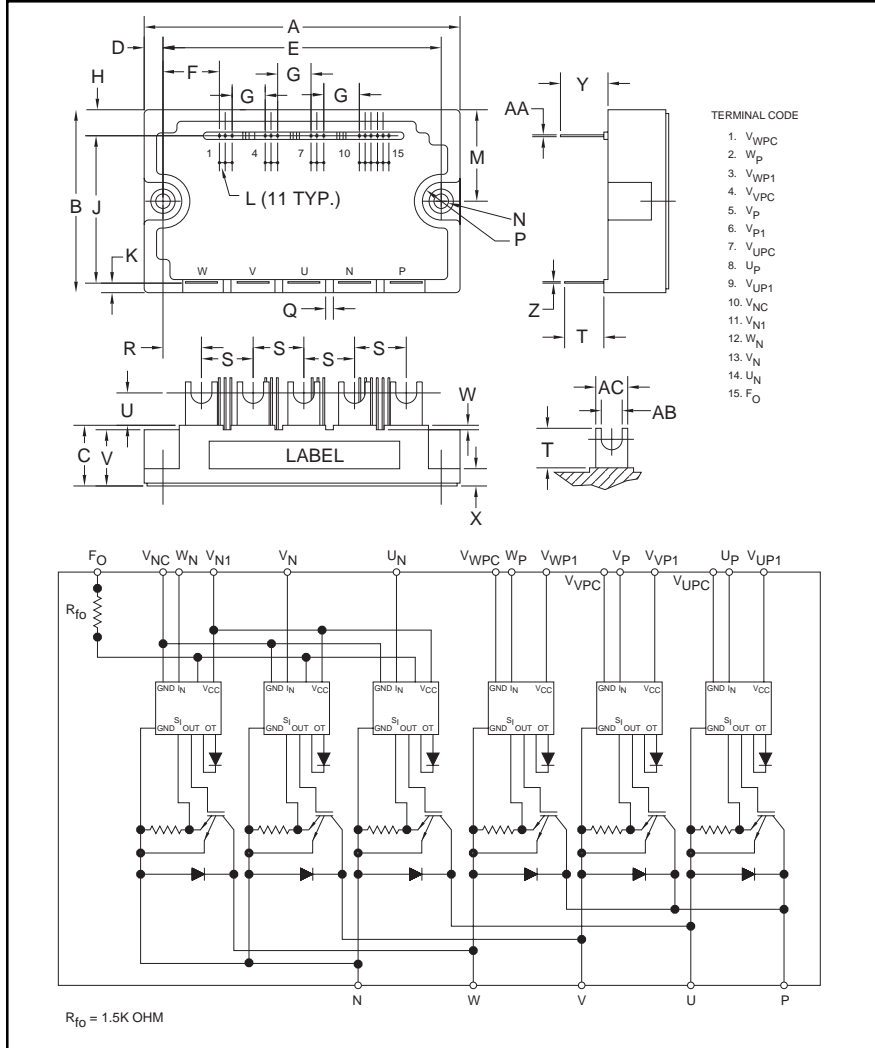


### Intellimod™ Module MAXISS Series™ Multi AXIS Servo IPM 150 Amperes/600 Volts



#### 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
  - Under Voltage
  - Over Temperature by On-Chip Temperature Sensor
- Low Loss Using 4th Generation IGBT Chip

#### Applications:

- Motion Control
- Servo Control

#### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM100CBS060 is a 600V, 100 Ampere Intellimod™ Intelligent Power Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 10) |
|------|---------------------------|---------------------------|
| PM   | 150                       | 060                       |

#### Outline Drawing and Circuit Diagram

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| A          | 4.72      | 120.0       |
| B          | 1.97      | 50.0        |
| C          | 1.18      | 30.0        |
| D          | 0.3       | 7.0         |
| E          | 4.17±0.1  | 106.0±0.3   |
| F          | 0.94      | 23.79       |
| G          | 0.40      | 10.16       |
| H          | 0.34      | 8.5         |
| J          | 1.54      | 39.0        |
| K          | 0.10      | 2.5         |
| L          | 0.10      | 2.54        |
| M          | 0.98      | 25.0        |
| N          | 5.5 Dia.  | Dia 5.5     |
| P          | 0.28 Rad. | Rad. 7.0    |

