±20	5	6.7	—	—	-1	-2.5	80	8000
	RSS060P05	FRA	TB	Single	P	-45	-6	±20	26	35	—	—	-1	-2.5	23	2700
	RSS070P05	FRA	TB	Single	P	-45	-7	±20	19	25	—	—	-1	-2.5	34	4100
	SP8K5	FRA	TB	Dual	N+N	30	3.5	±20	59	93	—	—	1	2.5	2.5	140
	SP8K1	FRA	TB	Dual	N+N	30	5	±20	36	52	—	—	1	2.5	3.9	230
	SP8K2	FRA	TB	Dual	N+N	30	6	±20	21	30	—	—	1	2.5	7.2	520
	SP8K3	FRA	TB	Dual	N+N	30	7	±20	17	23	—	—	1	2.5	8.4	600
	SP8K22	FRA	TB	Dual	N+N	45	4.5	±20	33	41	—	—	1	2.5	6.8	550
	SP8K23	FRA	TB	Dual	N+N	45	5	±20	26	33	—	—	1	2.5	8.6	700
	SP8K24	FRA	TB	Dual	N+N	45	6	±20	18	24	—	—	1	2.5	15.4	1400
	SP8K31	FRA	TB	Dual	N+N	60	3.5	±20	85	100	—	—	1	2.5	3.7	250
	SP8K32	FRA	TB	Dual	N+N	60	4.5	±20	46	52	—	—	1	2.5	7	500
	SP8K33	FRA	TB	Dual	N+N	60	5	±20	34	38	—	—	1	2.5	8	620
	SP8K52	FRA	TB	Dual	N+N	100	3	±20	120	130	—	—	1	2.5	8.5	610 <sup>-3</sup>
	SP8J5	FRA	TB	Dual	P+P	-30	-7	±20	20	25	—	—	1	2.5	2.5	2600
	SP8J66	FRA	TB	Dual	P+P	-30	-9	±20	13.5	17.5	—	—	-1	-2.5	35	3000
	SP8M1	FRA	TB	Dual	N+P	30	4	±20	36	52	—	—	1	2.5	3.9	230
						-30	-4	±20	40	57	—	—	-1	-2.5	8.5	850
	SP8M3	FRA	TB	Dual	N+P	30	5	±20	36	52	—	—	1	2.5	3.9	230
						-30	-4.5	±20	40	57	—	—	-1	-2.5	8.5	850
	SP8M4	FRA	TB	Dual	N+P	30	9	±20	12	16	—	—	1	2.5	15	1190
						-30	-7	±20	20	25	—	—	-1	-2.5	25	2600
	SP8M5	FRA	TB	Dual	N+P	30	6	±20	21	30	—	—	1	2.5	7.2	520
						-30	-7	±20	20	25	—	—	-1	-2.5	25	2600
	SP8M6	FRA	TB	Dual	N+P	30	5	±20	36	52	—	—	1	2.5	3.9	230
						-30	-3.5	±20	65	100	—	—	-1	-2.5	5.5	490
	SP8M8	FRA	TB	Dual	N+P	30	6	±20	21	30	—	—	1	2.5	7.2	520
						-30	-4.5	±20	40	57	—	—	-1	-2.5	8.5	850
SP8M10	FRA	TB	Dual	N+P	30	7	±20	17	23	—	—	1	2.5	8.4	600	
					-30	-4.5	±20	40	57	—	—	-1	-2.5	8.5	850	
SP8M21	FRA	TB	Dual	N+P	45	6	±20	18	24	—	—	1	2.5	15.4	1400	
					-45	-4	±20	33	43	—	—	-1	-2.5	20	2400	
SP8M24	FRA	TB	Dual	N+P	45	4.5	±20	33	41	—	—	1	2.5	6.8	550	
					-45	-3.5	±20	45	60	—	—	-1	-2.5	13	1700	
SP8M41	FRA	TB	Dual	N+P	80	3.4	±20	90	110	—	—	1	2.5	6.6	600	
					-80	-2.6	±20	165	220	—	—	-1	-2.5	8.2	1000	
SP8M51	FRA	TB	Dual	N+P	100	3	±20	120	130	—	—	1	2.5	8.5	610	
					-100	-2.5	±20	210	230	—	—	-1	-2.5	12.5	1550	

\*1 V<sub>GS</sub>=10V \*2 V<sub>GS</sub>=4.5V \*3 V<sub>GS</sub>=25V \*4 V<sub>GS</sub>=6V

# Bipolar Transistors (Surface mount type)

Bipolar Transistors (Surface mount type) 1										
Package	VMT3 (1212) (SC-105AA)		EMT3F (1616) (SC-89)		EMT3 (1616) (SC-75A) (SOT-416)		V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	h <sub>FE</sub> *2	Automotive Grade Available
	P <sub>D</sub> =0.15W		P <sub>D</sub> =0.15W		P <sub>D</sub> =0.15W					
Application	PNP	NPN	PNP	NPN	PNP	NPN				
General Purpose	2SAR522M	2SCR522M	2SAR522EB	2SCR522EB	—	—	20	0.2	120 to 560	—
Amplification	2SAR523M	2SCR523M	2SAR523EB	2SCR523EB	—	—	50	0.1	120 to 560	—
Low V <sub>CE</sub> (sat)	2SA2029	2SC5658	2SA1774EB	2SC4617EB	2SA1774	2SC4617	50	0.15	120 to 390	Yes
Driver	—	—	2SAR502EB	2SCR502EB	—	—	30	0.5	200 or more	—
High h <sub>FE</sub> muting	—	2SD2707	—	—	—	2SD2654	50	0.15	820 to 2700	—
High Frequency	—	2SC5659	—	—	—	2SC4618	25	0.05	82 to 180 (f <sub>T</sub> =300MHz)	—
	—	2SC5661	—	—	—	2SC4725	20	0.05	82 to 180 (f <sub>T</sub> =1500MHz)	—
	—	2SC5662	—	—	—	2SC4726	11	0.05	56 to 180 (f <sub>T</sub> =3200MHz)	—

Notes : 1. \*1 With reference land installed 2. \*2 For h<sub>FE</sub>, please see the technical specifications. 3. PNP (-) symbol omitted.

Bipolar Transistors (Surface mount type) (For oversea customer only)										
Package	UMT3 (2012) (SC-70) (SOT-323)		SMT3 (2916) / SST3 (2913) (SC-59) (SOT-346) / (SOT-23)		V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	UMT3 SMT3 SST3	h <sub>FE</sub> *2	Automotive Grade Available	
	P <sub>D</sub> =0.2W		P <sub>D</sub> =0.2W							P <sub>C</sub> (W) (T <sub>a</sub> =25°C)
Application	PNP	NPN	PNP	NPN						
General Purpose	BC858BW	BC848BW	BC858B <sup>-3</sup>	BC848B <sup>-3</sup>	30	0.1	0.2	200 to 800	—	
Amplification & Pre Amp	—	—	BCX71H <sup>-3</sup>	BCX70J,K <sup>-3</sup>	45	0.2	0.2	140 to 630	—	
Driver	—	—	BCX17 <sup>-3</sup>	BCX19 <sup>-3</sup>	45	0.5	0.2	100 to 600	—	
Switching	UMT3906	UMT3904	SST3906	SST3904 <sup>-3</sup>	40	0.2	0.2	100 to 300	—	
	—	—	MMST3906	MMST3904	40	0.6	0.2	100 to 300	—	
	—	UMT2222A	—	SST2222A <sup>-3</sup>	40	0.6	0.2	100 to 300	—	
	UMT2907A	—	SST2907A <sup>-3</sup>	MMST2907A	60	0.6	0.2	100 to 300	—	
Darlington*4	—	—	—	SSTA13 <sup>-3</sup>	30 (V <sub>CEs</sub> )	0.5	0.2	5k or more	—	
	—	—	—	SSTA28 <sup>-3</sup>	80 (V <sub>CEs</sub> )	0.3	0.2	10k or more	—	

Notes: 1. \*1 With reference land installed 2. \*2 For h<sub>FE</sub>, please see the technical specifications. 3. \*3 SST3 package 4. \*4 For internal circuit, please see the technical specifications. 5. PNP (-) symbol omitted.

Bipolar Transistors (Surface mount type)

Bipolar Transistors (Surface mount type) 2											
Package	UMT3F (2021) (SC-85)		UMT3 (2021) (SC-70) (SOT-323)		SMT3 (2928) (SC-59) (SOT-346)		V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	h <sub>FE</sub> *2	Automotive Grade Available	
	P <sub>D</sub> =0.2W		P <sub>D</sub> =0.2W		P <sub>D</sub> =0.2W						
Application	PNP	NPN	PNP	NPN	PNP	NPN					
General Purpose Amplification	2SAR522UB	2SCR522UB	—	—	—	—	20	0.2	120 to 560	—	
	2SAR523UB	2SCR523UB	—	—	—	—	50	0.1	120 to 560	—	
	2SA1576UB	2SC4081UB	2SA1576A	2SC4081	2SA1037AK	2SC2412K	50	0.15	120 to 390	Yes	
	—	—	2SA1579	2SC4102	2SA1514K	2SC3906K	120	0.05	180 to 560	Yes	
Low V <sub>CE</sub> (sat)	—	—	—	—	2SA2119K	—	12	0.5	270 to 680	—	
	—	—	—	—	—	2SD1757K	15	0.5	120 to 560	—	
	—	—	—	—	2SB1590K	2SD2444K	15	1	120 to 270 180 to 390	—	
	—	—	2SB1689	2SD2652	—	—	12	1.5	270 to 680	—	
	—	—	—	—	2SB1690K	2SD2653K	12	2	270 to 680	—	
	—	—	2SB1694	2SD2656	—	—	30	1	270 to 680	Yes	
Driver	2SAR502UB	2SCR502UB	—	—	—	—	30	0.5	200 to 500	—	
	—	—	2SA1577	2SC4097	2SA1036K	2SC2411K	32	0.5	120 to 390	Only SMT3 Yes	
	—	—	—	—	2SB1197K	2SD1781K	32	0.8	120 to 390	Yes	
	—	—	—	2SD1949	—	2SD1484K	50	0.5	120 to 390	Yes	
High speed SW	—	—	2SA2088	2SC5876	—	—	60	0.5	120 to 270 120 to 390	Yes	
	—	—	—	—	—	2SD2704K	25 (V <sub>EBO</sub> )	0.3	820 to 2700	—	
High h <sub>FE</sub> Muting	—	—	—	—	—	2SD2114K	20	0.5	820 to 2700	—	
	—	—	—	2SD2351	—	—	50	0.15	820 to 2700	—	
High Voltage	—	—	—	—	—	2SC4061K	300	0.1	56 to 120	—	
High Frequency	—	—	—	2SC4098	—	2SC2413K	25	0.05	82 to 180 (f <sub>r</sub> =300MHz)	—	
	—	—	—	2SC4774	—	2SC4713K	6	0.05	180 to 560 (f <sub>r</sub> =800MHz)	—	
	—	—	—	2SC4082	—	2SC3837K	20	0.05	82 to 180 (f <sub>r</sub> =1500MHz)	—	
	—	—	—	2SC4083	—	2SC3838K	11	0.05	56 to 180 (f <sub>r</sub> =3200MHz)	—	
Darlington*3	—	—	—	—	—	2SD2142K	30	0.3	5k or more	—	
	—	—	—	—	2SB852K	2SD1383K	32 (V <sub>CES</sub> )	0.3	5k or more	—	

Notes : 1.\*1 With reference land installed 2.\*2 For h<sub>FE</sub>, please see the technical specifications. 3.\*3 For internal circuit, please see the technical specifications. 4.PNP (-)symbol omitted.

Bipolar Transistors (Surface mount type) 3												
Package	TUMT3 (2021)		TUMT6 (2021)		TSMT3 (2928) (SC-96)		TSMT6 (2928) (SC-95)		V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	h <sub>FE</sub> *2	Automotive Grade Available
	P <sub>D</sub> =0.4W		P <sub>D</sub> =0.4W		P <sub>D</sub> =0.5W		P <sub>D</sub> =0.5W					
Application	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN				
Low V <sub>CE</sub> (sat)	2SB1732	2SD2702	—	—	2SB1709	2SD2674	—	—	12	1.5	270 to 680	—
	2SB1730	2SD2700	—	—	2SB1690	2SD2653	—	—	12	2	270 to 680	—
	—	—	US6T4	US6X3	2SB1705	2SD2670	—	—	12	3	270 to 680	—
	—	—	—	—	2SB1707	2SD2672	—	—	12	4	270 to 680	—
	—	—	—	—	—	—	QST2	QSX1	12	6	270 to 680	—
	2SB1733	2SD2703	—	—	2SB1710	2SD2675	—	—	30	1	270 to 680	—
	2SB1731	2SD2701	—	—	2SB1695	2SD2657	—	—	30	1.5	270 to 680	—
	—	—	US6T5	US6X4	2SB1706	2SD2671	—	—	30	2	270 to 680	—
	—	—	—	—	2SB1708	2SD2673	—	—	30	3	270 to 680	—
	—	—	—	—	New 2SB1708Q5	—	—	—	30	3	270 to 680	—
Driver	—	—	—	—	2SAR512R	2SCR512R	—	—	30	2	200 to 500	—
	—	—	—	—	2SAR513R	2SCR513R	—	—	50	1	180 to 450	—
	—	—	—	—	2SAR553R	2SCR553R	—	—	50	2	180 to 450	—
	—	—	—	—	2SAR543R	2SCR543R	—	—	50	3	180 to 450	—
	—	—	—	—	2SAR514R	2SCR514R	—	—	80	0.7	120 to 390	—
	—	—	—	—	2SAR554R	2SCR554R	—	—	80	1.5	120 to 390	—
	—	—	—	—	2SAR544R	2SCR544R	—	—	80	2.5	120 to 390	—
	—	—	—	—	—	—	New 2SAR340Q	New 2SCR341Q	400	0.1	82 to 270	Yes
High speed SW	—	—	—	—	2SA2094	2SC5866	—	—	60	2	120 to 270/ 120 to 390	—

Notes : 1.\*1 With reference land installed 2.\*2 For h<sub>FE</sub>, please see the technical specifications. 3.\*3 For internal circuit, please see the technical specifications. 4.PNP (-)symbol omitted.



# Bipolar Transistors (Surface mount type)

Bipolar Transistors (Surface mount type) 4												
Package	HUML2020L3 (2020)		MPT3 (4540) (SC-62) (SOT-89)		CPT3 (SC-63) (SOT-428)		LPT (SC-83)		V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	h <sub>FE</sub> *2	Automotive Grade Available
	Polarity	Pd=0.5W		Pd=0.5W		Pd=1W		Pd=30W				
Application	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN				
Low V <sub>CE</sub> (sat)	—	—	2SB1697	2SD2661	—	—	—	—	12	2	270 to 680	—
	—	—	2SB1698	2SD2662	—	—	—	—	30	1.5	270 to 680	—
Driver	—	—	2SAR293P	2SCR293P	—	—	—	—	30	1	270 to 680	Yes
	—	—	New 2SAR293P5	New 2SCR293P5	—	—	—	—	30	1	270 to 680	—
	—	—	2SAR512P	2SCR512P	—	—	—	—	30	2	200 to 500	Yes
	—	—	2SAR552P	2SCR552P	—	—	—	—	30	3	200 to 500	Yes
	New 2SAR542F3	☆2SCR542F3	—	—	—	—	—	—	30	3	200 to 500	—
	—	—	2SAR542P	2SCR542P	2SAR572D	2SCR572D	—	—	30	5	200 to 500	Yes
	☆2SAR562F3	☆2SCR562F3	—	—	—	—	—	—	30	6	200 to 500	—
	—	—	2SAR513P	2SCR513P	—	—	—	—	50	1	180 to 450	Yes
	—	—	2SAR553P	2SCR553P	—	—	—	—	50	2	180 to 450	Yes
	—	—	☆2SAR553P5	☆2SCR553P5	—	—	—	—	50	2	180 to 450	—
	—	—	2SAR533P	2SCR533P	2SAR573D	2SCR573D	—	—	50	3	180 to 450	Yes
	—	—	2SB1561	2SD2391	—	—	—	—	60	2	120 to 270	—
	—	—	2SAR514P	2SCR514P	—	—	—	—	80	0.7	120 to 390	Yes
	—	—	2SB1260	2SD1898	2SB1181	2SD1733	—	—	80	1	120 to 390	Only MPT3 Yes
	—	—	2SAR554P	2SCR554P	—	—	—	—	80	1.5	120 to 390	Yes
	—	—	—	—	2SAR574D	2SCR574D	—	—	80	2	120 to 390	Yes
	—	—	2SAR544P	2SCR544P	—	—	—	—	80	2.5	120 to 390	Yes
	—	—	—	—	—	—	2SB1644J	—	80	4	100 to 320	Yes
—	—	—	2SCR372P	—	—	—	—	120	0.7	120 to 390	Yes	
—	—	—	2SCR375P	—	—	—	—	120	1.5	120 to 390	Yes	
—	—	—	—	2SB1275	2SD1918	—	—	160	1.5	82 to 180/ 120 to 270	—	
—	—	New 2SAR340P	New 2SCR346P	—	—	—	—	400	0.1	82 to 270	—	
High speed SW	—	—	2SA2071	2SC5824	—	—	—	—	60	3	120 to 270/ 120 to 390	—
	—	—	New 2SA2071P5	—	—	—	—	—	60	3	120 to 270	—
High h <sub>FE</sub>	—	—	—	2SD2537	—	—	—	—	25	1.2	820 to 1800	—
	—	—	2SB1427	—	—	—	—	—	20	2	390 to 820	—
—	—	—	2SD2153	—	—	—	—	25	2	820 to 1800	—	
Darlington*3	—	—	—	2SD1834	—	—	—	—	60 (V <sub>CE5</sub> )	1	2k or more	—
	—	—	—	—	—	2SD2143	—	—	60±10	2	1k to 10k	—
	—	—	—	—	2SB1316	2SD1980	—	—	100	2	1k to 10k	—

Notes : 1.\*1 With reference land installed 2.\*2 For h<sub>FE</sub>, please see the technical specifications. 3.\*3 For internal circuit, please see the technical specifications. 4.\*4 TC=25°C  
5.PNP (-) symbol omitted. ☆ : Under development

## IC Transistor Array

\*The following products are belonging to ICs. (Refer P.A20) Please ask IC product group for inquiry.

Transistor Array											
Part No.	Number of bit	Output Withstand Voltage (V)	Output Saturation Voltage (V)	Output Current (mA)	Input Resistance (kΩ)	Input/output relation	Input Active Level	Input/output relation	Circuit Construction	Features	Package
BA12003B	7	60	1.46*	500	2.7	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	DIP16
BA12003BF	7	60	1.46*	500	2.7	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	SOP16
BA12004B	7	60	1.46*	500	10.5	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	DIP16
BA12004BF	7	60	1.46*	500	10.5	Inverting type	H	Sink	Darlington	Built-in surge absorbing diode	SOP16

\* Output Current=350mA



# Complex Bipolar Transistors

Complex Bipolar Transistors 1																
Configuration	Package	Item	VMT6 (1212)	EMT5 / EMT6 (1616) (SC-107BB) (SC-107C)	UMT5 / UMT6 (2021) (SC-88A) (SC-88) (SOT-353) (SC-107C)	SMT5 / SMT6 (2928) (SC-74A) (SC-74) (SOT-457)	TUMT5 / TUMT6 (2021) (2021)	TSMT5 / TSMT6 (2928) (2928) (SC-95)	Equivalent element transistors	V <sub>CEO</sub> (V)	I <sub>C</sub> (mA)	h <sub>FE</sub>	Automotive Grade Available			
			Part No.													
Application	Equivalent circuit diagram(TOP View)															
PNP×2	Pre Amp.		—	EMT51	—	—	—	—	—	2SAR522EB×2	-20	-200	120 to 560	—		
			—	EMT52	—	—	—	—	—	—	2SAR523EB×2	-50	-100	120 to 560	—	
			—	EMT1	UMT1N	IMT1A	—	—	—	—	2SA1037AK×2	-50	-150	120 or more	Yes	
			—	EMT18	UMT18N	IMT18	—	—	—	—	2SA2018×2	-12	-500	270 to 680	—	
			—	VT6T1	—	—	—	—	—	—	2SAR522M×2	-20	-200	120 to 560	—	
			—	VT6T2	—	—	—	—	—	—	2SAR523M×2	-50	-100	120 to 560	—	
	Driver		—	EMT2	UMT2N	IMT2A	—	—	—	2SA1037AK×2	-50	-150	120 to 560	—		
			—	EMT3	—	IMT3A	—	—	—	2SA1037AK×2	-50	-150	120 to 560	—		
			—	—	—	IMT4	—	—	—	2SA1514K×2	-120	-50	180 or more	Yes		
			—	—	—	—	US6T8	QST8	2SB1709×2	-12	-1.5 (A)	270 to 680	—			
			—	—	—	—	US6T9	QST9	2SB1710×2	-30	-1 (A)	270 to 680	—			
			—	—	—	—	—	—	2SAR522M×2	-20	-200	120 to 560	—			
Suitable for current mirror circuit		—	—	—	—	—	—	—	2SAR523M×2	-50	-100	120 to 560	—			
		—	—	—	—	—	—	—	—	—	—	—	—			
NPN×2	Pre Amp.		—	EMX51	—	—	—	—	—	2SCR522EB×2	20	200	120 to 560	—		
			—	EMX52	—	—	—	—	—	—	2SCR523EB×2	50	100	120 to 560	—	
			—	EMX1	UMX1N	IMX1	—	—	—	—	2SC2412K×2	50	150	120 or more	Yes	
			—	EMX26	—	—	—	—	—	—	2SD2654×2	50	150	820 to 2700	—	
			—	EMX18	UMX18N	—	—	—	—	—	2SC5585×2	12	500	270 to 680	—	
			—	—	—	IMX25	—	—	—	—	2SD2704K×2	20	300	820 to 2700	—	
	High Frequency		—	—	—	—	—	—	—	2SCR522M×2	20	200	120 to 560	—		
			—	—	—	—	—	—	—	—	2SCR523M×2	50	100	120 to 560	—	
			—	EMX2	UMX2N	IMX2	—	—	—	—	2SC2412K×2	50	150	120 to 560	—	
			—	EMX3	UMX3N	IMX3	—	—	—	—	2SC2412K×2	50	150	120 to 560	—	
			—	—	—	IMX8	—	—	—	—	2SC3906K×2	120	50	180 or more	Yes	
			—	EMX4	UMX4N	—	—	—	—	—	2SC3837K×2	20	50	56 to 180	—	
Driver		—	—	—	—	—	—	—	2SC3838K×2	11	50	56 to 120	—			
		—	—	—	—	US6X7	QSX7	2SD2674×2	12	1.5 (A)	270 to 680	—				
Suitable for current mirror circuit		—	—	—	—	—	—	—	2SD2675×2	30	1 (A)	270 to 680	—			
		—	—	—	—	—	—	—	—	—	—	—	—			
DC-DC Converter		—	—	—	—	—	—	—	QS5W1	—	30	3 (A)	200 to 500	—		
		—	—	—	—	—	—	—	—	QS5W2	2SCR533P×2	50	3 (A)	180 to 450	—	
PNP + NPN	Amplifier		—	EMY1	UMY1N	FMY1A	—	—	—	2SA1037AK	-50	-150	120 or more	—		
			—	—	—	—	—	—	—	2SC2412K	50	150	120 or more	—		
	Inverter Driver		—	—	—	FMY4A	—	—	—	2SA1037AK	-50	-150	120 to 560	—		
			—	—	—	—	—	—	—	2SC2412K	50	150	120 to 560	—		
	Pre Amp.		—	EMZ51	—	—	—	—	—	2SAR522EB	-20	-200	120 to 560	—		
			—	EMZ52	—	—	—	—	—	—	2SCR523EB	-50	-100	120 to 560	—	
			—	EMZ1	UMZ1N	IMZ1A	—	—	—	—	2SA1037AK	-50	-150	120 or more	Yes	
			—	EMZ7	—	—	—	—	—	—	2SA2018	-12	-500	270 to 680	—	
			—	—	—	—	—	—	—	—	2SC5585	12	500	270 to 680	—	
			—	—	—	—	—	—	—	—	QS6Z5	2SAR513P	-50	-1 (A)	180 to 450	—
			—	—	—	—	—	—	—	—	2SCR513P	50	1 (A)	180 to 450	—	
			—	EMZ2	UMZ2N	IMZ2A	—	—	—	—	2SA1037AK	-50	-150	120 to 560	—	
Pre Amp.		—	—	—	—	—	—	—	2SC2412K	50	150	120 to 560	—			
		—	EMZ8	—	—	—	—	—	—	2SA2018	-12	-500	270 to 680	—		
		—	—	—	—	—	—	—	—	2SC2412K	50	150	120 to 560	—		
		—	VT6Z1	—	—	—	—	—	—	—	2SAR522M	-20	-200	120 to 560	—	
Pre Amp.		—	—	—	—	—	—	—	2SCR522M	20	200	120 to 560	—			
		—	—	—	—	—	—	—	—	—	—	—	—	—		
Pre Amp.		—	—	—	—	—	—	—	2SCR523M	-50	-100	120 to 560	—			
		—	—	—	—	—	—	—	—	2SCR523M	50	100	120 to 560	—		

No.1 Pin is located on the upper right of equivalent circuit diagram for VMT6, EMT5, EMT6, UMT5, UMT6, TUMT5, TUMT6, TSMT5 and TSMT6 packages.  
No.1 Pin is located on the lower right of equivalent circuit diagram for SMT5 and SMT6 packages.

# Complex Bipolar Transistors

Complex Bipolar Transistors 2																								
Configuration	Package	Item	Equivalent circuit diagram (TOP View)	VMT6 (1212)		EMT5 / EMT6 (1616) (SC-107BB) (SC-107C)		UMT5 / UMT6 (2021) (2021) (SC-88A) (SC-88) (SOT-353) (SOT-363)		SMT5 / SMT6 (2928) (2928) (SC-74A) (SC-74) (SOT-457)		TUMT5 / TUMT6 (2021) (2021)		TSMT5 / TSMT6 (2928) (2928) (SC-95)		Equivalent element transistors	V <sub>CEO</sub> (V)	I <sub>c</sub> (mA)	h <sub>FE</sub>	Automotive Grade Available				
				Part No.																				
PNP + NPN	DC-DC Converter			—	—	—	—	—	—	—	—	—	—	—	—	QSZ1	2SB1690 2SD2653	-12 12	-2 (A) 2 (A)	270 to 680 270 to 680	—			
				—	—	—	—	—	—	—	—	—	—	—	—	—	—	QSZ2	2SB1695 2SD2657	-30 30	-1.5 (A) 1.5 (A)	270 to 680 270 to 680	—	
				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-30 30	-3 (A) 3 (A)	200 to 500 200 to 500	—	
				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-30 30	-2 (A) 2 (A)	270 to 680 270 to 680	—
				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-50 50	-3 (A) 3 (A)	180 to 450 180 to 450	—

No.1 Pin is located on the upper right of equivalent circuit diagram for VMT6, EMT5, EMT6, UMT5, UMT6, TUMT5, TUMT6, TSMT5 and TSMT6 packages.  
No.1 Pin is located on the lower right of equivalent circuit diagram for SMT5 and SMT6 packages.

Complex Bipolar Transistors 3													
Configuration	Package	Item	Equivalent circuit diagram (TOP View)	EMT5 / EMT6 (1616) (1616) (SC-107BB) (SC-107C)		UMT5 / UMT6 (2021) (2021) (SC-88A) (SC-88) (SOT-353) (SOT-363)		Equivalent element transistors	V <sub>CEO</sub> (V)	I <sub>c</sub> (mA)	h <sub>FE</sub>	Automotive Grade Available	
				Part No.									
PNP + DTR	Power Management			EMF5	UMF5N	2SA2018 DTC144E	-12 50	-500 100	270 to 680 68 or more	—			
				—	UMF28N	2SA1774 DTC124X	-50 50	-150 100	180 to 390 68 or more	—			
PNP + Di	DC-DC Converter			—	UML1N	2SA1774 DAN202K	-50 80	-150 100	120 or more —	—			
				—	UML4N	2SA2018 RB521S-30	-12 30	-500 200	270 to 680 —	—			
NPN + Di	DC-DC Converter			—	UML2N	2SC4617 DAN202K	50 80	150 100	120 or more —	—			
				—	UML6N	2SC5585 RB521S-30	12 30	500 200	270 to 680 —	—			
NPN + Di	Shunt Regulator			EML22	UML23N	2SC2412K VDZ6.8B	50 V <sub>z</sub> =6.8	150 I <sub>z</sub> =5	120 to 270 —	—			

No.1 Pin is located on the upper right of equivalent circuit diagram for EMT5, EMT6, UMT5 and UMT6 packages.



# Digital Transistors

Digital Transistors																			
Specifications	Item	Part No.		R1 (kΩ)	R2 (kΩ)	Package							V <sub>CE0</sub> (V)	I <sub>0</sub> (mA)	G <sub>I</sub> (h <sub>FE</sub> )	Automotive Grade Available			
		PNP	NPN			VMT3 (1212) (SC-105AA)	EMT3F (1616) (SC-89)	EMT3 (1616) (SC-75A) (SOT-416)	UMT3F (2021) (SC-85)	UMT3 (2021) (SC-70) (SOT-323)	SMT3 (2928) (SC-59) (SOT-346)	MPT3 (4540) (SC-62) (SOT-89)							
		Type				Pd=150mW			Pd=200mW			Pd=500mW							
R1=R2 Potential Divider Type	100mA	DTA123ExA	DTC123ExA	2.2	2.2	●	—	●	—	●	—	●	—	50	100	20 or more	Yes		
		DTA023Ex	DTC023Ex	2.2	2.2	●	●	—	●	—	—	—	—	—	50	100	20 or more	—	
		DTA143ExA	DTC143ExA	4.7	4.7	●	●	—	●	—	—	—	—	—	50	100	20 or more	Yes	
		DTA043Ex	DTC043Ex	4.7	4.7	●	—	—	●	—	—	—	—	—	50	100	20 or more	—	
		DTA114ExA	DTC114ExA	10	10	●	●	—	●	—	—	—	—	—	50	50	30 or more	Yes	
		DTA014Ex	DTC014Ex	10	10	●	—	—	●	—	—	—	—	—	50	50	30 or more	—	
		DTA124ExA	DTC124ExA	22	22	●	●	—	●	—	—	—	—	—	50	30	56 or more	Yes	
		DTA024Ex	DTC024Ex	22	22	●	—	—	●	—	—	—	—	—	50	30	56 or more	—	
		DTA144ExA	DTC144ExA	47	47	●	●	—	●	—	—	—	—	—	50	30	68 or more	Yes	
		DTA044Ex	DTC044Ex	47	47	●	—	—	●	—	—	—	—	—	50	30	80 or more	—	
		DTA115ExA	DTC115ExA	100	100	●	●	—	—	●	—	—	—	—	50	20	82 or more	—	
		DTA015Ex	DTC015Ex	100	100	●	—	—	—	●	—	—	—	—	50	20	80 or more	—	
		500mA	DTB543Ex	DTD543Ex	4.7	4.7	—	—	—	—	—	—	—	—	12	500	115 or more	—	
			DTB113Ex	DTD113Ex	1	1	—	—	—	—	—	—	—	—	50	500	33 or more	—	
			DTB123Ex	DTD123Ex	2.2	2.2	—	—	—	—	—	—	—	—	50	500	39 or more	—	
DTB143Ex	DTD143Ex		4.7	4.7	—	—	—	—	—	—	—	—	50	500	47 or more	—			
DTB114Ex	DTD114Ex		10	10	—	—	—	—	—	—	—	—	50	500	56 or more	—			
R1 ≠ R2 Leak Absorption Type	100mA		DTA113ZxA	DTC113ZxA	1	10	—	—	DTA only	—	●	●	—	—	50	100	33 or more	Yes	
		DTA013Zx	DTC013Zx	1	10	●	●	—	●	—	—	—	—	50	100	30 or more	—		
		DTA123YxA	DTC123YxA	2.2	10	—	—	—	—	●	●	—	—	—	50	100	33 or more	Yes	
		DTA023Yx	DTC023Yx	2.2	10	●	●	—	●	—	—	—	—	—	50	100	33 or more	—	
		DTA123JxA	DTC123JxA	2.2	47	●	●	—	●	—	—	—	—	—	50	100	80 or more	Yes	
		DTA023Jx	DTC023Jx	2.2	47	●	—	—	—	—	—	—	—	—	50	100	80 or more	—	
		DTA143XxA	DTC143XxA	4.7	10	●	●	—	●	—	—	—	—	—	50	100	30 or more	Yes	
		DTA043Xx	DTC043Xx	4.7	10	●	—	—	—	—	—	—	—	—	50	100	35 or more	—	
		DTA143ZxA	DTC143ZxA	4.7	47	●	●	—	●	—	—	—	—	—	50	100	80 or more	Yes	
		DTA043Zx	DTC043Zx	4.7	47	●	—	—	—	—	—	—	—	—	50	100	80 or more	—	
		DTA114WxA	DTC114WxA	10	4.7	—	—	—	—	—	—	—	—	—	50	100	24 or more	—	
		DTA114YxA	DTC114YxA	10	47	●	●	—	●	—	—	—	—	—	50	70	68 or more	Yes	
		DTA014Yx	DTC014Yx	10	47	●	—	—	—	—	—	—	—	—	50	70	68 or more	—	
		DTA124XxA	DTC124XxA	22	47	●	—	—	—	—	—	—	—	—	50	50	68 or more	Yes	
		DTA024Xx	DTC024Xx	22	47	●	●	—	—	—	—	—	—	—	50	50	80 or more	—	
	DTA144VxA	DTC144VxA	47	10	—	—	—	—	—	DTC only	●	—	—	50	100	33 or more	—		
	DTA144WxA	DTC144WxA	47	22	—	—	—	—	—	●	●	—	—	50	30	56 or more	—		
	500mA	DTB513Zx	DTD513Zx	1	10	●	—	—	—	—	—	—	—	12	500	140 or more	—		
		DTB523Yx	DTD523Yx	2.2	10	●	—	—	—	—	—	—	—	12	500	140 or more	—		
		DTB543Xx	DTD543Xx	4.7	10	●	—	—	—	—	—	—	—	12	500	140 or more	—		
		DTB543Zx	DTD543Zx	4.7	47	●	—	—	—	—	—	—	—	12	500	140 or more	—		
		DTB113Zx	DTD113Zx	1	10	—	—	—	—	—	—	—	—	50	500	56 or more	—		
		DTB123Yx	DTD123Yx	2.2	10	—	—	—	—	—	—	—	—	50	500	56 or more	—		
		1A	DTDG23YP*	—	2.2	10	—	—	—	—	—	—	—	—	60±10	1000	300 or more	Yes	
			DTDG23Y*	—	2.2	10	—	—	—	—	—	—	—	—	60±10	1000	300 or more	Yes	
Type using R1 alone as input Resistor	100mA	DTA113TKA	—	1	None	—	—	—	—	—	—	—	—	50	100	100 to 600	—		
		—	DTC123TKA	2.2	None	—	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		DTA143TxA	DTC143TxA	4.7	None	●	●	—	●	—	—	—	—	—	50	100	100 to 600	Yes	
		DTA043Tx	DTC043Tx	4.7	None	●	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		DTA114TxA	DTC114TxA	10	None	●	●	—	●	—	—	—	—	—	50	100	100 to 600	Yes	
		DTA014Tx	DTC014Tx	10	None	●	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		DTA124TxA	DTC124TxA	22	None	—	—	—	—	—	—	—	—	—	50	100	100 to 600	Yes	
		DTA144TxA	DTC144TxA	47	None	●	—	—	—	—	—	—	—	—	50	100	100 to 600	Yes	
		DTA044Tx	DTC044Tx	47	None	—	—	—	—	—	—	—	—	—	50	60	100 to 600	—	
		DTA115TxA	DTC115TxA	100	None	●	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		DTA015Tx	DTC015Tx	100	None	●	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		DTA125TxA	DTC125TxA	200	None	—	—	—	—	—	—	—	—	—	50	100	100 to 600	—	
		500mA	DTB123TK	DTD123TK	2.2	None	—	—	—	—	—	—	—	—	—	40	500	100 to 600	—
			DTB143TK	DTD143TK	4.7	None	—	—	—	—	—	—	—	—	—	40	500	100 to 600	—
			DTB114TK	—	10	None	—	—	—	—	—	—	—	—	—	40	500	100 to 600	—
	For muting	—	DTC614Tx	10	None	—	—	—	—	—	—	—	—	—	20	600	820 to 2700	—	
		—	DTC623Tx	2.2	None	—	—	—	—	—	—	—	—	—	20	600	820 to 2700	—	
		—	DTC643Tx	4.7	None	—	—	—	—	—	—	—	—	—	20	600	820 to 2700	—	
—		DTC923TUB	2.2	None	—	—	—	—	—	—	—	—	40 (V <sub>EB0</sub> )	400	820 to 2700	—			
—		DTC943TUB	4.7	None	—	—	—	—	—	—	—	—	40 (V <sub>EB0</sub> )	400	820 to 2700	—			
Type using R2 alone as Bleeder Resistor	100mA	DTA114GxA	DTC114GxA	None	10	—	—	—	—	●	●	—	—	50	100	30 or more	Only UMT3 Yes		
		DTA124GxA	DTC124GxA	None	22	—	—	—	—	DTC only	●	—	—	50	100	68 or more	Only UMT3 Yes		
		DTA144GxA	DTC144GxA	None	47	—	—	DTC only	—	●	●	—	—	50	100	68 or more	Only UMT3 Yes		
	500mA	DTA115GxA	DTC115GxA	None	100	—	—	—	—	—	—	—	—	50	100	68 or more	—		
		DTB114GK	DTD114GK	None	10	—	—	—	—	—	—	—	—	—	500	56 or more	—		
1A	—	DTDG14GP*	None	10	—	—	—	—	—	—	—	—	60±10	1000	300 or more	Yes			

Notes: 1. For internal circuit, please see the technical specifications. 2. VMT3, EMT3F, EMT3 and UMT3F without suffix A. 3. PNP (-) symbol omitted.

# Complex Digital Transistors

Complex Digital Transistors 1										
Configuration	Equivalent circuit diagram (TOP View)	EMT5 / 6 (1616) (SC-107BB) (SC-107C)	UMT5 / 6 (2021) (SC-88A) (SC-88) (SOT-353) (SOT-363)	SMT5 / 6 (2928) (SC-74A) (SC-74) (SOT-457)	TUMT5 / 6 (2021)	TSMT6 (2928) (SC-95)	Equivalent element transistors	R1 (kΩ)	R2 (kΩ)	Automotive Grade Available
		Part No.								
PNP ×2 (100mA)		EMA5	UMA5N	FMA5A	—	—	DTA123J×2	2.2	47	—
		—	UMA9N	FMA9A	—	—	DTA114E×2	10	10	—
		—	UMA1N	FMA1A	—	—	DTA124E×2	22	22	—
		EMA2	UMA2N	FMA2A	—	—	DTA144E×2	47	47	—
		EMA3	UMA3N	FMA3A	—	—	DTA143T×2	4.7	—	—
		EMA4	UMA4N	FMA4A	—	—	DTA114T×2	10	—	—
		EMB10	UMB10N	IMB10A	—	—	DTA123J×2	2.2	47	Yes
		EMB60	—	—	—	—	DTA023J×2	2.2	47	—
		EMB75	—	—	—	—	DTA043Z×2	4.7	47	—
		EMB59	—	—	—	—	DTA014Y×2	10	4.7	—
		EMB11	UMB11N	IMB11A	—	—	DTA114E×2	10	10	Yes
		EMB61	—	—	—	—	DTA014E×2	10	10	—
		EMB51	—	—	—	—	DTA024E×2	22	22	—
		EMB2	UMB2N	IMB2A	—	—	DTA144E×2	47	47	Yes
		EMB52	—	—	—	—	DTA044E×2	47	47	—
		EMB6	UMB6N	—	—	—	DTA144E×2	47	47	—
		EMB3	UMB3N	IMB3A	—	—	DTA143T×2	4.7	—	Yes
		EMB53	—	—	—	—	DTA043T×2	4.7	—	—
		EMB4	UMB4N	—	—	—	DTA114T×2	10	—	Yes
		EMG11	UMG11N	—	—	—	DTC123J×2	2.2	47	—
	EMG8	UMG8N	—	—	—	DTC143Z×2	4.7	47	—	
	EMG9	UMG9N	FMG9A	—	—	DTC114E×2	10	10	—	
	EMG5	UMG5N	—	—	—	DTC114Y×2	10	47	—	
	EMG1	UMG1N	FMG1A	—	—	DTC124E×2	22	22	—	
	EMG2	UMG2N	FMG2A	—	—	DTC144E×2	47	47	—	
	EMG3	UMG3N	FMG3A	—	—	DTC143T×2	4.7	—	—	
	EMG4	UMG4N	FMG4A	—	—	DTC114T×2	10	—	—	
	EMG6	UMG6N	FMG6A	—	—	DTC144T×2	47	—	—	
		EMH10	UMH10N	—	—	—	DTC123J×2	2.2	47	Yes
		EMH60	—	—	—	—	DTC023J×2	2.2	47	—
EMH25		—	—	—	—	DTC143Z×2	4.7	47	Yes	
EMH75		—	—	—	—	DTC043Z×2	4.7	47	—	
EMH11		UMH11N	IMH11A	—	—	DTC114E×2	10	10	Yes	
EMH61		—	—	—	—	DTC014E×2	10	10	—	
EMH9		UMH9N	IMH9A	—	—	DTC114Y×2	10	47	Yes	
EMH59		—	—	—	—	DTC014Y×2	10	47	—	
EMH1		UMH1N	IMH1A	—	—	DTC124E×2	22	22	Yes	
EMH51		—	—	—	—	DTC024E×2	22	22	—	
EMH2		UMH2N	IMH2A	—	—	DTC144E×2	47	47	Yes	
EMH52		—	—	—	—	DTC044E×2	47	47	—	
—		UMH5N	IMH5A	—	—	DTC124E×2	22	22	—	
EMH6		UMH6N	IMH6A	—	—	DTC144E×2	47	47	—	
	EMH3	UMH3N	IMH3A	—	—	DTC143T×2	4.7	—	Yes	
	EMH53	—	—	—	—	DTC043T×2	4.7	—	—	
	EMH4	UMH4N	IMH4A	—	—	DTC114T×2	10	—	Yes	
	EMH15	—	IMH15A	—	—	DTC144T×2	47	—	Yes	
	—	UMH8N	IMH8A	—	—	DTC114T×2	10	—	—	
	—	UMH14N	IMH14A	—	—	DTC144T×2	47	—	—	
	—	UMH33N	—	—	—	DTC923TUB×2	2.2	—	—	
NPN ×2 muting		—	—	IMH23	US6H23	—	DTC643T×2	4.7	—	—
		—	UMH32N	—	—	—	DTC943TUB×2	4.7	—	—
		—	—	IMH21	—	—	DTC614T×2	10	—	—
		—	UMH37N	—	—	—	DTC914TUB×2	10	—	—
NPN ×2 Driver		—	—	—	—	QSH29	60±10V/500mA ×2	—	10	—

Complex Digital Transistors 2								
Configuration	Equivalent circuit diagram (TOP View)	EMT5 / 6 (1616) (SC-107BB) (SC-107C)	UMT5 / 6 (2021) (SC-88A) (SC-88) (SOT-353) (SOT-363)	SMT5 / 6 (2928) (SC-74A) (SC-74) (SOT-457)	Equivalent element transistors	R1 (kΩ)	R2 (kΩ)	Automotive Grade Available
		Part No.						
PNP+NPN (100mA) complimentary		<b>EMD22</b>	<b>UMD22N</b>	—	DTA143Z DTC143Z	4.7 4.7	47 47	Yes
		<b>EMD72</b>	—	—	DTA043Z DTC043Z	4.7 4.7	47 47	—
		<b>EMD3</b>	<b>UMD3N</b>	<b>IMD3A</b>	DTA114E DTC114E	10 10	10 10	Yes
		<b>EMD53</b>	—	—	DTA014E DTC014E	10 10	10 10	—
		<b>EMD9</b>	<b>UMD9N</b>	<b>IMD9A</b>	DTA114Y DTC114Y	10 10	47 47	Yes
		<b>EMD59</b>	—	—	DTA014Y DTC014Y	10 10	47 47	—
		<b>EMD2</b>	<b>UMD2N</b>	<b>IMD2A</b>	DTA124E DTC124E	22 22	22 22	Yes
		<b>EMD52</b>	—	—	DTA024E DTC024E	22 22	22 22	—
		<b>EMD12</b>	<b>UMD12N</b>	—	DTA144E DTC144E	47 47	47 47	Yes
		<b>EMD62</b>	—	—	DTA044E DTC044E	47 47	47 47	—
PNP+NPN (100mA) different type		<b>EMD38</b>	—	—	DTA113Z DTC114Y	1 10	10 47	—
		<b>EMD5</b>	<b>UMD5N</b>	—	DTA143X DTC144E	4.7 47	10 47	—
		<b>EMD4</b>	<b>UMD4N</b>	—	DTA114Y DTC144E	10 47	47 47	—
PNP+NPN Power management		<b>EMD29</b>	—	—	DTB513Z DTC114E	1 10	10 10	—
		<b>EMD30</b>	—	—	DTB713Z DTC114E	1 10	10 10	—
		—	—	<b>IMD10A</b>	—50V/—0.5A DTC114T	0.1 10	10 —	—
		—	—	<b>IMD16A</b>	—50V/—0.5A DTC115T	2.2 100	10 —	—

No.1 Pin is located on the upper right of equivalent circuit diagram for EMT5, EMT6, UMT5 and UMT6 packages.  
No.1 Pin is located on the lower right of equivalent circuit diagram for SMT5 and SMT6 packages.

# Packages

## ● Dimensions (Unit : mm)

<b>VML0604</b> 	<b>VML0806</b> 	<b>VML1006</b> 	<b>VMT3</b> [SC-105AA] 	<b>VMT6</b> 	<b>EMT3F</b> [SC-89] 	<b>EMT3</b> [SC-75A] [SOT-416] 	<b>EMT5</b> [SC-107BB] 
<b>EMT6</b> [SC-107C] 	<b>UMT3F</b> [SC-85] 	<b>UMT3</b> [SC-70] [SOT-323] 	<b>UMT5</b> [SC-88A] [SOT-353] 	<b>UMT6</b> [SC-88] [SOT-363] 			
<b>SST3</b> [SOT-23] 	<b>SMT3</b> [SC-59] [SOT-346] 	<b>SMT5</b> [SC-74A] 	<b>SMT6</b> [SC-74] [SOT-457] 	<b>TSST8</b> 			
<b>TUMT3</b> 	<b>TUMT5</b> 	<b>TUMT6</b> 	<b>WEMT6</b> 	<b>TSMT3</b> [SC-96] 	<b>TSMT5</b> 		
<b>TSMT6</b> [SC-95] 	<b>TSMT8</b> 	<b>HUML2020L3</b> 	<b>HUML2020L8 (Single)</b> 	<b>HUML2020L8 (Dual)</b> 			
<b>HSMT8</b> 	<b>HSML3030L10</b> 	<b>MPT3</b> [SC-62] [SOT-89] 					
<b>SOP8</b> 	<b>CPT3 (D-PAK)</b> [SC-63] [SOT-428] 	<b>LPT(S) (D2-PAK)</b> [SC-83] 					

Notes: 1. Characters in ( ) under package designation denotes JEITA No. Characters in < > under package designation denotes Code No. 2. For details of dimensions, please refer to the technical specifications.

# Part No. Explanation

## •MOSFET Part No. Explanation

### <Single-Chip Type>

Example: **R T Q 0 3 5 P 0 2 T R**

ROHM

Drive Voltage

Type of MOSFET	Drive Voltage (V)				
	0.9/1.2/1.5/1.8	2.5	4	4.5	10
Low loss type	—	—	C	—	—
General use type	Z,U,Y	F, T	D,R,S,X	—	D,N
Low capacitance type	—	—	E, Q	M, G	—
High ESD resistance type	—	J	H	—	—
Stripe	A	—	—	—	—
Gen.1	—	S	—	—	—
Low IGSS	—	—	—	—	C

Io (Unit: 100mA)  
ex.)  
035=350mA (3.5A)

Polarity

N	Nch
P	Pch

Package

Symbol	Package
M	VMT3
E	EMT3
U	UMT3
F	TUMT3
L	TUMT6
C	SST3
K	SMT3
R	TSMT3
Q	TSMT6
P	MPT3
H	SOP8
S	SOP8
D	CPT3
J	LPTS

Vbss

Symbol	Vbss(V)
01	12
02	20
03	30
04	40
05	45
06	60
10	100
15	150
19	190
20	200
25	250
50	500
60	600

Tape code

### <Single-Chip Type>

Example: **R T 1 A 0 4 0 Z P T L**

ROHM

Package

Symbol	Package
V3	VML0604
V1	VML0806
V2	VML1006
M1	VMT3
EB	EMT3F
UB	UMT3F
W1	WEMT6
T1	TSST8
Q5	TSMT3
Q6	TSMT6
Q1	TSMT8
Q7	TSMT8
F4	HUML2020L8
Q3	HSMT8
S3	SOP8

Vbss (V)

A=12V  
C=20V  
E=30V  
G=40V  
J=50V  
L=60V  
W=500V  
X=600V

Io (A)  
ex.)  
040=4A  
013=1.3A

Drive Voltage

Symbol	Process	Pol.	Drive Voltage	comment
SN	Gen.1	Nch	2.5V/4.0V	—
UN	Gen.1	Nch	1.2V/1.5V	—
YN	Gen.1	Nch	0.9V	—
XN	Gen.3	Nch	4.0V	—
MN	Gen.3	Nch	4.5V	High Performance
BN	Gen.4	Nch	4.5V	—
AD	Gen.4	Nch	4.5V	Built-in ESD protection
GN	Gen.4	Nch	4.5V	High Performance
AJ	Gen.5	Nch	2.5V	—
SP	Gen.1	Pch	2.5V/4.0V	—
RP	Gen.2	Pch	4.0V	—
ZP	Gen.2	Pch	1.2V/1.5V	—
AP	Gen.4	Pch	1.5V	—
AT	Gen.4	Pch	4.5V	—
AB	Planar	Nch	10V	Low IGSS
AC	Planar	Nch	10V	—

Tape code

### <Dual-Chip Type>

Example: **S H 8 M 3 ( ) T B**

Package

Symbol	Package
VT6	VMT6
EM6	EMT6
UM5	UMT5
UM6	UMT6
ES6	WEMT6
US5	TUMT5
US6	TUMT6
TT8	TSSST8
SM6	SMT6
QS5	TSMT5
QS6	TSMT6
QH6	TSMT6
QS8	TSMT8
QH8	TSMT8
UT6	HUML2020L8
HS8	HUML3030L10
SH8	SOP8
SP8	SOP8
HP8	HSOP8

Polarity

K	Nch+Nch
J	Pch+Pch
M	Nch+Pch
U	MOS+SBD
S	Nch+Nch+SBD

Serial No.

Note) "N" is put to UMT5 & UMT6 packages



# Part No. Explanation

## • Bipolar Transistor Part No. Explanation

Example:

Part No.						Tape code							
2	S	C	2	4	1	2	K		T	1	4	6	R
2	S	C	R	5	2	3	E	B	T	L			

### • hFE Ranking Code

Code	hFE Range
A	16 to 32
B	25 to 50
C	40 to 80
D	60 to 120
E	100 to 200
F	160 to 320
M	39 to 82
N	56 to 120
P	82 to 180
Q	120 to 270
R	180 to 390
S	270 to 560
E	390 to 820
U	560 to 1200
V	820 to 1800
W	1200 to 2700

## • Digital Transistor Part No. Explanation

Example :

DT	Digital Transistor
----	--------------------

0	General use	3	10 <sup>3</sup>	M	VMT3
1	General use	4	10 <sup>4</sup>	EB	EMT3F
5	Low Vce(sat) 12V	5	10 <sup>5</sup>	E	EMT3
6	Muting 20V			UB	UMT3F
9	Muting Vce 40V			U	UMT3
				K	SMT3
				P	MPT3

D	T	A	1	2	4	E	K	A	T	1	4	6
①	②	③	④	⑤	⑥	⑦	⑧					

Polarity	Basic R <sub>1</sub> resistance value	Resistance Ratio R <sub>1</sub> /R <sub>2</sub>
A	1 1.0	E R <sub>1</sub> /R <sub>2</sub> =1/1
B	2 2.2	X R <sub>1</sub> /R <sub>2</sub> =1/2
C	4 4.7	Y R <sub>1</sub> /R <sub>2</sub> =1/5
D	6 6.8	Z R <sub>1</sub> /R <sub>2</sub> =1/10
		J R <sub>1</sub> /R <sub>2</sub> =1/20
		W R <sub>1</sub> /R <sub>2</sub> =2/1
		V R <sub>1</sub> /R <sub>2</sub> =5/1
		T R <sub>1</sub> only
		G R <sub>2</sub> only

Suffix (except VMT3, EMT3F, EMT3, UMT3F)

Note: ④ and ⑤ together represent the R<sub>1</sub> resistance value

Example

24	2.2 × 10 <sup>4</sup> Ω = 22kΩ
43	4.7 × 10 <sup>3</sup> Ω = 4.7kΩ

## • Packaging type

Package	Code	Packaging style	Direction	Basic ordering unit (pcs)
VML0604	T2L,T2CL	Embossed tape	Terminal No.1 on opposite side from sprocket hole side	8,000
VML0806	T2L,T2CL	Embossed tape	Terminal No.1 on opposite side from sprocket hole side	8,000
VML1006	T2L,T2CL	Embossed tape	Terminal No.1 on opposite side from sprocket hole side	8,000
VMT3	T2L,T2CL	Embossed tape	One terminal on sprocket hole side	8,000
VMT6	T2R,T2CR	Embossed tape	Terminal No.1 on sprocket hole side	8,000
EMT3F	TL,TCL	Embossed tape	One terminal on sprocket hole side	3,000
EMT3	TL,TCL	Embossed tape	One terminal on sprocket hole side	3,000
EMT5	T2R,T2CR	Embossed tape	Three terminals on sprocket hole side	8,000
EMT6	T2R,T2CR	Embossed tape	Terminal No.1 on sprocket hole side	8,000
UMT3F	TL,TCL	Embossed tape	One terminal on sprocket hole side	3,000
UMT3	T106,T306	Embossed tape	One terminal on sprocket hole side	3,000
UMT5	TR,TCR	Embossed tape	Three terminals on sprocket hole side	3,000
UMT6	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
	TN,TCN	Embossed tape	Non-direction	3,000
WEMT6	T2R,T2CR	Embossed tape	Terminal No.1 on sprocket hole side	8,000
TUMT3	TL,TCL	Embossed tape	One terminal on sprocket hole side	3,000
TUMT5	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TUMT6	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
SST3	T116,T316	Embossed tape	One terminal on sprocket hole side	3,000
SMT3	T146	Embossed tape	One terminal on sprocket hole side	3,000
SMT5	T148	Embossed tape	Three terminals on sprocket hole side	3,000
SMT6	T108	Embossed tape	Terminal No.1 on opposite side from sprocket hole side	3,000
	T110	Embossed tape	Non-direction	3,000
TSST8	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TSMT3	TL,TCL	Embossed tape	One terminal on sprocket hole side	3,000
TSMT5	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TSMT6	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TSMT8	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
HUML2020L3	TL,TCL	Embossed tape	Terminal No.1 on opposite side from sprocket hole side	3,000
HUML2020L8	TR,TCR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
HSMT8	TB,TCB	Embossed tape	Terminal No.1 on sprocket hole side	3,000
HSML3030L10	TB	Embossed tape	Terminal No.1 on sprocket hole side	3,000
SOP8	TB	Embossed tape	Terminal No.1 on sprocket hole side	2,500
HSOP8	TB	Embossed tape	Three terminals on sprocket hole side	2,500
MPT3	T100	Embossed tape	Three terminals on sprocket hole side	1,000
CPT3	TL	Embossed tape	Fin on sprocket hole side	2,500
LPT	TL	Embossed tape	Fin on sprocket hole side	1,000



## *Small Signal Devices*

# Diodes

### CONTENTS

■ Schottky Barrier Diodes .....	P. C28
■ Rectifier Diodes .....	P. C34
■ Fast Recovery Diodes .....	P. C35
■ Zener Diodes (Including TVS) .....	P. C36
■ Switching Diodes .....	P. C40
■ High Frequency Diodes .....	P. C41
■ JEDEC and Euro Standard Diodes .....	P. C42
■ Packages .....	P. C43
■ Part No. Explanation .....	P. C44

# Schottky Barrier Diodes

## Quick Reference for Small Signal Type Schottky Barrier Diodes

V <sub>R</sub> (V)	I <sub>o</sub> (mA)	Package																	
		0603 Size		0603 Size		1006 Size		1006 Size		1006 Size		1406 Size		1608 Size		2512 Size			
		SMD0603		GMD2 (SOD962)		VML2		VMN2 (SOD923)		VMN2M (SOD923F)		VMD2 (SOD723)		EMD2 (SOD523)		UMD2 (SOD323F)			
20	200													<b>New</b> RBE02SM20A	30				
	30							RB751CS-40	13	<b>New</b> RB751CM-40	18		RB751G-40	27		RB751SM-40	39	RB751VM-40	55
	100	RASMI <sup>TM</sup> <b>New</b> RB521ES-30	1	RB521ZS-30	3	RB520ZS-30	4			RB521CS-30	11	<b>New</b> RB521CM-30	14	RB521G-30	25	<b>New</b> RB510SM-30	31	RB530VM-30	46
								RB520CS-30	12	<b>New</b> RB520CM-30	15	<b>New</b> RB520G-30	16	<b>New</b> RB530G-30	23	<b>New</b> RB511SM-30	32	<b>New</b> RB510VM-30	47
										<b>New</b> RB530CM-30	16	<b>New</b> RB530G-30	17	<b>New</b> RB531G-30	24	<b>New</b> RB500SM-30	37	<b>New</b> RB511VM-30	48
										<b>New</b> RB531CM-30	17	<b>New</b> RB531G-30	17	<b>New</b> RB531SM-30	38	<b>New</b> RB501SM-30	38	<b>New</b> RB531VM-30	49
	200					RB521AS-30	5								RB521SM-30	36	<b>New</b> RB520VM-30	50	
						RB520AS-30	6								RB520SM-30	35	<b>New</b> RB521VM-30	51	
						<b>New</b> RB540AS-30	7								<b>New</b> RB531SM-30	33	<b>New</b> RB540VM-30	52	
						<b>New</b> RB541AS-30	8								<b>New</b> RB530SM-30	34	<b>New</b> RB541VM-30	53	
	500																<b>New</b> RB550VM-30	54	
	30			<b>New</b> RB751ZS-40	2														
	100									<b>New</b> RB520CM-40	19	<b>New</b> RB520G-40	28	<b>New</b> RB530SM-40	40		RB501VM-40	58	
										<b>New</b> RB521CM-40	20	<b>New</b> RB521G-40	29	<b>New</b> RB531SM-40	41		<b>New</b> RB500VM-40	59	
																	RB531VM-40	56	
																	RB530VM-40	57	
	200					RB521AS-40	10								RB521SM-40	45	<b>New</b> RB540VM-40	60	
						RB520AS-40	9								RB520SM-40	44	<b>New</b> RB541VM-40	61	
															<b>New</b> RB540SM-40	42	<b>New</b> RB521VM-40	62	
															<b>New</b> RB541SM-40	43	<b>New</b> RB520VM-40	63	
	100									<b>New</b> RB530CM-60	21								
										<b>New</b> RB520CM-60	22								


  

V <sub>R</sub> (V)	I <sub>o</sub> (mA)	Package											
		1608 Size		1212 Size		1616 Size		1616 Size		1616 Size		2120 Size	
		HMD8		VMD3 (SOT723)		EMD3 (SOT523)		EMD3F (SOT490)		EMD4 (SOT543)		UMD3 (SOT323)	
	30	RB521ZS8A30	64										
		RB520ZS8A30	65										
	100					RB557W	73	<b>New</b> RB558WM	78	RB481Y	85		
						RB558W	75			RB480Y	86		
						RB548W	76						
	30			RB715Z	66	RB715W	67						
						RB706W-40	77						
	100											RB715F	68
												RB717F	74
												RB706F-40	79
	200									RB481Y-40	87	RB451F	81
										RB480Y-40	88	RB450F	82
	90									RB481Y-90	89		
										RB480Y-90	90		

V <sub>R</sub> (V)	I <sub>o</sub> (mA)	Package											
		2120 Size		2120 Size		2120 Size		2928 Size		2928 Size		2928 Size	
		UMD3F (SOT323F)		UMD4 (SOT-343)		UMD6 (SOT363)		SMD3 (SOT346)		SMD5 (SOT25)		SMD6 (SOT457)	
	400							RB495D	70				
	30											RB731U	98
	100					RB531XN	94						
						RB530XN	95						
						RB541XN	96						
	30			RB481K	91	RB731XN	97	RB705D	71				
								RB706D-40	80				
	100	<b>New</b> RB715UM	69					RB425D	72	RB471E	93		
								RB421D	83				
								RB420D	84				
	200			RB480K	92								

©RASMI<sup>TM</sup>: ROHM's proprietary new method that enables superior dimensional precision, making it possible to develop the ultra-compact products  
RASMI<sup>TM</sup> is registered trademarks of ROHM Co Ltd.

Small Signal Type Schottky Barrier Diodes 1												
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>j</sub> =25°C) *2				Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>o</sub> *1 (mA)	I <sub>FSM</sub> (A)*2 60Hz.1~∞	V <sub>F</sub> (V) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)			
1	RASMD™ New RB521ES-30	30	30	100	0.5	0.37	10	7	10	SMD0603		—
2	New RB751ZS-40	40	40	30	0.2	0.37	1	0.5	30	GMD2		—
3	RB521ZS-30	30	30	100	0.5	0.37	10	7	10			—
4	RB520ZS-30	30	30	100	0.5	0.46	10	0.3	10	—		
5	RB521AS-30	30	30	200	1	0.5	200	30	10	VML2		—
6	RB520AS-30	30	30	200	1	0.6	200	1	10			—
7	New RB540AS-30	30	30	200	0.5	0.45	10	0.5	10			—
8	New RB541AS-30	30	30	200	0.5	0.35	10	30	10	—		
9	RB520AS-40	40	40	200	1	0.55	100	10	40	—		
10	RB521AS-40	45	40	200	1	0.45	100	90	40	—		
11	RB521CS-30	—	30	100	0.5	0.35	10	10	10	VMN2		—
12	RB520CS-30	—	30	100	0.5	0.45	10	0.5	10			—
13	RB751CS-40	40	30	30	0.2	0.37	1	0.5	30	—		
14	New RB521CM-30	—	30	100	0.5	0.35	10	10	10	VMN2M		—
15	New RB520CM-30	—	30	100	0.5	0.45	10	0.5	10			—
16	New RB530CM-30	30	30	100	0.5	0.46	10	0.3	10			—
17	New RB531CM-30	30	30	100	0.5	0.37	10	7	10			—
18	New RB751CM-40	40	30	30	0.2	0.37	1	0.5	30			—
19	New RB520CM-40	40	40	100	0.5	0.71	100	1.5	40			—
20	New RB521CM-40	40	40	100	0.5	0.61	100	100	40			—
21	New RB530CM-60	60	60	100	0.5	0.6	15	1	60			—
22	New RB520CM-60	60	60	100	0.5	0.47	15	3	60			—
23	New RB530G-30	30	30	100	0.5	0.46	10	3	10			VMD2
24	New RB531G-30	30	30	100	0.5	0.37	10	7	10	Yes		
25	RB521G-30	—	30	100	0.5	0.35	10	10	10	Yes		
26	RB520G-30	—	30	100	0.5	0.45	10	0.5	10	Yes		
27	RB751G-40	40	30	30	0.2	0.37	1	0.5	30	Yes		
28	New RB520G-40	40	40	100	0.5	0.71	100	15	40	Yes		
29	New RB521G-40	40	40	100	0.5	0.61	100	100	40	Yes		
30	New RBE02SM20A	30	20	200	1	0.49	200	80	20	EMD2		—
31	New RB510SM-30	30	30	100	0.5	0.46	10	0.3	10			Yes
32	New RB511SM-30	30	30	100	0.5	0.37	10	7	10			Yes
33	New RB531SM-30	30	30	200	1	0.35	10	10	10			Yes
34	New RB530SM-30	30	30	200	1	0.45	10	0.5	10			Yes
35	RB520SM-30	—	30	200	1	0.58	200	1	10			Yes
36	RB521SM-30	—	30	200	1	0.47	200	30	10			Yes
37	New RB500SM-30	30	30	100	0.5	0.45	10	0.5	10			Yes
38	New RB501SM-30	30	30	100	0.5	0.35	10	10	10			Yes
39	RB751SM-40	40	30	30	0.2	0.37	1	0.5	30			Yes
40	New RB530SM-40	40	40	100	0.5	0.71	100	15	40			Yes
41	New RB531SM-40	40	40	100	0.5	0.61	100	100	40			Yes
42	New RB540SM-40	40	40	200	0.5	0.71	100	15	40			Yes
43	New RB541SM-40	40	40	200	0.5	0.61	100	100	40			Yes
44	RB520SM-40	40	40	200	1	0.55	100	10	40			Yes
45	RB521SM-40	45	40	200	1	0.45	100	90	40	Yes		
46	RB530VM-30	30	30	100	0.5	0.45	10	0.5	10	UMD2		Yes
47	New RB510VM-30	30	30	100	0.5	0.46	10	0.3	10			Yes
48	New RB511VM-30	30	30	100	0.5	0.37	10	7	10			Yes
49	New RB531VM-30	30	30	100	0.5	0.35	10	10	10			Yes
50	New RB520VM-30	30	30	200	1	0.58	200	1	10			Yes
51	New RB521VM-30	30	30	200	1	0.47	200	30	10			Yes
52	New RB540VM-30	30	30	200	0.5	0.45	10	0.5	10			Yes
53	New RB541VM-30	30	30	200	0.5	0.35	10	30	10			Yes
54	New RB550VM-30	30	30	500	1	0.59	500	30	30			Yes
55	RB751VM-40	40	30	30	0.2	0.37	1	0.5	30			Yes
56	RB531VM-40	40	40	100	1	0.61	100	100	40			Yes
57	RB530VM-40	40	40	100	1	0.71	100	15	40			Yes
58	RB501VM-40	45	40	100	1	0.55	100	30	10			Yes
59	New RB500VM-40	45	40	100	1	0.45	10	1	10			Yes
60	New RB540VM-40	40	40	200	0.5	0.71	100	15	40			Yes
61	New RB541VM-40	40	40	200	0.5	0.61	100	100	40	Yes		
62	New RB521VM-40	40	40	200	1	0.54	200	90	40	Yes		
63	New RB520VM-40	40	40	200	1	0.55	100	10	40	Yes		
64	RB521ZS8A30	30	30	100 *2	0.5	0.37	10	7	10	HMD8		—
65	RB520ZS8A30	30	30	100 *2	0.5	0.46	10	0.3	10			—

\*1 : I<sub>o</sub> : Average output current per chip. In case of 1, 2 or 3 chip diodes. I<sub>o</sub> indicates average output current of 1, 2 or 3 chips.

\*2 : Value / Chip

© RASMD™ : ROHM's proprietary new method that enables superior dimensional precision, making it possible to develop the ultra-compact products RASMD™ is registered trademarks of ROHM Co Ltd.

# Schottky Barrier Diodes

Small Signal Type Schottky Barrier Diodes 2												
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>j</sub> =25°C) *2				Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O</sub> *1 (mA)	I <sub>FSM</sub> (A)*2 60Hz, 1% <sub>dv</sub>	V <sub>F</sub> (V) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)			
66	RB715Z	40	40	30	0.2	0.37	1	1	10	VMD3		Yes
67	RB715W	40	40	30	0.2	0.37	1	1	10	EMD3		Yes
68	RB715F	40	40	30	0.2	0.37	1	1	10	UMD3		Yes
69	<i>New</i> RB715UM	40	40	30	0.2	0.37	1	1	10	UMD3F		Yes
70	RB495D	40	25	400	2	0.5	200	70	25	SMD3		Yes
71	RB705D	40	40	30	0.2	0.37	1	1	10			Yes
72	RB425D	40	40	100	1	0.55	100	30	10	EMD3	Yes	
73	RB557W	—	30	100 <sup>-2</sup>	0.5	0.35	10	10	10		EMD3	Yes
74	RB717F	40	40	30 <sup>-2</sup>	0.2	0.37	1	1	10	UMD3		Yes
75	RB558W	—	30	100 <sup>-2</sup>	0.5	0.35	10	10	10	EMD3		Yes
76	RB548W	—	30	100 <sup>-2</sup>	0.5	0.45	10	0.5	10			Yes
77	RB706W-40	45	40	30	0.2	0.37	1	1	10	EMD3F		Yes
78	<i>New</i> RB558WM	—	30	100 <sup>-2</sup>	0.5	0.49	100	10	10			EMD3F
79	RB706F-40	45	40	30 <sup>-2</sup>	0.2	0.37	1	1	10	UMD3		Yes
80	RB706D-40	45	40	30	0.2	0.37	1	1	10	SMD3	Yes	
81	RB451F	40	40	100	1	0.55	100	30	10	UMD3	Yes	
82	RB450F	45	40	100	1	0.45	10	1	10		Yes	
83	RB421D	40	40	100	1	0.55	100	30	10	SMD3	Yes	
84	RB420D	40	40	100	1	0.45	10	1	10		Yes	
85	RB481Y	—	30	100 <sup>-2</sup>	1	0.43	100	30	10	EMD4	Yes	
86	RB480Y	—	30	100 <sup>-2</sup>	1	0.53	100	1	10		Yes	
87	RB481Y-40	40	40	200	1	0.45	100	90	40		Yes	
88	RB480Y-40	40	40	200	1	0.55	100	10	40		Yes	
89	RB481Y-90	90	90	100 <sup>-2</sup>	1	0.61	100	100	90		Yes	
90	RB480Y-90	90	90	100 <sup>-2</sup>	1	0.69	100	5	90		Yes	
91	RB481K	30	30	200 <sup>-2</sup>	1	0.5	200	30	10	UMD4	Yes	
92	RB480K	45	40	100 <sup>-2</sup>	1	0.6	100	1	10		Yes	
93	RB471E	40	40	100 <sup>-2</sup>	1	0.55	100	30	10	SMD5	Yes	
94	RB531XN	—	30	100 <sup>-2</sup>	1	0.43	100	30	10	UMD6	Yes	
95	RB530XN	—	30	100 <sup>-2</sup>	1	0.53	100	1	10		Yes	
96	RB541XN	—	30	100	0.5	0.35	10	10	10		Yes	
97	RB731XN	40	40	30	0.2	0.37	1	1	10		Yes	
98	RB731U	40	40	30	0.2	0.37	1	1	10	SMD6	Yes	

\*1 : I<sub>O</sub> : Average output current per chip. In case of 1, 2 or 3 chip diodes. I<sub>O</sub> indicates average output current of 1, 2 or 3 chips.  
\*2 : Value / Chip

©RASMID™ : ROHM's proprietary new method that enables superior dimensional precision, making it possible to develop the ultra-compact products  
RASMID™ is registered trademarks of ROHM Co Ltd.

