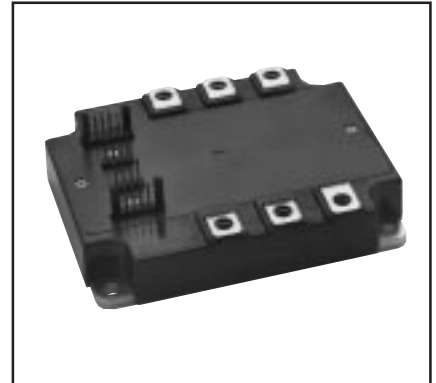
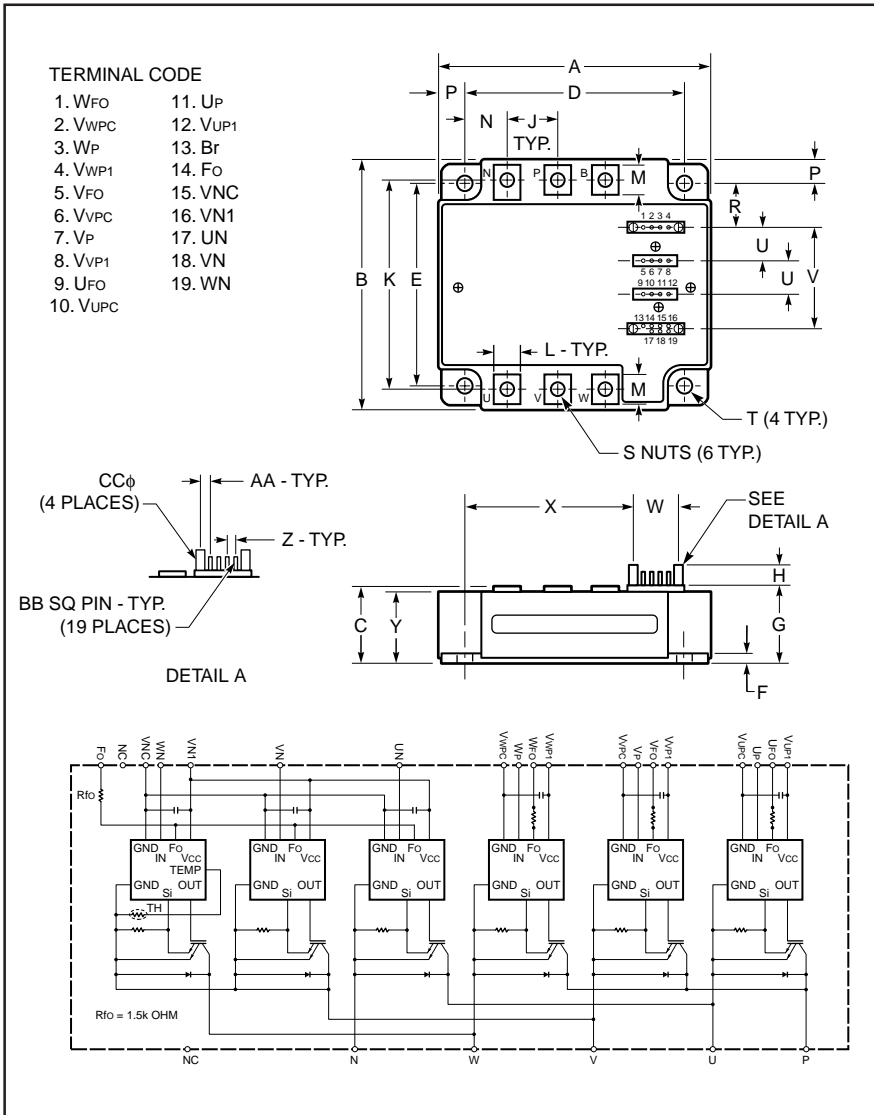


PM100CVA060

FLAT-BASE TYPE
INSULATED PACKAGE



Description:

Mitsubishi Intelligent Power Modules are isolated base modules designed for power switching applications operating at frequencies to 20kHz. Built-in control circuits provide optimum gate drive and protection for the IGBT and free-wheel diode power devices.