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| Q          | 0.12   | 3.0         |
| R          | 0.59   | 15.0        |
| S          | 0.75   | 19.0        |
| T          | 0.39   | 10.0        |
| U          | 0.24   | 6.0         |
| V          | 1.10   | 28.0        |
| W          | 0.08   | 2.0         |
| X          | 0.26   | 6.5         |
| Y          | 0.43   | 11.0        |
| Z          | 0.04   | 1.0         |
| AA         | 0.03   | 0.64        |
| AB         | 0.20   | 5.0         |
| AC         | 0.35   | 9.0         |

**PM150CBS060**  
**Intellimod™ Module**  
**MAXISS Series™, Multi AXIS Servo IPM**  
 150 Amperes/600 Volts

**Absolute Maximum Ratings, T<sub>j</sub> = 25°C unless otherwise specified**

| Characteristics  | Symbol                 | PM150CBS060 | Units            |
|--|------------------------|-------------|------------------|
| Storage Temperature  | T <sub>stg</sub>       | -40 to 125  | °C               |
| Case Operating Temperature*  | T <sub>C</sub>         | -20 to 100  | °C               |
| Mounting Torque, M5 Mounting Screws  | —                      | 31          | in-lb            |
| Mounting Torque, M5 Main Terminal Screws   | —                      | 31          | in-lb            |
| Module Weight (Typical)  | —                      | 400         | Grams            |
| Supply Voltage Protected by OC and SC (V <sub>D</sub> = 13.5 - 16.5V, Inverter Part, T <sub>j</sub> = 125°C) | V <sub>CC(prot.)</sub> | 400         | Volts            |
| Supply Voltage, Surge (Applied between P - N)  | V <sub>CC(surge)</sub> | 500         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal  | V <sub>ISO</sub>       | 2500        | V <sub>rms</sub> |

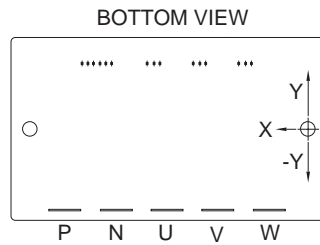
**IGBT Inverter Sector**

|  |                  |            |         |
|--|------------------|------------|---------|
| Collector-Emitter Voltage (V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V) | V <sub>CES</sub> | 600        | Volts   |
| Collector Current, ± (T <sub>C</sub> = 25°C)                             | I <sub>C</sub>   | 150        | Amperes |
| Peak Collector Current, ± (T <sub>C</sub> = 25°C)                        | I <sub>CP</sub>  | 300        | Amperes |
| Collector Dissipation  | P <sub>C</sub>   | 735        | Watts   |
| Power Device Junction Temperature  | T <sub>j</sub>   | -20 to 150 | °C      |

**Control Sector**

|  |                  |                     |       |
|--|------------------|---------------------|-------|
| Supply Voltage Applied between (V <sub>UP1</sub> -V <sub>UPC</sub> , V <sub>VP1</sub> -V <sub>VPC</sub> , V <sub>WP1</sub> -V <sub>WPC</sub> , V <sub>N1</sub> -V <sub>Nc</sub> )                          | V <sub>D</sub>   | 20                  | Volts |
| Input Voltage Applied between (U <sub>P</sub> -V <sub>UPC</sub> , V <sub>P</sub> -V <sub>VPC</sub> , W <sub>P</sub> -V <sub>WPC</sub> , U <sub>N</sub> -V <sub>Nc</sub> -W <sub>N</sub> -V <sub>Nc</sub> ) | V <sub>CIN</sub> | 20                  | Volts |
| Fault Output Supply Voltage (Applied between F <sub>O</sub> and V <sub>Nc</sub> )  | V <sub>FO</sub>  | V <sub>D</sub> +0.5 | Volts |
| Fault Output Current (Sink Current at F <sub>O</sub> Terminal)   | I <sub>FO</sub>  | 20                  | mA    |

\*T<sub>C</sub> Measure Point (Under the Chip)



