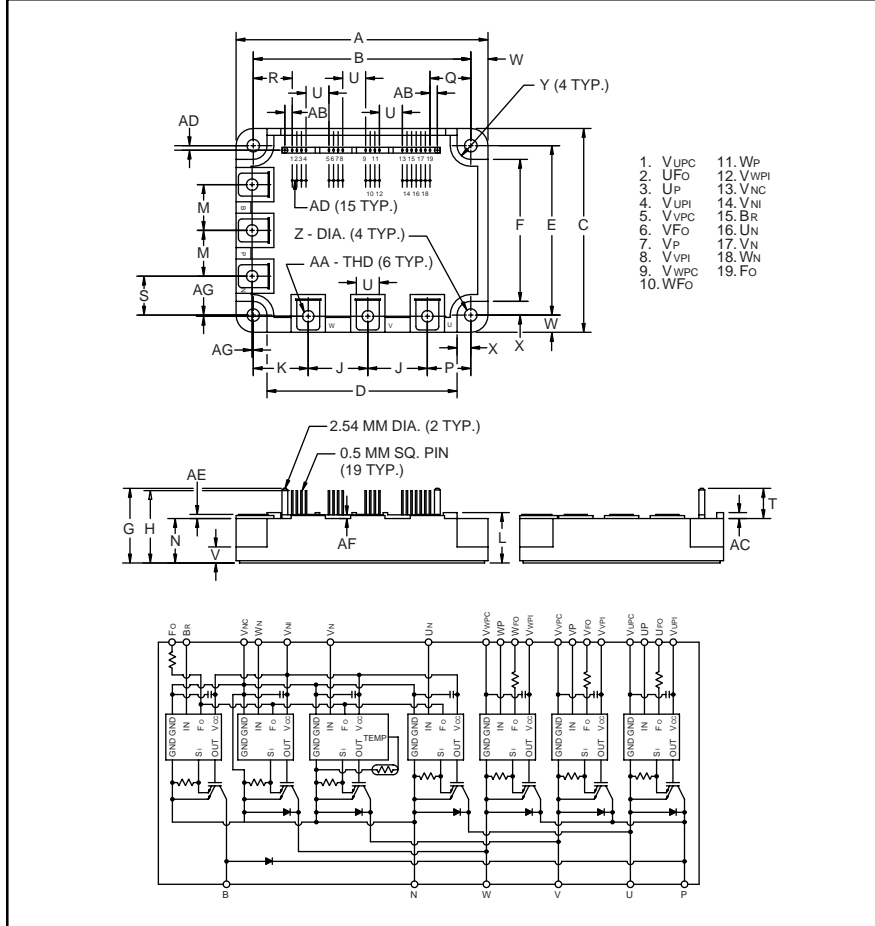


### Intellimod™ Module Three Phase + Brake IGBT Inverter Output 100 Amperes/600 Volts



#### Description:

Powerex Intellimod™ 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. PM100RSA060 is a 600V, 100 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

| Dimensions | Inches          | Millimeters    |
|------------|-----------------|----------------|
| A          | 4.33±0.04       | 110.0±1.0      |
| B          | 3.74±0.02       | 95.0±0.5       |
| C          | 3.50±0.04       | 89.0±1.0       |
| D          | 3.27            | 83.0           |
| E          | 2.91±0.02       | 74.0±0.5       |
| F          | 2.44            | 62.0           |
| G          | 1.28            | 32.6           |
| H          | 1.24            | 31.6           |
| J          | 1.02            | 26.0           |
| K          | 0.94            | 24.0           |
| L          | 0.87 +0.06/-0.0 | 22.0 +1.5/-0.0 |
| M          | 0.79            | 20.0           |
| N          | 0.76            | 19.4           |
| P          | 0.75            | 19.0           |
| Q          | 0.708           | 17.98          |
| R          | 0.670           | 17.02          |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| S          | 0.67      | 17.0        |
| T          | 0.52      | 13.2        |
| U          | 0.39      | 10.0        |
| V          | 0.32      | 8.0         |
| W          | 0.30      | 7.5         |
| X          | 0.24      | 6.0         |
| Y          | 0.24 Rad. | Rad. 6.0    |
| Z          | 0.22 Dia. | Dia. 5.5    |
| AA         | Metric M5 | M5          |
| AB         | 0.127     | 3.22        |
| AC         | 0.10      | 2.6         |
| AD         | 0.08      | 2.0         |
| AE         | 0.07      | 1.8         |
| AF         | 0.06      | 1.6         |
| AG         | 0.02      | 0.5         |

| Type | Current Rating<br>Amperes | V <sub>CES</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 100                       | 60                               |

