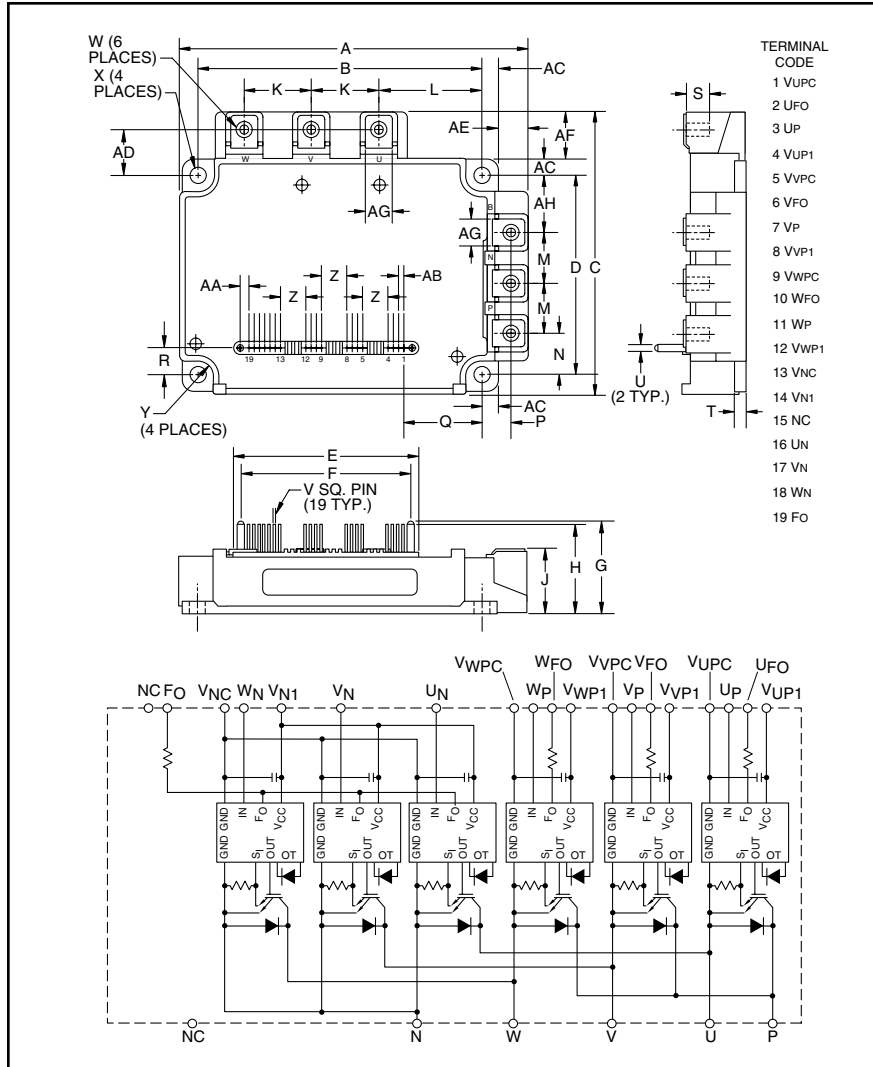


### Intellimod™ L-Series

Three Phase  
IGBT Inverter  
300 Amperes/600 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches          | Millimeters   |
|------------|-----------------|---------------|
| A          | 5.31            | 135.0         |
| B          | 4.33±0.02       | 110±0.5       |
| C          | 4.33            | 110.0         |
| D          | 3.07            | 78.0±0.5      |
| E          | 2.81            | 71.5          |
| F          | 2.62            | 66.5          |
| G          | 1.37            | 34.7          |
| H          | 1.32            | 33.6          |
| J          | 0.95+0.04/-0.01 | 24.1+1.0/-0.5 |
| K          | 1.02            | 26.0          |
| L          | 1.59            | 40.5          |
| M          | 0.79            | 20.0          |
| N          | 0.65            | 16.5          |
| P          | 0.43±0.01       | 11.0±0.3      |
| Q          | 1.19            | 30.15         |
| R          | 0.43            | 11.0          |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| S          | 0.51      | 13.0        |
| T          | 0.16      | 4.0         |
| U          | 0.1 Dia.  | Dia.2.5     |
| V          | 0.02 Sq.  | Sq. 0.5     |
| W          | M5 Metric | M5          |
| X          | 0.22 Dia. | Dia. 5.5    |
| Y          | 0.24 Rad. | Rad. 6      |
| Z          | 0.39      | 10.0        |
| AA         | 0.13      | 3.25        |
| AB         | 0.08      | 2.0         |
| AC         | 0.24      | 6.05        |
| AD         | 0.71      | 18.0        |
| AE         | 0.46      | 11.7        |
| AF         | 0.74      | 18.7        |
| AG         | 0.41      | 10.5        |
| AH         | 0.85      | 21.5        |



#### 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 Temperature
  - Using On-chip Temperature Sensing
  - Under Voltage
- ☐ Low Loss Using 5th Generation IGBT Chip

#### Applications:

- ☐ Inverters
- ☐ UPS
- ☐ Motion/Servo Control
- ☐ Power Supplies

#### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM300CLA060 is a 600V, 300 Ampere Intellimod™ Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CES</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 300                       | 60                               |

**PM300CLA060**  
**Intellimod™ L-Series**  
**Three Phase IGBT Inverter**  
**300 Amperes/600 Volts**

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

| Characteristics                                                             | Symbol                 | PM300CLA060 | Units            |