### Quick Reference for Middle Power Schottky Barrier Diodes

V <sub>F</sub> (V)	I <sub>F</sub> (A)	Package																			
		1006 Size		1608 Size		2512 Size		2513 Size		2514 Size		3516 Size		5026 Size							
		VML2		EMD2 (SOD523)		KMD2		UMD2 (SOD323F)		TUMD2		TUMD2M		PMDU (SOD123)		PMDS (SOD106)					
20	0.5	RBE05AS20A	1	RBE05SM20A	2	RB551SS-30	3	RB551VM-30 RBE05VM20A RBE07V20A	7 8 9	RB411VA-50	14										
	0.7																				
	1					RB161SS-20	4					RB162VA-20 RB161VA-20 RBE1VA20A RBE2VA20A	10 11 12 13	New RB162VAM-20 New RB161VAM-20 New RBE1VAM20A New RBE2VAM20A	25 26 27 28	RB161M-20 New RB161MM-20	57 92	RB161L-40	131		
	2																				
	3																				
30	0.1																				
	0.5					RB550SS-30	5														
	0.7																				
	1																				
	1.5																				
40	0.1																				
	0.5																				
	0.7																				
	1																				
	1.5																				
60	0.1																				
	0.5																				
	0.7																				
	1																				
	1.5																				

V <sub>F</sub> (V)	I <sub>F</sub> (A)	Package								
		2120 Size		2928 Size		3028 Size				
		UMD3 (SOT323)		TUMD5		SMD3 (SOT346)				
20	0.5					RB411D	183			
	0.7	RB461F	181							
30	1									
	1.4									
40	0.5									
	0.5									

# Schottky Barrier Diodes

Middle Power Schottky Barrier Diodes 1													
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>j</sub> =25°C) *2					Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O</sub> <sup>-1</sup> (A)	I <sub>FSM</sub> (A) *2 60Hz, 1~	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (mA) Max.	V <sub>R</sub> (V)				
1	RBE05AS20A	30	20	0.5	1	0.53	0.5	0.15	20	VML2		—	
2	RBE05SM20A	30	20	0.5	1	0.53	0.5	0.15	20	EMD2		—	
3	RB551SS-30	30	20	0.5	5	0.47	0.5	0.1	20	KMD2		—	
4	RB161SS-20	30	20	1	5	0.42	1	1	20			—	
5	RB550SS-30	30	30	0.5	5	0.59	0.5	0.008	15			—	
6	RB160SS-40	40	40	1	5	0.55	0.7	0.05	20			—	
7	RB551VM-30	30	20	0.5	2	0.36	0.1	0.1	20			—	
8	RBE05VM20A	30	20	0.5	2	0.43	0.5	0.2	20			UMD2	—
9	RBE07V20A	30	20	0.7	1	0.43	0.5	0.2	20	—			
10	RB162VA-20	25	20	1	5	0.4	1	1.2	20	—			
11	RB161VA-20	30	20	1	5	0.42	1	1	20	—			
12	RBE1VA20A	30	20	1	3	0.53	1	0.2	20	TUMD2		—	
13	RBE2VA20A	30	20	2	5	0.46	2	0.7	20			—	
14	RB411VA-50	50	20	0.5	3	0.5	0.5	0.03	10			Yes	
15	RSX051VA-30	30	30	0.5	5	0.39	0.5	0.2	30			Yes	
16	RSX071VA-30	30	30	0.7	5	0.42	0.7	0.2	30			Yes	
17	RSX101VA-30	30	30	1	5	0.47	1	0.2	30			Yes	
18	RB550VA-30	30	30	1	3	0.52	1	0.03	10			Yes	
19	RSX201VA-30	30	30	1.5	8	0.46	1.5	0.3	30			Yes	
20	RB160VA-40	40	40	1	5	0.55	0.7	0.05	40			Yes	
21	RB400VA-50	50	40	0.5	3	0.55	0.5	0.05	30			Yes	
22	New RB160VA-60	60	60	1	3	0.67	1	0.4	60			Yes	
23	RB021VA90	90	90	0.2	5	0.49	0.2	0.9	90			—	
24	RB558VA150	150	150	0.5	3	0.95	0.5	0.0005	150			Yes	
25	New RB162VAM-20	25	20	1	5	0.4	1	1.2	20			—	
26	New RB161VAM-20	30	20	1	5	0.42	1	1	20			—	
27	New RBE1VAM20A	30	20	1	3	0.53	1	0.2	20	—			
28	New RBE2VAM20A	30	20	2	5	0.46	2	0.7	20	—			
29	New RB550VAM-30	30	30	1	3	0.52	1	0.03	10	—			
30	New RSX101VAM30	30	30	1	5	0.47	1	0.2	30	—			
31	New RB168VAM-30	30	30	1	5	0.73	1	0.0003	30	—			
32	New RSX201VAM30	30	30	1.5	8	0.46	1.5	0.3	30	—			
33	New RB160VAM-40	40	40	1	5	0.55	0.7	0.05	40	—			
34	New RB168VAM-40	40	40	1	5	0.73	1	0.0005	40	—			
35	New RB400VAM-50	50	40	0.5	3	0.55	0.5	0.05	30	—			
36	New RB160VAM-60	60	60	1	3	0.67	1	0.4	60	—			
37	New RB168VAM-60	60	60	1	5	0.72	1	0.001	60	—			
38	New RB021VAM90	90	90	0.2	5	0.49	0.2	0.9	90	—			
39	New RB578VAM100	100	100	0.7	5	0.85	0.7	0.0002	100	—			
40	New RB168VAM100	100	100	1	5	0.85	1	0.2	100	—			
41	New RB558VAM150	150	150	0.5	3	0.95	0.5	0.0005	150	—			
42	New RB168VAM150	150	150	1	5	0.88	1	1	150	—			
43	New RB550VYM-30	30	30	1	3	0.52	1	0.03	10	Yes			
44	New RSX101VYM30	30	30	1	5	0.47	1	0.2	30	Yes			
45	New RSX201VYM30	30	30	1.5	8	0.46	1.5	0.3	30	Yes			
46	New RB160VYM-40	40	40	1	5	0.55	0.7	0.05	40	Yes			
47	New RB400VYM-50	50	40	0.5	3	0.55	0.5	0.05	30	Yes			
48	New RB160VYM-60	60	60	1	3	0.67	1	0.4	60	Yes			
49	New RB578VYM100	100	100	0.7	5	0.85	0.7	0.0002	100	Yes			
50	New RB168VYM-30	30	30	1	5	0.73	1	0.0003	30	Yes			
51	New RB168VYM-40	40	40	1	5	0.73	1	0.0005	40	Yes			
52	New RB168VYM-60	60	60	1	5	0.72	1	0.001	60	Yes			
53	New RB168VYM100	100	100	1	5	0.85	1	0.2	100	Yes			
54	New RB558VYM150	150	150	0.5	3	0.95	0.5	0.0005	150	Yes			
55	New RB168VYM150	150	150	1	5	0.88	1	1	150	Yes			
56	RB051M-2Y	20	20	3	30	0.46	3	0.9	20	—			
57	RB161M-20	25	20	1	30	0.35	1	0.7	20	—			
58	RB162M-30	30	30	1	30	0.52	1	0.1	30	Yes			
59	RB160M-30	30	30	1	30	0.48	1	0.05	30	Yes			
60	RSX101M-30	30	30	1	45	0.39	1	0.2	30	Yes			
61	RB070M-30	30	30	1.5	30	0.49	1.5	0.05	30	Yes			
62	RB060M-30	30	30	2	55	0.49	2	0.05	30	Yes			
63	New RBR1M30A	30	30	1	30	0.48	1	0.05	30	Yes			
64	New RBR2M30A	30	30	2	30	0.53	2	0.05	30	Yes			
65	New RBR2M30B	30	30	2	30	0.49	2	0.08	30	Yes			
66	RB162M-40	40	40	1	30	0.55	1	0.1	40	Yes			
67	RB160M-40	40	40	1	30	0.51	1	0.03	40	Yes			
68	New RBR3M30A	30	30	3	30	0.51	3	0.1	30	Yes			
69	RB168M-40	40	40	1	30	0.65	1	0.00055	40	Yes			
70	RB060M-40	40	40	2	30	0.56	2	0.5	40	Yes			
71	RB068M-40	40	40	2	30	0.725	2	0.00055	40	Yes			
72	New RBR1M40A	40	40	1	20	0.53	1	0.05	40	Yes			
73	New RBR2M40A	40	40	2	20	0.62	2	0.05	40	Yes			
74	New RBR2M40B	40	40	2	30	0.56	2	0.08	40	Yes			
75	New RBR2M40C	40	40	2	30	0.54	2	0.1	40	Yes			
76	New RBR3M40A	40	40	3	30	0.62	3	0.08	40	Yes			
77	New RBR3M40B	40	40	3	30	0.58	3	0.1	40	Yes			
78	RB162M-60	60	60	1	20	0.65	1	0.1	60	Yes			
79	RB160M-60	60	60	1	30	0.55	1	0.05	60	Yes			
80	New RBR1M60A	60	60	1	20	0.53	1	0.075	60	Yes			
81	RB168M-60	60	60	1	30	0.68	1	0.0015	60	Yes			
82	RB060M-60	60	60	2	30	0.61	2	0.05	60	Yes			
83	New RBR2M60A	60	60	2	20	0.65	2	0.075	60	Yes			
84	New RBR2M60B	60	60	2	30	0.58	2	0.1	60	Yes			
85	New RBR2M60C	60	60	2	30	0.55	2	0.12	60	Yes			
86	RB068M-60	60	60	2	30	0.765	2	0.0015	60	Yes			
87	New RBR3M60A	60	60	3	30	0.66	3	0.1	60	Yes			
88	New RBR3M60B	60	60	3	30	0.6	3	0.12	60	Yes			
89	RB160M-90	90	90	1	30	0.73	1	0.1	90	Yes			
90	RB168M150	150	150	1	30	0.84	1	0.01	150	Yes			

\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes. I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip



Middle Power Schottky Barrier Diodes 2												
Quick Reference No.	Product No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)				Electrical Characteristics (T <sub>j</sub> =25°C) <sup>2</sup>				Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O</sub> <sup>1</sup> (A)	I <sub>FSM</sub> (A) <sup>2</sup> 60Hz, 1 <sub>~</sub>	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (mA) Max.	V <sub>R</sub> (V)			
91	New RB051MM-2Y	20	20	3	30	0.46	3	0.9	20	PMDU (Wide)		—
92	New RB161MM-20	25	20	1	30	0.35	1	0.7	20			Yes
93	New RB162MM-30	30	30	1	30	0.52	1	0.1	30			Yes
94	New RB160MM-30	30	30	1	30	0.48	1	0.05	30			Yes
95	New RSX101MM-30	30	30	1	45	0.39	1	0.2	30			Yes
96	New RBR1MM30A	30	30	1	30	0.48	1	0.05	30			Yes
97	New RB168MM-30	30	30	1	20	0.69	1	0.0004	30			Yes
98	New RB070MM-30	30	30	1.5	30	0.49	1.5	0.05	30			Yes
99	New RB060MM-30	30	30	2	55	0.49	2	0.05	30			Yes
100	New RBR2MM30A	30	30	2	30	0.53	2	0.05	30			Yes
101	New RBR2MM30B	30	30	2	30	0.49	2	0.08	30			Yes
102	New RBR3MM30A	30	30	3	30	0.51	3	0.1	30			Yes
103	New RB068MM-30	30	30	2	30	0.69	2	0.0007	30			Yes
104	New RB162MM-40	40	40	1	30	0.55	1	0.1	40			Yes
105	New RB160MM-40	40	40	1	30	0.51	1	0.03	40			Yes
106	New RB168MM-40	40	40	1	30	0.65	1	0.00055	40			Yes
107	New RBR1MM40A	40	40	1	20	0.53	1	0.05	40			Yes
108	New RB060MM-40	40	40	2	30	0.56	2	0.5	40			Yes
109	New RB068MM-40	40	40	2	30	0.725	2	0.00055	40			Yes
110	New RBR2MM40A	40	40	2	20	0.62	2	0.05	40			Yes
111	New RBR2MM40B	40	40	2	30	0.56	2	0.08	40			Yes
112	New RBR2MM40C	40	40	2	30	0.54	2	0.10	40			Yes
113	New RBR3MM40A	40	40	3	30	0.62	3	0.08	40			Yes
114	New RBR3MM40B	40	40	3	30	0.58	3	0.10	40			Yes
115	New RB162MM-60	60	60	1	20	0.65	1	0.1	60			Yes
116	New RB160MM-60	60	60	1	30	0.55	1	0.05	60			Yes
117	New RBR1MM60A	60	60	1	20	0.53	1	0.075	60			Yes
118	New RB168MM-60	60	60	1	30	0.68	1	0.0015	60			Yes
119	New RB060MM-60	60	60	2	30	0.61	2	0.05	60			Yes
120	New RBR2MM60A	60	60	2	20	0.65	2	0.075	60			Yes
121	New RBR2MM60B	60	60	2	30	0.58	2	0.1	60			Yes
122	New RBR2MM60C	60	60	2	30	0.55	2	0.12	60			Yes
123	New RB068MM-60	60	60	2	30	0.765	2	0.0015	60			Yes
124	New RBR3MM60A	60	60	3	30	0.66	3	0.1	60			Yes
125	New RBR3MM60B	60	60	3	30	0.60	3	0.12	60			Yes
126	New RB160MM-90	90	90	1	30	0.73	1	0.1	90			Yes
127	New RB168MM100	100	100	1	30	0.79	1	0.0006	100			Yes
128	New RB168MM150	150	150	1	30	0.84	1	0.004	150			Yes
129	RSX501L-20	25	20	5	70	0.39	3	0.5	20			—
130	RB081L-20	25	20	5	70	0.45	5	0.7	20			—
131	RB161L-40	40	20	1	70	0.4	1	1	20			—
132	New RBR1L30A	30	30	1	30	0.48	1	0.05	30			Yes
133	New RB168L-30	30	30	1	20	0.69	1	0.0004	30			Yes
134	RB051L-40	40	20	3	70	0.45	3	1	20			—
135	RSX205L-30	30	30	2	60	0.49	2	0.2	30			Yes
136	RSX201L-30	30	30	2	60	0.44	2	0.15	30			Yes
137	New RBR2L30A	30	30	2	40	0.49	2	0.08	30			Yes
138	New RB068L-30	30	30	2	40	0.69	1	0.0007	30			Yes
139	RSX301L-30	30	30	3	70	0.42	3	0.2	30			Yes
140	RB055L-30	30	30	3	55	0.55	3	0.05	30			Yes
141	New RBR3L30A	30	30	3	30	0.58	3	0.05	30			Yes
142	New RBR3L30B	30	30	3	40	0.53	3	0.08	30			Yes
143	New RB058L-30	30	30	3	70	0.68	3	0.0015	30			Yes
144	RB090L-30	30	30	5	70	0.51	5	0.15	30			Yes
145	New RBR5L30A	30	30	5	50	0.54	5	0.1	30			Yes
146	New RBR5L30B	30	30	5	50	0.49	5	0.15	30			Yes
147	RB162L-40	40	40	1	20	0.55	1	0.5	40			Yes
148	RB160L-40	40	40	1	70	0.55	1	0.1	40			Yes
149	New RBR1L40A	40	40	1	30	0.52	1	0.05	40			Yes
150	New RB168L-40	40	40	1	30	0.65	1	0.00055	40			Yes
151	RB060L-40	40	40	2	70	0.5	2	1	40			Yes
152	RB068L-40	40	40	2	40	0.69	2	0.001	40			Yes
153	New RBR2L40A	40	40	2	40	0.55	2	0.08	40			Yes
154	RB056L-40	40	40	3	70	0.67	3	0.05	40			Yes
155	RB055L-40	40	40	3	40	0.65	3	0.5	40			Yes
156	RB050L-40	40	40	3	70	0.55	3	1	40			Yes
157	RB058L-40	40	40	3	70	0.7	3	0.005	40			Yes
158	New RBR3L40A	40	40	3	30	0.69	3	0.05	40			Yes
159	New RBR3L40B	40	40	3	40	0.62	3	0.08	40			Yes
160	New RBR3L40C	40	40	3	50	0.55	3	0.1	40			Yes
161	New RBR5L40A	40	40	5	50	0.53	5	0.2	40			Yes
162	RB162L-60	60	60	1	20	0.65	1	0.1	60			Yes
163	RB160L-60	60	60	1	30	0.58	1	1	60			Yes
164	New RBR1L60A	60	60	1	30	0.53	1	0.075	60			Yes
165	New RB168L-60	60	60	1	30	0.68	1	0.0015	60			Yes
166	RB068L-60	60	60	2	40	0.7	2	0.002	60			Yes
167	New RBR2L60A	60	60	2	30	0.65	2	0.075	60			Yes
168	New RBR2L60B	60	60	2	50	0.52	2	0.15	60			Yes
169	RB055L-60	60	60	3	70	0.68	3	0.07	60			Yes
170	RB050L-60	60	60	3	70	0.52	2	0.1	60			Yes
171	RB058L-60	60	60	3	70	0.64	3	0.004	60			Yes
172	New RBR3L60A	60	60	3	40	0.66	3	0.1	60			Yes
173	New RBR3L60B	60	60	3	50	0.56	3	0.15	60			Yes
174	New RBR5L60A	60	60	5	50	0.53	5	0.25	60			Yes
175	RB160L-90	95	90	1	30	0.73	1	0.1	90			Yes
176	New RB168L100	100	100	1	30	0.69	1	0.0006	100			Yes
177	RB068L100	100	100	2	60	0.79	2	0.015	100			Yes
178	New RB168L150	150	150	1	30	0.69	1	0.004	150			Yes
179	New RB068L150	150	150	2	50	0.81	2	0.003	150			Yes
180	New RB058L150	150	150	3	50	0.85	3	0.003	150			Yes
181	RB461F	25	20	0.7	3	0.49	0.7	0.2	20			—
182	RB491D	25	20	1	3	0.45	1	0.2	20			—
183	RB411D	40	20	0.5	3	0.5	0.5	0.03	10			Yes
184	RB400D	40	40	0.5	3	0.55	0.5	0.05	30			Yes
185	RB496KA	—	20	1 <sup>2</sup>	5	0.43	1	0.8	10			—
186	RBE1KA20A	30	20	1	3	0.43	0.5	0.2	20			—
187	RB496EA	20	20	1 <sup>2</sup>	10	0.4	1	0.5	10			—
188	RBE2EA20A	30	20	2	5	0.39	1	0.7	20			—
189	RB552EA	30	30	1	7	0.59	0.5	0.008	15			Yes
190	RB550EA	30	30	1.4	15	0.49	0.7	0.05	30			Yes
191	RB061US-30	30	30	2	8	0.4	2	0.9	15			—

\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes. I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip

# Rectifier Diodes

## ● Quick Reference for Rectifier Diodes

	V <sub>RM</sub> (V)	I <sub>o</sub> (A)	Surface Mount Type											
General Purpose Rectifier Diodes	400	0.2	RRE02VS4S	1	<b>New</b> RRE02VSM4S <b>New</b> RRE02VTM4S	4 8								
		0.4										RRE04EA4D	19	
		0.5											RR274EA-400	20
		0.7	RRE07VS4S	2	<b>New</b> RRE07VSM4S <b>New</b> RRE07VTM4S	5 9	RR264M-400 <b>New</b> RR264MM-400 <b>New</b> RRD07M4S	13 14 12						
		1									1SR154-400	15		
		2									RR2L4S	16		
	600	0.2	RRE02VS6S	3	<b>New</b> RRE02VSM6S <b>New</b> RRE02VTM6S	6 10								
		0.7			<b>New</b> RRE07VSM6S <b>New</b> RRE07VTM6S	7 11								
		1									1SR154-600	17		
		2									RR2L6S	18		
High-speed Rectifier Diodes	600	1										1SR156-400	21	











## Rectifier Diodes



General Purpose Rectifier Diodes																
Quick Reference No.	Product No.	Absolute Maximum Ratings (T <sub>c</sub> =25°C)					Electrical Characteristics (T <sub>j</sub> =25°C) *2							Package	Equivalent Circuit Diagram	Automotive Grade Available
	Part No.	V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>o</sub> (A)	I <sub>FSM</sub> (A) 60Hz, 1 $\phi$	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>R</sub> ( $\mu$ A) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (mA)				
1	RRE02VS4S	400	400	0.2	1	1.1	0.2	1	400	—	—	—	TUMD2S		Yes	
2	RRE07VS4S	400	400	0.7	2	1.1	0.7	1	400	—	—	—			Yes	
3	RRE02VS6S	600	600	0.2	1	1.1	0.2	1	600	—	—	—			Yes	
4	<b>New</b> RRE02VSM4S	400	400	0.2	1	1.1	0.2	1	400	—	—	—			—	
5	<b>New</b> RRE07VSM4S	400	400	0.7	2	1.1	0.7	1	400	—	—	—			—	
6	<b>New</b> RRE02VSM6S	600	600	0.2	1	1.1	0.2	1	600	—	—	—			—	
7	<b>New</b> RRE07VSM6S	600	600	0.7	2	1.1	0.7	1	600	—	—	—			—	
8	<b>New</b> RRE02VTM4S	400	400	0.2	1	1.1	0.2	1	400	—	—	—			Yes	
9	<b>New</b> RRE07VTM4S	400	400	0.7	2	1.1	0.7	1	400	—	—	—			Yes	
10	<b>New</b> RRE02VTM6S	600	600	0.2	1	1.1	0.2	1	600	—	—	—			Yes	
11	<b>New</b> RRE07VTM6S	600	600	0.7	2	1.1	0.7	1	600	—	—	—			Yes	
12	<b>New</b> RRD07M4S	400	400	0.7	150 <sup>-3</sup>	0.98	0.7	10	400	—	—	—			PMDU	—
13	RR264M-400	400	400	0.7	25	1.1	0.7	10	400	—	—	—	PMDU (Wide)	Yes		
14	<b>New</b> RR264MM-400	400	400	0.7	25	1.1	0.7	10	400	—	—	—	PMDS	Yes		
15	1SR154-400	500	400	1	30	1.1	1	10	400	—	—	—	PMDS	Yes		
16	RR2L4S	400	400	2	50	1.1	2	10	400	—	—	—	PMDS	Yes		
17	1SR154-600	750	600	1	30	1.1	1	10	600	—	—	—	PMDS	Yes		
18	RR2L6S	600	600	2	50	1.1	2	10	600	—	—	—	PMDS	Yes		
19	RRE04EA4D	400	400	0.4 <sup>-1</sup>	2	1.1	0.2	1	400	—	—	—	TSMD5		Yes	
20	RR274EA-400	400	400	1 <sup>-1</sup>	8	1.1	0.5	10	400	—	—	—	TSMD5		Yes	
High-speed Rectifier Diodes																
21	1SR156-400	500	400	1	20	1.3	0.8	10	400	400	10	10	PMDS		Yes	

\*1 : I<sub>o</sub> : Average output current per chip. In case of 2 chip diodes. I<sub>o</sub> indicates average output current of 2 chips. \*2 : Value / Chip \*3 IFRM (guaranteed) : charged waveform t=500us(1/2peak), 1pulse/4s, Rth<80°C/W

# Fast Recovery Diodes

## Quick Reference for Fast Recovery Diodes

V <sub>RM</sub> (V)	I <sub>O</sub> (A)	Surface Mount Type																		
																				
		1006 Size VML2	1608 Size EMD2 (SOD523)	2512 Size UMD2 (SOD323F)	2513 Size TUMD2	2514 Size TUMD2M	2513 Size TUMD2S	2514 Size TUMD2SM	3516 Size PMDU (SOD123)	5026 Size PMS (SOD106)	2928 Size TSMD6 (SOT23-6)									
100	0.5				RF05VA1S 4	<b>New</b> RF05VAM1S 6														
	0.1			RF01VM2S 3																
	0.4																			RF04UA2D 28
	0.5				RF05VA2S 5	<b>New</b> RF05VAM2S 7														
	0.7																			
	0.8																			
	1																			
	2																			
	0.7																			
	1																			
	1.5																			
450	0.1	RFU01AS4S 1	RFU01SM4S 2																	
	0.2																			
	0.8																			
	1.5																			
700	0.8																			
800	0.2																			

Fast Recovery Diodes															
Quick Reference No.	Product No. Part No.	Absolute Maximum Ratings (T <sub>C</sub> =25°C)					Electrical Characteristics (T <sub>J</sub> =25°C) *2						Package	Equivalent Circuit Diagram	Automotive Grade Available
		V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>O</sub> (A)	I <sub>FSM</sub> (A) 60Hz, 1ms	V <sub>F</sub> (V) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	I <sub>F</sub> (A)	I <sub>R</sub> (A)			
1	RFU01AS4S	450	450	0.1	1	1.8	0.1	10	450	35	0.1	0.1	VML2		—
2	RFU01SM4S	450	450	0.1	1	1.8	0.1	10	450	35	0.1	0.1	EMD2		Yes
3	RF01VM2S	250	250	0.1	1	1.2	0.1	10	250	50	*		UMD2		Yes
4	RF05VA1S	100	100	0.5	6	0.98	0.5	10	100	25	0.5	1	TUMD2		Yes
5	RF05VA2S	200	200	0.5	6	0.98	0.5	10	200	25	0.5	1			Yes
6	RF05VAM1S	100	100	0.5	6	0.98	0.5	10	100	25	0.5	1	TUMD2M		—
7	RF05VAM2S	200	200	0.5	6	0.98	0.5	10	200	25	0.5	1			—
8	<b>New</b> RF05VYM1S	100	100	0.5	6	0.98	0.5	10	100	25	0.5	1			Yes
9	<b>New</b> RF05VYM2S	200	200	0.5	6	0.98	0.5	10	200	25	0.5	1	Yes		
10	RFU02VS6S	600	600	0.2	1	2.2	0.2	10	600	35	0.1	0.1	TUMD2S		—
11	RFU02VS8S	800	800	0.2	1	3	0.2	10	800	35	0.1	0.1			—
12	<b>New</b> RFU02VSM6S	600	600	0.2	1	2.2	0.2	10	600	35	0.1	0.1	TUMD2SM		—
13	<b>New</b> RFU02VSM8S	800	800	0.2	1	3	0.2	10	800	35	0.1	0.1			—
14	RF071M2S	200	200	0.7	15	0.85	0.7	10	200	25	0.5	1	PMDU		Yes
15	RF081M2S	200	200	0.8	20	0.95	0.8	10	200	25	0.5	1			Yes
16	<b>New</b> RF071MM2S	200	200	0.7	15	0.85	0.7	10	200	25	0.5	1			Yes
17	<b>New</b> RF081MM2S	200	200	0.8	20	0.95	0.8	10	200	25	0.5	1	PMDU (Wide)		Yes
18	RF101L2S	200	200	1	20	0.87	1	10	200	25	0.5	1	PMS		Yes
19	RF081L2S	200	200	1.1	25	0.98	1	10	200	25	0.5	1			Yes
20	RF201L2S	200	200	2	20	0.87	2	10	200	25	0.5	1			Yes
21	RF071L4S	400	400	1	15	1.25	0.7	10	400	25	0.5	1			Yes
22	RF101L4S	400	400	1	25	1.25	1	10	400	25	0.5	1			Yes
23	RF201L4S	400	400	1.5	50	1.2	1.5	1	400	30	0.5	1			Yes
24	RFN2L4S	400	400	1.5	50	1.2	1.5	1	400	30	0.5	1			Yes
25	RFN1L6S	600	600	0.8	15	1.45	0.8	1	600	35	0.5	1			Yes
26	RFN2L6S	600	600	1.5	40	1.55	1.5	1	600	35	0.5	1			Yes
27	RFN1L7S	700	700	0.8	15	1.5	0.8	1	700	80	0.5	1			Yes
28	RF04UA2D	200	200	0.4 <sup>-1</sup>	1	0.98	0.2	10	200	25	0.5	1	TSMD6		








\*1 : I<sub>O</sub> : Average output current per chip. In case of 2 chip diodes, I<sub>O</sub> indicates average output current of 2 chips. \*2 : Value / Chip  
\*V<sub>R</sub>=6V, I<sub>F</sub>=10mA, I<sub>R</sub>=0.1A

## Zener Diodes (Including TVS)









2-Terminal (Single) 4-Terminal (Dual) Zener Diodes																												
Package	Surface Mount Type																											
	0603 Size SMD0603			0603 Size GMD2 (SOD962)			1006 Size VMN2 (SOD923)			1006 Size VMN2			1608 Size EMD2 (SOD523)			2512 Size UMD2 (SOD323F)			2513 Size TUMD2									
Equivalent Circuit Diagram																												
Series Name	New SDZ Series			GDZ Series			CDZ Series			New CDZ V Series			EDZ V Series			UDZ V Series			TFZ Series									
Power(mW)	100			100			100			100			150			200			500									
Taping Code	T15R			T2R			T2RA			T2RA			T2R			TE-17			TR									
Electrical Characteristics (Ta=25°C)	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available	Vz (V)	Iz (mA)	Automotive Grade Available							
Voltage	2.0B	2.02 to 2.20	5	Yes	2.0B	2.02 to 2.20	5	Yes	2.0B	2.02 to 2.20	5	Yes	2.0B	2.02 to 2.20	5	Yes	2.0B	2.02 to 2.20	5	Yes	2.0B	2.02 to 2.20	20	Yes				
	2.2B	2.22 to 2.41	5	Yes	2.2B	2.22 to 2.41	5	Yes	2.2B	2.22 to 2.41	5	Yes	2.2B	2.22 to 2.41	5	Yes	2.2B	2.22 to 2.41	5	Yes	2.2B	2.22 to 2.41	20	Yes				
	2.4B	2.43 to 2.63	5	Yes	2.4B	2.43 to 2.63	5	Yes	2.4B	2.43 to 2.63	5	Yes	2.4B	2.43 to 2.63	5	Yes	2.4B	2.43 to 2.63	5	Yes	2.4B	2.43 to 2.63	20	Yes				
	2.7B	2.69 to 2.91	5	Yes	2.7B	2.69 to 2.91	5	Yes	2.7B	2.69 to 2.91	5	Yes	2.7B	2.69 to 2.91	5	Yes	2.7B	2.69 to 2.91	5	Yes	2.7B	2.69 to 2.91	20	Yes				
	3.0B	3.01 to 3.22	5	Yes	3.0B	3.01 to 3.22	5	Yes	3.0B	3.01 to 3.22	5	Yes	3.0B	3.01 to 3.22	5	Yes	3.0B	3.01 to 3.22	5	Yes	3.0B	3.01 to 3.22	20	Yes				
	3.3B	3.32 to 3.53	5	Yes	3.3B	3.32 to 3.53	5	Yes	3.3B	3.32 to 3.53	5	Yes	3.3B	3.32 to 3.53	5	Yes	3.3B	3.32 to 3.53	5	Yes	3.3B	3.32 to 3.53	20	Yes				
	3.6B	3.60 to 3.845	5	Yes	3.6B	3.60 to 3.845	5	Yes	3.6B	3.60 to 3.845	5	Yes	3.6B	3.60 to 3.845	5	Yes	3.6B	3.60 to 3.845	5	Yes	3.6B	3.60 to 3.845	20	Yes				
	3.9B	3.89 to 4.16	5	Yes	3.9B	3.89 to 4.16	5	Yes	3.9B	3.89 to 4.16	5	Yes	3.9B	3.89 to 4.16	5	Yes	3.9B	3.89 to 4.16	5	Yes	3.9B	3.89 to 4.16	20	Yes				
	4.3B	4.17 to 4.43	5	Yes	4.3B	4.17 to 4.43	5	Yes	4.3B	4.17 to 4.43	5	Yes	4.3B	4.17 to 4.43	5	Yes	4.3B	4.17 to 4.43	5	Yes	4.3B	4.17 to 4.43	20	Yes				
	4.7B	4.55 to 4.75	5	Yes	4.7B	4.55 to 4.75	5	Yes	4.7B	4.55 to 4.75	5	Yes	4.7B	4.55 to 4.75	5	Yes	4.7B	4.55 to 4.75	5	Yes	4.7B	4.55 to 4.80	20	Yes				
	5.1B	4.98 to 5.20	5	Yes	5.1B	4.98 to 5.20	5	Yes	5.1B	4.98 to 5.20	5	Yes	5.1B	4.98 to 5.20	5	Yes	5.1B	4.98 to 5.20	5	Yes	5.1B	4.94 to 5.20	20	Yes				
	5.6B	5.49 to 5.73	5	Yes	5.6B	5.49 to 5.73	5	Yes	5.6B	5.49 to 5.73	5	Yes	5.6B	5.49 to 5.73	5	Yes	5.6B	5.49 to 5.73	5	Yes	5.6B	5.45 to 5.73	20	Yes				
	6.2B	6.06 to 6.33	5	Yes	6.2B	6.06 to 6.33	5	Yes	6.2B	6.06 to 6.33	5	Yes	6.2B	6.06 to 6.33	5	Yes	6.2B	6.06 to 6.33	5	Yes	6.2B	5.96 to 6.27	20	Yes				
	6.8B	6.47 to 7.14	5	Yes	6.8B	6.47 to 7.14	5	Yes	6.8B	6.47 to 7.14	5	Yes	6.8B	6.47 to 7.14	5	Yes	6.8B	6.49 to 6.83	20	Yes								
	7.5B	7.06 to 7.84	5	Yes	7.5B	7.06 to 7.84	5	Yes	7.5B	7.28 to 7.60	5	Yes	7.5B	7.28 to 7.60	5	Yes	7.5B	7.28 to 7.60	5	Yes	7.5B	7.07 to 7.45	20	Yes				
	8.2B	7.76 to 8.64	5	Yes	8.2B	7.76 to 8.64	5	Yes	8.2B	8.02 to 8.36	5	Yes	8.2B	8.02 to 8.36	5	Yes	8.2B	8.02 to 8.36	5	Yes	8.2B	7.78 to 8.19	20	Yes				
	9.1B	8.85 to 9.23	5	Yes	9.1B	8.85 to 9.23	5	Yes	9.1B	8.85 to 9.23	5	Yes	9.1B	8.85 to 9.23	5	Yes	9.1B	8.85 to 9.23	5	Yes	9.1B	8.57 to 9.01	20	Yes				
	10B	9.77 to 10.21	5	Yes	10B	9.77 to 10.21	5	Yes	10B	9.77 to 10.21	5	Yes	10B	9.77 to 10.21	5	Yes	10B	9.77 to 10.21	5	Yes	10B	9.41 to 9.90	20	Yes				
	11B	10.76 to 11.22	5	Yes	11B	10.76 to 11.22	5	Yes	11B	10.76 to 11.22	5	Yes	11B	10.76 to 11.22	5	Yes	11B	10.76 to 11.22	5	Yes	11B	10.50 to 11.05	10	Yes				
	12B	11.74 to 12.24	5	Yes	12B	11.74 to 12.24	5	Yes	12B	11.74 to 12.24	5	Yes	12B	11.74 to 12.24	5	Yes	12B	11.74 to 12.24	5	Yes	12B	11.44 to 12.03	10	Yes				
	13B	12.91 to 13.49	5	Yes	13B	12.91 to 13.49	5	Yes	13B	12.91 to 13.49	5	Yes	13B	12.91 to 13.49	5	Yes	13B	12.91 to 13.49	5	Yes	13B	12.55 to 13.21	10	Yes				
	15B	14.34 to 14.98	5	Yes	15B	14.34 to 14.98	5	Yes	15B	14.34 to 14.98	5	Yes	15B	14.34 to 14.98	5	Yes	15B	14.34 to 14.98	5	Yes	15B	13.89 to 14.62	10	Yes				
	16B	15.85 to 16.51	5	Yes	16B	15.85 to 16.51	5	Yes	16B	15.85 to 16.51	5	Yes	16B	15.85 to 16.51	5	Yes	16B	15.85 to 16.51	5	Yes	16B	15.25 to 16.04	10	Yes				
	18B	17.56 to 18.35	2	Yes	18B	17.56 to 18.35	2	Yes	18B	17.56 to 18.35	2	Yes	18B	17.56 to 18.35	2	Yes	18B	17.56 to 18.35	2	Yes	18B	16.82 to 17.70	10	Yes				
	20B	19.52 to 20.39	2	Yes	20B	19.52 to 20.39	2	Yes	20B	19.52 to 20.39	2	Yes	20B	19.52 to 20.39	2	Yes	20B	19.52 to 20.39	2	Yes	20B	18.63 to 19.59	10	Yes				
	22B	21.54 to 22.47	2	Yes	22B	21.54 to 22.47	2	Yes	22B	21.54 to 22.47	2	Yes	22B	21.54 to 22.47	2	Yes	22B	21.54 to 22.47	2	Yes	22B	20.64 to 21.71	5	Yes				
	24B	23.72 to 24.78	2	Yes	24B	23.72 to 24.78	2	Yes	24B	23.72 to 24.78	2	Yes	24B	23.72 to 24.78	2	Yes	24B	23.72 to 24.78	2	Yes	24B	22.61 to 23.77	5	Yes				
	27B	26.19 to 27.53	2	Yes	27B	26.19 to 27.53	2	Yes	27B	26.19 to 27.53	2	Yes	27B	26.19 to 27.53	2	Yes	27B	26.19 to 27.53	2	Yes	27B	24.97 to 26.26	5	Yes				
	30B	29.19 to 30.69	2	Yes	30B	29.19 to 30.69	2	Yes	30B	29.19 to 30.69	2	Yes	30B	29.19 to 30.69	2	Yes	30B	29.19 to 30.69	2	Yes	30B	27.70 to 29.13	5	Yes				
	33B	32.15 to 33.79	2	Yes	33B	32.15 to 33.79	2	Yes	33B	32.15 to 33.79	2	Yes	33B	32.15 to 33.79	2	Yes	33B	32.15 to 33.79	2	Yes	33B	30.32 to 31.88	5	Yes				
	36B	35.07 to 36.87	2	Yes	36B	35.07 to 36.87	2	Yes	36B	35.07 to 36.87	2	Yes	36B	35.07 to 36.87	2	Yes	36B	35.07 to 36.87	2	Yes	36B	32.79 to 34.49	5	Yes				
	39B	38.02 to 39.98	2	Yes	39B	38.02 to 39.98	2	Yes	39B	38.02 to 39.98	2	Yes	39B	38.02 to 39.98	2	Yes	39B	38.02 to 39.98	2	Yes	39B	35.36 to 37.19	5	Yes				
	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes	UDZV4	40.00 to 45.00	2	Yes
	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes	UDZV4	44.00 to 49.00	2	Yes

Note : This table shows available voltages.






● Quick Reference for Protection Devices (TVS) [2-4 Elements]

V <sub>Z</sub> (V)	Package						
	1212 Size	1616 Size	1616 Size	2120 Size	2120 Size	2928 Size	2928 Size
							
	VMD3 (SOT723)	EMD3 (SOT523)	EMD5 (SOT553)	UMD3 (SOT323)	UMD5 (SOT353)	SMD3 (SOT346)	SMD5 (SOT25)
4.3							FTZ4.3E
5.1				UMZ5.1N			
5.6						STZ5.6N	FTZ5.6E
6.2						STZ6.2N	
6.8	VMZ6.8N	EMZ6.8N	EMZ6.8E	UMZ6.8N	UMZ6.8EN	STZ6.8T STZ6.8N	FTZ6.8E
8.2				UMZ8.2T UMZ8.2N			
12				UMZ12N			
16				UMZ16N			
18				UMZ18N			
27				UMZ27N			
30				UMZ30N			FTZ30E
36				UMZ36N			









● Quick Reference for Low Capacitance Protection Devices (TVS)

V <sub>Z</sub> (V)	Package											
	0603 Size	1006 Size	1212 Size	1608 Size	1616 Size	1616 Size	1616 Size	2512 Size	2120 Size	2928 Size	2928 Size	1006 Size
												
	SMD0603	VMN2 (SOD923)	VMD3 (SOT723)	EMD2 (SOD523)	EMD3 (SOT523)	EMD5 (SOT553)	EMD6 (SOT563)	UMD2 (SOD323F)	UMD3 (SOT323)	SMD3 (SOT346)	SMD5 (SOT25)	VMN2M (SOD923F)
5.1												CDZCV5.1
5.6								UDZU5.6B				
6.2								New UDZU6.2	UMZU6.2N			FTZU6.2E
6.6	New VS5V0BA1ES											
6.8		CDZC6.8B RSAC6.8CS	VMZT6.8N	New EDZCV6.8B	EMZC6.8N	EMZT6.8E	RSB6.8JS2		UMZC6.8N	STZC6.8N		RSAC6.8CM
12			RSB12Z		RSB12W		RSB12JS2					
16		RSAC16CS										
18		RSAC18CS										


● Quick Reference for ESD Protection Devices (TVS)

V <sub>Z</sub> (V)	Package				
	1616 Size	2120 Size	3516 Size	2928 Size	5026 Size
					
	EMD5 (SOT553)	UMD5 (SOT353)	PMDU (SOD123)	SMD6 (SOT457)	PMDS (SOD106)
6	RSA6.1J4	RSA6.1EN	RSA5M	RSA6.1U5	RSA5L
12			RSA12M		RSA12L
30					RSA30L

● Quick Reference for Bi-Directional Zener Diodes

V <sub>Z</sub> (V)	Package									
	0603 Size	1006 Size	1406 Size	1608 Size	2512 Size	2513 Size	2120 Size	2120 Size	2120 Size	1006 Size
										
	GMD2 (SOD962)	VMN2 (SOD923)	VMD2 (SOD723)	EMD2 (SOD523)	UMD2 (SOD323F)	TUMD2	UMD3 (SOT323)	UMD4 (SOT343)	UMD6 (SOT363)	VMN2M (SOD923F)
5.6				RSB5.6SM						
6.8	RSB6.8ZS	RSB6.8CS	RSB6.8G	RSB6.8SM			RSB6.8F2			RSB6.8CM
12					RSB12V					
16					RSB16V	RSB16VA	RSB16F2		RSB16X3N	
18					RSB18V	New RSB18VA	RSB18F2			
27					RSB27V	New RSB27VA	RSB27F2	RSB27K2		
29					RSB33V		RSB33F2			
32					RSB36V		RSB36F2			
35					RSB39V		RSB39F2			

● Quick Reference for Ultra Low Capacitance Bi-Directional Zener Diodes

V <sub>Z</sub> (V)	Package
	1006 Size
	
	VMN2 (SOD923)
6.8	RSBC6.8CS










# Zener Diodes (Including TVS)

Protection Devices (TVS) [2-4 Elements]								
Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)	Electrical Characteristics (Ta=25°C)		Remarks	Package	Equivalent Circuit Diagram	Automotive Grade Available	
	P (mW)	VZ (V)	IZ(mA)					
UMZ8.2T	200	7.76 to 8.64	5	IEC61000-4-2 150pF,330Ω Contact 8kV Air 15kV	UMD3		Yes	
STZ6.8T	200	6.47 to 7.14	5		SMD3		Yes	
VMZ6.8N	150	6.47 to 7.14	5		VMD3		Yes	
EMZ6.8N	150	6.47 to 7.14	5		EMD3		Yes	
UMZ5.1N	200	4.84 to 5.37	5				Yes	
UMZ6.8N	200	6.47 to 7.14	5				Yes	
UMZ8.2N	200	7.76 to 8.64	5				Yes	
UMZ12N	200	11.0 to 13.0	5				Yes	
UMZ16N	200	15.85 to 16.51	5				Yes	
UMZ18N	200	17.56 to 18.35	5				Yes	
UMZ27N	200	26.19 to 27.53	5				Yes	
UMZ30N	200	29.19 to 30.69	5				Yes	
UMZ36N	200	35.07 to 36.87	5				Yes	
STZ5.6N	200	5.31 to 5.92	5				Yes	
STZ6.2N	200	5.81 to 6.40	5				Yes	
STZ6.8N	200	6.47 to 7.14	5				Yes	
EMZ6.8E	150	6.47 to 7.14	5			EMD5		Yes
UMZ6.8EN	200	6.47 to 7.14	5			UMD5		Yes
FTZ4.3E	200	4.04 to 4.57	5			SMD5		Yes
FTZ5.6E	200	5.31 to 5.92	5					Yes
FTZ6.8E	200	6.47 to 7.14	5					Yes
FTZ30E	200	29.19 to 30.09	5					Yes

Low Capacitance Protection Devices (TVS)									
Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)	Electrical Characteristics (Ta=25°C)				Package	Equivalent Circuit Diagram	Automotive Grade Available	
	P (mW)	Vz (V)	IZ(mA)	Ct (pF)	f (MHz)				Vs(V)
<b>New</b> VS5V0BA1ES	100	6.0 to 10.0	1	5	1	0	SMD0603		—
UMZU6.2N	200	5.9 to 6.5	5	8	1	0	UMD3		Yes
FTZU6.2E	200	5.9 to 6.5	5	8	1	0	SMD5		Yes
CDZC6.8B	100	6.65 to 6.93	5	3	1	0	VMN2		Yes
CDZCV5.1B	100	4.98 to 5.20	5	5.5	1	0	VMN2M		—
<b>New</b> EDZCV6.8B	150	6.65 to 6.93	5	3	1	0	EMD2		Yes
UDZU5.6B	200	5.49 to 5.73	5	8	1	0	UMD2		Yes
<b>New</b> UDZU6.2	200	5.90 to 6.50	5	8	1	0		Yes	
EMZC6.8N	150	6.47 to 7.14	5	3	1	0	EMD3		Yes
VMZT6.8N	150	6.47 to 7.14	5	7	1	0	VMD3		Yes
UMZC6.8N	200	6.47 to 7.14	5	3	1	0	UMD3		Yes
STZC6.8N	200	6.47 to 7.14	5	3	1	0	SMD3		Yes
RSB12Z	100	9.6 to 14.4	5	1	1	0	VMD3		Yes
RSB12W	150	9.6 to 14.4	5	1	1	0	EMD3		Yes
EMZT6.8E	150	6.47 to 7.14	5	7	1	0	EMD5		Yes
RSB6.8JS2	150	6.0 to 8.0	5	1	1	0	EMD6		Yes
RSB12JS2	150	9.6 to 14.4	5	1	1	0			Yes
RSAC6.8CS	100	6.70 to 7.33	5	0.3	1	0	VMN2		—
RSAC16CS	100	16.49 to 17.51	5	0.3	1	0			—
RSAC18CS	100	18.20 to 19.35	5	0.3	1	0			—
RSAC6.8CM	100	6.70 to 7.33	5	0.3	1	0			VMN2N

\* : (3),(6) pin must be open when using.



ESD Protection Devices (TVS)									
Product No.	Absolute Maximum Ratings (Ta=25°C)	Electrical Characteristics (Ta=25°C)		Peak Pulse Power (W) (tp=10×1000µs)	Package	Equivalent Circuit Diagram	Automotive Grade Available		
	Part No.	P (mW)	Vz (V)					Iz(mA)	
RSA6.1J4	150	6.10 to 7.20	1	10	EMD5		Yes		
RSA6.1EN	200	6.10 to 7.20	1	30	UMD5		Yes		
RSA6.1U5	200	6.10 to 7.20	1	30	SMD6		Yes		
RSA5M	700	6.4 to 7.0	10	200	PMDU		Yes		
RSA12M	700	13.3 to 14.7	1	200			Yes		
RSA5MM	1,000	6.4 to 7.0	10	200			Yes		
RSA12MM	1,000	13.3 to 14.7	1	200			Yes		
RSA5L	1,000	6.45 to 7.14	10	600	PMDS		Yes		
RSA12L	1,000	13.3 to 14.7	1	600			Yes		
RSA30L	1,000	28.5 to 31.5	1	600			Yes		
Bi-Directional Zener Diodes									
Product No.	Absolute Maximum Ratings (Ta=25°C)	Electrical Characteristics (Ta=25°C)		Remarks	Package	Equivalent Circuit Diagram	Automotive Grade Available		
	Part No.	P (mW)	Vz (V)					Iz(mA)	
RSB6.8ZS	100	5.78 to 7.82	1	IEC61000-4-2 150pF,330Ω Contact 8kV Air 15kV	GMD2		Yes		
RSB6.8CS	100	5.78 to 7.82	1		VMN2		Yes		
RSB6.8CM	100	5.78 to 7.82	1		VMN2M		—		
RSB6.8G	100	5.78 to 7.82	1		VMD2		Yes		
RSB5.6SM	150	4.76 to 6.44	1		EMD2		Yes		
RSB6.8SM	150	5.78 to 7.82	1				Yes		
RSB12V	200	10.8 to 13.2	1		UMD2		Yes		
RSB16V	200	14.4 to 17.6	1		UMD2		Yes		
RSB18V	200	16.2 to 19.8	1				Yes		
RSB27V	200	26.2 to 32.0	1				Yes		
RSB33V	200	29.7 to 36.3	1			Yes			
RSB36V	200	32.4 to 39.6	1			Yes			
RSB39V	200	35.1 to 42.9	1		TUMD2	Yes			
RSB16VA	500	14.4 to 17.6	1			Yes			
☆RSB18VA	500	16.2 to 19.8	1		Yes				
☆RSB27VA	500	26.2 to 32.0	1		Yes				
RSB6.8F2	200	5.78 to 7.82	1		UMD3		Yes		
RSB16F2	200	14.4 to 17.6	1				Yes		
RSB18F2	200	16.2 to 19.8	1				Yes		
RSB27F2	200	26.2 to 32.0	1				Yes		
RSB33F2	200	29.7 to 36.3	1	Yes					
RSB36F2	200	32.4 to 39.6	1	Yes					
RSB39F2	200	35.1 to 42.9	1	Yes					
RSB27K2	200	26.2 to 32.0	1	UMD4		Yes			
RSB16X3N	200	14.4 to 17.6	1	UMD6		Yes			
Ultra Low Capacitance Bi-Directional Zener Diodes									
Product No.	Absolute Maximum Ratings (Ta=25°C)	Electrical Characteristics (Ta=25°C)				Package	Equivalent Circuit Diagram	Automotive Grade Available	
	Part No.	P (mW)	Vz (V)	Iz(mA)	Ct (pF)				f (MHz)
RSBC6.8CS	100	6.62 to 7.24	5	1	1	0	VMN2		Yes

☆ : Under development



# Switching Diodes

## Quick Reference for Switching Diodes

V <sub>R</sub> (V)	Package																
	1006 Size	1406 Size	1212 Size	1608 Size	1616 Size			1616 Size			2512 Size	2120 Size				2928 Size	
	VMN2 (SOD923)	VMD2 (SOD723)	VMD3 (SOT723)	EMD2 (SOD523)	EMD3 (SOT523)	EMD3F (SOT490)	EMD4 (SOT543)	EMD6 (SOT563)	UMD2 (SOD323F)	UMD3 (SOT323)	UMD3F	UMD4 (SOT343)	UMD5 (SOT353)	UMD6 (SOT363)	SMD3 (SOT346)	SMD5 (SOT25)	SMD6 (SOT457)
20			DA221M		DA221										DA204K		
40									1SS380								
80 to 90	1SS400CS	1SS400G	DAN222M DAP222M	1SS400SM	DAN217W DAN222 DAP222 ☆DA228W	DAN222WM DAP222WM	DA227Y	EMN11 EMP11	1SS355VM	DA228U DAN202U DAN217U DAP202U DA380U	DAN202UM DAP202UM DAN217UM	DA227	UMN11N UMP11N	UMN10N UMN11N UMP11N UMR11N UMR12N UMN20N	DA228K DAN202K DAN217 DAP202K	FMP1	IMN10 IMN11 IMP11

☆ : Under Development

High-speed type																
Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)*					Electrical Characteristics (Ta=25°C)*								Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>FM</sub> (mA)	I <sub>O</sub> (mA)	I <sub>surge</sub> (mA)	V <sub>F</sub> (V) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	V <sub>R</sub> (V)	I <sub>F</sub> (mA)				
1SS400CS	90	80	—	100	500(1s)	1.2	100	0.1	80	4	6	10	VMN2		Yes	
1SS400G	90	80	—	100	500(1s)	1.2	100	0.1	80	4	6	10	VMD2		Yes	
1SS400SM	90	80	225	100	500(1s)	1.2	100	0.1	80	4	6	10	EMD2		Yes	
1SS355VM	90	80	225	100	500(1s)	1.2	100	0.1	80	4	6	10	UMD2	Yes		
DAN222M	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	VMD3		Yes	
DAN222	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD3		Yes	
DAN222WM	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD3F		Yes	
DAN202U	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD3		Yes	
DAN202UM	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD3F		Yes	
DAN202K	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD3		Yes	
DAP222M	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	VMD3		Yes	
DAP222	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD3		Yes	
DAP222WM	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD3F		Yes	
DAP202U	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD3		Yes	
DAP202UM	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD3F		Yes	
DAP202K	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD3		Yes	
DA221M	20	20	200	100	300(1μs)	1	10	0.1	15	—	—	—	VMD3		Yes	
DA221	20	20	200	100	300(1μs)	1	10	0.1	15	—	—	—	EMD3		Yes	
DAN217W	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD3		Yes	
☆DA228W	80	80	200	100	300(1μs)	1.2	100	0.1	80	—	—	—	UMD3		Yes	
DA204U	20	20	200	100	300(1μs)	1	10	0.1	15	—	—	—	UMD3		Yes	
DAN217U	80	80	300	100	4000(1μs)	1.2	100	0.2	70	4	6	5	UMD3F		Yes	
DAN217UM	80	80	300	100	4000(1μs)	1.2	100	0.2	70	4	6	5	UMD3F		Yes	
DA228U	80	80	200	100	300(1μs)	1.2	100	0.1	80	—	—	—	UMD3		Yes	
DAN217	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD3		Yes	
DA228K	80	80	200	100	300(1μs)	1.2	100	0.1	80	—	—	—	SMD3		Yes	
DA204K	20	20	200	100	300(1μs)	1	10	0.1	15	—	—	—	SMD3		Yes	
UMN11N	80	80	80	25	250(1μs)	0.9	5	0.1	70	4	6	5	UMD5			Yes
FMP1	80	80	80	25	250(1μs)	0.9	5	0.1	70	4	6	5	SMD5	Yes		
UMP11N	80	80	80	25	250(1μs)	0.9	5	0.1	70	4	6	5	SMD5	Yes		
FMP1	80	80	80	25	250(1μs)	0.9	5	0.1	70	4	6	5	SMD5		Yes	
EMN11	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD6		Yes	
UMN11N	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD6		Yes	
IMN11	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD6		Yes	
EMP11	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	EMD6		Yes	
UMP11N	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD6		Yes	
IMP11	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD6	Yes		
UMR11N	80	80	300	100	400(1μs)	1.2	100	0.1	70	4	6	5	UMD6		Yes	
UMR12N	80	80	200	100	300(1μs)	1.2	100	0.1	80	—	—	—	UMD6		Yes	
DA227Y	80	80	300	100	400(1μs)	1.2	100	0.1	70	4	6	5	EMD4		Yes	
DA227	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD4		Yes	
UMN10N	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	UMD6		Yes	
IMN10	80	80	300	100	4000(1μs)	1.2	100	0.1	70	4	6	5	SMD6		Yes	












Low Leak type																
Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)					Electrical Characteristics (Ta=25°C)								Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>FM</sub> (mA)	I <sub>O</sub> (mA)	I <sub>surge</sub> (mA)	V <sub>F</sub> (V) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	V <sub>R</sub> (V)	I <sub>F</sub> (mA)				
1SS380	40	35	225	100	400(1s)	1.2	100	0.01	20	—	—	—	UMD2		Yes	
DA380U	80	80	225	100	400(1s)	1.2	100	0.01	20	—	—	—	UMD3		Yes	
UMN20N	80	80	225	100	400(1s)	1.2	100	0.01	20	—	—	—	UMD6		Yes	

\* : Value / Chip



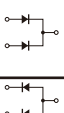
☆ : Under Development

# High Frequency Diodes




## Quick Reference for High Frequency Diodes

	V <sub>R</sub> (V)	Package										
		0603 Size	1006 Size	1406 Size	1608 Size	1616 Size	1616 Size	2512 Size	2120 Size	2928 Size	1608 Size	2408 Size
												
		GMD2 (SOD962)	VMN2 (SOD923)	VMD2 (SOD723)	EMD2 (SOD523)	EMD3 (SOT523)	EMD4 (SOT543)	UMD2 (SOD323F)	UMD3 (SOT323)	SMD3 (SOT346)	HMD8	HMD12
Band Switching Diodes	35				1SS390	DAN235E		1SS356	DAN235U DAP236U			
PIN Diodes	30		RN242CS RN262CS	RN262G							RN142ZS8A	RN142ZS12A
	50			RN141G	RN141S			RN731V RN771V	RN739F RN779F	RN779D		
	60	RN142ZS		RN142G	RN142S							
Detection Schottky Diodes	3							RB851Y				
	5		RB886CS	RB886G		RB876W	RB861Y					
	15						RB886Y					






### Band Switching Diodes

Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)*				Electrical Characteristics (Ta=25°C)*						Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>R</sub> (V)	T <sub>J</sub> (°C)	T <sub>stg</sub> (°C)	C <sub>t</sub> (pF) Max.			r <sub>F</sub> (Ω) Max.						
				V <sub>R</sub> (V)	f (MHz)		I <sub>F</sub> (mA)	f (MHz)					
1SS390	35	125	-55 to +125	1.2	6	1	0.9	2	100	EMD2		Yes	
1SS356	35	125	-55 to +125	1.2	6	1	0.9	2	100	UMD2		Yes	
DAN235E	35	125	-55 to +125	1.2	6	1	0.9	2	100	EMD3		Yes	
DAN235U	35	125	-55 to +125	1.2	6	1	0.9	2	100	UMD3		Yes	
DAP236U	35	125	-55 to +125	1.2	6	1	0.9	2	100	UMD3		Yes	

### PIN Diodes

Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)*				Electrical Characteristics (Ta=25°C)*						Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>R</sub> (V)	I <sub>F</sub> (mA)	T <sub>J</sub> (°C)	T <sub>stg</sub> (°C)	C <sub>t</sub> (pF) Max.			r <sub>F</sub> (Ω) Max.					
					V <sub>R</sub> (V)	f (MHz)		I <sub>F</sub> (mA)	f (MHz)				
RN142ZS	30	50	150	-55 to +150	0.45	1	1	2.5	3	100	GMD2		—
RN242CS	30	100	150	-55 to +150	0.35	1	1	3	3	100	VMN2		—
RN262CS	30	100	150	-55 to +150	0.4	1	1	2.8	3	100			—
RN262G	30	100	150	-55 to +150	0.35	1	1	2.8	3	100			—
RN141G	50	100	150	-55 to +150	0.8	1	1	2	3	100	VMD2		—
RN142G	60	100	150	-55 to +150	0.45	1	1	3	3	100			—
RN141S	50	100	150	-55 to +150	0.8	1	1	2	3	100	EMD2		—
RN142S	60	100	150	-55 to +150	0.45	1	1	3	3	100			—
RN731V	50	50	125	-55 to +150	0.4	35	1	7	10	100	UMD2		Yes
RN771V	50	50	150	-55 to +150	0.9	35	1	7	10	100			Yes
RN739F	50	50	125	-55 to +150	0.4	35	1	7	10	100	UMD3		Yes
RN779F	50	50	150	-55 to +150	0.9	35	1	7	10	100			Yes
RN779D	50	50	150	-55 to +150	0.9	35	1	7	10	100	SMD3	Yes	
RN142ZS8A	30	50	150	-55 to +150	0.45	1	1	2.5	3	100	HMD8		—
RN142ZS12A	30	50	150	-55 to +150	0.45	1	1	2.5	3	100	HMD12		—

### Detection Schottky Diodes

Product No. Part No.	Absolute Maximum Ratings (Ta=25°C)*				Electrical Characteristics (Ta=25°C)*						Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>R</sub> (V)	I <sub>F</sub> (mA)	T <sub>J</sub> (°C)	T <sub>stg</sub> (°C)	V <sub>F</sub> (V) Max.			C <sub>t</sub> (pF) Max.					
					I <sub>F</sub> (mA)	f (MHz)		V <sub>R</sub> (V)	f (MHz)				
RB886CS	5	10	125	-40 to +125	0.35	1	—	0.8	1	1	VMN2		—
RB886G	5	10	125	-40 to +125	0.35	1	—	0.8	1	1	VMD2		—
RB876W	5	10	125	-40 to +125	0.35	1	—	0.8	1	1	EMD3		—
RB886Y	15	10	125	-40 to +125	0.35	1	—	0.8	1	1	EMD4		—
RB851Y	3	30	125	-40 to +125	0.46	1	—	0.8	0	1			—
RB861Y	5	10	125	-40 to +125	0.3	1	—	1.1	0	1			—


\* : Value / Chip




C

Diodes

# JEDEC and Euro Standard Diodes

## ● Quick Reference for JEDEC and Euro Standard Diodes

Application	V <sub>RM</sub> (V)	Surface Mount Type
		2913 Size
		
		SSD3 (SOT23)
Switching Diodes	75	<b>BAV70</b>
	80 to 100	<b>BAV99</b>
		<b>BAW56</b>

JEDEC and Euro Standard Diodes															
Product No. Part No.	Absolute Maximum Ratings (Ta=25°C) <sup>*1</sup>					Electrical Characteristics (Ta=25°C) <sup>*1</sup>							Package	Equivalent Circuit Diagram	Automotive Grade Available
	V <sub>RM</sub> (V)	V <sub>R</sub> (V)	I <sub>FM</sub> (mA)	I <sub>O</sub> (mA)	I <sub>surge</sub> (mA)	V <sub>F</sub> (V) Max.	I <sub>F</sub> (mA)	I <sub>R</sub> (μA) Max.	V <sub>R</sub> (V)	t <sub>rr</sub> (ns) Max.	I <sub>R</sub> (mA) <sup>*2</sup>	I <sub>F</sub> (mA)			
<b>BAV70</b>	75	70	450	215 (IF)	4000 (1μs)	1.25	150	2.5	70	4	10	10	SSD3		Yes
<b>BAW56</b>	85	75	450	215 (IF)	4000 (1μs)	1.25	150	1	75	4	10	10	SSD3		Yes
<b>BAV99</b>	85	75	450	215 (IF)	4000 (1μs)	1.25	150	1	75	4	10	10	SSD3		Yes

\*1 : Value / Chip    \*2 : I<sub>F</sub> = I<sub>R</sub> = 10mA

# Packages

## ■ Dimensions (Unit : mm)

### Surface Mount Type

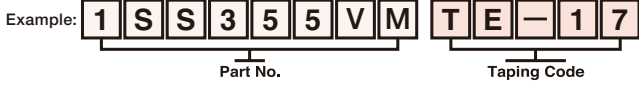
<p><b>SMD0603</b></p> <p>Cathode Mark</p> <p>0.280±0.010 0.190±0.010 0.260±0.010 0.380±0.010 0.600±0.010 0.300±0.010 0.010 0.010</p>	<p><b>GMD2 (SOD962)</b></p> <p>0.3 0.3 0-0.03 0.27 0.19</p>	<p><b>VML2</b></p> <p>0.60 0.45 0-0.03 0.75 0.15 0.50</p>	<p><b>VMN2 (SOD923)</b></p> <p>0.6 0.3 0.16 0.37 0.4Max 0.05 0.23</p>	<p><b>VMN2M</b></p> <p>CATHODE MARK</p> <p>0.37±0.03 0.85±0.05 1.00±0.05 0.22±0.05 0.60±0.05 0.26±0.05 0.10-0.10 0.16±0.05</p>
<p><b>VMD2 (SOD723) (SC-104A)</b></p> <p>0.6 0.3 1.4 0.27 0.5 0.25</p>	<p><b>VMD3 (SOT723) (SC-105AA)</b></p> <p>0.8 0.4 0.4 0.22 0.2 0.2 0.2 0.2 0.5 0-0.1 0.13 0.3</p>	<p><b>KMD2</b></p> <p>1.6 0.6 0.7 0.4 0.3 1.2</p>	<p><b>EMD2 (SOD523) (SC-79)</b></p> <p>0.8 0.6 1.2 1.6 0.3 0.12 0.3</p>	<p><b>EMD3 (SOT523) (SC-75A)</b></p> <p>1.6 1.0 0.5 0.5 0.2 0.8 1.6 0.7 0-0.1 0.15 0.1Min.</p>
<p><b>EMD3F (SOT490) (SC-81)</b></p> <p>1.6 0.85 0.26 1.0 0.7 0.13</p>	<p><b>EMD4 (SOT543) (SC-107A)</b></p> <p>1.0 0.5 0.5 0.22 0.2 0.2 0.2 0.2 0.5 0-0.1 0.13 0.3</p> <p>Each lead has same dimensions</p>	<p><b>EMD5 (SOT553) (SC-107BB)</b></p> <p>1.0 0.5 0.5 0.22 0.2 0.2 0.2 0.2 0.5 0-0.1 0.13 0.3</p> <p>Each lead has same dimensions</p>	<p><b>EMD6 (SOT563) (SC-107C)</b></p> <p>1.0 0.5 0.5 0.22 0.2 0.2 0.2 0.2 0.5 0-0.1 0.13 0.3</p> <p>Each lead has same dimensions</p>	<p><b>UMD2 (SOD323F) (SC-90/A)</b></p> <p>1.25 1.7 2.5 0.7 0.1 0.52</p>
<p><b>UMD3 (SOT323) (SC-70)</b></p> <p>2.0 1.3 0.65 0.65 1.25 2.1 0.9 0-0.1 0.15 0.1Min.</p>	<p><b>UMD3F (SC-85)</b></p> <p>2.0 0.32 2.1 1.25 1.3 0.9 0.13</p>	<p><b>UMD4 (SOT343) (SC-82)</b></p> <p>2.0 1.3 0.65 0.65 1.25 2.1 0.9 0-0.1 0.15 0.1Min.</p> <p>Each lead has same dimensions</p>	<p><b>UMD5 (SOT353) (SC-88A)</b></p> <p>2.0 1.3 0.65 0.65 1.25 2.1 0.9 0-0.1 0.15 0.1Min.</p>	<p><b>UMD6 (SOT363) (SC-88)</b></p> <p>2.0 1.3 0.65 0.65 1.25 2.1 0.9 0-0.1 0.15 0.1Min.</p> <p>Each lead has same dimensions</p>
<p><b>SMD3 (SOT346) (SC-59)</b></p> <p>2.9 1.9 0.95 0.95 1.6 2.8 1.1 0-0.1 0.15 0.3-0.6</p>	<p><b>SMD5 (SOT25) (SC-74A)</b></p> <p>2.9 1.9 0.95 0.95 1.6 2.8 1.1 0-0.1 0.15 0.3-0.6</p>	<p><b>SMD6 (SOT457) (SC-74)</b></p> <p>2.9 1.9 0.95 0.95 1.6 2.8 1.1 0-0.1 0.15 0.3-0.6</p> <p>Each lead has same dimensions</p>	<p><b>TSMD5 (SOT23-5)</b></p> <p>2.9 1.9 0.95 0.95 1.6 2.8 1.1 0-0.1 0.15 0.3-0.6 1.0MAX 0.85 0.7</p>	<p><b>TSMD6 (SOT23-6) (SC-95)</b></p> <p>2.9 1.9 0.95 0.95 1.6 2.8 1.1 0-0.1 0.15 0.3-0.6 1.0MAX 0.85 0.7 0.3-0.6</p> <p>Each lead has same dimensions</p>
<p><b>TSMD8 (SOT23-8)</b></p> <p>3.0 2.8 2.4 0.65 0.32 0.8 0.17</p> <p>Each lead has same dimensions</p>	<p><b>TUMD2</b></p> <p>1.3 1.9 0.8 0.6 0.17 0.3 0.2 1.45</p>	<p><b>TUMD2S</b></p> <p>1.3 1.9 2.5 0.8 0.6 0.17 0.3 0.2</p>	<p><b>TUMD2M</b></p> <p>CATHODE MARK</p> <p>1.40 0.17 0.2-0.10 2.00 2.50 0.80 1.00 1.50 0.29 0.40</p>	<p><b>TUMD2SM</b></p> <p>CATHODE MARK</p> <p>1.40±0.10 0.17 +0.10 -0.05 0.2-0.10 2.00±0.10 2.50±0.20 0.80±0.05 1.00 1.50 0.29 0.40±0.10 0.4±0.10</p>
<p><b>TUMD5</b></p> <p>2.0 1.3 0.85Max. 0.77 1.0 2.1 0.17 0.3</p>	<p><b>PMDU (SOD123)</b></p> <p>1.6 0.80 2.6 3.5 0.9 0.1</p>	<p><b>PMDS (SOD106)</b></p> <p>2.6 2.0 1.5 0.1 1.2</p>	<p><b>HMD8</b></p> <p>0.8 0.3 0-0.03 0.23 0.18 0.4</p>	<p><b>HMD12</b></p> <p>0.8 0.3 0-0.03 0.23 0.18</p>

< > : JEDEC Code, ( ) : JEITA Code

# Part No. Explanation

- When ordering, specify the part number.
- Check each code against the tables shown below.
- Fill in from the left, leaving any extra boxes empty on the right.

### • Small signal / rectifier diode



### • Zener diode



### • Packaging type

Package	Code	Package style	Direction	Basic ordering unit (pcs)
SMD0603	T15R	Embossed tape	Cathode on sprocket hole side	15,000
	T2R	Embossed tape	Cathode on sprocket hole side	8,000
GMD2	T2N	Embossed tape	Cathode on sprocket hole side	8,000
			Non-direction	
VML2	T2R	Embossed tape	Cathode on sprocket hole side	8,000
VMN2	T2RA	Embossed tape	Cathode on sprocket hole side	8,000
VMN2M	T2R	Embossed tape	Cathode on sprocket hole side	8,000
VMD2	T2R	Embossed tape	Cathode on sprocket hole side	8,000
KMD2	T2R	Embossed tape	Cathode on sprocket hole side	8,000
VMD3	T2L	Embossed tape	One terminal on sprocket hole side	8,000
EMD2	TE61	Embossed tape	Cathode on sprocket hole side	3,000
	T2R	Embossed tape	Cathode on sprocket hole side	8,000
	T2N	Embossed tape	Cathode on sprocket hole side	8,000
		Non-direction		
EMD3	TL	Embossed tape	One terminal on sprocket hole side	3,000
EMD3F	TL	Embossed tape	One terminal on sprocket hole side	3,000
EMD4 EMD5 EMD6	T2R	Embossed tape	Cathode on sprocket hole side	8,000
UMD2	TE-17	Embossed tape	Cathode on sprocket hole side	3,000
	TW11*1			
UMD3	T106	Embossed tape	One terminal on sprocket hole side	3,000
UMD3F	TL	Embossed tape	One terminal on sprocket hole side	3,000
UMD4	TL	Embossed tape	Cathode on sprocket hole side (DA227)	3,000
UMD5	TR	Embossed tape	Three terminals on sprocket hole side	3,000
UMD6	TR	Embossed tape	Cathode on sprocket hole side	3,000
UMD6	TN	Embossed tape	Non-direction	3,000
	★TR*2	Embossed tape	Cathode on sprocket hole side	
SSD3	T116	Embossed tape	One terminal on sprocket hole side	3,000
SMD3	T146	Embossed tape	One terminal on sprocket hole side	3,000
SMD5	T148	Embossed tape	Three terminals on sprocket hole side	3,000
SMD6	T108*3	Embossed tape	Anode on sprocket hole side	3,000
	T110	Embossed tape	Non-direction	
TSMD5	TR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TSMD6	TR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TSMD8	TR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
TUMD2	TR	Embossed tape	Cathode on sprocket hole side	3,000
TUMD2S	TR	Embossed tape	Cathode on sprocket hole side	3,000
TUMD2M	TR	Embossed tape	Cathode on sprocket hole side	3,000
TUMD2SM	TR	Embossed tape	Cathode on sprocket hole side	3,000
TUMD5	TR	Embossed tape	Terminal No.1 on sprocket hole side	3,000
PMDU	TR	Embossed tape	Cathode on sprocket hole side	3,000
PMDS	TE25	Embossed tape	Cathode on sprocket hole side	1,500
HMD8	TE61	Embossed tape	Cathode on sprocket hole side	3,000
HMD12	TE61	Embossed tape	Cathode on sprocket hole side	3,000
TSMD8	TR	Embossed tape	Terminal No.1 on sprocket hole side	3,000

Notes:\*1 Regarding the UMD2 package, only 1SS356 is available in TW11.  
 \*2 Regarding the UMD6 package, only RB731XN is offered in TR.  
 \*3 Regarding the SMD6 package, only IMN10 and RB731U are available in T108.  
 ★Available outside Japan



## Passive Devices

# Resistors

### CONTENTS

- **Quick Reference of Resistance Range** ..... P. D2
- **Class-leading Compact Size Chip Resistors (RASMID™ series)**
  - Ultra-Compact Chip Resistors (SMR 003 <009005>) ..... P. D3
- **Thick Film Chip Resistors (Standard series)**
  - Compact Chip Resistors (MCR series <01005 to 0805>) ..... P. D4
  - Chip Resistors (MCR series <1206 to 2512>) ..... P. D5
  - Compact Chip Resistor Networks (MNR series <0402×2 to 1206×4>) ..... P. D6
  - 8-element Chip Resistor Networks (MNR series <0603×5 to 1206×5>) ..... P. D7
- **Thick Film Chip Resistors (High reliability series)**
  - High Anti-surge Chip Resistors (SDR series) ..... P. D8
  - Anti-surge Chip Resistors (ESR series) ..... P. D8
  - High Power Chip Resistors <Wide Terminal type> (LTR series) ..... P. D9
  - High Voltage Resistance Chip Resistors (KTR series) ..... P. D10
- **Thick Film Chip Resistors (Low Ohmic type)**
  - Chip Resistors (Low Ohmic MCR series) ..... P. D11
  - Low Ohmic Chip Resistors <Face down type> (UCR series) ..... P. D12
  - High Power Chip Resistors <Wide Terminal type> (Low Ohmic LTR series) ..... P. D13
- **Chip Resistors for Current Detection (Metal plate type)**
  - Ultra Low Ohmic Chip Shunt Resistors (PMR series) ..... P. D14
  - Ultra Low Ohmic Chip Shunt Resistors <Wide Terminal type> (PML series) ..... P. D15
  - High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series) ..... P. D16
  - High Power Low Ohmic Chip Shunt Resistors (GMR series) ..... P. D17
- **Standard Nominal Resistance Values** ..... P. D18

ISO9001- / ISO / TS 16949-approved

## Quick Reference of Resistance Range

### Low Ohmic Resistor Lineup

Part No. / mm[inch] / Page

PSR GMR PML PMR Metal Strip UCR LTR MCR Thick Film

Rated Power (W)	Resistance[Ω]						
	0.1m	1m	10m	100m	1	10	
5	0.2m PSR500 / 15×7.75[5931] / P.D16 2m						
4	0.3m PSR400 / 10×5.2[3921] / P.D16 3m						
3	10m ☆GMR100 / 6432[2512] / P.D17 220m						
2	PML100 / 6432[2512] / P.D15 1m 2.2m 1m PMR100 / 6432[2512] / P.D14 10m 100m LTR100 / 6432[2512] / P.D13 910m						
1.5	☆PML50 / 5025[2010] / P.D15 0.5m 2.2m 1m PMR50 / 5025[2010] / P.D14 10m						
1	PMR25 / 3225[1210] / P.D14 1m 5m 47m MCR100 / 6432[2512] / P.D11 9.1 1m PMR18 / 3216[1206] / P.D14 10m 10m LTR18 / 3216[1206] / P.D13 1 PML18 / 3216[1206] / P.D15 0.5m 2.5m						
0.66	PML10 / 2012[0805] / P.D15 1m 2.5m						
1/2	47m MCR50 / 5025[2010] / P.D11 9.1 47m MCR25 / 3225[1210] / P.D11 9.1 11m UCR18 / 3216[1206] / P.D12 100m 2m PMR10 / 2012[0805] / P.D14 10m 47m LTR10 / 2012[0805] / P.D13 9.1						
1/3	11m UCR10 / 2012[0805] / P.D12 100m						
1/4	47m MCR18 / 3216[1206] / P.D11 9.1 47m MCR10 / 2012[0805] / P.D11 9.1 PMR03 / 1608[0603] / P.D14 10m 20m UCR03 / 1608[0603] / P.D12 200m						
1/5	PMR01 / 1005[0402] / P.D14 10m UCR03 / 1608[0603] / P.D12 220m 910m						
1/8	68m UCR01 / 1005[0402] / P.D12 910m						
1/10	100m UCR006 / 0603[0201] / P.D12 910m MCR03 / 1608[0603] / P.D11 1 9.1						
1/16	MCR01 / 1005[0402] / P.D11 1 9.1						
1/20	MCR006 / 0603[0201] / P.D11 1 9.1						

☆: Under Development

### 1 Ω or more Resistor Lineup

Part No. / mm[inch] / Page

ESR SDR KTR LTR MCR SMR Thick Film

Rated Power (W)	Resistance[Ω]									
	1	10	100	1K	10K	100K	1M	10M	30M	
2	LTR100 / 6432[2512] / P.D9 1M									
1	LTR50 / 5025[2010] / P.D9 1M									
0.75	MCR100 / 6432[2512] / P.D5 100K 1M									
1/2	LTR18 / 3216[1206] / P.D9 1M MCR50 / 5025[2010] / P.D5 560K									
2/5	ESR25 / 3225[1210] / P.D8 10M 30M ESR10 / 2012[0805] / P.D8 30M									
1/3	KTR25 / 3225[1210] / P.D10 10M ESR18 / 3216[1206] / P.D8 15M									
1/4	MCR25 / 3225[1210] / P.D5 3.3M MCR18 / 3216[1206] / P.D5 10M KTR18 / 3216[1206] / P.D10 15M LTR10 / 2012[0805] / P.D9 1M									
1/5	SDR03 / 1608[0603] / P.D8 10M ESR03 / 1608[0603] / P.D8 10M ESR01 / 1005[0402] / P.D8 10M									
1/8	MCR10 / 2012[0805] / P.D4 10M KTR10 / 2012[0805] / P.D10 30M									
1/10	MCR03 / 1608[0603] / P.D4 10M KTR03 / 1608[0603] / P.D10 10M									
1/16	MCR01 / 1005[0402] / P.D4 10M									
1/20	MCR006 / 0603[0201] / P.D4 10M									
1/32	MCR004 / 0402[01005] / P.D4 3M									
1/50	10 SMR003 / 03015[009005] / P.D3 1M									



# Class-leading Compact Size Chip Resistors (RASMID™ series) Ultra-Compact Chip Resistors (SMR003 <009005>)

- Original process technology ensures greater accuracy
- Chip dimensional precision improved from  $\pm 20\mu\text{m}$  to  $\pm 10\mu\text{m}$
- Gold electrodes utilized for superior solderability and reliability



## SMR003 <009005>

Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
New SMR003	03015 (009005)	0.020W	10	J ( $\pm 5\%$ )	$\pm 200$	10 to 1M $\Omega$ (E24 Series)	-55 to +125	—
				F ( $\pm 1\%$ )				

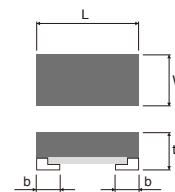
## Jumper type

Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range (°C)	Automotive Grade Available
SMR003	03015 (009005)	0.5A	50m $\Omega$ Max.	-55 to +125	—

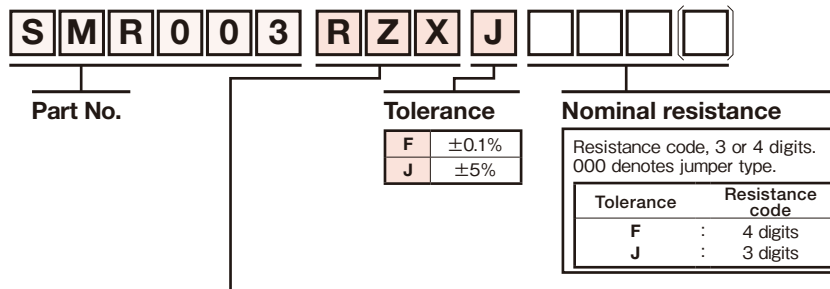
## Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
SMR003	03015 (009005)	0.30 $\pm$ 0.01	0.15 $\pm$ 0.01	0.11 $\pm$ 0.01	—	0.07 $\pm$ 0.01

## SMR003



## Part No. Explanation



## Packaging specifications Code

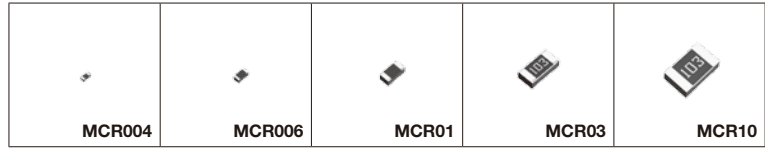
Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J ( $\pm 5\%$ )	F ( $\pm 1\%$ )			
SMR003	RZX	○	○	Embossed tape (1mm Pitch)	$\phi 180\text{mm}$ (7inch)	40,000

Reel ( $\phi 180\text{mm}$ ) : Compatible with JEITA standard "EIAJ ET-7200B"  
 ○ : Standard product

※ RASMID™ : ROHM's proprietary new method that enables superior dimensional precision, making it possible to develop the ultra-compact products  
 RASMID™ is registered trademarks of ROHM Co Ltd.

## Thick Film Chip Resistors (Standard series) Compact Chip Resistors (MCR series <01005 to 0805>)

- High reliability chip resistors optimized for a variety of applications.
- Nine package sizes, ranging from 01005 to 2512.
- Market-proven reliability.