**PM100RSA060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

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

| Characteristics  | Symbol                 | PM100RSA060 | 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  | —                      | 17          | in-lb            |
| Mounting Torque, M5 Main Terminal Screw  | —                      | 17          | in-lb            |
| Module Weight (Typical)  | —                      | 550         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ ) | $V_{\text{CC(prot.)}}$ | 400         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal  | $V_{\text{RMS}}$       | 2500        | Volts            |

### 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 ( $U_P$ , $V_P$ , $W_P$ , $U_N$ , $V_N$ , $W_N$ , $B_r$ )  | $V_{\text{CIN}}$ | 20 | Volts |
| Fault Output Supply Voltage  | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current   | $I_{\text{FO}}$  | 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, $\pm$   | $I_C$                  | 100 | Amperes |
| Peak Collector Current, $\pm$  | $I_{\text{CP}}$        | 200 | Amperes |
| Supply Voltage (Applied between P - N)   | $V_{\text{CC}}$        | 450 | Volts   |
| Supply Voltage, Surge (Applied between P - N)                                    | $V_{\text{CC(surge)}}$ | 500 | Volts   |
| Collector Dissipation  | $P_C$                  | 403 | Watts   |

### Brake Sector

|   |                        |     |         |
|---|------------------------|-----|---------|
| Collector-Emitter Voltage                     | $V_{\text{CES}}$       | 600 | Volts   |
| Collector Current, $\pm$                      | $I_C$                  | 30  | Amperes |
| Peak Collector Current, $\pm$                 | $I_{\text{CP}}$        | 60  | Amperes |
| Supply Voltage (Applied between P - N)        | $V_{\text{CC}}$        | 450 | Volts   |
| Supply Voltage, Surge (Applied between P - N) | $V_{\text{CC(surge)}}$ | 500 | Volts   |
| Collector Dissipation                         | $P_C$                  | 208 | Watts   |
| Diode Forward Current                         | $I_F$                  | 30  | Amperes |
| Diode DC Reverse Voltage                      | $V_{\text{R(DC)}}$     | 600 | Volts   |

**PM100RSA060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

## 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                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$  | 158  | 240  | —    | Amperes          |
| Over Current Trip Level Brake Part      |                             |  | 39   | 53   | —    | Amperes          |
| Short Circuit Trip Level Inverter Part  | SC                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$  | —    | 360  | —    | Amperes          |
| Short Circuit Trip Level Brake Part     |                             |  | —    | 79   | —    | Amperes          |
| Over Current Delay Time                 | $t_{\text{off}}(\text{OC})$ | $V_D = 15\text{V}$   | —    | 10   | —    | $\mu\text{S}$    |
| Over Temperature Protection             | OT                          | Trip Level   | 111  | 118  | 125  | $^\circ\text{C}$ |
|   | $\text{OT}_R$               | Reset Level  | —    | 100  | —    | $^\circ\text{C}$ |
| 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 $V_{\text{UP1}}-V_{\text{UPC}}$ ,<br>$V_{\text{VP1}}-V_{\text{VPC}}$ , $V_{\text{WP1}}-V_{\text{WPC}}$ , $V_{\text{N1}}-V_{\text{NC}}$ | 13.5 | 15   | 16.5 | 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              | $V_{\text{CIN(on)}}$        | Applied between  | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage             | $V_{\text{CIN(off)}}$       | $U_P, V_P, W_P, U_N, V_N, W_N, B_r$  | 1.7  | 2.0  | 2.3  | Volts            |
| PWM Input Frequency                     | $f_{\text{PWM}}$            | 3- $\emptyset$ 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               |

**PM100RSA060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

## 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 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            |
| Diode Forward Voltage                | $V_{FM}$      | $-I_C = 100\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$                         | —   | 2.2  | 3.3  | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, I_{CIN} = 0\text{V}, I_C = 100\text{A}$                          | —   | 1.8  | 2.7  | Volts         |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A}, T_j = 125^\circ\text{C}$ | —   | 1.75 | 2.63 | Volts         |
| Inductive Load Switching Times       | $t_{on}$      |   | 0.4 | 0.8  | 2.0  | $\mu\text{S}$ |
|                                      | $t_{rr}$      | $V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$                                     | —   | 0.15 | 0.3  | $\mu\text{S}$ |
|                                      | $t_{C(on)}$   | $V_{CC} = 300\text{V}, I_C = 100\text{A}$   | —   | 0.4  | 1.0  | $\mu\text{S}$ |
|                                      | $t_{off}$     | $T_j = 125^\circ\text{C}$   | —   | 2.0  | 2.9  | $\mu\text{S}$ |
|                                      | $t_{C(off)}$  |   | —   | 0.6  | 1.2  | $\mu\text{S}$ |

