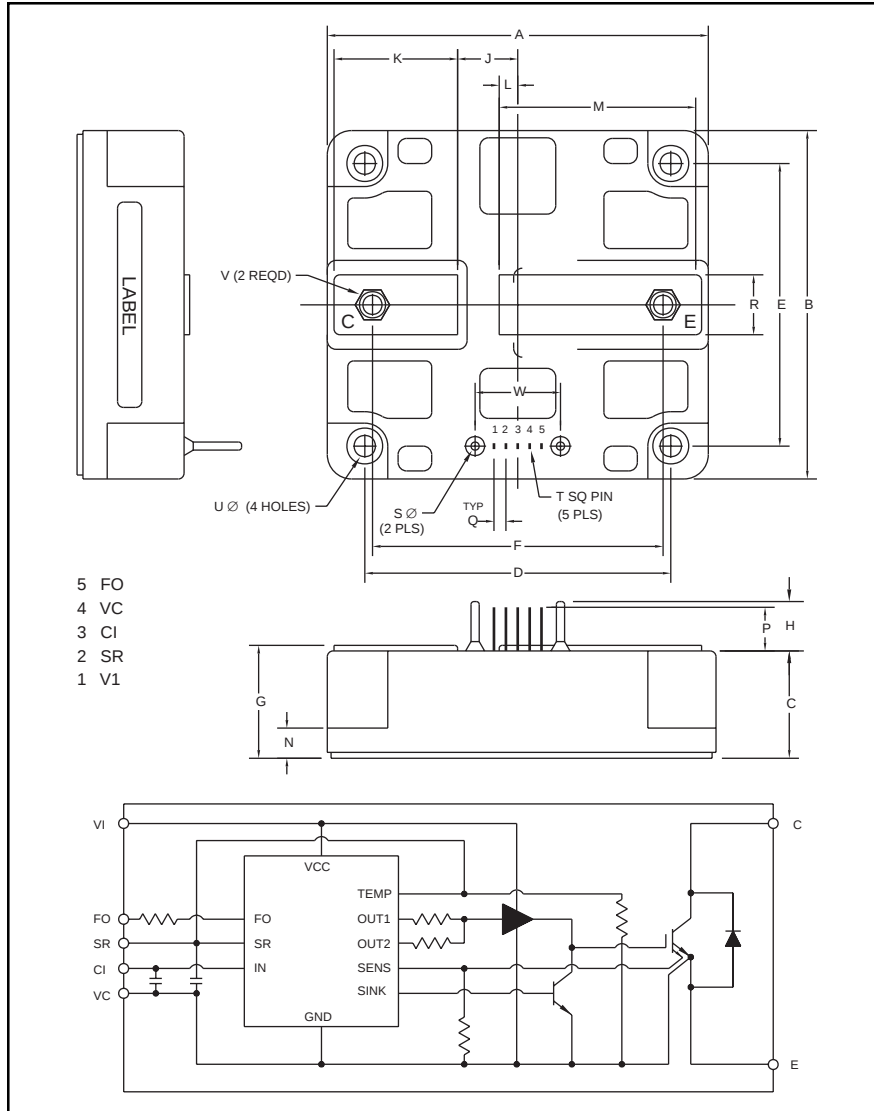


### Intellimod™ Module

Half Phase

IGBT Inverter Output

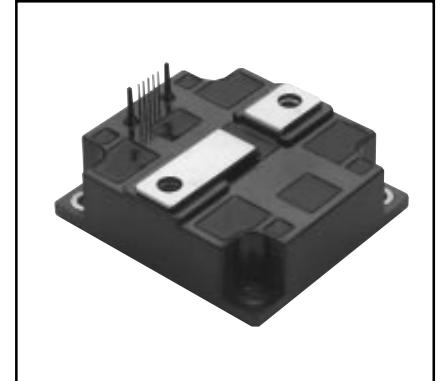
800 Amperes/600 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| A          | 3.46   | 88.0        |
| B          | 3.85   | 98.0        |
| C          | 1.16   | 29.5        |
| D          | 2.76   | 70.0        |
| E          | 3.15   | 80.0        |
| F          | 2.56   | 65.0        |
| G          | 1.34   | 34.0        |
| H          | 0.63   | 16.0        |
| J          | 0.63   | 16.1        |
| K          | 1.00   | 25.4        |
| L          | 0.20   | 5.1         |

