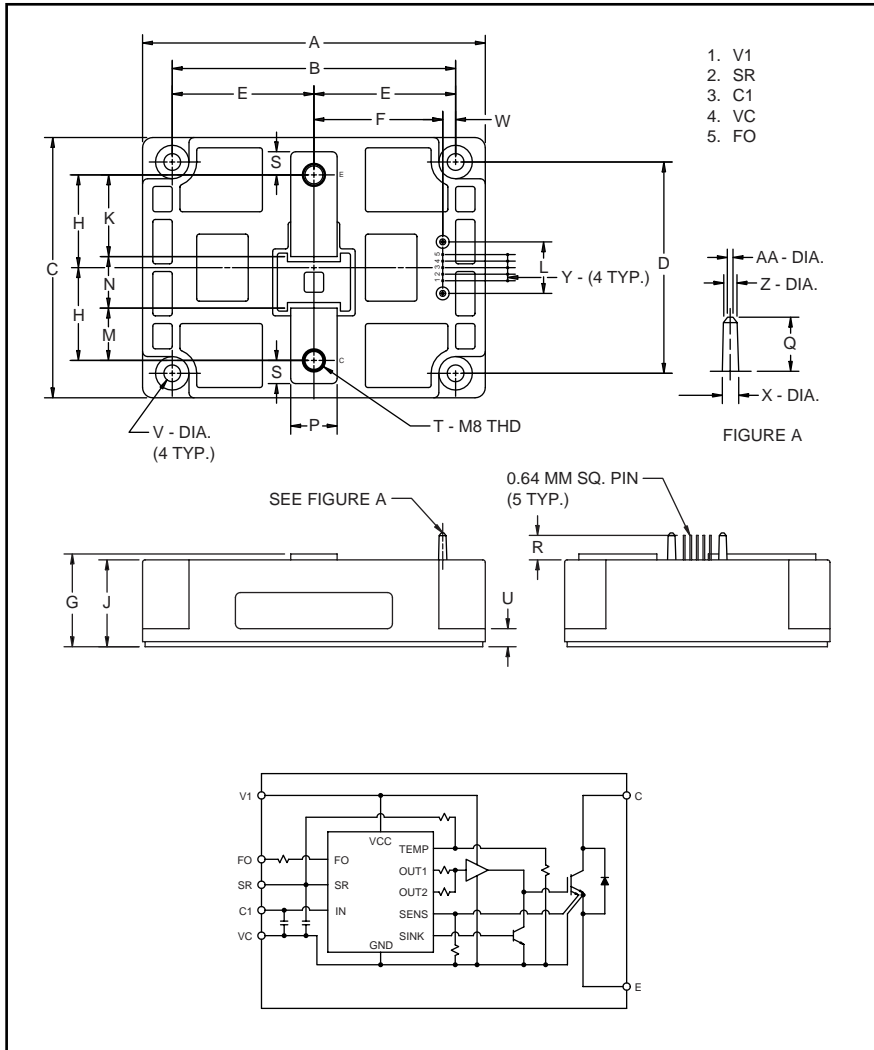


# PM600HSA120

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. PM600HSA120 is a 1200V, 600 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CEs</sub> Volts (x 10)
PM	600	120

Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.24	133.0
B	4.33±0.01	110.0±0.25
C	3.98	101.0
D	3.23±0.01	82.0±0.25
E	2.16	55.0
F	1.97	50.0
G	1.42 +0.04/-0.02	36.0 +1.0/-0.5
H	1.42	36.0
J	1.33	33.7
K	1.25	31.7
L	1.02	26.0
M	0.80	20.3
N	0.79	20.0

Dimensions	Inches	Millimeters
P	0.71	18.0
Q	0.59	15
R	0.53	13.5
S	0.35	9.0
T	M8 Metric	M8
U	0.28	7.0
V	0.26 Dia.	Dia. 6.5
W	0.02	5.0
X	0.17 Dia.	Dia. 4.4
Y	0.100	2.54
Z	0.15 Dia.	Dia. 3.8
AA	0.06 Dia.	Dia. 1.5