Features:

- Complete Output Power Circuit
- Gate Drive Circuit
- Protection Logic
 - Short Circuit
 - Over Temperature
 - Under Voltage

Applications:

- Inverters
- UPS
- Motion/Servo Control
- Power Supplies

Ordering Information:

Example: Select the complete part number from the table below -i.e. PM100CVA060 is a 600V, 100 Ampere Intelligent Power Module.

| Type | Current Rating Amperes | V _{CES} Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM | 100 | 60 |

Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|------------------|----------------|
| A | 4.33 | 110.0 |
| B | 3.50 | 89.0 |
| C | 0.87 +0.04/-0.02 | 22.0 +1.0/-0.5 |
| D | 3.74±0.010 | 95.0±0.25 |
| E | 2.91±0.010 | 74.0±0.25 |
| F | 0.16 | 4.0 |
| G | 0.87 | 22.0 |
| H | 0.42 | 10.6 |
| J | 0.79 | 20.0 |
| K | 2.99±0.02 | 76.0±0.5 |
| L | 0.39 | 10.0 |
| M | 0.49 | 12.5 |
| N | 0.67 | 17.0 |

| Dimensions | Inches | Millimeters |
|------------|------------------|---------------|
| P | 0.30 | 7.5 |
| R | 0.65 | 16.5 |
| S | M5 Metric | M5 |
| T | 0.22 Dia. | Dia. 5.5 |
| U | 0.56±0.010 | 14.1±0.25 |
| V | 1.72±0.012 | 43.57±0.3 |
| W | 0.57±0.012 | 14.6±0.3 |
| X | 2.90 | 73.7 |
| Y | 0.78 | 19.7 |
| Z | 0.10±0.010 | 2.54±0.25 |
| AA | 1.37±0.010 | 3.49±0.25 |
| BB | 0.02 SQ | 0.64 SQ |
| CC | 0.12 +0.04/-0.02 | 3.0 +1.0/-0.5 |

PM100CVA060

**FLAT-BASE TYPE
INSULATED PACKAGE**

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

| | Symbol | Ratings | Units |
|-------------------------------------------------------------------------------------------------------------------|------------------------|------------|---------------------------|
| Power Device Junction Temperature | T_j | -20 to 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -40 to 125 | $^\circ\text{C}$ |
| Case Operating Temperature | T_C | -20 to 100 | $^\circ\text{C}$ |
| Mounting Torque, M5 Mounting Screws | — | 2.5~3.5 | $\text{N} \cdot \text{m}$ |
| Mounting Torque, M5 Main Terminal Screws | — | 2.5~3.5 | $\text{N} \cdot \text{m}$ |
| Module Weight (Typical) | — | 560 | Grams |
| Supply Voltage, Surge (Applied between P - N, Surge Value) | $V_{\text{CC(surge)}}$ | 500 | Volts |
| Supply Voltage Protected by SC ($V_D = 13.5 \sim 16.5\text{V}$, Inverter Part, $T_j = 125^\circ\text{C}$ Start) | $V_{\text{CC(prot.)}}$ | 400 | Volts |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.) | V_{iso} | 2500 | V_{rms} |

Control Sector

| | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----|-------|
| Supply Voltage (Applied between $V_{\text{UP1}}-V_{\text{UPC}}$, $V_{\text{VP1}}-V_{\text{VPC}}$, $V_{\text{WP1}}-V_{\text{WPC}}$, $V_{\text{N1}}-V_{\text{NC}}$) | V_D | 20 | Volts |
| Input Voltage (Applied between U_P-V_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , $U_N \cdot V_N \cdot W_N-V_{\text{NC}}$) | V_{CIN} | 20 | Volts |
| Fault Output Supply Voltage (Applied between F_O-V_{NC} , $*F_O-V_{*PC}$) | V_{FO} | 20 | Volts |
| Fault Output Current (Sink Current at U_{FO} , V_{FO} , W_{FO} and F_O Terminal) | I_{FO} | 20 | mA |

IGBT Inverter

| | | | |
|----------------------------------------------------------------------------------|------------------|-----|---------|
| Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$) | V_{CES} | 600 | Volts |
| Collector Current, ($T_C = 25^\circ\text{C}$) | I_C | 100 | Amperes |
| Peak Collector Current, ($T_C = 25^\circ\text{C}$) | I_{CP} | 200 | Amperes |
| Collector Dissipation ($T_C = 25^\circ\text{C}$) | P_C | 338 | Watts |

