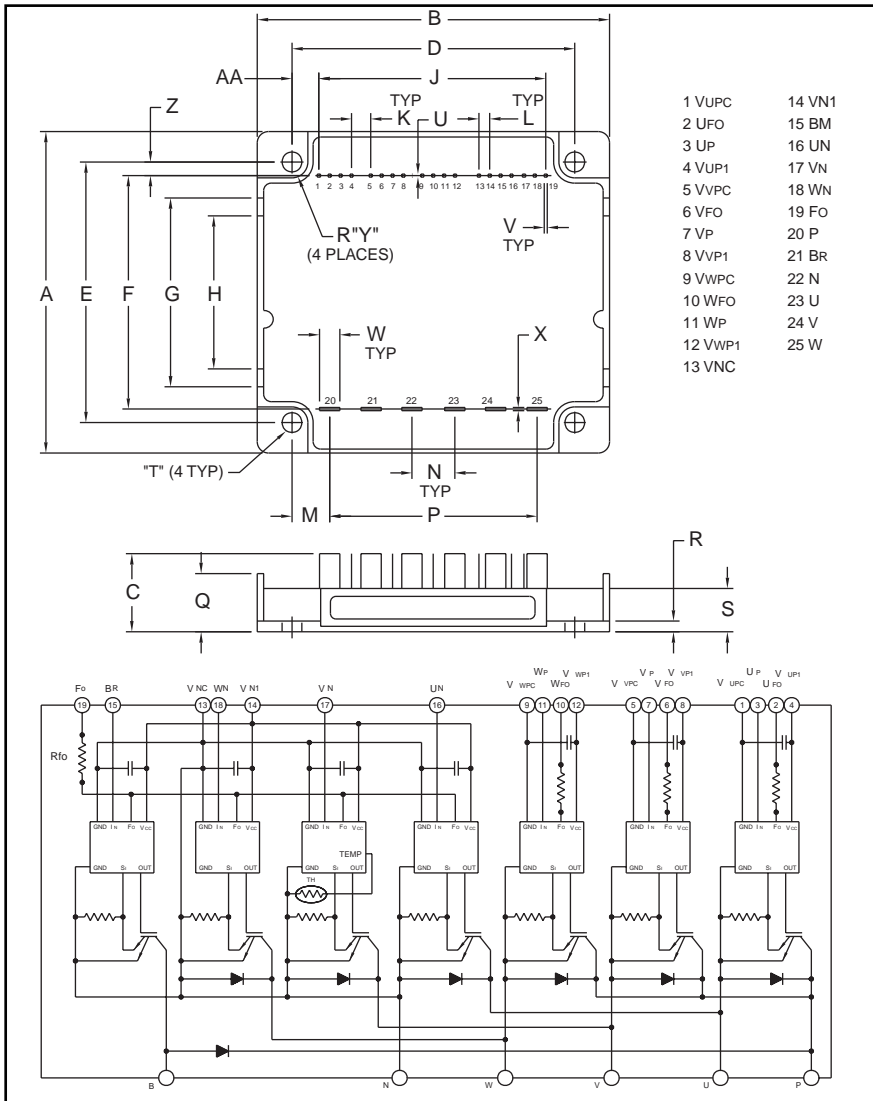


# PM25RSK120

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 Current
  - 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. PM25RSK120 is a 1200V, 25 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	25	120

**Outline Drawing and Circuit Diagram**

Dimensions	Inches	Millimeters
A	2.76±0.04	70.0±1.0
B	3.96±0.04	100.5±1.0
C	0.71±0.04	18.0±1.0
D	3.48±0.02	88.5±0.5
E	2.30±0.02	58.5±0.5
F	2.23±0.03	56.75±0.8
G	1.61	41.0
H	1.30	33.0
J	2.70±0.03	68.58±0.8
K	0.40	10.16
L	0.10±0.01	2.54±0.25
M	0.41	10.5
N	0.53±0.01	13.5±0.3

Dimensions	Inches	Millimeters
P	2.66±0.03	67.5±0.8
Q	0.49	12.4
R	0.17 Rad.	4.4 Rad.
S	0.35	8.9
T	0.18 Dia.	Dia. 4.5
U	0.02	0.4
V	0.02±0.004	0.6±0.1
W	0.08±0.004	2.0±0.1
X	0.02	0.5
Y	0.20	5.0
Z	0.04	1.02
AA	0.39	9.96

**PM25RSK120**

FLAT-BASE TYPE  
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**Absolute Maximum Ratings,  $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified**

	Symbol	Ratings	Units
Junction Temperature	$T_j$	-20 to 150	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Case Operating Temperature	$T_C$	-20 to 100	$^\circ\text{C}$
Mounting Torque M4 Mounting Screws	-	0.98 ~ 1.47	N · m
Module Weight (Typical)	-	130	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ )	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{iso}}$	2500	Vrms