MCR series <01005 to 0805>								
Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
MCR004	0402 (01005)	1/32W (0.031W)	15	J (±5%)	+600/−100 ±300 ±250	1.0Ω to 9.1Ω (E24 Series) 10Ω to 91Ω (E24 Series) 100Ω to 3MΩ (E24 Series)	−55 to +125	—
				F (±1%)	±300 ±250	10Ω to 91Ω (E24,96 Series) 100Ω to 3MΩ (E24,96 Series)		
MCR006	0603 (0201)	1/20W (0.05W)	25	J (±5%)	+600/−200 ±250	1.0Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	−55 to +125	Preparing
				F (±1%)	±250	10Ω to 10MΩ (E24,96 Series)		
				D (±0.5%)	±200 ±100	10Ω to 910Ω (E24,96 Series) 1kΩ to 1MΩ (E24,96 Series)		
MCR01	1005 (0402)	1/16W (0.063W)	50	J (±5%)	+500/−250 ±200	1.0Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	−55 to +125	Yes
				F (±1%)	±100	10Ω to 2.2MΩ (E24,96 Series)		
				D (±0.5%)	±100 ±50	10Ω to 91Ω (E24,96 Series) 100Ω to 1MΩ (E24,96 Series)		
MCR03	1608 (0603)	1/10W (0.1W)	50	J (±5%)	±400 ±200	1.0Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	−55 to +155	Yes
				FX (±1%)	±100	10Ω to 10MΩ (E24,96 Series)		
				D (±0.5%)	±100 ±50	10Ω to 91Ω (E24,96 Series) 100Ω to 1MΩ (E24,96 Series)		
MCR10	2012 (0805)	1/8W (0.125W)	150	J (±5%)	±400 ±200	1.0Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	−55 to +155	Yes
				F (±1%)	±100	10Ω to 2.2MΩ (E24,96 Series)		
		D (±0.5%)		±100 ±50	10Ω to 91Ω (E24,96 Series) 100Ω to 1MΩ (E24,96 Series)			

※E24 : Standard products E96 : Custom products

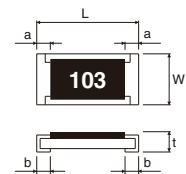
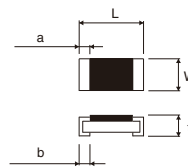
Jumper type					
Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range (°C)	Automotive Grade Available
MCR004	0402 (01005)	0.5A	50mΩ Max.	−55 to +125	—
MCR006	0603 (0201)	0.5A			Preparing
MCR01	1005 (0402)	1A		Yes	
MCR03	1608 (0603)	1A	−55 to +155	Yes	
MCR10	2012 (0805)	2A		Yes	

### Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
MCR004	0402 (01005)	0.4 ± 0.02	0.2 ± 0.02	0.13 ± 0.02	0.1 ± 0.03	0.1 ± 0.03
MCR006	0603 (0201)	0.6 ± 0.03	0.3 ± 0.03	0.23 ± 0.03	0.1 ± 0.05	0.15 ± 0.05
MCR01	1005 (0402)	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.1	0.25 +0.05 −0.10
MCR03	1608 (0603)	1.6 ± 0.1	0.8 ± 0.1	0.45 ± 0.1	0.3 ± 0.2	0.3 ± 0.2
MCR10	2012 (0805)	2.0 ± 0.1	1.25 ± 0.1	0.55 ± 0.1	0.4 ± 0.2	0.4 ± 0.2

- MCR004/006/01
- MCR03 (Partially marked)

- MCR10



### Part No. Explanation



Part No.

Tolerance

Nominal resistance

D	±0.5%
F	±1%
J	±5%

J is also used for jumper

Tolerance	Resistance code
D, F	: 4 digits
J	: 3 digits

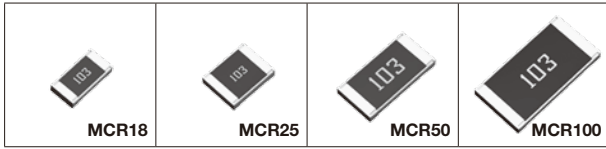
Resistance code, 3 or 4 digits.  
000 denotes jumper type.

### Packaging specifications Code

Part No.	Code	Tolerance			Packaging specifications	Reel	Basic ordering unit (pcs)	Remarks
		J (±5%)	F (±1%)	D (±0.5%)				
MCR004	YZP	○	○	—	Paper tape (2mm Pitch)	φ180mm (7inch)	15,000	—
MCR006	YZP	○	○	○	Paper tape (2mm Pitch)	φ180mm (7inch)	15,000	—
MCR01	MZP	○	○	○	Paper tape (2mm Pitch)	φ180mm (7inch)	10,000	—
MCR03	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	—
MCR10	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	—

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product

# Thick Film Chip Resistors (Standard series) Chip Resistors (MCR Series <1206 to 2512>)



MCR Series <1206 to 2512>								
Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
MCR18	3216 (1206)	1/4W (0.25W) 1/8W (0.125W)	200	J (±5%)	±400 ±200	1.0Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	-55 to +155	Yes
				F (±1%)	±100	10Ω to 2.2MΩ (E24,96 Series)		
				D (±0.5%)	±100 ±50	10Ω to 91Ω (E24,96 Series) 100Ω to 1MΩ (E24,96 Series)		
MCR25	3225 (1210)	1/4W (0.25W)	200	J (±5%)	500±350 ±500 ±200	1.0Ω to 2.0Ω (E24 Series) 2.2Ω to 5.1Ω (E24 Series) 5.6Ω to 3.3MΩ (E24 Series)		
				F (±1%)	±100	10Ω to 1.0MΩ (E24,96 Series)		
MCR50	5025 (2010)	1/2W (0.5W)	200	J (±5%)	500±350 ±500 ±200 ±350	1.0Ω to 2.0Ω (E24 Series) 2.2Ω to 9.1Ω (E24 Series) 10Ω to 330kΩ (E24 Series) 360kΩ to 560kΩ (E24 Series)		
				F (±1%)	±100	10Ω to 180kΩ (E24,96 Series)		
MCR100	6432 (2512)	1W	200	J (±5%)	500±350 ±500 ±350 ±200	1.0Ω to 2.0Ω (E24 Series) 2.2Ω to 9.1Ω (E24 Series) 10Ω to 22Ω (E24 Series) 24Ω to 100kΩ (E24 Series)	-55 to +125	Yes
				F (±1%)	±100	10Ω to 82kΩ (E24,96 Series)		

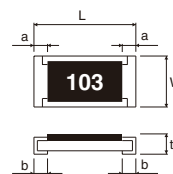
※E24 : Standard products E96 : Custom products

Jumper type					
Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range (°C)	Automotive Grade Available
MCR18	3216 (1206)	2A	50mΩ Max.	-55 to +155	Yes
MCR25	3225 (1210)	2A			Yes
MCR50	5025 (2010)	3A			Yes
MCR100	6432 (2512)	4A		-55 to +125	Yes

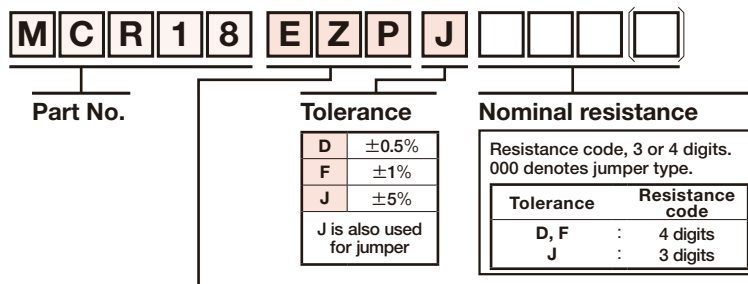
## Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
MCR18	3216 (1206)	3.2±0.15	1.6±0.15	0.55±0.1	0.5±0.25	0.5±0.25
MCR25	3225 (1210)	3.2±0.15	2.5±0.15	0.55±0.15	0.5±0.25	0.5±0.25
MCR50	5025 (2010)	5.0±0.15	2.5±0.15	0.55±0.15	0.6±0.25	0.6±0.25
MCR100	6432 (2512)	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.25	0.6±0.25

### ●MCR18/25/50/100



## Part No. Explanation



## Packaging Specifications Code

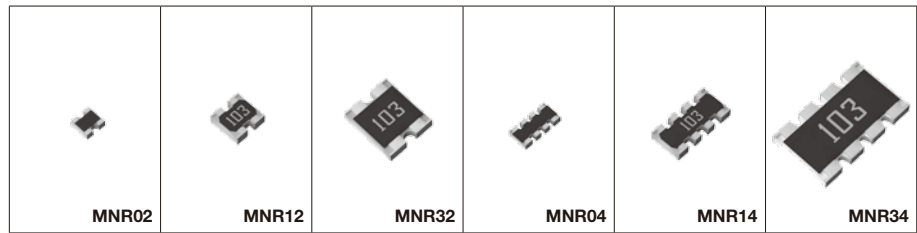
Part No.	Code	Tolerance			Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)	D (±0.5%)			
MCR18	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MCR25	JZH	○	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000
MCR50	JZH	○	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000
MCR100	JZH	○	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product

# Thick Film Chip Resistors (Standard series)

## Compact Chip Resistor Networks (MNR series <0402×2 to 1206×4>)

- **Reduces cost**  
Use of chip networks reduces the number of components and saves mounting space.
- **Easy fillet inspection**  
Convex type electrodes facilitate visual inspection of fillets.  
Inspection can be performed with automatic inspection equipment.

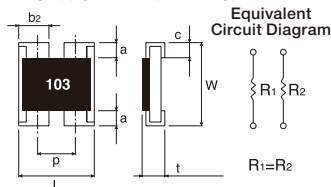


MNR series <0402×2 to 1206×4>										
Part No.	Size code mm (inch)	No. of terminals	No. of elements	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
MNR02	1005 (0402) ×2	4	2	0.063W / Element	25	J (±5%)	±200	10Ω to 1MΩ (E24 Series)	-55 to +155	Yes
MNR04	1005 (0402) ×4	8	4	0.063W / Element	25	J (±5%)	+500/-250 ±200	1Ω to 9.1Ω (E24 Series) 10Ω to 1MΩ (E24 Series)		Yes
MNR12	1608 (0603) ×2	4	2	0.063W / Element	50	J (±5%) F (±1%)	±200 ±100	10Ω to 1MΩ (E24 Series)		Yes
MNR14	1608 (0603) ×4	8	4	0.063W / Element	50	J (±5%) F (±1%)	±500 ±200 ±100	2.2Ω to 6.8Ω (E6 Series) 10Ω to 1MΩ (E24 Series) 10Ω to 1MΩ (E24 Series)		Yes
MNR32	3216 (1206) ×2	4	2	0.125W / Element	200	J (±5%)	±200	10Ω to 1MΩ (E24 Series)	-55 to +125	Yes
MNR34	3216 (1206) ×4	8	4	0.125W / Element	200	J (±5%)	±200	10Ω to 1MΩ (E24 Series)		Yes

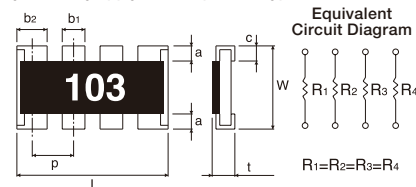
Jumper type					
Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range	Automotive Grade Available
MNR02	1005 (0402) ×2	1A / Element	50mΩ Max.	-55 to +155°C	Yes
MNR04	1005 (0402) ×4	1A / Element	50mΩ Max.		Yes
MNR12	1608 (0603) ×2	1A / Element	50mΩ Max.		Yes
MNR14	1608 (0603) ×4	1A / Element	50mΩ Max.		Yes
MNR32	3216 (1206) ×2	2A / Element	50mΩ Max.	-55 to +125°C	Yes
MNR34	3216 (1206) ×4	2A / Element	50mΩ Max.		Yes

### Dimensions (Unit : mm)

- **MNR02 / MNR12 / MNR32** (Marked except MNR02)  
Different marking system may apply to each product type.



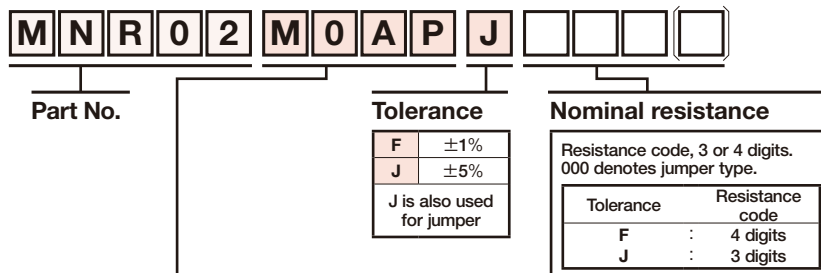
- **MNR04 / MNR14 / MNR34** (Marked except MNR04)  
Different marking system may apply to each product type.



Part No.	L	W	t	a	b2	c	p
MNR02	1.0±0.1	1.0±0.1	0.35±0.1	0.2±0.1	0.33 <sup>+0.1</sup> <sub>-0.05</sub>	0.25±0.1	0.68
MNR12	1.6±0.1	1.6±0.1	0.5±0.1	0.3±0.2	0.6±0.15	0.25±0.15	0.8
MNR32	2.6±0.2	3.1±0.2	0.55±0.1	0.5±0.3	1.0±0.2	0.5Max.	1.27

Part No.	L	W	t	a	b1	b2	c	p
MNR04	2.0±0.1	1.0±0.1	0.35±0.1	0.2±0.1	0.3±0.1	0.4±0.1	0.25±0.1	0.5
MNR14	3.2±0.1	1.6±0.1	0.5±0.1	0.3±0.2	0.4±0.15	0.6±0.15	0.25±0.15	0.8
MNR34	5.2±0.4	3.1±0.2	0.55±0.1	0.5±0.3	0.8±0.2	1.0±0.2	0.5Max.	1.27

### Part No. Explanation



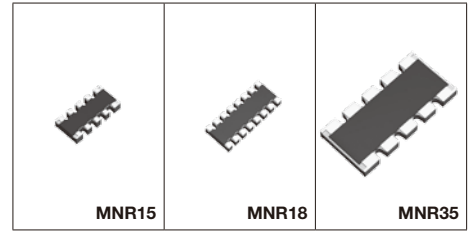
### Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
MNR02	M0AP	○	—	Paper tape (2mm Pitch)	φ180mm (7inch)	10,000
MNR04	M0AP	○	—	Paper tape (2mm Pitch)	φ180mm (7inch)	10,000
MNR12	E0AP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MNR14	E0AP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MNR32	J0AB	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000
MNR34	J5AB	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product

# Thick Film Chip Resistors (Standard series) 8-element Chip Resistor Networks (MNR series <0603×5 to 1206×5>)

- One package built in 8-element chip contributes to space-saving
- 8 resistor elements reduce mounting cost
- Convex type electrodes facilitate visual inspection of fillets.  
Inspection can be performed with automatic inspection equipment.
- Suitable for pull-up resistor, damping resistor
- No direction to be mounted

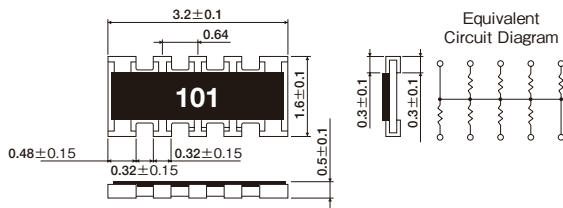


MNR series <0603×5 to 1206×5>										
Part No.	Size code mm (inch)	No. of terminals	No. of elements	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
MNR15	1608 (0603) ×5	10	8	0.031W / Element	12.5	J (±5%)	±200	56Ω to 100kΩ (E24 Series)	-55 to +125	Yes
MNR18	1605 (0602) ×8	16	8	0.063W / Element	25	J (±5%)	±200	10Ω to 1MΩ (E24 Series)		Yes
MNR35	3216 (1206) ×5	10	8	0.063W / Element	50	J (±5%)	±200	56Ω to 100kΩ (E12 Series)		Yes

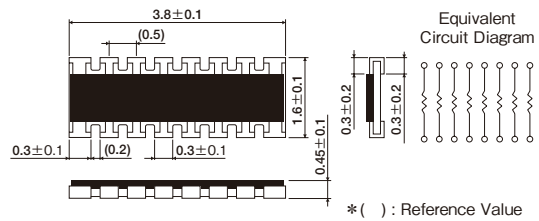
Jumper type					
Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range	Automotive Grade Available
MNR18	1605 (0602) ×8	1A / Element	50mΩ Max.	-50 to +125°C	Yes

## Dimensions (Unit : mm)

### MNR15

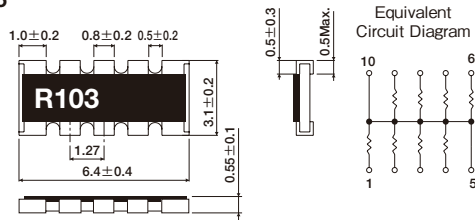


### MNR18

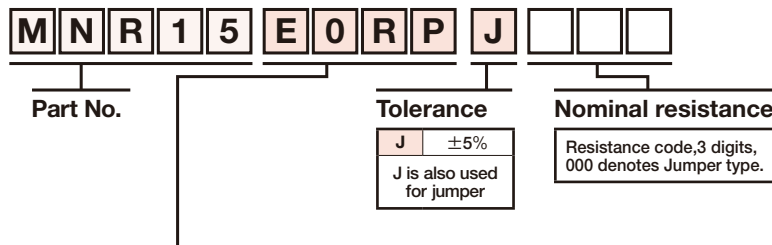


\*( ) : Reference Value

### MNR35



## Part No. Explanation



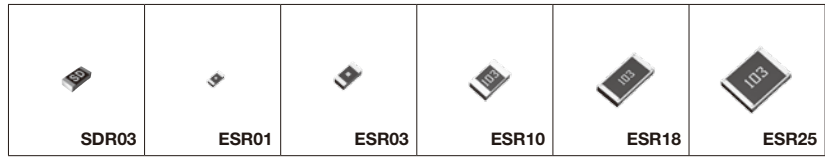
## Packaging specifications Code

Part No.	Code	Tolerance	Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)			
MNR15	E0RP	⊙	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MNR18	E0AP	⊙	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MNR35	J5R	⊙	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
⊙ : Standard product

## Thick Film Chip Resistors (High reliability series) High Anti-surge Chip Resistors (SDR series) Anti-surge Chip Resistors (ESR series)

- Exclusive resistive element pattern and laser trimming technology results in significantly improved surge resistance characteristics.
- Superior power ratings.



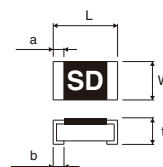
SDR series									
Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available	
<b>New</b> SDR03	1608 (0603)	1/4W (0.25W)	150	J (±5%)	±200	1Ω to 10MΩ (E24 Series)	-55 to +155	Yes	
				F (±1%)	±200 ±100	1Ω to 9.76Ω (E24, 96 Series) 1Ω to 10MΩ (E24, 96 Series)			
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)			
ESR series									
ESR01	1005 (0402)	1/5W (0.2W)	50	J (±5%)	+500 / -250 ±200	1Ω to 9.1Ω (E24 Series) 10Ω to 10MΩ (E24 Series)	-55 to +155	Yes	
				F (±1%)	±100	10Ω to 976kΩ (E24, 96 Series) 1MΩ to 2.2MΩ (E24 Series)			
ESR03	1608 (0603)	1/4W (0.25W)	150	J (±5%)	±200	1Ω to 10MΩ (E24 Series)		Yes	
				F (±1%)	±200 ±100	1Ω to 9.76Ω (E24, 96 Series) 10Ω to 10MΩ (E24, 96 Series)			
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)			
ESR10	2012 (0805)	2/5W (0.4W)	150	J (±5%)	±200	1Ω to 30MΩ (E24 Series)		Yes	
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)			
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)			
ESR18	3216 (1206)	1/3W <sup>-1</sup> (0.33W)	200	J (±5%)	±200	1Ω to 15MΩ (E24 Series)		Yes	
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)			
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)			
ESR25	3225 (1210)	1/2W <sup>-1</sup> (0.5W)	200	J (±5%)	±200	1Ω to 10MΩ (E24 Series)	Yes		
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)			
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)			

<sup>-1</sup> Please contact us for the higher rated power.  
\*E24 : Standard products E96 : Custom products

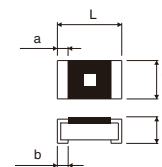
### Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
SDR03	1608 (0603)	1.6±0.1	0.8±0.1	0.45±0.1	0.25±0.1	0.25±0.1
ESR01	1005 (0402)	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	0.25 <sup>+0.05</sup> <sub>-0.1</sub>
ESR03	1608 (0603)	1.6±0.1	0.8±0.1	0.45±0.1	0.3±0.2	0.3±0.2
ESR10	2012 (0805)	2.0±0.1	1.25±0.1	0.55±0.1	0.3±0.2	0.4±0.2
ESR18	3216 (1206)	3.2±0.15	1.6±0.15	0.55±0.1	0.3±0.25	0.5±0.25
ESR25	3225 (1210)	3.2±0.15	2.5±0.15	0.55±0.1	0.3±0.25	0.5±0.25

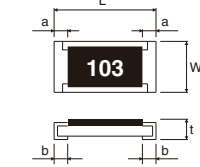
●SDR03



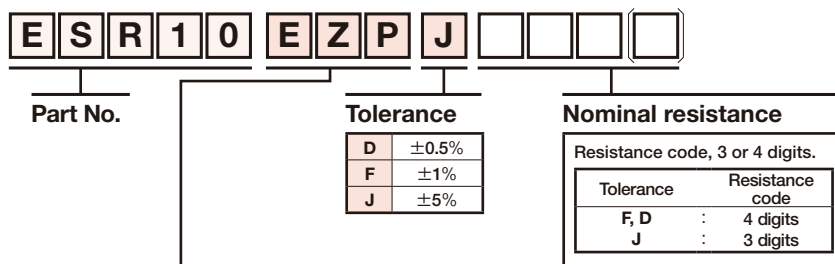
●ESR01/03



●ESR10/18/25



### Part No. Explanation



### Packaging specifications Code

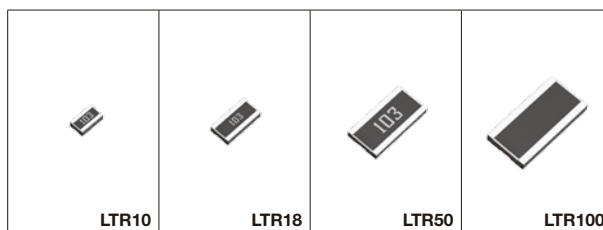
Part No.	Code	Tolerance			Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)	D (±0.5%)			
SDR03	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm	5,000
ESR01	MZP	○	○	—	Paper tape (4mm Pitch)	φ180mm (7inch)	10,000
ESR03	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
ESR10	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
ESR18	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
ESR25	JZP	○	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product



# Thick Film Chip Resistors (High reliability series) High Power Chip Resistors <Wide Terminal type> (LTR series)

- High joint reliability with long side terminations.
- Highest power ratings in their class.
- Guaranteed anti-surge characteristic in all series.



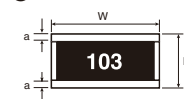
LTR series										
Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm / °C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available		
LTR10	2012 (0805)	1/4W (0.25W)	150	J (±5%)	±200	1Ω to 1MΩ (E24 Series)	-55 to +155	Yes		
				F (±1%)	±100	1Ω to 1MΩ (E24, 96 Series)				
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)				
LTR18	3216 (1206)	3/4W (0.75W)	200	J (±5%)	±200	1Ω to 1MΩ (E24 Series)		-55 to +155	Yes	
				F (±1%)	±100	1Ω to 1MΩ (E24, 96 Series)				
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)				
LTR50	5025 (2010)	1W	200	J (±5%)	±200	1Ω to 1MΩ (E24 Series)			-55 to +155	Yes
				F (±1%)	±100	1Ω to 1MΩ (E24, 96 Series)				
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)				
LTR100	6432 (2512)	2W	200	J (±5%)	±200	1Ω to 1MΩ (E24 Series)	-55 to +155			Yes
				F (±1%)	±100	1Ω to 1MΩ (E24, 96 Series)				
				D (±0.5%)	±100	10Ω to 1MΩ (E24, 96 Series)				

※E24 : Standard products E96 : Custom products

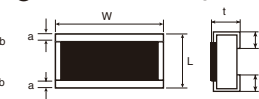
## ■ Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
LTR10	2012 (0805)	1.2±0.1	2.0±0.1	0.55±0.1	0.25±0.1	0.35±0.2
LTR18	3216 (1206)	1.6±0.15	3.2±0.15	0.55±0.1	0.3±0.2	0.5±0.2
LTR50	5025 (2010)	2.5±0.15	5.0±0.15	0.55±0.1	0.38±0.2	0.9±0.2
LTR100	6432 (2512)	3.2±0.15	6.4±0.15	0.55±0.15	0.4±0.25	1.13±0.25

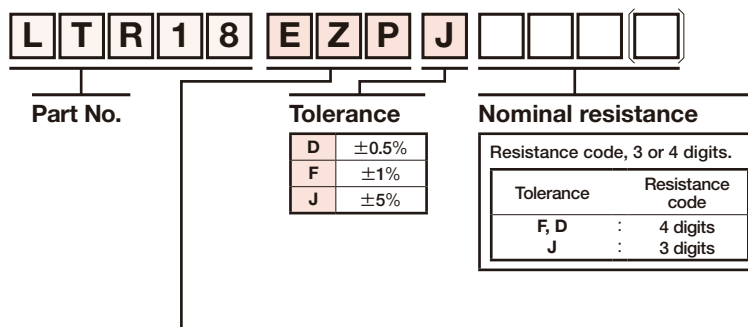
## ● LTR10/18/50



## ● LTR100 (No marking)



## ■ Part No. Explanation



## Packaging specifications Code

Part No.	Code	Tolerance			Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)	D (±0.5%)			
LTR10	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
LTR18	EZP	○	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
LTR50	UZP	○	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	5,000
LTR100	JZP	○	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

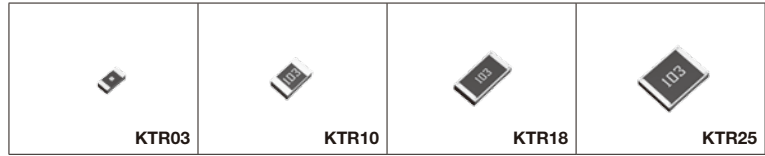
Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product



# Thick Film Chip Resistors (High reliability series)

## High Voltage Resistance Chip Resistors (KTR series)

- Twice the rated voltage of conventional products.
- Perfect for use in Camera Flash circuit, etc.



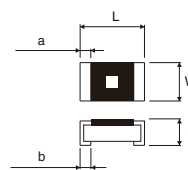
KTR series											
Part No.	Size code mm (inch)	Rated power (70°C)	Limiting element voltage (V)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available			
KTR03	1608 (0603)	1/10W (0.1W)	350	J (±5%)	±200	1Ω to 10MΩ (E24 Series)	-55 to +155	Yes			
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)					
KTR10	2012 (0805)	1/8W (0.125W)	400	J (±5%)	±200	1Ω to 30MΩ (E24 Series)		-55 to +155	Yes		
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)					
KTR18	3216 (1206)	1/4W (0.25W)	500	J (±5%)	±200	1Ω to 15MΩ (E24 Series)			-55 to +155	Yes	
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)					
KTR25	3225 (1210)	1/3W (0.33W)	600	J (±5%)	±200	1Ω to 10MΩ (E24 Series)				-55 to +155	Yes
				F (±1%)	±100	1Ω to 10MΩ (E24, 96 Series)					

※E24 : Standard products E96 : Custom products

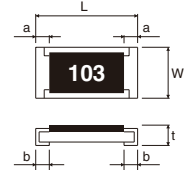
### ■ Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
KTR03	1608 (0603)	1.6±0.1	0.8±0.1	0.45±0.1	0.3±0.2	0.3±0.2
KTR10	2012 (0805)	2.0±0.1	1.25±0.1	0.55±0.1	0.3±0.2	0.4±0.2
KTR18	3216 (1206)	3.2±0.15	1.6±0.15	0.55±0.1	0.3±0.25	0.5±0.25
KTR25	3225 (1210)	3.2±0.15	2.5±0.15	0.55±0.1	0.3±0.25	0.5±0.25

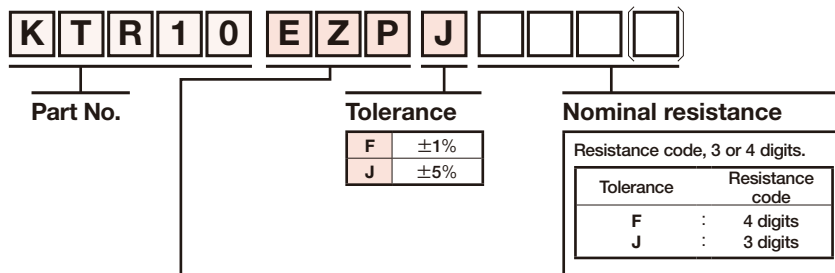
●KTR03



●KTR10/18/25



### ■ Part No. Explanation



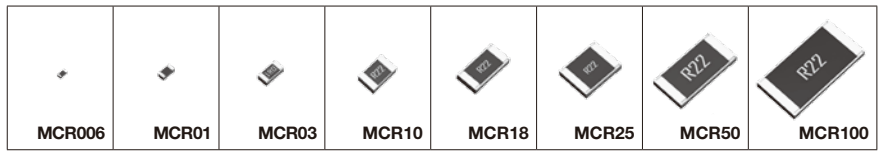
### Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
KTR03	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
KTR10	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
KTR18	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
KTR25	JZP	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

 Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
 ○ : Standard product

# Thick Film Chip Resistors (Low Ohmic type) Chip Resistors (Low Ohmic MCR series)

- Very-low ohmic resistance from 47m Ohm is in lineup by thick-film resistive element.
- High-reliability chip resistor employing metal glaze as resistive element.



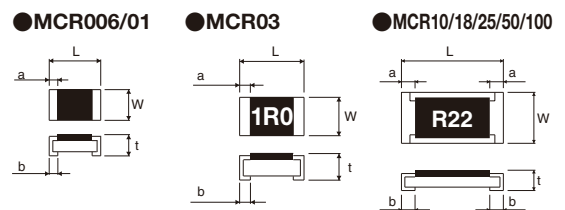
Low Ohmic MCR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
MCR006	0603 (0201)	1/20W (0.05W)	F (±1%)	+600 / -200	1.0Ω to 9.1Ω (E24 Series)	-55 to +125	Preparing
MCR01	1005 (0402)	1/16W (0.063W)	F (±1%)	±400	1.0Ω to 9.1Ω (E24 Series)	-55 to +155	Yes
MCR03	1608 (0603)	1/10W (0.1W)	F (±1%)	±400	1.0Ω to 9.1Ω (E24 Series)		Yes
MCR10	2012 (0805)	1/4W (0.25W)	J (±5%)	*Table 1	0.047Ω to 0.91Ω (E24 Series)		Yes
MCR18	3216 (1206)	1/4W (0.25W)	J (±5%)	*Table 1	0.047Ω to 0.91Ω (E24 Series)		Yes
			F (±1%)	*Table 1	0.047Ω to 9.1Ω (E24 Series)		
MCR25	3225 (1210)	1/2W (0.5W)	J (±5%)	300±300	0.047Ω to 0.091Ω (E24 Series)		Yes
			F (±1%)	±200	0.1Ω to 0.91Ω (E24 Series)		
				300±300	0.047Ω to 0.091Ω (E24 Series)		
MCR50	5025 (2010)	1/2W (0.5W)	J (±5%)	*Table 1	0.047Ω to 0.91Ω (E24 Series)		Yes
			F (±1%)	*Table 1	0.047Ω to 9.1Ω (E24 Series)		
MCR100	6432 (2512)	1W	J (±5%)	*Table 1	0.047Ω to 0.91Ω (E24 Series)	-55 to +125	Yes
			F (±1%)	*Table 1	0.047Ω to 9.1Ω (E24 Series)		

\*Table 1

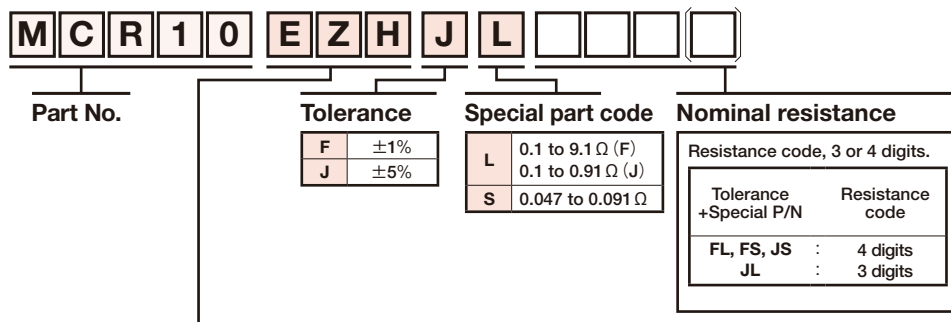
Tolerance	Temperature coefficient (ppm/°C)	Resistance range
J (±5%)	500±300	0.047Ω to 0.091Ω (E24 Series)
F (±1%)	400±200	0.1Ω to 0.13Ω (E24 Series)
	±250	0.15Ω to 9.1Ω (E24 Series)

## Dimensions (Unit: mm)

Part No.	Size code mm (inch)	L	W	t	a	b
MCR006	0603 (0201)	0.6±0.03	0.3±0.03	0.23±0.03	0.1±0.05	0.15±0.05
MCR01	1005 (0402)	1.0±0.05	0.5±0.05	0.35±0.05	0.2±0.1	0.25 <sup>+0.05</sup> <sub>-0.1</sub>
MCR03	1608 (0603)	1.6±0.1	0.8±0.1	0.45±0.1	0.3±0.2	0.3±0.2
MCR10	2012 (0805)	2.0±0.1	1.25±0.1	0.55±0.1	0.4±0.2	0.4±0.2
MCR18	3216 (1206)	3.2±0.15	1.6±0.15	0.55±0.1	0.5±0.25	0.5±0.25
MCR25	3225 (1210)	3.2±0.15	2.5±0.15	0.55±0.15	0.5±0.25	0.5±0.25
MCR50	5025 (2010)	5.0±0.15	2.5±0.15	0.55±0.15	0.6±0.25	0.6±0.25
MCR100	6432 (2512)	6.3±0.15	3.2±0.15	0.55±0.15	0.6±0.25	0.6±0.25



## Part No. Explanation



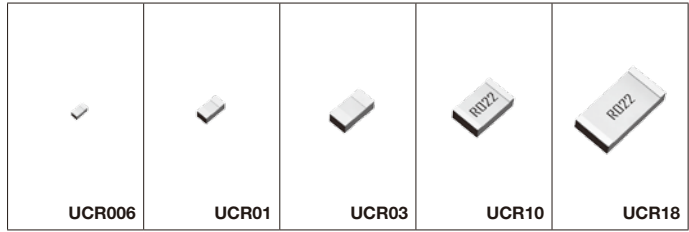
## Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
MCR006	YZP	—	○	Paper tape (2mm Pitch)	φ180mm (7inch)	15,000
MCR01	MZP	—	○	Paper tape (2mm Pitch)	φ180mm (7inch)	10,000
MCR03	EZP	—	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MCR10	EZH	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MCR18	EZH	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
MCR25	JZH	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000
MCR50	JZH	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000
MCR100	JZH	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
○ : Standard product

# Thick Film Chip Resistors (Low Ohmic type) Low Ohmic Chip Resistors <Face down type> (UCR series)

- Chip resistors for current detection. (11mΩ-)
- Resistive element is located at bottom side, which reduces the resistance shift during mounting process.
- ROHM's unique structure achieved improvement of heat.

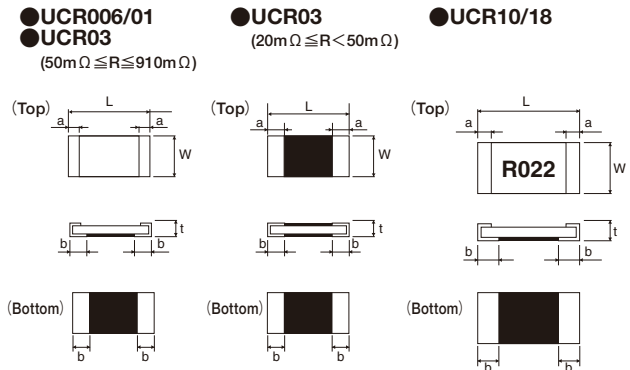


UCR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available
<b>New</b> UCR006	0603 (0201)	1/10W (0.1W)	J (±5%) F (±1%)	0 to 300	100mΩ to 910mΩ (E24 Series)	-55 to +155	Preparing
UCR01	1005 (0402)	1/8W (0.125W)	J (±5%) F (±1%)	0 to 300 0 to 250 0 to 200	68mΩ to 91mΩ (E24 Series) 100mΩ to 200mΩ (E24 Series) 220mΩ to 910mΩ (E24 Series)		Yes
UCR03	1608 (0603)	1/4W (0.25W)	J (±5%) F (±1%)	0 to 250 0 to 200 0 to 150	20mΩ to 47mΩ (E24 Series) 51mΩ to 91mΩ (E24 Series) 100mΩ to 200mΩ (E24 Series)		Yes*1
			J (±5%) F (±1%)	0 to 150	220mΩ to 910mΩ (E24 Series)		
UCR10	2012 (0805)	1/3W (0.33W)	J (±5%) F (±1%)	250±200 0 to 250 0 to 150	11mΩ to 18mΩ (E24 Series) 20mΩ to 47mΩ (E24 Series) 51mΩ to 100mΩ (E24 Series)		Yes
			J (±5%) F (±1%)	0 to 250 0 to 150	11mΩ to 47mΩ (E24 Series) 51mΩ to 100mΩ (E24 Series)		
UCR18	3216 (1206)	1/2W (0.5W)	J (±5%) F (±1%)	0 to 350 0 to 200 0 to 150	11mΩ to 18mΩ (E24 Series) 20mΩ to 39mΩ (E24 Series) 43mΩ to 100mΩ (E24 Series)	Yes	
			J (±5%) F (±1%)	0 to 150			

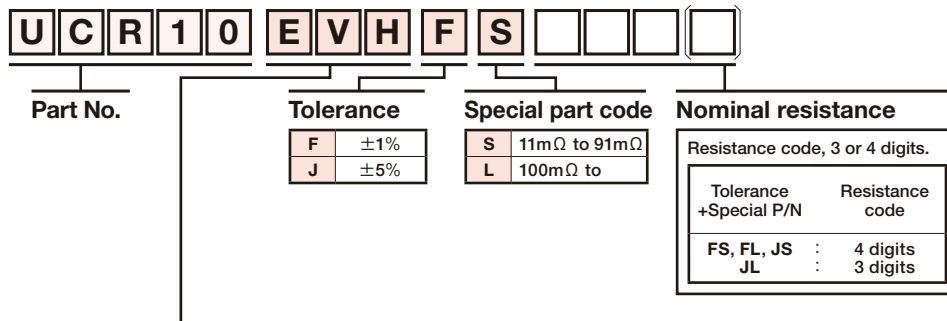
\*1 Limited to 100mΩ and higher.

## Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
UCR006	0603 (0201)	0.64±0.05	0.34±0.05	0.28±0.05	0.16±0.1	0.22±0.1
UCR01	1005 (0402)	1.0±0.1	0.55±0.1	0.37±0.05	0.28±0.1	0.34±0.1
UCR03	1608 (0603)	1.6±0.1	0.87±0.1	0.5±0.1	0.45±0.2	0.45±0.2
UCR10	2012 (0805)	2.0±0.1	1.25±0.1	0.55±0.1	0.24±0.2	0.5±0.2
UCR18	3216 (1206)	3.2±0.15	1.6±0.15	0.55±0.1	0.3±0.2	0.9±0.25



## Part No. Explanation



## Packaging specifications Code

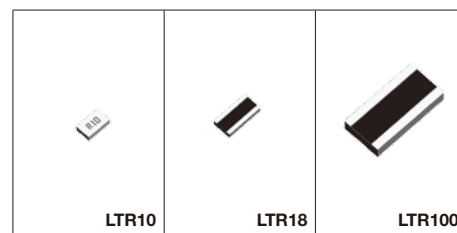
Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)	Remarks
		J (±5%)	F (±1%)				
UCR006	YVP	○	○	Paper tape (2mm Pitch)	φ180mm (7inch)	15,000	—
UCR01	MVP	○	○	Paper tape (2mm Pitch)	φ180mm (7inch)	10,000	—
UCR03	EWP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	20mΩ to 47mΩ
	EVP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	51mΩ to 910mΩ
UCR10	EVH	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	—
UCR18	EVH	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000	—

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"E  
○ : Standard product

# Thick Film Chip Resistors (Low Ohmic type)

## High Power Chip Resistors <Wide Terminal type> (Low Ohmic LTR series)

- Chip resistors for current detection. (10mΩ-)
- High joint reliability with long side terminations.
- Improvement of rated power enables to displace smaller size of resistors, and it contributes space savings in your set.



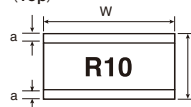
Low Ohmic LTR series									
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance range	Operating temperature range (°C)	Automotive Grade Available		
LTR10	2012 (0805)	1/2W (0.5W)	J (±5%)	±150	47mΩ to 9.1Ω (E24 Series)	-55 to +155	Yes		
			F (±1%)						
LTR18	3216 (1206)	1W	J (±5%)	0 to 300	10mΩ to 18mΩ (E24 Series)		-55 to +155	Yes	
			F (±1%)	0 to 200	20mΩ to 47mΩ (E24 Series)				
LTR100	6432 (2512)	2W	J (±5%)	0 to 150	51mΩ to 470mΩ (E24 Series)			-55 to +155	Yes
			F (±1%)	±100	510mΩ to 1Ω (E24 Series)				
LTR100	6432 (2512)	2W	J (±5%)	±200	100mΩ to 910mΩ (E24 Series)	-55 to +155			Yes
			F (±1%)	0 to 150	100mΩ to 910mΩ (E24 Series)				

### Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b
LTR10	2012 (0805)	1.2±0.1	2.0±0.1	0.55±0.1	0.3±0.2	0.35±0.2
LTR18	3216 (1206)	1.6±0.1	3.2±0.1	0.58±0.1	0.5±0.2	0.5±0.2
LTR100	6432 (2512)	3.2±0.15	6.4±0.15	0.55±0.15	0.4±0.25	1.13±0.25

#### ● LTR10

(Top)

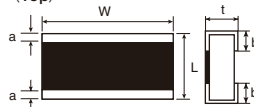


(Bottom)

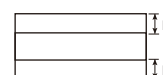


#### ● LTR18/100 (No marking)

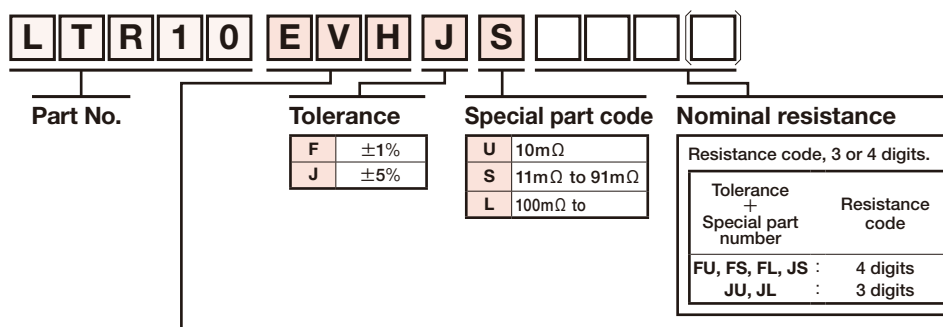
(Top)



(Bottom)



### Part No. Explanation



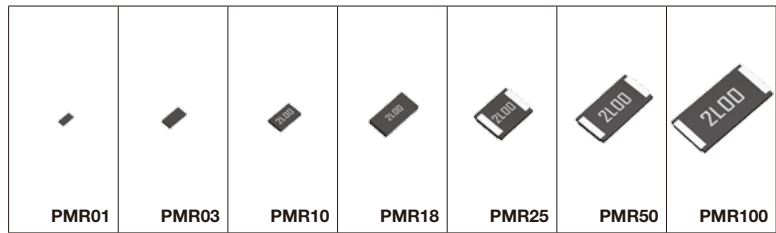
### Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
LTR10	EVH	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
LTR18	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
LTR100	JZP	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	4,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
 ○ : Standard product

# Chip Resistors for Current Detection (Metal plate type) Ultra Low Ohmic Chip Shunt Resistors (PMR series)

- Ultra low-ohmic resistance range (1mΩ-)
- Improved current detection accuracy by trimming-less structure.  
Highly recommended for large current / High speed switching circuit.
- Special low resistance temperature coefficient (TCR) alloy utilized for the resistive element.



PMR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm/°C)	Resistance value (mΩ)	Operating temperature range (°C)	Automotive Grade Available
<b>New</b> PMR01	1005 (0402)	1/5W (0.2W)	J (±5%)	0 to 200	10	-55 to +155	Yes
PMR03	1608 (0603)	1/4W (0.25W)	J (±5%) F (±1%)	0 to 150	10(☆5)		preparing
PMR10	2012 (0805)	1/2W (0.5W)	J (±5%) F (±1%)	±150	2,3,4,5,6,7,8,9,10		Yes
PMR18	3216 (1206)	1W	J (±5%) F (±1%)	±100	1,2,3,4,5,6,7,8,9,10		Yes
PMR25	3225 (1210)	1W	J (±5%) F (±1%)	±100	1,2,3,4,5		Yes
PMR50	5025 (2010)	1W	J (±5%) F (±1%)	±100	1,2,3,4,5,6,7,8,9,10(☆2.5)		Yes
PMR100	6432 (2512)	2W	J (±5%) F (±1%)	±150 ±100	1,2 3,4,5,6,7,8,9,10		Yes

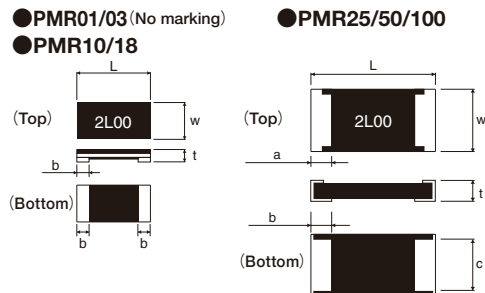
☆ : Under development

Large current jumper type					
Part No.	Size code mm (inch)	Rated current	Resistance	Temperature range (°C)	Automotive Grade Available
PMR01	1005 (0402)	20.0A	0.5mΩ Max.	-55 to +155	Yes
PMR03	1608 (0603)	22.4A			Yes
PMR10	2012 (0805)	31.6A			Yes
PMR18	3216 (1206)	38.7A			Yes
PMR25	3225 (1210)	44.7A			Yes
PMR50	5025 (2010)	50.0A			Yes
PMR100	6432 (2512)	63.2A			Yes

## Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	W	t	a	b	c
PMR01	1005 (0402)	1.0±0.05	0.5±0.05	0.25±0.1	—	0.30±0.10	—
PMR03	1608 (0603)	1.6±0.15	0.8±0.15	0.25±0.1	—	0.35±0.15	—
PMR10	2012 (0805)	2.0±0.15	1.2±0.15	0.42 to 0.28*±0.15	—	0.75 to 0.35*±0.25	—
PMR18	3216 (1206)	3.2±0.15	1.6±0.15	0.42 to 0.28*±0.15	—	1.20 to 0.5 *±0.25	—
PMR25	3225 (1210)	3.2±0.2	2.5±0.2	0.52 to 0.32*±0.15	0.5±0.2	1.0 to 0.8 *±0.2	1.95±0.2
PMR50	5025 (2010)	5.0±0.2	2.5±0.2	0.52 to 0.32*±0.15	0.5±0.2	1.85 to 0.9 *±0.2	1.95±0.2
PMR100	6432 (2512)	6.4±0.25	3.2±0.25	0.52 to 0.32*±0.15	0.5±0.25	2.3 to 1.1 *±0.25	2.65±0.25

\* Each value range varies with the resistance. Please contact a ROHM sales representative for further details.



## Part No. Explanation



Part No.

Tolerance

F	±1%
J	±5%

Special part code

U	5 to 10mΩ
V	1 to 4mΩ

\* Jumper type doesn't have a special part code

Nominal resistance

Resistance code, 3 or 4 digits.		
Tolerance	Resistance code	
F	:	4 digits
J	:	3 digits

## Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
PMR01	ZZP	○	—	Embossed tape (2mm Pitch)	φ180mm (7inch)	10,000
PMR03	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
PMR10	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
PMR18	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
PMR25	HZP	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	2,000
PMR50	HZP	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	2,000
PMR100	HZP	○	○	Embossed tape (4mm Pitch)	φ180mm (7inch)	2,000

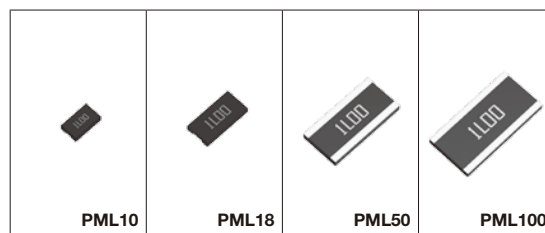
Reel (φ180mm) : Compatible with JEITA standard \*EIAJ ET-7200B\*  
○ : Standard product

Resistance Value (Ω)	Tolerance	
	J	F
Jumper	000	—
1mΩ	1L0	1L00
2mΩ	2L0	2L00
3mΩ	3L0	3L00
4mΩ	4L0	4L00
5mΩ	5L0	5L00
6mΩ	6L0	6L00
7mΩ	7L0	7L00
8mΩ	8L0	8L00
9mΩ	9L0	9L00
10mΩ	10L	10L0

# Chip Resistors for Current Detection (Metal plate type)

## Ultra Low Ohmic Chip Shunt Resistors <Wide Terminal type> (PML series)

- Ultra-low resistance range (0.5mΩ-).
- Wide terminal configuration for high joint reliability.
- Improved current detection accuracy by trimming-less structure.



PML series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm / °C)	Resistance value (mΩ)	Operating temperature range (°C)	Automotive Grade Available
PML10	2012 (0805)	0.66W	J (±5%) G (±2%)	±200	1.0, 1.5, 2.0, 2.5	-55 to +155	Yes
PML18	3216 (1206)	1W	J (±5%) G (±2%)	±150	0.5, 1.0, 1.5, 2.0, 2.5		Yes
☆ PML50	5025 (2010)	1.5W (2W at 25°C)	J (±5%)	±200	0.5, 1.0, 1.5, 2.0, 2.2		Under development
PML100	6432 (2512)	2W (3W at 25°C)	J (±5%)	±100	1.0, 1.5, 2.0, 2.2		Yes
		2W		±150	0.5		

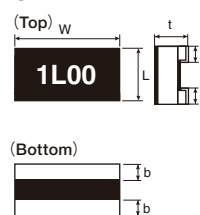
☆ : Under development (Development schedule will vary depending on resistance value. Please Contact us.)

### Dimensions (Unit : mm)

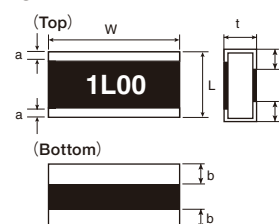
Part No.	Size code mm (inch)	L	W	t	a	b
PML10	2012 (0805)	1.2±0.15	2.0±0.15	0.42±0.15	—	0.45 to 0.3* ±0.2
PML18	3216 (1206)	1.6±0.15	3.2±0.15	0.42 to 0.28* ±0.15	—	0.55 to 0.3* ±0.2
PML50	5025 (2010)	2.5±0.2	5.0±0.2	0.52 to 0.32* ±0.15	0.4±0.2	1.0 to 0.5* ±0.2
PML100	6432 (2512)	3.2±0.25	6.4±0.25	0.5 to 0.36* ±0.15	0.45±0.25	0.9 to 0.7* ±0.25

\* Each value range varies with the resistance. Please contact a ROHM sales representative for further details.

#### ● PML10/18



#### ● PML50/100



### Part No. Explanation

Part No.	Tolerance	Special part code	Nominal resistance
P M L 5 0 H Z P J V	G ±2% J ±5%		Resistance code, 3 or 4 digits. Tolerance Resistance code J : 3 digits G : 4 digits
			Resistance Value (Ω) Tolerance 0.5mΩ 0L5 0L50 1mΩ 1L0 1L00 1.5mΩ 1L5 1L50 2mΩ 2L0 2L00 2.2mΩ 2L2 2.5mΩ 2L5 2L50

### Packaging specifications Code

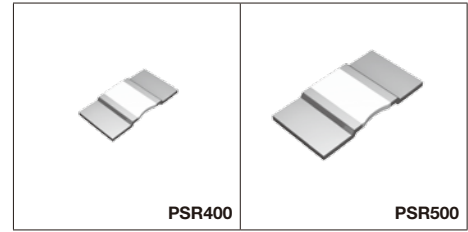
Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	G (±2%)			
PML10	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
PML18	EZP	○	○	Paper tape (4mm Pitch)	φ180mm (7inch)	5,000
PML50	HZP	☆	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	2,000
PML100	HZP	○	—	Embossed tape (4mm Pitch)	φ180mm (7inch)	2,000

Reel (φ180mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
☆ : Under development  
○ : Standard product

# Chip Resistors for Current Detection (Metal plate type)

## High Power Ultra Low Ohmic Chip Shunt Resistors (PSR series)

- High power 4W to 5W
- Ultra low resistance range (0.2mΩ-).
- Excellent TCR characteristics
- Ideal replacing current sensor and current trans



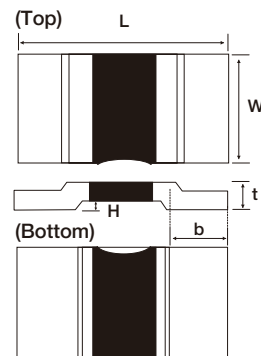
PSR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient <sup>*1</sup> (ppm / °C)	Resistance range (mΩ)	Operating temperature range (°C)	Automotive Grade Available
<b>New</b> PSR400	10×5.2 (3921)	4W	J (±5%)	±175	0.3, 0.5	-55 to +170	Yes
			G (±2%)	±75	1.0, 2.0, 3.0		
<b>New</b> PSR500	15×7.75 (5931)	5W	J (±5%)	±225	0.2, 0.3		-55 to +170
			G (±2%)	±175	0.4, 0.5		
			F (±1%)	±75	1.0, 2.0		

\*1 (+20°C to +125°C)

### Dimensions (Unit : mm)

Part No.	Resistance	L	W	t	H	b
PSR400	0.3mΩ	10±0.3	5.2±0.3	1.85±0.15	0.5±0.1	2.0±0.6
	0.5mΩ			1.3±0.15		
	1.0mΩ			0.9±0.15		
	2.0mΩ			1.1±0.15		
	3.0mΩ			0.9±0.15		
PSR500	0.2mΩ	15±0.3	7.75±0.3	1.85±0.15	0.5±0.1	4.0±0.6
	0.3mΩ			1.4±0.15		
	0.4mΩ			1.15±0.15		
	0.5mΩ			1.05±0.15		
	1.0mΩ			1.3±0.15		
	2.0mΩ			0.9±0.15		

### ● PSR400/500



### Part No. Explanation



Part No.

Tolerance

Special part code

Nominal resistance

F	1%
G	2%
J	5%

C	0.2mΩ
D	0.3mΩ
E	0.4mΩ
F	0.5mΩ
H	1.0mΩ
J	2.0mΩ
L	3.0mΩ

Resistance code, 3 or 4 digits.	
Tolerance	Resistance code
F, G	: 4 digits
J	: 3 digits

Resistance	Tolerance	
	J	F, G
0.2mΩ	0L2	0L20
0.3mΩ	0L3	0L30
0.4mΩ	0L4	0L40
0.5mΩ	0L5	0L50
1.0mΩ	1L0	1L00
2.0mΩ	2L0	2L00
3.0mΩ	3L0	3L00

### Packaging specifications Code

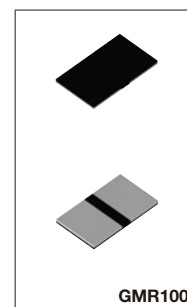
Part No.	Code	Tolerance			Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	G (±2%)	F (±1%)			
PSR400	ITQ	○	○	○	Embossed tape (8mm Pitch)	φ330mm	3,000
PSR500	HTQ	○	○	○	Embossed tape (12mm Pitch)	φ330mm	2,000

 Reel (φ330mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
 ○ : Standard product



# Chip Resistors for Current Detection (Metal plate type) High Power Low Ohmic Chip Shunt Resistors (GMR series)

- High power (3W)
- High heat dissipation
- Low ohmic (10mΩ to 220mΩ)
- Ideal for the replacement from ceramic resistors.



GMR100

GMR series							
Part No.	Size code mm (inch)	Rated power (70°C)	Tolerance	Temperature coefficient (ppm / °C)	Resistance range (mΩ)	Operating temperature range (°C)	Automotive Grade Available
☆GMR100	6432 (2512)	3W	J (±5%) F (±1%)	±25	10mΩ to 220mΩ (E6 series <sup>*2</sup> )	-55 ~ +170	Under development

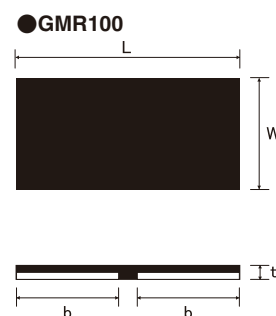
\*1 (+25°C to +60°C)

\*2 Please contact us for another standard nominal resistance values.

☆ : Under development (Development schedule will vary depending on resistance value. Please Contact us.)

## Dimensions (Unit : mm)

Part No.	Size code mm (inch)	L	w	t	b
GMR100	6432 (2512)	6.40±0.25	3.20±0.25	0.40±0.15	2.75±0.25



## Part No. Explanation

Part No.	Tolerance	Special part code	Nominal resistance																														
G M R 1 0 0 H Z P J U	<table border="1"> <tr><td>F</td><td>1%</td></tr> <tr><td>J</td><td>5%</td></tr> </table>	F	1%	J	5%	<table border="1"> <tr><td>U</td><td>10mΩ</td></tr> <tr><td>S</td><td>11mΩ to 91mΩ</td></tr> <tr><td>L</td><td>100mΩ to 220mΩ</td></tr> </table>	U	10mΩ	S	11mΩ to 91mΩ	L	100mΩ to 220mΩ	<table border="1"> <tr><td colspan="2">Resistance code, 3 or 4 digits.</td></tr> <tr><td>Tolerance + Resistance code</td><td>Special part code</td></tr> <tr><td>FU, FS, FL</td><td>: 4 digits</td></tr> <tr><td>JU, JS, JL</td><td>: 3 digits</td></tr> <tr><td>Resistance range</td><td>Resistance Value(Ω)</td><td>Tolerance</td></tr> <tr><td>10</td><td>10mΩ</td><td>J F</td></tr> <tr><td>10 &lt; R &lt; 100</td><td>11mΩ</td><td>R011 R011</td></tr> <tr><td>100 ≤ R ≤ 120</td><td>100mΩ</td><td>R10 R100</td></tr> </table>	Resistance code, 3 or 4 digits.		Tolerance + Resistance code	Special part code	FU, FS, FL	: 4 digits	JU, JS, JL	: 3 digits	Resistance range	Resistance Value(Ω)	Tolerance	10	10mΩ	J F	10 < R < 100	11mΩ	R011 R011	100 ≤ R ≤ 120	100mΩ	R10 R100
F	1%																																
J	5%																																
U	10mΩ																																
S	11mΩ to 91mΩ																																
L	100mΩ to 220mΩ																																
Resistance code, 3 or 4 digits.																																	
Tolerance + Resistance code	Special part code																																
FU, FS, FL	: 4 digits																																
JU, JS, JL	: 3 digits																																
Resistance range	Resistance Value(Ω)	Tolerance																															
10	10mΩ	J F																															
10 < R < 100	11mΩ	R011 R011																															
100 ≤ R ≤ 120	100mΩ	R10 R100																															

## Packaging specifications Code

Part No.	Code	Tolerance		Packaging specifications	Reel	Basic ordering unit (pcs)
		J (±5%)	F (±1%)			
GMR100	HZP	☆	☆	Embossed tape (8mm Pitch)	φ180mm	2,000

Reel (φ180mm, φ330mm) : Compatible with JEITA standard "EIAJ ET-7200B"  
☆ : Under development

# Standard Nominal Resistance Values

E3	10				22				47								
E6	10		15		22		33		47		68						
E12	10	12	15	18	22	27	33	39	47	56	68	82					
E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47
	51	56	62	68	75	82	91										
E96	100	102	105	107	110	113	115	118	121	124	127	130	133	137	140	143	147
	150	154	158	162	165	169	174	178	182	187	191	196	200	205	210	215	221
	226	232	237	243	249	255	261	267	274	280	287	294	301	309	316	324	332
	340	348	357	365	374	383	392	402	412	422	432	442	453	464	475	487	499
	511	523	536	549	562	576	590	604	619	634	649	665	681	698	715	732	750
	768	787	806	825	845	866	887	909	931	953	976						

## Nominal Resistance

Resistors of a series fall into one of nominal resistance ranges shown in the table above. Nominal resistance is determined by the common ratio shown right.

## Resistance coding

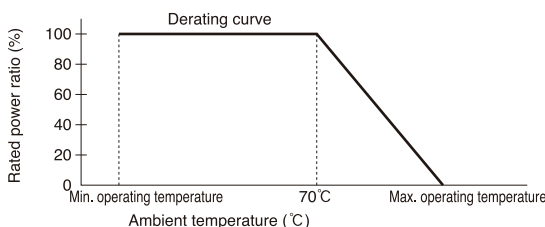
Nominal resistance is expressed in 3 digits when the resistance tolerance is  $\pm 5\%$  and in 4 digits when  $\pm 1\%$ . The leading 2 or 3 digits indicate significant figure while the last digit indicates the number of zeros. The letter R denotes the decimal point if necessary.

Series	Common ratio	Remarks
E6	$\sqrt[6]{10} \approx 1.46$	Rounded off to a 2-digit figure.
E12	$\sqrt[12]{10} \approx 1.21$	
E24	$\sqrt[24]{10} \approx 1.10$	
E96	$\sqrt[96]{10} \approx 1.02$	Rounded off to a 3-digit figure.

- EX1  $22\Omega \rightarrow 22 \times 10^0\Omega \rightarrow 220$  (the last digit indicates the number "0" of a multiplier)
- EX2  $47k\Omega \rightarrow 47 \times 10^3\Omega \rightarrow 473$  (the last digit indicates the number "3" of a multiplier)
- EX3  $1.2M\Omega \rightarrow 12 \times 10^5\Omega \rightarrow 125$  (the last digit indicates the number "5" of a multiplier)
- EX4  $2.7\Omega \rightarrow 2R7$  (the decimal point indicate the letter R / the letter R apply to the low Resistance less than  $10\Omega$ )
- EX5  $1130\Omega \rightarrow 113 \times 10^1\Omega \rightarrow 1131$  (the last digit indicates the number "1" of a multiplier / Resistance Tolerance 1% (F) products)
- EX6  $0.10\Omega \rightarrow R10$

## Supplement of rated power

- When the ambient temperature exceeds the rated ambient temperature, derate the load power based on the derating curve.



For basic guidelines on using resistors, see the technical reports issued by Japan Electronics and Information Technology Industries Association. JEITA RCR-2121A. "Guideline of notabilia for fixed resistors for use in electronic equipment (Safety Application Guide for fixed resistors for use in electronic equipment)"

## Supplementary to notes

- \* 1 : When resistor is to be exposed to a transient load (excessive large load, such as pulse), mount the resistor on your product and check the condition and evaluate the result. Constant application of a voltage above the rated voltage will degrade the performance and reliability of the resistor.  
Do not apply a voltage exceeding the rated voltage across any ROHM resistors.
- \* 2 : Rated voltage (V) =  $\sqrt{\text{rated power (W)} \times \text{nominal resistance } (\Omega)}$  or the limiting element voltage, whichever smaller, is the rated voltage.



## Passive Devices

# Tantalum Capacitors

## CONTENTS

### Tantalum Capacitors

- **New Bottom surface electrode (Extra large capacitance) : TCS Series** ..... P. D20
  - M case : 1608-10 (0603) size
  - PS case : 2012-09 (0805) Ultra Low profile size
  - P case : 2012-12 (0805) size
- **Bottom surface electrode (Large capacitance) : TCT, TC Series** ..... P. D21
  - U case : 1005-06 (0402) size ..... P. D21
  - ML case : 1608-06 (0603) Low profile size ..... P. D21
  - M case : 1608-09 (0603) size ..... P. D21
  - PL case : 2012-10 (0805) Low profile size ..... P. D22
  - P case : 2012-12 (0805) size ..... P. D22
  - AS case : 3216-10 (1206) Ultra Low profile size ..... P. D22
  - AL case : 3216-12 (1206) Low profile size ..... P. D22
- **Standard : TC Series** ..... P. D23
  - P case : 2012-12 (0805) size
  - A case : 3216-18 (1206) size
- **Fail-safe open structure : TCFG Series** ..... P. D23
  - B case : 3528-21 (1411) size

### Conductive polymer capacitors

- **New bottom surface electrode (Extra large capacitance) : TCSO Series** ..... P. D24
  - M case : 1608-10 (0603) size
  - PL case : 2012-10 (0805) Low profile size
- **Bottom surface electrode (Large capacitance) : TCTO Series** ..... P. D25
  - U case : 1005-06 (0402) size ..... P. D25
  - M case : 1608-09 (0603) size ..... P. D25
  - P case : 2012-12 (0805) size ..... P. D25
  - AS case : 3216-10 (1206) Ultra Low profile size ..... P. D26
  - AL case : 3216-12 (1206) Low profile size ..... P. D26
  - A case : 3216-18 (1206) size ..... P. D26
  - BL case : 3528-12 (1411) Low profile size ..... P. D26
- **Standard : TCO Series** ..... P. D27
  - B case : 3528-21 (1411) size

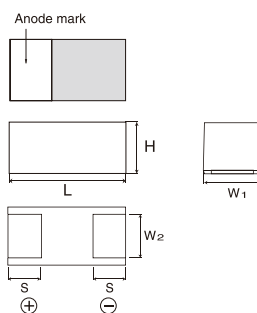
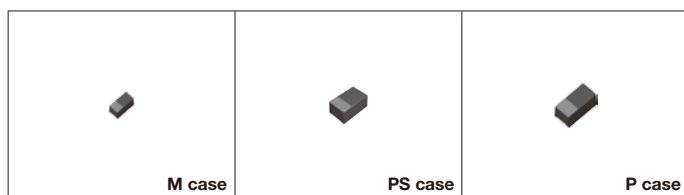
# New Bottom surface electrode (Extra large capacitance) : TCS Series

■ M case : 1608-10 (0603) size

■ PS case : 2012-09 (0805) Ultra Low profile size

■ P case : 2012-12 (0805) size

■ Dimensions



(Unit : mm)

Dimensions	Size		
	M case	PS case	P case
L	1.6+0.2/-0	2.0±0.2	2.0±0.2
W <sup>1</sup>	0.85±0.1	1.25±0.2	1.25±0.2
W <sup>2</sup>	0.55±0.1	0.85±0.2	0.85±0.2
H	0.8+0.2/-0	0.9Max.	1.2Max.
S	0.5±0.1	0.5±0.1	0.5±0.1

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCS Series	M case 1608-10 (0603) size	±20% (M)	-55°C to +125°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +125°C	Max. 40% at 120Hz (25°C)*	Max 0.2 CV (25°C, 5min)**	Max. 6.0Ω (at 100kHz)**
	PS case 2012-09 (0805) Ultra Low profile size				Max 0.1 CV (25°C, 5min)**	
	P case 2012-12 (0805) size					

\*\*Spec. values are specified for each parts number.

## ■ Capacitance range

● M case : 1608-10 (0603) size

Capacitance (μF)	Rated voltage (V.DC)				
	4	6.3	10	16	20
10 (106)				M	
22 (226)			M		
33 (336)			☆M		
47 (476)		M			
100 (107)	M				

☆:Under development

● PS case : 2012-09 (0805) Ultra Low profile size

Capacitance (μF)	Rated voltage (V.DC)				
	4	6.3	10	16	20
22 (226)					
47 (476)			☆PS		
100 (107)					
220 (227)					

☆:Under development

● P case : 2012-12 (0805) size

Capacitance (μF)	Rated voltage (V.DC)				
	4	6.3	10	16	20
10 (106)					P
22 (226)				☆P	
47 (476)			P		
100 (107)		P			
150 (157)		P			
220 (227)	P	☆P			
330 (337)	☆P				

☆:Under development

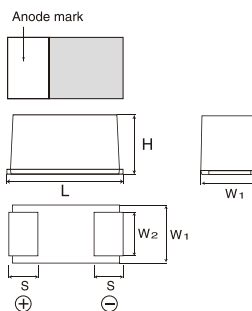
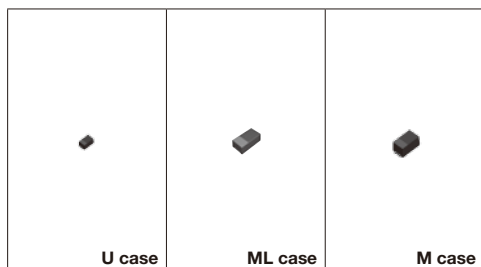
\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

▶ Bottom surface electrode (Large capacitance) : TCT, TC Series

## Bottom surface electrode (Large capacitance) : TCT, TC Series

- U case : 1005-06 (0402) size
- ML case : 1608-06 (0603) Low profile size
- M case : 1608-09 (0603) size

### ■ Dimensions



(Unit : mm)

Dimensions	Size		
	U case	ML case	M case
L	1.0+0.2/-0	1.6±0.1	1.6±0.1
W <sup>1</sup>	0.5+0.2/-0	0.85±0.1	0.85±0.1
W <sup>2</sup>	0.35±0.1	0.55±0.1	0.55±0.1
H	0.55Max.	0.55±0.1	0.8±0.1
S	0.35±0.1	0.5±0.1	0.5±0.1

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCT Series	U case 1005-06 (0402) size	±10% (K) ±20% (M)	-55°C to +125°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +125°C	Max.50% at 120Hz (25°C)*	0.5μA or 0.1 CV whichever is greater (25°C,5min)*	Max. 35Ω (at 100kHz)*
TCT Series	ML case 1608-06 (0603) Low profile size	±20% (M)		Max.30% at 120Hz (25°C)*	0.5μA or 0.01 CV whichever is greater (25°C,5min)*	Max. 15.0Ω (at 100kHz)*
TC Series	M case 1608-09 (0603) size					

\*Spec. values are specified for each parts number.

### ■ Capacitance range

#### ● U case : 1005-06 (0402) size

Capacitance (μF)	Rated voltage (V.DC)					
	2.5	4	6.3	10	16	20
0.33 (334)						U
0.47 (474)			U			
1 (105)			U		☆U	
2.2 (225)			U			
4.7 (475)		U	U	☆U		
10 (106)		☆U				
15 (156)	U					

☆:Under development

#### ● ML case 1608-06 (0603) Low profile size

Capacitance (μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
1 (105)						☆ML
2.2 (225)						
4.7 (475)						
10 (106)						
22 (226)						

☆:Under development

#### ● M case : 1608-09 (0603) size

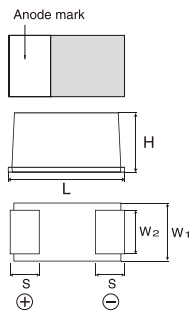
Capacitance (μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
1 (105)				M		M
2.2 (225)			M	M		
4.7 (475)		M	M			
10 (106)	M	M	M			
22 (226)	M	M				
33 (336)	M	M				

\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

# Bottom surface electrode (Large capacitance) : TCT, Series

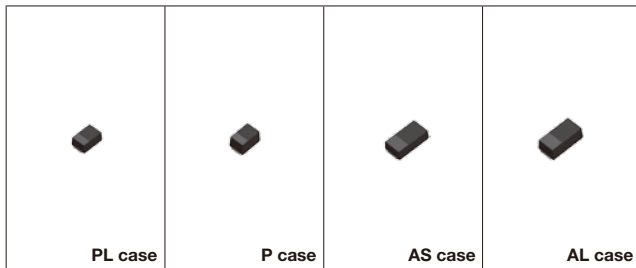
- PL case : 2012-10 (0805) Low profile size
- P case : 2012-12 (0805) size
- AS case : 3216-10 (1206) Ultra Low profile size
- AL case : 3216-12 (1206) Low profile size

## Dimensions



(Unit : mm)

Dimensions	Size			
	PL case	P case	AS case	AL case
L	2.0±0.2	2.0±0.2	3.2±0.2	3.2±0.2
W <sup>1</sup>	1.25±0.2	1.25±0.2	1.6±0.2	1.6±0.2
W <sup>2</sup>	0.85±0.2	0.85±0.2	1.2±0.2	1.2±0.2
H	0.9±0.1	1.2 Max.	0.9±0.1	1.1±0.1
S	0.5±0.2	0.5±0.2	0.8±0.2	0.8±0.2



Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCT Series	PL case 2012-10 (0805) Low profile size	±20% (M)	-55°C to +125°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +125°C	Max.30% at 120Hz (25°C)*	Max. 0.05 CV (25°C,5min)*	Max. 8.0Ω (at 100kHz)*
	P case 2012-12 (0805) size					
	AS case 3216-10 (1206) Ultra Low profile size					
	AL case 3216-12 (1206) Low profile size					

※Spec. values are specified for each parts number.

## Capacitance range

### ● PL case : 2012-10 (0805) Low profile size

Capacitance (μF)	Rated voltage (V.DC)						
	4	6.3	10	16	20	25	35
1 (105)							☆PL
2.2 (225)							
4.7 (475)					PL		
10 (106)				PL			
22 (226)			PL				
33 (336)			☆PL				
47 (476)		PL					
100 (107)	PL						

☆:Under development

### ● P case : 2012-12 (0805) size

Capacitance (μF)	Rated voltage (V.DC)						
	4	6.3	10	16	20	25	35
1 (105)							
2.2 (225)						P	
4.7 (475)							
10 (106)				P			
22 (226)			P				
33 (336)		P	P				
47 (476)	P	P	☆P				
100 (107)	P						

☆:Under development

### ● AS case : 3216-10 (1206) Ultra Low profile size

Capacitance (μF)	Rated voltage (V.DC)							
	2.5	4	6.3	10	16	20	25	35
1 (105)								AS
2.2 (225)								☆AS
4.7 (475)							AS	
10 (106)						AS		
22 (226)					AS			
33 (336)				AS				
47 (476)			AS	AS				
100 (107)		AS	AS					
220 (227)		AS						

☆:Under development

### ● AL case : 3216-12 (1206) Low profile size

Capacitance (μF)	Rated voltage (V.DC)							
	2.5	4	6.3	10	16	20	25	35
3.3 (335)								AL
4.7 (475)							AL	
10 (106)						AL		
22 (226)					AL	AL		
33 (336)					AL			
47 (476)				AL				
100 (107)			AL	☆AL				
150 (157)			AL					
220 (227)	AL	AL	☆AL					
330 (337)	AL							

☆:Under development

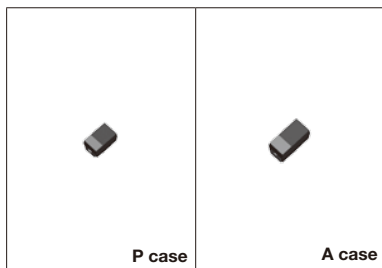
\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

- ▶ Standard : TC Series
- ▶ Fail-safe open structure : TCFG Series

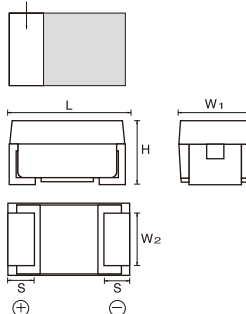
# Tantalum Capacitors

## Standard : TC Series

- P case : 2012-12 (0805) size
- A case : 3216-18 (1206) size
- Dimensions



Anode mark



(Unit : mm)

Dimensions	Size	
	P case	A case
L	2.0±0.2	3.2±0.2
W <sup>1</sup>	1.25±0.2	1.6±0.2
W <sup>2</sup>	0.9±0.2	1.2±0.2
H	1.2 Max.	1.6±0.2
S	0.45±0.3	0.8±0.3

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TC Series	P case 2012-12 (0805) size	±20% (M)	-55°C to +125°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +125°C	Max.25% at 120Hz (25°C)*	0.5μA or 0.01 CV whichever is greater (25°C,1min)*	Max. 17.5Ω (at 100kHz)*
	A case 3216-18 (1206) size			Max.30% at 120Hz (25°C)*		Max. 8.8Ω (at 100kHz)*

\*Spec. values are specified for each parts number.