### Brake Sector

|                                      |               |   |   |     |     |       |
|--------------------------------------|---------------|---|---|-----|-----|-------|
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A}, T_j = 25^\circ\text{C}$  | — | 2.7 | 3.5 | Volts |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 100\text{A}, T_j = 125^\circ\text{C}$ | — | 3.1 | 4.0 | Volts |
| Diode Forward Voltage                | $V_{FM}$      | $-I_C = 30\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$                          | — | 1.7 | 2.7 | Volts |
| 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    |

**PM100RSA060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

## Thermal Characteristics

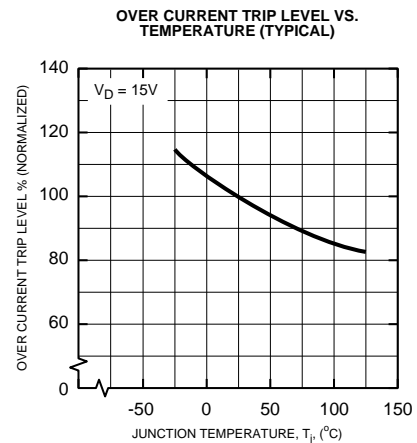
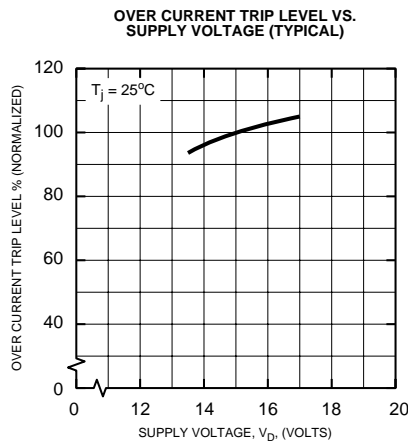
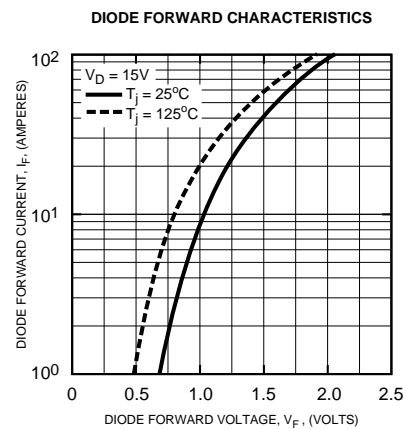
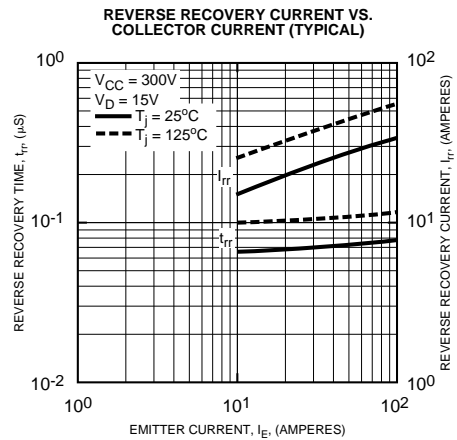
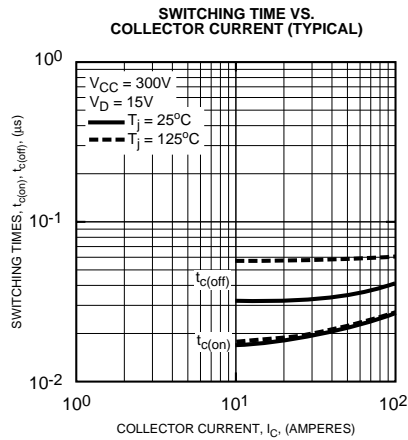
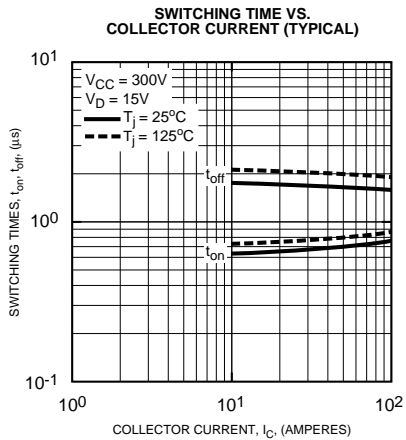
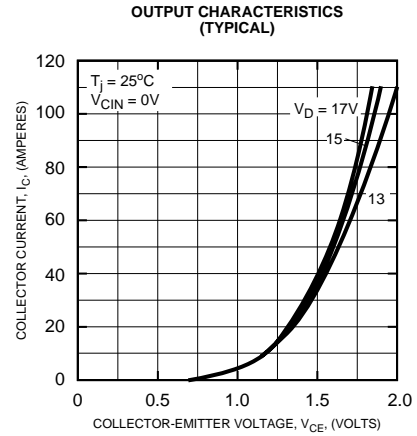
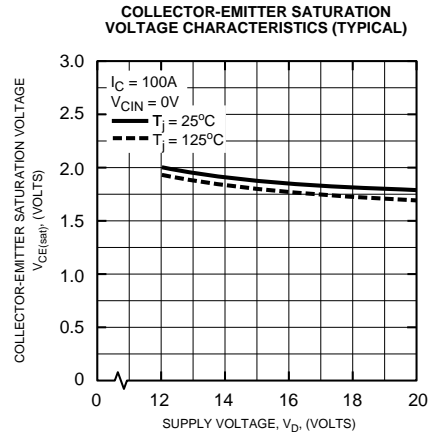
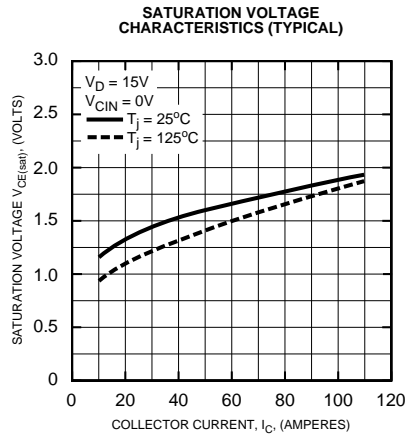
| Characteristic                      | Symbol         | Condition   | Min. | Typ. | Max.  | Units   |
|-------------------------------------|----------------|---|------|------|-------|---------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each Inverter IGBT                                | —    | —    | 0.31  | °C/Watt |
|                                     | $R_{th(j-c)D}$ | Each Inverter FWDi                                | —    | —    | 0.7   | °C/Watt |
|                                     | $R_{th(c-f)Q}$ | Each Brake IGBT                                   | —    | —    | 0.6   | °C/Watt |
|                                     | $R_{th(c-f)D}$ | Each Brake FWDi                                   | —    | —    | 1.5   | °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   | 0 ~ 400        | Volts   |
|                     | $V_D$          | Applied between $V_{UP1}$ - $V_{UPC}$ ,<br>$V_{N1}$ - $V_{NC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ | $15 \pm 1.5$   | Volts   |
| Input ON Voltage    | $V_{CIN(on)}$  | Applied between  | 0 ~ 0.8        | Volts   |
| Input OFF Voltage   | $V_{CIN(off)}$ | $U_P, V_P, W_P, U_N, V_N, W_N, B_r$  | $4.0 \sim V_D$ | Volts   |
| PWM Input Frequency | $f_{PWM}$      | Using Application Circuit  | 5 ~ 20         | kHz     |
| Minimum Dead Time   | $t_{DEAD}$     | Input Signal   | $\geq 2.5$     | $\mu S$ |