| Dimensions | Inches  | Millimeters |
|------------|---------|-------------|
| M          | 1.83    | 46.6        |
| N          | 0.28    | 7.0         |
| P          | 0.59    | 15.0        |
| Q          | 0.10    | 2.54        |
| R          | 0.71    | 18.0        |
| S          | 0.08    | 2.0         |
| T          | 0.02 SQ | 0.64 SQ     |
| U          | 0.26    | 6.5         |
| V          | M8      | M8          |
| W          | 0.79    | 20.0        |



#### 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. PM800HSA060 is a 600V, 800 Ampere Intellimod™ Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CE</sub><br>Volts (x 10) |
|------|---------------------------|---------------------------------|
| PM   | 800                       | 60                              |



Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

**PM800HSA060**  
**Intellimod™ Module**  
**Half Phase IGBT Inverter Output**  
800 Amperes/600 Volts

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

| Characteristics                                                                         | Symbol                 | PM800HSA060 | 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 (Typical)                                           | —                      | 25          | in-lb            |
| Mounting Torque, M8 Main Terminal Screws (Typical)                                      | —                      | 100         | in-lb            |
| Module Weight (Typical)                                                                 | —                      | 630         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part) | $V_{\text{CC(prot.)}}$ | 400         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal                                         | $V_{\text{RMS}}$       | 2500        | Volts            |

#### Control Sector, $T_j = 25^\circ\text{C}$ unless otherwise specified

|                                                                          |                  |    |       |
|--------------------------------------------------------------------------|------------------|----|-------|
| 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 $F_O$ and $V_{\text{NC}}$ ) | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current                                                     | $I_{\text{FO}}$  | 20 | mA    |

#### IGBT Inverter Sector, $T_j = 25^\circ\text{C}$ unless otherwise specified

|                                                                                 |                  |      |         |
|---------------------------------------------------------------------------------|------------------|------|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ ) | $V_{\text{CES}}$ | 600  | Volts   |
| Collector Current, $\pm$                                                        | $I_C$            | 800  | Amperes |
| Peak Collector Current, $\pm$                                                   | $I_{\text{CP}}$  | 1600 | Amperes |
| Collector Dissipation                                                           | $P_C$            | 2100 | Watts   |



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**PM800HSA060**  
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**Half Phase IGBT Inverter Output**  
800 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                          | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$ | 1000 | 1350 | —    | Amperes          |
| Short Circuit Trip Level Inverter Part  | SC                          | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$ | 1350 | 1870 | —    | 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 $V_1$ - $V_C$                                            | 13.5 | 15   | 16.5 | Volts            |
| Circuit Current                         | $I_D$                       | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$                        | —    | 23   | 30   | mA               |
| Input ON Threshold Voltage              | $V_{\text{CIN(on)}}$        | Applied between $C_1$ - $V_C$                                            | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage             | $V_{\text{CIN(off)}}$       | Applied between $C_1$ - $V_C$                                            | 1.7  | 2.0  | 2.3  | Volts            |
| PWM Input Frequency                     | $f_{\text{PWM}}$            | 3- $\emptyset$ Sinusoidal                                                | —    | 15   | 20   | kHz              |
| Arm Shoot-through Blocking Time         | $t_{\text{DEAD}}$           | At IPM's Input Terminals                                                 | 3.5  | —    | —    | $\mu\text{S}$    |
| 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               |