### Capacitance range

- P case : 2012-12 (0805) size

Capacitance (μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
1 (105)			P	P		P
2.2 (225)	P	P	P			
4.7 (475)	P	P	P			
10 (106)	P	P	P			
22 (226)	P	P				

- A case : 3216-18 (1206) size

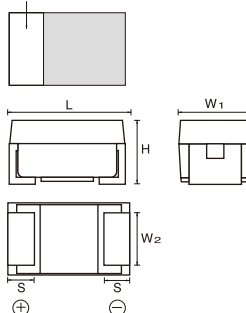
Capacitance (μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
1 (105)				A	A	A
2.2 (225)			A	A		
4.7 (475)	A	A	A	A	A	A
10 (106)	A	A	A	A		
22 (226)	A	A	A			
47 (476)	A	A				
100 (107)	A					

## Fail-safe open structure : TCFG Series

- B case : 3528-21 (1411) size
- Dimensions



Anode mark



(Unit : mm)

Dimensions	Size
	L
W <sup>1</sup>	2.8±0.2
W <sup>2</sup>	1.9±0.2
H	1.9±0.2
S	0.8±0.3

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCFG Series	B case 3528-21 (1411) size	±20% (M)	-55°C to +125°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +125°C	Max.30% at 120Hz (25°C)*	0.5μA or 0.01 CV whichever is greater (25°C,1min)	Max. 15.0Ω (at 100kHz)*

\*Spec. values are specified for each parts number.

### Capacitance range

- B case : 3528-21 (1411) size

Capacitance (μF)	Rated voltage (V.DC)					
	4	6.3	10	16	20	25
4.7 (475)				B		B
10 (106)				B	B	
22 (226)		B	B	B		
47 (476)		B	B			
100 (107)	B	B	B			
220 (227)	B	B				
330 (337)	B					

\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

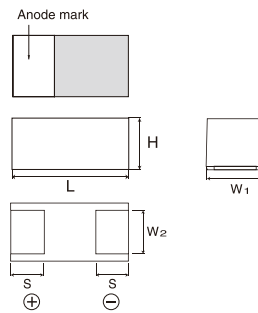
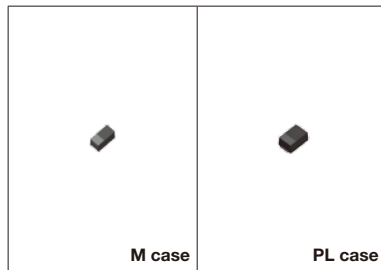


# Conductive polymer new bottom surface electrode (Extra large capacitance) : TCSO Series

■ M case : 1608-10 (0603) size

■ PL case : 2012-10 (0805) Low profile size

■ Dimensions



(Unit : mm)

Dimensions	Size	
	M case	PL case
L	1.6+0.2/-0	2.0±0.2
W <sup>1</sup>	0.85±0.1	1.25±0.2
W <sup>2</sup>	0.55±0.1	0.85±0.2
H	0.8+0.2/-0	0.9±0.1
S	0.5±0.1	0.5±0.1

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCSO Series	M case 1608-10 (0603) size	±20% (M)	-55°C to +105°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +105°C	Max. 15% at 120Hz (25°C)*	Max. 0.1 CV (25°C, 5min)	Max. 300mΩ (at 100kHz)*
	PL case 2012-10 (0805) Low profile size					Max. 200mΩ (at 100kHz)*

\*Spec. values are specified for each parts number.

## ■ Capacitance range

● M case : 1608-10 (0603) size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
10 (106)				☆300
22 (226)			300	
33 (336)		☆300		
47 (476)				

☆:Under development

● PL case : 2012-10 (0805) Low profile size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
4.7 (475)				
10 (106)				
22 (226)				
33 (336)				☆200
47 (476)			150/200	
100 (107)	☆200			

☆:Under development

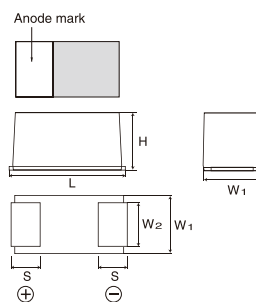
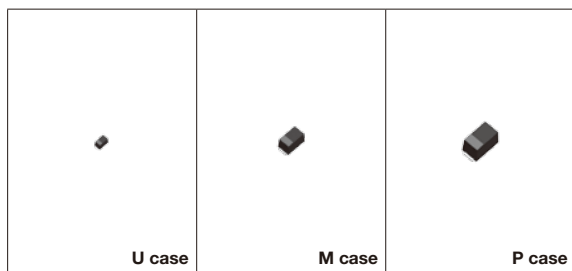
## Conductive polymer bottom surface electrode (Large capacitance) : TCTO Series

■ U case : 1005-06 (0402) size

■ M case : 1608-09 (0603) size

■ P case : 2012-12 (0805) size

### ■ Dimensions



(Unit : mm)

Dimensions	Size		
	U case	M case	P case
L	1.0+0.2/-0	1.6±0.1	2.0±0.2
W <sup>1</sup>	0.5+0.2/-0	0.85±0.1	1.25±0.2
W <sup>2</sup>	0.35±0.1	0.55±0.1	0.85±0.2
H	0.55 Max.	0.8±0.1	1.2 Max.
S	0.35±0.1	0.5±0.1	0.5±0.2

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCTO Series	U case 1005-06 (0402) size	±20% (M)	-55°C to +105°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +105°C	Max.30% at 120Hz (25°C)*	0.5μA or 0.1CV whichever is greater (25°C,5min)	Max. 3.5Ω (at 100kHz)*
	M case 1608-09 (0603) size			Max.8% at 120Hz (25°C)*	Max. 0.1 CV (25°C, 5min)	Max. 500mΩ (at 100kHz)*
	P case 2012-12 (0805) size			Max.15% at 120Hz (25°C)*	3μA or 0.1CV whichever is greater (25°C,5min)	Max. 300mΩ (at 100kHz)*

\*Spec. values are specified for each parts number.

### ■ Capacitance range

● U case : 1005-06 (0402) size (ESR : Ω)

Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
0.47 (474)				
1 (105)				
2.2 (225)			☆3500	
3.3 (335)				
4.7 (475)	☆3500			

☆:Under development

● M case : 1608-09 (0603) size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
2.2 (225)				500
4.7 (475)				500
10 (106)				☆500
22 (226)		☆500		

☆:Under development

● P case : 2012-12 (0805) size (ESR : mΩ)

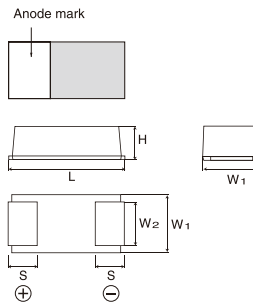
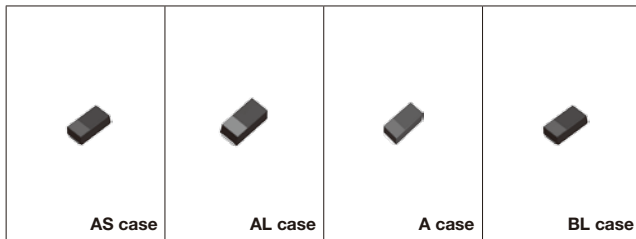
Capacitance (μF)	Rated voltage (V.DC)			
	2.5	4	6.3	10
10 (106)				300
22 (226)				☆300
47 (476)		300	☆300	
100 (107)	☆300			

☆:Under development

\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

# Conductive polymer bottom surface electrode (Large capacitance) : TCTO Series

- AS case : 3216-10 (1206) Ultra Low profile size
- AL case : 3216-12 (1206) Low profile size
- A case : 3216-18 (1206) size
- BL case : 3528-12 (1411) Low profile size



(Unit : mm)

Dimensions	Size			
	AS case	AL case	A case	BL case
L	3.2±0.2	3.2±0.2	3.2±0.2	3.5±0.2
W <sup>1</sup>	1.6±0.2	1.6±0.2	1.6±0.2	2.8±0.2
W <sup>2</sup>	1.2±0.2	1.2±0.2	1.2±0.2	2.0±0.2
H	0.9±0.1	1.1±0.1	1.6±0.2	1.1±0.1
S	0.8±0.2	0.8±0.2	0.8±0.2	0.8±0.2

Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCTO Series	AS case 3216-10 (1206) Ultra Low profile size	±20% (M)	-55°C to +105°C Rated voltage at -55°C to +85°C Derated voltage at +85°C to +105°C	Max.10% at 120Hz (25°C)*	3μA or 0.1CV whichever is greater (25°C,5min)	Max. 200mΩ (at 100kHz)*
	AL case 3216-12 (1206) Low profile size			Max.15% at 120Hz (25°C)*		
	A case 3216-18 (1206) size				Max. 0.1 CV (25°C, 5min)	Max. 150mΩ (at 100kHz)*
	BL case 3528-12 (1411) Low profile size					

※Spec. values are specified for each parts number.

## Capacitance range

- AS case : 3216-10 (1206) Ultra Low profile size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)				
	2.5	4	6.3	10	16
22 (226)					
47 (476)			200		
100 (107)			☆70/☆200		
150 (157)					

☆:Under development

- AL case : 3216-12 (1206) Low profile size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V)				
	2.5	4	6.3	10	16
22 (226)				200	
33 (336)				200	
47 (476)			70/200	☆200	
100 (107)		200	70/200		
220 (227)					

☆:Under development

- A case : 3216-18 (1206) size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V)				
	2.5	4	6.3	10	16
10 (106)					☆200
22 (226)					
47 (476)				200	
100 (107)			35/45/70		
150 (157)		35	35/200		
220 (227)	35				
330 (337)	☆35/☆200				

☆:Under development

- BL case : 3528-12 (1411) Low profile size (ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)					
	2.5	4	6.3	10	16	25
15 (156)						☆100
22 (226)						
33 (336)					☆100	
47 (476)				☆25/☆35		
100 (107)						
150 (157)		☆25/☆35	☆25/☆35			
220 (227)	☆25/☆35					
330 (337)						

☆:Under development

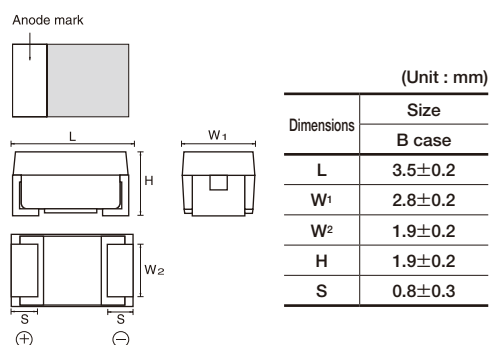
\*Usage precaution : Based on JEITA Technical Report "EIAJ RCR-2368A"

## Conductive polymer standard : TCO Series

### ■ B case : 3528-21 (1411) size



### ■ Dimensions



Series name	Case name	Capacitance tolerance	Operating temperature range	Tangent of loss angle	Leakage current	ESR
TCO Series	<b>B case 3528-21 (1411) size</b>	±20% (M)	−55°C to +105°C Rated voltage at −55°C to +85°C Derated voltage at +85°C to +105°C	Max.15% at 120Hz (25°C)*	Less than 0.1 CV (25°C, 5min)	Max. 150mΩ (at 100kHz)*

\*Spec. values are specified for each parts number.

### ■ Capacitance range

#### ● B case : 3528-21 (1411) size

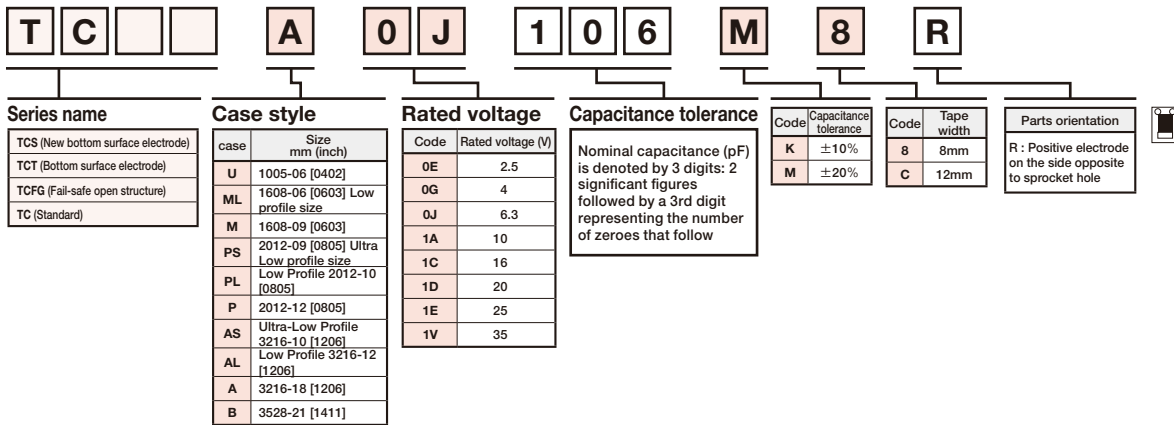
(ESR : mΩ)

Capacitance (μF)	Rated voltage (V.DC)					
	2.5	4	6.3	10	16	25
15 (156)						☆100
33 (336)				150	☆100	
47 (476)			70/150	150		
100 (107)			35/45/150			
150 (157)		150	☆25/35 45/150			
220 (227)	35/45/150		☆25/35 45/150			
330 (337)	35/45					

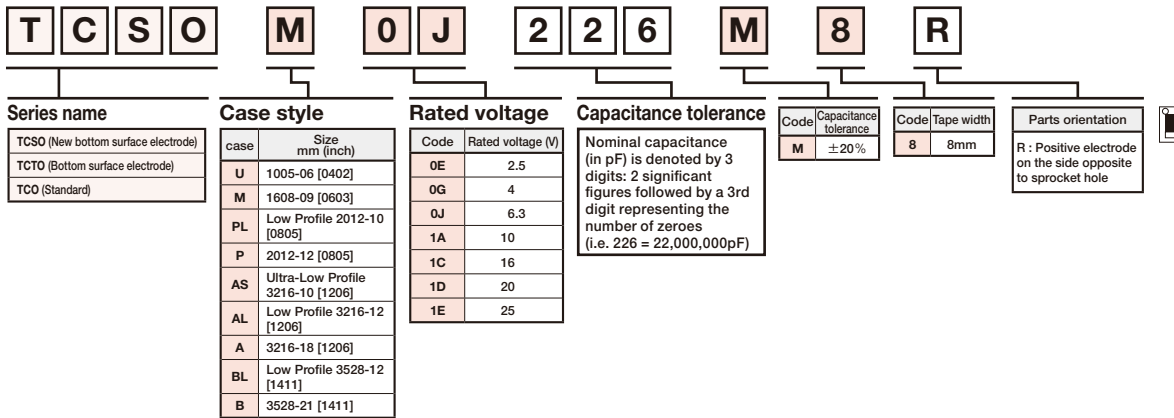
☆:Under development

## ● Part Number Explanation

### ■ Tantalum Capacitors



### ■ Conductive Polymer Capacitors



## ● Package quantity

### ■ Tantalum Capacitors

Case (mm[inch])	Series	Package quantity (pcs)
U (1005-06 [0402])	TCT	10,000
ML (1608-06 [0603] Low profile size)	TCT	5,000
M (1608-09 [0603])	TC	4,000
M (1608-10 [0603])	TCS	3,000
PS (2012-09 [0805] Ultra Low profile size)	TCS	
PL (Low Profile 2012-10 [0805])	TCT	
P (2012-12 [0805])	TCS/TCT/TC	
AS (Ultra-Low Profile 3216-10 [1206])	TCT	
AL (Low Profile 3216-12 [1206])	TC	2,000
A (3216-18 [1206])		
B (3528-21 [1411])		

### ■ Conductive Polymer Capacitors

Case (mm[inch])	Series	Package quantity (pcs)
U (1005-06 [0402])	TCTO	10,000
M (1608-09 [0603])		4,000
PL (Low Profile 2012-10 [0805])	TCSO	3,000
P (2012-12 [0805])		
AS (Ultra-Low Profile 3216-10 [1206])		
AL (Low Profile 3216-12 [1206])		
A (3216-18 [1206])		
BL (Low Profile 3528-12 [1411])	TCTO	2,000
B (3528-21 [1411])		



## Opto Devices

# LEDs

### CONTENTS

■ <b>SMD LEDs</b> .....	P. E2
Quick Reference of Brightness .....	P. E2
Characteristics .....	P. E5
Part No. Configuration .....	P. E9
Packages .....	P. E10
■ <b>Through-hole LEDs</b> .....	P. E12
Quick Reference of Brightness .....	P. E12
Characteristics .....	P. E14
Part No. Configuration .....	P. E15
Directivity .....	P. E16
Packages .....	P. E16

ISO/TS 16949-approved

※For all new products released after April of 2011, luminous intensity (luminous flux) value is stated under NIST standard. Therefore please contact LED division when comparison with conventional LEDs is needed.

SMD LEDs

# SMD LEDs

ROHM's chip LEDs were designed for automatic surface mount processes and are available in a wide variety of package sizes (from 1.0×0.6mm)

## Red(V,U) Quick Reference of Brightness

Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2500	2500 to 3120	
Mini-mold	1006	0.2	1	SML-P11VT(R)		SML-P11UT(R)																
			20							SML-P12VT(R)		SML-P12UT(R)										
	1608	0.36	20	SML-E12V8W		SML-E12U8W		SML-E12UW*		SML-D15VW(A)*		SML-D14VW(A)*										
				SML-D13VW(A)*		SML-D12V8W		SML-D15UW(A)*		SML-D15U2W(A)*		SML-D14U2W(A)*										
				SML-D13UW(A)		SML-D13U8W		SML-D12U8W														
		20125	0.8	20	SML-H12V8T		SML-H12U8T		SML-M13VT		SML-M13UT		SML-012VT(A)*		SML-012V8T		SML-013UT		SML-012U8T		SML-012UT*	
					SML-Z14V4T*		SML-Z14V4T*		SML-Z14VT(A)*		SML-Z14UT(A)*											
		Reflector	20125	0.8	20	SML-A12V8T		SML-A12U8T		SML-A12UT(J)*												
	SML-811VT(A)*					SML-811UT(A)*																
	PLCC2	3528	1.9	50													SML-S13VT		SML-S13UT			
20																						
Side View (mold)	16115	0.55	20																			
Reverse Mount	34125	1.1	10																			
Lens	3216	1.85	20																			
Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	6 to 7	7 to 8	8 to 9	9 to 10	10 to 12	12 to 14	14 to 16	16 to 18	18 to 20	20 to 22	22 to 24	CSL0701UT							
Lens	2924	3.1	20																			

## Orange(D) Quick Reference of Brightness

Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2800		
Mini-mold	1006	0.2	1	SML-P11DT(R)																		
			20							SML-P12DT(R)		SML-E12DW*		SML-E12D8W		SML-D15DW(A)*		SML-D14DW(A)*				
	1608	0.36	20	SML-D13DW(A)		SML-D12D8W		SML-H12D8T		SML-M13DT		SML-012DT(A)		SML-012D8T		SML-012DT*		SML-Z14D4T*				
				SML-D13DW(A)		SML-H12D8T		SML-M13DT		SML-012DT(A)		SML-012D8T		SML-012DT*		SML-Z14DT(A)*						
				SML-A12D8T		SML-A12DT(J)																
		20125	0.8	20	SML-811DT(A)*																	
		Reflector	20125	0.8	20																	
	PLCC2	3528	1.9	50																		
20																						
Side View (mold)	16115	0.55	20																			
Reverse Mount	34125	1.1	10																			
Lens	3216	1.85	20																			
Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	6 to 7	7 to 8	8 to 9	9 to 10	10 to 12	12 to 14	14 to 16	16 to 18	18 to 20	20 to 22	22 to 24	24 to 27	27 to 30	30 to 33	33 to 36	36 to 40	40 to 45	45 to 56	
Lens	2924	3.1	20																			

\*Please note that the brightness of some products may fall between ranks (half rank).  
 Note1: Please note that there is a measurement tolerance of with  $\pm 10\%$  in the actual products. Note2: Please be sure to refer the specifications about the rank.

E2

www.rohm.com

SMD LEDs





### Yellow(Y,W) Quick Reference of Brightness

Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	I <sub>f</sub> (mA)	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1600	1600 to 2800								
					Mini-mold	1006	0.2	1		SML-P11YT(R)					SML-P12YT(R)														
		0.36	20							SML-E12Y8W																			
	1608	0.55	20	2	SML-D11YW					SML-D12W8W(A)*					SML-D15WW(A)*					SML-D14YW(A)*					SML-D14WW(A)*				
	20125	0.8	20							SML-D12Y3W					SML-D12Y8W					SML-H12Y8T									
Reflector	20125	0.8	20							SML-M13YT					SML-012Y8T					SML-012YT*									
	3020	1.3	20							SML-012YT(A)					SML-013YT					SML-Z14Y4T*									
PLCC2	3528	1.9	50												SML-Z14YT(A)*					SML-Z14Y4T*									
		20																											
Side View (mold)	16115	0.55	20							SML-A12Y8T					SML-A12WT(J)*														
Reverse Mount	34125	1.1	10							SML-811WT(A)*																			
Lens	3216	1.85	20																	SML-S13YT									

### Green(M,P,F) Quick Reference of Brightness

Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	I <sub>f</sub> (mA)	0.63 to 1.0	1.0 to 1.6	1.6 to 2.5	2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	630 to 1000	1000 to 1800	1800 to 2500				
					Mini-mold	1006	0.2	1		SML-P11MT(R)					SML-P12MT(R)											
		0.36	20							SML-P12PT(R)																
	1608	0.55	20	2	SML-E12P8W					SML-E12M8W					SML-D15PW(A)*					SML-D15MW(A)*						
	20125	0.8	20							SML-D13FW*					SML-D13M8W					SML-D12P8W						
										SML-D12M8W					SML-D12FW					SML-310MT*						
	20125	0.8	20							SML-H12P8T					SML-H12M8T					SML-M13MT						
Reflector	20125	0.8	20							SML-M13PT					SML-012PT(A)*					SML-012M8T						
	3020	1.3	20							SML-012P8T					SML-012M8T					SML-Z14P4T*						
															SML-Z14M4T*					SML-Z14F4T*						
PLCC2	3528	1.9	50												SML-Z14MT(A)*					SML-Z14FT(A)*						
		20								SML-Z14PT(A)*					SML-Z14MT(A)*					SML-Z14FT(A)*						
Side View (mold)	16115	0.55	20							SML-A12MT(J)*					SML-A12M8T					SML-A12P8T						
Reverse Mount	34125	1.1	20							SML-812MT*																
Lens	3216	1.85	20																	SML-S13MT						

### Bluish-Green (E) Quick Reference of Brightness

Package structure	Package size	Height (mm)	Luminous Intensity (mcd)	I <sub>f</sub> (mA)	9.0 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1400	1400 to 2200	2200 to 3600	3600 to 5600	
					Mini-mold	1006	0.2	5		SMLP13EC8T									
	1608	0.36	5							SMLE13EC8T									
PLCC2	3528	1.9	20												SMLZ14EGT(A)*				
Side View (mold)	16115	0.55	5		SMLA12EC6T														
Lens	3216	1.85	20												SMLS14EET				

\*Please note that the brightness of some products may fall between ranks (half rank).

Note1: Please note that there is a measurement tolerance of with in ±10% in the actual products. Note2: Please be sure to refer the specifications about the rank.



# SMD LEDs

## Blue(B) Quick Reference of Brightness

Package structure	Package size	Height (mm)	I <sub>f</sub> (mA)	Luminous Intensity (mcd)	0.9 to 1.4	1.4 to 2.2	2.2 to 3.6	3.6 to 5.6	5.6 to 9.0	9 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1400		
Mini-mold	1006	0.2	5								SMLP13BC8T											
	1608	0.36	20								SMLE13BC8T											
Reflector	20125	0.8	5								SMLMN2BCT											
PLCC2	3528	1.9	20																	SMLZN4BGT(A)		
Side View (mold)	16115	0.55	5																			
Reverse Mount	34125	1.1	20										SMLA13BC8T									
													SML812BCT									
Lens	3216	1.85	20																	SMLS14BET		

## White(WB) Quick Reference of Brightness

Package structure	Package size	Height (mm)	I <sub>f</sub> (mA)	Luminous Intensity (mcd)	9 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1100	1100 to 1400	1400 to 1800	1800 to 2200	2200 to 2800	2800 to 3600	3600 to 7000	7000 to 8500
Mini-mold	1006	0.2	5								SCMP13WBC8W											
	1608	0.36	5								SMLE13WBC8W											
Side View (Reflector)	16115	0.55	5								SMLA12WBC7W											
Reverse Mount	2812	0.8	20																			CSL0406WBCW
Reflector	34125	1.1	5								SML813WBC8W											
	20125	0.8	5								SMLMN2WB1CW											
	3528	1.9	20																			SMLZN4WBGUW(A)
Package structure	Package size	Height (mm)	I <sub>f</sub> (mA)	Luminous Intensity (mcd)	2.2 to 2.8	2.8 to 3.3	3.3 to 4.0	4.0 to 4.8	4.8 to 5.8	5.8 to 7.0	7.0 to 8.5	8.5 to 10.2	10.2 to 12.3	12.3 to 14.8	14.8 to 19	19 to 21.8	21.8 to 24.5	24.5 to 27.2	27.2 to 29.3	29.3 to 32.6	32.6 to 35.4	
PSML2	4520	0.6	90		SMLK18WBJAW																	
					SMLK18WBJBW																	
					SMLK18WBJCW																	
					SMLK18WBJDW																	
					SMLK28WBJCW																	

## Dual Color Quick Reference of Brightness

Package structure	Package size	Height (mm)	I <sub>f</sub> (mA)	Luminous Intensity (mcd)	Emitting Color	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	
Mini-mold	1010	0.2	20		Red									
					Green									
	1315	0.6	5		Red									
					Blue									
					Green									
					Red									
			20		Green									
					Red									
					Orange									
					Green									
	Yellow													

## Triple Color Quick Reference of Brightness

Package structure	Package size	Height (mm)	I <sub>f</sub> (mA)	Luminous Intensity (mcd)	Emitting Color	5.6 to 9.0	9.0 to 14	14 to 22	22 to 36	36 to 56	56 to 90	90 to 140	140 to 220	220 to 360	360 to 560	560 to 900	900 to 1400	1400 to 1800		
Mini-mold	1010	0.2	5		Red															
					Green															
					Blue															
	1510	0.2	5		Red															
					Green															
					Blue															
Reflector	3528	0.6	20		Red															
					Green															
					Blue															
					Red															
					Green															
	6922	2.15	20		Blue															
					Red															
					Green															
					Red															
					Blue															

\*Please note that the brightness of some products may fall between ranks (half rank).

Note1: Please note that there is a measurement tolerance of with  $\pm 10\%$  in the actual products. Note2: Please be sure to refer the specifications about the rank.

# SMD LEDs



PICOLED™																						
Package size(mm)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)												
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf		Reverse Current Ir		Dominant Wavelength λD			Luminous Intensity Iv					
										Typ. (V)	Ir (mA)	Max. (μA)	Vr (V)	Min.*6 (nm)	Typ.*6 (nm)	Max.*6 (nm)	Ir (mA)	Min. (mcd)	Typ. (mcd)	Ir (mA)		
PICOLED™-sco 1.0×0.6 (t=0.2)	SML-P11VT(R)	AlGaInP	Red	50				-40 to +85	-40 to +100	1.8				621	626	631		1.6	4.0			
	SML-P11UT(R)		Orange	52	20	100**2	5			1	10	5		616	621	626		1.0	2.5			
	SML-P11DT(R)		Yellow											602	605	608	1	4.0	7.3	1		
	SML-P11YT(R)		Yellowish-Green											583	586	589			7.6			
	SML-P11MT(R)		White											566	569	572		1.0	2.1			
PICOLED™ 1.0×0.6 (t=0.2)	SML-P12VT(R)	AlGaInP	Red	50				-40 to +85	-40 to +100	2.0				625	630	635		25	(40)			
	SML-P12UT(R)		Orange	52	20	100**2	5			2.1	20	10		615	620	625		40	(60)			
	SML-P12DT(R)		Yellow							2.2				602	605	608	20	63	(82)	20		
	SML-P12YT(R)		Yellowish-Green							2.2				587	590	593		40	(70)			
	SML-P12MT(R)	Green							2.2				569	572	575		10	(25)				
	SML-P12PT(R)	Bluish-Green							3.0				557	560	563		2.5	(6.3)				
	SMLP13EC8T	Blue	InGaIn		33	10	50**2			2.9	5	100		520	527	535	5	(56)	(110)	5		
	SMLP13BC8T	White											465	470	475		(9)	(25)				
SCMP13WBC8W												(x,y)	(0.30,0.30)			90	150					
<b>(Mold Type (1608))</b>																						
1.6×0.8 (t=0.36)	SML-E12V8W	AlGaInP	Red	54	20	100**2		-40 to +85	-40 to +100	2.2				625	630	635		16	40			
	SML-E12UW		Orange	62	25	60**1		-30 to +85	-40 to +85	2.1				619	624	629		36	100			
	SML-E12U8W		Yellow	54	20	100**2		-40 to +85	-40 to +100	2.2				615	620	625		25	63			
	SML-E12DW		Yellowish-Green	62	25	60**1		-30 to +85	-40 to +85	1.9				604	606	610	20	56	200	20		
	SML-E12D8W		Green							2.2				602	605	608		40	100			
	SML-E12Y8W		White	54	20	100**2	5	-40 to +85	-40 to +100	2.2		10	5	587	590	593		25	63			
	SML-E12M8W								2.2				569	572	575		10	25				
	SML-E12P8W								2.2				557	560	563		2.5	6.3				
	SML-E13EC8T	Bluish-Green	InGaIn		68					3.0				520	527	535		56	120			
	SML-E13BC8T	Blue		66						2.9	5			465	470	475	5	14	40	5		
	SML-E13WBC8W	White		33	10	50**2				2.9		100		(x,y)	(0.30,0.30)		56	120				
	1.6×0.8 (t=0.55)	☆SML-D15VW(A)	AlGaInP	Red	84	35			-40 to +100		(2.0)		(10)		627	630	634		(71.0)	—		
		SML-D14VW(A)			72	30			-40 to +85		2.0		10		71	71	100		35.5	55		
SML-D13VW(A)		54			20			-40 to +85		2.2				625	630	635		16	40			
SML-D12V8W		84			35			-40 to +100		(2.0)		(10)		616	620	624		(71.0)	—			
☆SML-D15UW(A)		72			30			-40 to +85		2.1		10		615	620	625		56	(85)			
SML-D13U8W		52			20			-40 to +85		2.2				615	620	625		40	70			
SML-D12U8W		54			20			-40 to +85		2.2								25	63			
☆SML-D15U2W(A)		84			35			-40 to +100		(2.0)		(10)		611	615	619	20	(90)	—			
SML-D14U2W(A)		75			30			-40 to +100		2.0		20		10	5	611	615	619	20	90	160	20
☆SML-D15DW(A)		84			35			-40 to +100		(2.0)		(10)						(112)	—			
SML-D14DW(A)		75			30			-40 to +85		2.0								112	200			
SML-D13DW(A)		72			30			-40 to +85		(2.0)		10						71	(120)			
SML-D12D8W		54	20			-40 to +85		2.2								40	100					
☆SML-D15YW(A)		87	35			-40 to +100		(2.1)		(10)						(112)	—					
SML-D14YW(A)		75	30			-40 to +100		2.1								112	200					
SML-D13Y8W		54	20	100**2		-40 to +85	-40 to +100	2.2			10			587	590	593		63	100			
SML-D12Y8W		67	25			-40 to +85	-40 to +100	1.85								25	63					
SML-D11YW		52	20			-40 to +85	-40 to +100	2.0		2		12		585	588	591	2	1.6	4.0	2		
☆SML-D15WW(A)		87	35			-40 to +100		(2.1)		(10)				586	587.5	589		4.5	7.1			
SML-D14WW(A)		75	30			-40 to +100		2.1						584	587	591		(112)	—			
SML-D13WW(A)		75	30			-40 to +100		(2.1)						584	587	591		112	180			
SML-D13Y2W		78				-40 to +85		(2.1)						578	581	584		71	(110)			
SML-D12Y3W						-40 to +85				10								40	(80)			
SML-D13M8W		54	20			-40 to +85		2.2						568	572	574		16	40			
SML-D12M8W						-40 to +85								569	572	575	20	10	25	20		
☆SML-D15MW(A)		87	35			-40 to +100		(2.1)		(10)				568	571	574		(35.5)	—			
SML-D14MW(A)		75	30			-40 to +100		2.1						568	571	574		35.5	(60)			
SML-D13MW(A)						-40 to +85		2.1										28	45			
SML-D12FW		67	25			-40 to +85		2.2			10			563	564.5	566		14	18			
SML-D13FW		75	30			-40 to +85		2.1						561	564	567		18	22			
☆SML-D15PW(A)		87	35			-40 to +100		(2.1)		(10)				557	560	563		(11.2)	—			
SML-D12P8W		54	20			-40 to +85		2.2			10							2.5	6.3			

\*1:Duty1/5, 200Hz \*2:Duty1/10, 1kHz \*3:Duty≤1/20, 1ms \*4:Duty≤1/5, 1kHz \*5:Duty1/10, pulse width 10ms Max. \*6:Reference ( ) Reference ☆: Under Development  
\* "PICOLED" is a pending trademarks of ROHM Co., Ltd.





# SMD LEDs

SMD LEDs																										
《Mold Type (20125)》																										
Package size(mm)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)																
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf (V)	Reverse Current Ir (μA)	Dominant Wavelength λD (nm)			Luminous Intensity Iv (mcd)											
	SML-H12V8T	AlGaInP	Red	54	20	100 <sub>0.2</sub>	5	-40 to +85	-40 to +100	2.2	20	10	5	625	630	635	16	25	20							
	SML-H12U8T													615	620	625	25	40								
	SML-H12D8T													602	605	608	40	63								
	SML-H12Y8T													587	590	593	10	25								
	SML-H12M8T													659	572	575	2.5	4.0								
	SML-H12P8T													557	560	563										
														(x,y)	(0.30,0.28)											
《Reflector Type》																										
	SML-M13VT	AlGaInP	Red	75	30	100 <sub>0.2</sub>	5	-40 to +85	-40 to +100	2.0	20	10	5	625	630	635	40	75	20							
	SML-M13UT													615	620	625	63	120								
	SML-M13DT													602	605	608	100	200								
	SML-M13YT													587	590	593	25	45								
	SML-M13MT													569	572	575	6.3	16								
	SML-M13PT													557	560	563										
														(x,y)	(0.30,0.28)											
	SMLMN2BCT	InGaIn	Blue	68	20	—	12	—	—	2.9	5	—	—	464	470	476	14	36	5							
	SMLMN2WB1CW													White	56	140	56	140								
	SML-012VT(A)	AlGaInP	Red	75	30	100 <sub>0.2</sub>	5	-40 to +100	-40 to +100	2.0	20	10	5	626	630	636	35.5	71	20							
	SML-012V8T			54	20			-40 to +85		2.2				625	630	635	25	63								
	SML-013UT			75	30			-30 to +85		2.0				619	624	629	90	220								
	SML-012U8T			54	20			-40 to +85		2.2				615	620	625	40	100								
	SML-012UT			75	30			-40 to +100		2.0				603	609	36	100									
	SML-012DT(A)			54	20			-40 to +85		2.2				602	605	608	63	160								
	SML-012D8T		75	30	-40 to +100	2.0	602	605	608	36	100															
	SML-013YT		75	30	-40 to +85	2.1	587	590	593	100	250															
	SML-012Y8T		54	20	-40 to +85	2.2	587	590	593	40	100															
	SML-012YT		75	30	-40 to +100	2.0	585	587	590	36	100															
	SML-012YT(A)		54	20	-40 to +85	2.2	569	572	575	56	112															
	SML-012M8T		62	25	60 <sub>0.2</sub>	5	558	560	564	16	40															
	SML-012PT(A)		54	20	100 <sub>0.2</sub>	5	557	560	563	9	18															
	SML-012P8T		54	20	100 <sub>0.2</sub>	5	557	560	563	2.5	10															
	SML-Z14VT(A)		AlGaInP	Red	168	—	200 <sub>0.2</sub>	12	-40 to +100	-40 to +100	1.9	20	10	12	625	630	635	20	56	112	20					
	SML-Z14V4T				189	—					2.0	50	100		615	620	625	50	140	280	50					
	SML-Z14UT(A)				168	—					1.9	20	10		20	112	224	20								
	SML-Z14U4T				189	—					2.0	50	100		50	280	560	50								
	SML-Z14DT(A)				168	—					1.9	20	10		20	140	280	20								
	SML-Z14D4T				189	—					2.0	50	100		50	355	710	50								
	SML-Z14Y4T			Yellow	175	70	2.1	50	100	587	590	593	20	140	280	50										
SML-Z14YT(A)	189	—			2.0	20	10	586	589	592	50	112	224	50												
SML-Z14M4T	189	—			2.1	50	100	569	572	575	50	112	224	50												
SML-Z14MT(A)	175	—			2.0	20	10	568	571	574	20	45	90	20												
SML-Z14F4T	189	—			2.1	50	100	562	565	568	50	71	120	50												
SML-Z14FT(A)	175	—			2.0	20	10	561.5	564	566.5	20	22.4	45	20												
SML-Z14P4T	Green	189		—	2.1	50	100	558	561	564	50	22.4	56	50												
SML-Z14PT(A)		175		—	2.0	20	10	557	560	563	20	11.2	22.4	20												
SMLZ14EGT(A)		120		—	3.4	—	—	519	528	536	710	1,100														
SMLZ14BGT(A)		114		30	100 <sub>0.2</sub>	5	3.3	20	—	—	464	470	476	20	220	330	20									
SMLZ14WBGUW(A)		White		114	30	100 <sub>0.2</sub>	(0.9)	-40 to +85							1,800	2,400										
		(x,y)		(0.30,0.28)																						
《Side view Type》																										
	SML-A12V8T	AlGaInP		Red	54	20	100 <sub>0.2</sub>	5	-40 to +85	-40 to +100	2.2	20	10	5	625	630	635	16	40	20						
	SML-A12UT(J)				75	30									619	624	629	36	100							
	SML-A12U8T		54		20	2.2									615	620	625	25	63							
	SML-A12DT(J)		75		30	2.0									603	606	609	36	100							
	SML-A12D8T		54		20	2.2									602	605	608	40	100							
	SML-A12WT(J)		75		30	2.0									602	605	608	36	63							
	SML-A12Y8T		54	20	2.2	587	590	593	25	63																
	SML-A12M8T		Yellowish-Green	65	25	—	—	—	10	25																
	SML-A12MT(J)			65	25	-30 to +85	-40 to +85	2.1	100	567	570	573	14	40												
	SML-A12P8T			54	20	2.2	557	560	563	2.5	6.3															
	SMLA12EC6T			68	20	3.0	—	—	100	520	527	535	56	56												
	SMLA13BC8T			66	—	2.9	5	10	465	470	475	5	22	(36)	5											
	SMLA12WBC7W			White	33	10	50 <sub>0.2</sub>	—	—	(x,y)	(0.30,0.30)	5	22	56												
	CSL0406WBCW		InGaIn	White	117	30	100 <sub>0.2</sub>	5	-40 to +85	-40 to +85	(3.2)	20	50	5	(x,y)	(0.30,0.28)	20	1,400	(2,200)	20						
	《Reverse mount available》																									
			SML-811VT(A)	AlGaInP	Red	62	25	100 <sub>0.2</sub>	5	-40 to +85	-40 to +100	1.95	10	100	5	626	630	636	10	11.2	22.4	10				
			SML-811UT(A)													615	620	625								
SML-811DT(A)		602	605													608										
SML-811WT(A)		587	590													593										
SML-812MT		65	—		60 <sub>0.1</sub>	4	2.1	—	4	569	572	575	14	28												
SML812BCT		InGaIn	Blue		80	20	100 <sub>0.2</sub>	5	-30 to +85	-40 to +85	3.3	20	—	5	20											
SML813WBC8W		White	33		10	50 <sub>0.5</sub>	—	—	-40 to +85	-40 to +85	(2.9)	5	10	5	(x,y)	(0.30,0.30)	5	22	(45)	5						
《High Power Type》																										
Package size(mm)	Part No.	Chip Structure	Emitting Color	Color Rendering Index (Ra)	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)															
					Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf (V)	Reverse Current Ir (μA)	Chromaticity Coordinates (x, y)		Luminous Intensity Iv (cd)			Luminous Flux φv (lm)								
	SMLK18WBJAW	InGaIn	White (5,000K)	—	675	150	230 <sub>0.5</sub>	5	-40 to +100	-40 to +100	3.9	90	10	5	(0.36, 0.36)	90	3.3	4.8	90	90						
	SMLK18WBJBW														(0.44, 0.40)						4.5	(17)				
	SMLK18WBJCW														(0.30, 0.28)								5.9	(21)		
	SMLK18WBJDW														(0.34, 0.34)										6.0	(22)
	SMLK28WBJCW														(0.30, 0.28)											

※1:Duty1/5, 200Hz ※2:Duty1/10, 1kHz ※3:Duty≤1/20, 1ms ※4:Duty≤1/5, 1kHz ※5:Duty1/10, pulse width 10ms Max. ※6:Reference \* Brightness for white color is noted with chromaticity coordinate (x, y). ( ) : Reference ☆ : Under Development



<b>(Surface mount Circular Type)</b>																				
Package size(mm)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)										
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf		Reverse Current Ir		Dominant Wavelength λD				Luminous Intensity Iv		
										Typ. (V)	If (mA)	Max. (μA)	Vr (V)	Min.*6 (nm)	Typ. (nm)	Max.*6 (nm)	If (mA)	Min. (cd)	Typ. (cd)	If (mA)
 (Reverse mount available) 3.2×1.6 (t=1.35)	SML-S13VT	AlGaInP	Red	75	30	100 <sub>a2</sub>	5	-40 to +85	-40 to +100	1.9	20	10	5	625	630	635	20	0.16	0.45	
	SML-S13UT		Orange											615	620	625		0.4	0.7	
	SML-S13DT		Yellow											602	605	608		0.63	1.4	
	SML-S13YT	Yellowish-Green	InGaN	Yellowish-Green	78	30	100 <sub>a2</sub>	5	-40 to +85	-40 to +100	2.0	20	10	5	587	590	593	20	0.16	0.4
	SML-S13MT	Bluish-Green		659											572	575	1.8		3.0	
	SMLS14EET	Bluish-Green		520											527	538	0.6		0.8	
SMLS14BET	Blue	117								3.2				464	470	476				
 2.9×2.4 (t=3.1)	<b>New</b> CSL0701UT	AlGaInP	Red	120	50	150 <sub>a2</sub>	5	-40 to +85	-40 to +100	2.1	20	10	5	619	624	629	20	9	18	
	<b>New</b> CSL0701DT		Orange											599	605	611		20	35	


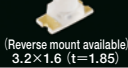
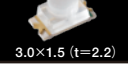
  

<b>(Multi color Type)</b>																				
Package size(mm)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)										
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf		Reverse Current Ir		Dominant Wavelength λD				Luminous Intensity Iv		
										Typ. (V)	If (mA)	Max. (μA)	Vr (V)	Min.*6 (nm)	Typ. (nm)	Max.*6 (nm)	If (mA)	Min. (mcd)	Typ. (mcd)	If (mA)
 Dual color type PICOLED™-Duo 1.0×1.0 (t=0.2)	SML-P24MUW(R)	AlGaInP	Yellowish-Green	54	20	100 <sub>a2</sub>	5	-40 to +85	-40 to +100	2.2	20	10	5	569	572	575	20	10	21	
			Red	52						2.1				615	620	625		25	52	
 Dual color type 1.3×1.5 (t=0.6)	SML522BU1W	InGaN	Blue	66	20	60 <sub>a2</sub>	5	-40 to +85	-40 to +100	2.9	5	10	5	465	470	475	5	9	22	
		AlGaInP	Red	50						1.9				619	624	629		10	21	
	SML-522MUW	AlGaInP	Yellowish-Green	52	20	60 <sub>a1</sub>	4	-30 to +85	-40 to +85	2.1	20	100	4	569	572	575	20	14	40	
			Red	50						1.9				615	620	625		22	63	
	SML-522MU8W		Yellowish-Green	54						2.2				569	572	575		16	40	
	SML-522MD8W	Red	54	2.2	615	620	625	25	63											
	Yellowish-Green	54	2.2	569	572	575	10	25												
	Orange	54	2.2	602	605	608	40	100												
SML-522MY8W	Yellowish-Green	54	2.2	569	572	575	16	40												
	Yellow	54	2.2	587	590	593	40	63												
 3 colors, 4-terminal PICOLED™-RGB 1.0×1.0 (t=0.2)	SMLP34RGB2W	AlGaInP	Red							2.1				619	624	629		14	35	
			InGaN	Green	35	10	50 <sub>a3</sub>	5	-40 to +85	-40 to +100	3.1	5	10	5	520	527	535	5	56	110
				Blue							3.0				465	470	475		28	35
 3 colors, 6-terminal PICOLED™-RGB 1.5×1.0 (t=0.2)	SMLP36RGB2W(R)	AlGaInP	Red							2.1				619	624	629		14	35	
			InGaN	Green	35	10	50 <sub>a3</sub>	5	-40 to +85	-40 to +100	3.1	5	10	5	520	527	535	5	56	110
				Blue							3.0				465	470	475		28	35




\*1:Duty1/5, 200Hz \*2:Duty1/10, 1kHz \*3:Duty≤1/20, 1ms \*4:Duty≤1/5, 1kHz \*5:Duty1/10, pulse width 10ms Max. \*6:Reference

# SMD LEDs

<b>(Multi color Type)</b>																					
Package size(mm)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)											
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf			Reverse Current Ir			Dominant Wavelength λD			Luminous Intensity Iv		
										Typ. (V)	If (mA)	Max. (μA)	Vr (V)	Min. (nm)	Typ. (nm)	Max. (nm)	If (mA)	Min. (mcd)	Typ. (mcd)	If (mA)	
 SRGB2 3 colors 3.5×2.8 (t=0.6)	<b>New</b> SMLVN6RGB1W※9	AlGaInP	Red	400 <sup>※7</sup> <sub>※8</sub>	50	100	5	-40 to +85	-40 to +100	2.1	20	10	5	619	624	629	20	450	700		
		InGaN	Green		40					520				527	535	710		1,200	20		
		InGaN	Blue		40					465				470	475	220		400			
	<b>New</b> SMLVN6RGB1U※10	AlGaInP	Red	400 <sup>※7</sup> <sub>※8</sub>	50	100	5	-40 to +85	-40 to +100	2.1	20	10	5	619	624	629	20	450	700		
		InGaN	Green		40					520				527	535	710		1,200	20		
		InGaN	Blue		40					465				470	475	220		400			
 SRGB-S 3 colors 6.9×2.2 (t=2.15)	MSL0101RGBW※9	AlGaInP	Red	400 <sup>※7</sup> <sub>※8</sub>	50	100	5	-40 to +85	-40 to +100	2.1	20	10	5	619	624	629	20	450	700		
		InGaN	Green		40					520				527	535	710		1,200	20		
		InGaN	Blue		40					465				470	475	220		400			
	MSL0101RGBU※10	AlGaInP	Red	400 <sup>※7</sup> <sub>※8</sub>	50	100	5	-40 to +85	-40 to +100	2.1	20	10	5	619	624	629	20	450	700		
		InGaN	Green		40					520				527	535	710		1,200	20		
		InGaN	Blue		40					465				470	475	220		400			

<b>(Surface mount type Infrared LEDs)</b>																				
Package size (mm)	Part No.	LED Chip	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)										
				Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf			Reverse Current Ir			Light Wavelength λP		Radiant Intensity Ie		
										Typ. (V)	If (mA)	Max. (μA)	Vr (V)	Typ. (nm)	If (mA)	Min. (mW/sr)	Typ. (mW/sr)	If (mA)		
 2.0×1.25 (t=0.8)	SML-M13RT	AlGaAs	Infrared	60	100 <sup>※2</sup>	300 <sup>※2</sup>	5	-40 to +85	-40 to +100	1.4	20	10	5	870	20	0.5	1.7	20		
 (Reverse mount available) 3.2×1.6 (t=1.85)	SML-S13RT													850		1.5	2.5			
 3.0×1.5 (t=2.2)	SCM-013RT													57		500 <sup>※2</sup>	0.5		2.0	

\*Mounting Conditions must be carefully Considered

<b>(Surface mount Phototransistors)</b>																		
Package size (mm)	Part No.	LED Chip	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)									
			Collector-Emitter Voltage (V)	Emitter-Collector Voltage (V)	Collector Current (mA)	Collector Power Dissipation (mW)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Light Current		Dark Current		Sensitivity λP Typ. (nm)	Collector-emitter Saturation Voltage				
									Min. (mA)	Max. (mA)	VCE (V) / Ie (Lx)	Max. (μA)		VCE (V)	Min. (V)	Typ. (V)	Max. (V)	Ic (mA) / Ie (Lx)
 2.0×1.25 (t=0.8)	SML-H10TB	Si	32	5	30	80	-30 to +85	-30 to +100	2.0	3.8	5 / 500	0.5	10	800	—	—	0.4	0.1 / 500
 (Reverse mount available) 3.4×1.25 (t=1.1)	SML-810TB								2.3									
 3.0×1.5 (t=2.2)	SCM-014TB								0.3									

※1:Duty1/5, 200Hz ※2:Duty1/10, 1kHz ※3:Duty≤1/20, 1ms ※4:Duty≤1/5, 1kHz ※5:Duty1/10, pulse width 10ms Max. ※6:Reference  
 ※7:Total power dissipation in case of lighting three colors. (when lighting three colors, it will be reduced down to 30% of it.) ※8:50mm×50mm, Substrate: FR4 : t=1.6mm Cu foil : t=0.07mm  
 ※9:Epoxy resin ※10:Silicon resin





### ● Part No. Configuration (Chip LEDs)

- When ordering, please specify the part number.
- Check each code in light of the tables shown below.
- Fill in the part number from the left, leaving any extra boxes on the right empty.
- ※Part names are appointed individually per each ranks.
- ※Please refer to Specifications sheet for details.

"-" will be taken out for emitting color blue, bluish-green, and white.

Dice classification code      Chromaticity\* Rank (for white LED)      Brightness Rank\*

S M L - D 1 2 M   T T 8 6    

Series Name	Shape	Dice Type	Color	Resin Color	Taping Specifications*																																																																																																														
<b>SML</b> Chip LEDs	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>P1</td><td>1.0 × 0.6</td><td>t=0.2 mm</td> <td>81</td><td>3.4 × 1.25</td><td>t=1.1 mm</td> </tr> <tr> <td>E1</td><td>1.6 × 0.8</td><td>t=0.36 mm</td> <td>K1</td><td>4.5 × 2.0</td><td>t=0.6 mm</td> </tr> <tr> <td>D1</td><td>1.6 × 0.8</td><td>t=0.55 mm</td> <td>S1</td><td>3.2 × 1.6</td><td>t=1.85 mm</td> </tr> <tr> <td>M1</td><td>2.0 × 1.25</td><td>t=0.8 mm</td> <td>P2</td><td>1.0 × 1.0</td><td>t=0.2 mm</td> </tr> <tr> <td>O1</td><td>3.0 × 2.0</td><td>t=1.3 mm</td> <td>S2</td><td>1.3 × 1.5</td><td>t=0.6 mm</td> </tr> <tr> <td>Z1</td><td>3.5 × 2.8</td><td>t=1.9 mm</td> <td>P3(4)</td><td>1.0 × 1.0</td><td>t=0.2 mm</td> </tr> <tr> <td>ZN</td><td>3.5 × 2.8</td><td>t=1.9 mm</td> <td>P3(6)</td><td>1.5 × 1.0</td><td>t=0.2 mm</td> </tr> <tr> <td>A1</td><td>1.6 × 1.15</td><td>t=0.55 mm</td> <td>VN</td><td>3.5 × 2.8</td><td>t=0.6 mm</td> </tr> </table>	P1	1.0 × 0.6	t=0.2 mm	81	3.4 × 1.25	t=1.1 mm	E1	1.6 × 0.8	t=0.36 mm	K1	4.5 × 2.0	t=0.6 mm	D1	1.6 × 0.8	t=0.55 mm	S1	3.2 × 1.6	t=1.85 mm	M1	2.0 × 1.25	t=0.8 mm	P2	1.0 × 1.0	t=0.2 mm	O1	3.0 × 2.0	t=1.3 mm	S2	1.3 × 1.5	t=0.6 mm	Z1	3.5 × 2.8	t=1.9 mm	P3(4)	1.0 × 1.0	t=0.2 mm	ZN	3.5 × 2.8	t=1.9 mm	P3(6)	1.5 × 1.0	t=0.2 mm	A1	1.6 × 1.15	t=0.55 mm	VN	3.5 × 2.8	t=0.6 mm	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>0</td><td>Standard Type</td> </tr> <tr> <td>1</td><td>Low Current Type</td> </tr> <tr> <td>2</td><td>High Brightness Type</td> </tr> <tr> <td>3</td><td rowspan="5">Ultra High Brightness Type</td> </tr> <tr> <td>4</td> </tr> <tr> <td>5</td> </tr> <tr> <td>6</td> </tr> <tr> <td>8</td> </tr> </table>	0	Standard Type	1	Low Current Type	2	High Brightness Type	3	Ultra High Brightness Type	4	5	6	8	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>V</td><td>Red:630nm</td></tr> <tr><td>U</td><td>Red:620nm</td></tr> <tr><td>U2</td><td>Red:611nm</td></tr> <tr><td>D</td><td>Orange:605nm</td></tr> <tr><td>Y</td><td>Yellow:587(590)nm</td></tr> <tr><td>W</td><td>Yellow:590nm</td></tr> <tr><td>M</td><td>Yellowish-Green:572nm</td></tr> <tr><td>F</td><td>Green:564(565)nm</td></tr> <tr><td>P</td><td>Green:560nm</td></tr> <tr><td>E</td><td>Bluish-Green:527nm</td></tr> <tr><td>B</td><td>Blue:470nm</td></tr> <tr><td>WB</td><td>White</td></tr> <tr><td>R</td><td>Infrared LED</td></tr> <tr><td>T</td><td>Phototransistors</td></tr> <tr><td>R</td><td>Red:624(630)nm</td></tr> <tr><td>G</td><td>Green:527(530)nm</td></tr> <tr><td>B</td><td>Blue:470nm</td></tr> </table>	V	Red:630nm	U	Red:620nm	U2	Red:611nm	D	Orange:605nm	Y	Yellow:587(590)nm	W	Yellow:590nm	M	Yellowish-Green:572nm	F	Green:564(565)nm	P	Green:560nm	E	Bluish-Green:527nm	B	Blue:470nm	WB	White	R	Infrared LED	T	Phototransistors	R	Red:624(630)nm	G	Green:527(530)nm	B	Blue:470nm	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>T</td><td>Transparent Colorless</td> </tr> <tr> <td>W</td><td>MilkyWhite</td> </tr> <tr> <td>B</td><td>Black</td> </tr> </table>	T	Transparent Colorless	W	MilkyWhite	B	Black	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>T86</td><td>Cathode at sprocket hole side (the top)</td> </tr> <tr> <td>T87</td><td>Anode at sprocket hole side (the top)</td> </tr> <tr> <td>T68</td><td>Cathode at sprocket hole side (the back)</td> </tr> <tr> <td>1</td><td>For whiteLED, cathode at sprocket hole side</td> </tr> <tr> <td>3</td><td></td> </tr> </table>	T86	Cathode at sprocket hole side (the top)	T87	Anode at sprocket hole side (the top)	T68	Cathode at sprocket hole side (the back)	1	For whiteLED, cathode at sprocket hole side	3	
P1	1.0 × 0.6	t=0.2 mm	81	3.4 × 1.25	t=1.1 mm																																																																																																														
E1	1.6 × 0.8	t=0.36 mm	K1	4.5 × 2.0	t=0.6 mm																																																																																																														
D1	1.6 × 0.8	t=0.55 mm	S1	3.2 × 1.6	t=1.85 mm																																																																																																														
M1	2.0 × 1.25	t=0.8 mm	P2	1.0 × 1.0	t=0.2 mm																																																																																																														
O1	3.0 × 2.0	t=1.3 mm	S2	1.3 × 1.5	t=0.6 mm																																																																																																														
Z1	3.5 × 2.8	t=1.9 mm	P3(4)	1.0 × 1.0	t=0.2 mm																																																																																																														
ZN	3.5 × 2.8	t=1.9 mm	P3(6)	1.5 × 1.0	t=0.2 mm																																																																																																														
A1	1.6 × 1.15	t=0.55 mm	VN	3.5 × 2.8	t=0.6 mm																																																																																																														
0	Standard Type																																																																																																																		
1	Low Current Type																																																																																																																		
2	High Brightness Type																																																																																																																		
3	Ultra High Brightness Type																																																																																																																		
4																																																																																																																			
5																																																																																																																			
6																																																																																																																			
8																																																																																																																			
V	Red:630nm																																																																																																																		
U	Red:620nm																																																																																																																		
U2	Red:611nm																																																																																																																		
D	Orange:605nm																																																																																																																		
Y	Yellow:587(590)nm																																																																																																																		
W	Yellow:590nm																																																																																																																		
M	Yellowish-Green:572nm																																																																																																																		
F	Green:564(565)nm																																																																																																																		
P	Green:560nm																																																																																																																		
E	Bluish-Green:527nm																																																																																																																		
B	Blue:470nm																																																																																																																		
WB	White																																																																																																																		
R	Infrared LED																																																																																																																		
T	Phototransistors																																																																																																																		
R	Red:624(630)nm																																																																																																																		
G	Green:527(530)nm																																																																																																																		
B	Blue:470nm																																																																																																																		
T	Transparent Colorless																																																																																																																		
W	MilkyWhite																																																																																																																		
B	Black																																																																																																																		
T86	Cathode at sprocket hole side (the top)																																																																																																																		
T87	Anode at sprocket hole side (the top)																																																																																																																		
T68	Cathode at sprocket hole side (the back)																																																																																																																		
1	For whiteLED, cathode at sprocket hole side																																																																																																																		
3																																																																																																																			
<b>SCM</b> Chip LEDs	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>O1</td><td>3.0 × 1.5</td><td>t=2.2 mm</td> </tr> </table>	O1	3.0 × 1.5	t=2.2 mm																																																																																																															
O1	3.0 × 1.5	t=2.2 mm																																																																																																																	

Taping Specifications\*

C S L 0 4 0 6 W B C W 1 3 B E

Series Name	Shape	Dice Type	Color	Resin Color (Color Rendering Index)	Chromaticity* Rank (for white LED)	Brightness Rank*																								
<b>CSL</b> Chip LEDs	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>04</td><td>2.8 × 1.2</td><td>t=0.8 mm</td> </tr> <tr> <td>07</td><td>2.9 × 2.5</td><td>t=3.06 mm</td> </tr> </table>	04	2.8 × 1.2	t=0.8 mm	07	2.9 × 2.5	t=3.06 mm		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>U</td><td>Red:620nm</td></tr> <tr><td>D</td><td>Orange:605nm</td></tr> <tr><td>WB</td><td>White</td></tr> <tr><td>R</td><td>Red:624(630)nm</td></tr> <tr><td>G</td><td>Green:527(530)nm</td></tr> <tr><td>B</td><td>Blue:470nm</td></tr> </table>	U	Red:620nm	D	Orange:605nm	WB	White	R	Red:624(630)nm	G	Green:527(530)nm	B	Blue:470nm	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>T</td><td>Transparent Colorless</td> </tr> <tr> <td>W</td><td>MilkyWhite</td> </tr> <tr> <td>U</td><td></td> </tr> </table>	T	Transparent Colorless	W	MilkyWhite	U			
04	2.8 × 1.2	t=0.8 mm																												
07	2.9 × 2.5	t=3.06 mm																												
U	Red:620nm																													
D	Orange:605nm																													
WB	White																													
R	Red:624(630)nm																													
G	Green:527(530)nm																													
B	Blue:470nm																													
T	Transparent Colorless																													
W	MilkyWhite																													
U																														
<b>MSL</b> Multi color LEDs	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>01</td><td>6.9 × 2.2</td><td>t=2.15 mm</td> </tr> </table>	01	6.9 × 2.2	t=2.15 mm																										
01	6.9 × 2.2	t=2.15 mm																												

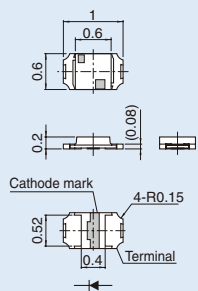


# SMD LEDs

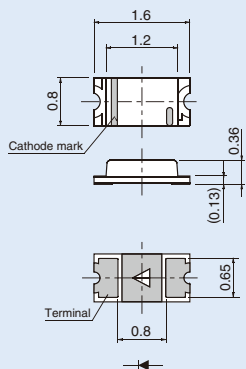
## ● Packages (Unit:mm)

### <Mold Type>

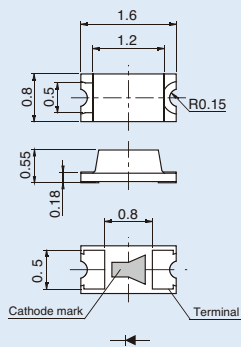
#### ● SML-P1 series



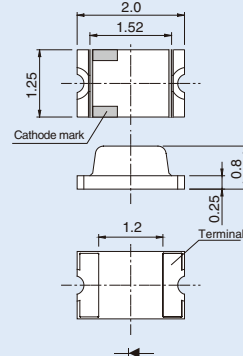
#### ● SML-E1 series



#### ● SML-D1 series

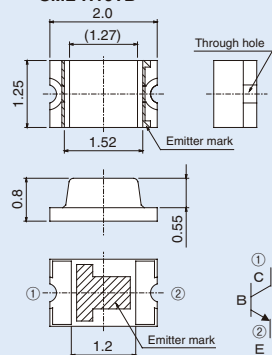


#### ● SML-H1 series

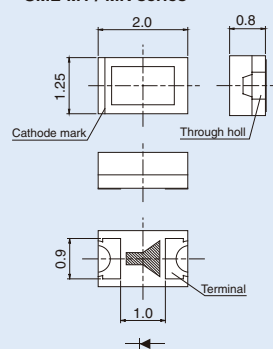


### <Reflector Type>

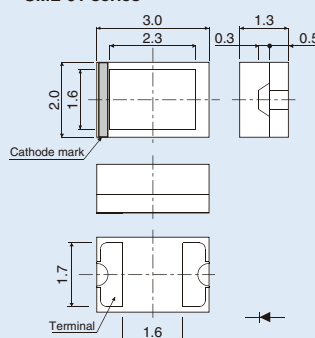
#### ● SML-H10TB



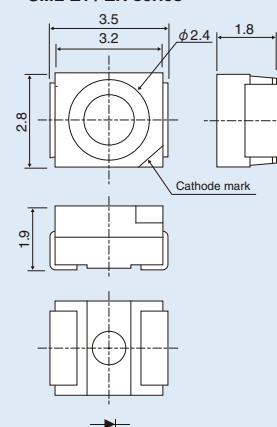
#### ● SML-M1 / MN series



#### ● SML-01 series

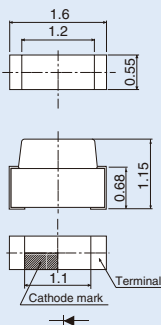


#### ● SML-Z1 / ZN series

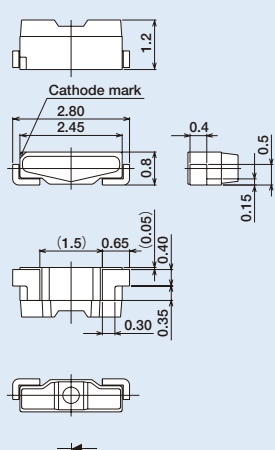


### <Side view Type>

#### ● SML-A1 series

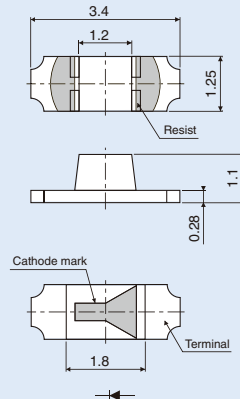


#### ● CSL04 series

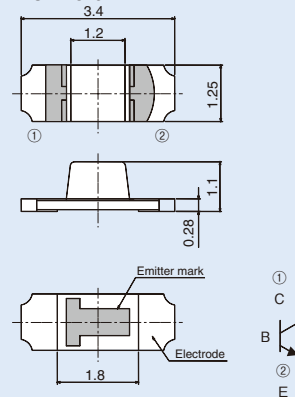


### <Reverse mount Type>

#### ● SML-81 series



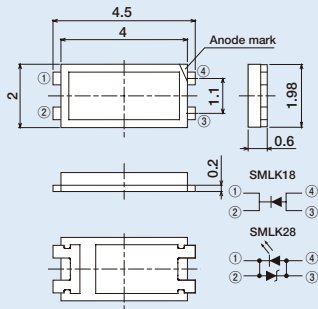
#### ● SML-810TB



"PICOLED" is a pending trademarks of ROHM Co., Ltd.  
※For further information, please refer to the data sheets.

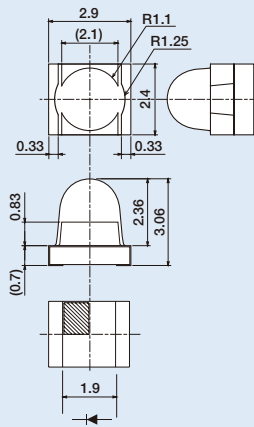
<High Brightness White Type>

• SMLK1 / K2 series

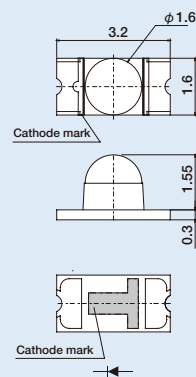


<Surface mount Lens Type>

• CSL07 series

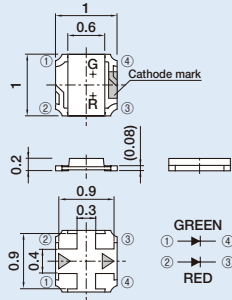


• SML-S13 series

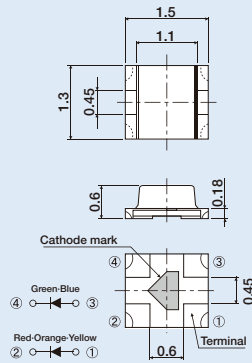


<Multi color Type>

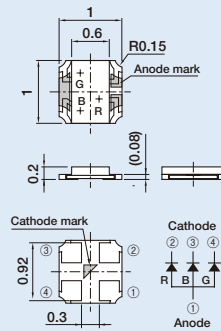
• SMLP2 series



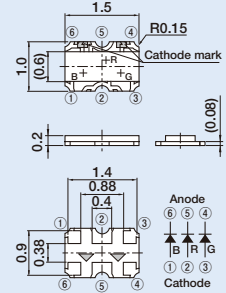
• SML-52 series



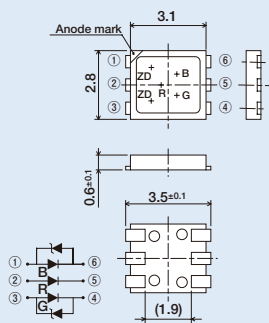
• SMLP34 series



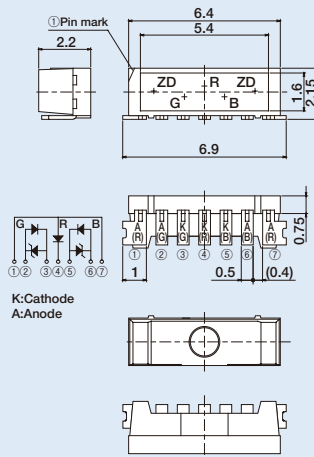
• SMLP36 series



• SMLVN6 series



• MSL01 series



※For further information, please refer to the data sheets.



# Through-hole LEDs

ROHM offers a wide variety of through-hole LEDs, including lamps that can be automatically mounted onto the PCB as well as high brightness units suitable for public outdoor displays.

## Red(V,U) Quick Reference of Brightness

<High Brightness Rank Table>

XE	XF	XG	XH	XJ	XK	XL	XM	XN	XP	XQ	XR	XS	XT	XU
47 to 68	68 to 100	100 to 150	150 to 220	220 to 330	330 to 470	470 to 680	680 to 1000	1000 to 1500	1500 to 2200	2200 to 3300	3300 to 4700	4700 to 6800	6800 to 10000	10000 to 15000

Viewing angle (2θ1/2)	Resin Color	Brightness Rank													
		Brightness (mcd)													
		K	L	M	N	P	Q	R	S	T	U	V			
		4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	(If=20mA)		
φ3 Circular type	40°	Transparent Colored									*SLI-343URC				
													*SLI-343V8RC*		
														*SLI-343U8RC*	
	Diffused Colored														
85°	Transparent Colored														
	Diffused Colored														
φ3 Circular type (Direct mount 5mm pitch type)	40°	Transparent Colored													
		Diffused Colored													
φ3 Flat disc type	35°	Transparent Colored													
	50°	Diffused Colored													
φ4 Oval type	140°	Diffused Colored													
	10°	Transparent Colorless													
φ5 Circular type	20°	Transparent Colorless													
	40°	Transparent Colored													
		Diffused Colored													

## Orange(D) Quick Reference of Brightness

<High Brightness Rank Table>

XE	XF	XG	XH	XJ	XK	XL	XM	XN	XP	XQ	XR	XS	XT	XU
47 to 68	68 to 100	100 to 150	150 to 220	220 to 330	330 to 470	470 to 680	680 to 1000	1000 to 1500	1500 to 2200	2200 to 3300	3300 to 4700	4700 to 6800	6800 to 10000	10000 to 15000

Viewing angle (2θ1/2)	Resin Color	Brightness Rank														
		Brightness (mcd)														
		J	K	L	M	N	P	Q	R	S	T	U	V			
		2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	(If=20mA)		
φ3 Circular type	40°	Transparent Colored														
	Diffused Colored															
85°	Transparent Colored															
	Diffused Colored															
φ3 Circular type (Direct mount 5mm pitch type)	40°	Transparent Colored														
		Diffused Colored														
φ3 Flat disc type	35°	Transparent Colored														
	50°	Diffused Colored														
φ4 Oval type	140°	Diffused Colored														
	10°	Transparent Colorless														
φ5 Circular type	20°	Transparent Colorless														
	40°	Transparent Colored														
		Diffused Colored														

## Yellow(Y) Quick Reference of Brightness

<High Brightness Rank Table>

XE	XF	XG	XH	XJ	XK	XL	XM	XN	XP	XQ	XR	XS	XT	XU
47 to 68	68 to 100	100 to 150	150 to 220	220 to 330	330 to 470	470 to 680	680 to 1000	1000 to 1500	1500 to 2200	2200 to 3300	3300 to 4700	4700 to 6800	6800 to 10000	10000 to 15000

Viewing angle (2θ1/2)	Resin Color	Brightness Rank														
		Brightness (mcd)														
		J	K	L	M	N	P	Q	R	S	T	U	V			
		2.5 to 4.0	4.0 to 6.3	6.3 to 10	10 to 16	16 to 25	25 to 40	40 to 63	63 to 100	100 to 160	160 to 250	250 to 400	400 to 630	(If=20mA)		
φ3 Circular type	40°	Transparent Colored														
	Diffused Colored															
85°	Transparent Colored															
	Diffused Colored															
φ3 Circular type (Direct mount 5mm pitch type)	40°	Transparent Colored														
		Diffused Colored														
φ3 Flat disc type	35°	Transparent Colored														
	50°	Diffused Colored														
φ4 Oval type	140°	Diffused Colored														
	10°	Transparent Colorless														
φ5 Circular type	20°	Transparent Colorless														
	40°	Transparent Colored														
		Diffused Colored														

\*SYMBOL are settled for Green only. For red, we set only min. intensity and not \*SYMBOL\* ※Brightness on specification sheet include tolerance of within ±10%.

\*: This product refer to high brightness rank table.



# Through-hole LEDs

## Characteristics

( $\phi 3$ Type)																		
Shape	Package	Viewing angle 2 $\theta$ 1/2 (Element type)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)						
						Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current IFP (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf (V)	Reverse Current Ir ( $\mu$ A)	Dominant Wavelength $\lambda$ D Typ. (nm)		Luminous Intensity Iv (mcd)		
	Standard EXCELED™	40°	SLI-343V8RC	AIGaInP	Red	54	20	100※2	9	-30 to +85	-40 to +100	2.2	10	630	20	150	330	
			SLI-343V8R													100	220	
			SLI-343U8RC		620											150	330	
			SLI-343U8R													100	220	
			SLI-343D8C		605											330	680	
			SLI-343D8U													220	470	
		SLI-343Y8C	590	330	680													
		SLI-343Y8Y		220	470													
		SLI-343M8C	Green	572	68	150												
		SLI-343M8G					10	22										
		SLI-343P8C							20									
		SLI-343P8G					10	22										
	High brightness	40°	SLI-343URC	AIGaInP	Red	125	50	200※2	9	-25 to +85	-30 to +100	1.9	100	620	90	450	350	
			SLI-343UR													500		
			SLI-343DC		605											350		
			SLI-343DU														200	200
			SLI-343YC		587											300		
			SLI-343YY														200	200
	SLI-343MC	572	56	180														
	SLI-343MG				180													
	Standard	40°	SLR-343VC	GaAsP	Red	60	25	100※2	3	-25 to +85	-30 to +100	2.0	10	650	10	9	25	
			SLR-343VR													5.6	16	
			SLR-343DC		610											9	25	
			SLR-343DU															5.6
			SLR-343YC		585											3.6	10	
			SLR-343YY															10
		SLR-343MC	563	9	25													
		SLR-343MG				5.6	16											
SLR-343PC		555	2.2	6.3														
SLR-343PG					6.3													
SLR343ECT		InGaN	Bluish-Green	120	30	100※2	5	-20 to +80	-30 to +100	3.3	5	527	200	900	2200			
SLR343EC4T														420	1500			
SLR343BCT	470													200	600			
SLR343BC4T																470		
Low current	40°	SLI-343URC(W)	AIGaInP	Red	125	50	200※2	9	-25 to +85	-30 to +100	1.9	100	630	20	36	200		
		SLI-343UR(W)													160			
		SLI-343DC(W)		611											56	300		
		SLI-343DU(W)															250	
		SLI-343YC(W)		591											36	200		
		SLI-343YY(W)															160	
Standard	85°	SLR-332VC	GaAsP	Red	60	20	60※1	3	-25 to +85	-30 to +100	2.0	10	630	20	3.6	10		
		SLR-332VR													5.6	16		
		SLR-332DC		605											3.6	10		
		SLR-332DU															20	
		SLR-332YC		587											2.2	6.3		
		SLR-332YY															6.3	
SLR-332MC	572	5.6	16															
SLR-332MG				16														
( $\phi 5$ Type)																		
	High brightness	10°	SLI-580UT	AIGaInP	Red	125	50	200※2	9	-30 to +85	-40 to +100	1.9	100	620	20	2000	5000	
			SLI-580DT													1350	5000	
			SLI-580YT		587											200	470	
			SLA-580MT															200
			SLA580ECT		527											3000	8000	
			SLA580EC4T															2000
		SLA580BCT	470	900	2500													
		SLA580BC4T				610	1500											
		High brightness	20°	SLI-570UT	AIGaInP	Red	125	50	200※2	9	-30 to +85	-40 to +100	1.9	100	630	20	900	3000
				SLI-570U2T													2200	4000
				SLI-570DT		605											900	3000
				SLI-570YT														
	SLI-570Y2T			587		2200											5200	
	SLA-570MT																	200
	SLA-570MT	563	42	100														
	SLA-570MT				100													
	Standard	40°	SLI-560UT	AIGaInP	Red	125	50	200※2	9	-30 to +85	-40 to +100	1.9	100	620	20	300	1000	
			SLI-560DT													1000		
			SLI-560YT		587											200	1000	
			SLA-560MT															42
			SLR-56VC		GaAsP											630	9	25
			SLR-56VR															
		SLR-56DC	605	9		25												
		SLR-56DU					3.6	10										
		SLR-56YC	587	9	25													
		SLR-56YY				16												
		SLR-56MC	572	14	40													
		SLR-56MG				5.6	16											
SLA560ECT	InGaN	Bluish-Green	120	30	100※2	5	-20 to +80	-30 to +100	3.3	5	527	20	610	2000				
SLA560EC4T													1500					
SLA560BCT													470	200	600			
SLA560BC4T																470		

※1:Duty1/5, 200Hz ※2:Duty1/10, 1kHz  
 \* EXCELED™ is a pending trademark of ROHM Co., Ltd. \* Brightness for white color is noted with chromaticity coordinate (x, y).