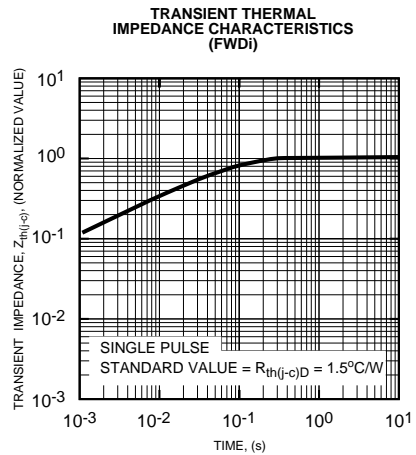
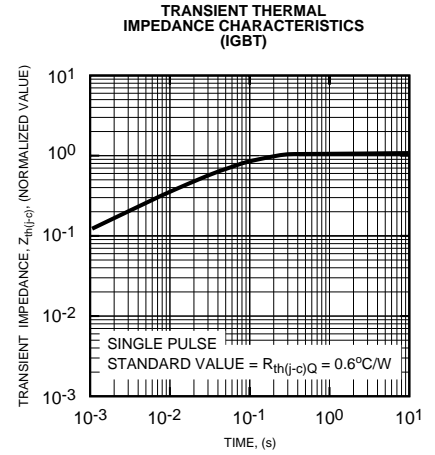
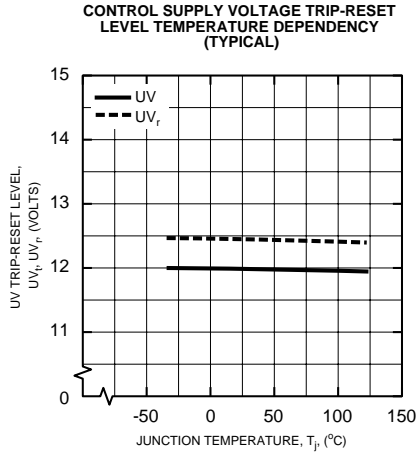
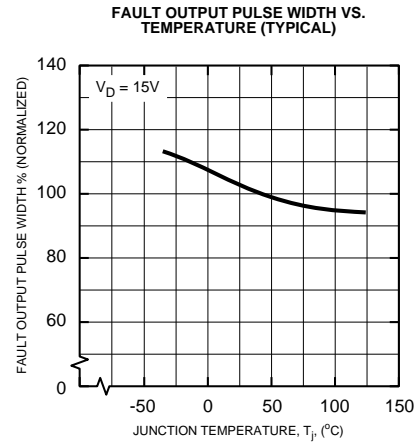
**PM100RSA060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**100 Amperes/600 Volts**