|-----------------------------------------------------------------------------|------------------------|-------------|------------------|
| Power Device Junction Temperature                                           | $T_j$                  | -20 to 150  | $^\circ\text{C}$ |
| Storage Temperature                                                         | $T_{\text{stg}}$       | -40 to 125  | $^\circ\text{C}$ |
| MMounting Torque, M5 Mounting Screws                                        | —                      | 31          | in-lb            |
| Mounting Torque, M5 Main Terminal Screws                                    | —                      | 31          | in-lb            |
| Module Weight (Typical)                                                     | —                      | 800         | Grams            |
| Supply Voltage, Surge (Applied between P - N)                               | $V_{\text{CC(surge)}}$ | 550         | Volts            |
| Self-protection Supply Voltage Limit (Short Circuit protection Capability)* | $V_{\text{CC(prot.)}}$ | 400         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal                             | $V_{\text{ISO}}$       | 2500        | Volts            |

\* $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part,  $T_j = 125^\circ\text{C}$

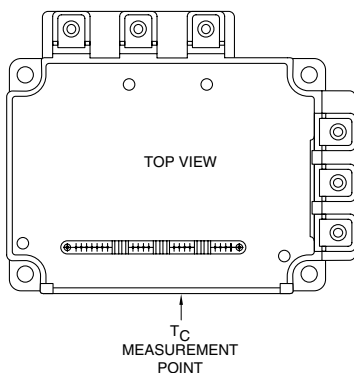
**IGBT Inverter Sector**

|                                                                                  |                     |     |         |
|----------------------------------------------------------------------------------|---------------------|-----|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$    | 600 | Volts   |
| Collector Current ( $T_C = 25^\circ\text{C}$ )                                   | $\pm I_C$           | 300 | Amperes |
| Peak Collector Current ( $T_C = 25^\circ\text{C}$ )                              | $\pm I_{\text{CP}}$ | 600 | Amperes |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$               | 801 | Watts   |

**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 $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_{\text{NC}}$ , $W_N-V_{\text{NC}}$ )                          | $V_{\text{CIN}}$ | 20 | Volts |
| Fault Output Supply Voltage<br>(Applied between $U_{\text{FO}}-V_{\text{UPC}}$ , $V_{\text{FO}}-V_{\text{VPC}}$ , $W_{\text{FO}}-V_{\text{WPC}}$ , $F_O-V_{\text{NC}}$ ) | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ Terminals)                                                                            | $I_{\text{FO}}$  | 20 | mA    |

