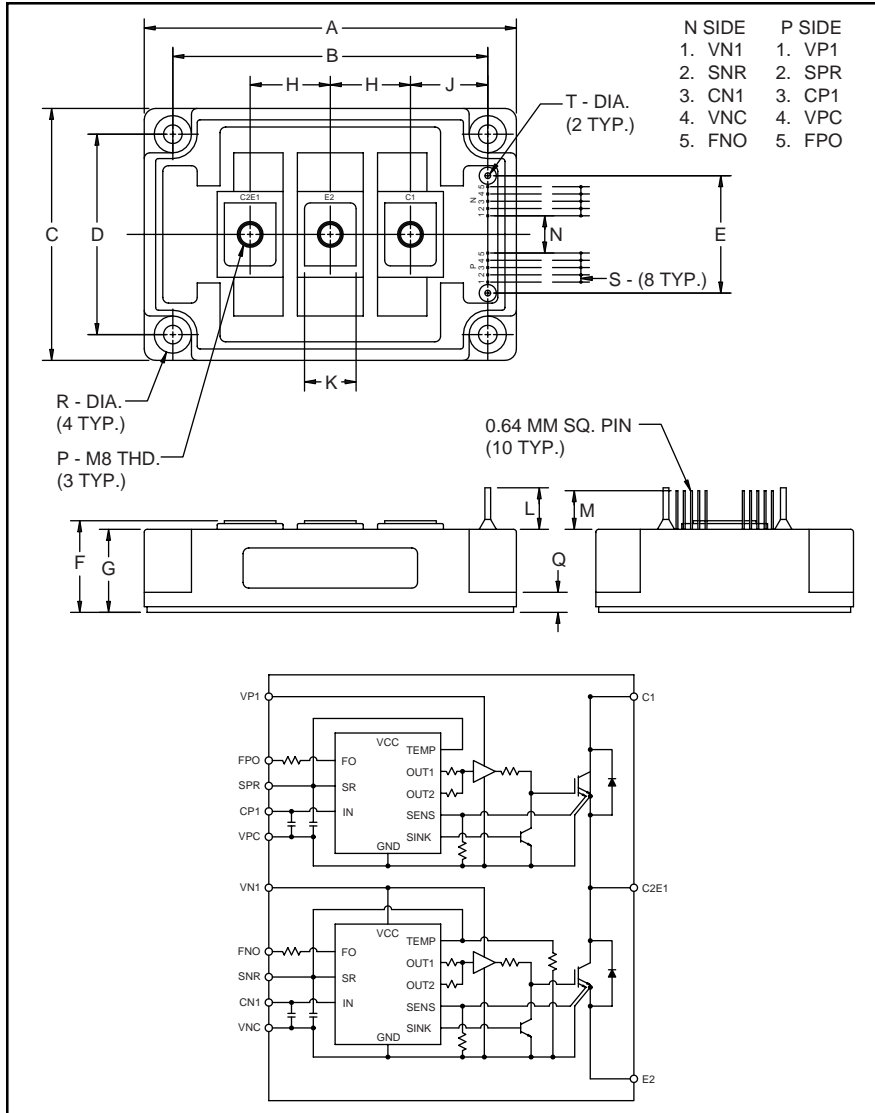


### Intellimod™ Module Single Phase IGBT Inverter Output 300 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches           | Millimeters  |
|------------|------------------|--------------|
| A          | 5.12             | 130.0        |
| B          | 4.33±0.010       | 110.0±0.25   |
| C          | 3.54             | 90.0         |
| D          | 2.76±0.010       | 70.0±0.25    |
| E          | 1.61             | 41.0         |
| F          | 1.34 +0.04/-0.02 | 34.0 +1/-0.5 |
| G          | 1.22             | 31.0         |
| H          | 1.10             | 28.0         |
| J          | 1.06             | 27.0         |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| K          | 0.71      | 18.0        |
| L          | 0.57      | 14.5        |
| M          | 0.53      | 13.5        |
| N          | 0.51      | 13.0        |
| P          | M8 Metric | M8          |
| Q          | 0.28      | 7.0         |
| R          | 0.26 Dia. | Dia. 6.5    |
| S          | 0.100     | 2.54        |
| T          | 0.08 Dia. | Dia. 2.0    |



#### 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. PM300DSA120 is a 1200V, 300 Ampere Intellimod™ Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CE</sub><br>Volts (x 10) |
|------|---------------------------|---------------------------------|
| PM   | 300                       | 120                             |



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

**PM300DSA120**  
**Intellimod™ Module**  
**Single Phase IGBT Inverter Output**  
**300 Amperes/1200 Volts**

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

| Characteristics  | Symbol                 | PM300DSA120 | 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  | —                      | 26          | in-lb            |
| Mounting Torque, M8 Main Terminal Screws   | —                      | 95          | in-lb            |
| Module Weight (Typical)  | —                      | 910         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part) | $V_{\text{CC(prot.)}}$ | 800         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal                                      | $V_{\text{RMS}}$       | 2500        | Volts            |

