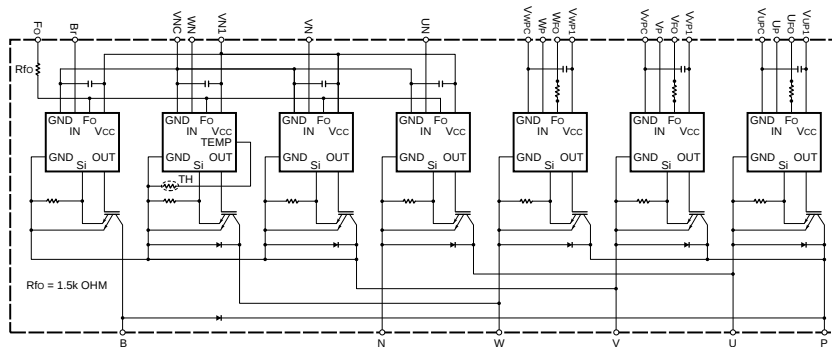
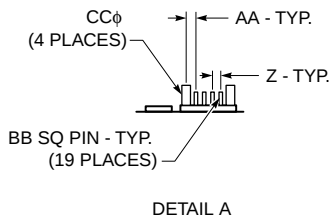
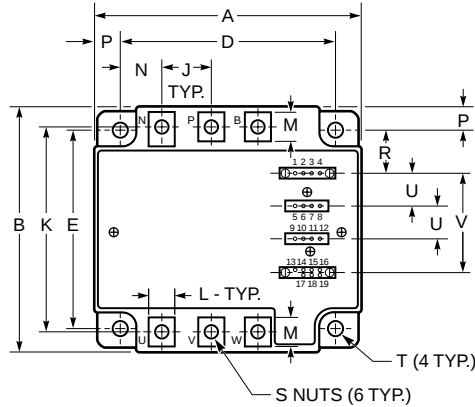


# PM75RVA060

FLAT-BASE TYPE  
INSULATED PACKAGE

## TERMINAL CODE

- |          |          |
|----------|----------|
| 1. WFO   | 11. UP   |
| 2. VWPC  | 12. VUP1 |
| 3. WP    | 13. Br   |
| 4. VWP1  | 14. Fo   |
| 5. VFO   | 15. VNC  |
| 6. VVPC  | 16. VN1  |
| 7. VP    | 17. UN   |
| 8. VVP1  | 18. VN   |
| 9. UFO   | 19. WN   |
| 10. VUPC |          |



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 |



## 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. PM75RVA060 is a 600V, 75 Ampere Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CES</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 75                        | 60                               |

# PM75RVA060

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                                                                               | —                      | 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 (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.)                                                         | $V_{\text{iso}}$       | 2500       | $V_{\text{rms}}$          |

## 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 $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N \cdot B_r-V_{\text{NC}}$ )               | $V_{\text{CIN}}$ | 20 | Volts |
| Fault Output Supply Voltage (Applied between $F_O-V_{\text{NC}}$ , $*F_O-V_{\text{PC}}$ )                                                                             | $V_{\text{FO}}$  | 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 ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$ | 600 | Volts   |
| Collector Current, ( $T_C = 25^\circ\text{C}$ )                                  | $I_C$            | 75  | Amperes |
| Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )                             | $I_{\text{CP}}$  | 150 | Amperes |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$            | 284 | Watts   |

## Brake Sector

|                                                                                  |                    |     |         |
|----------------------------------------------------------------------------------|--------------------|-----|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$   | 600 | Volts   |
| Collector Current, ( $T_C = 25^\circ\text{C}$ )                                  | $I_C$              | 30  | Amperes |
| Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )                             | $I_{\text{CP}}$    | 60  | Amperes |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$              | 178 | Watts   |
| FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )                                | $I_F$              | 30  | Amperes |
| FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )                       | $V_{\text{R(DC)}}$ | 600 | Volts   |