(mm)

| ARM<br>AXIS | U <sub>P</sub> |      | V <sub>P</sub> |      | W <sub>P</sub> |      | U <sub>N</sub> |       | V <sub>N</sub> |       | W <sub>N</sub> |       |
|-------------|----------------|------|----------------|------|----------------|------|----------------|-------|----------------|-------|----------------|-------|
|             | IGBT           | FWDi | IGBT           | FWDi | IGBT           | FWDi | IGBT           | FWDi  | IGBT           | FWDi  | IGBT           | FWDi  |
| X           | 83.3           | 83.3 | 41.8           | 41.8 | 16.8           | 16.8 | 70.8           | 70.8  | 54.3           | 54.3  | 29.3           | 29.3  |
| Y           | 5.3            | -4.8 | 5.3            | -4.8 | 5.3            | -4.8 | -0.8           | -10.8 | -0.8           | -10.8 | -0.8           | -10.8 |



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**PM150CBS060**  
**Intellimod™ Module**  
**MAXISS Series™, Multi AXIS Servo IPM**  
 150 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-Emitter Cutoff Current        | $I_{CES}$     | $V_{CE} = V_{CES}, V_D = 15V, T_j = 25^\circ\text{C}$               | —    | —    | 1.0  | mA               |
|   |               | $V_{CE} = V_{CES}, V_D = 15V, T_j = 125^\circ\text{C}$              | —    | —    | 10   | mA               |
| Diode Forward Voltage                   | $V_{EC}$      | $-I_C = 150A, V_D = 15V, V_{CIN} = 15V$                             | —    | 2.2  | 3.3  | Volts            |
| Collector-Emitter Saturation Voltage    | $V_{CE(sat)}$ | $V_D = 15V, V_{CIN} = 0V, I_C = 150A,$<br>$T_j = 25^\circ\text{C}$  | —    | 1.7  | 2.3  | Volts            |
|   |               | $V_D = 15V, V_{CIN} = 0V, I_C = 150A,$<br>$T_j = 125^\circ\text{C}$ | —    | 1.7  | 2.3  | Volts            |
| Inductive Load Switching Times          | $t_{on}$      |   | 0.8  | 1.2  | 2.4  | $\mu\text{S}$    |
|   | $t_{rr}$      | $V_D = 15V, V_{CIN} = 0 \sim 15V,$                                  | —    | 0.15 | 0.3  | $\mu\text{S}$    |
|   | $t_{C(on)}$   | $V_{CC} = 300V, I_C = 150A,$  | —    | 0.4  | 1.0  | $\mu\text{S}$    |
|   | $t_{off}$     | $T_j = 125^\circ\text{C},$ Inductive Load                           | —    | 2.4  | 3.3  | $\mu\text{S}$    |
|   | $t_{C(off)}$  |   | —    | 0.5  | 1.0  | $\mu\text{S}$    |
| <b>Control Sector</b>                   |               |   |      |      |      |                  |
| Over Current Trip Level                 | OC            | $T_j = -20^\circ\text{C}, V_D = 15V$                                | —    | —    | 690  | Amperes          |
|   |               | $T_j = 25^\circ\text{C}, V_D = 15V$                                 | 286  | 404  | 570  | Amperes          |
|   |               | $T_j = 125^\circ\text{C}, V_D = 15V$                                | 210  | —    | —    | Amperes          |
| Short Circuit Trip Level                | SC            | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}, V_D = 15V$      | —    | 420  | —    | Amperes          |
| Over Current Delay Time                 | $t_{off(OC)}$ | $V_D = 15V$   | —    | 10   | —    | $\mu\text{S}$    |
| Over Temperature Protection             | OT            | Trip Level  | 135  | 145  | 155  | $^\circ\text{C}$ |
| (Detect $T_j$ of IGBT Chip)             | $OT_R$        | Reset Level   | —    | 125  | —    | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection | UV            | Trip Level  | 11.5 | 12.0 | 12.5 | Volts            |
|   | $UV_R$        | Reset Level   | —    | 12.5 | —    | Volts            |
| Circuit Current                         | $I_D$         | $V_D = 15V, V_{CIN} = 15V, V_{N1} \sim V_{NC}$                      | —    | 45   | 65   | mA               |
|   |               | $V_D = 15V, V_{CIN} = 15V, V_{XP1} \sim V_{XPC}$                    | —    | 15   | 20   | mA               |
| Input ON Threshold Voltage              | $V_{th(on)}$  | Applied between $U_P \sim V_{UPC}, V_P \sim V_{VPC},$               | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage             | $V_{th(off)}$ | $W_P \sim V_{WPC}, U_N, V_N, W_N \sim V_{NC}$                       | 1.7  | 2.0  | 2.3  | Volts            |
| Fault Output Current                    | $I_{FO(H)}$   | $V_D = 15V, V_{FO} = 15V$   | —    | —    | 0.01 | mA               |
|   | $I_{FO(L)}$   | $V_D = 15V, V_{FO} = 15V$   | —    | 10   | 15   | mA               |
| Minimum Fault Output Pulse Width        | $t_{FO}$      | $V_D = 15V$   | 1.0  | 1.8  | —    | mS               |