Through-hole LEDs

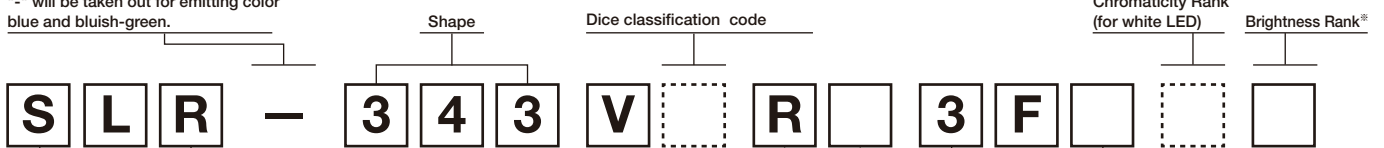
〈Oval Type〉																											
Shape	Package	Viewing angle 2θ1/2 (Element type)	Part No.	Chip Structure	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)															
						Power Dissipation Pd (mW)	Forward Current If (mA)	Peak Forward Current Ifp (mA)	Reverse Voltage Vr (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage Vf		Reverse Current Ir		Dominant Wavelength λD		Luminous Intensity Iv									
						Typ. (V)	If (mA)	Max. (μA)	Vr (V)	Typ. (°C)	Tstg (°C)	Typ. (nm)	If (mA)	Min. (mcd)	Typ. (mcd)	If (mA)											
Oval type φ4		140° Standard	SLI-430U2R	AlGaInP	Red	75	30	100※2	9	-40 to +85	-40 to +100	2.0	20	10	9	620	20	400									
			SLI-430DU		Orange							605				470											
			SLI-430Y2U		Yellow							590				330		500									
			SLI-430MG		Yellowish-Green							570				68		120									
〈Others〉																											
φ3.2 Circular type Direct mount 5mm pitch type		40° Low current	SLI-325URC(W)※1	AlGaInP	Red	48	20	4		-25 to +85	-30 to +100	1.85	20	100	4	620	36	160									
			SLI-325UR(W)※1		Orange							605				100											
			SLI-325DC(W)※1		Yellow							587				100											
			SLI-325DU(W)※1		Yellowish-Green							572				100											
			SLI-325YC(W)※1		Yellow							587				100											
			SLI-325YY(W)※1		Yellowish-Green							572				100											
Standard	SLR-325VC※1	Red	60	60※1	3	2.0	10	10	3	630	20	5.6	16														
	SLR-325VR※1	Orange								605		3.6	10														
	SLR-325DC※1	Yellow								587		3.6	10														
	SLR-325DU※1	Yellowish-Green								572		3.6	10														
	SLR-325YC※1	Yellow								587		2.2	6.3														
	SLR-325YY※1	Yellowish-Green								572		9	25														
Standard	SLR-325MC※1	Yellowish-Green	75	25		2.1				572		5.6	16														
	SLR-325MG※1	Yellowish-Green								572		5.6	16														
	φ3 Flat disc type									35° Standard		SLR-322VC	GaAsP	Red	60	20			-25 to +85	-30 to +100	2.0	10	10	3	630	20	5.6
												SLR-322DC		Orange							605				3.6		10
												SLR-322YC		Yellow							587				3.6		10
												SLR-322MC		GaP							75				25		60※1
SLR-322VR			Red	60	20	3	2.0	10	10		3	630		2.2							6						
SLR-322DU			Orange									605													2.2		6
SLR-322YY	Yellow	587	3.6							10																	
SLR-322MG	Yellowish-Green	572	5.6							16																	

※1:Duty1/5, 200Hz ※2:Duty1/10, 1kHz  
※1 SLI-325/SLR-325 series : straight taping only.

●Part No. Configuration 〈Through-hole LEDs〉

- When ordering, please specify the part number.
- Check each code in light of the tables shown below.
- Fill in the part number from the left, leaving any extra boxes on the right empty.
- ※Part names are appointed individually per each ranks.
- ※Please refer to Specifications sheet for details.

"-" will be taken out for emitting color blue and bluish-green.



Series Name	
SLA	1-Die Circular Type High Brightness LED Lamps
SLI	1-Die Circular Type Low Current High Brightness LED Lamps
SLR	1-Die Circular Type LED Lamps

Color	
V	Red:630nm
U	Red:620(624)nm
D	Orange:605nm
Y	Yellow:587(590)nm
M	Yellowish-Green:572(563)nm
P	Green:560nm
E	Bluish-Green:527(525)nm
B	Blue:470nm

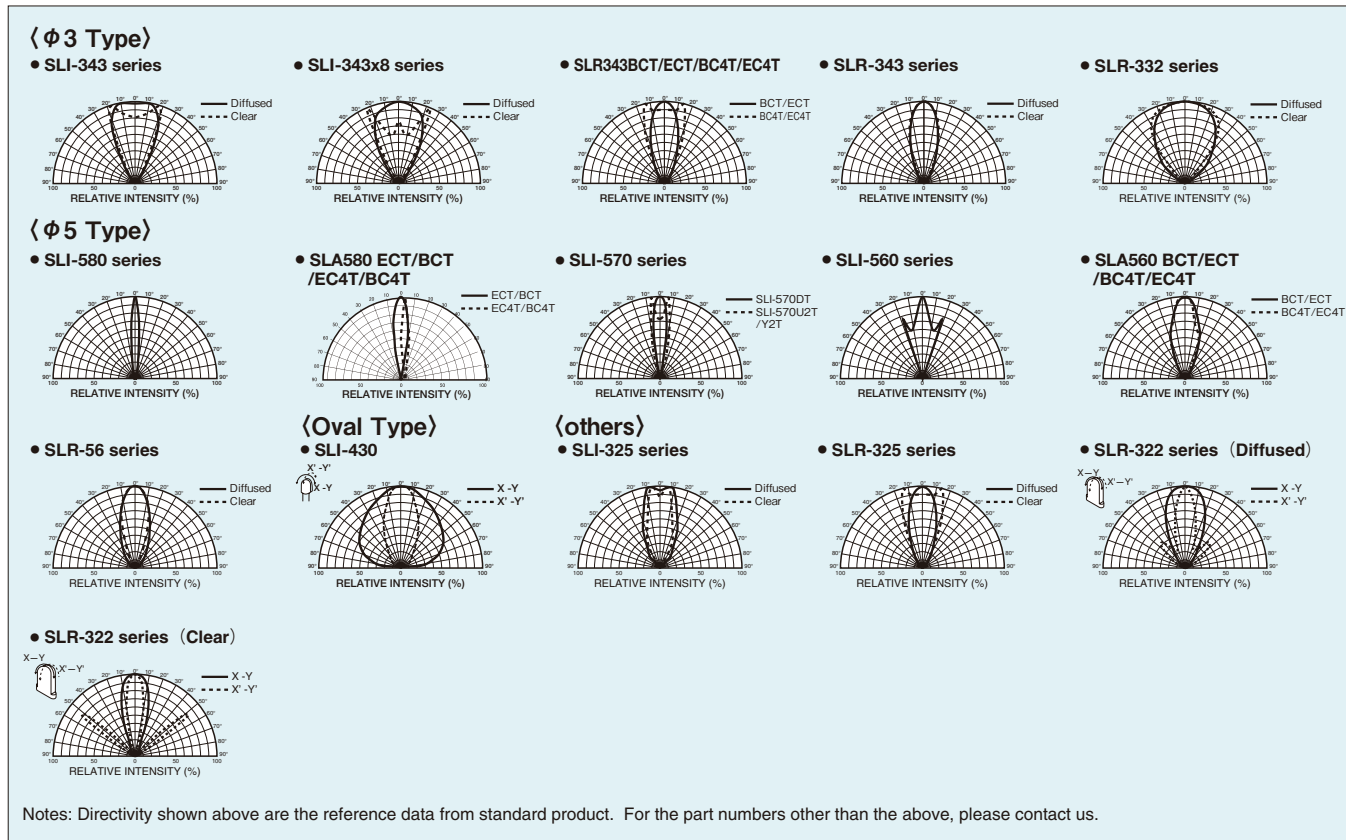
Resin Color	
R	<Red>Diffused Colored
U	<Orange>Diffused Colored
Y	<Yellow>Diffused Colored
G	<Green>Diffused Colored
C	Transparent Colored
RC	Transparent Colored
T	Transparent Colorless

Terminal shape and tapping specifications	
3F	1-Die straight bulk
T	Refer to taping specifications

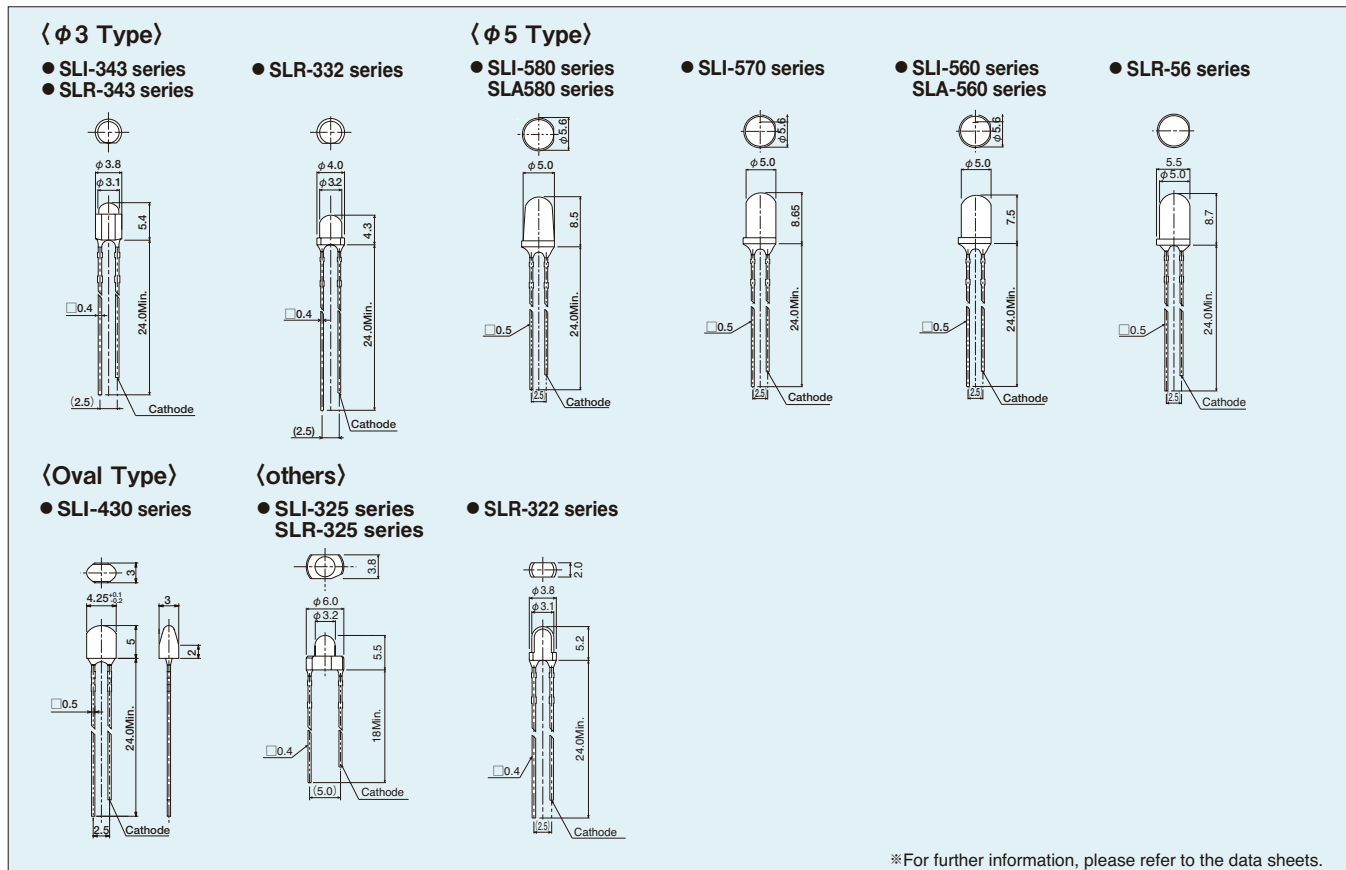
Notes: SLI-325, SLR-325 : straight taping only

# Through-hole LEDs

## ● Directivity (Unit:deg)



## ● Packages (Unit:mm)



### ※ LIFE TIME

This product will cause reduction of luminous intensity depending on the using conditions and environmental. Please inquire a ROHM sales contact if long life time is required on your application.





# LED Displays

## CONTENTS

■ High Brightness LED Numeric Displays .....	P. E18
■ LED Numeric Displays .....	P. E18
Single Digit LED Numeric Displays (Surface Mount Type) .....	P. E19
Single Digit LED Numeric Displays .....	P. E19
Two Digit LED Numeric Displays .....	P. E19
Three Digit LED Numeric Displays .....	P. E19
■ LED Dot Matrix Units .....	P. E20
16×32 Dots Matrix Units .....	P. E20
16×16 Dots Matrix Units .....	P. E21
24×24 Dots Matrix Units .....	P. E21
24×48 Dots Matrix Units .....	P. E21

# High Brightness LED Numeric Displays

High brightness, low power consumption, and high reliability.

High Brightness LED Numeric Displays																	
Shape	Part No.	Emitting color	Absolute maximum ratings (Ta=25°C)				Absolute maximum ratings		Electrical and optical characteristics (Ta=25°C)								
			Power dissipation Pd (mW)	Forward current If (mA)	Peak forward current *Ifp (mA)	Reverse voltage Vr (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)	Forward voltage Vf		Reverse current Ir		Light wavelength			Brightness / Digit Iv	
									Typ. (V)	If (mA)	Max. (µA)	Vr (V)	λp Typ. (nm)	λh Typ. (nm)	If (mA)	Min. (mcd)	Typ. (mcd)
Character Height:8mm External Dimensions:(7×11)	LAP-301VB/VL	Red											650			14	36
	LAP-301MB/ML	Green	448	20	60	5	-25 to +75	-30 to +85	1.9	10	100	3	572	20	10	36	100
	LAP-301DB/DL	Orange											605			56	250
	LAP-301YB/YL	Yellow											590			90	450
Character Height:10.16mm External Dimensions:(9.6×13)	LAP-401VD/VN	Red											650			14	36
	LAP-401MD/MN	Green	448	20	60	5	-25 to +75	-30 to +85	1.9	10	100	3	572	20	10	36	100
	LAP-401DD/DN	Orange											605			56	250
	LAP-401YD/YN	Yellow											590			90	450
Character Height:14.6mm External Dimensions:(12.5×19)	LAP-601VB/VL	Red											650			14	36
	LAP-601MB/ML	Green	448	20	60	5	-25 to +75	-30 to +85	1.9	10	100	3	572	20	10	36	100
	LAP-601DB/DL	Orange											605			56	250
	LAP-601YB/YL	Yellow											590			90	450
Character Height:14.3mm External Dimensions:(25×19)	LBP-602VA2/VK2	Red											650			14	36
	LBP-602MA2/MK2	Green	896	20	60	5	-25 to +75	-30 to +85	1.9	10	100	3	572	20	10	36	100
	LBP-602DA2/DK2	Orange											605			56	250
	LBP-602YA2/YK2	Yellow											590			90	450

Notes:\*Ifp measured under duty ≤ 1/5, Pulse width ≤ 1ms

## LED Numeric Displays

ROHM's LED numeric displays are compatible with automatic reflow processes.

Single Digit LED Numeric Displays (Surface Mount Type)																		
Shape	Part No.	Emitting color	Absolute maximum ratings (Ta=25°C)				Absolute maximum ratings		Electrical and optical characteristics (Ta=25°C)									
			Power dissipation Pd (mW)	Forward current If (mA)	Peak forward current *Ifp (mA)	Reverse voltage Vr (V)	Operating temperature Topr (°C)	Storage temperature Tstg (°C)	Forward voltage Vf		Reverse current Ir		Light wavelength			Brightness / Digit Iv		
									Typ. (V)	If (mA)	Max. (µA)	Vr (V)	λp Typ. (nm)	λh Typ. (nm)	If (mA)	Min. (mcd)	Typ. (mcd)	If (mA)
Character Height:8mm External Dimensions:(6.8×11)	LF-3011VA/VK	Red	320	15	60	5	-25 to +75	-30 to +85	2.0	10	100	3	650	40	10	3.6	10	10
	LF-3011MA/MK	Green	480	20					2.1				563					

Notes:\*Ifp measured under duty ≤ 1/5, Pulse width ≤ 1 ms

These single digit numeric displays are 8 to 25.4mm in height and available in a range of colors.

Single Digit LED Numeric Displays																											
Shape	Part No.	Emitting color	Absolute maximum ratings (Ta=25°C)				Absolute maximum ratings		Electrical and optical characteristics (Ta=25°C)																		
			Power dissipation P <sub>D</sub> (mW)	Forward current I <sub>F</sub> (mA)	Peak forward current I <sub>FP</sub> (mA)	Reverse voltage V <sub>R</sub> (V)	Operating temperature T <sub>opr</sub> (°C)	Storage temperature T <sub>stg</sub> (°C)	Forward voltage V <sub>F</sub>		Reverse current I <sub>R</sub>		Light wavelength Peak Half-wave			Brightness / Digit I <sub>v</sub>											
								Typ. (V)	I <sub>F</sub> (mA)	Max. (μA)	V <sub>R</sub> (V)	λ <sub>P</sub> Typ. (nm)	λ <sub>A</sub> Typ. (nm)	I <sub>F</sub> (mA)	Min. (mcd)	Typ. (mcd)	I <sub>F</sub> (mA)										
	LA-301VB/VL	Red	320	15	60				2.0	10		650	40	10	3.6	10											
	LA-301MB/ML	Green	480	20																							
	LA-301BB/BL	Blue	336	10																							
	LA-301AB/AL	High Brightness Red	520	25	50													2.05	20	610	17	20	36	90			
	LA-301EB/EL	High Brightness Orange																									
	LA-301XB/XL	High Brightness Yellow																									
LA-401VD/VN	Red	320				15	60				2.0	10		650	40	10	5.6								16		
LA-401MD/MN	Green	480	20																								
LA-401BD/BN	Blue	336	10																								
LA-401AD/AN	High Brightness Red	520	25	50	2.05	20	610											17	20	36	90						
LA-401ED/EN	High Brightness Orange																										
LA-401XD/XN	High Brightness Yellow																										
LA-501VD/VN	Red							480	20	60				2.0			650							5.6	16		
LA-501MD/MN	Green																										
	LA-601VB/VL	Red	336	10	50				2.0	10									650	40	10					14	
	LA-601MB/ML	Green																									
	LA-601BB/BL	Blue																									
	LA-601AB/AL	High Brightness Red	520	25	50																						
	LA-601EB/EL	High Brightness Orange																									
	LA-601XB/XL	High Brightness Yellow																									
LA-101VA/VK	Red	640				15	60				4.0			650	40	10	3.6	10									
LA-101MA/MK	Green	640	20																								

Notes: \*I<sub>FP</sub> measured under duty ≤ 1/5, Pulse width ≤ 1 ms, High Brightness and Blue I<sub>FP</sub> measured under duty ≤ 1/10, Pulse width ≤ 0.1 ms 2) LA-101 series : order-based production

These two digit numeric displays are 7.62 to 14.3mm in height and available in a range of colors.

Two Digit LED Numeric Displays																																		
Shape	Part No.	Emitting color	Absolute maximum ratings (Ta=25°C)				Absolute maximum ratings		Electrical and optical characteristics (Ta=25°C)																									
			Power dissipation P <sub>D</sub> (mW)	Forward current I <sub>F</sub> (mA)	Peak forward current I <sub>FP</sub> (mA)	Reverse voltage V <sub>R</sub> (V)	Operating temperature T <sub>opr</sub> (°C)	Storage temperature T <sub>stg</sub> (°C)	Forward voltage V <sub>F</sub>		Reverse current I <sub>R</sub>		Light wavelength Peak Half-wave			Brightness / Digit I <sub>v</sub>																		
								Typ. (V)	I <sub>F</sub> (mA)	Max. (μA)	V <sub>R</sub> (V)	λ <sub>P</sub> Typ. (nm)	λ <sub>A</sub> Typ. (nm)	I <sub>F</sub> (mA)	Min. (mcd)	Typ. (mcd)	I <sub>F</sub> (mA)																	
	LB-302VF/VP	Red	800	15	60				2.0			650			2.2	6.3																		
	LB-302MF/MP	Green	960	20																														
	LB-402VD/VN	Red	640	15	60	5	-25 to +75	-30 to +85	2.0	10		650	40	10	5.6	16																		
	LB-402MD/MN	Green																																
	LB-502VD/VN	Red	960	20	60				2.0			650			5.6	16																		
	LB-502MD/MN	Green																																
	LB-602VA2/VK2	Red	960	20	60				2.0			650	40	10	5.6	16																		
	LB-602MA2/MK2	Green																																
	LB-602BA2/BK2	Blue	672	10	50																3.6			470	26	14	56							
	LB-602AA2/AK2	High Brightness Red																																
	LB-602EA2/EK2	High Brightness Orange	1040	25	50																							2.05	20	610	17	20	36	90
	LB-602XA2/XK2	High Brightness Yellow																																

Notes: \*I<sub>FP</sub> measured under duty ≤ 1/5, Pulse width ≤ 1 ms, High Brightness and Blue I<sub>FP</sub> measured under duty ≤ 1/10, Pulse width ≤ 0.1 ms

This lineup of three digit numeric displays ranges in height from 8 to 14.3mm and are available in either red or green.

Three Digit LED Numeric Displays																		
Shape	Part No.	Emitting color	Absolute maximum ratings (Ta=25°C)				Absolute maximum ratings		Electrical and optical characteristics (Ta=25°C)									
			Power dissipation P <sub>D</sub> (mW)	Forward current I <sub>F</sub> (mA)	Peak forward current I <sub>FP</sub> (mA)	Reverse voltage V <sub>R</sub> (V)	Operating temperature T <sub>opr</sub> (°C)	Storage temperature T <sub>stg</sub> (°C)	Forward voltage V <sub>F</sub>		Reverse current I <sub>R</sub>		Light wavelength Peak Half-wave			Brightness / Digit I <sub>v</sub>		
								Typ. (V)	I <sub>F</sub> (mA)	Max. (μA)	V <sub>R</sub> (V)	λ <sub>P</sub> Typ. (nm)	λ <sub>A</sub> Typ. (nm)	I <sub>F</sub> (mA)	Min. (mcd)	Typ. (mcd)	I <sub>F</sub> (mA)	
	LB-303VA/VK	Red	960	15	60				2.0			650			1.4	4.0		
	LB-303MA/MK	Green	1440	20														
	LB-603VF/VP	Red	960	15	60	5	-25 to +75	-30 to +85	2.0	10	100	3	650	40	10	5.6	16	10
	LB-603MF/MP	Green	1440	20														

Notes: \*I<sub>FP</sub> measured under duty ≤ 1/5, Pulse width ≤ 1 ms

# LED Dot Matrix Units

The 16×32 dot matrix LED modules combine the LED matrix and IC drivers. Character strings can be displayed via cascade connection. The IC drivers have enough RAM to allow programming of one screen of information while another screen is being displayed. Both graphics and characters can be displayed.

16×32 Dots Matrix Units															
Emitting surface size (mm)	Shape	Part No.	Display	Emitting color	Wavelength (nm)	Dot size (mm)	Dot pitch (mm)	Number of dots (dot)	Control		LED		Brightness (cd/m <sup>2</sup> )	Operating freq. (MHz)	Drive type
									V <sub>DD</sub> (V)	I <sub>CC1</sub> Max. (mA)	V <sub>LED</sub> (V)	I <sub>CC2</sub> Max. (A)			
40×80		LUM-512CMU300	Milky white Chip LEDs	Red	630	1.1×1.3	2.5	16×32	5	80	4.5	2.0	100	13 (Max.)	1/16 duty (Shift register type)
	Green			570	120										
		LUM-512CMU301	Milky white Chip LEDs with Louver	Red	630	1.1×1.3	2.5	16×32	5	80	4.5	2.0	100	13 (Max.)	1/16 duty (Shift register type)
	Green			570	120										
		LUM-512CMU320	Milky white Chip LEDs	Red	630	1.1×1.3	2.5	16×32	5	30	5	2.0	100	20 (Max.)	1/16 duty (Memory type)
	Green			570	120										
	LUM-512CY300	Milky white Chip LEDs	Yellow	590	1.2×0.8	2.5	16×32	5	80	5	1.7	1000	10 (Max.)	1/16 duty (Shift register type)	
	LUM-512CD300	Milky white Chip LEDs	Orange	611	1.2×0.8	2.5	16×32	5	80	5	1.7	1000	10 (Max.)	1/16 duty (Shift register type)	
	LUM-512CU300	Milky white Chip LEDs	Red	630	1.2×0.8	2.5	16×32	5	80	5	1.7	800	10 (Max.)	1/16 duty (Shift register type)	
64×128		LPM-5123BMU813	Potting lens	Red	(624)	φ2.8	4	16×32	5	500	5	3.0	330	10 (Max.)	1/16 duty (Shift register type) External gray levels clock 1024 gray levels
	Green			(525)	890										
	Blue			(471)	180										
		LUM-512HY304	Chip LEDs with Louver	Yellow	590	1.6×2.3	4	16×32	5	30	5	2.0	2400	20 (Max.)	1/16 duty (Memory type)
		LPM-5123Y320	Potting lens	Yellow	590	φ2.8	4	16×32	5	100	5	1.6	500	10 (Max.)	1/16 duty (Shift register type)
		LPM-5123D320	Potting lens	Orange	605	φ2.8	4	16×32	5	100	5	1.6	700	10 (Max.)	1/16 duty (Shift register type)
	LPM-5123U320	Potting lens	Red	624	φ2.8	4	16×32	5	100	5	1.6	500	10 (Max.)	1/16 duty (Shift register type)	
96×192		LPM-5123MU300	Potting lens	Red	624	φ2.8	4	16×32	5	30	5	3.0	300	20 (Max.)	1/16 duty (Memory type)
	Green			571	300										
96×192		LPM-5123MU350	Potting lens	Red	624	φ2.8	6	16×32	5	20	5	5.2	250	20 (Max.)	1/16 duty (Memory type)
	Green			571	200										
96×192		LUM-512HY354	Chip LEDs with Louver	Yellow	590	1.6×2.3	6	16×32	5	60	5	4.0	2000	20 (Max.)	1/8 duty (Memory type)
				LUM-512HY3A0	Chip LEDs with Louver	Yellow	590	1.6×2.3	7.62	16×32	5	2000	5	6.0	2000

The 16×16 dot matrix LED modules combine the LED matrix and IC drivers. Multiple letters can be displayed by cascade connection. The IC drivers have enough RAM to allow programming of one screen of information while another screen is being displayed. Both graphics and characters can be displayed.

16×16 Dots Matrix Units															
Emitting surface size (mm)	Shape	Part No.	Display	Emitting color	Wavelength (nm)	Dot size (mm)	Dot pitch (mm)	Number of dots (dot)	Control		LED		Brightness (cd/m <sup>2</sup> )	Operating freq. (MHz)	Drive type
									V <sub>DD</sub> (V)	I <sub>CC1</sub> Max. (mA)	V <sub>LED</sub> (V)	I <sub>CC2</sub> Max. (A)			
64×64		LPM-2563MU300	Potting lens	Red	624	φ2.8	4	16×16	5	20	5	1.6	300	20 (Max.)	1/16 duty (Memory type)
				Green	571								300		

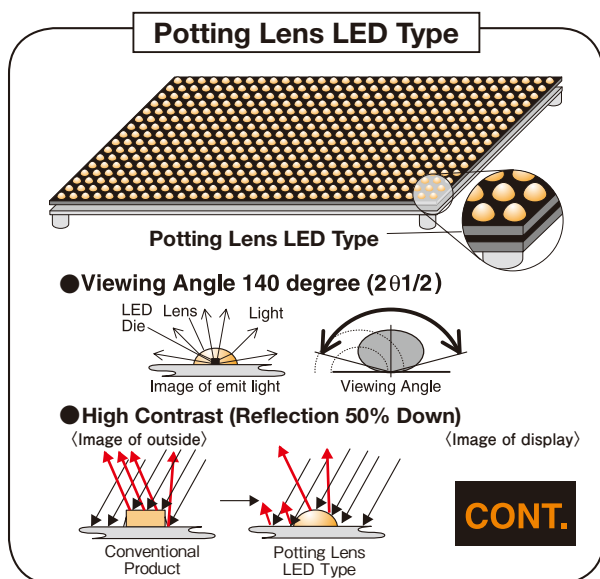
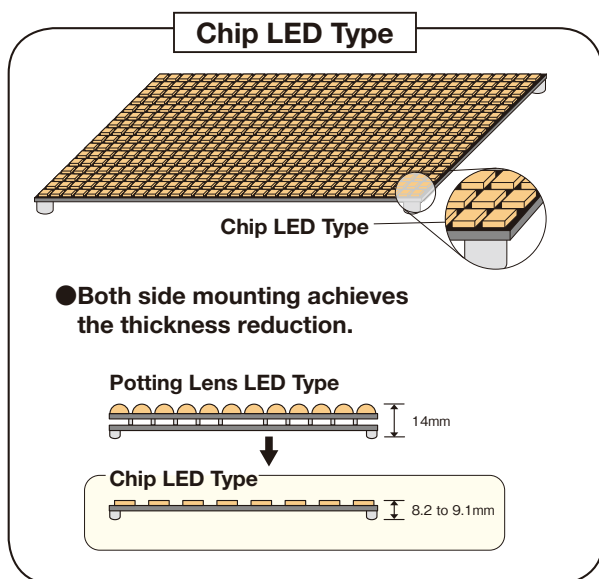
The 24×24 dot matrix LED modules combine the LED matrix and IC drivers. Multiple letters can be displayed by cascade connection. The IC drivers have enough RAM to allow programming of one screen of information while another screen is being displayed. Both graphics and characters can be displayed.

24×24 Dots Matrix Units															
Emitting surface size (mm)	Shape	Part No.	Display	Emitting color	Wavelength (nm)	Dot size (mm)	Dot pitch (mm)	Number of dots (dot)	Control		LED		Brightness (cd/m <sup>2</sup> )	Operating freq. (MHz)	Drive type
									V <sub>DD</sub> (V)	I <sub>CC1</sub> Max. (mA)	V <sub>LED</sub> (V)	I <sub>CC2</sub> Max. (A)			
96×96		LPM-5763BMU813	Potting lens	Red	(624)	φ2.8	4	24×24	5	400	5	3.0	330	10 (Max.)	1/24 duty (shift register type) External gray levels clock 1024 gray levels
				Green	(525)								890		
				Blue	(471)								180		
		LPM-5763MU301	Potting lens	Red	624	φ2.8	4	24×24	5	20	5	2.6	300	20 (Max.)	1/24 duty (Memory type)
				Green	571								300		

※ LPM-5763BMU813 was designed to be used with the LPM-1153BMU813 and therefore does not have a signal output pin.

The 24×48 dot matrix LED modules combine the LED matrix and IC drivers. Multiple letters can be displayed by cascade connection. The IC drivers have enough RAM to allow programming of one screen of information while another screen is being displayed. Both graphics and characters can be displayed.

24×48 Dots Matrix Units															
Emitting surface size (mm)	Shape	Part No.	Display	Emitting color	Wavelength (nm)	Dot size (mm)	Dot pitch (mm)	Number of dots (dot)	Control		LED		Brightness (cd/m <sup>2</sup> )	Operating freq. (MHz)	Drive type
									V <sub>DD</sub> (V)	I <sub>CC1</sub> Max. (mA)	V <sub>LED</sub> (V)	I <sub>CC2</sub> Max. (A)			
96×192		LPM-1153BMU813	Potting lens	Red	(624)	φ2.8	4	24×48	5	600	5	6.0	330	10 (Max.)	1/24 duty (shift register type) External gray levels clock 1024 gray levels
				Green	(525)								890		
				Blue	(471)								180		
		LPM-1153MU300	Potting lens	Red	624	φ2.8	4	24×48	5	40	5	5.2	300	20 (Max.)	1/24 duty (Memory type)
				Green	571								300		







*Opto Devices*

# Laser Diodes

## CONTENTS

■ Red / Infrared Dual Wavelength Lasers	..... P. E24
■ Multi-beam Lasers	..... P. E24
■ Red Lasers	..... P. E25
■ Infrared Lasers	..... P. E25
■ Packaging Specifications	..... P. E26



# Laser Diodes

Red / Infrared Dual Wavelength Lasers															
Part No.	Wavelength $\lambda_p$ (nm)	Absolute maximum ratings (Tc=25°C)			Electrical and optical characteristics (Tc=25°C)								Po (mW)	Package	Equivalent circuit
		Po (mW)	V <sub>R</sub> (V)	To <sub>pr</sub> Max. (°C)	I <sub>TH</sub> (mA)	I <sub>op</sub> (mA)	$\eta$ (W/A)	V <sub>op</sub> (V)	I <sub>m</sub> (mA)	$\theta_{\perp}$ (deg)	$\theta_{//}$ (deg)				
RLD2WMFV2	658	7	2	75	20	27	0.72	2.3	0.13	27.0	8.0	5	High radiation 4PIN frame		
	782	7	2	75	18	27	0.55	1.8	0.16	32.0	9.0	5			
RLD2WMNL2 (For Car DVD)	663	7	2	85	18	24	0.70	2.3	0.25	28.0	10.0	5	$\phi$ 5.6mm (4PIN)		
	785	7	2	85	15	20	0.70	1.8	0.25	32.0	10.0	5			
RLD2WMFL3 (Operation guarantee at 80°C)	658	7	2	80	13	18	0.90	2.2	0.15	27.0	8.5	5	High radiation 4PIN frame		
	782	7	2	80	12	17	0.85	1.8	0.17	32.0	10.0	5			
RLD2WMFR1 (Self pulsation)	660	6	2	70	35	45	0.75	2.3	0.13	37.0	9.0	5	High radiation 4PIN frame		
	790	7	2	70	30	45	0.50	1.9	0.26	39.0	11.0	5			
<b>New</b> RLD2WMFR5 (Higher ESD Self pulsation)	663	6	2	70	35	45	0.75	2.3	0.13	36.0	9.0	5	High radiation 4PIN frame		
	790	7	2	70	30	45	0.50	1.9	0.26	39.0	11.0	5			

Notes :1.Unless otherwise specified, the electrical and optical characteristics are typical values.  
2.Following characteristics are typical specs. Please contact us for the custom characteristics.

Multi-beam Lasers																	
Part No.	Number of beams	Pitch ( $\mu$ m)	Wavelength $\lambda_p$ (nm)	Absolute maximum ratings (Tc=25°C)			Electrical and optical characteristics (Tc=25°C)								Po (mW)	Package	Equivalent circuit
				Po (mW)	V <sub>R</sub> (V)	To <sub>pr</sub> Max. (°C)	I <sub>TH</sub> (mA)	I <sub>op</sub> (mA)	$\eta$ (W/A)	V <sub>op</sub> (V)	I <sub>m</sub> (mA)	$\theta_{\perp}$ (deg)	$\theta_{//}$ (deg)				
RLD2BPNK4	2	90	792	6	2	60	10	30	0.30	1.8	3.0	29.0	9.5	6	$\phi$ 5.6mm (4PIN②)		
RLD2BPNK5	2	28	787	10	2	60	12	23	0.55	1.8	0.9	27.5	9.0	6	$\phi$ 5.6mm (4PIN②)		
RLD2BPNK2	2	28	787	15	2	60	12	29	0.55	1.8	1.5	27.5	9.0	10	$\phi$ 5.6mm (4PIN②)		
<b>New</b> RLD2BPNG4	2	28	790	25	2	60	17	48	0.65	2.3	2.0	27.5	10.0	20	$\phi$ 5.6mm (4PIN②)		
<b>New</b> RLD2BPNG3	2	14	788	15	2	60	14	25	0.75	1.8	1.0	31.0	9.0	10	$\phi$ 5.6mm (4PIN②)		
<b>New</b> RLD2BPND1	2	30	660	15	2	60	13	23	0.60	2.2	0.5	20.0	10.0	6	$\phi$ 5.6mm (4PIN②)		
<b>New</b> RLD4BPMP2	4	28	792	15	2	60	14	25	0.55	1.7	1.3	27.0	9.0	6	$\phi$ 5.6mm (6PIN)		

Notes :1.Unless otherwise specified, the electrical and optical characteristics are typical values.  
2.Following characteristics are typical specs. Please contact us for the custom characteristics.



Red Lasers															
Part No.	Wavelength $\lambda_p$ (nm)	Absolute maximum ratings (Tc=25°C)			Electrical and optical characteristics (Tc=25°C)								Po (mW)	Package	Equivalent circuit
		PO (mW)	VR (V)	Topr Max. (°C)	I <sub>TH</sub> (mA)	I <sub>OP</sub> (mA)	$\eta$ (W/A)	V <sub>OP</sub> (V)	I <sub>m</sub> (mA)	$\theta_{\perp}$ (deg)	$\theta_{//}$ (deg)				
RLD65MZT7	655	7	2	70	20	30	0.70	2.3	0.24	27.0	8.0	5			
RLD65MQX1 (Higher ESD)	660	10	2	70	15	21	0.85	2.3	0.15	27.0	9.0	5			
RLD65PZX2 (Higher ESD)	655	7	2	70	25	33	0.60	2.3	0.20	28.0	8.5	5			
RLD65PZX3 (Higher ESD)	655	12	2	70	25	42	0.60	2.3	0.20	28.0	8.5	10			
RLD65NZX2 (Higher ESD)	655	7	2	70	25	33	0.60	2.3	0.20	28.0	8.5	5			
RLD63NZC5 (Pure red)	635	6	2	40	24	33	0.55	2.2	0.18	32.0	8.0	5			
<b>New</b> RLD63NPC5 (Pure red)	635	6	2	40	24	33	0.55	2.2	0.18	32.0	8.0	5			

Note: Unless otherwise specified, the electrical and optical characteristics are typical values.

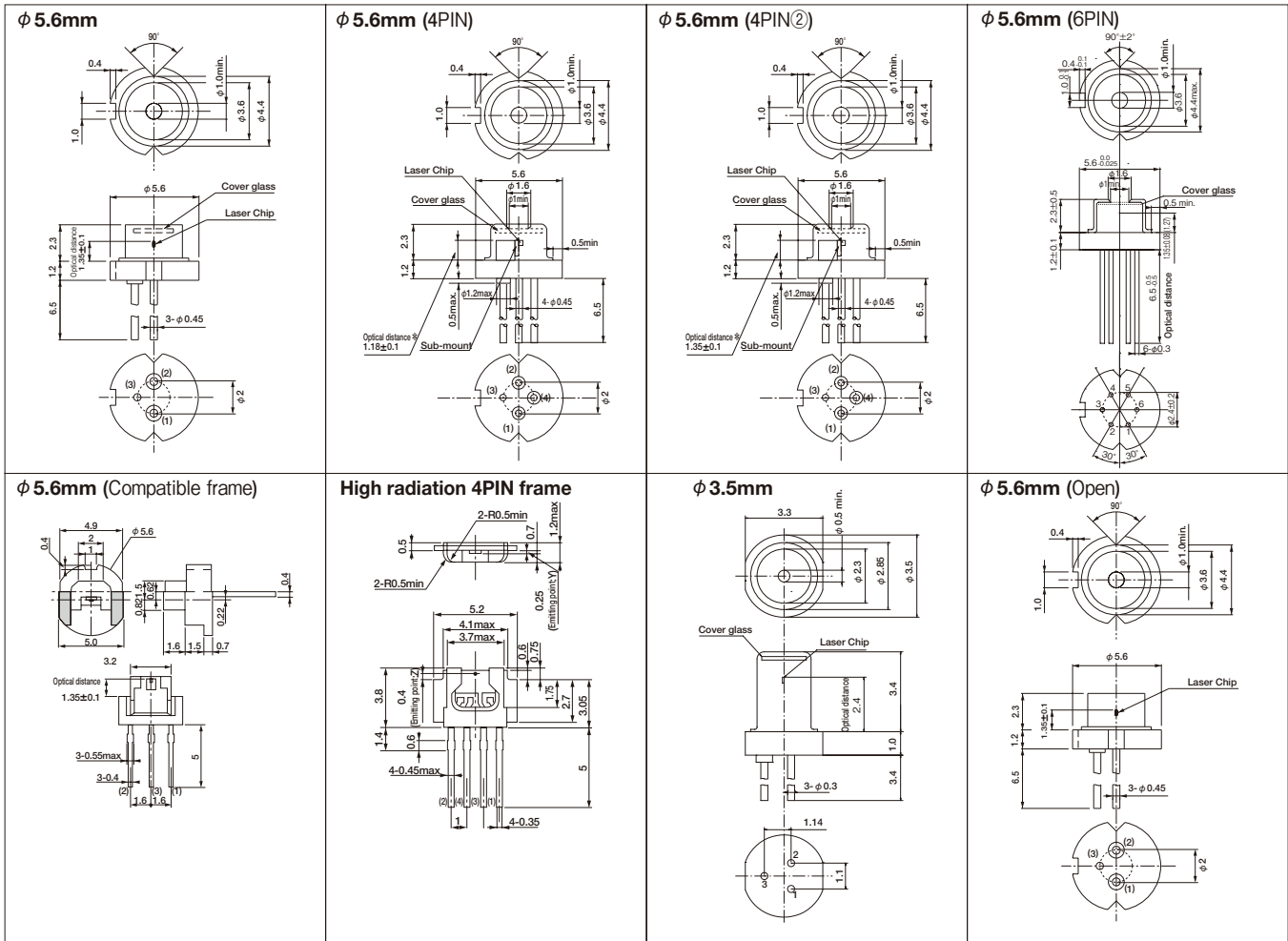
Infrared Lasers															
Part No.	Wavelength $\lambda_p$ (nm)	Absolute maximum ratings (Tc=25°C)			Electrical and optical characteristics (Tc=25°C)								Po (mW)	Package	Equivalent circuit
		PO (mW)	VR (V)	Topr Max. (°C)	I <sub>TH</sub> (mA)	I <sub>OP</sub> (mA)	$\eta$ (W/A)	V <sub>OP</sub> (V)	I <sub>m</sub> (mA)	$\theta_{\perp}$ (deg)	$\theta_{//}$ (deg)				
RLD78NZM5	793	10	2	60	11	20	0.55	1.8	1.15	28.0	9.0	6			
RLD78MRA6	790	4.5	2	70	25	35	0.35	1.9	0.15	37.0	11.0	3			
RLD78MZM7	792	20	2	60	11	33	0.65	1.8	0.50	24.0	8.5	15			
RLD78MFA7 (For Car CD)	790	4.5	2	85	25	35	0.35	1.9	0.15	37.0	11.0	3			
☆RLD82PZJ1	822	220	2	60	50	255	0.95	2.4	0.30	17.0	9.5	200			
☆RLD84PZJ2	842	220	2	60	50	255	0.95	2.4	0.30	17.0	9.5	200			

Note: Unless otherwise specified, the electrical and optical characteristics are typical values.

☆ : Under development

# Packaging Specifications

## ● Dimensions (Unit : mm)



\* : Please note that differences may exist depending on the part number. Therefore, it is strongly recommended that the customer verify the actual specifications before usage.

## ● Safety

The light emitted from laser diodes, can cause retinal damage if viewed directly. Never look directly into the laser beam or through any lenses or fibers when the system is operating.

For optical axis alignment or other operations, we recommend the use of an infrared-sensitive camera (ITV) or wearing protective goggles.

<p><b>DANGER</b></p> <p>INVISIBLE LASER RADIATION-AVOID DIRECT EXPOSURE TO BEAM</p> <p>MAXIMUM OUTPUT _____ mW</p> <p>WAVELENGTH _____ nm</p> <p>CLASS IIb LASER PRODUCT</p>	<p>VISIBLE AND INVISIBLE SEMICONDUCTOR LASER</p> <p>AVOID EXPOSURE-Invisible Laser radiation is emitted from this aperture</p>
	<p>ROHM Laser Diode</p> <p>This product complies with 21 CFR Part 1040.10 and 1040.11</p> <p><b>ROHM Co.,Ltd.</b></p> <p>21 Saini Mizosaki-cho, Ukyo-ku Kyoto 615-8585, Japan.</p>

The products described in this specification are designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communication device, electrical appliances, and electronic toys). If you intend to use these products or devices which require an extremely high level of reliability and malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.



# Optical Sensors

## CONTENTS

■ Photointerrupter Selection Guide	..... P. E28
■ Transmission type Photointerrupters	..... P. E29
Linear Phototransistor output	..... P. E29
Digital Phototransistor output	..... P. E30
■ Reflective type Photosensors (Photoreflectors)	..... P. E30
■ 4 Direction Detector	..... P. E30
■ Infrared Light Emitting Diodes	..... P. E32
■ Phototransistors	..... P. E33
■ Photodiodes	..... P. E33
■ Packages	..... P. E34

# Photointerrupter Selection Guide

## ● Transmission type Photointerrupters

Part No.	Package	Output type	Standard characteristics				
			Detection groove width(mm)	Slit width(mm)	Screw stop	Positioning	Remarks
RPI-0125	Surface Mount type		1.2	0.3			
RPI-0129			1.2	0.7			Side slit type
RPI-0226			2.0	0.3		○	Wide gap surface mount type
RPI-122	Leaded type	Phototransistor	0.8	0.25			
RPI-121			0.8	0.4			
RPI-124			1.0	0.15			High resolution
RPI-125			1.2	0.3			
RPI-129B			1.2	0.7			Side slit type
RPI-131			1.2	0.4	○		
RPI-221			2.3	0.4			
RPI-222			2.0	0.2			
RPI-243			2.0	0.4	○		
RPI-246			2.0	0.2	○		
RPI-352			3.0	0.4		○	
RPI-303			3.0	0.4			High profile type
RPI-441C1			4.0	0.5		○	
RPI-392			4.0	0.5			
RPI-5100			—	—			Actuator type
RPI-1133				Photo IC	1.1	0.3	○

## ● Energysaving Photointerrupters (Eco-friendly type)

Part No.	Package	Output type	Standard characteristics		
			Detection groove width(mm)	Slit width(mm)	Remarks
RPI-0352E	Surface Mount type	Phototransistor	3.0	0.4	Energy saving, High efficiency
RPI-352E	Leaded type	Phototransistor	3.0	0.4	Energy saving, High efficiency
RPI-441C1E	Leaded type	Phototransistor	4.0	0.5	Energy saving, High efficiency

## ● Reflective type Photosensors (Photoreflectors)

Part No.	Package	Output type	Standard characteristics		
			Focal length(mm)	Light wave length(nm)	Remarks
RPR-220	Leaded type	Phototransistor	6.0	940	
RPR-220UC30N		Phototransistor	6.0	630	Emitting Color : Red
RPR-220PC30N		Phototransistor	6.0	470	Emitting Color : Blue


## ● 4 Direction Detector

Part No.	Package	Output type	Standard characteristics	
			Light wave length (nm)	Remarks
RPI-1035	Surface Mount type	Phototransistor	950	

# Transmission type Photointerrupters




Linear Phototransistor output								
Package	Exterior	Part No.	Standard characteristics					
			Detection groove width (mm)	Slit width (mm)	I <sub>c</sub> (mA)	V <sub>CE</sub> (V)	I <sub>F</sub> (mA)	t <sub>r</sub> , t <sub>f</sub> (μs)
Ultraminiature SMD type		RPI-0125	1.2	0.3	0.45Min. 4.95Max.	5	20	10
		RPI-0129	1.2	0.7	0.95Min. 4.95Max.	5	20	10
Miniature SMD type		RPI-0226	2.0	0.3	0.1Min.	5	5	50
Ultra-Compact type		RPI-122	0.8	0.25	0.18Min. 1.08Max.	0.7	3	10
		RPI-121	0.8	0.4	0.7Min.	5	20	10
		RPI-124	1.0	0.15	0.3Min. 1.5Max.	5	20	10
		RPI-125	1.2	0.3	0.45Min. 4.95Max.	5	20	10
		RPI-129B	1.2	0.7	0.95Min. 4.95Max.	5	20	10
Compact type		RPI-131	1.2	0.4	0.7Min.	5	20	10
		RPI-221	2.3	0.4	0.2Min.	5	20	10
		RPI-222	2.0	0.2	0.18Min. 0.95Max.	5	10	10
		RPI-243	2.0	0.4	0.5Min.	5	20	10
		RPI-246	2.0	0.2	0.35Min. 1.2Max.	5	20	10
		RPI-352	3.0	0.4	0.2Min.	5	20	10
		RPI-441C1	4.0	0.5	0.2Min.	5	20	10
General type		RPI-392	4.0	0.5	0.5Min.	5	20	10
Eco-Friendly type		RPI-0352E	3.0	0.4	0.18Min.	5	10	10
		RPI-352E	3.0	0.4	0.2Min.	5	10	10
		RPI-441C1E	4.0	0.5	0.2Min.	5	10	10
High profile type		RPI-303	3	0.4	0.2Min. 2.0Max.	5	20	10
Actuator type		RPI-5100	Actuator type		0.2Min.	5	20	10

## Transmission type Photointerrupters


Digital Phototransistor output								
Package	Exterior	Part No.	Standard characteristics					
			Detection groove width (mm)	Slit width (mm)	$V_F$ (V)	$V_{OL}$ (V)	Threshold input current (mA)	Output type
Compact type		RPI-1133	1.1	0.3	1.1	0.35Max.	2.5*	ON when light beam is interrupted.

\* Max. value

## Reflective type Photosensors

Photoreflectors Type								
Package	Exterior	Part No.	Standard characteristics					tr, tf ( $\mu$ s)
			LED $\lambda_P$ (nm)	PTr $\lambda_P$ (nm)	$I_C$ (mA)	$V_{CE}$ (V)	$I_F$ (mA)	
Case type		RPR-220	940	800	0.08Min. 0.8Max.	2	10	10
		RPR-220UC30N	630	800	0.08Min. 0.8Max.	5	10	10
		RPR-220PC30N	470	800	0.08Min. 0.8Max.	5	10	10

## 4 Direction Detector

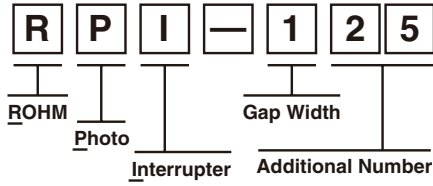
4 Direction Detector								
Package	Exterior	Part No.	Standard characteristics					tr, tf ( $\mu$ s)
			LED $\lambda_P$ (nm)	PTr $\lambda_P$ (nm)	$I_C$ (mA)	$V_{CE}$ (V)	$I_F$ (mA)	
Surface Mount type		RPI-1035	950	800	0.1Min.	5	5	10



### ● Part No. Explanation

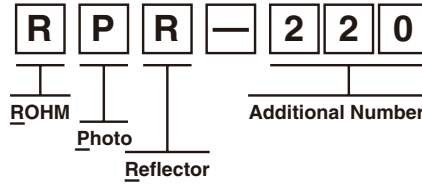
#### ● Transmission Type

7 characters

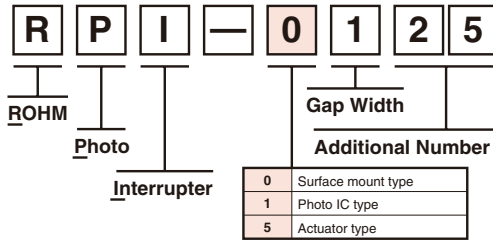


#### ● Reflective Type

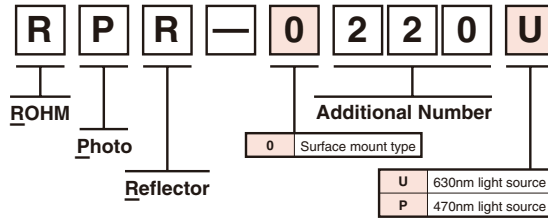
7 characters



8 characters

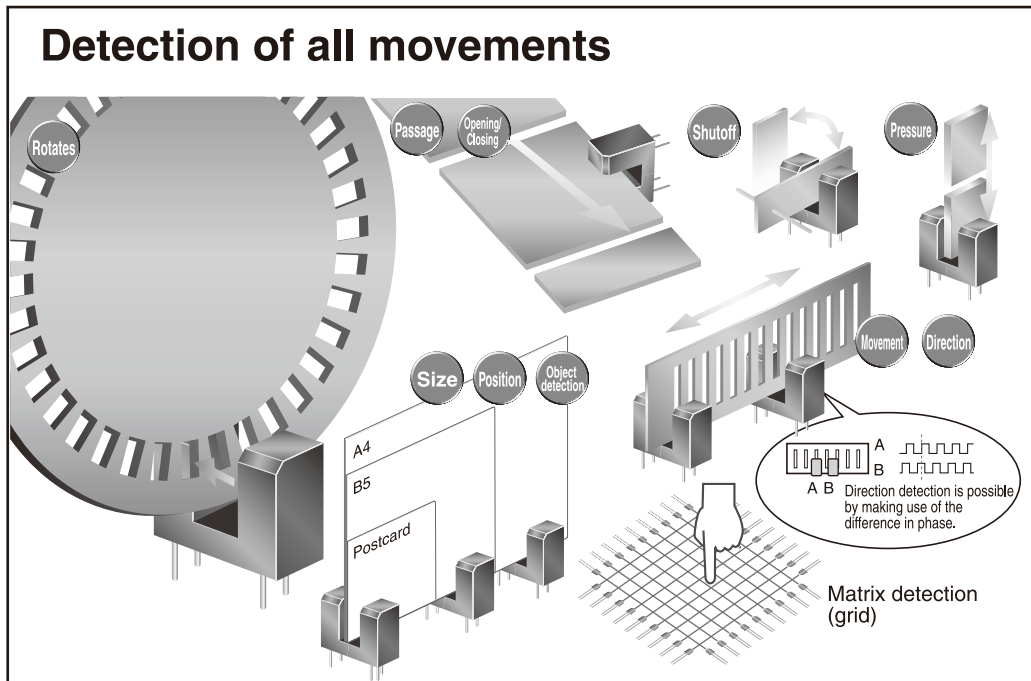


8 characters



### ● Packaging Specifications \* Examples

Packaging Style	Part No.	Specifications		Quantity per unit (pcs)	Basic ordering unit (pcs)
		Item packaging	Case		
Bulk	RPI-243*	Polyethylene bag	Paper box	250 / bag	1000 / box
Taping	RPI-0125*	Reel + Aluminum bag	Paper box	750 / reel	750 / reel
Bulk	RPR-220	Polyethylene bag	Paper box	100 / bag	500
Tube	RPR-220UC30N	Stick	Paper box	100 / tube	2500



# Infrared Light Emitting Diodes

These Ir-LEDs can be used for various remote control applications.

Infrared Light Emitting Diodes 1											
Package	Exterior	Part No.	Features	Standard characteristics							
				Absolute maximum rating							
				I <sub>F</sub> (mA)	I <sub>E</sub> (mW/sr)	I <sub>F</sub> (mA)	V <sub>F</sub> (V)	I <sub>F</sub> (mA)	λ <sub>P</sub> (nm)	tr, tf (μs)	θ <sub>1/2</sub> (deg)
Surface mount type(Side view)	SIM-012SB	<b>SIM-012SB</b>	Ultra-small size, High power Automatic mounting, Reflow-compatible	40	2.8	20	1.2	20	950	1	12
φ3 resin	SIR-320ST3F	<b>SIR-320ST3F</b>	Optimized for card remote controls	75	15	50	1.2	50	940	1	18
		<b>SIR-34ST3F</b>	Optimized for remote controls	100	10.5	50	1.3	100	950	1	27
		<b>SIR-341ST3F</b>	Compact, high power	75	18.1	50	1.3	50	940	1	16
φ5 resin	SIR-505STA47	<b>SIR-505STA47</b>	Direct mount type	100	10	50	1.38	100	950	1	15
		<b>SIR-56ST3F</b>	Optimized for remote controls	100	15	50	1.3	100	950	1	15
		<b>SIR-563ST3F</b>	High output, Optimized for remote controls	100	21	50	1.34	50	940	1	15
		<b>SIR-568ST3F</b>	High speed LED for optical communications	100	38	50	1.6	50	850	fc=50MHz	13
Resin side view type	SIM-20ST	<b>SIM-20ST</b>	General purpose molded type	50	7.5	50	1.3	50	950	1	15
		<b>SIM-22ST</b>	General purpose molded type	50	6.5	10	1.3	50	950	1	30
Surface mount type(Top view)	SIM-030ST	<b>SIM-030ST</b>	Low Profile (0.9mm), Ideal for Proximity Sensors	100	25	100	1.7	100	870	0.1	20
		<b>SIM-040ST</b>	High power, Ideal for Proximity Sensors	100	40	100	1.7	100	870	0.1	20

The following products are belonging to LEDs. (Refer P.E8) Please ask LED Product group for in inquiry.

Infrared Light Emitting Diodes 2																		
Package size (mm)	Part No.	LED Chip	Emitting Color	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)								
				Power Dissipation P <sub>0</sub> (mW)	Forward Current I <sub>F</sub> (mA)	Peak Forward Current I <sub>FP</sub> (mA)	Reverse Voltage V <sub>R</sub> (V)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Forward Voltage V <sub>F</sub>		Reverse Current I <sub>R</sub>		Light Wavelength λ <sub>P</sub>		Radiant Intensity		
										Typ. (V)	I <sub>F</sub> (mA)	Max. (μA)	V <sub>R</sub> (V)	Typ. (nm)	I <sub>F</sub> (mA)	Min. (mW/sr)	Typ. (mW/sr)	I <sub>F</sub> (mA)
Surface mount type Infrared LEDs 2.0 × 1.25 (t=0.8)	<b>SML-M13RT</b>	AlGaAs	Infrared	60	30	300 <sup>±1</sup>	5	-40 to +85	-40 to +100	1.4	20	10	5	870	20	0.5	1.7	20
Surface mount type Infrared LEDs (Reverse mount available) 3.2 × 1.6 (t=1.85)	<b>SML-S13RT</b>															1.5	2.8	
Surface mount type Infrared LEDs 3.0 × 1.5 (t=2.2)	<b>SCM-013RT</b>															57	500 <sup>±1</sup>	

\*1:Duty1/10, 1kHz \*Mounting Conditions must be carefully Considered

## ●Packaging Specifications

Packaging style	Package	Specifications	Quantity per unit (pcs)	Basic ordering unit (pcs)
Taping	Surface mount type	Embossed taping	—	3500 / reel, 1000 / reel
	All Part No	Radial taping	—	2000 / reel
Bulk	φ3, φ5 types	Item packaging: polyethylene bag	500 / bag	φ5mm lamps 1000 / box. φ3mm and side view 2000 / box.
	Side-view	Case:paper box	200 / bag	

## ●Part No. Explanation



### Series Name

SIR	3mm and 5mm lamp infrared LED
SIM	Side view infrared LED
SCM	Surface mount Infrared LED
SCM	Chip LEDs
SML	Chip LEDs

### Additional Number

### Output configuration

S	Infrared LED
R	Infrared LED

### Package color

B	Colored
T	Clear

### Terminal shape

3F	Straight	A47	Taping
T31	Taping	T87	Embossed taping
T32	Taping	T97	Embossed taping

# Phototransistors

ROHM phototransistors have high reliability and large collector currents. Surface mount type, side view packages, and  $\phi 3$  mm lamp packages are available.

Phototransistors 1												
Package	Exterior	Part No.	Features	Visible light filter	Absolute maximum rating			Standard characteristics				
					V <sub>CEO</sub> (V)	P <sub>c</sub> Max. (mW)	I <sub>CEO</sub> Max. ( $\mu$ A)	V <sub>CE</sub> (V)	I <sub>c</sub> (mA)	$\lambda_P$ (nm)	tr, tf ( $\mu$ s)	$\theta 1/2$ (deg)
Surface mount type (Sideview)	RPM-012PB	RPM-012PB	Ultra-small size, High sensitivity Automatic mounting, Reflow-compatible	○	32	75	0.5	10	0.56Min.	800	10	12
$\phi 3$ resin	RPT-34PB3F	RPT-34PB3F	Visible light filter	○	32	150	0.5	10	2.0Min.	800	10	36
		RPT-37PB3F	Visible light filter, Polarity discrimination	○	32	150	0.5	10	2.0Min.	800	10	36
		RPT-38PB3F	Visible light filter	○	32	150	0.5	10	2.0Min.	800	10	36
Resin side view type	RPM-20PB	RPM-20PB	Visible light filter	○	32	100	0.5	10	0.5Min.	800	10	14
		RPM-22PB	Visible light filter, Wide viewing angle	○	32	100	0.5	10	0.48Min.	800	10	32

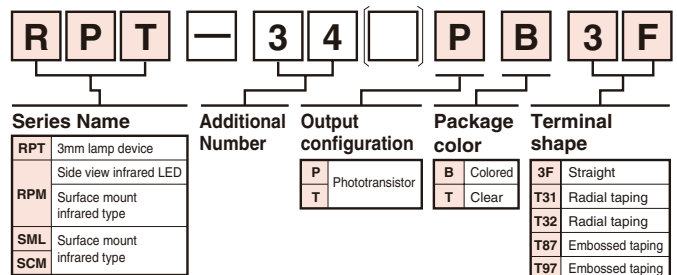
The following products are belonging to LEDs. (Refer PE8) Please ask LED Product group for in query.

Phototransistors 2																		
Package size (mm)	Part No.	LED Chip	Absolute Maximum Ratings (Ta=25°C)						Electrical and Optical Characteristics (Ta=25°C)									
			Collector-Emitter Voltage (V)	Emitter-Collector Voltage (V)	Collector Current (mA)	Collector Power Dissipation (mW)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)	Light Current		Dark Current		Sensitivity Wavelength	Collector-emitter Saturation Voltage				
								Min. (mA)	Max. (mA)	V <sub>CE</sub> (V) I <sub>E</sub> (Lx)	Max. ( $\mu$ A)	V <sub>CE</sub> (V)	$\lambda_P$ Typ. (nm)	Min. (V)	Typ. (V)	Max. (V)	I <sub>c</sub> (mA) I <sub>E</sub> (Lx)	
Surface mount photo transistor 2.0x1.25 (t=0.8)	SML-H10TB	Si	32	5	30	80	-30 to +85	-30 to +100	2.0	3.8	5 / 500	0.5	10	800	—	—	0.4	0.1 / 500
Surface mount photo transistor (Reverse mount available) 3.4x1.25 (t=1.1)	SML-810TB								2.3									
Surface mount photo transistor 3.0x1.5 (t=2.2)	SCM-014TB								0.3	2.8								

## ●Packaging Specifications

Packaging style	Package	Specifications	Quantity per unit (pcs)	Basic ordering unit (pcs)
Taping	Surface mount type	Embossed taping	—	3500 / reel, 3000 / reel, 1000 / reel
	$\phi 3$ type Side-view	Radial taping	—	2000 / reel
Bulk	$\phi 3$ type	Item packaging: polyethylene bag	Case: paper box	500 / bag
	Side-view			200 / bag

## ●Part No. Explanation



# Photodiodes

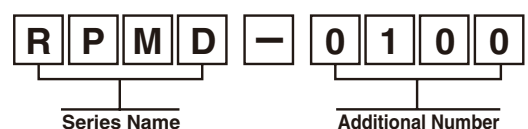
ROHM photodiodes have been used Compact accurate instrument. Surface mount type, side view packages, and top view packages are available.

Photodiodes												
Package	Exterior	Part No.	Features	Visible light filter	Absolute maximum rating			Standard characteristics				
					V <sub>R</sub> (V)	P <sub>D</sub> Max. (mW)	Light Current ( $\mu$ A)	Dark Current (nA)	$\lambda_P$ (nm)	tr, tf (ns)	$\theta 1/2$ (deg)	
Surface mount type (Topview)	RPMD-0100	RPMD-0100	Small size, Thin type	○	60	30	8	6Max.	940	100	60	

## ●Packaging Specifications

Packaging style	Package	Specifications	Quantity per unit (pcs)	Basic ordering unit (pcs)
Taping	Surface mount type	Embossed taping	—	2000 / reel, 3000 / reel

## ●Part No. Explanation



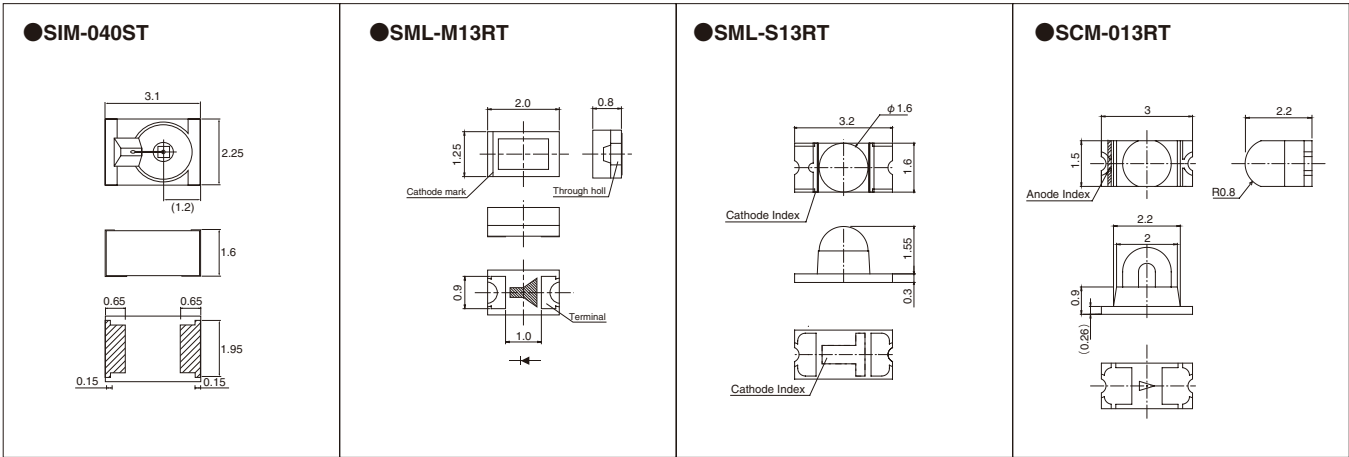
# Packages

## ● Dimensions (Unit : mm)

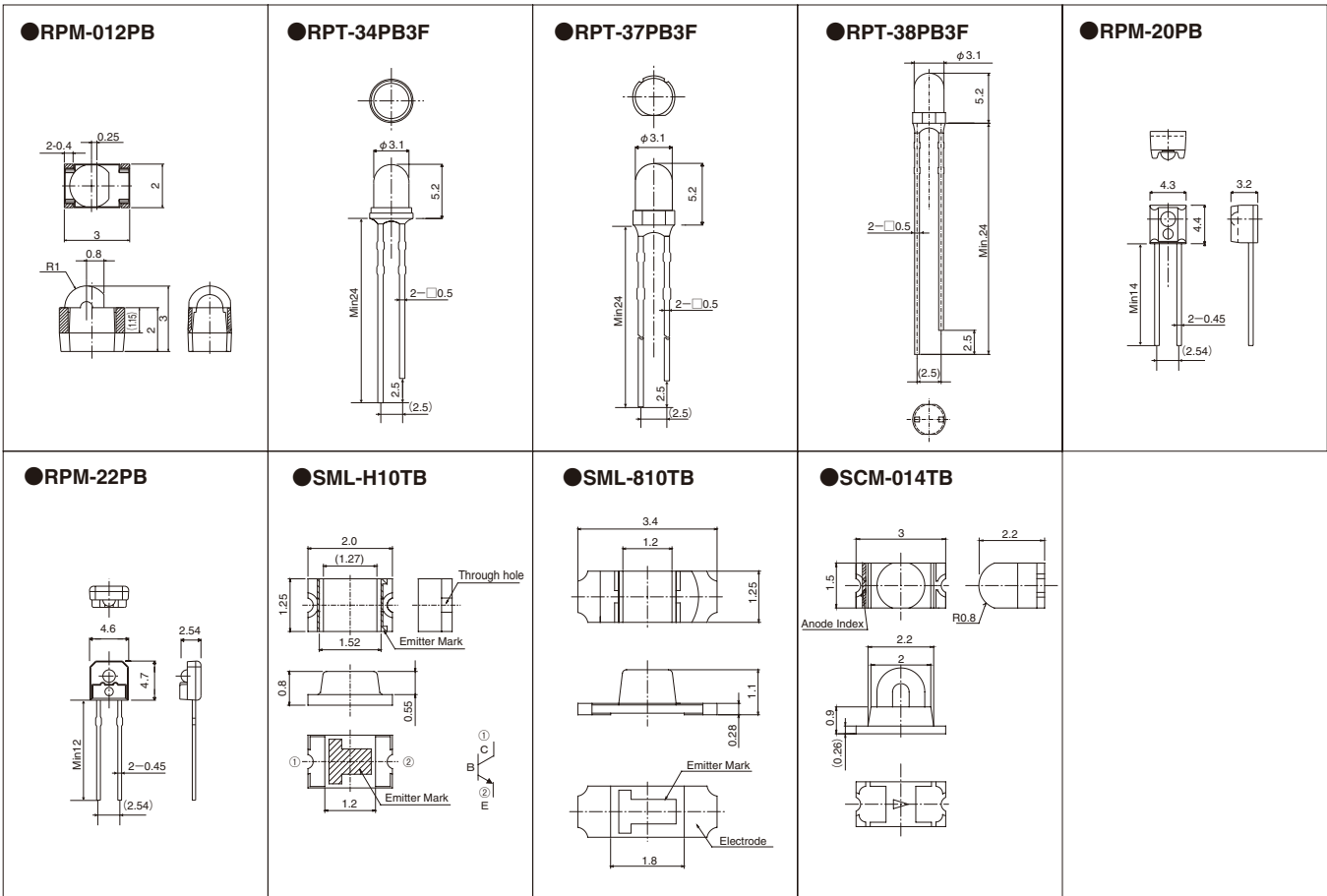
### (Photointerrupter)

<p>● RPI-0125</p>	<p>● RPI-0129</p>	<p>● RPI-0226</p>	<p>● RPI-122</p>
<p>● RPI-121</p>	<p>● RPI-124</p>	<p>● RPI-125</p>	<p>● RPI-129B</p>
<p>● RPI-131</p>	<p>● RPI-221</p>	<p>● RPI-222</p>	<p>● RPI-243</p>
<p>● RPI-246</p>	<p>● RPI-0352E</p>	<p>● RPI-352, RPI-352E</p>	<p>● RPI-441C1, RPI-441C1E</p>

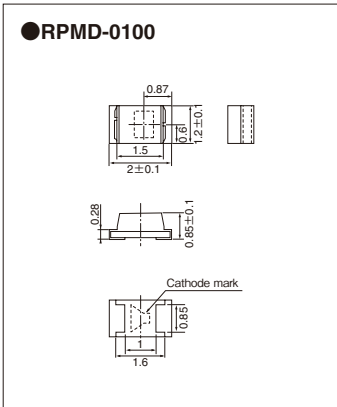




(Phototransistors)



(Photodiodes)





*Opto Devices*

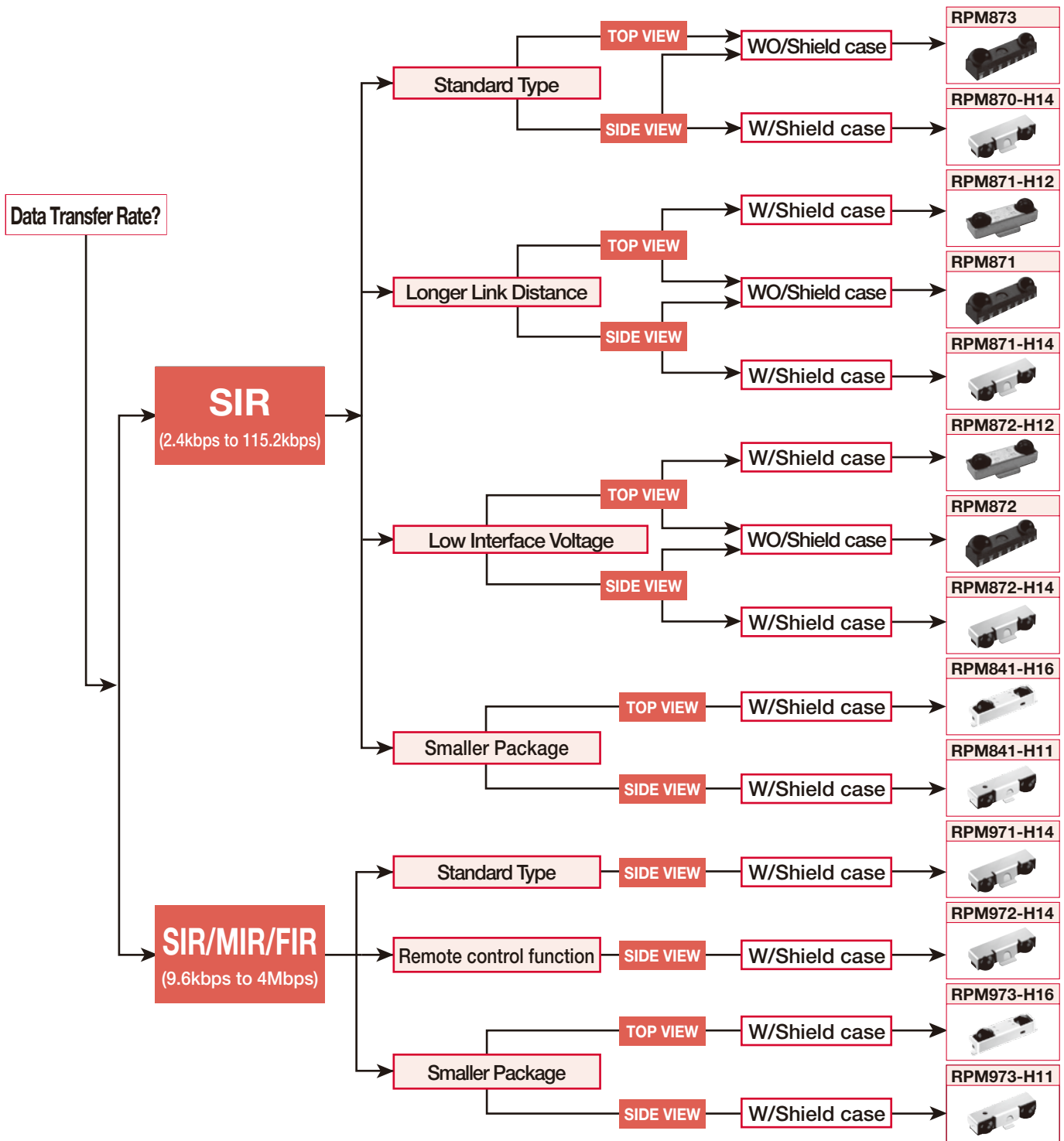
# IrDA Infrared Communication Modules

## CONTENTS

■ IrDA Infrared Communication Module Selection Guide	··· P. E38
■ IrDA Infrared Communication Modules	··· P. E39
■ Packages	·········· P. E39



# IrDA Infrared Communication Module Selection Guide



IrDA Infrared Communication Modules

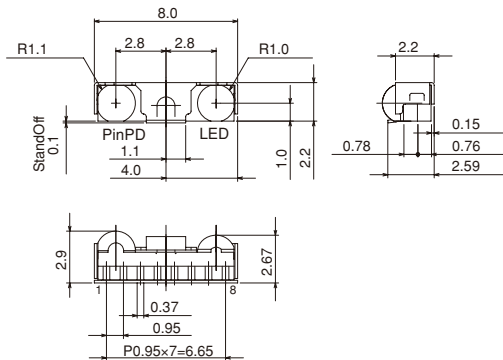
# IrDA Infrared Communication Modules

IrDA Infrared Communication Modules													
Part No.	Feature	Compatible Format			Data rate (bps)	Characteristics		Function			Lens direction		Package
		SIR	MIR	FIR		Supply Voltage (V)	Distance (cm)	Low Voltage Interface	LED Current Adjustable	IR Transmitter	SIDE VIEW	TOP VIEW	
RPM841-H11	Very small size package IR remote control function	○			2.4k to 115.2k	2.4 to 3.6	>30 (SIR)		○	○	○		Fig.5
RPM841-H16	Very small size package IR remote control function	○			2.4k to 115.2k	2.4 to 3.6	>30 (SIR)		○	○		○	Fig.6
RPM870-H14	Standard type	○			2.4k to 115.2k	2.6 to 3.6	>30 (SIR)				○		Fig.1
RPM873	Standard type Shield case less	○			2.4k to 115.2k	2.4 to 3.6	>30 (SIR)				○	○	Fig.2
RPM871	Adjustable of LED intensity Shield case less	○			2.4k to 115.2k	2.6 to 3.6	>60 (SIR)		○		○	○	Fig.2
RPM871-H12	Adjustable of LED intensity	○			2.4k to 115.2k	2.6 to 3.6	>60 (SIR)		○			○	Fig.3
RPM871-H14	Adjustable of LED intensity	○			2.4k to 115.2k	2.6 to 3.6	>60 (SIR)		○		○		Fig.1
RPM872	Extra Vcc terminal for interface Shield case less	○			2.4k to 115.2k	2.0 to 3.6	>30 (SIR)	○			○	○	Fig.2
RPM872-H12	Extra Vcc terminal for interface	○			2.4k to 115.2k	2.0 to 3.6	>30 (SIR)	○				○	Fig.3
RPM872-H14	Extra Vcc terminal for interface	○			2.4k to 115.2k	2.0 to 3.6	>30 (SIR)	○			○		Fig.1
RPM971-H14	Adjustable of LED intensity	○	○	○	9.6k to 4M	2.4 to 3.6	>30 (FIR)	○	○		○		Fig.4
RPM972-H14	Adjustable of LED intensity IR remote control function	○	○	○	9.6k to 4M	2.4 to 3.6	>30 (FIR)	○	○	○	○		Fig.4
RPM973-H11	Very small size package IR remote control function	○	○	○	9.6k to 4M	2.4 to 3.6	>30 (FIR)	○	○	○	○		Fig.5
RPM973-H16	Very small size package IR remote control function	○	○	○	9.6k to 4M	2.4 to 3.6	>30 (FIR)	○	○	○		○	Fig.6