# PM75RVA060

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            |
|---------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|------|------|------|------------------|
| <b>Control Sector</b>                                   |                      |                                                                                      |      |      |      |                  |
| Over Current Trip Level Brake Part                      | OC                   | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$             | 39   | —    | —    | Amperes          |
| Short Circuit Trip Level Inverter Part                  | SC                   | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$             | 115  | —    | —    | Amperes          |
| Short Circuit Trip Level Brake Part                     |                      |                                                                                      | —    | 94   | —    | Amperes          |
| Short Circuit Current Shut-off Time                     | $t_{\text{off(SC)}}$ | $V_D = 15\text{V}$                                                                   | —    | 10   | —    | $\mu\text{s}$    |
| Over Temperature Protection                             | OT                   | Trip Level                                                                           | 100  | 110  | 120  | $^\circ\text{C}$ |
| ( $V_D = 15\text{V}$ , Lower Arm)                       | $\text{OT}_r$        | Reset Level                                                                          | 85   | 95   | 105  | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection                 | UV                   | Trip Level                                                                           | 11.5 | 12.0 | 12.5 | Volts            |
| ( $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ ) | $\text{UV}_r$        | Reset Level                                                                          | —    | 12.5 | —    | Volts            |
| Circuit Current                                         | $I_D$                | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$   | —    | 44   | 60   | 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 $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ ,                        | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage                             | $V_{\text{th(off)}}$ | $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N \cdot B_r-V_{\text{NC}}$             | 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                        | $t_{\text{FO}}$      | $V_D = 15\text{V}^*$                                                                 | 1.0  | 1.8  | —    | ms               |

\* Fault output is given only when the internal SC, OT, and UV protections circuits of either an upper-arm or a lower-arm device operate to protect it.

# PM75RVA060

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                                | $V_{EC}$      | $-I_C = 75\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$                                                                                      | —   | 2.20 | 3.30 | Volts         |
| Collector-Emitter Saturation Voltage                | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$<br>Pulsed, $T_j = 25^\circ\text{C}$                                                   | —   | 2.35 | 2.80 | Volts         |
|                                                     |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$<br>Pulsed, $T_j = 125^\circ\text{C}$                                                  | —   | 2.55 | 3.05 | Volts         |
| Inductive Load Switching Times<br>(Upper-Lower Arm) | $t_{on}$      | $V_D = 15\text{V}, V_{CIN} = 0\text{V} \leftrightarrow 15\text{V}$<br><br>$V_{CC} = 300\text{V}, I_C = 75\text{A},$<br>$T_j = 125^\circ\text{C}$ | 0.4 | 0.8  | 2.1  | $\mu\text{s}$ |
|                                                     | $t_{rr}$      |                                                                                                                                                  | —   | 0.2  | 0.3  | $\mu\text{s}$ |
|                                                     | $t_{C(on)}$   |                                                                                                                                                  | —   | 0.3  | 1.1  | $\mu\text{s}$ |
|                                                     | $t_{off}$     |                                                                                                                                                  | —   | 1.8  | 2.9  | $\mu\text{s}$ |
|                                                     | $t_{C(off)}$  |                                                                                                                                                  | —   | 0.6  | 1.2  | $\mu\text{s}$ |

### Brake 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                 | $V_{FM}$      | $I_F = 30\text{A}$                                                                              | — | 2.20 | 3.30 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A},$<br>Pulsed, $T_j = 25^\circ\text{C}$  | — | 2.35 | 2.80 | Volts |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A},$<br>Pulsed, $T_j = 125^\circ\text{C}$ | — | 2.55 | 3.05 | Volts |

**PM75RVA060****FLAT-BASE TYPE  
INSULATED PACKAGE****Thermal Characteristics**

| Characteristic                      | Symbol         | Condition                                         | Min. | Typ. | Max.  | Units   |
|-------------------------------------|----------------|---------------------------------------------------|------|------|-------|---------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each Inverter IGBT                                | —    | —    | 0.44  | °C/Watt |
|                                     | $R_{th(j-c)F}$ | Each Inverter FWDi                                | —    | —    | 1.00  | °C/Watt |
|                                     | $R_{th(j-c)Q}$ | Each Brake IGBT                                   | —    | —    | 0.70  | °C/Watt |
|                                     | $R_{th(j-c)F}$ | Each Brake FWDi                                   | —    | —    | 1.50  | °C/Watt |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.027 | °C/Watt |

