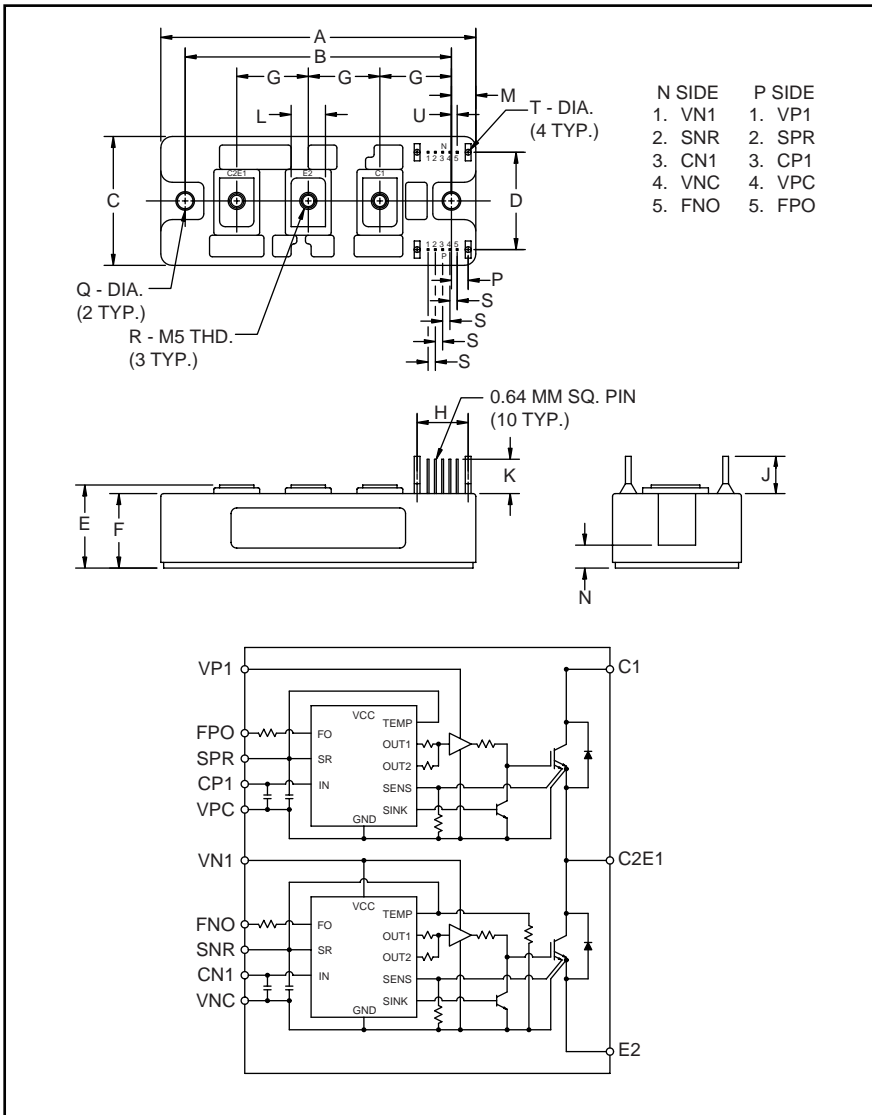


# PM200DSA060

FLAT-BASE TYPE  
INSULATED PACKAGE



Outline Drawing and Circuit Diagram

| Dimensions | Inches           | Millimeters  |
|------------|------------------|--------------|
| A          | 4.33             | 110.0        |
| B          | 3.66±0.010       | 93.0±0.25    |
| C          | 1.77             | 45.0         |
| D          | 1.34             | 34.0         |
| E          | 1.14 +0.04/-0.02 | 29.0 +1/-0.5 |
| F          | 1.02             | 26.0         |
| G          | 0.98             | 25.0         |
| H          | 0.702            | 17.84        |
| J          | 0.55             | 14.0         |
| K          | 0.51             | 13.0         |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| L          | 0.47      | 12.0        |
| M          | 0.33      | 8.5         |
| N          | 0.28      | 7.0         |
| P          | 0.230     | 5.84        |
| Q          | 0.22 Dia. | Dia. 5.5    |
| R          | M5 Metric | M5          |
| S          | 0.100     | 2.54        |
| T          | 0.08 Dia. | Dia. 2.0    |
| U          | 0.08      | 2.0         |



**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. PM200DSA060 is a 600V, 200 Ampere Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CEs</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 200                       | 60                               |