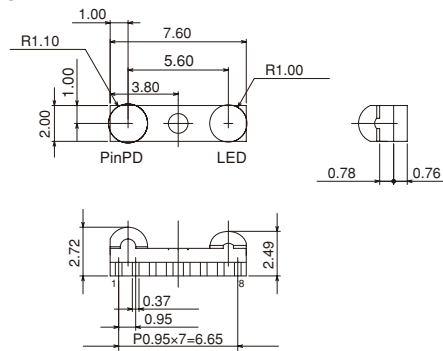
## Packages

### ● Dimensions 1 (Unit : mm)

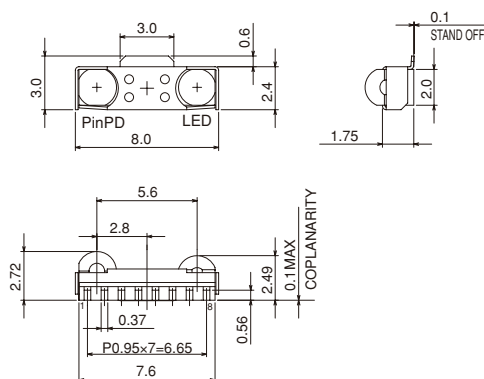
● Fig.1



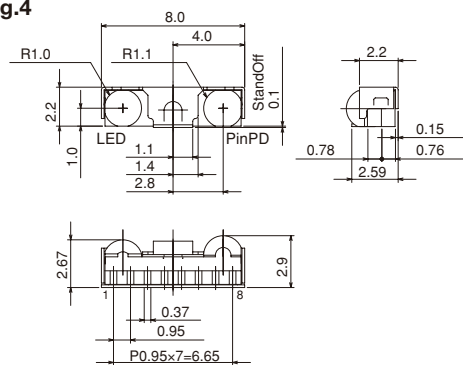
● Fig.2



● Fig.3



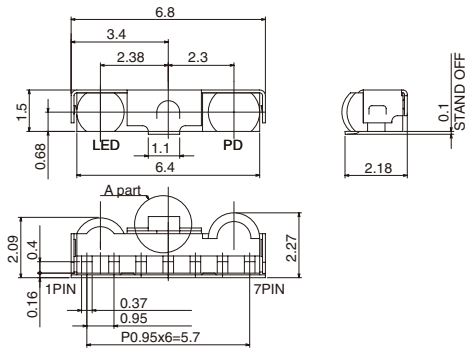
● Fig.4



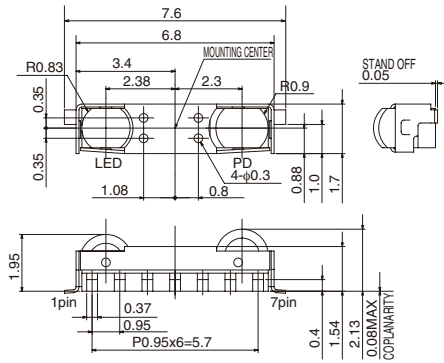
# Packages

## ●Dimensions 2 (Unit : mm)

●Fig.5



●Fig.6



## ●Packaging type

Packaging Style	Part No.	Lens Direction	Taping Type No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Emboss taping	RPM870-H14	SIDE VIEW	E2A	2500	2500
	RPM871-H14				
	RPM872-H14				
	RPM871				
	RPM872				
	RPM873				
	RPM841-H11	TOP VIEW	E4A		
	RPM973-H11				
	RPM871-H12				
	RPM872-H12				
	RPM871				
	RPM872				
	RPM873	SIDE VIEW	E3A		
	RPM841-H16				
	RPM973-H16				
RPM971-H14					
RPM972-H14					

## ●Part No. Explanation



Additional Number

Holder

### Taping specifications

E2A/E3A	Embossed tape (1 pin, sprocket hole side, Side view type)
E4A	Embossed tape (1 pin, sprocket hole side, Top view type)



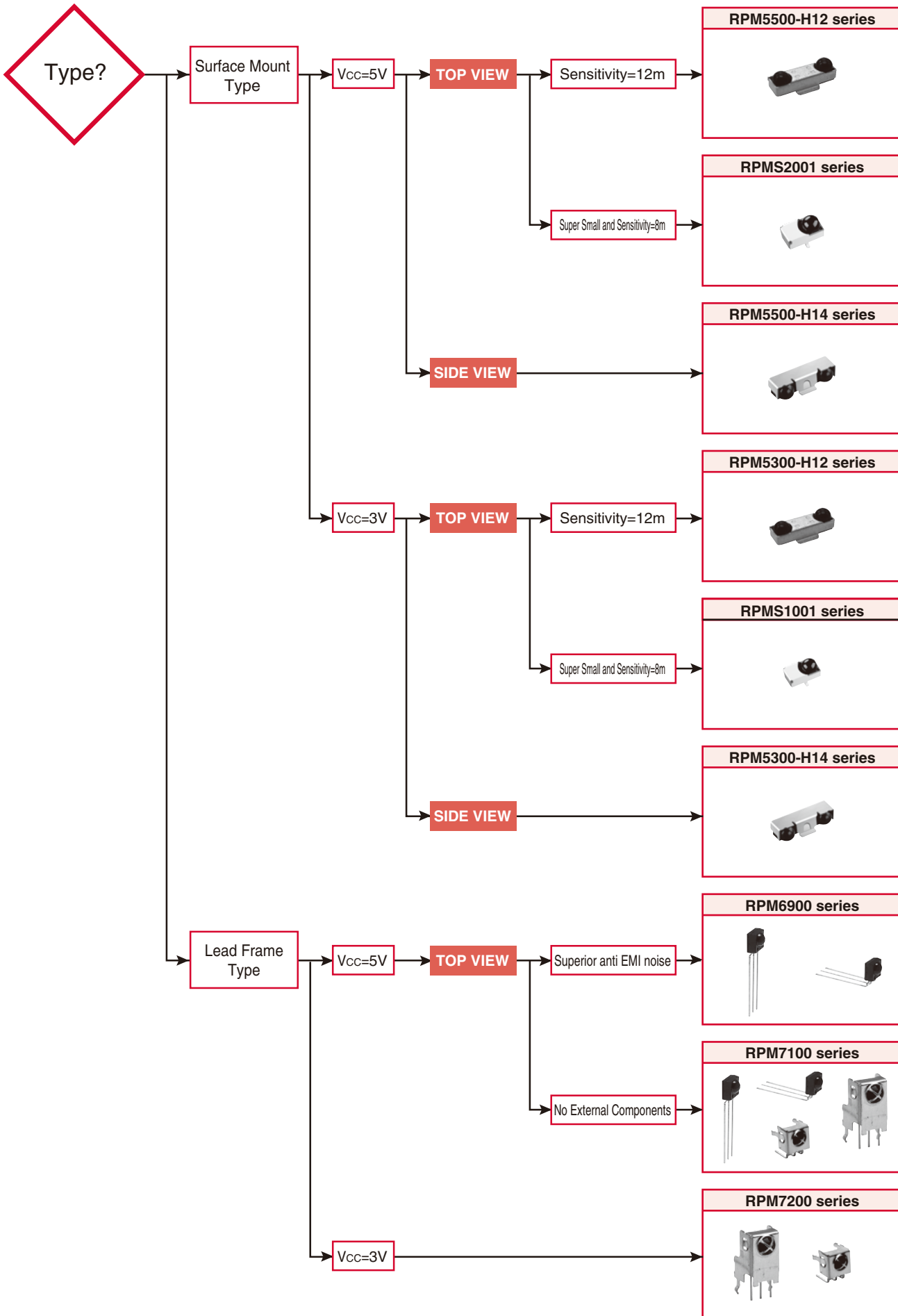
## *Opto Devices*

# Remote Control Receiver Modules

### CONTENTS

■ Remote Control Receiver Module Selection Guide .....	P. E42
■ Surface Mount Remote Control Receiver Modules .....	P. E43
■ Packages .....	P. E43
■ Lead Frame Remote Control Receiver Modules .....	P. E44
■ Packages .....	P. E45

# Remote Control Receiver Module Selection Guide



Remote Control Receiver Modules

# Surface Mount Remote Control Receiver Modules

Dual-receiver Type														
Type	fo (kHz)	Part No.	Feature	Supply voltage (V)	Characteristics						Lens Direction		Package	
					Current consumption (mA)	Effective Distance (m)	V <sub>OL</sub> Max. (V)	V <sub>OH</sub> Min. (V)	θ <sub>50%</sub> Horizontal (deg)	θ <sub>50%</sub> Vertical (deg)	SIDE VIEW	TOP VIEW		
RPM5537 series	36.7	RPM5537-H12	5V Operation Dual lens make the receiving characteristics wide & high sensitive.	4.5 to 5.5	0.95	12	0.5	4.5	42	38	○	○	Fig.2	
		RPM5537-H14									○	○	Fig.1	
RPM5538 series	37.9	RPM5538-H12		4.5 to 5.5	0.95	12	0.5	4.5	42	38	○	○	Fig.2	
		RPM5538-H14									○	○	Fig.1	
RPM5540 series	40.0	RPM5540-H12		4.5 to 5.5	0.95	12	0.5	4.5	42	38	○	○	Fig.2	
		RPM5540-H14									○	○	Fig.1	
RPM5337 series	36.7	RPM5337-H12		3V Operation Dual lens make the receiving characteristics wide & high sensitive.	2.7 to 3.6	0.3	12	0.5	2.5	42	38	○	○	Fig.2
RPM5337 series	36.7	RPM5337-H14										○	○	Fig.1
RPM5338 series	37.9	RPM5338-H12	2.7 to 3.6		0.3	12	0.5	2.5	42	38	○	○	Fig.2	
		RPM5338-H14									○	○	Fig.1	
RPM5340 series	40.0	RPM5340-H12	2.7 to 3.6		0.3	12	0.5	2.5	42	38	○	○	Fig.2	
		RPM5340-H14									○	○	Fig.1	

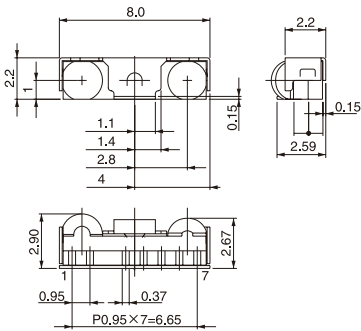
  

Ultra-compact Type													
Type	fo (kHz)	Part No.	Feature	Supply voltage (V)	Characteristics						Lens Direction		Package
					Current consumption (mA)	Effective Distance (m)	V <sub>OL</sub> Max. (V)	V <sub>OH</sub> Min. (V)	θ <sub>50%</sub> Horizontal (deg)	θ <sub>50%</sub> Vertical (deg)	SIDE VIEW	TOP VIEW	
RPMS2371 series	36.7	RPMS2371-H19	Super small package Good characteristics against Sunlight noise	4.5 to 5.5	0.95	8	0.5	4.5	34	32	○	○	Fig.3
RPMS2381 series	37.9	RPMS2381-H19		4.5 to 5.5	0.95	8	0.5	4.5	34	32	○	○	Fig.3
RPMS2401 series	40.0	RPMS2401-H19		4.5 to 5.5	0.95	8	0.5	4.5	34	32	○	○	Fig.3
RPMS1371 series	36.7	RPMS1371-H19		2.7 to 3.6	0.3	8	0.5	2.5	34	32	○	○	Fig.3
RPMS1381 series	37.9	RPMS1381-H19		2.7 to 3.6	0.3	8	0.5	2.5	34	32	○	○	Fig.3
RPMS1401 series	40.0	RPMS1401-H19		2.7 to 3.6	0.3	8	0.5	2.5	34	32	○	○	Fig.3

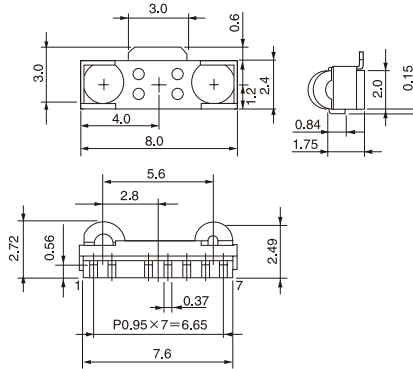
## Packages

### ● Dimensions (Unit : mm)

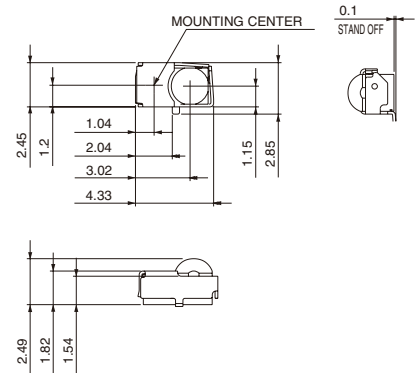
● Fig.1



● Fig.2



● Fig.3



### ● Packaging Specifications

Packing Style	Part No.	Lens Direction	Taping Type No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Emboss taping	RPM5537-H14	SIDE VIEW	E2A	2500	2500
	RPM5538-H14				
	RPM5540-H14				
	RPM5337-H14				
	RPM5338-H14				
	RPM5340-H14				
	RPM5537-H12	TOP VIEW	E4A		
	RPM5538-H12				
	RPM5540-H12				
	RPM5337-H12				
	RPM5338-H12				
	RPM5340-H12				
	RPMS2371-H19				
	RPMS2381-H19				
RPMS2401-H19					
RPMS1371-H19					
RPMS1381-H19					
RPMS1401-H19					

# Lead Frame Remote Control Receiver Modules

5V Type (Superior Anti-noise Characteristics) : RPM6900 Series														
Type	fo (kHz)	Part No.	Feature	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package	
					Current consumption (mA)	Effective Distance (m)	V <sub>OL</sub> Max. (V)	V <sub>OH</sub> Min. (V)	θ <sub>50%</sub> Horizontal (deg)	θ <sub>50%</sub> Vertical (deg)				
RPM6937 series	36.7	RPM6937	Internal photo IC ensures excellent anti-noise characteristics.	4.5 to 5.5	1.5	15	0.5	4.5	42	35	SIDE VIEW	5.5	Fig.1	
		RPM6937-V4									TOP VIEW	4.8	Fig.4	
RPM6938 series	37.9	RPM6938									RPM6938-V4	SIDE VIEW	5.5	Fig.1
		TOP VIEW											4.8	Fig.4
RPM6940 series	40.0	RPM6940									RPM6940-V4	SIDE VIEW	5.5	Fig.1
		TOP VIEW											4.8	Fig.4

5V Type : RPM7100 Series													
Type	fo (kHz)	Part No.	Feature	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package
					Current consumption (mA)	Effective Distance (m)	V <sub>OL</sub> Max. (V)	V <sub>OH</sub> Min. (V)	θ <sub>50%</sub> Horizontal (deg)	θ <sub>50%</sub> Vertical (deg)			
RPM7137-R series	36.7	RPM7137-R	Standard Application	4.5 to 5.5	0.95	15	0.5	4.5	45	35	SIDE VIEW	5.5	Fig.1
		RPM7137-H5R										9.6	Fig.2
		RPM7137-H13R										15.0	Fig.3
		RPM7137-V4R									4.8	Fig.4	
		TOP VIEW									RPM7137-H8R	7.2	Fig.5
											RPM7137-H9R	12.0	Fig.6
											RPM7137-H4R	15.9	Fig.7
RPM7138-R	5.5										Fig.1		
RPM7138-R series	37.9	RPM7138-H5R									9.6	Fig.2	
		RPM7138-H13R									15.0	Fig.3	
		RPM7138-V4R									4.8	Fig.4	
		TOP VIEW									RPM7138-H8R	7.2	Fig.5
											RPM7138-H9R	12.0	Fig.6
											RPM7138-H4R	15.9	Fig.7
			RPM7140-R	5.5	Fig.1								
RPM7140-R series	40.0	RPM7140-H5R	9.6	Fig.2									
		RPM7140-H13R	15.0	Fig.3									
		RPM7140-V4R	4.8	Fig.4									
		TOP VIEW	RPM7140-H8R	7.2	Fig.5								
			RPM7140-H9R	12.0	Fig.6								
			RPM7140-H4R	15.9	Fig.7								

3V Type : RPM7200 Series													
Type	fo (kHz)	Part No.	Feature	Supply voltage (V)	Characteristics						Lens Direction	Height to lens (mm)	Package
					Current consumption (mA)	Effective Distance (m)	V <sub>OL</sub> Max. (V)	V <sub>OH</sub> Min. (V)	θ <sub>50%</sub> Horizontal (deg)	θ <sub>50%</sub> Vertical (deg)			
RPM7237-R series	36.7	RPM7237-H5R	Standard Application	2.7 to 3.6	0.3	15	0.5	2.5	45	35	SIDE VIEW	9.6	Fig.2
		RPM7237-H13R										15.0	Fig.3
		RPM7237-H8R									7.2	Fig.5	
		TOP VIEW									RPM7237-H9R	12.0	Fig.6
											RPM7237-H4R	15.9	Fig.7
RPM7238-R series	37.9	RPM7238-H5R									9.6	Fig.2	
		RPM7238-H13R									15.0	Fig.3	
		RPM7238-H8R									7.2	Fig.5	
		TOP VIEW									RPM7238-H9R	12.0	Fig.6
											RPM7238-H4R	15.9	Fig.7
RPM7240-R series	40.0	RPM7240-H5R	9.6	Fig.2									
		RPM7240-H13R	15.0	Fig.3									
		RPM7240-H8R	7.2	Fig.5									
		TOP VIEW	RPM7240-H9R	12.0	Fig.6								
			RPM7240-H4R	15.9	Fig.7								

Remote Control Receiver Modules

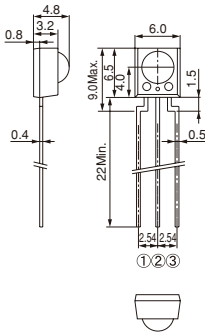


# Packages

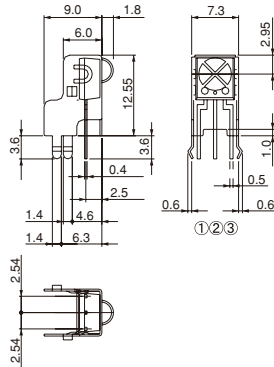
## ● Dimensions (Unit : mm)

### 〈SIDE VIEW〉

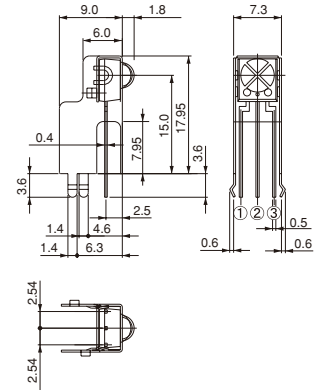
● Fig.1



● Fig.2

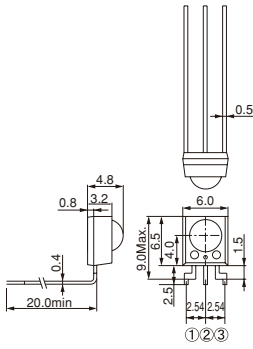


● Fig.3

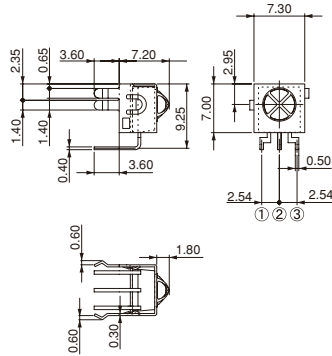


### 〈TOP VIEW〉

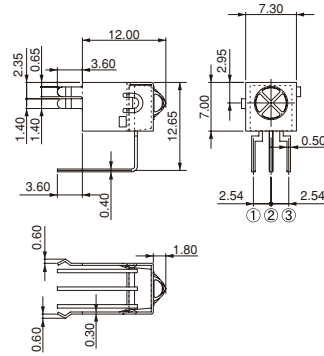
● Fig.4



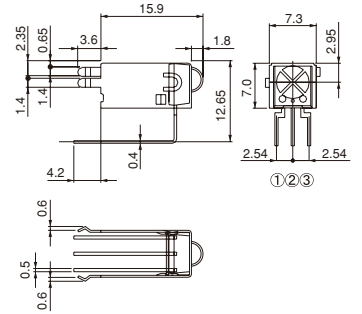
● Fig.5



● Fig.6



● Fig.7



PIN番号	
①	Rout
②	GND
③	Vcc

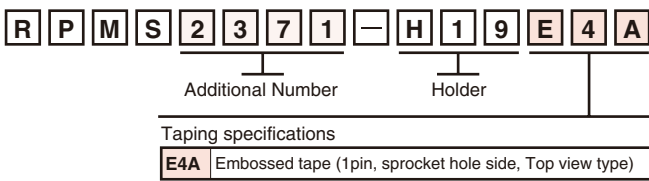
## ● Packaging Specifications (Lead frame type)

5V Type (Superior Anti-noise Characteristics) : RPM6900 Series			
Packing Style	Package Type No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Bulk : Tube	RPM6937	80	2000
	RPM6938		
	RPM6940		
	RPM6937-V4	80	2000
	RPM6938-V4		
RPM6940-V4			
3V Type : RPM7200 Series			
Bulk : Tube	RPM7237-H4R	50	1000
	RPM7238-H4R		
	RPM7240-H4R		
	RPM7237-H5R	50	1000
	RPM7238-H5R		
	RPM7240-H5R		
	RPM7237-H8R	50	1000
	RPM7238-H8R		
	RPM7240-H8R		
	RPM7237-H9R	50	1000
	RPM7238-H9R		
	RPM7240-H9R		
	RPM7237-H13R	50	1000
	RPM7238-H13R		
	RPM7240-H13R		

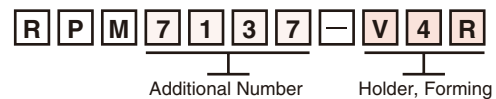
5V Type : RPM7100 Series			
Packing Style	Package Type No.	Quantity per unit (pcs)	Basic ordering unit (pcs)
Bulk : Tube	RPM7137-R	80	2000
	RPM7138-R		
	RPM7140-R		
	RPM7137-V4R	80	2000
	RPM7138-V4R		
	RPM7140-V4R		
	RPM7137-H4R	50	1000
	RPM7138-H4R		
	RPM7140-H4R		
	RPM7137-H5R	50	1000
	RPM7138-H5R		
	RPM7140-H5R		
	RPM7137-H8R	50	1000
	RPM7138-H8R		
	RPM7140-H8R		
RPM7137-H9R	50	1000	
RPM7138-H9R			
RPM7140-H9R			
RPM7137-H13R	50	1000	
RPM7138-H13R			
RPM7140-H13R			

## ● Part No. Explanation

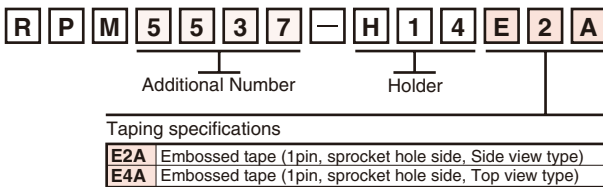
### ● Ultra-compact Surface Mount Type



### ● Lead Frame Type



### ● Surface Mount Type





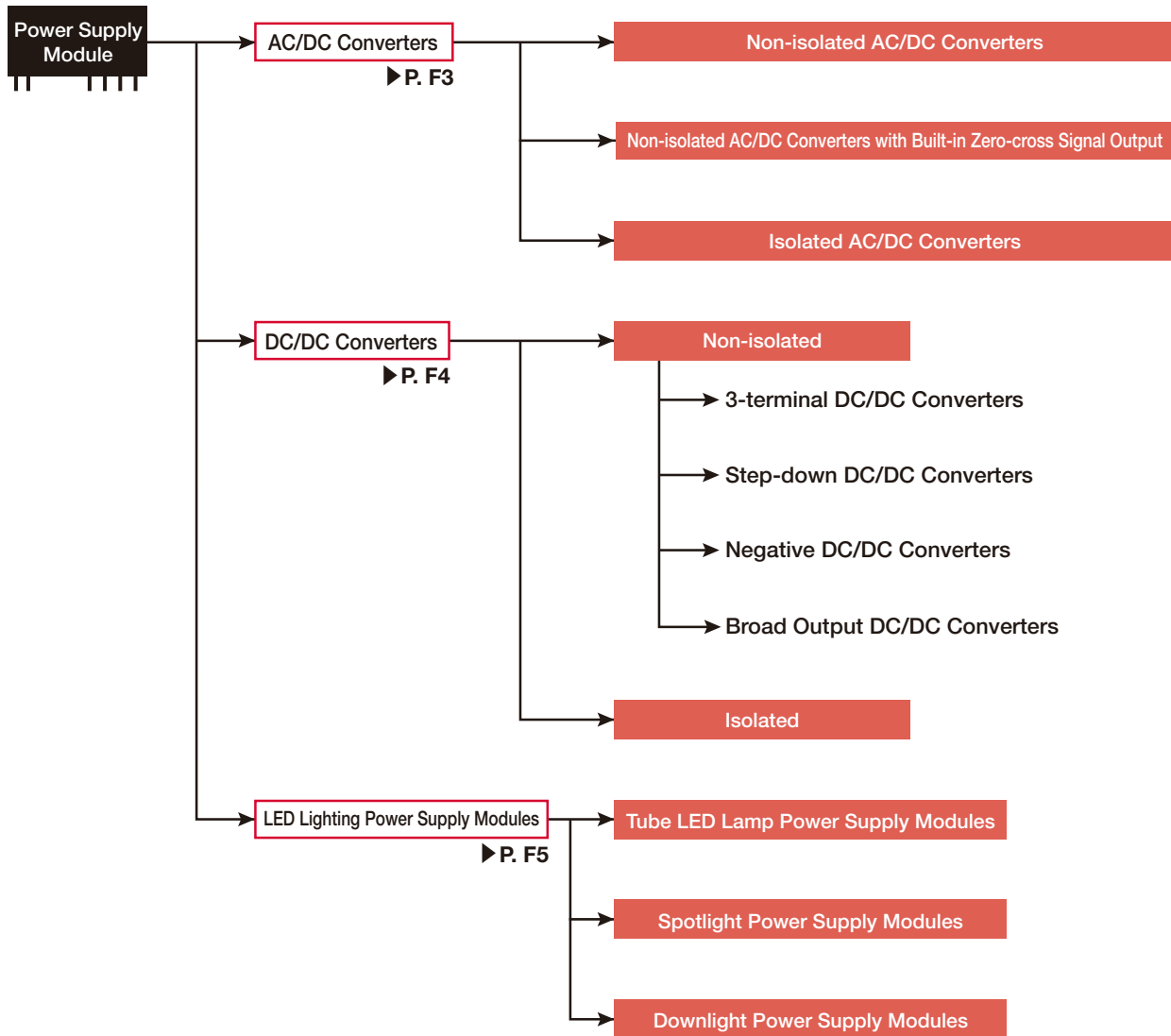
*Modules*

# Power Supply Modules

## CONTENTS

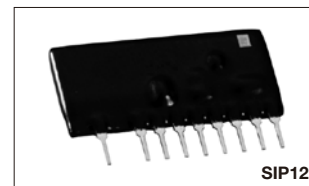
■ Power Supply Module Selection Guide .....	P. F2
■ AC/DC Converters .....	P. F3
■ DC/DC Converters .....	P. F4
■ LED Lighting Power Supply Modules .....	P. F5

## Power Supply Module Selection Guide



## AC/DC Converters

- **No transformer (Non-isolation)**  
Few external components required, simplifying the DC power supply.
- **Reduces the size and weight of the power supply unit (Non-isolation type)**  
Footprint and weight reduced to 1/4th and 1/30th the value, respectively, compared to transformer-equipped power supplies.
- **Wider input voltage range**
- **For industrial equipment, lighting fixtures, and home electronics**



Non-isolated AC/DC Converters						
Part No.	Input voltage (V)	Output voltage (V)	Output current (mA)	Dimensions (mm)	Package*	
BP5038A1	113 to 170 (AC conversion 80 to 120VAC)	+5	30	18.0×16.8×9.1	SIP6	
BP5063-5			200	28.2×17.9×9.1	SIP10	
BP5038A			30	18.0×16.8×9.1	SIP6	
BP5033-12		+12	100	28.2×15.5×10.5	SIP10	
BP5037B12			200	28.2×16.8×9.0	SIP10	
BP5039B12			300	35.0×18.0×9.1	SIP12	
BP5067-12		+15	350	34.5×20.0×9.9	SIP12	
BP5037B15			170	28.2×16.8×9.0	SIP10	
BP5039-15			200	35.0×19.5×9.1	SIP12	
BP5067-15		+24	300	35.0×22.0×9.2	SIP12	
BP5039A			200	35.0×19.5×9.1	SIP12	
BP5034D5			+5	100	28.2×15.7×10.0	SIP10
BP5034D12	113 to 195 (AC conversion 80 to 138VAC)	+12	100	28.2×15.7×10.0	SIP10	
BP5034D15		+15	80	28.2×15.7×10.0	SIP10	
BP5034B20		+20	70	28.2×15.7×10.0	SIP10	
BP5034D24		+24	50	28.2×15.7×10.0	SIP10	
BP5075-5	-113 to -170 (AC conversion 80 to 120VAC)	-5	120	20.5×19.5×10.7	SIP7	
BP5035A5			200	28.2×17.9×9.1	SIP10	
BP5061-5			350	34.5×19.1×9.1	SIP12	
BP5062A5		500	34.5×21.5×10.9	SIP12		
BP5065C		-12	90	26.1×15.2×7.2	SIP9	
BP5090-12			200	26.5×21.5×10.0	SIP8	
BP5061			300	35.0×19.1×9.1	SIP12	
BP5062A		-15	500	34.5×21.5×9.9	SIP12	
BP5068A			800	34.5×21.5×11.3	SIP12	
BP5068-15			800	35.0×22.0×11.5	SIP12	
BP5068A24		-24	600	34.5×21.5×11.3	SIP12	
BP5041A5		226 to 358 (AC conversion 160 to 253VAC)	+5	100	32.5×19.3×11.5	SIP10
BP5041A	100			32.5×19.3×11.5	SIP10	
BP5048	300			34.5×19.1×9.2	SIP12	
BP5041B15	+12		80	32.5×19.3×11.5	SIP10	
BP5047B15			150	32.5×19.1×10.1	SIP10	
BP5048-15			200	34.5×19.1×9.2	SIP12	
BP5048-15	120 to 239 (AC conversion 85 to 170VAC)		+15	427	22.5×27.1×7.8	SIP7
BP5726-15				800		
BP5047A24	240 to 358 (AC conversion 176 to 253VAC)		+24	150	34.5×19.1×9.2	SIP12
BP5048-24	249 to 358 (AC conversion 176 to 253VAC)			200	34.5×19.1×9.2	SIP12
BP5045A5	-113 to -390 (AC conversion 80 to 276VAC)		-5	200	28.2×17.9×10.1	SIP10
BP5045A				200	28.2×17.9×10.1	SIP10
BP5053-12		200		28.2×17.9×10.1	SIP10	
BP5053-12	-240 to -420 (AC conversion 170 to 300VAC)	-12	250	28.2×21.5×9.9	SIP10	
BP5055-12	-240 to -420 (AC conversion 170 to 300VAC)		130			
BP5055-12	-420 to -600 (AC conversion 300 to 425VAC)					

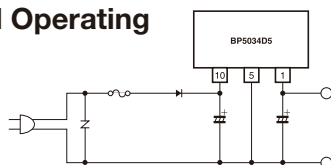
Non-isolated AC/DC Converters with Built-in Zero-cross Signal Output					
Part No.	Input voltage (V)	Output voltage (V)	Output current (mA)	Dimensions (mm)	Package*
BP5011	-85 to -170 (AC conversion 60 to 120VAC)	-5	200	35.1 × 17.4 × 8.1	SIP13
BP5013	-113 to -170 (AC conversion 80 to 120VAC)	-12 to -30	12W MAX	38.5 × 23.2 × 11.2	SIP14
BP5014	-113 to -170 (AC conversion 80 to 120VAC)	-5	500	37.5 × 21.5 × 10.0	SIP12

Isolated AC/DC Converters					
Part No.	Input voltage (V)	Output voltage (V)	Output current (mA)	Dimensions (mm)	Package*
BP5710-1	120 to 162 (AC conversion 85 to 115VAC)	+12	350	35.0×24.0×14.9	SIP11
BP5716	113 to 170 (AC conversion 80 to 120VAC)	+12	1000	24.0×25.5×10.1	SIP8
BP5718A12	113 to 195 (AC conversion 80 to 138VAC)	+12	1000	32.5×21.5×9.3	SIP11
BP5722A12	217 to 405 (AC conversion 154 to 286VAC)	+12	1000	32.5×21.5×9.3	SIP11
BP5723-33	113 to 374 (AC conversion 80 to 264VAC)	+3.3	3000	38.5×21.5×10.9	SIP11
BP5720-5	113 to 374 (AC conversion 80 to 264VAC)	+5.0	500	35.5×20.5×10.0	SIP12
Part No.	Input voltage (V)	Output electric power (W)	Switching method	Dimensions (mm)	Package*
BP5725	119 to 405 (AC conversion 85 to 286VAC)	6	PWM (light load compatible)	22.5×24.0×7.8	SIP7
BP5729	120 to 372 (AC conversion 85 to 264VAC)	12 / 24	quasi-resonance	37.4×24.3×9.3	SIP12
BP5728	113 to 405 (AC conversion 80 to 286VAC)	6 / 12	PWM (light load compatible)	18.8×19.5×9.9	SIP6
BP5717	113 to 195 (AC conversion 80 to 138VAC)	18	quasi-resonance	37.4×24.3×9.3	SIP12

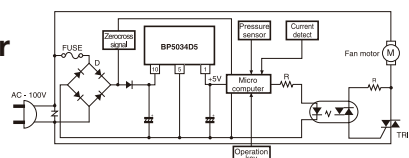
※: Original power supply module package used

### Typical Applications

#### Typical Operating Circuit

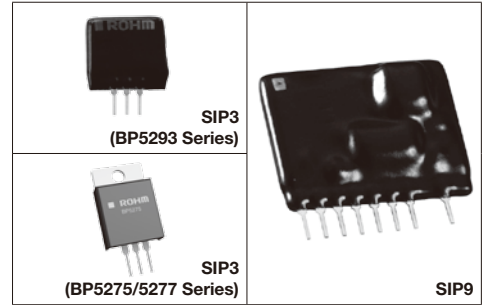


#### Typical Supply for Vacuum Cleaner



## DC/DC Converters

- **High efficiency**  
High energy conversion factor (85 to 93%) contributes to compact, power-saving supplies.
- **Few external parts**  
Because the external part is only two condensers, it can compose a powersupply circuit easily.
- **Internal output switch**  
Enables full use of power saving feature.
- **Wider input voltage range**  
Can operate with unregulated mains. (BP5220A/5221A : 8 to 38V)
- **Universal**  
Wide applicability (i.e. output switches, protection circuits, output voltage regulators)
- **Small footprint**  
SIP package requires less mounting space. (Board footprint: 65mm<sup>2</sup>)



\*Because there is a product which doesn't have some of these features and characteristic, too, confirm details with each specification.

### 3-terminal DC/DC Converters (Non-isolated)

Part No.	Input voltage(V)	Output voltage(V)	Output current1 (mA)*1	Output current2 (mA)*2	Output voltage accuracy(%)	STBY terminal	Dimensions (mm)	Package*
☆ BP5293-18	7 to 26	+1.8	1000	—	±3.0%	None	17.0×17.8×5.5	SIP3
☆ BP5293-33	7 to 26	+3.3	1000	—	±2.0%	None	17.0×17.8×5.5	SIP3
☆ BP5293-50	7 to 26	+5.0	1000	—	±2.0%	None	17.0×17.8×5.5	SIP3
☆ BP5293-12	15 to 26	+12.0	1000	—	±2.0%	None	17.0×17.8×5.5	SIP3
BP5275-18	4.0 to 14	+1.8	500	800	±3.0%	None	13.8×23.0×5.2	SIP3
BP5275-25	4.0 to 14	+2.5	500	800	±2.0%	None	13.8×23.0×5.2	SIP3
BP5275-33	4.5 to 14	+3.3	500	800	±2.0%	None	13.8×23.0×5.2	SIP3
BP5275-50	6.0 to 14	+5.0	500	800	±2.0%	None	13.8×23.0×5.2	SIP3
BP5277-33	8 to 32	+3.3	500	800	±2.0%	None	16.3×26.4×6.2	SIP3
BP5277-50	8 to 32	+5.0	500	800	±2.0%	None	16.3×26.4×6.2	SIP3
BP5277-90	12 to 32	+9.0	500	800	±2.0%	None	16.3×26.4×6.2	SIP3
BP5277-12	15 to 32	+12.0	500	800	±2.0%	None	16.3×26.4×6.2	SIP3
BP5277-13	16.5 to 32	+13.0	500	800	±2.0%	None	16.3×26.4×6.2	SIP3
BP5277-15	19 to 32	+15.0	500	800	±2.0%	None	16.3×26.4×6.2	SIP3

☆ Non need external parts. (Incorporates input and output Capacitor and Inductor) ◦ Pin compatible with Three-terminal LDO.  
\*1 The maximum output current when the module is not fixed to the heatsink. \*2 The maximum output current when the module is fixed to the heatsink.

### Step-down DC/DC Converters (Non-isolated)

Part No.	Input voltage (V)	Output voltage (V)	Output current (mA)	Dimensions (mm)	Package*
BP5224-33	7 to 18	+3.3	300	17.8×18.1×9.7	SIP6
BP5223	8 to 18	+5	150	17.0×16.8×10.4	SIP5
BP5220A	8 to 38	+5	1000	28.0×19.5×12.0	SIP9
BP5221A	8 to 38	+5	500	28.0×19.5×12.0	SIP9
BP5225	10 to 26.4	+5	150	17.0×16.8×9.7	SIP5
BP5222A	15 to 38	+12	500	28.0×19.5×12.0	SIP9
BP5226-18	20 to 46	+18	500	34.0×17.4×8.1	SIP12

### Negative DC/DC Converters (Non-isolated)

Part No.	Input voltage(V)	Output voltage(V)	Output current(mA)	Dimensions (mm)	Package*
BP5122	8 to 20	-12	100	26.7×19.5×12.7	SIP9

### Broad Output DC/DC Converters (Non-isolated)

Part No.	Input voltage(V)	Output voltage(V)	Output current(mA)	Output(ch)	Dimensions (mm)	Package*
BP5811	19 to 21	0 to 19	300	1	27.7×16.0×7.6	SIP9

◦ The output voltage can be controlled with the PWM signal or the DC signal. This product is best to control a motor and so on.

### Isolated DC/DC Converters

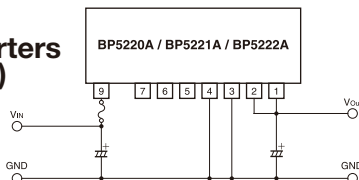
Part No.	Input voltage(V)	Output voltage(V)	Output current(mA)	Isolation Voltage(V)	Dimensions (mm)	Package*
BP5512A	4.5 to 6.5	+5	200	AC2300	28.2×21.4×17.2	SIP7
BP5324A	4.5 to 5.5	+12	250	AC500	38.5×27.0×13.6	SIP12
BP5510-24	10.8 to 13.2	+24	200	AC500	32.6×24.2×13.6	SIP11

\*: Original power supply module package used

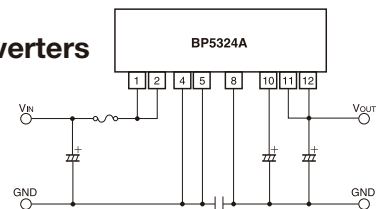
☆ : Under development

## ■ Typical Applications (Basic)

### ● Step-down DC/DC Converters (Non-isolated)

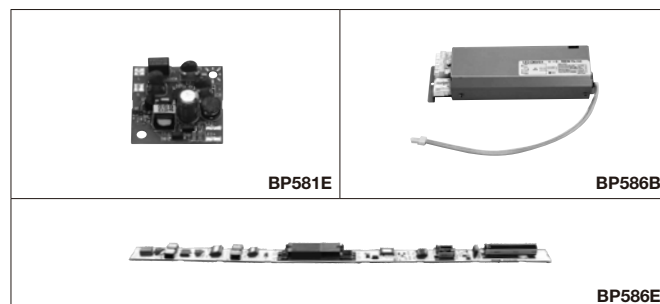


### ● Isolated DC/DC Converters



# LED Lighting Power Supply Modules

- It can supply stable output current even if the LED's Vf is varied.
- It can supply stable output current even if the ambient temperature of a power supply rises by flash of the LED.
- High efficiency of power supply contributes to device efficiency.
- Broad lineup corresponding to devices.



Tube LED Lamp Power Supply Modules								
Part No.	Input Voltage (V)	Output Power (W)	LED Current (mA)	LED Vf Range (V)	Efficiency	PFC	Dimming	Dimension (mm)
BP581C	90 to 264	21.8	400	44 to 54	90%	○	No	215.0×16.0×15.8
<b>New</b> BP586E	90 to 264	11.5	130	82 to 92	92%	○	No	295.0×18.5×10.8
Spotlight Power Supply Modules								
<b>New</b> BP587C	90 to 242	20	400	46 to 54	88%	○	No	164.0×34.5×24.8
<b>New</b> BP587C-1	90 to 242	30	250	104 to 122	90%	○	No	164.0×34.5×24.8
BP586A	90 to 242	7.2 to 42.0	600	12 to 70	90%	○	No	171.0×61.0×29.4
Downlight Power Supply Modules								
BP581D	90 to 110	2.2	90	20 to 28	82%	—	No	35.0×35.0×16.0
BP581E	90 to 110	6.5	90	62 to 77	89%	—	No	35.0×35.0×17.0
BP585C	90 to 110	6.6	150	34 to 56	89%	—	No	22.0×36.0×20.0
BP585D	90 to 110	12.8	225	45 to 70	90%	—	No	22.0×42.0×21.7
BP5892	90 to 110	6.3	88	67 to 77	88%	—	No	53.0×17.5×16.0
BP583F	90 to 110	9.3	135	65 to 72	86%	—	No	66.0×42.0×19.1
<b>New</b> BP585E	90 to 242	9.8	120	69 to 81	88%	○	No	34.5×70.0×25.8
<b>New</b> BP585F	90 to 242	20	300	55 to 65	87%	○	No	90.0×87.0×24.8
<b>New</b> BP586A-1	90 to 242	3.6 to 30.0	300	40 to 100	88%	○	No	224.0×69.0×49.0 Metal case
BP586A-2	90 to 242	7.2 to 42.0	600	40 to 70	89%	○	No	224.0×69.0×49.0 Metal case
BP586B	90 to 242	3.6 to 50.4	1050	12 to 48	90%	○	PWM	224.0×69.0×49.0 Metal case







*Modules*

# Wireless Modules

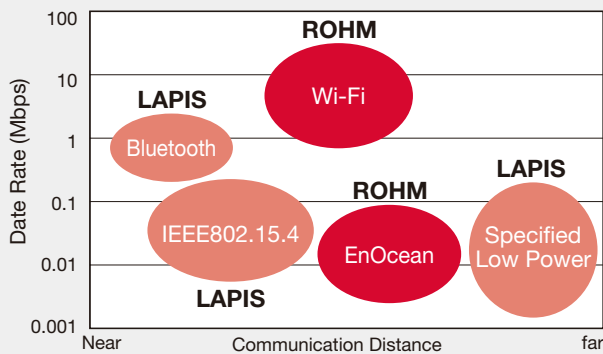
## CONTENTS

- ROHM Wireless Modules Technology ..... P. F8
- Specified Low Power Radio Modules ..... P. F8
- Wireless LAN Modules ..... P. F9
- Wireless Communication Modules ..... P. F10
  - Bluetooth® Low Energy (LAPIS Semiconductor products) ..... P. F10
  - IEEE802.15.4 / ZigBee® (LAPIS Semiconductor products) ..... P. F10
- EnOcean® Communication Modules ..... P. F10

# ROHM Wireless Modules Technology

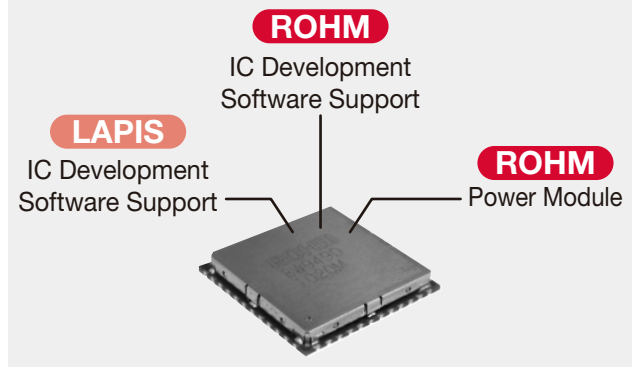
## Short-Range Wireless Communication

The correspondence of various wireless specifications



•ROHM group is developing Near-Field Wireless Communication devices in a *broad* range of fields.

## Comprehensive support



•In-house ICs are integrated into our modules, making it possible to provide comprehensive support.

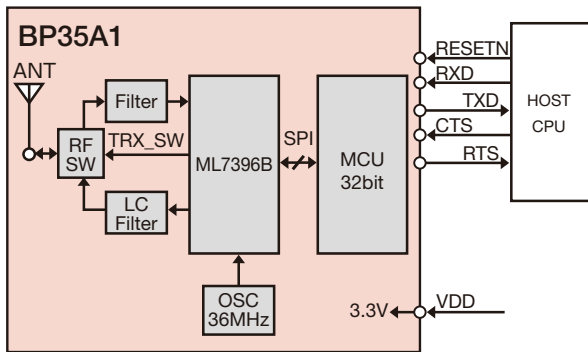
# Specified Low Power Radio Modules

## Wi-SUN

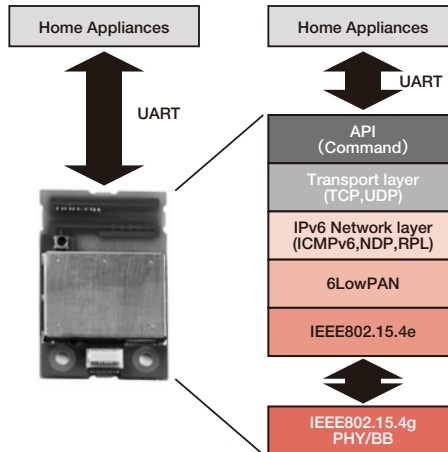
- 920MHz specified low-power wireless module
- Industry-leading receiver sensitivity
- Built-in antenna eliminates the need for high-frequency designs
- Transmitting power pre-adjusted
- MAC address included
- Japan Radio Law certified
- Incorporates HEMS-optimized firmware



## Block diagram



## Protocol Stack



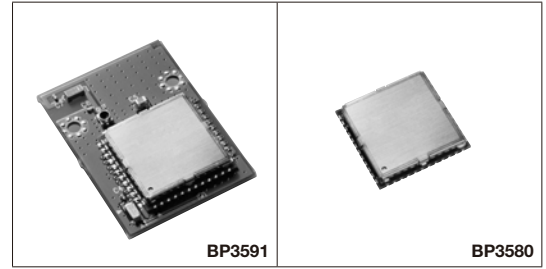
## Specified Low Power Radio Modules

Part No.	Supply Voltage (V)	Operating Temperature (°C)	Host/IF	Terminal standards	Onboard System IC	Dimensions (mm)	Package
<b>New</b> BP35A1	2.7 to 3.6V (Single power)	-20 to +80	UART	ARIB STD-T108 standard	ML7396B (LAPIS Semiconductor Co., Ltd.)	22.0×33.5×4.0	Connector joint type 0.5mm pitch, 20pin

# Wireless LAN Modules

## Wi-Fi

- IEEE802.11b/g/n compliant Wireless LAN Module (BP3580 / BP3591/BP3599 / BP3595)
- ROHM ICs for Base Band / MAC IC
- Fully-Calibrated wireless characteristics at shipment.
- Auto start up mode by Flash memory.
- With built-in chip antenna. (BP3591 / BP3599)
- BP3591 and BP3599 are certificate with Japanese radio law and FCC.



## Wireless LAN module designed for embedded devices

Stable support (domestic) provided via in-house firmware

ROHM baseband IC specifications

Single 3.3V power supply drive

Surface mount type

Built-in antenna type

Radio Act certified

Wide operating temperature range -40°C to +85°C

Stable, long-term supply possible using 100% ROHM components, from the IC to the module

## Software Stack Comparison

### Aerial Device Driver Features

- ROHM original device drivers
- Multi-platform specifications
- Easy porting\* even with different host CPU and OS
- \*Proven OS : Windows® XP, Windows®CE 5.0, Linux 2.6, TOPPERS (ultron 4.0), T-kernel
- 3rd party porting support, test system

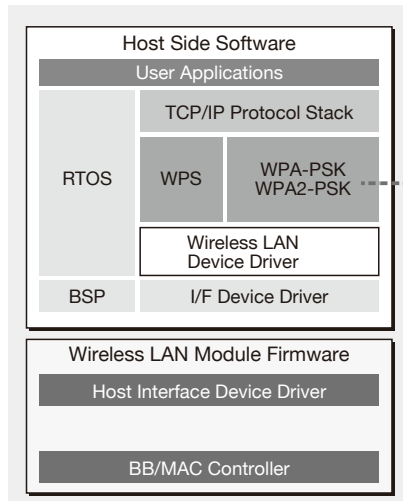
### Driver Sample Source

- Linux sample source provided free of charge
- Itron available for purchase (from 3rd party)

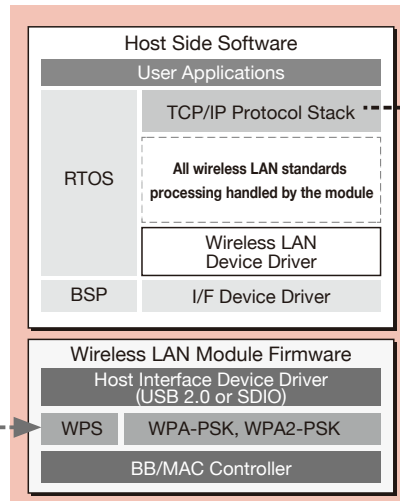
### All functions performed by the module

- Simple
- Device driver development not required (shorter development time/program-based control possible)
- Wireless LAN operation possible even in systems with underpowered CPUs
- Eliminates the need for driver development costs and TCP/IP purchase expenses

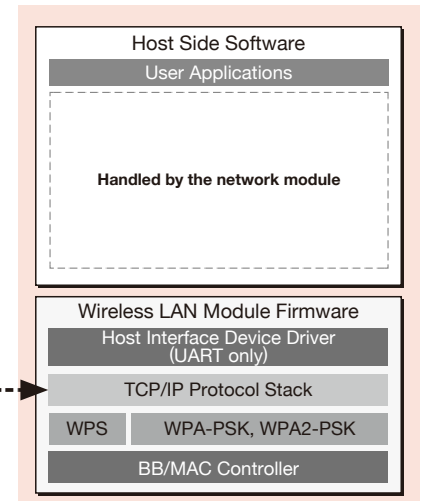
### Conventional Wireless LAN Module



### ROHM Wireless LAN Module



### Wireless LAN Module with Built-In TCP/IP Stack



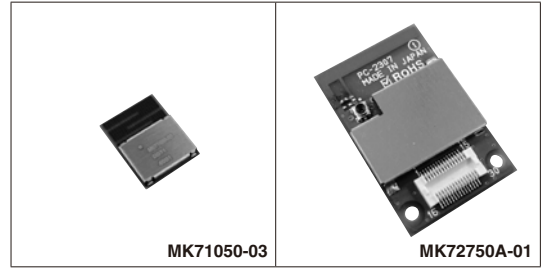
Wireless LAN Modules							
Part No.	Supply Voltage (V)	Operating Temperature (°C)	Host/IF	Terminal standards	Onboard System IC	Dimensions (mm)	Package*
BP3580	3.1 to 3.5 (Single power)	-40 to +85	USB/SDIO /UART	•IEEE802.11b/g/n(CH1 to CH13) •IEEE802.11i(security standard) •Available switching signal output for antenna A or antenna B. •Stored WPS and TCP/IP	BU1805GU	17.0×17.0×2.3	Surface mount type End face through hole 1.27mm pitch, 48pin
BP3591	3.1 to 3.5 (Single power)	-40 to +85	USB/SDIO /UART	•IEEE802.11b/g/n(CH1 to CH13) •IEEE802.11i(security standard) •Built-in chip-antenna •Stored WPS and TCP/IP	BU1805GU	24.0×33.1×4.7	Connector joint type 0.5mm pitch, 34pin
BP3599	3.1 to 3.5 (Single power)	-40 to +85	USB/SDIO /UART	•A flash memory is built in BP3591. •Firmware is written in a flash memory.	BU1805GU	24.0×33.1×4.7	Connector joint type 0.5mm pitch, 34pin
<b>New</b> BP3595	3.1 to 3.5 (Single power)	-40 to +85	USB/SDIO /UART	•IEEE802.11b/g/n (CH1 to CH13) •IEEE802.11i (security standard) •Built-in chip-antenna •Stored WPS, TCP/IP	BU1805GU	15.3×27.6×2.6	Connector joint type 0.4mm pitch, 30pin

\*: Original power module package used.

# Wireless Communication Modules

## Bluetooth® Low Energy

- Bluetooth Low Energy single mode module
- Compliant to Bluetooth Core Spec v4.0 (MK71050-03)
- Low power consumption and the best solution for the instruments using coin type/button battery  
TX : 9mA, RX : 9mA (MK71050-03)
- LAPIS Semiconductor's RF LSI mounted
- RF characteristic adjusted before shipment
- Built-in antenna and certified TELEC, FCC, CE (Under planning)



## IEEE802.15.4 / ZigBee®

- IEEE802.15.4 compliant wireless communication module
- ZigBee RF4CE compliant network protocol integrated (MK72750A-01)
- Easy to develop one-chip RF remote controller using built-in 8×8 keyscan circuit
- LAPIS Semiconductor's RF LSI mounted
- RF characteristic adjusted before shipment
- Built-in antenna and certified TELEC.

### Bluetooth® Low Energy Module (LAPIS Semiconductor products)

Part No.	Supply Voltage(V)	Operating Temperature (°C)	Host / IF	Terminal Standards	Dimension (mm)	Package	Frequency Band	Transmission Output	Reception Sensitivity	Note
☆MK71050-03	1.8 to 3.6	-20 to +70	Synchronous serial or UART	Bluetooth® Core Spec v4.0 (Single mode)	10.7×13.6×1.78	SMT	2.4GHz ISM Band	0/-6/-12/-18dBm	-86dBm	Certified Bluetooth® Products, TELEC, FCC, CE

\*Bluetooth® is a registered trademark of Bluetooth® SIG.

☆ : Under development

### IEEE802.15.4 / ZigBee® Modules (LAPIS Semiconductor products)

Part No.	Supply Voltage(V)	Operating Temperature (°C)	Host / IF	Terminal Standards	Dimension (mm)	Package	Frequency Band	Transmission Output	Reception Sensitivity	Note
MK72220-01	2.7 to 3.6	-20 to +60	UART	IEEE802.15.4	21.5×32.8×2.1	Connector	2.4GHz ISM Band	0dBm	-92dBm *1	Built-in LAPIS Semiconductor's original network
MK72660-01	2.1 to 3.6	-20 to +70	Synchronous serial	IEEE802.15.4	30.0×32.0×3.1	Connector		0dBm	-92dBm *1	—
MK72750A-01	1.8 to 3.6	-40 to +85	UART	IEEE802.15.4 ZigBee®RF4CE	20.0×31.0×2.7	Connector		0/-35/-45dBm	-92dBm *1	Built-in ZigBee®RF4CE network

\*1: PER(Packet Error Rate)&lt;1% \*ZigBee® is a registered trademark of ZigBee®Alliance.

# EnOcean® Communication Modules

EnOcean products are based on energy harvesting battery-less / wireless telecommunication technology. ROHM has become a promoter of EnOcean alliance which promote next generation radio telecommunication standard since 2012, and we contribute to the expansion of EnOcean communication method.

\*EnOcean® is a registered trademark of EnOcean GmbH.

## Feature (BP35A3)

- EnOcean Wireless Standard(ISO/IEC14543-3-10)
- Built-in antenna eliminates the need for high-frequency designs
- Japan Radio Law certification proceeding
- Selectable either sensor node mode[TX] and Gateway mode[TX/RX]
- Both modes also implement the sleep function

\*BP35A3 is an original product of ROHM which modularized an IC supplied from EnOcean® in ROHM.

\*This product (928MHz frequency band) is permitted as "specified low-power radio station" in Japanese Radio law.


**BP35A3**

### EnOcean communication modules/devices

Frequency band	Use target area	Products									
928MHz	Japan	<b>New</b> ECO 200	<b>New</b> PTM 430J	<b>New</b> PTM 210J	<b>New</b> STM 400J	<b>New</b> TCM 410J	<b>New</b> STM 429J	<b>New</b> STM 431J	<b>New</b> USB 400J	<b>New</b> EDK 400J	☆BP35A3
868MHz	Europe-China	<b>New</b> ECO 200	<b>New</b> PTM 330	<b>New</b> PTM 210	<b>New</b> STM 300	<b>New</b> TCM 300	<b>New</b> STM 320	<b>New</b> STM 330	<b>New</b> USB 300	<b>New</b> EDK 350	—

☆ : Under development

- Please choose your region products by frequency band
- Please contact a ROHM sales representative for purchase and inquiry
- Please refer to our EnOcean introduction page (<http://www.rohm.com/web/global/enocan>) for detail



*Modules*

# Contact Image Sensor Heads

## CONTENTS

- ROHM has unique expertise in key fields ..... P. F12
- 8inch CIS ..... P. F12

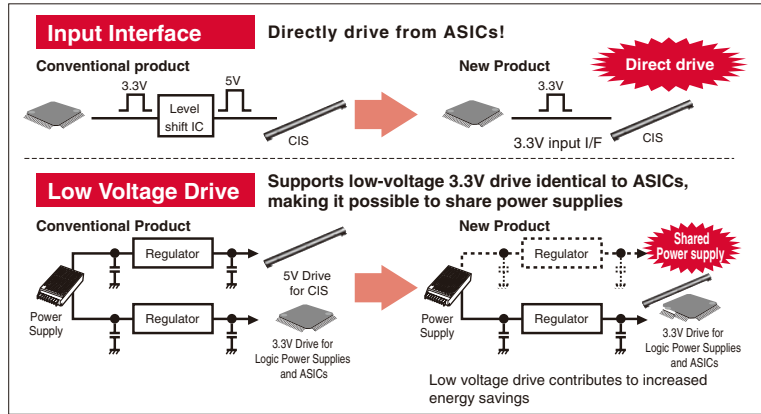
## ROHM has unique expertise in key fields

High performance in a lightweight and compact package places these leading-edge products in great demand for a broad range of applications.

### Distinctive feature

#### 1 The low 3.3 voltage supply contributes to simple end-product design.

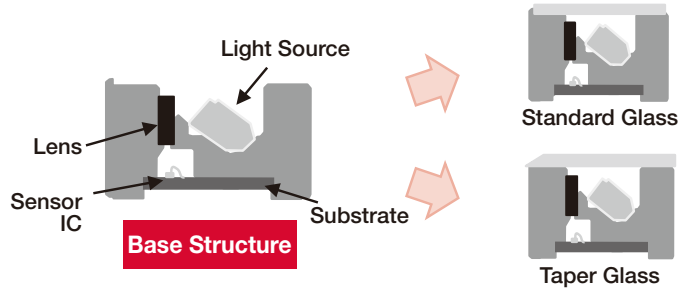
Contact Image Sensor Heads (CIS) is equipped with a 3.3 volt input interface, the sensor is directly driven by an ASIC. The low 3.3 voltage supply helps conserve power and contributes to simple end-product design.



### Distinctive feature

#### 2 The Basic CIS by which the add-on can respond to various sets.

The Basic CIS by which the add-on can shorten the development period of a product sharply while being able to satisfy broad demand. A taper glass and tempered glass can respond as an option.



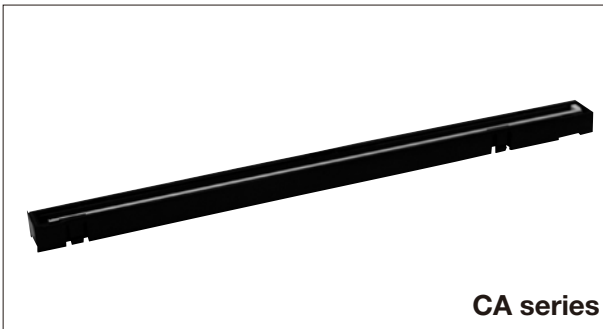
Add-on structure which unified the core design which determines an optical system

Also in a sudden specification change, ROHM's CIS is the same outside dimension. it is easy to replace.

ROHM's CIS is carrying out the lineup of the series by reading width, resolution, and an output channel. Since it is designing by the common frame, about the specification change with the same outside dimension, a mechanism re-design is unnecessary.

Size	Resolution		
	200dpi	300dpi	600dpi
8 inch			

## 8inch CIS



### Features

ROHM's flatbed-type Contact Image sensor have to chose three resolution-600dpi, 300dpi and 200dpi and two output-1ch and 3ch.

8inch CIS										
Part No.	Resolutions (dpi)	Effective Scanning Width (mm)	Total Pixels (pixels)	Pixel Clock (MHz)	Scanning Speed (ms/Line)	Dynamic Range Max. (V)	Logic Voltage (V)	Light Source* Input Voltage (V)	Light Source Type	Output Type
LSH2008-CA10A	200	216	1,724	8	0.25 × 3	0.5	3.3	7	RGB	1ch
LSH3008-CA10A	300	216	2,592	8	0.35 × 3	0.5	3.3	7	RGB	1ch
LSH6008-CA10A	600	216	5,184	8	0.7 × 3	0.5	3.3	7	RGB	1ch
LSH3008-CA50A	300	216	2,592	8	0.14 × 3	0.5	3.3	7	RGB	3ch
LSH6008-CA50A	600	216	5,184	8	0.28 × 3	0.5	3.3	7	RGB	3ch

\* : Current control resistor must be mounted in set.

● We can also develop a CIS per customized specifications. Please contact a ROHM sales representative for further details.





*Modules*

# Thermal Printheads

## CONTENTS

- ROHM has unique expertise in key fields ..... P. F14
- Thermal Printheads Selection Guide ..... P. F15
- For Facsimiles : A series ..... P. F16
- For Mobile Printers : B series ..... P. F16
- For Gaming Equipment, ATMs : CF, CG series ..... P. F17
- For POS Terminals : DF, DG series ..... P. F18
- For Ticket or Scale Printers : DC92, DC72 series ..... P. F19
- For Distribution or Food Labels : DC series ..... P. F20
- For Packaging High-speed Printers : AH series ..... P. F20

## ROHM has unique expertise in key fields

Leading-edge solutions based on advanced technologies: semiconductors, thick-film screen printing, and thin-film layer formation.

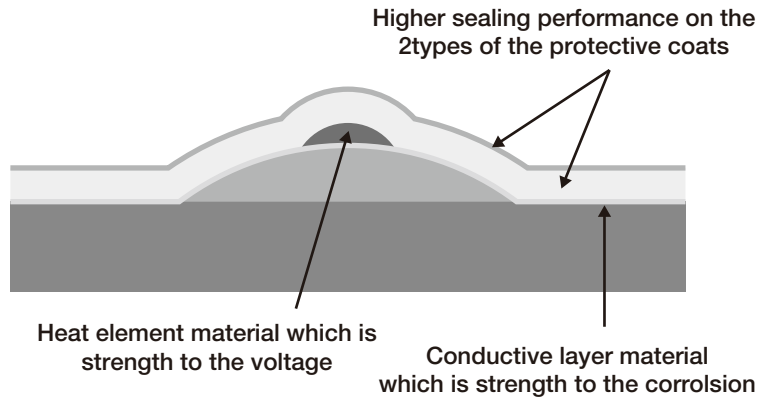
**Distinctive feature**

### 1 Reliable technology of the thick film

- To adapt the heat element material which is strength to the voltage.
- To adapt the conductive layer material which is strength to the corrosion.
- Higher sealing performance on the coating. The reliability has been improved by adapting above three technologies.

**Ultra High Reliability**

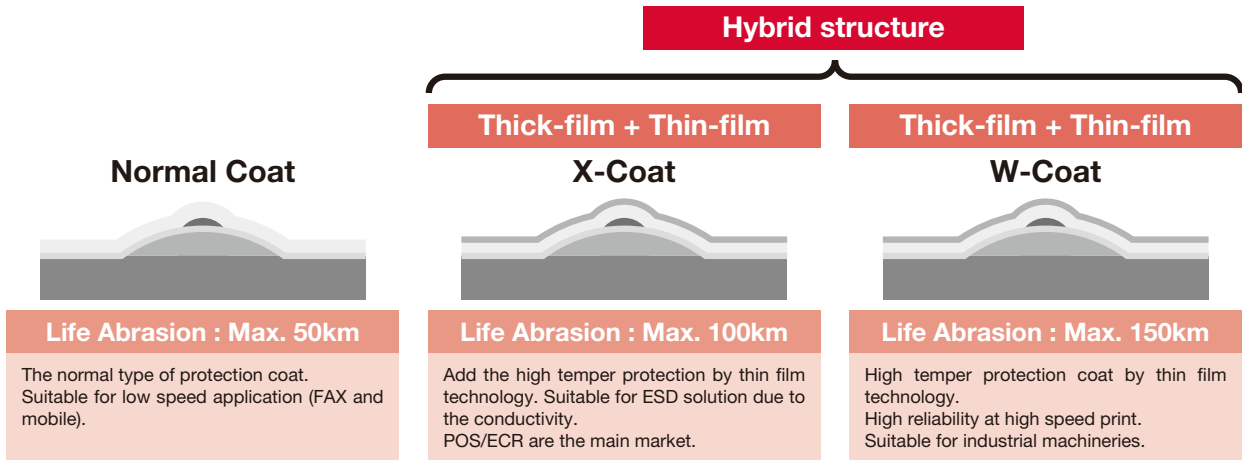
An image of the cutting edge of the heat element



The high reliability is guaranteed by the 2 types of anti-corrosion protective coats.

**Distinctive feature**

### 2 The technology of TPH protection coat



The protection film technology which ROHM has is suitable for POS and desktop printer.

**Distinctive feature**

### 3 High-speed, high quality thin-film technology.

ROHM original thin-film technology improves print density, making it possible to maintain quality even at high speeds.

**Conventional**

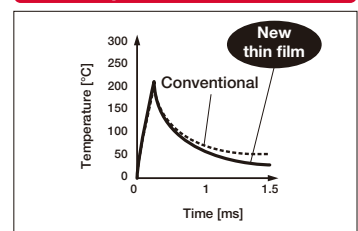


**ROHM New thin film**



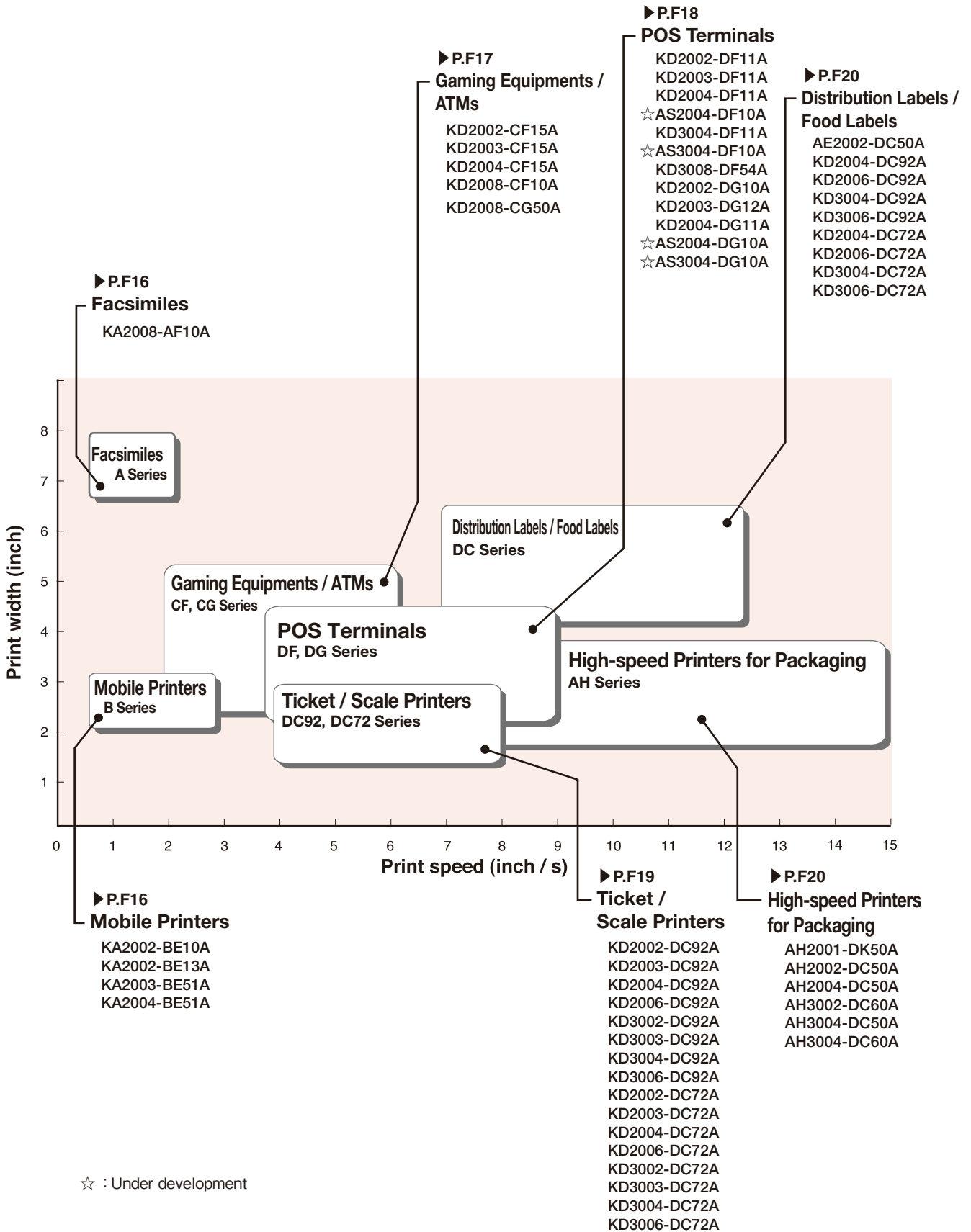
ROHM's new thin film provides superior image quality at high speeds compared with competitor products.

**Heat response of heat element**



The peak temperature is higher and cooling response quicker compared with conventional models, providing fast, sharp printing.

# Thermal Printheads Selection Guide



## For Facsimiles : A series


**A series**

### ■ Features

ROHM's thermal printheads for A4 facsimiles employ cutting-edge LSI mounting technology, contributing to a reduction in the size and weight of printers. It enjoys wide use due to their high productivity, basic structure and reliable performance.

### ■ Applications

Facsimiles of all types, from personal to business. Also ideal for ECGs and other medical imaging equipment due to particle-free printing.

#### For Facsimiles : A series

Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [ $\times 1$ million] (pulses)
KA2008-AF10A	203	3.13 to 5.25	216	1728	3000	20.0	6.25 to 12.5	24	Yes	30	30

## For Mobile Printers : B series


**B series**

### ■ Features

Leading-edge LSI mounting technology contributes to more compact, lightweight printers. A 2.7V circuit supply voltage makes operation possible on a single li-ion cell. This series implement world-class energy-saving measures and most suitable for mobile printers.

### ■ Applications

Ideal for mobile printers, with low voltage and current capacity limitations, and EFT-POS terminals or compact label printers, where small size and low energy consumption are important requirements.

#### For Mobile Printers : B series

Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [ $\times 1$ million] (pulses)
KA2002-BE10A	203	2.70 to 5.25	48	384	176	8.0	25 to 100	3.13 to 8.5	No	50	100
KA2002-BE13A	203	2.70 to 5.25	48	384	176	14.0	25 to 100	3.13 to 8.5	No	50	100
KA2003-BE51A	203	2.70 to 5.25	72	576	176	14.0	25 to 100	3.13 to 8.5	No	50	100
KA2004-BE51A	203	2.70 to 5.25	104	832	176	14.0	25 to 100	3.13 to 8.5	No	50	100

## For Gaming Equipment, ATMs : CF, CG series



CF series

### ■ Features

Adopting the most suitable structures of the heat elements such as CF series for 100mm/s high speed printing, CG series for 150mm/s make the high quality printings and energy-savings possible. Plus, those thermal print heads are able to cover various controls by adopting the high-frequency clock.

### ■ Applications

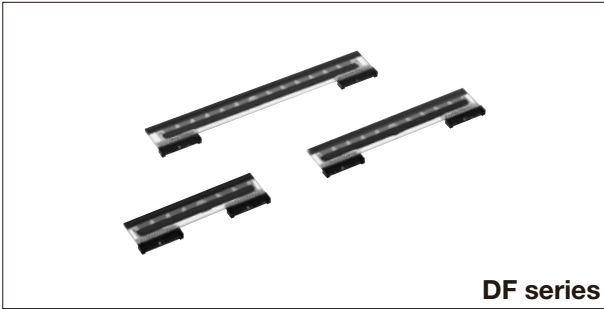
High versatility makes these products ideal for POS terminals, ATMs slot machines, lottery printers, and the like.



CG series

CF series											
Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [×1 million] (pulses)
KD2002-CF15A	203	3.13 to 5.25	54	432	800	14.0	50 to 150	24	Yes	50	50
KD2003-CF15A	203	3.13 to 5.25	72	576	800	14.0	50 to 150	24	Yes	50	50
KD2004-CF15A	203	3.13 to 5.25	108	864	800	14.0	50 to 150	24	Yes	50	50
KD2008-CF10A	203	3.13 to 5.25	216	1,728	1,000	20.0	50 to 100	24	Yes	50	50
CG series											
KD2008-CG50A	203	4.75 to 5.25	216	1,727	800	20.0	50 to 150	24	Yes	50	50

## For POS Terminals : DF, DG series


**DF series**

**DG series**

### ■ Features

The original heat element structure enables dark printing from the get go with minimal smearing at the end for optimum print quality, even at high 50-250mm/s printing speeds.

### ■ Applications

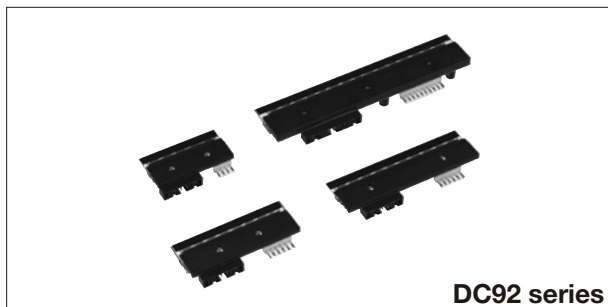
Ideal for POS and ECR printers that support high-speed printing (6-10ips) and compact label printers using thick labels.