**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   | $I_{\text{FO}}$  | 20 | mA    |

**IGBT Inverter Sector**

|   |                        |      |         |
|---|------------------------|------|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ ) | $V_{\text{CES}}$       | 1200 | Volts   |
| Collector Current, $\pm$  | $I_C$                  | 300  | Amperes |
| Peak Collector Current, $\pm$   | $I_{\text{CP}}$        | 600  | Amperes |
| Supply Voltage (Applied between C1 - E2)  | $V_{\text{CC}}$        | 900  | Volts   |
| Supply Voltage, Surge (Applied between C1 - E2)                                 | $V_{\text{CC(surge)}}$ | 1000 | Volts   |
| Collector Dissipation   | $P_C$                  | 1790 | Watts   |

**PM300DSA120**  
**Intellimod™ Module**  
**Single Phase IGBT Inverter Output**  
**300 Amperes/1200 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                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$  | 380  | 560  | —    | Amperes          |
| Short Circuit Trip Level Inverter Part  | SC                          | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$  | 500  | 840  | —    | 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  | $^\circ\text{C}$ |
|   | OT <sub>R</sub>             | Reset Level  | 85   | 95   | 105  | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection | UV                          | Trip Level   | 11.5 | 12.0 | 12.5 | Volts            |
|   | UV <sub>R</sub>             | 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                         | $I_D$                       | $V_D = 15\text{V}$ , $V_{CIN} = 5\text{V}$ , $V_{N1}-V_{NC}$   | —    | 23   | 30   | mA               |
|   |                             | $V_D = 15\text{V}$ , $V_{CIN} = 5\text{V}$ , $V_{XP1}-V_{XPC}$   | —    | 23   | 30   | mA               |
| Input ON Threshold Voltage              | $V_{CIN(\text{on})}$        | Applied between  | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage             | $V_{CIN(\text{off})}$       | $C_{P1}-V_{PC}$ , $C_{N1}-V_{NC}$  | 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               |
| SXR Terminal Output Voltage             | $V_{\text{SXR}}$            | $T_j \leq 125^\circ\text{C}$ , $R_{\text{in}} = 6.8 \text{ k}\Omega$ ( $S_{\text{PR}}$ , $S_{\text{NR}}$ ) | 4.5  | 5.1  | 5.6  | Volts            |

**PM300DSA120**  
**Intellimod™ Module**  
**Single Phase IGBT Inverter Output**  
**300 Amperes/1200 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             | $I_{CEX}$     | $V_{CE} = V_{CEX}, T_j = 25^\circ\text{C}$  | —    | —    | 1    | mA            |
|                                      |               | $V_{CE} = V_{CEX}, T_j = 125^\circ\text{C}$   | —    | —    | 10   | mA            |
| Diode Forward Voltage                | $V_{FM}$      | $-I_C = 300\text{A}, V_D = 15\text{V}, V_{CIN} = 5\text{V}$                         | —    | 2.5  | 3.5  | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 300\text{A}$                          | —    | 2.3  | 3.2  | Volts         |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 300\text{A}, T_j = 125^\circ\text{C}$ | —    | 2.1  | 2.9  | Volts         |
| Inductive Load Switching Times       | $t_{on}$      |   | 0.5  | 1.4  | 2.5  | $\mu\text{S}$ |
|                                      | $t_{rr}$      | $V_D = 15\text{V}, V_{CIN} = 0 \sim 5\text{V}$                                      | —    | 0.2  | 0.4  | $\mu\text{S}$ |
|                                      | $t_{C(on)}$   | $V_{CC} = 600\text{V}, I_C = 300\text{A}$   | —    | 0.4  | 1.0  | $\mu\text{S}$ |
|                                      | $t_{off}$     | $T_j = 125^\circ\text{C}$   | —    | 2.5  | 3.5  | $\mu\text{S}$ |
|                                      | $t_{C(off)}$  |   | —    | 0.6  | 1.1  | $\mu\text{S}$ |