**PM800HSA060**  
**Intellimod™ Module**  
**Half Phase IGBT Inverter Output**  
**800 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>IGBT Inverter Sector</b>          |               |                                                                                                                          |      |      |      |               |
| Collector Cutoff Current             | $I_{CES}$     | $V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$                                                                               | —    | —    | 1.0  | mA            |
|                                      |               | $V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$                                                                              | —    | —    | 10.0 | mA            |
| Diode Forward Voltage                | $V_{FM}$      | $-I_C = 800\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$                                                              | —    | 1.9  | 2.8  | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 800\text{A}, T_j = 25^\circ\text{C}, \text{ Pulsed}$                       | —    | 2.0  | 2.7  | Volts         |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 800\text{A}, T_j = 125^\circ\text{C}, \text{ Pulsed}$                      | —    | 2.1  | 2.8  | Volts         |
| Inductive Load Switching Times       | $t_{on}$      | $V_D = 15\text{V}, V_{CIN} = 0 \sim 5\text{V}$<br>$V_{CC} = 300\text{V}, I_C = 800\text{A}$<br>$T_j = 125^\circ\text{C}$ | 0.5  | 1.4  | 2.5  | $\mu\text{S}$ |
|                                      | $t_{rr}$      |                                                                                                                          | —    | 0.15 | 0.3  | $\mu\text{S}$ |
|                                      | $t_{C(on)}$   |                                                                                                                          | —    | 0.4  | 1.0  | $\mu\text{S}$ |
|                                      | $t_{off}$     |                                                                                                                          | —    | 2.5  | 3.5  | $\mu\text{S}$ |
|                                      | $t_{C(off)}$  |                                                                                                                          | —    | 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                                         | —    | —    | 0.06  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)D}$ | Each FWDi                                         | —    | —    | 0.09  | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.038 | $^\circ\text{C/Watt}$ |

**Recommended Conditions for Use**

| Characteristic      | Symbol         | Condition                     | Value          | Units         |
|---------------------|----------------|-------------------------------|----------------|---------------|
| Supply Voltage      | $V_{CC}$       | Applied across C-E Terminals  | 0 ~ 400        | Volts         |
|                     | $V_D$          | Applied between $V_1$ - $V_C$ | $15 \pm 1.5$   | Vol           |
| Input ON Voltage    | $V_{CIN(on)}$  | Applied between $C_1$ - $V_C$ | 0 ~ 0.8        | Volts         |
| Input OFF Voltage   | $V_{CIN(off)}$ | Applied between $C_1$ - $V_C$ | $4.0 - V_{SE}$ | Volts         |
| PWM Input Frequency | $f_{PWM}$      | Using Application Circuit     | 5 ~ 20         | kHz           |
| Minimum Dead Time   | $t_{DEAD}$     | Input Signal                  | $\geq 3.5$     | $\mu\text{S}$ |

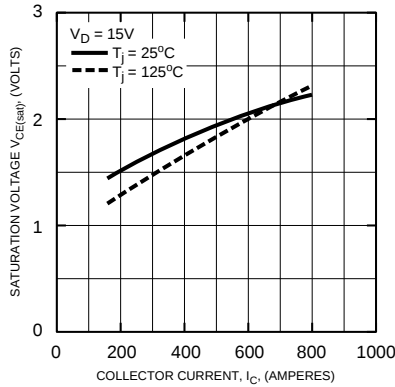
## PM800HSA060

### Intellimod™ Module

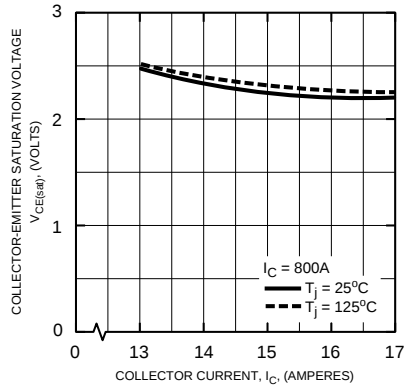
### Half Phase IGBT Inverter Output

800 Amperes/600 Volts

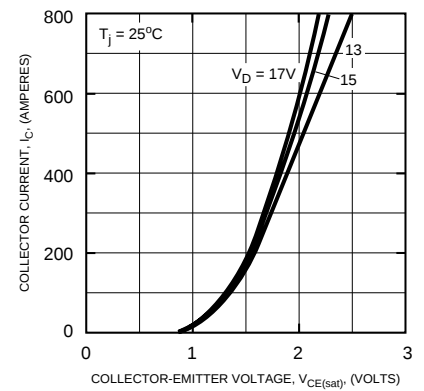
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