DF series											
Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [ $\times 1$ million] (pulses)
KD2002-DF11A	203	4.75 to 5.25	56	448	650	20.0	100 to 250	24	Yes	150	100
KD2003-DF11A	203	4.75 to 5.25	80	640	650	20.0	100 to 250	24	Yes	150	100
KD2004-DF11A	203	4.75 to 5.25	104	832	650	20.0	100 to 250	24	Yes	150	100
☆AS2004-DF10A	203	4.75 to 5.25	104	832	650	20.0	100 to 250	24	Yes	150	100
KD3004-DF11A	203	4.75 to 5.25	108.4	1,280	1,000	18.0	100 to 200	24	Yes	100	100
☆AS3004-DF10A	300	4.75 to 5.25	108.4	1,280	1,000	18.0	100 to 200	24	Yes	100	100
KD3008-DF54A	300	4.75 to 5.25	216.8	2,560	660	25.0	50 to 100	24	Yes	150	100
DG series											
KD2002-DG10A	203	4.75 to 5.25	56	448	650	20.0	100 to 250	24	Yes	50	50
KD2003-DG12A	203	4.75 to 5.25	80	640	650	20.0	100 to 250	24	Yes	150	100
KD2004-DG11A	203	4.75 to 5.25	104	832	650	20.0	100 to 250	24	Yes	50	50
☆AS2004-DG10A	203	4.75 to 5.25	104	832	650	20.0	100 to 250	24	Yes	150	100
☆AS3004-DG10A	300	4.75 to 5.25	108.4	1,280	1,000	18.0	100 to 200	24	Yes	100	100

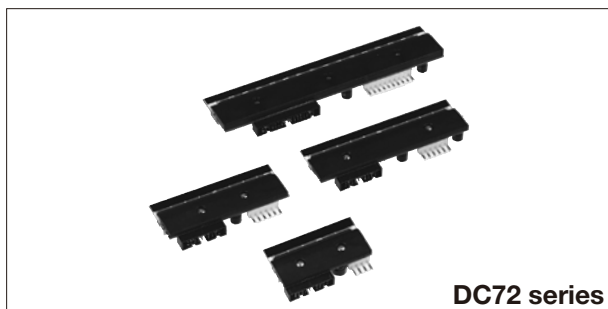
☆ : Under development

● We can also develop a thermal printhead per customized specifications. Please contact a ROHM sales representative for further details.

## For Ticket or Scale Printers : DC92, DC72 series



DC92 series



DC72 series

### ■ Features

ROHM's high-current thermal printheads, featuring a heat element structure compatible with high-speed printing along with a durable protective film, enable high-speed printing with superior energy savings, providing superior reliability in industrial equipment.

### ■ Applications

Ideal for applications used in the outdoor or requiring continuous printing, such as ticket machines, tag/food scales, or parking ticket machines. The heat history controls are equipped with DC72 which is ROHM's original and covers high speed printings of 12ips.

#### DC92 series

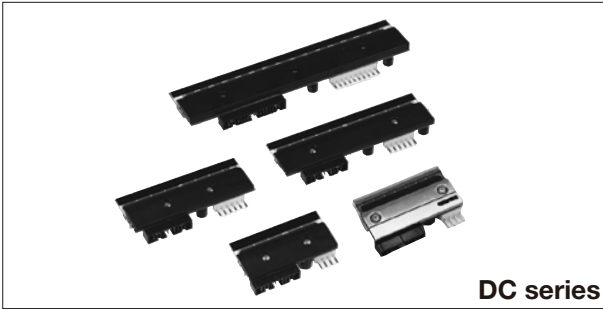
Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance ( $\Omega$ )	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [ $\times 1$ million] (pulses)
KD2002-DC92A	203	4.75 to 5.25	56	448	550	20.0	100 to 250	24	Yes	150	100
KD2003-DC92A	203	4.75 to 5.25	80	640	550	20.0	100 to 250	24	Yes	150	100
KD2004-DC92A	203	4.75 to 5.25	104	832	550	20.0	100 to 250	24	Yes	150	100
KD2006-DC92A	203	4.75 to 5.25	168	1,344	650	20.0	100 to 250	24	Yes	150	100
KD3002-DC92A	300	4.75 to 5.25	54.2	640	1,250	20.0	100 to 250	24	Yes	150	100
KD3003-DC92A	300	4.75 to 5.25	81.3	960	1,250	20.0	100 to 250	24	Yes	150	100
KD3004-DC92A	300	4.75 to 5.25	108.4	1,280	1,250	20.0	100 to 250	24	Yes	150	100
KD3006-DC92A	300	4.75 to 5.25	162.6	1,920	1,250	20.0	100 to 250	24	Yes	150	100

#### DC72 series

KD2002-DC72A	203	4.75 to 5.25	56	448	550	20.0	100 to 300	24	Yes	150	100
KD2003-DC72A	203	4.75 to 5.25	80	640	550	20.0	100 to 300	24	Yes	150	100
KD2004-DC72A	203	4.75 to 5.25	104	832	550	20.0	100 to 300	24	Yes	150	100
KD2006-DC72A	203	4.75 to 5.25	168	1,344	650	20.0	100 to 300	24	Yes	150	100
KD3002-DC72A	300	4.75 to 5.25	54.2	640	1,250	20.0	100 to 250	24	Yes	150	100
KD3003-DC72A	300	4.75 to 5.25	81.3	960	1,250	20.0	100 to 250	24	Yes	150	100
KD3004-DC72A	300	4.75 to 5.25	108.4	1,280	1,250	20.0	100 to 250	24	Yes	150	100
KD3006-DC72A	300	4.75 to 5.25	162.6	1,920	1,250	20.0	100 to 250	24	Yes	150	100



## For Distribution or Food Labels : DC series



DC series

### ■ Features

These thermal printheads are optimized for top-class bar code printers for the industrial equipment sector. In addition, a new structure utilizing thin-film technology enables high-speed, high-quality printing.

### ■ Applications

Ideal for bar-code printers or label printers at factory assembly lines or distribution centers where 24-hour operation or continuous printing are required.

### For Distribution or Food Labels : DC series

Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [×1 million] (pulses)
AE2002-DC50A	203	4.75 to 5.25	56	448	550	20.0	150	24	Yes	50	100
KD2004-DC92A	203	4.75 to 5.25	104	832	550	20.0	100 to 250	24	Yes	150	100
KD2006-DC92A	203	4.75 to 5.25	168	1,344	650	20.0	100 to 250	24	Yes	150	100
KD3004-DC92A	300	4.75 to 5.25	108.4	1,280	1,250	20.0	100 to 250	24	Yes	150	100
KD3006-DC92A	300	4.75 to 5.25	162.6	1,920	1,250	20.0	100 to 250	24	Yes	150	100
KD2004-DC72A	203	4.75 to 5.25	104	832	550	20.0	100 to 300	24	Yes	150	100
KD2006-DC72A	203	4.75 to 5.25	168	1,344	650	20.0	100 to 300	24	Yes	150	100
KD3004-DC72A	300	4.75 to 5.25	108.4	1,280	1,250	20.0	100 to 250	24	Yes	150	100
KD3006-DC72A	300	4.75 to 5.25	162.6	1,920	1,250	20.0	100 to 250	24	Yes	150	100

## For Packaging High-speed Printers : AH series



AH series

### ■ Features

These thermal heads feature a near-edge structure based on the high-speed, high-quality, reliable step-free SE, SF series, enabling straight path for hard media or high speed printing.

### ■ Applications

Ideal for packaging printers requiring high reliability.

### For Packaging High-speed Printers : AH series

Part No.	Resolutions (dpi)	Logic Voltage (V)	Print Width (mm)	Number of dot (dots)	Resistance Tolerance (Ω)	Platen Diameter Max. (mm)	Print Speed (mm/s)	Supply Voltage (V)	Heat Sink	Abrasion Life (km)	Pulse Life [×1 million] (pulses)
AH2001-DK50A	203	4.75 to 5.25	40	320	850	∞	62.5	12	Yes	50	100
AH2002-DC50A	203	4.75 to 5.25	56	448	850	∞	83.3	24	Yes	50	100
AH2004-DC50A	203	4.75 to 5.25	112	869	850	∞	83.3	24	Yes	50	100
AH3002-DC60A	300	4.75 to 5.25	54.2	640	1,250	∞	200	24	Yes	50	100
AH3004-DC50A	300	4.75 to 5.25	108.4	1,280	1,250	∞	56.5	24	Yes	50	100
AH3004-DC60A	300	4.75 to 5.25	108.4	1,280	1,250	∞	200	24	Yes	50	100

● We can also develop a thermal printhead per customized specifications. Please contact a ROHM sales representative for further details.



# Part No. List

# Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
1SR154-400	C34	2SC3906K	C17	2SD2696	C16	BA3472R	A14	BCX71H	C16
1SR154-600	C34	2SC4061K	C17	2SD2700	C17	BA3472W	A14, A139	BD00C0AW	A37, A38, A125
1SR156-400	C34	2SC4081	C17	2SD2701	C17	BA3472Y	A14, A139	BD00D0AW	A36
1SS355VM	C40	2SC4081UB	C17	2SD2702	C17	BA3474	A14	BD00FC0W	A37
1SS356	C41	2SC4082	C17	2SD2703	C17	BA3474R	A14	BD00GA3M	A41, A125
1SS380	C40	2SC4083	C17	2SD2704K	C17	BA3474W	A14, A139	BD00GA3W	A40
1SS390	C41	2SC4097	C17	2SD2707	C16	BA3474Y	A14, A139	BD00GA5M	A40, A125
1SS400CS	C40	2SC4098	C17	AE2002-DC50A	F20	BA3662	A38	BD00GA5W	A40
1SS400G	C40	2SC4102	C17	AH2001-DK50A	F20	BA3834	A101	BD00GC0M	A39, A125
1SS400SM	C40	2SC4617	C16	AH2002-DC50A	F20	BA3835	A101	BD00GC0W	A39
2SA1036K	C17	2SC4617EB	C16	AH2004-DC50A	F20	BA4510	A17	BD00HA3M	A43, A126
2SA1037AK	C17	2SC4618	C16	AH3002-DC60A	F20	BA4558	A17	BD00HA3W	A43
2SA1514K	C17	2SC4713K	C17	AH3004-DC50A	F20	BA4558R	A17	BD00HA5M	A42, A126
2SA1576A	C17	2SC4725	C16	AH3004-DC60A	F20	BA4558Y	A17, A139	BD00HA5W	A42
2SA1576UB	C17	2SC4726	C16	AS2004-DF10A	F18	BA4560	A17	BD00HC0M	A42, A126
2SA1577	C17	2SC4774	C17	AS2004-DG10A	F18	BA4560R	A17	BD00HC0W	A42
2SA1579	C17	2SC5585	C16	AS3004-DF10A	F18	BA4560Y	A17, A139	BD00HC5M	A41, A126
2SA1774	C16	2SC5658	C16	AS3004-DG10A	F18	BA4564R	A17	BD00HC5W	A41
2SA1774EB	C16	2SC5659	C16	BA00BC0W	A39	BA4564W	A18	BD00IA5M	A44, A127
2SA2018	C16	2SC5661	C16	BA00CC0W	A37	BA4580R	A17	BD00IA5W	A44
2SA2029	C16	2SC5662	C16	BA00DD0W	A36	BA4580Y	A17, A139	BD00IC0M	A43, A126
2SA2030	C16	2SC5663	C16	BA00JC5W	A38	BA4584	A17	BD00IC0W	A43
2SA2071	C18	2SC5824	C18	BA033CC0W	A37	BA4584R	A17	BD00KA5W	A44
2SA2071P5	C18	2SC5866	C17	BA03CC0	A37	BA4584Y	A17, A139	BD1020	A89
2SA2088	C17	2SC5876	C17	BA03CC0W	A37	BA50BC0	A38	BD10IA5M	A44, A127
2SA2094	C17	2SCR293P	C18	BA05CC0	A37	BA50BC0W	A39	BD10IA5W	A44
2SA2119K	C17	2SCR293P5	C18	BA05CC0W	A37	BA50DD0	A36	BD10IC0M	A43, A126
2SAR293P	C18	2SCR341Q	C17	BA06CC0	A37	BA50DD0W	A36	BD10IC0W	A43
2SAR293P5	C18	2SCR346P	C18	BA06CC0W	A37	BA50JC5	A38	BD10KA5	A44
2SAR340P	C18	2SCR372P	C18	BA07CC0	A37	BA5406	A97	BD10KA5W	A44
2SAR340Q	C17	2SCR375P	C18	BA07CC0W	A37	BA5417	A97	BD11600	A25
2SAR502EB	C16	2SCR502EB	C16	BA08CC0	A37	BA5814	A74	BD11601	A25
2SAR502UB	C17	2SCR502UB	C17	BA08CC0W	A37	BA5961	A74	BD11603	A25
2SAR512P	C18	2SCR512P	C18	BA09CC0	A37	BA5962	A74	BD12730	A15
2SAR512R	C17	2SCR512R	C17	BA09CC0W	A37	BA60BC0	A38	BD12732	A15
2SAR513P	C18	2SCR513P	C18	BA10324A	A12	BA60BC0W	A39	BD12734	A15
2SAR513R	C17	2SCR513R	C17	BA10339	A18	BA60JC5	A38	BD12IA5M	A44, A127
2SAR514P	C18	2SCR514P	C18	BA10358	A12	BA6219B	A68	BD12IA5W	A44
2SAR514R	C17	2SCR514R	C17	BA10393	A18	BA6222	A68	BD12IC0M	A43, A126
2SAR522EB	C16	2SCR522EB	C16	BA1117FP	A35	BA6238A	A69	BD12IC0W	A43
2SAR522M	C16	2SCR522M	C16	BA12003B	A20	BA6247	A69	BD12KA5	A44
2SAR522UB	C17	2SCR522UB	C17	BA12004B	A20	BA6285	A68	BD12KA5W	A44
2SAR523EB	C16	2SCR523EB	C16	BA14741	A17	BA6285A	A68	BD1321	A16
2SAR523M	C16	2SCR523M	C16	BA15218	A17	BA6287	A68	BD1482	A52
2SAR523UB	C17	2SCR523UB	C17	BA15532	A17	BA63JC5	A38	BD1484	A52
2SAR533P	C18	2SCR533P	C18	BA15BC0	A38	BA6406	A73	BD15GA3M	A41, A125
2SAR542F3	C18	2SCR542F3	C18	BA15BC0W	A39	BA6423A	A72	BD15GA3W	A40
2SAR542P	C18	2SCR542P	C18	BA15DD0	A36	BA6424A	A72	BD15GA5M	A40, A125
2SAR543R	C17	2SCR543R	C17	BA15DD0W	A36	BA6506	A73	BD15GA5W	A40
2SAR544P	C18	2SCR544P	C18	BA15JC5	A38	BA6664	A71, A74	BD15GC0M	A39, A125
2SAR544R	C17	2SCR544R	C17	BA18BC0	A38	BA6859A	A71, A74	BD15GC0W	A39
2SAR552P	C18	2SCR552P	C18	BA18BC0W	A39	BA6901	A73	BD15HA3M	A43, A126
2SAR553P	C18	2SCR553P	C18	BA18DD0	A36	BA6920	A68	BD15HA3W	A43
2SAR553P5	C18	2SCR553P5	C18	BA18DD0W	A36	BA6950	A68	BD15HA5M	A42, A126
2SAR553R	C17	2SCR553R	C17	BA18JC5	A38	BA6951	A68	BD15HA5W	A42
2SAR554P	C18	2SCR554P	C18	BA2107	A17	BA6956A	A68	BD15HC0M	A42, A126
2SAR554R	C17	2SCR554R	C17	BA2115	A17	BA70BC0	A38	BD15HC0W	A42
2SAR562F3	C18	2SCR562F3	C18	BA25BC0	A38	BA70BC0W	A39	BD15HC5M	A41, A126
2SAR572D	C18	2SCR572D	C18	BA25BC0W	A39	BA78Mxx	A35	BD15HC5W	A41
2SAR573D	C18	2SCR573D	C18	BA25DD0	A36	BA78xx	A35	BD15IA5M	A44, A127
2SAR574D	C18	2SCR574D	C18	BA25JC5	A38	BA80BC0	A38	BD15IA5W	A44
2SB1181	C18	2SD1383K	C17	BA2901	A18	BA80BC0W	A39	BD15IC0M	A43, A126
2SB1197K	C17	2SD1484K	C17	BA2901S	A18	BA80JC5	A38	BD15IC0W	A43
2SB1198K	C17	2SD1733	C18	BA2901Y	A18, A140	BA8391	A18	BD15KA5	A44
2SB1260	C18	2SD1757K	C17	BA2902	A12	BA8522R	A18	BD15KA5W	A44
2SB1275	C18	2SD1781K	C17	BA2902S	A12	BA90BC0	A38	BD1603	A53
2SB1316	C18	2SD1782K	C17	BA2902Y	A13, A139	BA90BC0W	A39	BD1604	A81
2SB1427	C18	2SD1834	C18	BA2903	A18	BA90DD0	A36	BD16805	A71, A131
2SB1561	C18	2SD1898	C18	BA2903S	A18	BA90DD0W	A36	BD1754	A81
2SB1590K	C17	2SD1918	C18	BA2903W	A19	BA90JC5	A38	BD18377	A81, A130
2SB1644J	C18	2SD1949	C17	BA2903Y	A18, A140	BA9741	A53	BD18GA3M	A41, A125
2SB1689	C17	2SD1980	C18	BA2904	A12	BA9743A	A53	BD18GA3W	A40
2SB1690	C17	2SD2114K	C17	BA2904S	A12	BA9744	A53	BD18GA5M	A40, A125
2SB1690K	C17	2SD2142K	C17	BA2904W	A18	BAJ0BC0	A38	BD18GA5W	A40
2SB1694	C17	2SD2143	C18	BA2904Y	A13, A139	BAJ0BC0W	A39	BD18GC0M	A39, A125
2SB1695	C17	2SD2153	C18	BA30BC0	A38	BAJ0CC0	A37	BD18GC0W	A39
2SB1695K	C17	2SD2226K	C17	BA30BC0W	A39	BAJ0CC0W	A37	BD18HA3M	A43, A126
2SB1697	C18	2SD2351	C17	BA30DD0	A36	BAJ2CC0	A37	BD18HA3W	A43
2SB1698	C18	2SD2391	C18	BA30DD0W	A36	BAJ2CC0W	A37	BD18HA5M	A42, A126
2SB1705	C17	2SD2444K	C17	BA30E00W	A49	BAJ2DD0	A36	BD18HA5W	A42
2SB1706	C17	2SD2537	C18	BA30JC5	A38	BAJ2DD0W	A36	BD18HC0M	A42, A126
2SB1707	C17	2SD2652	C17	BA3121	A98	BAJ5CC0	A37	BD18HC0W	A42
2SB1708	C17	2SD2653	C17	BA3123	A98	BAJ6DD0	A36	BD18HC5M	A41, A126
2SB1708Q5	C17	2SD2653K	C17	BA3131	A98	BAJ6DD0W	A36	BD18HC5W	A41
2SB1709	C17	2SD2654	C16	BA3258	A49	BAV70	C42	BD18IA5M	A44, A127
2SB1710	C17	2SD2656	C17	BA3259	A49	BAV99	C42	BD18IA5W	A44
2SB1730	C17	2SD2657	C17	BA3308	A98	BAW56	C42	BD18IC0M	A43, A126
2SB1731	C17	2SD2657K	C17	BA33BC0	A38	BC847B	C16	BD18IC0W	A43
2SB1732	C17	2SD2661	C18	BA33BC0W	A39	BC848B	C16	BD18KA5	A44
2SB1733	C17	2SD2662	C18	BA33D15	A49	BC848BW	C16	BD18KA5W	A44
2SB852K	C17	2SD2670	C17	BA33D18	A49	BC857B	C16	BD1CIC0W	A43
2SC2411K	C17	2SD2671	C17	BA33DD0	A36	BC858B	C16	BD2041A	A61
2SC2412K	C17	2SD2672	C17	BA33DD0W	A36	BC858BW	C16	BD2042A	A62
2SC2413K	C17	2SD2673	C17	BA33JC5	A38	BCX17	C16	BD2045A	A61
2SC3837K	C17	2SD2674	C17	BA3404	A12	BCX19	C16	BD2046A	A62
2SC3838K	C17	2SD2675	C17	BA3472	A14	BCX70J,K	C16	BD2051A	A61

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
BD2052A	A62	BD33GC0W	A39	BD3818	A99	BD6040	A63	BD6522	A62
BD2055A	A61	BD33HA3M	A43, A126	BD3841	A99	BD6041	A63	BD6524	A62
BD2056A	A62	BD33HA3W	A43	BD3843	A99	BD6042	A63	BD6528	A62
BD2061A	A61	BD33HA5M	A42, A126	BD3861	A100	BD6044	A63	BD6529	A62
BD2062	A62	BD33HA5W	A42	BD3869A	A99	BD6046	A63	BD6538	A60, A61
BD2065A	A61	BD33HC0M	A42, A126	BD3870	A99	BD6047A	A63	BD65491	A68, A76
BD2066	A62	BD33HC0W	A42	BD3871	A99	BD6049	A63	BD65492	A68, A76
BD2200	A62	BD33HC5M	A41, A126	BD3872	A99	BD6071	A80	BD65494	A68, A76
BD2201	A62	BD33HC5W	A41	BD3873	A99	BD6072	A80	BD65496	A68, A76
BD2202	A62	BD33IA5M	A44, A127	BD3881	A100	BD6079	A80	BD65499	A76
BD2204	A62	BD33IA5W	A44	BD3882	A100	BD60A00	A80	BD6562	A60
BD2206	A62	BD33IC0M	A43, A126	BD3883	A100	BD60A60	A80	BD6563	A60
BD2220	A60, A61	BD33IC0W	A43	BD3884	A99	BD60FC0W	A37	BD6583	A80
BD2221	A60, A61	BD33KA5	A44	BD3886	A99	BD60GA3M	A41, A125	BD6586	A80
BD2224	A60, A61	BD33KA5W	A44	BD3925	A48, A127	BD60GA3W	A40	BD65B60	A80
BD2225	A60, A61	BD3401	A101	BD41020	A31, A131	BD60GA5M	A40, A125	BD65D00	A80
BD2226	A60, A61	BD3402	A101	BD4153	A62	BD60GA5W	A40	BD6671	A71, A74
BD2227	A60, A61	BD3403	A100	BD4154	A62	BD60GC0M	A39, A125	BD6701	A73
BD2232	A60	BD3433	A100	BD4155	A62	BD60GC0W	A39	BD6721	A73
BD2233	A60	BD3452	A99	BD4157	A62	BD60HA3M	A43, A126	BD6722	A73
BD2240	A60	BD3460	A100	BD4233	A57	BD60HA3W	A43	BD6726	A73
BD2241	A60	BD3461	A100	BD4234	A57	BD60HA5M	A42, A126	BD6735	A76
BD2242	A60	BD3464	A100	BD4269	A48, A127	BD60HA5W	A42	BD6736	A76
BD2243	A60	BD3465	A100	BD4275	A48, A127	BD60HC0M	A42, A126	BD6753	A76
BD2244	A61, A130	BD34700	A98	BD433M2	A36, A124	BD60HC0W	A42	BD6758	A76
BD2245	A61, A130	BD34701	A98	BD433M2W	A36, A124	BD60HC5M	A41, A126	BD6761	A71, A75
BD2246	A60	BD3471	A98	BD433M5	A36, A124	BD60HC5W	A41	BD6762	A71, A75
BD2247	A60	BD3473	A98	BD433M5W	A36, A124	BD6142	A80	BD67776	A70
BD2248	A60	BD3474	A98	BD450M2	A36, A124	BD6164	A80	BD67929	A71, A75
BD2262	A61, A130	BD3490	A99	BD450M2W	A36, A124	BD62011	A74	BD6889	A76
BD2264	A61, A130	BD3491	A99	BD450M5	A36, A124	BD62012	A74	BD6933	A31, A131
BD2265	A61, A130	BD3504	A48	BD450M5W	A36, A124	BD62013	A74	BD6934	A31, A131
BD2266	A61, A130	BD3506	A48	BD45Exx1	A65, A140	BD62014	A74	BD6941	A68
BD2267	A61, A130	BD3507	A48	BD45Exx2	A65, A140	BD6210	A68	BD6961	A72
BD2268	A61, A130	BD3508	A48	BD45Exx5	A65, A140	BD6211	A68	BD6962	A72
BD2269	A61, A130	BD3509	A48	BD45xx1	A66	BD6212	A68	BD6964	A72
BD2270	A62	BD3512	A48	BD45xx2	A66	BD6220	A68	BD6965	A72
BD25GA3M	A41, A125	BD3521	A48	BD45xx5	A66	BD6221	A68	BD6966	A72
BD25GA3W	A40	BD35221	A48	BD46Exx1	A65, A140	BD62210	A68, A75	BD6967	A72
BD25GA5M	A40, A125	BD35222	A48	BD46Exx2	A65, A140	BD6222	A68	BD6968	A72
BD25GA5W	A40	BD3523	A48	BD46Exx5	A65, A140	BD62220	A68, A75	BD6971	A73
BD25GC0M	A39, A125	BD35230	A48	BD46xx1	A66	BD62222	A68	BD6973	A73
BD25GC0W	A39	BD35231	A48	BD46xx2	A66	BD6225	A68	BD6974	A73
BD25HA3M	A43, A126	BD35269	A48	BD46xx5	A66	BD6226	A68	BD6975	A73
BD25HA3W	A43	BD3531	A49	BD47xx	A65	BD6230	A68	BD6980	A72
BD25HA5M	A42, A126	BD3532	A49	BD48Exx	A64, A65, A140	BD6231	A68	BD6981	A72
BD25HA5W	A42	BD3533	A49	BD48Kxx	A64	BD6232	A68	BD6982	A72
BD25HC0M	A42, A126	BD3537	A49	BD48Lxx	A64	BD62321	A68	BD7003	A49
BD25HC0W	A42	BD3538	A49	BD48xx	A64	BD6236	A68	BD7004	A49
BD25HC5M	A41, A126	BD3539	A49	BD49Exx	A64, A65, A140	BD6237	A68	BD70511	A49
BD25HC5W	A41	BD35390	A49	BD49Kxx	A64	BD62491	A71, A75	BD70FC0W	A37
BD25IA5M	A44, A127	BD35395	A49, A127	BD49Lxx	A64	BD6290	A70	BD70GA3M	A41, A125
BD25IA5W	A44	BD3540	A48	BD49xx	A64	BD63000	A71	BD70GA3W	A40
BD25IC0M	A43, A126	BD3541	A48	BD50C0A	A37, A124	BD63005	A71	BD70GA5M	A40, A125
BD25IC0W	A43	BD3550	A48	BD50C0AW	A38, A125	BD63441A	A73	BD70GA5W	A40
BD25KA5	A44	BD3551	A48	BD50FC0W	A37	BD6346	A73	BD70GC0M	A39, A125
BD25KA5W	A44	BD3552	A48	BD50GA3M	A41, A125	BD63536	A53	BD70GC0W	A39
BD2606	A81	BD3570Y	A35, A124	BD50GA3W	A40	BD6360	A78	BD70HA3M	A43, A126
BD26IC0W	A43	BD3571Y	A35, A124	BD50GA5M	A40, A125	BD6369	A78	BD70HA3W	A43
BD27400	A96	BD3572Y	A35, A124	BD50GA5W	A40	BD6370	A76	BD70HA5M	A42, A126
BD2808	A81, A130	BD3573Y	A35, A124	BD50GC0M	A39, A125	BD63710A	A69	BD70HA5W	A42
BD28411	A97	BD3574Y	A35, A124	BD50GC0W	A39	BD63715A	A69, A75	BD70HC0M	A42, A126
BD28620	A97	BD3575Y	A35, A124	BD50HA3M	A43, A126	BD63720A	A69	BD70HC0W	A42
BD3010A	A48, A127	BD3650	A36, A124	BD50HA3W	A43	BD6373	A76	BD70HC5M	A41, A126
BD3020	A48, A127	BD37033	A100, A134	BD50HA5M	A42, A126	BD63730	A69	BD70HC5W	A41
BD3021	A48, A127	BD37034	A100, A134	BD50HA5W	A42	BD6376	A76	BD71801	A57
BD30FC0W	A37	BD37067	A100	BD50HC0M	A42, A126	BD6380	A70	BD71L4Lx	A65
BD30GA3M	A41, A125	BD37068	A100	BD50HC0W	A42	BD63801	A70, A75	BD7212	A57
BD30GA3W	A40	BD37503	A99	BD50HC5M	A41, A126	BD6381	A70	BD7213	A57
BD30GA5M	A40, A125	BD37511	A99	BD50HC5W	A41	BD6382	A70	BD7214	A57
BD30GA5W	A40	BD37512	A99	BD5291	A18	BD63821	A75	BD733L2	A36, A124
BD30GC0M	A39, A125	BD37513	A99	BD52Exx	A65, A140	BD63823	A75	BD733L5	A36, A124
BD30GC0W	A39	BD37514	A99	BD52xx	A65	BD6383	A69	BD7411	A88
BD30HA3M	A43, A126	BD37515	A99	BD53Exx	A65, A140	BD63843	A70	BD750L2	A36, A124
BD30HA3W	A43	BD37521	A99	BD53xx	A65	BD63847	A70	BD750L5	A36, A124
BD30HA5M	A42, A126	BD37522	A99	BD5413	A97	BD6385	A69	BD7541	A15
BD30HA5W	A42	BD37523	A99	BD5423	A97	BD63860	A70	BD7541S	A15
BD30HC0M	A42, A126	BD37524	A100	BD5423A	A97	BD6387	A69	BD7542	A15
BD30HC0W	A42	BD37531	A100	BD5424	A97	BD63872	A69	BD7542S	A15
BD30HC5M	A41, A126	BD37532	A100	BD5426	A97	BD63874	A69, A75	BD7561	A13
BD30HC5W	A41	BD37533	A100	BD5446	A97	BD63876	A69	BD7561S	A13
BD30IA5M	A44, A127	BD37534	A100	BD5451	A97	BD6389	A69	BD7562	A13
BD30IA5W	A44	BD37541	A100	BD5452A	A97	BD6393	A70	BD7562S	A13
BD30IC0M	A43, A126	BD37542	A100	BD5460	A96	BD63940	A70	BD7602	A49
BD30IC0W	A43	BD37543	A100	BD5461	A96	BD6395	A70	BD7671	A59
BD30KA5	A44	BD37544	A100	BD5465	A96	BD63960	A70	BD7672B	A59
BD30KA5W	A44	BD37545	A100	BD5466	A96	BD6422	A70	BD7673A	A59
BD33C0A	A37, A124	BD37A19	A66	BD5467	A96	BD6423	A70	BD7677	A59
BD33C0AW	A38, A125	BD37A41	A66	BD5468	A96	BD6425	A70	BD7678	A59
BD33FA1	A38	BD3811	A99	BD5471	A96	BD64532	A75	BD7681	A59
BD33FC0W	A37	BD3812	A98	BD54FA1	A38	BD64538	A75	BD7710	A80
BD33GA3M	A41, A125	BD3813	A99	BD555A1A	A80, A81	BD64550	A75	BD7755	A75
BD33GA3W	A40	BD3814	A98	BD555B	A81	BD6516	A62	BD7757	A80
BD33GA5M	A40, A125	BD3815	A99	BD5632	A96	BD6517	A62	BD7830	A96
BD33GA5W	A40	BD3816	A99	BD5634	A96	BD6519	A61	BD7836	A96
BD33GC0M	A39, A125	BD3817	A99	BD5638	A96	BD6520	A62	BD7851	A25



# Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
BD7931	A74	BD88420	A97	BD95601	A53	BH21M0AW	A45	BM1P0xx	A59
BD7959	A75	BD8876	A98	BD95602	A53	BH2219	A28	BM1P1xx	A59
BD80C0A	A37, A124	BD8878	A98	BD95820	A60	BH2220	A28	BM1Q00x	A59
BD80C0AW	A38, A125	BD8960	A51	BD95821	A52	BH2221	A28	BM28720	A96
BD80FC0W	A37	BD8961	A51	BD95830	A53	BH2223	A28	BM2P074K	A59
BD80GA3M	A41, A125	BD8962	A51	BD95831	A52	BH2226	A28	BM2P0xx	A59
BD80GA3W	A40	BD8963	A51	BD95835	A52	BH2227	A28	BM5446	A96
BD80GA5M	A40, A125	BD89630	A51	BD95841	A52	BH2228	A28	BM5449	A96
BD80GA5W	A40	BD8964	A51	BD95861	A52	BH25M0AW	A45	BM5480	A96
BD80GC0M	A39, A125	BD8966	A51	BD9611	A53	BH25MA3W	A45	BM5481	A96
BD80GC0W	A39	BD8967	A51	BD9634	A57	BH25NB1W	A47	BM60014	A60, A129
BD81002	A56	BD90010	A54, A128	BD9639	A57	BH25PB1W	A47	BM60051	A60, A129
BD81010	A56	BD9006	A54, A128	BD9701	A52	BH25RB1W	A47	BM6101	A60, A129
BD81026	A56	BD9007	A54, A128	BD9702	A52	BH26M0AW	A45	BM6102	A60, A129
BD8132	A56	BD9015	A54, A128	BD9703	A52	BH2715	A28	BM6104	A60, A129
BD8139A	A56	BD9016	A54, A128	BD9757	A57	BH27M0AW	A45	BM6105	A60
BD8143	A56	BD90201	A54, A128	BD9781	A54, A128	BH28M0AW	A45	BM6202	A74
BD8149	A56	BD9031	A54, A128	BD9845	A53	BH28MA3W	A45	BM6203	A74
BD8152	A53	BD9032	A54, A128	BD9848	A53	BH28NB1W	A47	BM63165S-VA	B12
BD8153	A56	BD9035A	A54, A128	BD9851	A53	BH28PB1W	A47	BM63363S-VA	B12
BD8157	A56	BD90522	A54, A128	BD9859	A52	BH28RB1W	A47	BM63364S-VA	B12
BD8158	A53	BD90525	A54, A128	BD9862	A56	BH28SA3W	A47	BM63364S-VC	B12
BD8160A	A56	BD90528	A54, A128	BD9865	A57	BH29M0AW	A45	BM63763S-VA	B12
BD8162	A56	BD90532	A54, A128	BD9866	A57	BH29MA3W	A45	BM63764S-VA	B12
BD8163	A56	BD90535	A54, A128	BD9870	A52	BH29NB1W	A47	BM65364S-VA	B12
BD8165	A56	BD90538	A54, A128	BD9873	A52	BH29PB1W	A47	BM66002	A60, A129
BD8166	A56	BD90571	A54, A128	BD9874	A52	BH29RB1W	A47	BM67220	A31, A131
BD8172	A56	BD9060	A54, A128	BD99010	A54, A128	BH2JNB1W	A47	BM67221	A31, A131
BD8174	A56	BD90610	A54, A128	BD99011	A54, A128	BH30M0AW	A45	BM67290	A60, A129
BD8179	A56	BD90620	A54, A128	BD99A41	A66	BH30MA3W	A45	BM81004	A56
BD8184	A56	BD90640	A54, A128	BD9A100	A51	BH30NB1W	A47	BM81028A	A56
BD81A04A	A80, A130	BD90C0A	A37, A124	BD9A101	A51	BH30PB1W	A47	BM81100	A56
BD81A34	A80, A130	BD90C0AW	A38, A125	BD9A300	A51	BH30RB1W	A47	BM81110	A56
BD82000	A61	BD90FC0W	A37	BD9A301	A51	BH30SA3W	A47	BP3580	F9
BD82001	A61	BD90GA3M	A41, A125	BD9A400	A51	BH31M0AW	A45	BP3591	F9
BD8201	A74	BD90GA3W	A40	BD9A600	A51	BH31MA3W	A45	BP3595	F9
BD82020	A61	BD90GA5M	A40, A125	BD9B100	A51	BH31NB1W	A47	BP3599	F9
BD82021	A61	BD90GA5W	A40	BD9B200	A51	BH31PB1W	A47	BP35A1	F8
BD82022	A61	BD90GC0M	A39, A125	BD9B300	A51	BH31RB1W	A47	BP35A3	F10
BD82023	A61	BD90GC0W	A39	BD9B301	A51	BH32M0AW	A45	BP5011	F3
BD82024	A61	BD9102	A51	BD9B330	A51	BH33M0AW	A45	BP5013	F3
BD82025	A61	BD9104	A51	BD9B400	A51	BH33MA3W	A45	BP5014	F3
BD82028	A61	BD9106	A51	BD9B500	A51	BH33NB1W	A47	BP5033-12	F3
BD82029	A61	BD9107	A51	BD9B600	A51	BH33PB1W	A47	BP5034B20	F3
BD8203	A74	BD9109	A51	BD9C301	A52	BH33RB1W	A47	BP5034D12	F3
BD82030	A61	BD9110	A51	BD9C401	A52	BH34M0AW	A45	BP5034D15	F3
BD82031	A61	BD9111	A51	BD9C501	A52	BH3544	A97	BP5034D24	F3
BD82032	A61	BD9120	A51	BD9C601	A52	BH3547	A97	BP5034D5	F3
BD82033	A61	BD9122	A51	BD9D320	A52	BH3548	A97	BP5035A5	F3
BD82034	A61	BD9123	A51	BD9D321	A52	BH5510	A75	BP5037B12	F3
BD82035	A61	BD9130	A51	BD9E100	A52	BH5511	A75	BP5037B15	F3
BD82061	A61	BD9132	A51	BD9E101	A52	BH6062	A57	BP5038A	F3
BD82065	A61	BD9134	A51	BD9E102	A52	BH6172	A57	BP5038A1	F3
BD8210	A74	BD91361	A51	BD9E151	A52	BH6173	A57	BP5039-15	F3
BD8215	A74	BD91362	A53	BD9E300	A52	BH6174	A57	BP5039A	F3
BD8217	A74	BD91363A	A51	BD9E301	A52	BH6176	A57	BP5039B12	F3
BD8223	A74	BD91364A	A51	BD9F800	A52	BH6178	A57	BP5041A	F3
BD8224	A74	BD9137	A51	BD9G101	A52	BH6179	A57	BP5041A5	F3
BD8226	A74	BD91370	A51	BD9G341	A52	BH6260	A25	BP5041B15	F3
BD8229	A74	BD9139	A51	BDJ0FC0W	A37	BH6578	A74	BP5045A	F3
BD8231	A74	BD91409	A63	BDJ0GA3M	A41, A125	BH67172	A73	BP5045A5	F3
BD8255	A74	BD9141	A52	BDJ0GA3W	A40	BH6766	A72	BP5047A24	F3
BD8256	A74	BD91411	A25	BDJ0GA5M	A40, A125	BH6789	A72	BP5047B15	F3
BD8266	A74	BD9150	A53	BDJ0GA5W	A40	BH6799	A72	BP5048	F3
BD8271	A74	BD91501	A53	BDJ0GC0M	A39, A125	BH76106	A102	BP5048-15	F3
BD8303	A53	BD9151	A53	BDJ0GC0W	A39	BH76109	A102	BP5048-24	F3
BD8306	A53	BD9152	A53	BDJ2FC0W	A37	BH76112	A102	BP5053-12	F3
BD8311	A53	BD9153	A53	BDJ2GA3M	A41, A125	BH7616	A102	BP5055-12	F3
BD8312	A52	BD9161	A51	BDJ2GA3W	A40	BH76206	A102	BP5061	F3
BD8313	A52	BD9206	A81	BDJ2GA5M	A40, A125	BH76330	A102	BP5061-5	F3
BD8314	A53	BD9207	A80, A81	BDJ2GA5W	A40	BH76331	A102	BP5062A	F3
BD8316	A53	BD9251	A89	BDJ2GC0M	A39, A125	BH76332	A103	BP5062A5	F3
BD8325	A59, A130	BD9271	A81	BDJ2GC0W	A39	BH76333	A103	BP5063-5	F3
BD8335	A49	BD9285	A80	BDJ5FC0W	A37	BH76360	A102	BP5065C	F3
BD8355	A57	BD9305A	A53	BDJxxx0	A89	BH76361	A102	BP5067-12	F3
BD8372	A81, A130	BD9306A	A53	BDJxxx1	A89	BH76362	A103	BP5067-15	F3
BD8374	A81, A130	BD9325	A52	BH12PB1W	A47	BH76363	A103	BP5068-15	F3
BD8378	A81, A130	BD9326	A52	BH15M0AW	A45	BH7649	A103	BP5068A	F3
BD8379	A81, A130	BD9327	A52	BH15MA3W	A45	BH76706	A102	BP5068A24	F3
BD8381A	A80, A130	BD9328	A52	BH15PB1W	A47	BH7673	A103, A134	BP5075-5	F3
BD8671	A58, A129	BD93290	A52	BH15RB1W	A47	BH76806	A102	BP5090-12	F3
BD8674	A58, A129	BD93291	A53	BH1603	A88	BH76809	A102	BP5122	F4
BD8676	A58, A129	BD9329A	A52	BH1620	A88	BH76812	A102	BP5220A	F4
BD8678A	A58, A129	BD9355	A57	BH1680	A88	BH76816	A102	BP5221A	F4
BD8682	A58, A129	BD9361	A57	BH1715	A88	BH76906	A102	BP5222A	F4
BD87A28	A66	BD9381	A57	BH1721	A88	BH76909	A102	BP5223	F4
BD87A29	A66	BD9397	A80	BH1730	A88	BH76912	A102	BP5224-33	F4
BD87A34	A66	BD9478	A81	BH1745	A89	BH76916	A102	BP5225	F4
BD87A41	A66	BD9479	A80	BH1751	A88	BH7824	A96, A134	BP5226-18	F4
BD88200	A97	BD9486	A80	BH1780	A88	BH7826	A96	BP5275-18	F4
BD88210	A97	BD9488	A80	BH18M0AW	A45	BH7881	A98	BP5275-25	F4
BD88215	A97	BD9535	A53	BH18MA3W	A45	BH7884	A98	BP5275-33	F4
BD88220	A97	BD9536	A53	BH18PB1W	A47	BM1050A	A59	BP5275-50	F4
BD88400	A97	BD95500	A52	BH18RB1W	A47	BM1051	A59	BP5277-12	F4
BD88410	A97	BD95513	A52	BH18SA3W	A47	BM1383	A89	BP5277-13	F4
BD88415	A97	BD95514	A52	BH20M0AW	A45	BM1C001	A59	BP5277-15	F4

Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
BP5277-33	F4	BU19TD3W	A46	BU30SA5W	A44	BU64297	A78	BU7988	A30
BP5277-50	F4	BU19UA3W	A45	BU30SD2M	A46, A127	BU64562	A78	BU82204	A31
BP5277-90	F4	BU1ATD2W	A46	BU30TA2W	A46	BU6521	A104, A135	BU8254	A30
BP5293-12	F4	BU1ATH5W	A44	BU30TD2W	A46	BU6650	A49	BU8332	A102, A135
BP5293-18	F4	BU1AUA3W	A45	BU30TD3W	A46	BU6651	A49	BU90002	A51
BP5293-33	F4	BU1BDT2W	A46	BU30UA3W	A45	BU6652	A49	BU90003	A51
BP5293-50	F4	BU1BUA3W	A45	BU31TA2W	A46	BU6653	A49	BU90004	A51
BP5324A	F4	BU1CTD2W	A46	BU31TD2W	A46	BU6654	A49	BU90005	A51
BP5510-24	F4	BU1CTD3W	A46	BU31TD3W	A46	BU6655	A49	BU90006	A51
BP5512A	F4	BU1CUA3W	A45	BU31UA3W	A45	BU6906A	A72	BU90007	A51
BP5710-1	F3	BU1JTD2W	A46	BU32TA2W	A46	BU7150	A97	BU90023	A51
BP5716	F3	BU1JTD3W	A46	BU32TD2W	A46	BU7205	A15	BU90028	A51
BP5717	F3	BU1JUA3W	A45	BU32TD3W	A46	BU7205S	A15	BU90030	A81
BP5718A12	F3	BU2050	A25	BU32UA3W	A45	BU7230	A19	BU9006	A51
BP5720-5	F3	BU2090	A25	BU33DV5	A53	BU7230S	A19	BU90AM4-xx	A30
BP5722A12	F3	BU2092	A25	BU33DV7	A53	BU7231	A19	BU90LV047A	A30
BP5723-33	F3	BU2098	A25	BU33SA4W	A47	BU7231S	A19	BU90LV048	A30
BP5725	F3	BU2099	A25	BU33SA5W	A44	BU7232	A19	BU90LV049A	A30
BP5726-15	F3	BU20TD2W	A46	BU33SD2M	A46, A127	BU7232S	A19	BU90R102	A30
BP5728	F3	BU20TD3W	A46	BU33TA2W	A46	BU7233	A19	BU90R104	A30
BP5729	F3	BU20UA3W	A45	BU33TD2W	A46	BU7233S	A19	BU90RT102	A30
BP5811	F4	BU21021	A89	BU33TD3W	A46	BU7241	A15	BU90T81	A30
BP581C	F5	BU21023	A89	BU33UA3W	A45	BU7241S	A15	BU90T82	A30
BP581D	F5	BU21024	A89, A136	BU34DV7	A53	BU7242	A15	BU92001	A31
BP581E	F5	BU21025	A89	BU34TA2W	A46	BU7242S	A15	BU92747	A31
BP583F	F5	BU21029	A89	BU34TD2W	A46	BU7244	A15	BU9406	A98
BP585C	F5	BU21072	A89	BU34TD3W	A46	BU7244S	A15	BU9408	A98
BP585D	F5	BU21077	A89	BU34UA3W	A45	BU7245	A15	BU9409	A98
BP585E	F5	BU21078	A89	BU35TH5W	A44	BU7245S	A15	BU9414	A98
BP585F	F5	BU21079	A89	BU37UA3W	A45	BU7250	A19	BU94501A	A101
BP586A	F5	BU21170	A89	BU4001	A24	BU7250S	A19	BU94502A	A101
BP586A-1	F5	BU2152	A25	BU4011	A24	BU7251	A19	BU94601	A101
BP586A-2	F5	BU21TD2W	A46	BU4015	A24	BU7251S	A19	BU94603	A101
BP586B	F5	BU21TD3W	A46	BU4021	A24	BU7252	A19	BU94604B	A101
BP586E	F5	BU21UA3W	A45	BU4028	A24	BU7252S	A19	BU94605A	A101
BP587C	F5	BU2280	A22	BU4030	A24	BU7253	A19	BU94607A	A101
BP587C-1	F5	BU22UA3W	A45	BU4051	A24	BU7253S	A19	BU94702A	A101
BP5892	F5	BU2360	A22	BU4052	A24	BU7255	A13	BU94705A	A101
BR24Axxxxx-WM series	A8, A138	BU2362	A22	BU4053	A24	BU7255S	A13	BU95303	A84
BR24C21	A7	BU2363	A22	BU4066	A24	BU7261	A13	BU95306	A84
BR24Gxxxxx-3 series	A6	BU2394	A22	BU4069	A24	BU7261S	A13	BU95408	A84
BR24Gxxxxx-3A series	A6	BU2396	A22	BU4070	A24	BU7262	A13	BU95401	A84
BR25Gxxxxx-W series	A6	BU23TD2W	A46	BU4081	A24	BU7262S	A13	BU97510C	A84, A133
BR25Hxxxxx-2C series	A8, A138	BU23UA3W	A45	BU4093	A24	BU7264	A13	BU97520A	A84, A133
BR25Lxxxxx-W series	A6	BU24020	A77	BU4094	A24	BU7264S	A13	BU97530K	A84, A133
BR25S128	A7	BU24024	A77	BU42xx	A65	BU7265	A15	BU97930	A84
BR34E02	A7	BU24025	A77	BU43xx	A65	BU7265S	A15	BU97931	A84
BR34L02	A7	BU24026	A77	BU4538	A24	BU7266	A15	BU97941	A84
BR35Hxxxxx-WC series	A8, A138	BU24031	A77	BU4551	A24	BU7266S	A15	BU9794A	A84
BR93Gxxxxx-3/3A/3B series	A6	BU24032	A77	BU4584	A24	BU7271	A15	BU97950	A84
BR93Hxxxxx-2C series	A8, A138	BU24033	A77	BU45Kxx2	A66	BU7271S	A15	BU9795A	A84
BRC A016	A7	BU24035	A77	BU45Kxx4	A66	BU7275	A15	BU9796A	A84
BRC B008	A7	BU24038	A77	BU45Lxx2	A66	BU7275S	A15	BU9797	A84, A133
BRC B016	A7	BU2505	A28	BU45Lxx4	A66	BU7291	A13	BU97981	A84
BRC B032	A7	BU2506	A28	BU46Kxx2	A66	BU7291S	A13	BU9799	A84
BRC B064	A7	BU2507	A28	BU46Kxx4	A66	BU7294	A13	BU9829	A7
BRC C016	A7	BU2508	A28	BU46Lxx2	A66	BU7294S	A13	BU9832	A7
BRC D016	A7	BU25SA4W	A47	BU46Lxx4	A66	BU7295	A13	BU9833	A7
BRC E064	A7	BU25SD2M	A46, A127	BU48xx	A65	BU7295S	A13	BU9847	A7
BRC G064	A7	BU25TA2W	A46	BU49xx	A65	BU7411	A16	BU9873	A22
BSM120D12P2C005	B6	BU25TD2W	A46	BU4501	A24	BU7411S	A16	BU9882	A7
BSM180D12P2C101	B6	BU25TD3W	A46	BU4511	A24	BU7421	A16	BU9883	A7
BSM300D12P2E001	B6	BU25UA3W	A45	BU45584	A24	BU7421S	A16	BU9889	A7
BU10TD2W	A46	BU25UB3W	A45	BU4566	A24	BU7441	A16	BU9891	A7
BU10TD3W	A46	BU26507	A81	BU4571	A24	BU7441S	A16	BU9897	A7
BU10UA3W	A45	BU26TA2W	A46	BU4581	A24	BU7442	A16	BU99022	A7
BU11TD3W	A46	BU26TD2W	A46	BU45U69	A24	BU7442S	A16	BU9B001	A51
BU11UA3W	A45	BU26TD3W	A46	BU52002	A88	BU7444	A16	BUS1DJC0	A62
BU12SD2M	A46, A127	BU26UA3W	A45	BU52003	A88	BU7444S	A16	BUS1DJC3	A62
BU12TD2W	A46	BU27TA2W	A46	BU52004	A88	BU7445	A16	CDZ Series	C36
BU12TD3W	A46	BU27TD2W	A46	BU52011	A88	BU7445S	A16	CDZ V Series	C36
BU12TH5W	A44	BU27TD3W	A46	BU52012	A88	BU7461	A14	CDZC6.8B	C38
BU12UA3W	A45	BU27UA3W	A45	BU52013	A88	BU7461S	A14	CDZCV5.1B	C38
BU12UB3W	A45	BU28SA4W	A47	BU52014	A88	BU7462	A14	CSL0406WBCW	E6
BU13TD3W	A46	BU28SD2M	A46, A127	BU52015	A88	BU7462S	A14	CSL0701DT	E7
BU13UA3W	A45	BU28TA2W	A46	BU52025	A88	BU7464	A14	CSL0701UT	E7
BU1523	A104, A135	BU28TD2W	A46	BU52040	A88	BU7464S	A14	DA204K	C40
BU1573	A104, A135	BU28TD3W	A46	BU52054	A88	BU7465	A14	DA204U	C40
BU15SD2M	A46, A127	BU28UA3W	A45	BU52055	A88	BU7465S	A14	DA221	C40
BU15TA2W	A46	BU29TA2W	A46	BU52058	A88	BU7475	A16	DA221M	C40
BU15TD2W	A46	BU29TD2W	A46	BU52061	A88	BU7475S	A16	DA227	C40
BU15TD3W	A46	BU29TD3W	A46	BU52075	A88	BU7481	A14	DA227Y	C40
BU15UA3W	A45	BU29UA3W	A45	BU52077	A88	BU7481S	A14	DA228K	C40
BU16501	A81	BU2ATD2W	A46	BU5255	A19	BU7485	A14	DA228U	C40
BU1840A	A63	BU2AUA3W	A45	BU5255S	A19	BU7485S	A14	DA228W	C40
BU1850	A31	BU2FSA4W	A47	BU5265	A19	BU7486	A14	DA380U	C40
BU1851	A31	BU2HTD2W	A46	BU5265S	A19	BU7486S	A14	DAN202K	C40
BU1852	A31	BU2HUA3W	A45	BU52742	A88	BU7487	A14	DAN202U	C40
BU18SA4W	A47	BU2JTA2W	A46	BU5281	A18	BU7487S	A14	DAN202UM	C40
BU18SD2M	A46, A127	BU2JTD2W	A46	BU5281S	A18	BU7495	A14	DAN217	C40
BU18TA2W	A46	BU2JTD3W	A46	BU64241	A78	BU7495S	A14	DAN217U	C40
BU18TD2W	A46	BU2JTH5W	A44	BU64243	A78	BU7961	A30	DAN217UM	C40
BU18TD3W	A46	BU2JUA3W	A45	BU64244	A78	BU7962	A30	DAN217W	C40
BU18UA3W	A45	BU2KUA3W	A45	BU64291	A78	BU7963	A30	DAN222	C40
BU18UB3W	A45	BU3087	A22	BU64295	A78	BU7964	A30	DAN222M	C40
BU19TD2W	A46	BU30SA4W	A47	BU64296	A78	BU7985	A30	DAN222WM	C40

# Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
DAN235E	C41	DTC123TKA	C21	EMH15	C22	IMH15A	C22	LA-401XD/XN	E19
DAN235U	C41	DTC123YxA	C21	EMH2	C22	IMH1A	C22	LA-501MD/MN	E19
DAP202K	C40	DTC124ExA	C21	EMH25	C22	IMH21	C22	LA-501VD/VN	E19
DAP202U	C40	DTC124GxA	C21	EMH3	C22	IMH23	C22	LA-601AB/AL	E19
DAP202UM	C40	DTC124TxA	C21	EMH4	C22	IMH2A	C22	LA-601BB/BL	E19
DAP222	C40	DTC124XxA	C21	EMH51	C22	IMH3A	C22	LA-601EB/EL	E19
DAP222M	C40	DTC125TxA	C21	EMH52	C22	IMH4A	C22	LA-601MB/ML	E19
DAP222WM	C40	DTC143ExA	C21	EMH53	C22	IMH5A	C22	LA-601VB/VL	E19
DAP236U	C41	DTC143TxA	C21	EMH59	C22	IMH6A	C22	LA-601XB/XL	E19
DTA013Zx	C21	DTC143XxA	C21	EMH6	C22	IMH8A	C22	LAP-301DB/DL	E18
DTA014Ex	C21	DTC143ZxA	C21	EMH60	C22	IMH9A	C22	LAP-301MB/ML	E18
DTA014Tx	C21	DTC144ExA	C21	EMH61	C22	IMN10	C40	LAP-301VB/VL	E18
DTA014Yx	C21	DTC144GxA	C21	EMH75	C22	IMN11	C40	LAP-301YB/YL	E18
DTA015Ex	C21	DTC144TxA	C21	EMH9	C22	IMP11	C40	LAP-401DD/DN	E18
DTA015Tx	C21	DTC144VxA	C21	EML22	C20	IMT18	C19	LAP-401MD/MN	E18
DTA023Ex	C21	DTC144WxA	C21	EMN11	C40	IMT1A	C19	LAP-401VD/VN	E18
DTA023Jx	C21	DTC614Tx	C21	EMP11	C40	IMT2A	C19	LAP-401YD/YN	E18
DTA023Yx	C21	DTC623Tx	C21	EMT1	C19	IMT3A	C19	LAP-601DB/DL	E18
DTA024Ex	C21	DTC643Tx	C21	EMT18	C19	IMT4	C19	LAP-601MB/ML	E18
DTA024Xx	C21	DTC914TUB	C21	EMT2	C19	IMX1	C19	LAP-601VB/VL	E18
DTA043Ex	C21	DTC923TUB	C21	EMT3	C19	IMX2	C19	LAP-601YB/YL	E18
DTA043Tx	C21	DTC943TUB	C21	EMT51	C19	IMX25	C19	LB-302MF/MP	E19
DTA043Xx	C21	DTD113Ex	C21	EMT52	C19	IMX3	C19	LB-302VF/VP	E19
DTA043Zx	C21	DTD113Zx	C21	EMX1	C19	IMX8	C19	LB-303MA/MK	E19
DTA044Ex	C21	DTD114Ex	C21	EMX18	C19	IMZ1A	C19	LB-303VA/VK	E19
DTA044Tx	C21	DTD114GK	C21	EMX2	C19	IMZ2A	C19	LB-402MD/MN	E19
DTA113TKA	C21	DTD123Ex	C21	EMX26	C19	KA2002-BE10A	F16	LB-402VD/VN	E19
DTA113ZxA	C21	DTD123TK	C21	EMX3	C19	KA2002-BE13A	F16	LB-502MD/MN	E19
DTA114ExA	C21	DTD123Yx	C21	EMX4	C19	KA2003-BE51A	F16	LB-502VD/VN	E19
DTA114GxA	C21	DTD143Ex	C21	EMX5	C19	KA2004-BE51A	F16	LB-602AA2/AK2	E19
DTA114TxA	C21	DTD143TK	C21	EMX51	C19	KA2008-AF10A	F16	LB-602BA2/BK2	E19
DTA114WxA	C21	DTD513Zx	C21	EMX52	C19	KD2002-CF15A	F17	LB-602EA2/EK2	E19
DTA114YxA	C21	DTD523Yx	C21	EMY1	C19	KD2002-DC72A	F19	LB-602MA2/MK2	E19
DTA115ExA	C21	DTD543Ex	C21	EMZ1	C19	KD2002-DC92A	F19	LB-602VA2/VK2	E19
DTA115GxA	C21	DTD543Xx	C21	EMZ2	C19	KD2002-DF11A	F18	LB-602XA2/XK2	E19
DTA115TxA	C21	DTD543Zx	C21	EMZ51	C19	KD2002-DG10A	F18	LB-603MF/MP	E19
DTA123ExA	C21	DTDG14GP	C21	EMZ52	C19	KD2003-CF15A	F17	LB-603VF/VP	E19
DTA123JxA	C21	DTDG23YP	C21	EMZ6.8E	C38	KD2003-DC72A	F19	LBP-602DA2/DK2	E18
DTA123YxA	C21	ECO 200	F10	EMZ6.8N	C38	KD2003-DC92A	F19	LBP-602MA2/MK2	E18
DTA124ExA	C21	EDK 350	F10	EMZ7	C19	KD2003-DF11A	F18	LBP-602VA2/VK2	E18
DTA124GxA	C21	EDK 400J	F10	EMZ8	C19	KD2003-DG12A	F18	LBP-602YA2/YK2	E18
DTA124TxA	C21	EDZ V Series	C36	EMZC6.8N	C38	KD2004-CF15A	F17	LF-301MA/MK	E18
DTA124XxA	C21	EDZC V6.8B	C38	EMZT6.8E	C38	KD2004-DC72A	F19, F20	LF-301VA/VK	E18
DTA125TxA	C21	EM6J1	C3	ES6U1	C9	KD2004-DC92A	F19, F20	LM2901	A18
DTA143ExA	C21	EM6K31	C3	ES6U2	C9	KD2004-DF11A	F18	LM2902	A13
DTA143TxA	C21	EM6K33	C3	ES6U3	C9	KD2004-DG11A	F18	LM2903	A18
DTA143XxA	C21	EM6K34	C3	ES6U41	C9	KD2006-DC72A	F19, F20	LM2904	A13
DTA143ZxA	C21	EM6K6	C3	ES6U42	C9	KD2006-DC92A	F19, F20	LM324	A13
DTA144ExA	C21	EM6K7	C3	ESR01	D8	KD2008-CF10A	F17	LM339	A18
DTA144GxA	C21	EM6M2	C3	ESR03	D8	KD2008-CG50A	F17	LM358	A13
DTA144TxA	C21	EMA2	C22	ESR10	D8	KD3002-DC72A	F19	LM393	A18
DTA144VxA	C21	EMA3	C22	ESR18	D8	KD3002-DC92A	F19	LM4559	A17
DTA144WxA	C21	EMA4	C22	ESR25	D8	KD3003-DC72A	F19	LM4565	A17
DTB113Ex	C21	EMA5	C22	FMA1A	C22	KD3003-DC92A	F19	LM7101	A18
DTB113Zx	C21	EMB10	C22	FMA2A	C22	KD3004-DC72A	F19, F20	LMR321	A16
DTB114Ex	C21	EMB11	C22	FMA3A	C22	KD3004-DC92A	F19, F20	LMR324	A16
DTB114GK	C21	EMB2	C22	FMA4A	C22	KD3004-DF11A	F18	LMR341	A16
DTB114TK	C21	EMB3	C22	FMA5A	C22	KD3006-DC72A	F19, F20	LMR342	A16
DTB123Ex	C21	EMB4	C22	FMA9A	C22	KD3006-DC92A	F19, F20	LMR358	A16
DTB123TK	C21	EMB51	C22	FMG1A	C22	KD3008-DF54A	F18	LMR821	A16
DTB123Yx	C21	EMB52	C22	FMG2A	C22	KDZ Series	C36	LMR822	A16
DTB143Ex	C21	EMB53	C22	FMG3A	C22	KDZ V Series	C36	LMR931	A15
DTB143TK	C21	EMB59	C22	FMG4A	C22	KMX61-1021	A90	LMR932	A15
DTB513Zx	C21	EMB6	C22	FMG6A	C22	KMX61G-1030	A90	LMR934	A15
DTB523Yx	C21	EMB60	C22	FMG9A	C22	KMX62-1031	A90	LMR981	A15
DTB543Ex	C21	EMB61	C22	FMN1	C40	KMX62G-1033	A90	LMR982	A15
DTB543Xx	C21	EMB75	C22	FMP1	C40	KTR03	D10	LPM-1153BMU813	E21
DTB543Zx	C21	EMD12	C23	FMY1A	C19	KTR10	D10	LPM-1153MU300	E21
DTC013Zx	C21	EMD2	C23	FMY4A	C19	KTR18	D10	LPM-2563MU300	E21
DTC014Ex	C21	EMD22	C23	FTZ30E	C38	KTR25	D10	LPM-5123BMU813	E20
DTC014Tx	C21	EMD29	C23	FTZ4.3E	C38	KX022-1020	A90	LPM-5123D320	E20
DTC014Yx	C21	EMD3	C23	FTZ5.6E	C38	KX023-1025	A90	LPM-5123MU300	E20
DTC015Ex	C21	EMD30	C23	FTZ6.8E	C38	KX122-1037	A90	LPM-5123MU350	E20
DTC015Tx	C21	EMD38	C23	FTZU6.2E	C38	KX23H-1035	A90	LPM-5123U320	E20
DTC023Ex	C21	EMD4	C23	GDZ Series	C36	KXCJ9-1008	A90	LPM-5123Y320	E20
DTC023Jx	C21	EMD5	C23	GMR100	D17	KXCJA-1019	A90	LPM-5763BMU813	E21
DTC023Yx	C21	EMD52	C23	HP8K22	B14	KXCJK-1013	A90	LPM-5763MU301	E21
DTC024Ex	C21	EMD53	C23	HP8K23	B14	KXCNL-1010	A90	LSH2008-CA10A	F12
DTC024Xx	C21	EMD59	C23	HP8K24	B14	KXD94 series	A90	LSH3008-CA10A	F12
DTC043Ex	C21	EMD6	C23	HP8KA1	B14	KXR94 series	A90	LSH3008-CA50A	F12
DTC043Tx	C21	EMD62	C23	HP8S36	B14	KXR85 series	A90	LSH6008-CA10A	F12
DTC043Xx	C21	EMD72	C23	HS8K1	C11	KXTC9 series	A90	LSH6008-CA50A	F12
DTC043Zx	C21	EMD9	C23	HS8K11	C11	KXTJ2-1009	A90	LTR10	D9, D13
DTC044Ex	C21	EMF5	C20	HS8K21	C11	LA-101MA/MK	E19	LTR100	D9, D13
DTC044Tx	C21	EMG1	C22	IMB10A	C22	LA-101VA/VK	E19	LTR18	D9, D13
DTC113ZxA	C21	EMG11	C22	IMB11A	C22	LA-301AB/AL	E19	LTR50	D9
DTC114ExA	C21	EMG2	C22	IMB2A	C22	LA-301BB/BL	E19	LUM-512CD300	E20
DTC114GxA	C21	EMG3	C22	IMB3A	C22	LA-301EB/EL	E19	LUM-512CMU300	E20
DTC114TxA	C21	EMG4	C22	IMD10A	C23	LA-301MB/ML	E19	LUM-512CMU301	E20
DTC114WxA	C21	EMG5	C22	IMD16A	C23	LA-301VB/VL	E19	LUM-512CMU320	E20
DTC114YxA	C21	EMG6	C22	IMD2A	C23	LA-301XB/XL	E19	LUM-512CU300	E20
DTC115ExA	C21	EMG8	C22	IMD3A	C23	LA-401AD/AN	E19	LUM-512CY300	E20
DTC115GxA	C21	EMG9	C22	IMD6A	C23	LA-401BD/BN	E19	LUM-512HY304	E20
DTC115TxA	C21	EMH1	C22	IMD9A	C23	LA-401ED/EN	E19	LUM-512HY354	E20
DTC123ExA	C21	EMH10	C22	IMH11A	C22	LA-401MD/MN	E19	LUM-512HY3A0	E20
DTC123JxA	C21	EMH11	C22	IMH14A	C22	LA-401VD/VN	E19	MCR004	D4



Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
MCR006	D4, D11	ML610406P	A114	ML610Q485	A112	ML9078-003	A122	MR37V6452B	A10
MCR01	D4, D11	ML610407	A114	ML610Q485P	A112	ML9092-01	A85	MR44V064A	A9, A139
MCR03	D4, D11	ML610407P	A114	ML610Q486P	A63	ML9092-02	A85	MR45V032A	A9, A139
MCR10	D4, D11	ML610408	A114	ML610Q488P	A63	ML9092-03	A85	MR45V200A	A9, A139
MCR100	D5, D11	ML610408P	A114	ML610Q793	A120	ML9092-04	A85	MR45V256A	A9, A139
MCR18	D5, D11	ML610409	A114	ML610Q794G	A120	ML9098B	A86, A133	MR48V256C	A9, A139
MCR25	D5, D11	ML610409P	A114	ML620Q131	A118	ML9208A-xxGA	A86	MS8104160A	A5
MCR50	D5, D11	ML610421	A112	ML620Q132	A118	ML9208A-xxTB	A86	MS81V03120	A5
MD51V65165E	A3	ML610421P	A112	ML620Q133	A118	ML9208-xxGA	A86	MS81V04160A	A5
MD54V16258BSL	A3	ML610426	A112	ML620Q134	A118	ML9208-xxMB	A86	MS81V04160AP	A5, A137
MD56V62160E	A4	ML610429	A112	ML620Q135	A118	ML9209-xxGA	A86	MS81V04166A	A5
MD56V62160E-xxTAP	A4, A137	ML610471	A116	ML620Q151	A118	ML9212GA	A86	MS81V05200	A5
MD56V62160M	A4	ML610472	A116	ML620Q152	A118	ML9213GP	A86	MS81V06160	A5
MD56V62160M-xxTAP	A4, A137	ML610473	A116	ML620Q153	A118	ML9271	A86	MS81V10160	A5
MD56V62161M	A4	ML610474	A116	ML620Q154	A118	ML9272	A86	MS81V26000	A5
MD56V62161M-xxTAP	A4	ML610475	A116	ML620Q155	A118	ML9286-xxGA	A86	MS81V26000-25TPZP3	A5, A137
MD56V72160C	A4	ML610476	A116	ML620Q156	A118	ML9286-xxTB	A86	MSL0101RGBU	E8
MD56V72160C-xxTAP	A4, A137	ML610477	A116	ML620Q157	A118	ML9289-xxGA	A86	MSL0101RGBW	E8
MD56V72161C	A4	ML610478	A116	ML620Q158	A118	ML9289-xxTB	A86	MSM5116160F	A3
MD56V72161C-xxTAP	A4	ML610479	A116	ML620Q159	A118	ML9298	A86, A133	MSM5116400F	A3
MD56V82160A	A4	ML610482	A112	ML620Q503	A112	ML9445	A85	MSM5117400F	A3
MD56V82160A-xxTAP	A4, A137	ML610482P	A112	ML620Q504	A112	ML9460	A85	MSM5117405F	A3
MD58W82160A	A4	ML610Q101	A118	ML620Q506	A112	ML9461B	A85	MSM5117800F	A3
MK71050-03	F10	ML610Q102	A118	ML620Q546	A112	ML9470-12	A85, A133	MSM5117805F	A3
MK72220-01	F10	ML610Q111	A118	ML620Q558	A112	ML9471	A85, A133	MSM5118160F	A3
MK72660-01	F10	ML610Q112	A118	ML630Q791	A120	ML9472	A85, A133	MSM5118160FP	A3, A137
MK72750A-01	F10	ML610Q172	A118	ML674001	A120	ML9473	A85, A133	MSM5118165F	A3
ML2011GD	A102	ML610Q173	A118	ML675001	A120	ML9475	A85, A133	MSM5118165FP	A3, A137
ML2011HB	A102	ML610Q174	A118	ML7005	A94	ML9476	A85, A133	MSM514260E	A3
ML22321	A108, A109, A134	ML610Q178	A118	ML7012-06	A94	ML9477	A85, A133	MSM514260EP	A3, A137
ML22331	A108, A109, A134	ML610Q304	A120	ML7020	A94	ML9478C	A85, A133	MSM514265E	A3
ML22341	A108, A109, A134	ML610Q359	A120	ML7029	A94	ML9479E	A85, A133	MSM514400DP	A3, A137
ML22420	A109	ML610Q360	A120	ML7033-01	A93	ML9480	A85, A133	MSM514400E	A3
ML22460	A109	ML610Q380	A120	ML7037-003	A93	ML9484	A85, A133	MSM514400EP	A3, A137
ML22562	A108	ML610Q407	A114	ML7041	A93	ML9488	A85, A133	MSM514800E	A3
ML22563	A108	ML610Q407A	A114	ML7066	A92	ML9489	A85, A133	MSM514800ESL	A3
ML22572	A109, A134	ML610Q407D	A114	ML7074-003	A93	ML9574	A94, A132	MSM51V16160F	A3
ML22573	A109, A134	ML610Q407P	A114	ML7074-004	A93	ML9860B	A84, A132	MSM51V16165F	A3
ML22594	A109, A134	ML610Q407PA	A114	ML7098C-01	A94	ML9863A	A84, A132	MSM51V16400F	A3
ML22723	A108	ML610Q408	A114	ML7105-00x	A92	ML9872	A84, A132	MSM51V16405F	A3
ML22724	A108	ML610Q408P	A114	ML7109S	A92, A132	ML9881	A84, A132	MSM51V17400F	A3
ML22725	A108	ML610Q409	A114	ML7125	A92	MMST2222A	C16	MSM51V17400FP	A3, A137
ML22763	A108	ML610Q409A	A114	ML7138	A92, A132	MMST2907A	C16	MSM51V17405F	A3
ML22764	A108	ML610Q409P	A114	ML7147	A92, A132	MMST3904	C16	MSM51V17800F	A3
ML22765	A108	ML610Q411	A114	ML7154	A94, A132	MMST3906	C16	MSM51V17805F	A3
ML22802	A108	ML610Q411P	A114	ML7174	A94, A132	MMST4401	C16	MSM51V18160F	A3
ML22804	A108	ML610Q411PA	A114	ML7183	A94, A132	MMST4403	C16	MSM51V18165F	A3
ML22808	A108	ML610Q412	A114	ML7202-001	A93	MMSTA06	C16	MSM51V18165FP	A3, A137
ML22823	A108	ML610Q412P	A114	ML7204-003	A93	MMSTA13	C16	MSM51V4265E	A3
ML22824	A108	ML610Q419	A114	ML7207-01	A94	MMSTA28	C16	MSM51V4265EP	A3, A137
ML22825	A108	ML610Q419C	A116	ML7214A-001	A93	MMSTA56	C16	MSM51V4400E	A3
ML22863	A108	ML610Q419P	A114	ML7224A-001	A93	MNR02	D6	MSM51V4400EP	A3, A137
ML22864	A108	ML610Q419PC	A116	ML7234-021	A93	MNR04	D6	MSM51V4800E	A3
ML22865	A108	ML610Q421	A112	ML7246	A92	MNR12	D6	MSM5412222B	A5
ML22P802	A108	ML610Q421P	A112	ML7247-001	A93	MNR14	D6	MSM5416258B	A3
ML22P804	A108	ML610Q422	A112	ML7257-01	A94	MNR15	D7	MSM54V12222B	A5
ML22P808	A108	ML610Q422B	A112	ML7266	A92	MNR18	D7	MSM54V16258B	A3
ML22Q321	A108, A109, A134	ML610Q422P	A112	ML7275	A92	MNR32	D6	MSM54V16258BP	A3, A137
ML22Q331	A108, A109, A134	ML610Q422PB	A112	ML7304-0x2	A93	MNR34	D6	MSM56V16160F	A4
ML22Q341	A108, A109, A134	ML610Q426	A112	ML7344C	A92	MNR35	D7	MSM56V16160FP	A4, A137
ML22Q374	A108, A109, A134	ML610Q426C	A112	ML7344J	A92	MR26T51203L	A10	MSM56V16160K	A4
ML22Q394	A108, A109, A134	ML610Q428	A112	ML7345	A92	MR26V51252R	A9	MSM56V16160KP	A4, A137
ML22Q553	A109, A134	ML610Q429	A112	ML7386	A92	MR26V6455J	A10	MSM56V16160N	A4
ML22Q563	A108	ML610Q431	A112	ML7396A	A92	MR27T12800L	A9	MSM56V16161K	A4
ML22Q573	A109, A134	ML610Q431A	A112	ML7396B	A92	MR27T12802L	A9	MSM56V16161KP	A4
ML2611GD	A96	ML610Q431PA	A112	ML7396E	A92	MR27T1602L	A9	MSM56V16161N	A4
ML2611HB	A96	ML610Q432	A112	ML7406	A92	MR27T25603L	A9	MSM56V16161NP	A4, A137
ML26121AHB	A103	ML610Q432A	A112	ML8511-00FC	A90	MR27T3202L	A9	MSM56V16800F	A4
ML26124-00HB	A103, A135	ML610Q435	A112	ML8511-00NA	A90	MR27T6402L	A9	MSM7533V	A93
ML26124-02GD	A103, A135	ML610Q435A	A112	ML8540	A90	MR27T802F	A9	MSM7578V	A93
ML26125HB	A103, A135	ML610Q436	A112	ML8540WD	A90	MR27V12800L	A9	MSM7581	A94
ML26127HB	A103	ML610Q436A	A112	ML86101A	A104, A135	MR27V12850L	A10	MSM7582B	A94
ML26128HB	A103	ML610Q438	A112	ML86203	A105, A136	MR27V12852L	A10	MSM7704-01	A93
ML2612GD	A103, A135	ML610Q438P	A112	ML86206	A105, A136	MR27V1602L	A9	MSM7717-01	A93
ML2614HB	A103, A135	ML610Q439	A112	ML86240	A105, A136	MR27V1641L	A10	MSM7732A	A93
ML2620GD	A96	ML610Q439P	A112	ML86286	A105, A136	MR27V1652L	A10	MSM9563	A94, A132
ML2620HP	A96	ML610Q461	A116	ML86790	A104	MR27V25653L	A10	MSM9565	A94, A132
ML26211EGD	A96	ML610Q462	A116	ML86V7655	A104, A136	MR27V3202L	A9	PML10	D15
ML26700CGD	A89	ML610Q463	A116	ML86V76580	A104, A136	MR27V3241L	A10	PML100	D15
ML26700SGD	A89	ML610Q471	A116	ML86V76655	A104	MR27V3252J	A10	PML18	D15
ML5203	A63	ML610Q471P	A116	ML86V7668A	A104, A135	MR27V6402L	A9	PML50	D15
ML5235	A63	ML610Q472	A116	ML86V7675	A104, A135	MR27V6441L	A10	PMR01	D14
ML5236	A63	ML610Q472P	A116	ML86V8101	A105, A136	MR27V6452L	A10	PMR03	D14
ML5238	A63	ML610Q473	A116	ML86V8102	A105, A136	MR27V6452R	A10	PMR10	D14
ML5239	A63	ML610Q473P	A116	ML86V8201	A105, A136	MR27V802F	A9	PMR100	D14
ML610401	A114	ML610Q474	A116	ML86V8202C	A105, A136	MR29V03252A	A9	PMR18	D14
ML610401P	A114	ML610Q475	A116	ML86V8207	A105	MR29V03252B	A9	PMR25	D14
ML610402	A114	ML610Q476	A116	ML86V8401	A105	MR29V06452B	A9	PMR50	D14
ML610402P	A114	ML610Q477	A116	ML9042-0x	A85	MR29V12852A	A9	PSR400	D16
ML610403	A114	ML610Q477P	A116	ML9042-1x	A85	MR29V12852B	A9	PSR500	D16
ML610403P	A114	ML610Q478	A116	ML9042-2x	A85	MR29V25652B	A9	PTM 210	F10
ML610404	A114	ML610Q478P	A116	ML9058E	A85	MR36V01G52B	A10	PTM 210J	F10
ML610404P	A114	ML610Q479	A116	ML9059E	A85	MR37T25602T	A9	PTM 330	F10
ML610405	A114	ML610Q479P	A116	ML9077	A122	MR37V12841A	A10	PTM 430J	F10
ML610405P	A114	ML610Q482	A112	ML9078-001	A122	MR37V12852B	A10	PTZ Series	C36
ML610406	A114	ML610Q482P	A112	ML9078-002	A122	MR37V25652T	A10	QH8KA1	C8

# Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
QH8KA2	C8	R6035ENZ1	B18	RB160MM-60	C33	RB420D	C30	RB578VYM100	C32
QH8KA4	C8	R6046FNZ	B18	RB160MM-90	C33	RB421D	C30	RB705D	C30
QH8MA2	C8	R6046FNZ1	B18	RB160SS-40	C32	RB425D	C30	RB706D-40	C30
QH8MA3	C8	R6047ENZ1	B18	RB160VA-40	C32	RB450F	C30	RB706F-40	C30
QH8MA4	C8	R6076ENZ1	B18	RB160VA-60	C32	RB451F	C30	RB706W-40	C30
QS5K2	C7	R8001CND	B18	RB160VAM-40	C32	RB461F	C33	RB715F	C30
QS5U2	C9	R8002ANX	B18	RB160VAM-60	C32	RB471E	C30	RB715UM	C30
QS5U13	C9	R8005ANX	B18	RB160VYM-40	C32	RB480K	C30	RB715W	C30
QS5U16	C9	R8008ANX	B18	RB160VYM-60	C32	RB480Y	C30	RB715Z	C30
QS5U17	C9	R8010ANX	B18	RB161L-40	C33	RB480Y-40	C30	RB717F	C30
QS5U21	C9	RAF040P01	C6	RB161M-20	C32	RB480Y-90	C30	RB731U	C30
QS5U23	C9	RAL025P01	C6	RB161MM-20	C33	RB481K	C30	RB731XN	C30
QS5U26	C9	RAL035P01	C6	RB161SS-20	C32	RB481Y	C30	RB751CM-40	C29
QS5U27	C9	RAL045P01	C6	RB161VA-20	C32	RB481Y-40	C30	RB751CS-40	C29
QS5U28	C9	RAQ045P01	C7	RB161VAM-20	C32	RB481Y-90	C30	RB751G-40	C29
QS5U33	C9	RB021VA90	C32	RB162L-40	C33	RB491D	C33	RB751SM-40	C29
QS5U34	C9	RB021VAM90	C32	RB162L-60	C33	RB495D	C30	RB751VM-40	C29
QS5U36	C9	RB050L-40	C33	RB162M-30	C32	RB496EA	C33	RB751ZS-40	C29
QS5W1	C19	RB050L-60	C33	RB162M-40	C32	RB496KA	C33	RB851Y	C41
QS5W2	C19	RB051L-40	C33	RB162M-60	C32	RB500SM-30	C29	RB861Y	C41
QS5Y1	C20	RB051M-2Y	C32	RB162MM-30	C33	RB500VM-40	C29	RB876W	C41
QS5Y2	C20	RB051MM-2Y	C33	RB162MM-40	C33	RB501SM-30	C29	RB886CS	C41
QS6J11	C7	RB055L-30	C33	RB162MM-60	C33	RB501VM-40	C29	RB886G	C41
QS6K1	C7, C14	RB055L-40	C33	RB162VA-20	C32	RB510SM-30	C29	RB886Y	C41
QS6K21	C7, C14	RB055L-60	C33	RB162VAM-20	C32	RB510VM-30	C29	RBE02SM20A	C29
QS6M4	C7	RB056L-40	C33	RB168L100	C33	RB511SM-30	C29	RBE05AS20A	C32
QS6U22	C9	RB058L150	C33	RB168L150	C33	RB511VM-30	C29	RBE05SM20A	C32
QS6U24	C9	RB058L-30	C33	RB168L-30	C33	RB520AS-30	C29	RBE05VM20A	C32
QS6Z5	C19	RB058L-40	C33	RB168L-40	C33	RB520AS-40	C29	RBE07V20A	C32
QS8J11	C8	RB058L-60	C33	RB168L-60	C33	RB520CM-30	C29	RBE1KA20A	C33
QS8J12	C8	RB060L-40	C33	RB168M150	C32	RB520CM-40	C29	RBE1VA20A	C32
QS8J13	C8	RB060M-30	C32	RB168M-40	C32	RB520CM-60	C29	RBE1VAM20A	C32
QS8J2	C8	RB060M-40	C32	RB168M-60	C32	RB520CS-30	C29	RBE2EA20A	C33
QS8J4	C8, C14	RB060M-60	C32	RB168MM100	C33	RB520G-30	C29	RBE2VA20A	C32
QS8J5	C8	RB060MM-30	C33	RB168MM150	C33	RB520G-40	C29	RBE2VAM20A	C32
QS8K11	C8	RB060MM-40	C33	RB168MM-30	C33	RB520SM-30	C29	RBQ10BM45A	B23
QS8K12	C8	RB060MM-60	C33	RB168MM-40	C33	RB520SM-40	C29	RBQ10BM65A	B23
QS8K13	C8	RB061US-30	C33	RB168MM-60	C33	RB520VM-30	C29	RBQ10NS45A	B23
QS8K2	C8, C14	RB068L100	C33	RB168VAM100	C32	RB520VM-40	C29	RBQ10NS65A	B23
QS8K21	C8	RB068L150	C33	RB168VAM150	C32	RB520ZS-30	C29	RBQ10T45A	B24
QS8K51	C8	RB068L-30	C33	RB168VAM-30	C32	RB520ZS8A30	C29	RBQ10T65A	B24
QS8M12	C8	RB068L-40	C33	RB168VAM-40	C32	RB521AS-30	C29	RBQ15BM45A	B23
QS8M13	C8	RB068L-60	C33	RB168VAM-60	C32	RB521AS-40	C29	RBQ15BM65A	B23
QS8M31	C8	RB068M-40	C32	RB168VYM100	C32	RB521CM-30	C29	RBQ20BM45A	B23
QS8M51	C8, C14	RB068M-60	C32	RB168VYM150	C32	RB521CM-40	C29	RBQ20BM65A	B23
QSH29	C22	RB068MM-30	C33	RB168VYM-30	C32	RB521CS-30	C29	RBQ20NS45A	B23
QST2	C17	RB068MM-40	C33	RB168VYM-40	C32	RB521ES-30	C29	RBQ20NS65A	B23
QST3	C17	RB068MM-60	C33	RB168VYM-60	C32	RB521G-30	C29	RBQ20T45A	B24
QST8	C19	RB070M-30	C32	RB205T-40	B24	RB521G-40	C29	RBQ20T65A	B24
QST9	C19	RB070MM-30	C33	RB205T-60	B24	RB521SM-30	C29	RBQ30NS45A	B23
QSX1	C17	RB075BM40S	B24	RB205T-90	B24	RB521SM-40	C29	RBQ30NS45B	B24
QSX2	C17	RB078BM30S	B24	RB208BM-60	B23	RB521VM-30	C29	RBQ30NS65A	B23
QSX7	C19	RB080L-30	C33	RB215T-40	B24	RB521VM-40	C29	RBQ30T45A	B24
QSX8	C19	RB081L-20	C33	RB215T-60	B24	RB521ZS-30	C29	RBQ30T65A	B24
QSZ1	C20	RB085BM-30	B23	RB215T-90	B24	RB521ZS8A30	C29	RBQ30TB45B	B24
QSZ2	C20	RB085BM-40	B23	RB218NS100	B23	RB530CM-30	C29	RBR10BM30A	B23
QSZ4	C20	RB085BM-90	B23	RB218NS150	B24	RB530CM-60	C29	RBR10BM40A	B23
R5009FNX	B18	RB085T-40	B24	RB218NS-30	B23	RB530G-30	C29	RBR10NS30A	B23
R5011FNX	B18	RB085T-60	B24	RB218NS-40	B23	RB530SM-30	C29	RBR10NS40A	B23
R5016FNX	B18	RB085T-90	B24	RB218NS-60	B23	RB530SM-40	C29	RBR10T30A	B24
R5205PND	B19	RB088BM100	B23	RB218T100	B24	RB530VM-30	C29	RBR10T40A	B24
R6002END	B18	RB088BM150	B23	RB218T150	B24	RB530VM-40	C29	RBR15BM30A	B23
R6004END	B18	RB088BM-30	B23	RB218T-30	B24	RB530XN	C30	RBR15BM40A	B23
R6004ENJ	B18	RB088BM-40	B23	RB218T-40	B24	RB531CM-30	C29	RBR1L30A	C33
R6004ENX	B18	RB088BM-60	B23	RB218T-60	B24	RB531G-30	C29	RBR1L40A	C33
R6004PND	B19	RB088NS100	B23	RB225NS-40	B23	RB531SM-30	C29	RBR1L60A	C33
R6006PND	B19	RB088NS150	B23	RB225T-40	B24	RB531SM-40	C29	RBR1M30A	C32
R6007ENJ	B18	RB088NS-30	B23	RB225T-60	B24	RB531VM-30	C29	RBR1M40A	C32
R6007ENX	B18	RB088NS-40	B23	RB228NS100	B23	RB531VM-40	C29	RBR1M60A	C32
R6008FNJ	B18	RB088NS-60	B23	RB228NS150	B24	RB531XN	C30	RBR1MM30A	C33
R6008FNX	B18	RB088T100	B24	RB228NS-30	B23	RB540AS-30	C29	RBR1MM40A	C33
R6009ENJ	B18	RB088T150	B24	RB228NS-40	B23	RB540SM-40	C29	RBR1MM60A	C33
R6009ENX	B18	RB088T-30	B24	RB228NS-60	B23	RB540VM-30	C29	RBR20BM30A	B23
R6011ENJ	B18	RB088T-40	B24	RB228T100	B24	RB540VM-40	C29	RBR20BM40A	B23
R6011ENX	B18	RB088T-60	B24	RB228T150	B24	RB541AS-30	C29	RBR20NS30A	B23
R6012FNJ	B18	RB095BM-30	B23	RB228T-30	B24	RB541SM-40	C29	RBR20NS40A	B23
R6012FNX	B18	RB095BM-40	B23	RB228T-40	B24	RB541VM-30	C29	RBR20T30A	B24
R6015ENJ	B18	RB095BM-60	B23	RB228T-60	B24	RB541VM-40	C29	RBR20T40A	B24
R6015ENX	B18	RB095BM-90	B23	RB238NS100	B23	RB541XN	C30	RBR2L30A	C33
R6015ENZ	B18	RB095T-40	B24	RB238NS150	B24	RB548W	C30	RBR2L40A	C33
R6015FNX	B18	RB095T-60	B24	RB238NS-30	B23	RB550EA	C33	RBR2L60A	C33
R6020ENJ	B18	RB095T-90	B24	RB238NS-40	B23	RB550SS-30	C32	RBR2L60B	C33
R6020ENX	B18	RB098BM100	B23	RB238NS-60	B23	RB550VA-30	C32	RBR2M30A	C32
R6020ENZ	B18	RB098BM150	B23	RB238T100	B24	RB550VAM-30	C32	RBR2M30B	C32
R6020ENZ1	B18	RB098BM-30	B23	RB238T150	B24	RB550VM-30	C29	RBR2M40A	C32
R6020FNX	B18	RB098BM-40	B23	RB238T-30	B24	RB550VYM-30	C32	RBR2M40B	C32
R6024ENJ	B18	RB098BM-60	B23	RB238T-40	B24	RB551SS-30	C32	RBR2M40C	C32
R6024ENX	B18	RB160L-40	C33	RB238T-60	B24	RB551VM-30	C32	RBR2M60A	C32
R6024ENZ	B18	RB160L-60	C33	RB298NS100	B23	RB552EA	C33	RBR2M60B	C32
R6024ENZ1	B18	RB160L-90	C33	RB298T100	B24	RB557W	C30	RBR2M60C	C32
R6025FNZ	B18	RB160M-30	C32	RB400D	C33	RB558VA150	C32	RBR2MM30A	C33
R6025FNZ1	B18	RB160M-40	C32	RB400VA-50	C32	RB558VAM150	C32	RBR2MM30B	C33
R6030ENX	B18	RB160M-60	C32	RB400VAM-50	C32	RB558VYM150	C32	RBR2MM40A	C33
R6030ENZ	B18	RB160M-90	C32	RB400VYM-50	C32	RB558W	C30	RBR2MM40B	C33
R6030ENZ1	B18	RB160MM-30	C33	RB411D	C33	RB558WM	C30	RBR2MM40C	C33
R6035ENZ	B18	RB160MM-40	C33	RB411VA-50	C32	RB578VAM100	C32	RBR2MM60A	C33

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
RBR2MM60B	C33	RF101L2S	C35	RFUS20TM4S	B26	RPI-0129	E29	RPMS1401-H19	E43
RBR2MM60C	C33	RF101L4S	C35	RFUS20TM6S	B26	RPI-0226	E29	RPMS2371-H19	E43
RBR30NS30A	B23	RF1501NS3S	B26	RFV12TG6S	B26	RPI-0352E	E29	RPMS2381-H19	E43
RBR30NS40A	B23	RF1501TF3S	B26	RFV12TJ6S	B26	RPI-1035	E30	RPMS2401-H19	E43
RBR30T30A	B24	RF1601NS2D	B26	RFV15TG6S	B26	RPI-1133	E30	RPR-220	E30
RBR30T40A	B24	RF1601T2D	B26	RFV15TJ6S	B26	RPI-121	E29	RPR-220PC30N	E30
RBR3L30A	C33	RF1E015AJ	C6	RFV8TG6S	B26	RPI-122	E29	RPR-220UC30N	E30
RBR3L30B	C33	RF2001NS2D	B26	RFV8TJ6S	B26	RPI-124	E29	RPT-34PB3F	E33
RBR3L40A	C33	RF2001NS3D	B26	RFV8TJ6S	B26	RPI-125	E29	RPT-37PB3F	E33
RBR3L40B	C33	RF2001T2D	B26	RFV8TJ6S	B26	RPI-129B	E29	RPT-38PB3F	E33
RBR3L40C	C33	RF2001T3D	B26	RFV8TJ6S	B26	RPI-131	E29	RQ1A060ZP	C8
RBR3L60A	C33	RF2001T4S	B26	RGJ10BN06	B17	RPI-221	E29	RQ1A070AP	C8
RBR3L60B	C33	RF201L2S	C35	RGJ12BN04	B17	RPI-222	E29	RQ1A070ZP	C8, C14
RBR3M30A	C32	RF201L4S	C35	RGJ12BN06	B17	RPI-243	E29	RQ1C065UN	C8
RBR3M40A	C32	RF301BM2S	B26	RGJ450N06	B17	RPI-246	E29	RQ1C075UN	C8, C14
RBR3M40B	C32	RF305BM6S	B26	RGJ650N04	B17	RPI-303	E29	RQ1E050RP	C8, C14
RBR3M60A	C32	RF4C050AP	C11	RGJ700N06	B17	RPI-352	E29	RQ1E070RP	C8, C14
RBR3M60B	C32	RF4E070BN	C11	RGJ80BN04	B17	RPI-352E	E29	RQ1E075XN	C8
RBR3MM30A	C33	RF4E070GN	C11	RGJ80CN04	B17	RPI-392	E29	RQ1E100XN	C8
RBR3MM40A	C33	RF4E075AT	C11	RGPR10BM40	B9	RPI-441C1	E29	RQ3A070AP	C11
RBR3MM40B	C33	RF4E080BN	C11	RGPR210BM40	B9	RPI-441C1E	E29	RQ3A085AP	C11
RBR3MM60A	C33	RF4E080GN	C11	RGTO0TS65D	B8	RPI-5100	E29	RQ3E070BN	C11
RBR3MM60B	C33	RF4E100AJ	C11	RGT16NS65D	B8	RPM-012PB	E33	RQ3E080BN	C11
RBR5L30A	C33	RF4E110BN	C11	RGT30NS65D	B8	RPM-20PB	E33	RQ3E080GN	C11
RBR5L30B	C33	RF4E110GN	C11	RGT40NS65D	B8	RPM-22PB	E33	RQ3E100BN	C11
RBR5L40A	C33	RF4G090GN	C11	RGT40TS65D	B8	RPM5337-H12	E43	RQ3E100GN	C11
RBR5L60A	C33	RF501BM2S	B26	RGT50TS65D	B8	RPM5337-H14	E43	RQ3E120AT	C11
RCD041N25	B16	RF505BM6S	B26	RGT60TS65D	B8	RPM5338-H12	E43	RQ3E120BN	C11
RCD051N20	B16	RF505TF6S	B26	RGT80TS65D	B8	RPM5338-H14	E43	RQ3E120GN	C11
RCD060N25	B16	RF601BM2D	B26	RGT8BM65D	B8	RPM5340-H12	E43	RQ3E130BN	C11
RCD075N19	B16	RF601T2D	B26	RGT8NS65D	B8	RPM5340-H14	E43	RQ3E150BN	C11
RCD075N20	B16	RF6E045AJ	C6	RGTH00TS65	B8	RPM5537-H12	E43	RQ3E150GN	C11
RCD080N25	B16	RFN10BM3S	B26	RGTH00TS65D	B8	RPM5537-H14	E43	RQ3E160AD	C11
RCD100N19	B16	RFN10BM6S	B26	RGTH40TS65	B8	RPM5538-H12	E43	RQ3E180AJ	C11
RCD100N20	B16	RFN10NS3S	B26	RGTH40TS65D	B8	RPM5538-H14	E43	RQ3E180BN	C11
RCJ050N25	B17	RFN10NS4S	B26	RGTH50TS65	B8	RPM5540-H12	E43	RQ3E180GN	C11
RCJ080N25	B17	RFN10NS6S	B26	RGTH50TS65D	B8	RPM5540-H14	E43	RQ3G100GN	C11
RCJ081N20	B17	RFN10T2D	B26	RGTH60TS65	B8	RPM6937	E44	RQ3G130MM	C11
RCJ100N25	B17	RFN10TB4S	B26	RGTH60TS65D	B8	RPM6937-V4	E44	RQ5E025AT	C7
RCJ120N20	B17	RFN10TF6S	B26	RGTH80TS65	B8	RPM6938	E44	RQ5E030AJ	C7
RCJ120N25	B17	RFN16T2D	B26	RGTH80TS65D	B8	RPM6938-V4	E44	RQ5E035AT	C7
RCJ160N20	B17	RFN1L6S	C35	RHK003N06	C14	RPM6940	E44	RQ5E035BN	C7
RCJ200N20	B17	RFN1L7S	C35	RHK005N03	C14	RPM6940-V4	E44	RQ5E040AJ	C7
RCJ220N25	B17	RFN20NS3S	B26	RHP020N06	C11, C15	RPM7137-H13R	E44	RQ5H020SP	C7
RCJ300N20	B17	RFN20NS4S	B26	RHP030N03	C11, C15	RPM7137-H4R	E44	RQ5L015SP	C7
RCJ330N25	B17	RFN20NS6S	B26	RHU002N06	C14	RPM7137-H5R	E44	RQ6C050UN	C7
RCJ450N20	B17	RFN20T2D	B26	RHU003N03	C14	RPM7137-H8R	E44	RQ6E030AT	C7
RCX510N25	B17	RFN20TB4S	B26	RJU1330AA	B19	RPM7137-H9R	E44	RQ6E035AT	C7
RCX700N20	B17	RFN20TF6S	B26	RJK005N03	C14	RPM7137-R	E44	RQ6E045BN	C7
RCX051N25	B17	RFN2L4S	C35	RJP020N06	C11, C15	RPM7137-V4R	E44	RQ6E050AT	C7
RCX080N25	B17	RFN2L6S	C35	RJU002N06	C14	RPM7138-H13R	E44	RQ6E055BN	C7
RCX081N20	B17	RFN30TS2D	B26	RJU003N03	C14	RPM7138-H4R	E44	RQ6P015SP	C7
RCX100N25	B17	RFN30TS3D	B26	RK7002A	C14	RPM7138-H5R	E44	RQ7E055AT	C8
RCX120N20	B17	RFN30TS6D	B26	RK7002BM	C3	RPM7138-H8R	E44	RR264M-400	C34
RCX120N25	B17	RFN30TS6S	B26	RLD2BPN1D	E24	RPM7138-H9R	E44	RR264MM-400	C34
RCX160N20	B17	RFN3BM2S	B26	RLD2BPN3	E24	RPM7138-R	E44	RR274EA-400	C34
RCX200N20	B17	RFN3BM6S	B26	RLD2BPN4	E24	RPM7138-V4R	E44	RR2L4S	C34
RCX220N25	B17	RFN5BM2S	B26	RLD2BPNK2	E24	RPM7140-H13R	E44	RR2L6S	C34
RCX300N20	B17	RFN5BM3S	B26	RLD2BPNK4	E24	RPM7140-H4R	E44	RRD07M4S	C34
RCX330N25	B17	RFN5BM6S	B26	RLD2BPNK5	E24	RPM7140-H5R	E44	RRE02VS4S	C34
RCX450N20	B17	RFN5TF6S	B26	RLD2WMFL3	E24	RPM7140-H8R	E44	RRE02VS6S	C34
RCX511N25	B17	RFN5TF8S	B26	RLD2WMFL1	E24	RPM7140-H9R	E44	RRE02VSM4S	C34
RCX700N20	B17	RFN60TS6D	B26	RLD2WMFL5	E24	RPM7140-R	E44	RRE02VSM6S	C34
RD3G400GN	B16	RFN6BM2D	B26	RLD2WMFL2	E24	RPM7140-V4R	E44	RRE02VTM4S	C34
RD3G450GN	B16	RFN6T2D	B26	RLD2WMNL2	E24	RPM7237-H13R	E44	RRE02VTM6S	C34
RD3G500GN	B16	RFN110TJ6S	B26	RLD4BMP2	E24	RPM7237-H4R	E44	RRE04EA4D	C34
RD3G600GN	B16	RFN15BM6S	B26	RLD63NPC5	E25	RPM7237-H5R	E44	RRE07VS4S	C34
RD3G800GN	B16	RFU01AS4S	C35	RLD63NZC5	E25	RPM7237-H8R	E44	RRE07VSM4S	C34
RD3L150GN	B16	RFU01SM4S	C35	RLD65MQX1	E25	RPM7237-H9R	E44	RRE07VSM6S	C34
RD3L200GN	B16	RFU02VS6S	C35	RLD65MZT7	E25	RPM7238-H13R	E44	RRE07VTM4S	C34
RD3L350GN	B16	RFU02VS8S	C35	RLD65NZX2	E25	RPM7238-H4R	E44	RRE07VTM6S	C34
RD3L500GN	B16	RFU02VSM6S	C35	RLD65PZX2	E25	RPM7238-H5R	E44	RRF015P03	C6
RE1C001UN	C3	RFU02VSM8S	C35	RLD65PZX3	E25	RPM7238-H8R	E44	RRH040P03	C13
RE1C001ZP	C3	RFU10TF6S	B26	RLD78MFA7	E25	RPM7238-H9R	E44	RRH050P03	C13
RE1C002UN	C3	RFU20TM5S	B26	RLD78MRA6	E25	RPM7240-H13R	E44	RRH075P03	C13
RE1C002ZP	C3	RFU5TF6S	B26	RLD78MZM7	E25	RPM7240-H4R	E44	RRH090P03	C13
RE1E002SP	C3	RFUH10NS4S	B26	RLD78NZM5	E25	RPM7240-H5R	E44	RRH100P03	C13
RE1J002YN	C3	RFUH10NS6S	B26	RLD82PZJ1	E25	RPM7240-H8R	E44	RRH140P03	C13
RE1L002SN	C3	RFUH10TB4S	B26	RLD84PZJ2	E25	RPM7240-H9R	E44	RRL025P03	C6
RF01VM2S	C35	RFUH10TF6S	B26	RN141G	C41	RPM841-H11	E39	RRL035P03	C6, C14
RF04UA2D	C35	RFUH20NS3S	B26	RN141S	C41	RPM841-H16	E39	RRQ020P03	C7
RF05VA1S	C35	RFUH20NS4S	B26	RN142G	C41	RPM870-H14	E39	RRQ030P03	C7, C14
RF05VA2S	C35	RFUH20NS6S	B26	RN142S	C41	RPM871	E39	RRQ045P03	C7, C14
RF05VAM1S	C35	RFUH20TB3S	B26	RN142ZS	C41	RPM871-H12	E39	RRR015P03	C7
RF05VAM2S	C35	RFUH20TB4S	B26	RN142ZS12A	C41	RPM871-H14	E39	RRR030P03	C7, C14
RF05VYM1S	C35	RFUH20TF6S	B26	RN142ZS8A	C41	RPM872	E39	RRR040P03	C7, C14
RF05VYM2S	C35	RFUH25NS3S	B26	RN242CS	C41	RPM872-H12	E39	RRS040P03	C15
RF071L4S	C35	RFUH25TB3S	B26	RN262CS	C41	RPM872-H14	E39	RRS050P03	C15
RF071M2S	C35	RFUH30TS6D	B26	RN262G	C41	RPM873	E39	RRS075P03	C15
RF071MM2S	C35	RFUH30TS6S	B26	RN731V	C41	RPM971-H14	E39	RRS090P03	C15
RF081L2S	C35	RFUH5TF6S	B26	RN739F	C41	RPM972-H14	E39	RRS100P03	C15
RF081M2S	C35	RFUH60TS6D	B26	RN771V	C41	RPM973-H11	E39	RRS140P03	C15
RF081MM2S	C35	RFUS10TF4S	B26	RN779D	C41	RPM973-H16	E39	RS1E130GN	B14
RF1001NS2D	B26	RFUS20NS4S	B26	RN779F	C41	RPMD-0100	E33	RS1E150GN	B14
RF1001T2D	B26	RFUS20NS6S	B26	RND030N20	B16	RPMS1371-H19	E43	RS1E170GN	B14
RF1005TF6S	B26	RFUS20TF6S	B26	RPI-0125	E29	RPMS1381-H19	E43	RS1E180BN	B14



# Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
RS1E200BN	B14	RSQ015P10	C14	RW1A030AP	C6	SCS230KE2	B3	SLI-560YT	E14
RS1E200GN	B14	RSQ020N03	C7, C14	RW1C015UN	C6	SCS240AE2	B3	SLI-570DT	E14
RS1E240AT	B14	RSQ025P03	C14	RW1C020UN	C6	SCS240AE2HR	B3	SLI-570U2T	E14
RS1E240BN	B14	RSQ035N03	C14	RW1C025ZP	C6	SCS240KE2	B3	SLI-570UT	E14
RS1E240GN	B14	RSQ035N06	C14	RW1E014SN	C6	SCT2080KE	B5	SLI-570Y2T	E14
RS1E280BN	B14	RSQ035P03	C14	RW1E015RP	C6	SCT2120AF	B5	SLI-570YT	E14
RS1E280GN	B14	RSQ045N03	C7, C14	RW1E025RP	C6	SCT2160KE	B5	SLI-580DT	E14
RS1E300GN	B14	RSR010N10	C7, C14	RX1G09BGN	B17	SCT2280KE	B5	SLI-580UT	E14
RS1E320GN	B14	RSR015P06	C14	RX1G11BGN	B17	SCT2450KE	B5	SLI-580YT	E14
RS1E350BN	B14	RSR020N06	C7, C14	RX1G12BGN	B17	SCTMU001F	B5	SLR-322DC	E15
RS1E350GN	B14	RSR020P05	C14	RX1G18BGN	B17	SDR03	D8	SLR-322DU	E15
RS1G120MN	B14	RSR025N03	C7, C14	RX1L03BGN	B17	SDZ Series	C36	SLR-322MC	E15
RS1G150MN	B14	RSR025N05	C7, C14	RX1L05BGN	B17	SH8J31	C13	SLR-322MG	E15
RS1G180MN	B14	RSR025P03	C14	RX1L06BGN	B17	SH8J62	C13	SLR-322VC	E15
RS1G240GN	B14	RSR030N06	C7, C14	RX1L09BGN	B17	SH8J65	C13	SLR-322VR	E15
RS1G260MN	B14	RSS060P05	C15	RX1L14BGN	B17	SH8J66	C13	SLR-322YC	E15
RS1G300GN	B14	RSS065N06	C15	RX1L18BGN	B17	SH8K11	C13	SLR-322YY	E15
RS3E075AT	C13	RSS070N05	C15	RX1L18CGN	B17	SH8K12	C13	SLR-325DC	E15
RSA12L	C39	RSS070P05	C15	RX2L600GN	B17	SH8K13	C13	SLR-325DU	E15
RSA12M	C39	RSS085N05	C15	RX2L750GN	B17	SH8K14	C13	SLR-325MC	E15
RSA12MM	C39	RSS090N03	C15	RX2L800GN	B17	SH8K15	C13	SLR-325MG	E15
RSA30L	C39	RSS095N05	C15	RX2W090AB	B17	SH8K22	C13	SLR-325VC	E15
RSA5L	C39	RSS100N03	C15	RX2W130AB	B17	SH8K25	C13	SLR-325VR	E15
RSA5M	C39	RSS130N03	C15	RX2W150AB	B17	SH8K26	C13	SLR-325YC	E15
RSAS5MM	C39	RSX051VA-30	C32	RX2X060AB	B17	SH8K32	C13	SLR-325YY	E15
RSA6.1EN	C39	RSX071VA-30	C32	RX2X100AB	B17	SH8K41	C13	SLR-332DC	E14
RSA6.1J4	C39	RSX101M-30	C32	RX2X120AB	B17	SH8KA1	C13	SLR-332DU	E14
RSA6.1U5	C39	RSX101MM-30	C33	RXH070N03	C13	SH8KA2	C13	SLR-332MC	E14
RSAC16CS	C38	RSX101VA-30	C32	RXH090N03	C13	SH8KA4	C13	SLR-332MG	E14
RSAC18CS	C38	RSX101VAM30	C32	RXH100N03	C13	SH8M11	C13	SLR-332VC	E14
RSAC6.8CM	C38	RSX101VYM30	C32	RXH125N03	C13	SH8M12	C13	SLR-332VR	E14
RSAC6.8CS	C38	RSX201L-30	C33	RXQ040N03	C7	SH8M13	C13	SLR-332YC	E14
RSB12JS2	C38	RSX201VA-30	C32	RXC035N03	C7	SH8M14	C13	SLR-332YY	E14
RSB12V	C39	RSX201VAM30	C32	RYC002N05	C3	SH8M24	C13	SLR343BC4T	E14
RSB12W	C38	RSX201VYM30	C32	RYM002N05	C3	SH8M41	C13	SLR343BCT	E14
RSB12Z	C38	RSX205L-30	C33	RZF013P01	C6	SIM-012SB	E32	SLR-343DC	E14
RSB16F2	C39	RSX301L-30	C33	RZF020P01	C6	SIM-030ST	E32	SLR-343DU	E14
RSB16V	C39	RSX501L-20	C33	RZF030P01	C6	SIM-040ST	E32	SLR343EC4T	E14
RSB16VA	C39	RT1A045AP	C6	RZM001P02	C3	SIM-20ST	E32	SLR343ECT	E14
RSB16X3N	C39	RT1A050ZP	C6	RZM002P02	C3	SIM-22ST	E32	SLR-343MC	E14
RSB18F2	C39	RT1A060AP	C6	RZQ050P01	C7	SIR-320ST3F	E32	SLR-343MG	E14
RSB18V	C39	RT1C060UN	C6	RZR020P01	C7	SIR-341ST3F	E32	SLR-343PC	E14
RSB18VA	C39	RT1E040RP	C6	RZR025P01	C7	SIR-34ST3F	E32	SLR-343PG	E14
RSB27F2	C39	RT1E050RP	C6	RZR040P01	C7	SIR-505STA47	E32	SLR-343VC	E14
RSB27K2	C39	RT1E060XN	C6	SCH2080KE	B5	SIR-563ST3F	E32	SLR-343VR	E14
RSB27V	C39	RTF016N05	C6, C14	SCM-013RT	E8	SIR-568ST3F	E32	SLR-343YC	E14
RSB27VA	C39	RTF025N03	C6, C14	SCM-014TB	E8	SIR-56ST3F	E32	SLR-343YY	E14
RSB33F2	C39	RTL020P02	C14	SCMP13WBC8W	E5	SLA560BC4T	E14	SLR-56DC	E14
RSB33V	C39	RTL035N03	C6, C14	SCS205KG	B3	SLA560BCT	E14	SLR-56DU	E14
RSB36F2	C39	RTQ020N03	C7	SCS205KGHR	B3	SLA560EC4T	E14	SLR-56MC	E14
RSB36V	C39	RTQ020N05	C7, C14	SCS206AG	B3	SLA560ECT	E14	SLR-56MG	E14
RSB39F2	C39	RTQ025P02	C14	SCS206AGHR	B3	SLA-560MT	E14	SLR-56VC	E14
RSB39V	C39	RTQ035N03	C7, C14	SCS206AJ	B3	SLA-570MT	E14	SLR-56VR	E14
RSB5.6SM	C39	RTQ035P02	C14	SCS206AJHR	B3	SLA580BC4T	E14	SLR-56YC	E14
RSB6.8CM	C39	RTQ045N03	C7, C14	SCS206AM	B3	SLA580BCT	E14	SLR-56YY	E14
RSB6.8CS	C39	RTR020N05	C7, C14	SCS208AG	B3	SLA580EC4T	E14	SML-012D8T	E6
RSB6.8F2	C39	RTR020P02	C14	SCS208AGHR	B3	SLA580ECT	E14	SML-012DT	E6
RSB6.8G	C39	RTR025N03	C7, C14	SCS208AJ	B3	SLA-580MT	E14	SML-012DT(A)	E6
RSB6.8JS2	C38	RTR025N05	C7, C14	SCS208AJHR	B3	SLI-325DC(W)	E15	SML-012M8T	E6
RSB6.8SM	C39	RTR025P02	C14	SCS208AM	B3	SLI-325DU(W)	E15	SML-012P8T	E6
RSB6.8ZS	C39	RTR030N05	C7, C14	SCS210AG	B3	SLI-325UR(W)	E15	SML-012PT(A)	E6
RSBC6.8CS	C39	RTR030P02	C14	SCS210AGHR	B3	SLI-325URC(W)	E15	SML-012U8T	E6
RSC002P03	C3	RTR040N03	C7, C14	SCS210AJ	B3	SLI-325YC(W)	E15	SML-012UT	E6
RSD046P05	B16, B19	RU1C001UN	C3	SCS210AJHR	B3	SLI-325YY(W)	E15	SML-012V8T	E6
RSD050N06	B16, B19	RU1C001ZP	C3	SCS210AM	B3	SLI-343D8C	E14	SML-012VT(A)	E6
RSD050N10	B16, B19	RU1C002UN	C3	SCS210KE2	B3	SLI-343D8U	E14	SML-012Y8T	E6
RSD080N06	B16, B19	RU1C002ZP	C3	SCS210KE2HR	B3	SLI-343DC	E14	SML-012YT	E6
RSD080P05	B16, B19	RU1E002SP	C3	SCS210KG	B3	SLI-343DC(W)	E14	SML-012YT(A)	E6
RSD100N10	B16, B19	RU1J002YN	C3	SCS210KGHR	B3	SLI-343DU	E14	SML-013UT	E6
RSD131P10	B16, B19	RU1L002SN	C3	SCS212AG	B3	SLI-343DU(W)	E14	SML-013YT	E6
RSD140P06	B16, B19	RUC002N05	C3	SCS212AGHR	B3	SLI-343M8C	E14	SML522BU1W	E7
RSD150N06	B16, B19	RUF015N02	C6	SCS212AJ	B3	SLI-343M8G	E14	SML-522MD8W	E7
RSD160P05	B16, B19	RUF020N02	C6	SCS212AJHR	B3	SLI-343MC	E14	SML-522MU8W	E7
RSD175N10	B16, B19	RUF025N02	C6, C14	SCS212AM	B3	SLI-343MG	E14	SML-522MUW	E7
RSD200N05	B16, B19	RUL035N02	C6, C14	SCS215AE	B3	SLI-343P8C	E14	SML-522MY8W	E7
RSD201N10	B16, B19	RUM001L02	C3	SCS215AG	B3	SLI-343P8G	E14	SML-810TB	E8
RSD221N06	B16, B19	RUM002N02	C3	SCS215AGHR	B3	SLI-343U8R	E14	SML-811DT(A)	E6
RSF010P05	C6	RUM002N05	C3	SCS215AJ	B3	SLI-343U8RC	E14	SML-811UT(A)	E6
RSF014N03	C6	RUQ050N02	C14	SCS215AJHR	B3	SLI-343UR	E14	SML-811VT(A)	E6
RSF015N06	C6, C14	RUR020N02	C7	SCS215AM	B3	SLI-343UR(W)	E14	SML-811WT(A)	E6
RSH065N06	C13	RUR040N02	C7, C14	SCS215KG	B3	SLI-343URC	E14	SML812BCT	E6
RSH070N05	C13	RUS100N03	C13	SCS215KGHR	B3	SLI-343URC(W)	E14	SML-812MT	E6
RSH070P05	C13	RV1C001ZP	C3	SCS220AE	B3	SLI-343V8R	E14	SML813WBC8W	E6
RSJ151P10	B17	RV1C002UN	C3	SCS220AE2	B3	SLI-343V8RC	E14	SML-A12D8T	E6
RSJ250P10	B17, B19	RV2C001ZP	C3	SCS220AE2HR	B3	SLI-343Y8C	E14	SML-A12DT(J)	E6
RSJ300N10	B17	RV2C002UN	C3	SCS220AG	B3	SLI-343Y8Y	E14	SMLA12EC6T	E6
RSJ400N06	B19	RV2C010UN	C3	SCS220AGHR	B3	SLI-343YC	E14	SML-A12M8T	E6
RSJ400N10	B17, B19	RV2C012BC	C3	SCS220AJ	B3	SLI-343YC(W)	E14	SML-A12MT(J)	E6
RSJ451N04	B19	RV3C001ZP	C3	SCS220AJHR	B3	SLI-343YY	E14	SML-A12P8T	E6
RSJ550N10	B17, B19	RV3C002UN	C3	SCS220AM	B3	SLI-343YY(W)	E14	SML-A12U8T	E6
RSJ650N10	B17, B19	RV3C006BC	C3	SCS220KE2	B3	SLI-430DU	E15	SML-A12UT(J)	E6
RSJ800N06	B19	RV3E007AJ	C3	SCS220KE2HR	B3	SLI-430MG	E15	SMLA12V8T	E6
RSLO20P03	C14	RVQ040N05	C7, C14	SCS220KG	B3	SLI-430U2R	E15	SMLA12WBC7W	E6
RSM002N06	C3	RW1A013ZP	C6	SCS220KGHR	B3	SLI-430Y2U	E15	SML-A12WT(J)	E6
RSM002P03	C3	RW1A020ZP	C6	SCS230AE2	B3	SLI-560DT	E14	SML-A12Y8T	E6
RSQ015N06	C7, C14	RW1A025AP	C6	SCS230AE2HR	B3	SLI-560UT	E14	SMLA13BC8T	E6

Part No. List

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
SML-D11YW	E5	SML-Z14FT(A)	E6	TT8K11	C6	UMZ1N	C19		
SML-D12D8W	E5	SML-Z14M4T	E6	TT8K2	C6	UMZ27N	C38		
SML-D12FW	E5	SML-Z14MT(A)	E6	TT8M1	C6	UMZ2N	C19		
SML-D12M8W	E5	SML-Z14P4T	E6	TT8M11	C6	UMZ30N	C38		
SML-D12P8W	E5	SML-Z14PT(A)	E6	TT8M2	C6	UMZ36N	C38		
SML-D12U8W	E5	SML-Z14U4T	E6	TT8M3	C6	UMZ5.1N	C38		
SML-D12V8W	E5	SML-Z14UT(A)	E6	TT8U1	C9	UMZ6.8EN	C38		
SML-D12W8W(A)	E5	SML-Z14V4T	E6	TT8U2	C9	UMZ6.8N	C38		
SML-D12Y3W	E5	SML-Z14VT(A)	E6	UCR006	D12	UMZ8.2N	C38		
SML-D12Y8W	E5	SML-Z14Y4T	E6	UCR01	D12	UMZ8.2T	C38		
SML-D13DW(A)	E5	SML-Z14YT(A)	E6	UCR03	D12	UMZC6.8N	C38		
SML-D13FW	E5	SMLZN4BGT(A)	E6	UCR10	D12	UMZU6.2N	C38		
SML-D13M8W	E5	SMLZN4WBGUW(A)	E6	UCR18	D12	US5U1	C9		
SML-D13MW(A)	E5	SMR003	D3	UDZ V Series	C36	US5U2	C9		
SML-D13U8W	E5	SP8J5	C15	UDZU5.6B	C38	US5U3	C9		
SML-D13UW(A)	E5	SP8J66	C15	UDZU6.2	C38	US5U30	C9		
SML-D13VW(A)	E5	SP8K1	C15	UM6J1N	C3	US5U35	C9		
SML-D13WW(A)	E5	SP8K2	C15	UM6K31N	C3	US5U38	C9		
SML-D13Y2W	E5	SP8K22	C15	UM6K33N	C3	US6H23	C22		
SML-D13Y8W	E5	SP8K23	C15	UM6K34N	C3	US6J11	C6		
SML-D14DW(A)	E5	SP8K24	C15	UMA1N	C22	US6J12	C6		
SML-D14MW(A)	E5	SP8K3	C15	UMA2N	C22	US6K1	C6		
SML-D14U2W(A)	E5	SP8K31	C15	UMA3N	C22	US6K2	C6		
SML-D14VW(A)	E5	SP8K32	C15	UMA4N	C22	US6K4	C6		
SML-D14WW(A)	E5	SP8K33	C15	UMA5N	C22	US6M1	C6		
SML-D14YW(A)	E5	SP8K5	C15	UMA9N	C22	US6M11	C6		
SML-D15DW(A)	E5	SP8K52	C15	UMB10N	C22	US6M2	C6		
SML-D15MW(A)	E5	SP8K80	B18	UMB11N	C22	US6T4	C17		
SML-D15PW(A)	E5	SP8M1	C15	UMB2N	C22	US6T5	C17		
SML-D15U2W(A)	E5	SP8M10	C15	UMB3N	C22	US6T8	C19		
SML-D15UW(A)	E5	SP8M21	C15	UMB4N	C22	US6T9	C19		
SML-D15VW(A)	E5	SP8M24	C15	UMB6N	C22	US6U37	C9		
SML-D15WW(A)	E5	SP8M3	C15	UMD12N	C23	US6X3	C17		
SML-D15YW(A)	E5	SP8M4	C15	UMD22N	C23	US6X4	C17		
SML-E12D8W	E5	SP8M41	C15	UMD2N	C23	US6X7	C19		
SML-E12DW	E5	SP8M5	C15	UMD3N	C23	US6X8	C19		
SML-E12M8W	E5	SP8M51	C13, C15	UMD4N	C23	USB 300	F10		
SML-E12P8W	E5	SP8M6	C15	UMD5N	C23	USB 400J	F10		
SML-E12U8W	E5	SP8M8	C15	UMD6N	C23	UT6J3	C11		
SML-E12UW	E5	SST2222A	C16	UMD9N	C23	UT6K1	C11		
SML-E12V8W	E5	SST2907A	C16	UMF28N	C20	UT6K3	C11		
SML-E12Y8W	E5	SST3904	C16	UMF5N	C20	UT6MA2	C11		
SMLE13BC8T	E5	SST3906	C16	UMG11N	C22	UT6MA3	C11		
SMLE13EC8T	E5	SST4401	C16	UMG1N	C22	VMZ6.8N	C38		
SMLE13WBC8W	E5	SST4403	C16	UMG2N	C22	VMZT6.8N	C38		
SML-H10TB	E8	SST6838	C16	UMG3N	C22	VS5V0BA1ES	C38		
SML-H12D8T	E6	SST6839	C16	UMG4N	C22	VT6J1	C3		
SML-H12M8T	E6	SSTA06	C16	UMG5N	C22	VT6K1	C3		
SML-H12P8T	E6	SSTA13	C16	UMG6N	C22	VT6M1	C3		
SML-H12U8T	E6	SSTA28	C16	UMG8N	C22	VT6T1	C19		
SML-H12V8T	E6	SSTA56	C16	UMG9N	C22	VT6T11	C19		
SML-H12Y8T	E6	STM 300	F10	UMH10N	C22	VT6T12	C19		
SMLK18WBJAW	E6	STM 320	F10	UMH11N	C22	VT6T2	C19		
SMLK18WBJBW	E6	STM 330	F10	UMH14N	C22	VT6X1	C19		
SMLK18WBJCW	E6	STM 400J	F10	UMH1N	C22	VT6X11	C19		
SMLK18WBJDW	E6	STM 429J	F10	UMH2N	C22	VT6X12	C19		
SMLK28WBJCW	E6	STM 431J	F10	UMH32N	C22	VT6X2	C19		
SML-M13DT	E6	STZ5.6N	C38	UMH33N	C22	VT6Z1	C19		
SML-M13MT	E6	STZ6.2N	C38	UMH37N	C22	VT6Z2	C19		
SML-M13PT	E6	STZ6.8N	C38	UMH3N	C22	YFZ V Series	C36		
SML-M13RT	E8	STZ6.8T	C38	UMH4N	C22				
SML-M13UT	E6	STZC6.8N	C38	UMH5N	C22				
SML-M13VT	E6	TC Series (A case)	D23	UMH6N	C22				
SML-M13YT	E6	TC Series (M case)	D21	UMH8N	C22				
SMLMN2BCT	E6	TC Series (P case)	D23	UMH9N	C22				
SMLMN2WB1CW	E6	TCFG Series (B case)	D23	UML1N	C20				
SML-P11DT(R)	E5	TCM 300	F10	UML23N	C20				
SML-P11MT(R)	E5	TCM 410J	F10	UML2N	C20				
SML-P11UT(R)	E5	TCO Series (B case)	D27	UML4N	C20				
SML-P11VT(R)	E5	TCS Series (M case)	D20	UML6N	C20				
SML-P11YT(R)	E5	TCS Series (P case)	D20	UMN10N	C40				
SML-P12DT(R)	E5	TCS Series (PS case)	D20	UMN11N	C40				
SML-P12MT(R)	E5	TCSO Series (M case)	D24	UMN1N	C40				
SML-P12PT(R)	E5	TCSO Series (PL case)	D24	UMN20N	C40				
SML-P12UT(R)	E5	TCT Series (AL case)	D22	UMP11N	C40				
SML-P12VT(R)	E5	TCT Series (AS case)	D22	UMP1N	C40				
SML-P12YT(R)	E5	TCT Series (ML case)	D21	UMR11N	C40				
SMLP13BC8T	E5	TCT Series (P case)	D22	UMR12N	C40				
SMLP13EC8T	E5	TCT Series (PL case)	D22	UMT18N	C19				
SML-P24MUW(R)	E7	TCT Series (U case)	D21	UMT1N	C19				
SMLP34RGB2W	E7	TCTO Series (A case)	D26	UMT222A	C16				
SMLP36RGB2W(R)	E7	TCTO Series (AL case)	D26	UMT2907A	C16				
SML-S13DT	E7	TCTO Series (AS case)	D26	UMT2N	C19				
SML-S13MT	E7	TCTO Series (BL case)	D26	UMT3904	C16				
SML-S13RT	E8	TCTO Series (M case)	D25	UMT3906	C16				
SML-S13UT	E7	TCTO Series (P case)	D25	UMX18N	C19				
SML-S13VT	E7	TCTO Series (U case)	D25	UMX1N	C19				
SML-S13YT	E7	TDZ Series	C36	UMX2N	C19				
SMLS14BET	E7	TFZ Series	C36	UMX3N	C19				
SMLS14EET	E7	TFZ V Series	C36	UMX4N	C19				
SMLVN6RGB1U	E8	TT8J11	C6	UMX5N	C19				
SMLVN6RGB1W	E8	TT8J13	C6	UMY1N	C19				
SML-Z14D4T	E6	TT8J2	C6	UMZ K Series	C36				
SML-Z14DT(A)	E6	TT8J21	C6	UMZ12N	C38				
SMLZ14EGT(A)	E6	TT8J3	C6	UMZ16N	C38				
SML-Z14F4T	E6	TT8K1	C6	UMZ18N	C38				

# The ROHM Sales Network



## THE AMERICAS

**1: Santa Clara / ROHM Semiconductor U.S.A., LLC**  
2323 Owen Street, Santa Clara, CA 95054 U.S.A.  
TEL: +1-408-720-1900 FAX: +1-408-720-1918

**2: Atlanta / ROHM Semiconductor U.S.A., LLC**  
4550 North Point Parkway, Suite 360, Alpharetta, GA 30022 U.S.A.  
TEL: +1-770-754-5972 FAX: +1-770-754-0691

**3: San Diego / ROHM Semiconductor U.S.A., LLC**  
6020 Cornerstone Court West, Suite 320, San Diego, CA 92121 U.S.A.  
TEL: +1-858-625-3600 FAX: +1-858-625-3640

**4: Sao Paulo / ROHM Semiconductor do Brasil Ltda.**  
Rua Dr.Candido Espinheira, No.396, 12th floor, Rooms123 and 124,  
Bairro Perdizes, Sao Paulo SP 05004-000 Brasil  
TEL: +55-11-3539-6320 FAX: +55-11-2892-5697

**5: Santa Clara / LAPIS Semiconductor America, Inc.**  
2323 Owen Street, Santa Clara, CA 95054 U.S.A.  
TEL: +1-408-720-6223 FAX: +1-408-720-1921

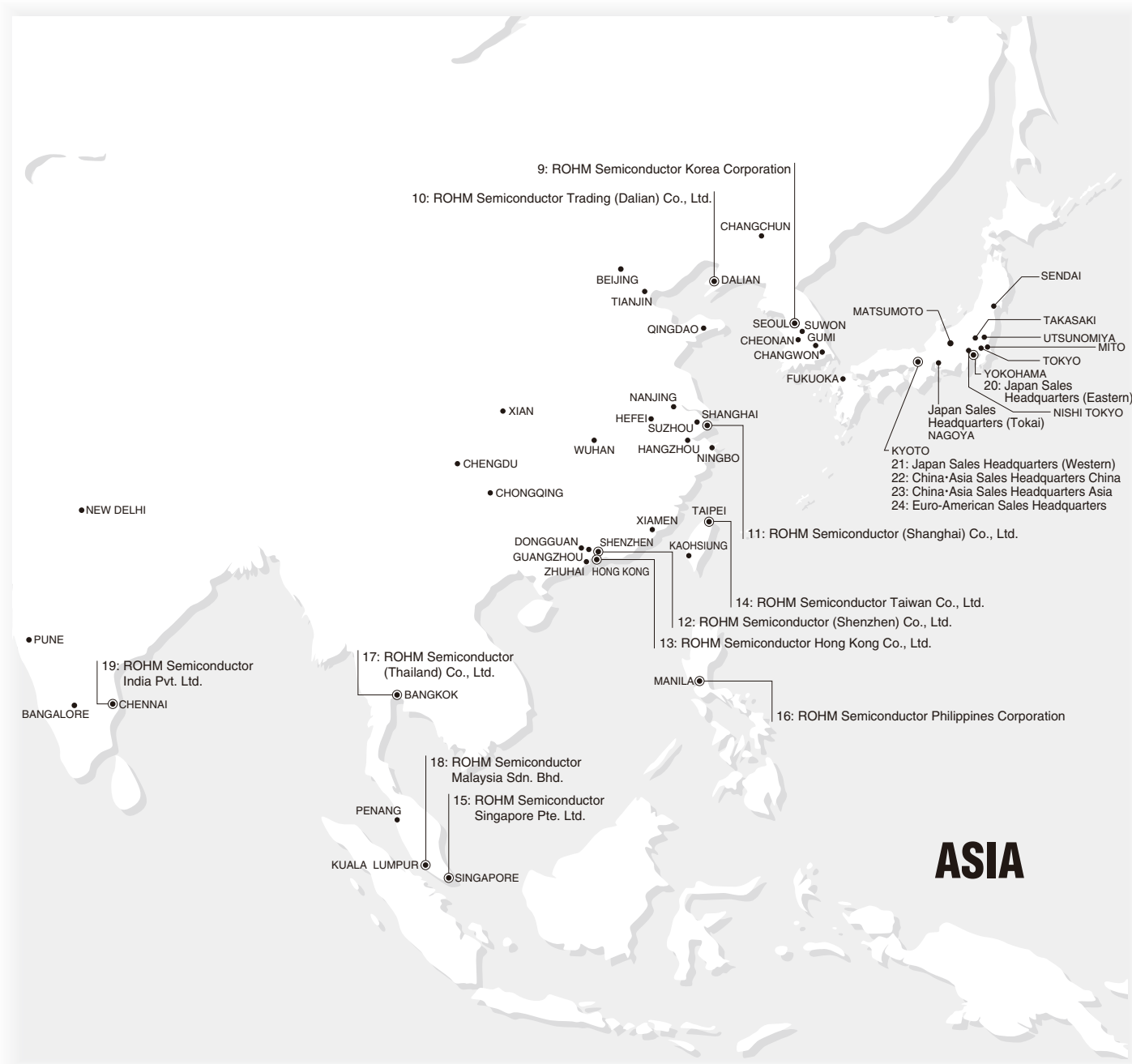
## EUROPE

**6: Germany / ROHM Semiconductor GmbH**  
Karl-Arnold-Straße 15, 47877 Willich-Munchheide Germany  
TEL: +49-2154-921-0 FAX: +49-2154-921-400

**7: France / ROHM Semiconductor GmbH**  
40 rue d'Oradour sur Glane, 75015 Paris France  
TEL: +33(0)1 40 60 87 30 FAX: +33(0)1 40 60 63 44

**8: United Kingdom / ROHM Semiconductor GmbH**  
Sunningdale House, 41 Caldecotte Lake Drive,  
Caldecotte Lake Business Park, Milton Keynes MK78LF U.K.  
TEL: +44-1-908-272400 FAX: +44-1-908-630011





## JAPAN

### 20: Japan

#### Sales Headquarters (Eastern)

ROHM Shin Yokohama Ekimae Building,  
2-4-8 Shin Yokohama, Kohoku-ku, Yokohama 222-8575 JAPAN  
TEL: +81-45-476-2121 FAX: +81-45-476-2295

### 21: Japan

#### Sales Headquarters (Western)

ROHM Kyoto Ekimae Building,  
579-32 Higashi Shioikoji-cho, Karasuma Nishi-iru,  
Shioikoji-dori, Shimogyo-ku, Kyoto 600-8216 Japan  
TEL: +81-75-365-1077 FAX: +81-75-365-1080

### 22: China-Asia Sales Headquarters

21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto 615-8585 Japan  
TEL: +81-75-311-2121 FAX: +81-75-315-0172

### 23: Euro-American Sales Headquarters

21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto 615-8585 Japan  
TEL: +81-75-311-2121 FAX: +81-75-315-0172

## ASIA

### 9: Korea / ROHM Semiconductor Korea Corporation

159-13 Gasan Digital 1-ro, Geumcheon-gu, Seoul, 153-803 Korea  
TEL: +82-2-8182-7000 FAX: +82-2-8182-715

### 10: Dalian / ROHM Semiconductor Trading (Dalian) Co., Ltd.

Room 02B-03 5/F Tower Two, Kerry Plaza, 1 Zhongxinsi Road,  
Dalian 116001 China  
TEL: +86-411-8230-8549 FAX: +86-411-8230-8535

### 11: Shanghai / ROHM Semiconductor (Shanghai) Co., Ltd.

22F. CENTRAL TOWERS, 567 Langao Road,  
Shanghai 200333 China  
TEL: +86-21-6072-8612 FAX: +86-21-6072-8610

### 12: Shenzhen / ROHM Semiconductor (Shenzhen) Co., Ltd.

Room 02B-03 5/F Tower Two, Kerry Plaza, 1 Zhongxinsi Road,  
Futian, Shenzhen 518034 China  
TEL: +86-755-8307-3008 FAX: +86-755-8307-3003-101

### 13: Hong Kong / ROHM Semiconductor Hong Kong Co., Ltd.

Room 1402-10 Tower 1, Silvercord, 30 Canton Road,  
Tsimshatsui, Kowloon, Hong Kong  
TEL: +852-2740-6262 FAX: +852-2375-8971

### 14: Taiwan / ROHM Semiconductor Taiwan Co., Ltd.

11F No.6 Sec.3 Min Chuan E.Road, Taipei, Taiwan  
TEL: +886-2-2500-6956 FAX: +886-2-2503-2869

### 15: Singapore / ROHM Semiconductor Singapore Pte. Ltd.

83 Clemenceau Avenue, #05-01 UE Square,  
Singapore, 239920  
TEL: +65-6436-5100 FAX: +65-6436-5190

### 16: Philippines / ROHM Semiconductor Philippines Corporation

Unit 4B Citibank-Frabelle Building, Madrigal Business Park,  
Alabang-Zapote Road, Muntinlupa City 1770 Philippines  
TEL: +63-2-807-6872 FAX: +63-2-809-1568

### 17: Thailand / ROHM Semiconductor (Thailand) Co., Ltd.

11th Floor GPF Witthayu Towers A 93/1 Wireless Road,  
Lumpini, Pathumwan, Bangkok 10330 Thailand  
TEL: +66-2-254-4890 FAX: +66-2-256-6334

### 18: Malaysia / ROHM Semiconductor Malaysia Sdn. Bhd.

L12-01-02, Level 12, PJX-HM Shah Tower, NO16A, Persiaran Barat, 46050  
Petaling Jaya, Selangor, Malaysia  
TEL: +60-3-7931-8155 FAX: +60-3-7931-8955

### 19: India / ROHM Semiconductor India Pvt. Ltd.

Unit No.715, 7th Floor Spencer Plaza, No.768 & 769, Anna Salai,  
Chennai-600002, Tamil Nadu, India  
TEL: +91-44-4352-0008 FAX: +91-44-4352-0003



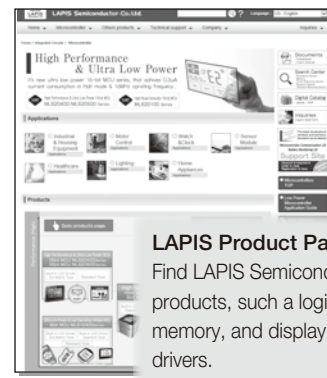
ROHM's website has been completely updated with a new design that's easier to use and includes additional content.

## Product Information

All product lineups from LAPIS Semiconductor and Kionix can now be accessed and searched directly on ROHM's website.



Products			
<b>ICs</b> <ul style="list-style-type: none"> <li>Memory</li> <li>Amplifiers &amp; Linear</li> <li>Power Management</li> <li>Clocks &amp; Timers</li> <li>Switch &amp; Multiplexer &amp; Logic</li> <li>Data Converter</li> <li>Sensors &amp; MEMS</li> <li>Display Drivers</li> <li>Motor / Actuator Drivers</li> <li>Interface</li> <li>Communication LSI (LAPIS)</li> <li>Audio &amp; Video</li> <li>Speech Synthesis LSI (LAPIS)</li> <li>Microcontrollers</li> </ul>	<b>Discrete Semiconductors</b> <ul style="list-style-type: none"> <li>Transistors</li> <li>Diodes</li> <li>Power Devices</li> <li>SiC Power Devices</li> <li>IGBT</li> <li>Opto Electronics</li> <li>LED</li> <li>LED Displays</li> <li>Laser Diodes</li> <li>Optical Sensors</li> <li>IrDA Infrared Communication</li> <li>Remote Control Receiver</li> </ul>	<b>Passive Components</b> <ul style="list-style-type: none"> <li>Resistors</li> <li>Tantalum Capacitors</li> </ul>	<b>Commercial Products</b> <ul style="list-style-type: none"> <li>LED Lighting</li> <li>Analyst</li> <li>Intel Chipset</li> </ul>
<b>Power Devices</b> <ul style="list-style-type: none"> <li>Clocks &amp; Timers</li> <li>Switch &amp; Multiplexer &amp; Logic</li> <li>Data Converter</li> <li>Sensors &amp; MEMS</li> <li>Display Drivers</li> <li>Motor / Actuator Drivers</li> <li>Interface</li> <li>Communication LSI (LAPIS)</li> <li>Audio &amp; Video</li> <li>Speech Synthesis LSI (LAPIS)</li> <li>Microcontrollers</li> </ul>	<b>Power Modules</b> <ul style="list-style-type: none"> <li>Wireless Communication Modules</li> <li>Contact Image Sensor Heads</li> <li>Printheads</li> <li>Batteryless Radio Module (EnOcean)</li> </ul>	<b>Modules (Sub Systems)</b> <ul style="list-style-type: none"> <li>Power Modules</li> <li>Wireless Communication Modules</li> <li>Contact Image Sensor Heads</li> <li>Printheads</li> <li>Batteryless Radio Module (EnOcean)</li> </ul>	



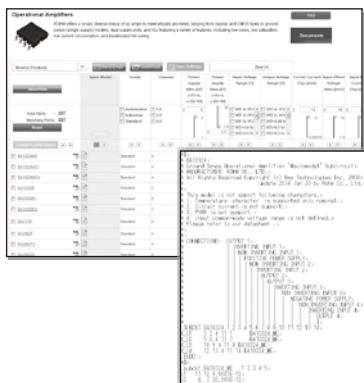
**LAPIS Product Page**  
Find LAPIS Semiconductor products, such a logic ICs, memory, and display drivers.



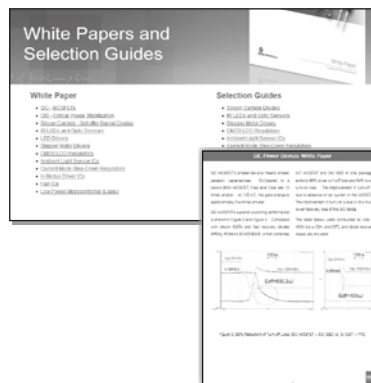
**Kionix Product Page**  
Search through Kionix's entire portfolio of products, including sensors and MEMS devices.

## Design Tools and Support

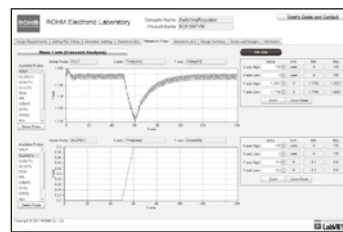
Design support such as tools and services are provided.



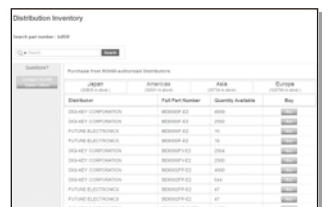
**Design Simulation Models**  
Access emulation models, including SPICE/IBIS models and thermal/frequency characteristics, for hundreds of ROHM products.



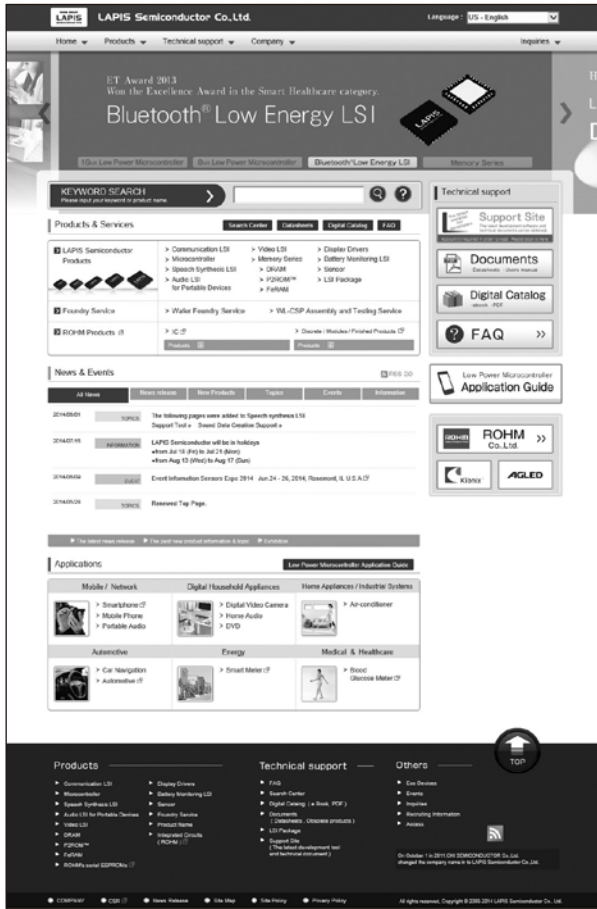
**White Papers And Selection Guides**  
Access white papers and selection guides for a range of ROHM products.



**ROHM's Electronic Laboratory**  
ROHM's online design tool, ROHM Electronic Laboratory (eLab), allows designers to evaluate products and circuits directly from the web.

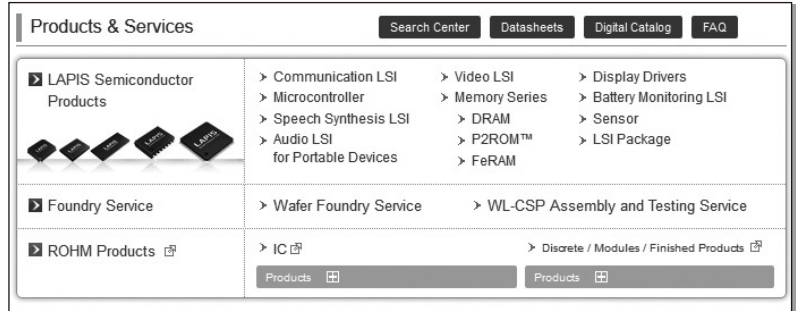


**Distribution Inventory**  
Search online for thousands of in-stock ROHM products at one of our global distributors.



## Products and Services

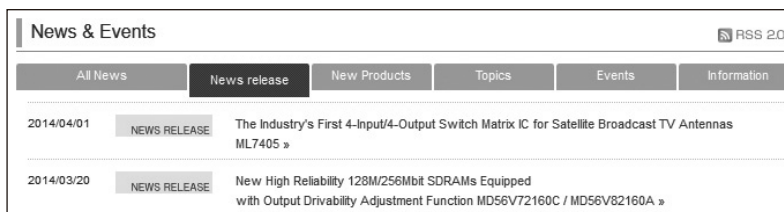
Includes new product announcements (i.e. ICs and modules) and downloadable materials such as product datasheets.



Part No	Operating Condition		ROM/RAM			Function/Feature		Package	Chip support	Remarks
	Operating Voltage (V)	Operant Temperature (°C)	ROM Type	ROM Capacity (Byte)	RAM Capacity (Byte)	LCD Driver				
ML610Q421 <a href="#">datasheet</a>	1.1 to 3.6	-20 to +70	Flash	32K	2K	Max 400dot 50seg x 8cm.	TQFP120 <a href="#">More</a>	○	-	
ML610Q421P <a href="#">datasheet</a>	1.1 to 3.6	-40 to +85	Flash	32K	2K	Max 400dot 50seg x 8cm.	TQFP120 <a href="#">More</a>	○	-	

## Latest News

Access the latest news and information, including Press Releases and New Product Bulletins.



## Support Page

Download useful development materials and software updates.



\*Registration required.

\*Some content requires the development board serial number.

### The Industry's First\* 4-Input/4-Output Switch Matrix IC for Satellite Broadcast TV Antennas

\*February 27, 2014  
LAPIS Semiconductor survey

**Contributes to greater performance<sup>1</sup> and miniaturization while simplifying board design**

LAPIS Semiconductor Co., Ltd., a ROHM Group Company, has recently developed a 4-input/4-output switch matrix IC designed for satellite broadcast antennas.

The ML7405 is the first IC to feature a **universal quad satellite broadcasting reception<sup>2</sup>** circuit that connects two conventional 4-input/2-output switch ICs in parallel on a single chip.

The optimized, integrated design improves performance while enabling increased miniaturization and is expected to spur demand for satellite broadcast receivers.

**Mounting Area and Layout Comparison : Conventional Solution vs. ML7405**

### LAPIS Semiconductor Support Site

#### Low Power Microcontroller

Type of MCU	Part Number	Operating voltage (V)	Operating frequency (MHz)	Current consumption (µA)	ROM capacity (KB)	Data Flash capacity (KB)	RAM capacity (KB)	LCD Driver	ADC (channel)	Number of pins	IC
High Performance & Ultra Low Power MCU 16bit ML620400 Series	ML620400	1.5 to 5.5	180kHz	0.5µA	Flash 64K	2K	6K	None (1/16dot)	10bits (2/12.5bit)	40pins	2
	ML620401	1.5 to 5.5	180kHz	0.5µA	Flash 64K	2K	6K	None (1/16dot)	10bits (2/12.5bit)	40pins	2
High Performance & Ultra Low Power MCU 16bit ML620500 Series	ML620500	1.5 to 5.5	180kHz	0.5µA	Flash 128K	2K	12K	None (1/16dot)	10bits (2/12.5bit)	40pins	2
	ML620501	1.5 to 5.5	180kHz	0.5µA	Flash 128K	2K	12K	None (1/16dot)	10bits (2/12.5bit)	40pins	2

Contact us for further information about the products.

**[THE AMERICAS]**

**Santa Clara** 2323 Owen Street, Santa Clara CA 95054 U.S.A.  
TEL: +1-408-720-1900 FAX: +1-408-720-1918

**Atlanta** 4550 North Point Parkway, Suite 360, Alpharetta, GA 30022 U.S.A.  
TEL: +1-770-754-5972 FAX: +1-770-754-0691

**Boston** 9 Main Street, Suite 2, Concord, MA 01742 U.S.A.  
TEL: +1-978-371-0382 FAX: +1-928-438-7164

**Chicago** 3800 N. Wilke Road, Suite 230, Arlington, Heights, IL 60004 U.S.A.  
TEL: +1-847-368-1006 FAX: +1-847-368-1008

**Denver** 16-A Inverness Place East, Suite 200, Englewood, CO 80112 U.S.A.  
TEL: +1-303-708-0908 FAX: +1-303-708-0858

**Detroit** 26800 Meadowbrook Road, Suite 120, Novi, MI 48377 U.S.A.  
TEL: +1-248-348-9920 FAX: +1-248-348-9942

**San Diego** 6020 Cornerstone Court West, Suite 320, San Diego, CA 92121 U.S.A.  
TEL: +1-858-625-3600 FAX: +1-858-625-3640

**Mexico** Av. Lazaro Cardenas #4135-PH, Jardines De San Ignacio, Zapopan,  
Jalisco 45040 Mexico  
TEL: +52-33-3123-2001 FAX: +52-33-3123-2002

**Brasil** Rua Dr.Candido Espinheira, No.396, 12th floor, Rooms123 and 124,  
Bairro Perdizes, Sao Paulo SP 05004-000 Brasil  
TEL: +55-11-3539-6320 FAX: +55-11-2892-5697

**[ASIA]**

**Seoul** 159-13 Gasan Digital 1-ro, Geumcheon-gu, Seoul, 153-803 Korea  
TEL: +82-2-8182-700 FAX: +82-2-8182-715

**Dalian** 1201 Swish-hotel, 21 Wuhui Road, Zhong Shan District, Dalian 116001 China  
TEL: +86-411-8230-8549 FAX: +86-411-8230-8535

**Shanghai** 22F. CENTRAL TOWERS, 567 Langao Road, Shanghai 200333 China  
TEL: +86-21-6072-8612 FAX: +86-21-6072-8610

**Shenzhen** Room 02B-03 5/F Tower Two, Kerry Plaza, 1 Zhongxinsi Road, Futian,  
Shenzhen 518048 China  
TEL: +86-755-8307-3008 FAX: +86-755-8307-3003-101

**Hong Kong** Room 1402-10 Tower 1, Silvercord, 30 Canton Road, Tsimshatsui, Kowloon,  
Hong Kong  
TEL: +852-2740-6262 FAX: +852-2375-8971

**Taiwan** 11F No.6 Sec.3 Min Chuan E. Road, Taipei, Taiwan  
TEL: +886-2-2500-6956 FAX: +886-2-2503-2869

**Singapore** 83 Clemenceau Avenue, #05-01 UE Square, Singapore, 239920  
TEL: +65-6436-5100 FAX: +65-6436-5190

**Philippines** Unit 4B Citibank-Frabelle Building, Madrigal Business Park, Alabang-Zapote Road,  
Muntinlupa City 1770 Philippines  
TEL: +63-2-807-6872 FAX: +63-2-809-1568

**Thailand** 11th Floor GPF Withthayu Towers A, 93/1 Wireless Road, Lumpini,  
Pathumwan Bangkok 10330 Thailand  
TEL: +66-2-254-4890 FAX: +66-2-256-6334

**Malaysia** L12-01-02, Level 12, PJX-HM Shah Tower, NO16A, Persiaran Barat,  
46050 Petaling Jaya, Selangor, Malaysia  
TEL: +60-3-7931-8155 FAX: +60-3-7931-8955

**India** Unit No.715, 7th Floor Spencer Plaza, No.768 & 769, Anna Salai, Chennai-600002,  
Tamil Nadu, India  
TEL: +91-44-4352-0008 FAX: +91-44-4352-0003

**[EUROPE]**

**Düsseldorf** Karl-Arnold-Straße 15, 47877 Willich-Munchheide Germany  
TEL: +49-2154-921-0 FAX: +49-2154-921-400

**Germany** Zettachring 6, 70567 Stuttgart Germany  
TEL: +49-711-7272370 FAX: +49-711-7272370

**France** 40 rue d' Oradour sur Glane, 75015 Paris France  
TEL: +33 (0)1 40 60 87 30 FAX: +33 (0)1 40 60 63 44

**United Kingdom** Sunningdale House, 41 Caldecotte Lake Drive,  
Caldecotte Lake Business Park, Milton Keynes MK78LF UK  
TEL: +44-1-908-272400 FAX: +44-1-908-630011

**Finland** Kiviharjuntie 11, 90220 Oulu Finland  
TEL: +358-400-726124

**Spain** c/Sant Christofol, 25 Local A+B, Premia de Mar, 08330 Barcelona Spain  
TEL: +34-9375-24320 FAX: +34-9375-24410

**Hungary** Fehérvári út 84/A, I em. HUN-1119 Budapest Hungary  
TEL: +36-1-950-5859

**Russia** 13F Office No.1301 Savelkinskiy proezd 4, 124482 Moscow Zelenograd Russia  
TEL: +74 95 739 4174 FAX: +74 95 739 4174

**[JAPAN]**

**Kyoto** ROHM Kyoto Ekimae Building, 579-32 Higashi Shiokoji-cho, Karasuma Nishi-iru,  
Shiokoji-dori, Shimogyo-ku, Kyoto 600-8216 Japan  
TEL: +81-75-365-1218 FAX: +81-75-365-1228

**Yokohama** 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama 222-8575 Japan  
TEL: +81-45-476-2289 FAX: +81-45-476-2295

---

## Notes

- 1) The information contained in this document is provided as of 1st. October, 2014.
  - 2) The information contained herein is subject to change without notice. Before you use our Products, please contact our sales representative (as listed below) and verify the before page specifications.
  - 3) Although "ROHM group" (It is said here in after refers to ROHM) is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.
  - 4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.
  - 5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.
  - 6) The Products are intended for use in general electronic equipment (i.e. AV/OA devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.
  - 7) The Products specified in this document are not designed to be radiation tolerant.
  - 8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative: transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.
  - 9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.
  - 10) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.
  - 11) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrant that such information is error-free and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.
  - 12) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office as listed the before page. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.
  - 13) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.
  - 14) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.
- 

### [ Compliance to RoHS Directive ]

All of the products comply with the RoHS Directive.  
With the exception of specific exemptions granted under the RoHS Directive and naturally occurring impurities, the products conform to control limits on the six substances regulated by the RoHS Directive (lead, cadmium, mercury, hexavalent chromium, PBB, and PBDE). Indicates that the product's terminals and electrodes contain no lead. The products internal components other than those specifically exempted under the RoHS Directive. It should not be construed as guarantee of compliance with laws and regulations enacted by EU member states in response to the RoHS Directive.

**ROHM**  
SEMICONDUCTOR

**ROHM Co.,Ltd.**

21 Saiin Mizosaki-cho, Ukyo-ku,  
Kyoto 615-8585 Japan  
TEL : +81-75-311-2121 FAX : +81-75-315-0172  
<http://www.rohm.com>

ROHM GROUP  
**LAPIS**  
SEMICONDUCTOR