PM100CVA060

FLAT-BASE TYPE
INSULATED PACKAGE

Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|------|------|------|------------------|
| Control Sector | | | | | | |
| Short Circuit Trip Level | SC | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$ | 158 | — | — | Amperes |
| Short Circuit Current Delay Time | $t_{\text{off(SC)}}$ | $V_D = 15\text{V}$ | — | 10 | — | μs |
| Over Temperature Protection | OT | Trip Level | 100 | 110 | 120 | $^\circ\text{C}$ |
| ($V_D = 15\text{V}$) | OT_r | Reset Level | 85 | 95 | 105 | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection | UV | Trip Level | 11.5 | 12.0 | 12.5 | Volts |
| ($-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$) | UV_r | Reset Level | — | 12.5 | — | Volts |
| Circuit Current | I_D | $V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{N1}}-V_{\text{NC}}$ | — | 40 | 55 | mA |
| | | $V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$, $V_{\text{XP1}}-V_{\text{XPC}}$ | — | 13 | 18 | mA |
| Input ON Threshold Voltage | $V_{\text{th(on)}}$ | Applied between U_P-V_{UPC} , V_P-V_{VPC} , | 1.2 | 1.5 | 1.8 | Volts |
| Input OFF Threshold Voltage | $V_{\text{th(off)}}$ | W_P-V_{WPC} , $U_N \cdot V_N \cdot W_N-V_{\text{NC}}$ | 1.7 | 2.0 | 2.3 | Volts |
| Fault Output Current | $I_{\text{FO(H)}}$ | $V_D = 15\text{V}$, $V_{\text{FO}} = 15\text{V}$ | — | — | 0.01 | mA |
| | $I_{\text{FO(L)}}$ | $V_D = 15\text{V}$, $V_{\text{FO}} = 15\text{V}$ | — | 10 | 15 | mA |
| Minimum Fault Output Pulse Width | t_{FO} | $V_D = 15\text{V}$ | 1.0 | 1.8 | — | ms |

PM100CVA060

FLAT-BASE TYPE
INSULATED PACKAGE

Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|---------------|--------------------------------------------------------------------------------------------------|------|------|------|---------------|
| IGBT Inverter Sector | | | | | | |
| Collector-Emitter Cutoff Current | I_{CES} | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$ | — | — | 1.0 | mA |
| | | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$ | — | — | 10.0 | mA |
| FWDi Forward Voltage | V_{EC} | $-I_C = 100\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$ | — | 2.20 | 3.30 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ Pulsed, $T_j = 25^\circ\text{C}$ | — | 2.35 | 2.80 | Volts |
| | | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A},$ Pulsed, $T_j = 125^\circ\text{C}$ | — | 2.55 | 3.05 | Volts |
| Inductive Load Switching Time | t_{on} | | 0.4 | 0.8 | 2.1 | μs |
| | t_{rr} | $V_D = 15\text{V}, V_{CIN} = 0\text{V} \leftrightarrow 15\text{V}$ | — | 0.2 | 0.3 | μs |
| | $t_{C(on)}$ | $V_{CC} = 300\text{V}, I_C = 100\text{A},$ $T_j = 125^\circ\text{C}$ | — | 0.3 | 1.1 | μs |
| | t_{off} | | — | 1.8 | 2.9 | μs |
| | $t_{C(off)}$ | (Per 1 arm) Inductive Load | — | 0.6 | 1.2 | μs |

Thermal Characteristics

| Characteristic | Symbol | Condition | Min. | Typ. | Max. | Units |
|-------------------------------------|----------------|---------------------------------------------------|------|------|-------|-----------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each Inverter IGBT | — | — | 0.37 | $^\circ\text{C/Watt}$ |
| | $R_{th(j-c)F}$ | Each Inverter FWDi | — | — | 0.70 | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance | $R_{th(c-f)}$ | Case to Fin Per Module, Thermal Grease Applied | — | — | 0.027 | $^\circ\text{C/Watt}$ |