**Recommended Conditions for Use**

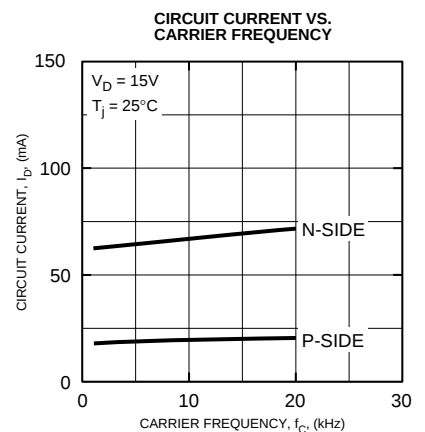
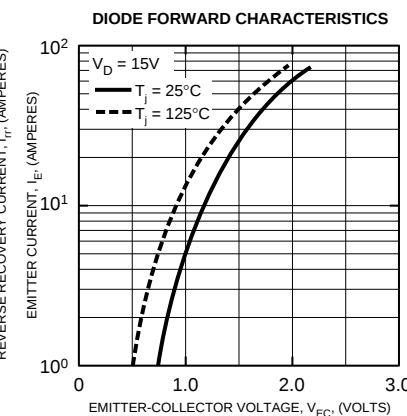
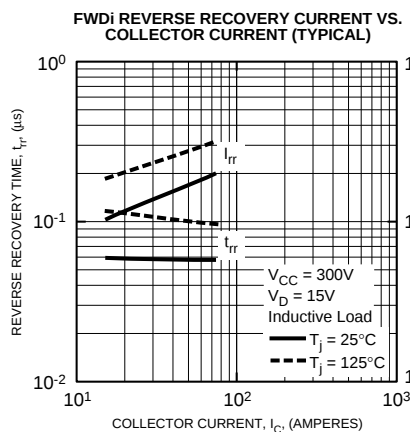
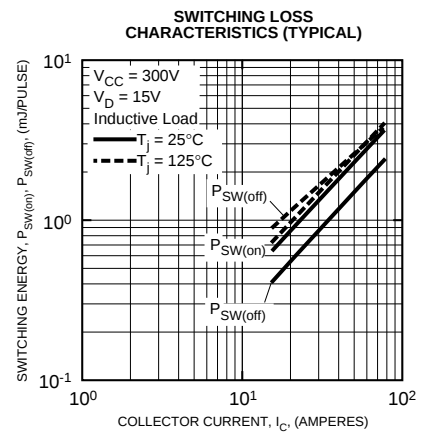
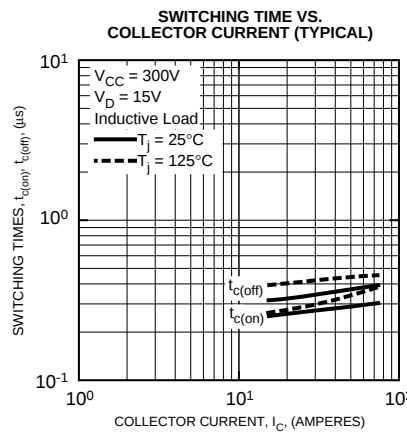
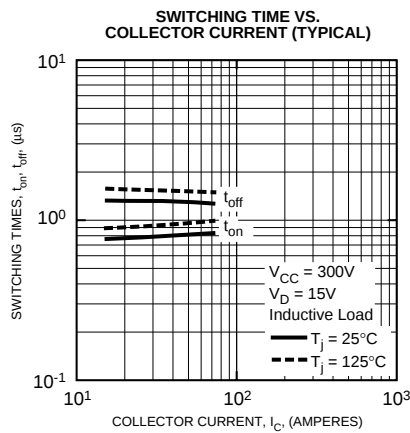
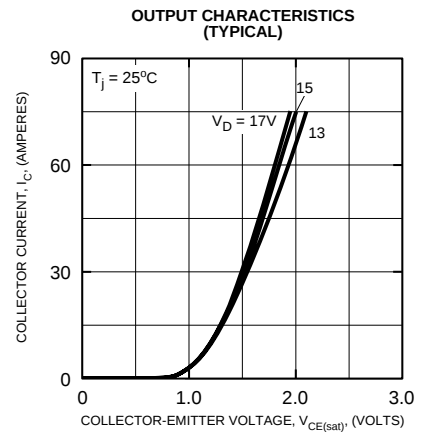
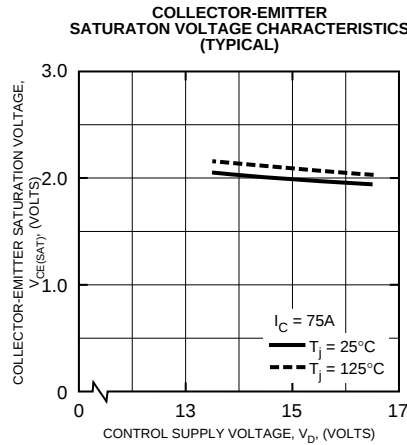
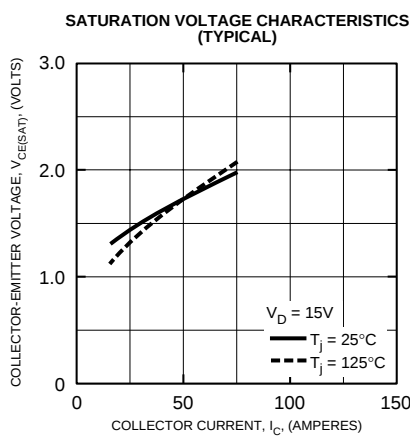
| Characteristic                  | Symbol          | Condition                                                                                                           | Value        | Units   |
|---------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------|--------------|---------|
| Supply Voltage                  | $V_{CC}$        | Applied across P-N Terminals                                                                                        | $\leq 400$   | Volts   |
|                                 | $V_{CE(surge)}$ | Applied across C-E Terminals                                                                                        | $\leq 500$   | Volts   |
|                                 | $V_D$           | Applied between $V_{UP1}$ - $V_{UPC}$ *,<br>$V_{VP1}$ - $V_{VPC}$ *, $V_{WP1}$ - $V_{WPC}$ *, $V_{N1}$ - $V_{NC}$ * | $15 \pm 1.5$ | Volts   |
|                                 |                 |                                                                                                                     |              |         |
| Input ON Voltage                | $V_{CIN(on)}$   | Applied between                                                                                                     | $\leq 0.8$   | Volts   |
| Input OFF Voltage               | $V_{CIN(off)}$  | $U_P$ - $V_{UPC}$ , $V_P$ - $V_{VPC}$ , $W_P$ - $V_{WPC}$ ,<br>$U_N$ · $V_N$ · $W_N$ · $B_F$ - $V_{NC}$             | $\geq 4.0$   | Volts   |
| Arm Shoot-Through Blocking Time | $t_{dead}$      | For IPM's each Input Signal                                                                                         | $\geq 2.5$   | $\mu s$ |