**Inverter Part**



**PM100RSA060**  
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**100 Amperes/600 Volts**

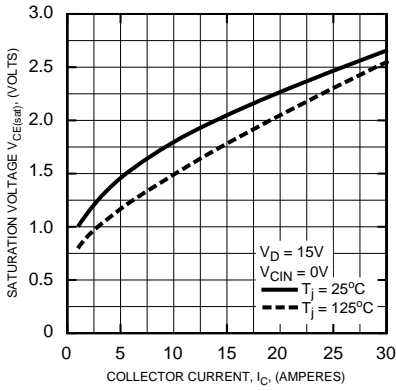
**Inverter Part**



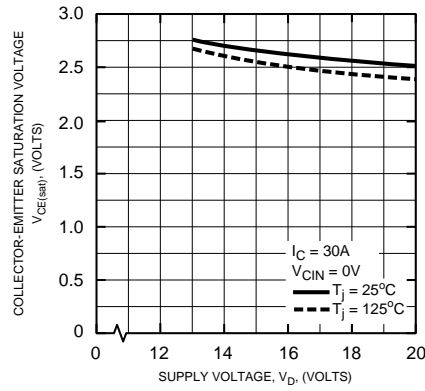
**PM100RSA060**  
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**Brake Part**

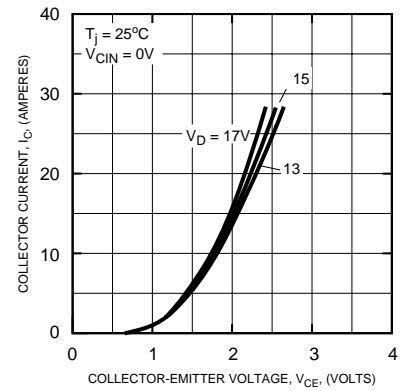
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



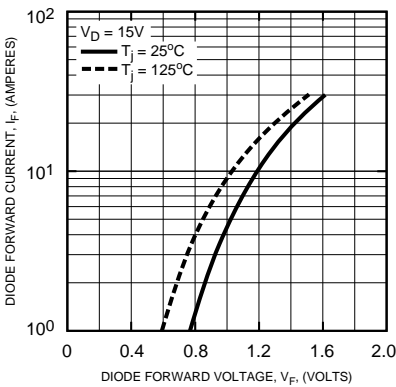
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



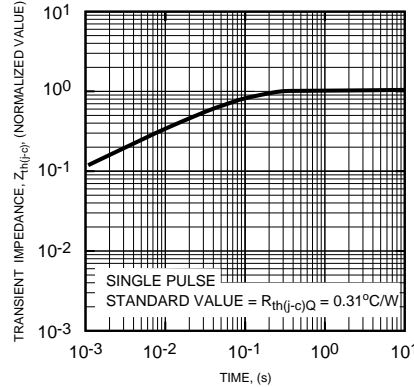
**OUTPUT CHARACTERISTICS (TYPICAL)**



**DIODE FORWARD CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)**