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

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	25	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	50	Amperes
Supply Voltage (Applied between P-N)	$V_{\text{CC}}$	900	Volts
Supply Voltage, Surge (Applied between P-N)	$V_{\text{CC (surge)}}$	1000	Volts
Collector Dissipation	$P_C$	100	Watts

**Brake Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	10	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	20	Amperes
Supply Voltage (Applied between P-N)	$V_{\text{CC}}$	900	Volts
Supply Voltage, Surge (Applied between P-N)	$V_{\text{CC (surge)}}$	1000	Volts
Collector Dissipation	$P_C$	43	Watts
Diode Forward Current	$I_F$	10	Amperes
Diode DC Reverse Voltage	$V_{\text{R(DC)}}$	1200	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level Inverter Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	32	58	–	Amperes
Over Current Trip Level Brake Part			15	30	–	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	–	81	–	Amperes
Short Circuit Trip Level Brake Part			–	41	–	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}$	–	10	–	$\mu\text{s}$
Over Temperature Protection	OT	Trip Level	100	110	120	$^\circ\text{C}$
	$OT_r$	Reset Level	–	90	–	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	$UV_r$	Reset Level	–	12.5	–	Volts
Supply Voltage	$V_D$	Applied between $V_{UP1}$ - $V_{UPC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ , $V_{N1}$ - $V_{NC}$	13.5	15.0	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{N1}$ - $V_{NC}$	–	44	60	mA
		$V_D = 15\text{V}$ , $V_{CIN} = 15\text{V}$ , $V_{XP1}$ - $V_{XPC}$	–	13	18	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	$U_P$ - $V_{UPC}$ , $V_P$ - $V_{VPC}$ , $W_P$ - $V_{WPC}$ , $U_N$ · $V_N$ · $W_N$ · $B_r$ - $V_{NC}$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\phi$ Sinusoidal	5	15	20	kHz
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	$t_{\text{FO}}$	$V_D = 15\text{V}$	1.0	1.8	–	ms

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>IGBT Inverter Sector</b>						
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	–	–	1	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	–	–	10	mA
Emitter-Collector Voltage	$V_{EC}$	$-I_C = 25\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	–	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 25\text{A}, T_j = 25^\circ\text{C}$	–	2.5	3.5	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 25\text{A}, T_j = 125^\circ\text{C}$	–	2.2	3.2	Volts
Inductive Load Switching Times	$t_{on}$		0.5	1.0	2.5	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 15\text{V},$	–	0.15	0.3	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 25\text{A},$	–	0.4	1.0	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}, \text{Inductive Load}$	–	2.0	3.0	$\mu\text{s}$
	$t_{C(off)}$		–	0.7	1.2	$\mu\text{s}$

**Brake Sector**

Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A}, T_j = 25^\circ\text{C}$	–	2.8	3.8	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A}, T_j = 125^\circ\text{C}$	–	2.5	3.5	Volts
Diode Forward Voltage	$V_{FM}$	$-I_C = 15\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	–	2.5	3.5	Volts
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$	–	–	1	mA
		$V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$	–	–	10	mA

**Thermal Characteristics**

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each Inverter IGBT	–	–	1.25	$^\circ\text{C/Watt}$
	$R_{th(j-c)F}$	Each Inverter FWDi	–	–	3.0	$^\circ\text{C/Watt}$
	$R_{th(j-c)Q}$	Each Brake IGBT	–	–	2.9	$^\circ\text{C/Watt}$
	$R_{th(j-c)F}$	Each Brake FWDi	–	–	5.4	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	–	–	0.038	$^\circ\text{C/Watt}$

**Recommended Conditions for Use**

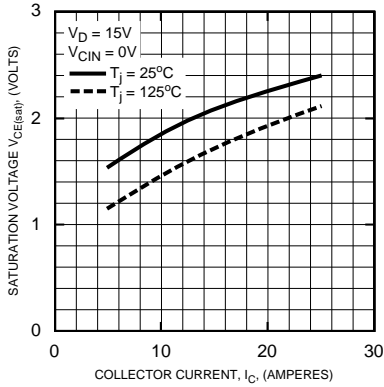
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 800	Volts
	$V_D$	Applied between $V_{UP1}-V_{UPC},$ $V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	$U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N \cdot V_N \cdot W_N \cdot B_r-V_{NC}$	$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{dead}$	Input Signal	$\geq 2.5$	$\mu\text{s}$