**PM200DSA060**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  | $T_{\text{stg}}$       | -40 to 125  | $^\circ\text{C}$ |
| Case Operating Temperature   | $T_C$                  | -20 to 100  | $^\circ\text{C}$ |
| Mounting Torque, M5 Mounting Screws  | —                      | 1.47 ~ 1.96 | N · m            |
| Mounting Torque, M5 Main Terminal Screws   | —                      | 1.47 ~ 1.96 | N · m            |
| Module Weight (Typical)  | —                      | 340         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part) | $V_{\text{CC(prot.)}}$ | 400         | Volts            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)                            | $V_{\text{iso}}$       | 2500        | Vrms             |

**Control Sector**

|  |                  |    |       |
|--|------------------|----|-------|
| Supply Voltage (Applied between $V_{P1}-V_{PC}$ , $V_{N1}-V_{NC}$ )                | $V_D$            | 20 | Volts |
| Input Voltage (Applied between $C_{P1}-V_{PC}$ , $C_{N1}-V_{NC}$ )                 | $V_{\text{CIN}}$ | 10 | Volts |
| Fault Output Supply Voltage (Applied between $F_{PO}-V_{PC}$ and $F_{NO}-V_{NC}$ ) | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current (Sink Current at $F_{PO}$ , $F_{NO}$ Terminal)                | $I_{\text{FO}}$  | 20 | mA    |

**IGBT Inverter Sector**

|   |                        |     |         |
|---|------------------------|-----|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ ) | $V_{\text{CES}}$       | 600 | Volts   |
| Collector Current, ( $T_C = 25^\circ\text{C}$ )                                 | $I_C$                  | 200 | Amperes |
| Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )                            | $I_{\text{CP}}$        | 400 | Amperes |
| Supply Voltage (Applied between C1 - E2)  | $V_{\text{CC}}$        | 450 | Volts   |
| Supply Voltage, Surge (Applied between C1 - E2)                                 | $V_{\text{CC(surge)}}$ | 500 | Volts   |
| Collector Dissipation   | $P_C$                  | 595 | 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                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$   | 310  | 400  | —    | Amperes          |
| Short Circuit Trip Level Inverter Part  | SC                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$   | 400  | 560  | —    | Amperes          |
| Over Current Delay Time                 | $t_{\text{off}}(\text{OC})$ | $V_D = 15\text{V}$  | —    | 5    | —    | $\mu\text{s}$    |
| Over Temperature Protection             | OT                          | Trip Level  | 100  | 110  | 120  | $^\circ\text{C}$ |
|   | $\text{OT}_r$               | Reset Level   | 85   | 95   | 105  | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection | UV                          | Trip Level  | 11.5 | 12.0 | 12.5 | Volts            |
|   | $\text{UV}_r$               | Reset Level   | —    | 12.5 | —    | Volts            |
| Supply Voltage                          | $V_D$                       | Applied between $V_{P1}-V_{PC}$ , $V_{N1}-V_{NC}$   | 13.5 | 15   | 16.5 | Volts            |
| Circuit Current                         | $I_D$                       | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{N1}-V_{NC}$   | —    | 19   | 26   | mA               |
|   |                             | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$   | —    | 19   | 26   | mA               |
| Input ON Threshold Voltage              | $V_{\text{th(on)}}$         | Applied between   | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage             | $V_{\text{th(off)}}$        | $C_{P1}-V_{PC}$ , $C_{N1}-V_{NC}$   | 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               |
| SXR Terminal Output Voltage             | $V_{\text{SXR}}$            | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $R_{\text{in}} = 6.8 \text{ k}\Omega$ ( $S_{\text{PR}}$ , $S_{\text{NR}}$ ) | 4.5  | 5.1  | 5.6  | Volts            |

## PM200DSA060

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    | mA            |
|                                      |               | $V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$  | —    | —    | 10   | mA            |
| Emitter-Collector Voltage            | $V_{EC}$      | $-I_C = 200\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$                              | —    | 1.9  | 2.8  | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 200\text{A}$                               | —    | 1.8  | 2.6  | Volts         |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 200\text{A},$<br>$T_j = 125^\circ\text{C}$ | —    | 1.9  | 2.7  | Volts         |
| Inductive Load Switching Times       | $t_{on}$      |  | 0.5  | 1.4  | 2.5  | $\mu\text{s}$ |
|                                      | $t_{rr}$      | $V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 5\text{V}$                                | —    | 0.15 | 0.3  | $\mu\text{s}$ |
|                                      | $t_{C(on)}$   | $V_{CC} = 300\text{V}, I_C = 200\text{A}$  | —    | 0.4  | 1.0  | $\mu\text{s}$ |
|                                      | $t_{off}$     | $T_j = 125^\circ\text{C}$  | —    | 2.0  | 3.0  | $\mu\text{s}$ |
|                                      | $t_{C(off)}$  |  | —    | 0.5  | 1.0  | $\mu\text{s}$ |