**PM600HSA120**

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**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	$T_{\text{stg}}$	-40 to 125	$^\circ\text{C}$
Case Operating Temperature	$T_C$	-20 to 100	$^\circ\text{C}$
Mounting Torque, M6 Mounting Screws	—	3.92 ~ 5.88	N · m
Mounting Torque, M8 Main Terminal Screws	—	8.83 ~ 10.8	N · m
Module Weight (Typical)	—	1090	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part)	$V_{\text{CC(prot.)}}$	800	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{iso}}$	2500	$V_{\text{rms}}$

**Control Sector**

Supply Voltage (Applied between $V_1$ - $V_C$ )	$V_D$	20	Volts
Input Voltage (Applied between $C_1$ - $V_C$ )	$V_{\text{CIN}}$	10	Volts
Fault Output Supply Voltage (Applied between $F_O$ - $V_C$ )	$V_{\text{FO}}$	20	Volts
Fault Output Current (Fault Current of $F_O$ Terminal)	$I_{\text{FO}}$	20	mA

**IGBT Inverter Sector**

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ )	$V_{\text{CES}}$	1200	Volts
Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_C$	600	Amperes
Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )	$I_{\text{CP}}$	1200	Amperes
Collector Dissipation	$P_C$	3470	Watts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level Inverter Part	OC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	740	1000	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	1000	1400	—	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}$	—	5	—	$\mu\text{s}$
Over Temperature Protection	OT	Trip Level	100	110	120	$^\circ\text{C}$
	$OT_r$	Reset Level	85	95	105	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	$UV_r$	Reset Level	—	12.5	—	Volts
Supply Voltage	$V_D$	Applied between $V_1$ - $V_C$	13.5	15	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_1$ - $V_C$	—	23	30	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between $C_1$ - $V_C$	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	Applied between $C_1$ - $V_C$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\phi$ Sinusoidal	—	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
SR Terminal Output Voltage	$V_{\text{SR}}$	$-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $R_{\text{in}} = 6.8\text{k}\Omega$	4.5	5.1	5.6	Volts

## PM600HSA120

FLAT-BASE TYPE  
INSULATED PACKAGEElectrical 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 Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$	—	—	10	mA
Emitter-Collector Voltage	$V_{EC}$	$-I_C = 600\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$	—	2.5	3.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 600\text{A},$ $T_j = 25^\circ\text{C}, \text{ Pulsed}$	—	2.3	3.2	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 600\text{A},$ $T_j = 125^\circ\text{C}, \text{ Pulsed}$	—	2.1	2.9	Volts
Inductive Load Switching Times	$t_{on}$		0.5	1.4	2.5	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 5\text{V}$	—	0.2	0.4	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 600\text{V}, I_C = 600\text{A}$	—	0.4	1.0	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	3.0	4.0	$\mu\text{s}$
	$t_{C(off)}$		—	0.6	1.1	$\mu\text{s}$

## Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	0.036	$^\circ\text{C/Watt}$
	$R_{th(j-c)F}$	Each FWDi	—	—	0.06	$^\circ\text{C/Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module, Thermal Grease Applied	—	—	0.025	$^\circ\text{C/Watt}$

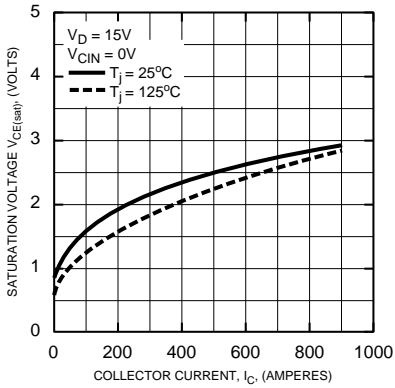
## Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across C1-E2 Terminals	0 ~ 800	Volts
	$V_D$	Applied between $V_1$ - $V_C$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between $C_1$ - $V_C$	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$	Applied between $C_1$ - $V_C$	$4.0 \sim V_{SR}$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{dead}$	Input Signal	$\geq 4.0$	$\mu\text{s}$