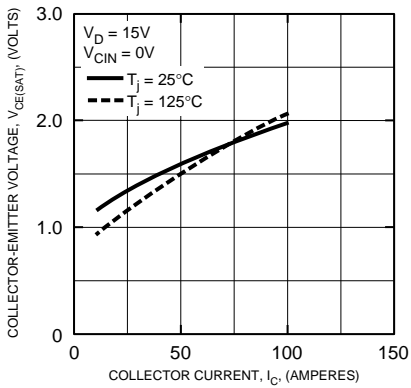
Recommended Conditions for Use

| Characteristic | Symbol | Condition | Value | Units |
|---------------------------------|-----------------|-----------------------------------------------------------------------------------------|--------------|---------------|
| Supply Voltage | V_{CC} | Applied across P-N Terminals | ≤ 400 | Volts |
| | $V_{CE(surge)}$ | Applied across Terminals | ≤ 500 | Volts |
| | | P-U, P-V, P-W, U-N, V-N, W-N | | |
| | V_D | Applied between $V_{UP1}-V_{UPC},$ $V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC}$ | 15 ± 1.5 | Volts |
| Input ON Voltage | $V_{CIN(on)}$ | Applied between | ≤ 0.8 | Volts |
| Input OFF Voltage | $V_{CIN(off)}$ | $U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC},$ $U_N \cdot V_N \cdot W_N-V_{NC}$ | ≥ 4.0 | Volts |
| Arm Shoot-Through Blocking Time | t_{dead} | For IPM's each Input Signal | ≥ 2.5 | μs |

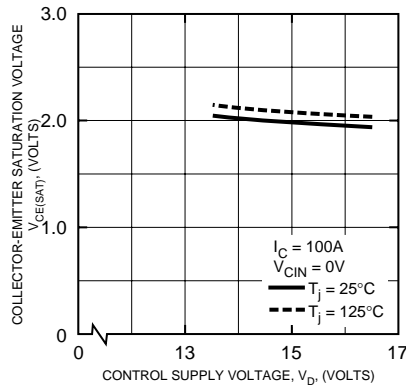
PM100CVA060

FLAT-BASE TYPE
INSULATED PACKAGE

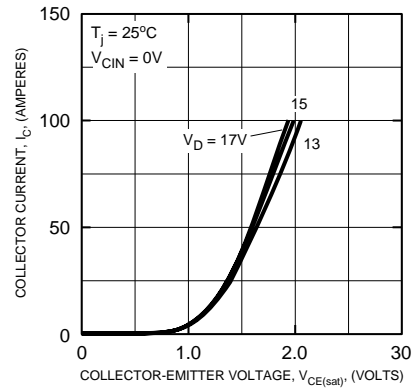
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



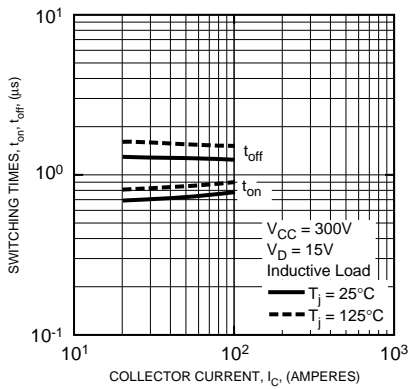
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



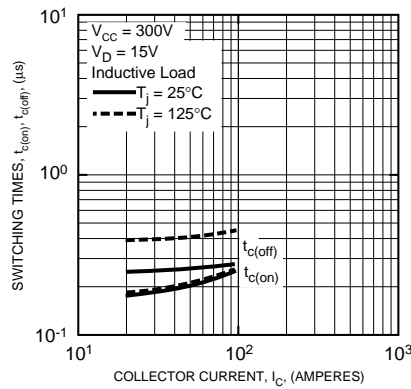
OUTPUT CHARACTERISTICS (TYPICAL)



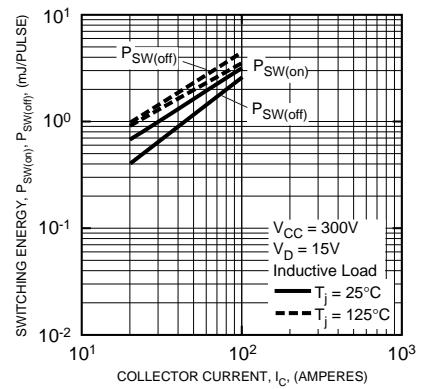
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



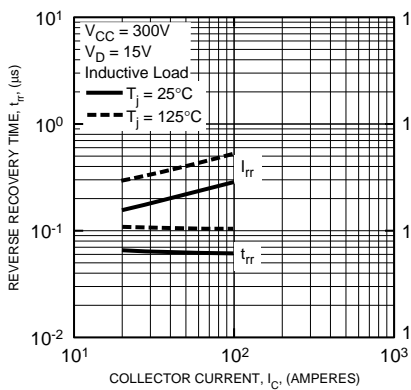
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