## Thermal Characteristics

| Characteristic                      | Symbol         | Condition   | Min. | Typ. | Max.  | Units                        |
|-------------------------------------|----------------|---|------|------|-------|------------------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each IGBT   | —    | —    | 0.21  | $^\circ\text{C}/\text{Watt}$ |
|                                     | $R_{th(j-c)F}$ | Each FWDi   | —    | —    | 0.35  | $^\circ\text{C}/\text{Watt}$ |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.060 | $^\circ\text{C}/\text{Watt}$ |

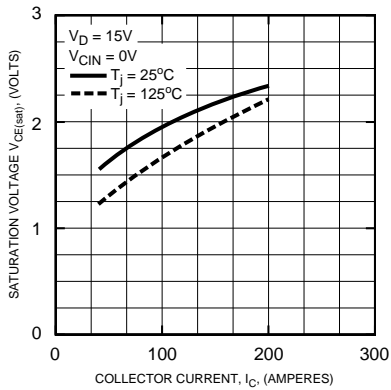
## Recommended Conditions for Use

| Characteristic      | Symbol         | Condition                                      | Value              | Units         |
|---------------------|----------------|--|--------------------|---------------|
| Supply Voltage      | $V_{CC}$       | Applied across C1-E2 Terminals                 | 0 ~ 400            | Volts         |
|                     | $V_D$          | Applied between $V_{P1}-V_{PC}, V_{N1}-V_{NC}$ | $15 \pm 1.5$       | Volts         |
| Input ON Voltage    | $V_{CIN(on)}$  | Applied between                                | 0 ~ 0.8            | Volts         |
| Input OFF Voltage   | $V_{CIN(off)}$ | $C_{P1}-V_{PC}, C_{N1}-V_{NC}$                 | $4.0 \sim V_{SXR}$ | Volts         |
| PWM Input Frequency | $f_{PWM}$      | Using Application Circuit                      | 5 ~ 20             | kHz           |
| Minimum Dead Time   | $t_{dead}$     | Input Signal                                   | $\geq 3.5$         | $\mu\text{s}$ |

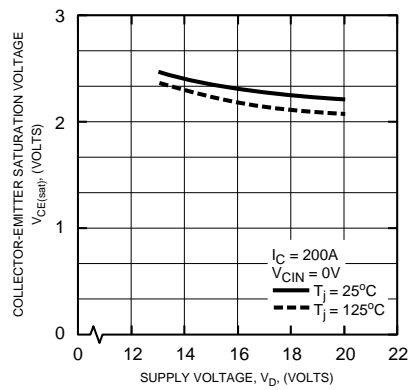
# PM200DSA060

FLAT-BASE TYPE  
INSULATED PACKAGE

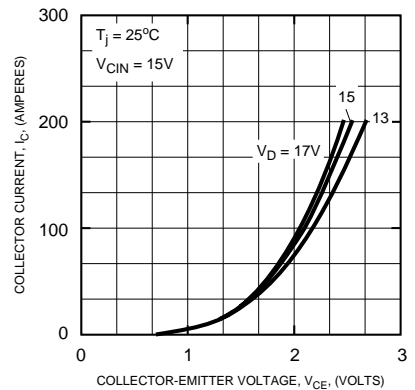
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



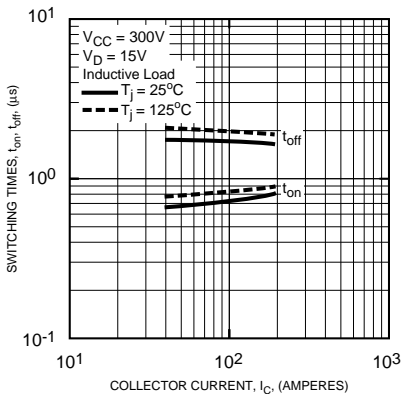
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