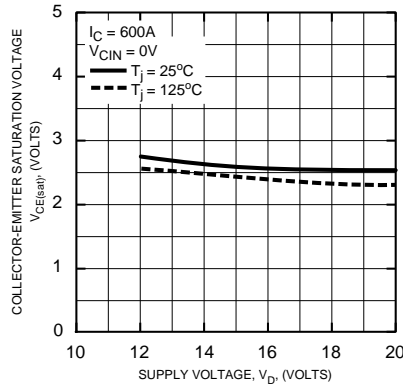
# PM600HSA120

FLAT-BASE TYPE  
INSULATED PACKAGE

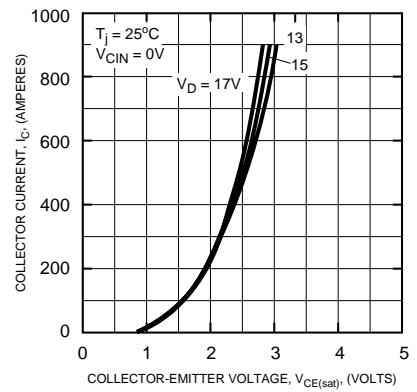
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



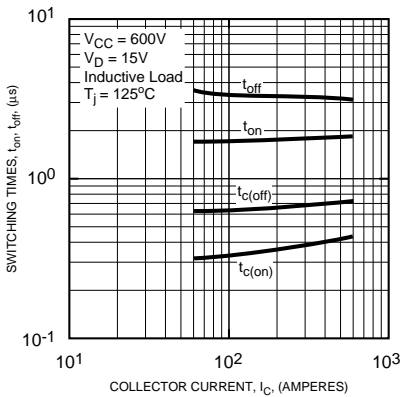
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



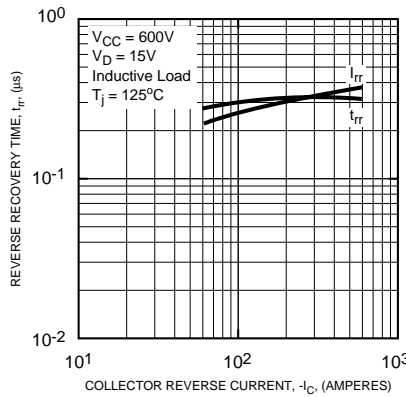
**OUTPUT CHARACTERISTICS (TYPICAL)**



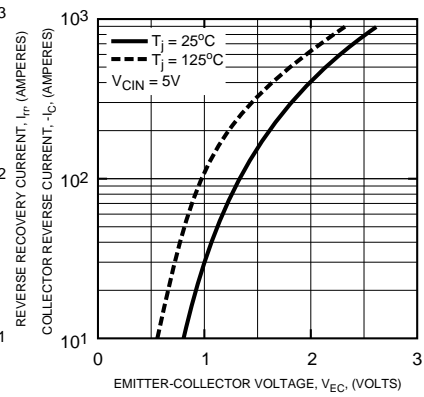
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



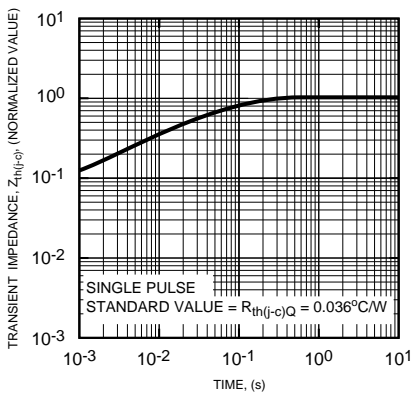
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



**DIODE FORWARD CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)**