\*With ripple satisfying the following conditions,  $dv/dt$  swing  $\leq 5V/\mu s$ , Variation  $\leq 2V$  peak to peak.

# PM75RVA060

FLAT-BASE TYPE  
INSULATED PACKAGE

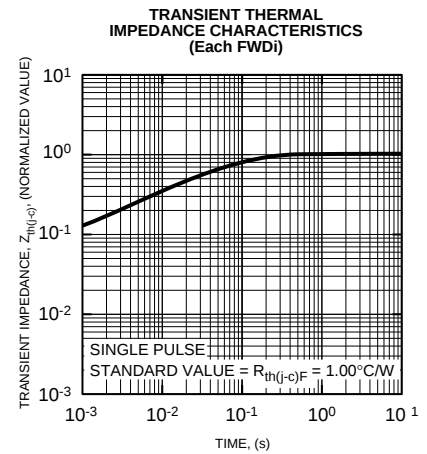
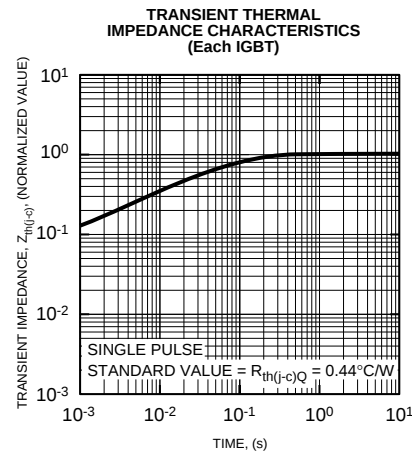
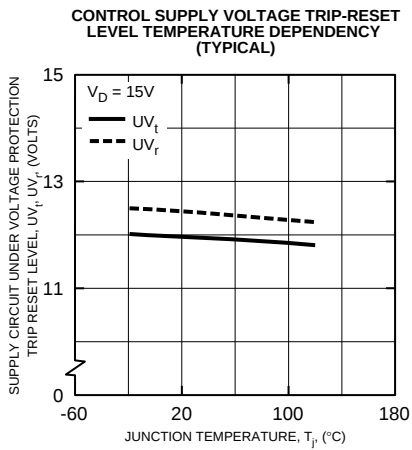
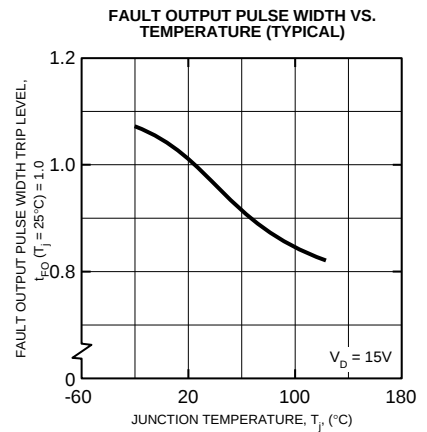
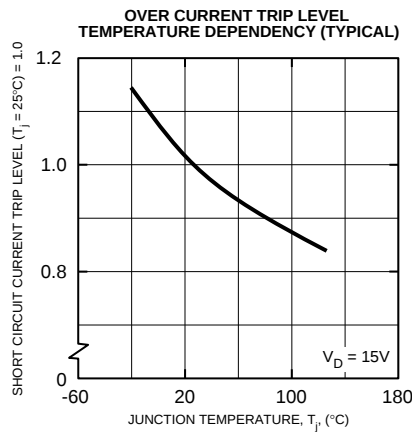
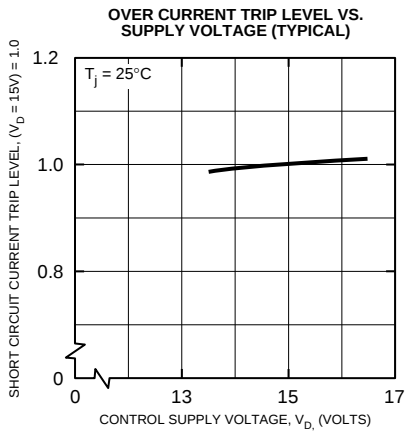
## Inverter Part