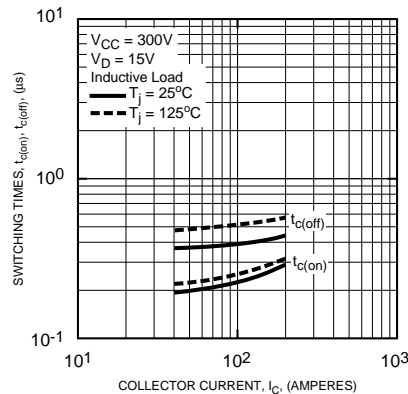
**OUTPUT CHARACTERISTICS (TYPICAL)**



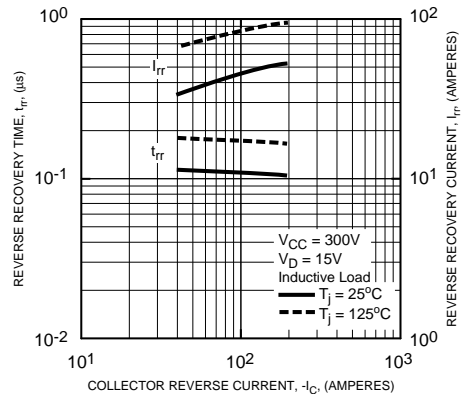
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



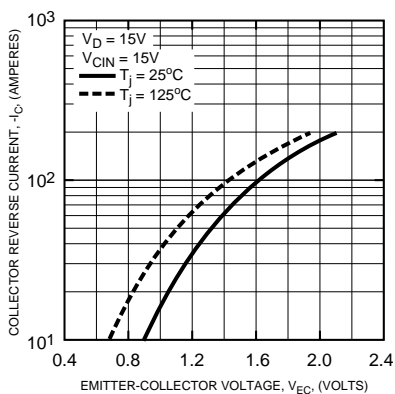
**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**



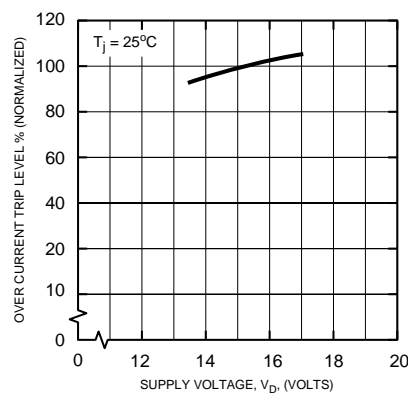
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



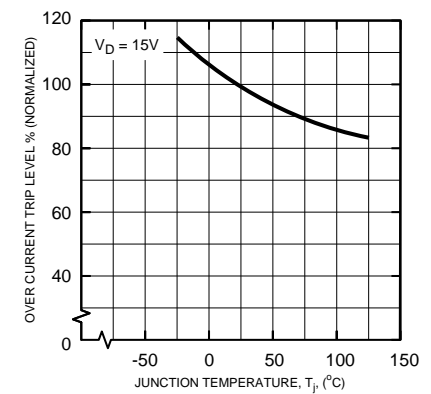
**DIODE FORWARD CHARACTERISTICS**



**OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)**



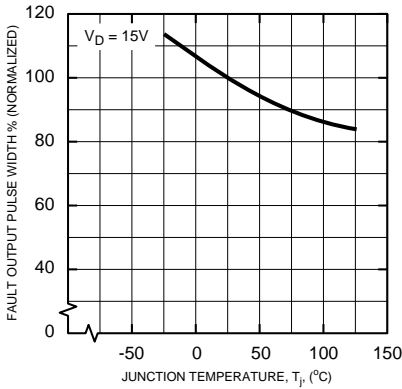
**OVER CURRENT TRIP LEVEL TEMPERATURE DEPENDENCY (TYPICAL)**



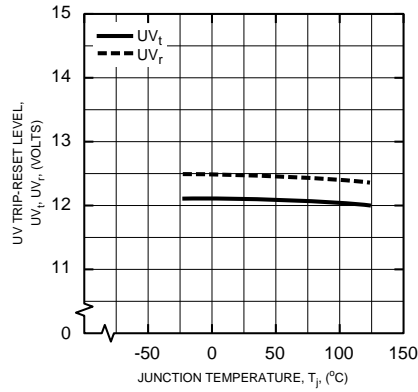
# PM200DSA060

FLAT-BASE TYPE  
INSULATED PACKAGE

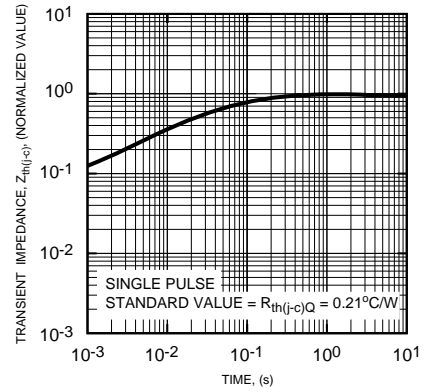
FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)



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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)