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 150 Amperes/600 Volts

### Thermal Characteristics

| Characteristic                      | Symbol         | Condition   | Min. | Typ. | Max.   | Units   |
|-------------------------------------|----------------|---|------|------|--------|---------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each IGBT*  | —    | —    | 0.17** | °C/Watt |
|                                     | $R_{th(j-c)F}$ | Each FWDI*  | —    | —    | 0.27** | °C/Watt |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.046  | °C/Watt |

\* $T_C$  measured point is just under the chips.

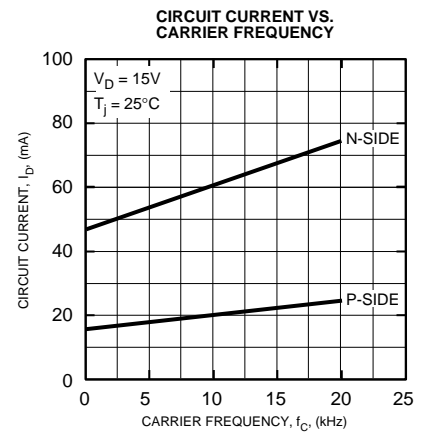
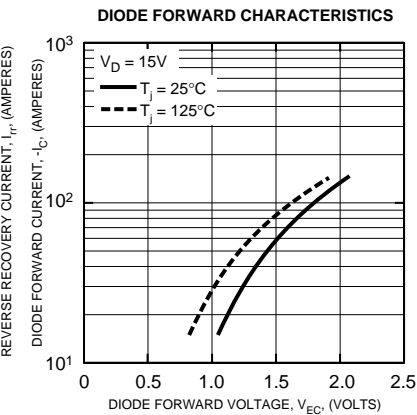
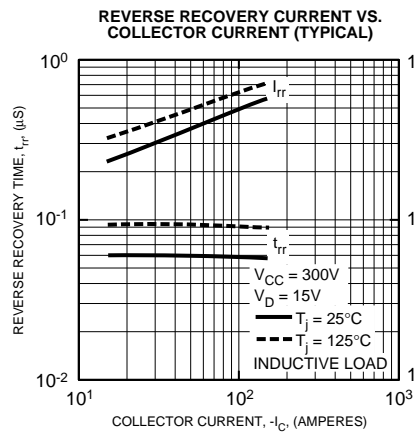
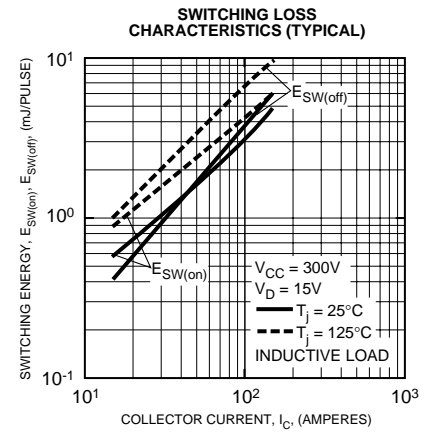
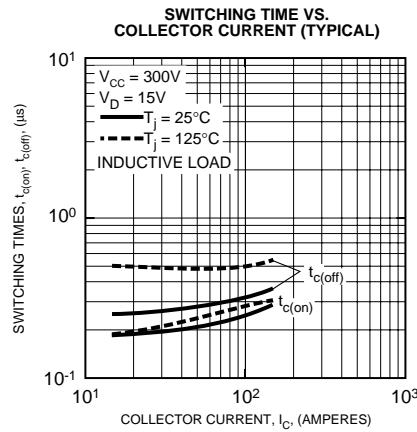
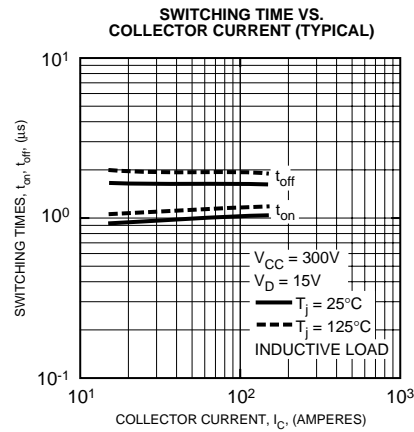
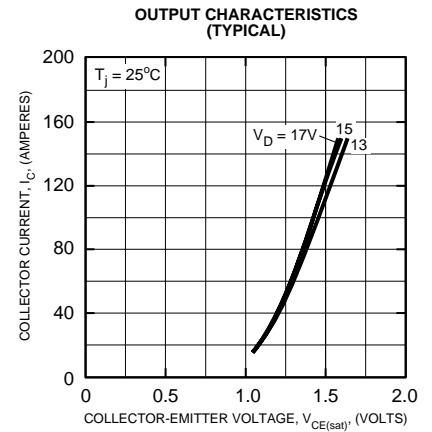
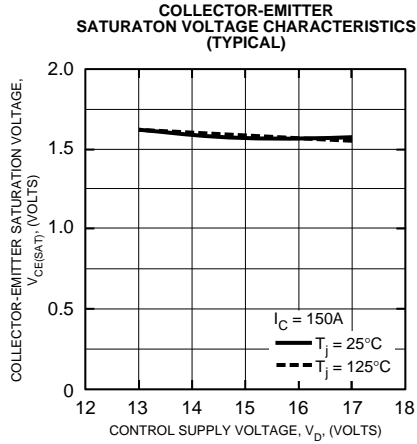
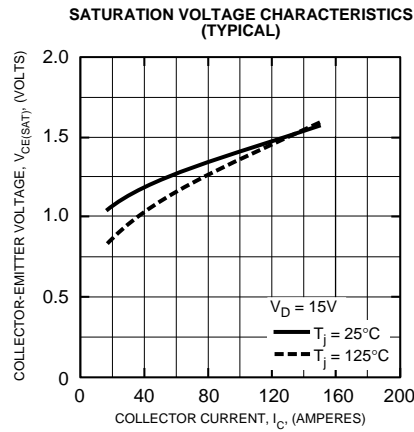
\*\*If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

### Recommended Conditions for Use

| Characteristic          | Symbol         | Condition  | Value        | Units   |
|-------------------------|----------------|--|--------------|---------|
| Supply Voltage          | $V_{CC}$       | Applied across P-N Terminals   | $\leq 400$   | Volts   |
| Control Supply Voltage* | $V_D$          | Applied between $V_{UP1}-V_{U1PC}$ ,<br>$V_{VP1}-V_{V1PC}$ , $V_{WP1}-V_{W1PC}$ , $V_{N1}-V_{N1C}$ | $15 \pm 1.5$ | Volts   |
| Input ON Voltage        | $V_{CIN(on)}$  | Applied between $U_P-V_{U1PC}$ , $V_P-V_{V1PC}$ ,  | $\leq 0.8$   | Volts   |
| Input OFF Voltage       | $V_{CIN(off)}$ | $W_P-V_{W1PC}$ , $U_N$ , $V_N$ , $W_N-V_{N1C}$   | $\geq 4.0$   | Volts   |
| PWM Input Frequency     | $f_{PWM}$      | Using Application Circuit  | $\leq 20$    | kHz     |
| Minimum Dead Time       | $t_{DEAD}$     | Input Signal   | $\geq 2.5$   | $\mu S$ |

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

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