# PM75RVA060

FLAT-BASE TYPE  
INSULATED PACKAGE

## Inverter Part

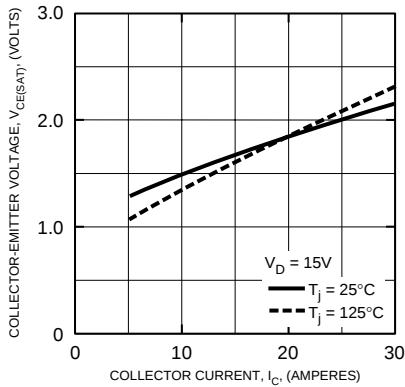


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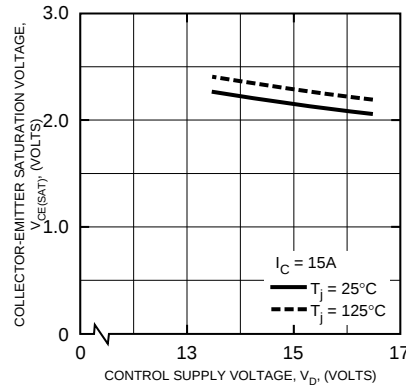
FLAT-BASE TYPE  
INSULATED PACKAGE

## Brake Part

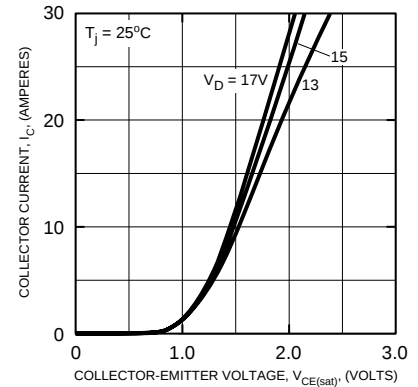
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



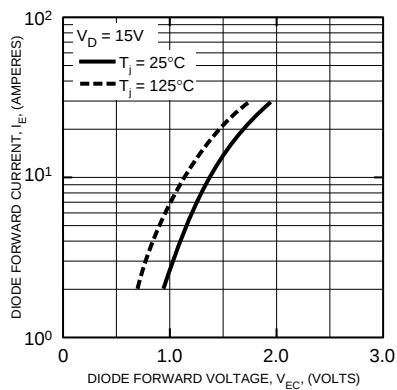
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



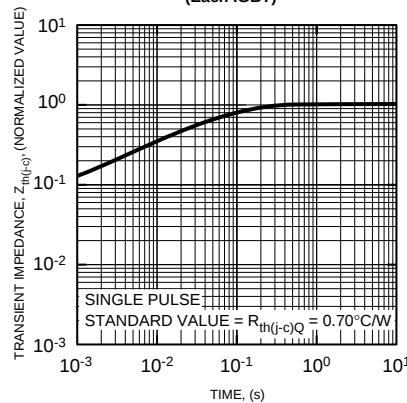
OUTPUT CHARACTERISTICS  
(TYPICAL)



DIODE FORWARD CHARACTERISTICS



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(Each IGBT)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(Each FWDi)