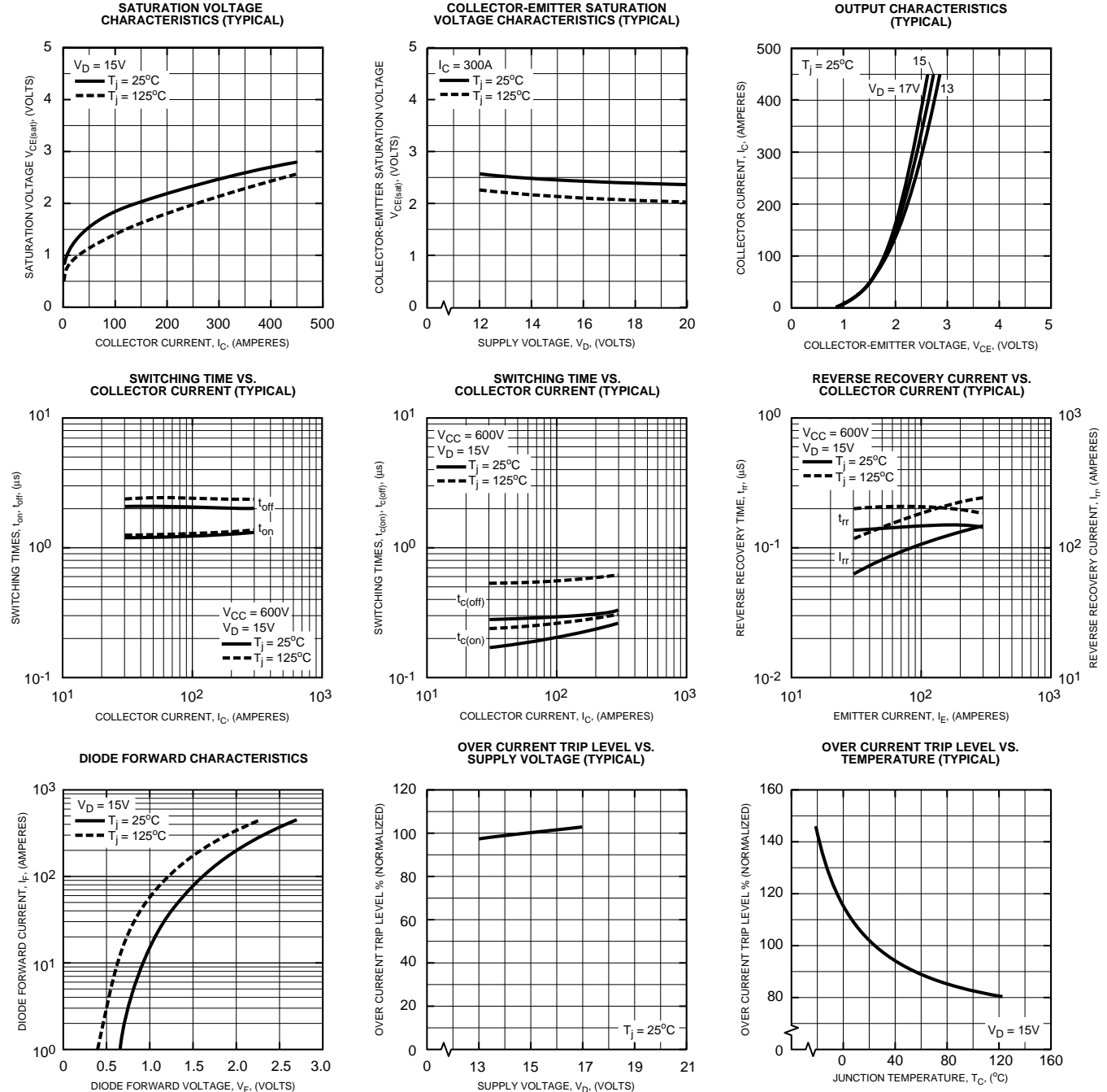
## Thermal Characteristics

| Characteristic                      | Symbol         | Condition   | Min. | Typ. | Max.  | Units                 |
|-------------------------------------|----------------|---|------|------|-------|-----------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each IGBT   | —    | —    | 0.07  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)D}$ | Each FWDi   | —    | —    | 0.13  | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.030 | $^\circ\text{C/Watt}$ |

## Recommended Conditions for Use

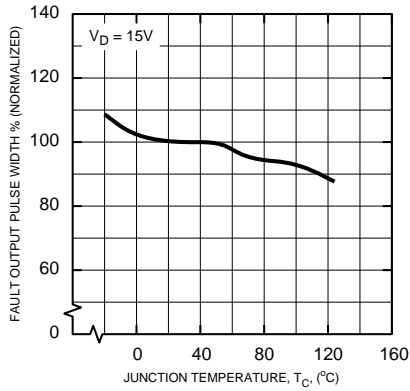
| Characteristic      | Symbol         | Condition                                      | Value              | Units         |
|---------------------|----------------|--|--------------------|---------------|
| Supply Voltage      | $V_{CC}$       | Applied across C1-E2 Terminals                 | 0 ~ 800            | 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                                   | $\geq 3.5$         | $\mu\text{S}$ |

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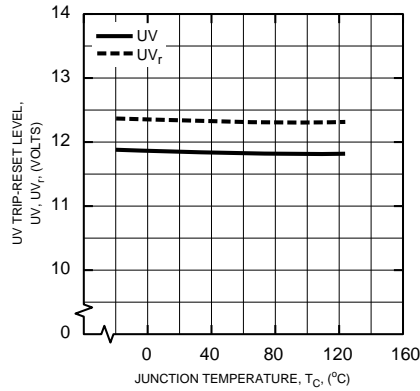


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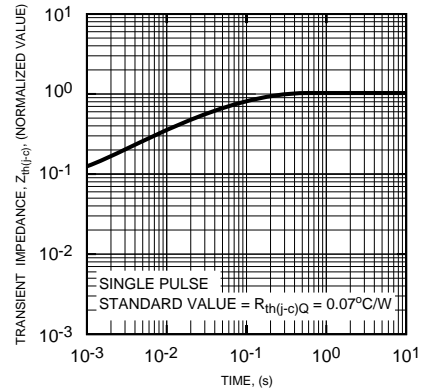
**FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)**



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



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)**