# PM25RSK120

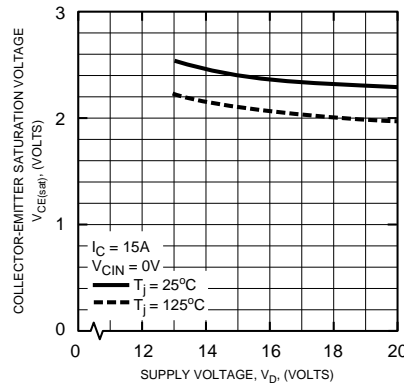
FLAT-BASE TYPE  
INSULATED PACKAGE

## Inverter Sector

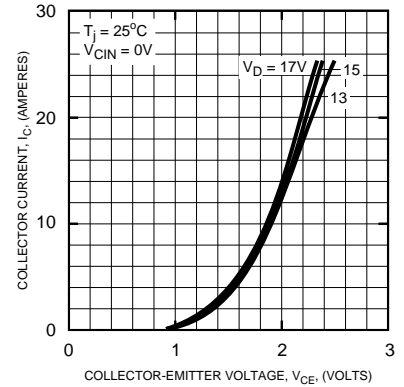
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



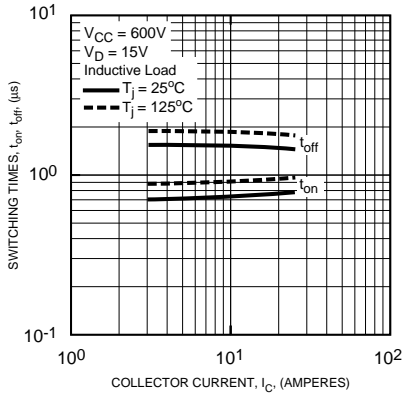
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



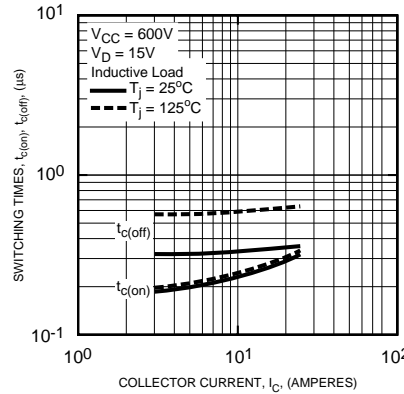
**OUTPUT CHARACTERISTICS (TYPICAL)**



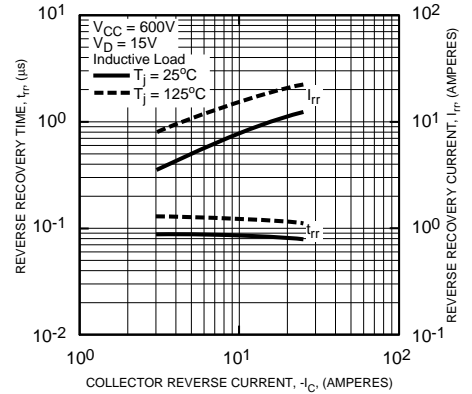
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



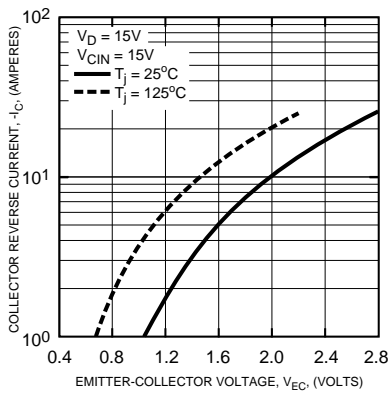
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



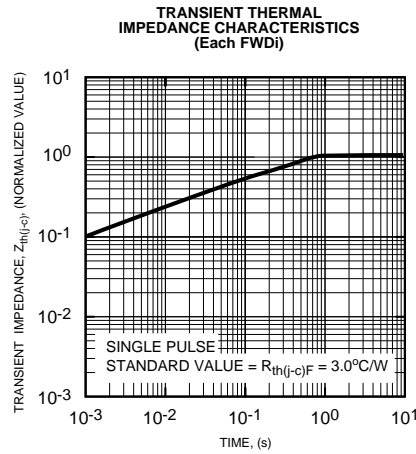
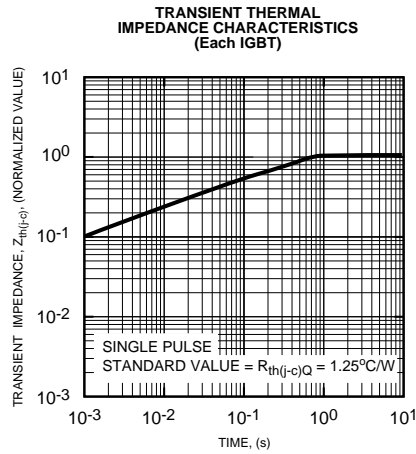
**DIODE FORWARD CHARACTERISTICS (TYPICAL)**



# PM25RSK120

FLAT-BASE TYPE  
INSULATED PACKAGE

## Inverter Sector



## Brake Sector