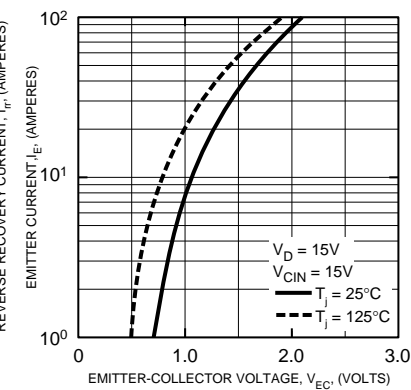
SWITCHING LOSS CHARACTERISTICS (TYPICAL)



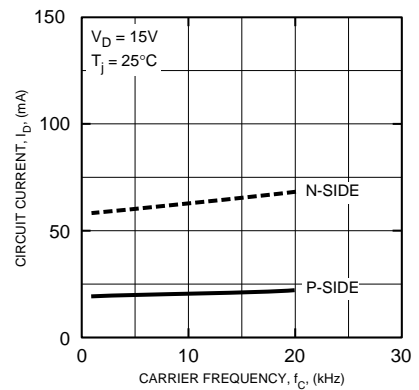
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



DIODE FORWARD CHARACTERISTICS (TYPICAL)



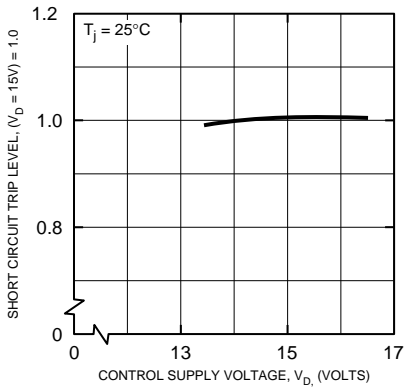
CIRCUIT CURRENT VS. CARRIER FREQUENCY (TYPICAL)



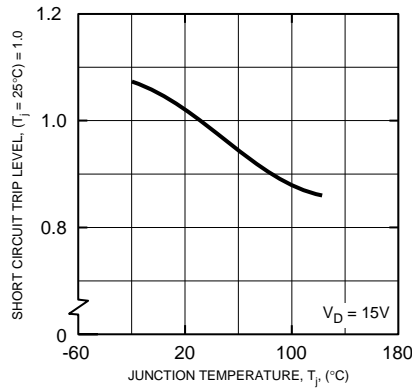
PM100CVA060

FLAT-BASE TYPE
INSULATED PACKAGE

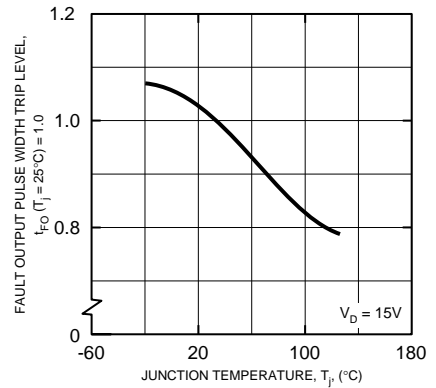
OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)



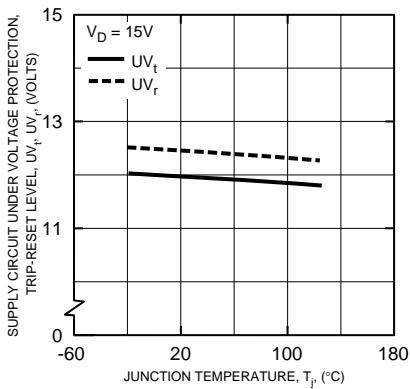
OVER CURRENT TRIP LEVEL TEMPERATURE DEPENDENCY (TYPICAL)



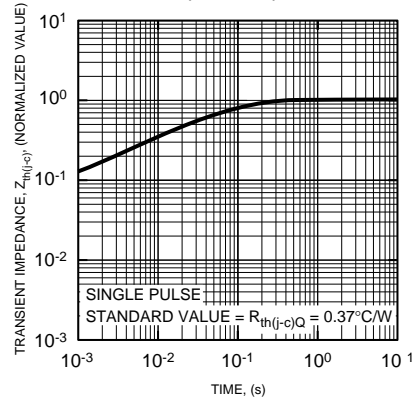
FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)



CONTROL SUPPLY VOLTAGE TRIP-RESET LEVEL TEMPERATURE DEPENDENCY (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)