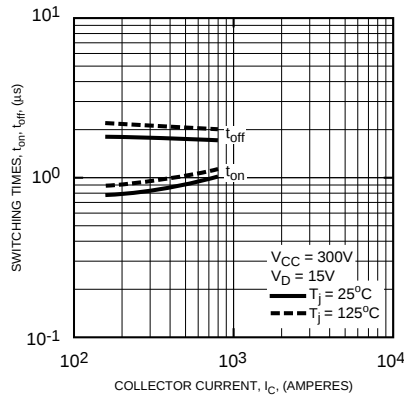
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



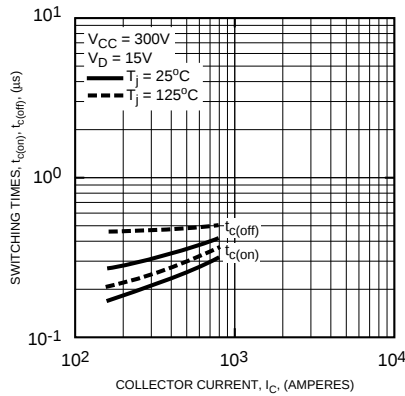
OUTPUT CHARACTERISTICS (TYPICAL)



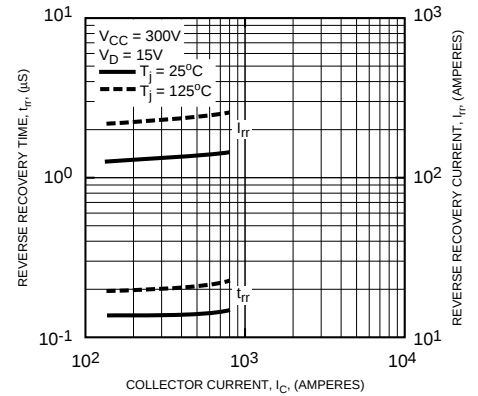
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



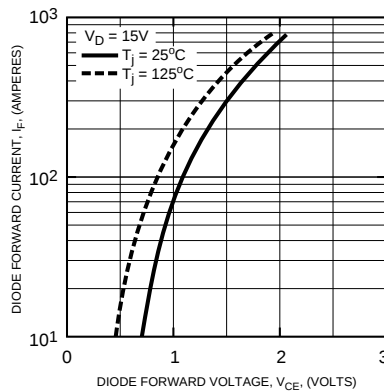
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



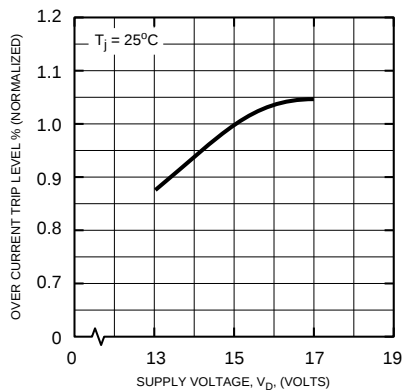
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



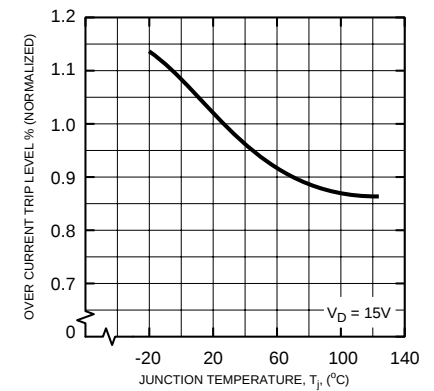
DIODE FORWARD CHARACTERISTICS



OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)



OVER CURRENT TRIP LEVEL VS. TEMPERATURE (TYPICAL)



**PM800HSA060**  
**Intellimod™ Module**  
**Half Phase IGBT Inverter Output**  
**800 Amperes/600 Volts**