Note 1:  $T_C$  (Base Plate) Measurement Point



**PM300CLA060**  
**Intellimod™ L-Series**  
**Three Phase IGBT Inverter**  
**300 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-Emitter Cutoff Current        | I <sub>CES</sub>      | V <sub>CE</sub> = V <sub>CES</sub> , V <sub>D</sub> = 15V, T <sub>j</sub> = 25°C                                                        | —    | —    | 1.0  | mA      |
|                                         |                       | V <sub>CE</sub> = V <sub>CES</sub> , V <sub>D</sub> = 15V, T <sub>j</sub> = 125°C                                                       | —    | —    | 10   | mA      |
| Diode Forward Voltage                   | V <sub>EC</sub>       | -I <sub>C</sub> = 300A, V <sub>CIN</sub> = 15V, V <sub>D</sub> = 15V                                                                    | —    | 2.2  | 3.3  | Volts   |
| Collector-Emitter Saturation Voltage    | V <sub>CES(sat)</sub> | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 300A, T <sub>j</sub> = 25°C                                               | —    | 1.6  | 2.1  | Volts   |
|                                         |                       | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 300A, T <sub>j</sub> = 125°C                                              | —    | 1.5  | 2.0  | Volts   |
| Inductive Load Switching Times          | t <sub>on</sub>       | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0 ⇔ 15V<br>V <sub>CC</sub> = 300V, I <sub>C</sub> = 300A<br>T <sub>j</sub> = 125°C             | 0.5  | 1.0  | 2.4  | μs      |
|                                         | t <sub>rr</sub>       |                                                                                                                                         | —    | 0.2  | 0.4  | μs      |
|                                         | t <sub>C(on)</sub>    |                                                                                                                                         | —    | 0.4  | 1.0  | μs      |
|                                         | t <sub>off</sub>      |                                                                                                                                         | —    | 1.2  | 2.5  | μs      |
|                                         | t <sub>C(off)</sub>   |                                                                                                                                         | —    | 0.5  | 1.0  | μs      |
| Control Sector                          |                       |                                                                                                                                         |      |      |      |         |
| Short Circuit Trip Level                | SC                    | -20°C ≤ T <sub>j</sub> ≤ 125°C, V <sub>D</sub> = 15V                                                                                    | 600  | —    | —    | Amperes |
| Short Circuit Current Delay Time        | t <sub>off(SC)</sub>  | V <sub>D</sub> = 15V                                                                                                                    | —    | 0.2  | —    | μs      |
| Over Temperature Protection             | OT                    | Trip Level                                                                                                                              | 135  | 145  | 155  | °C      |
| (Detect T <sub>j</sub> of IGBT Chip)    | OT <sub>R</sub>       | Reset Level                                                                                                                             | —    | 125  | —    | °C      |
| Supply Circuit Under-voltage Protection | UV                    | Trip Level                                                                                                                              | 11.5 | 12.0 | 12.5 | Volts   |
| (-20 ≤ T <sub>j</sub> ≤ 125°C)          | UV <sub>R</sub>       | Reset Level                                                                                                                             | —    | 12.5 | —    | Volts   |
| Circuit Current                         | I <sub>D</sub>        | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V, V <sub>N1</sub> -V <sub>NC</sub>                                                          | —    | 18   | 28   | mA      |
|                                         |                       | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V, V <sub>XP1</sub> -V <sub>XPC</sub>                                                        | —    | 6    | 12   | mA      |
| Input ON Threshold Voltage              | V <sub>th(on)</sub>   | Applied between U <sub>P</sub> -V <sub>UPC</sub> ,                                                                                      | 1.2  | 1.5  | 1.8  | Volts   |
| Input OFF Threshold Voltage             | V <sub>th(off)</sub>  | V <sub>P</sub> -V <sub>VPC</sub> , W <sub>P</sub> -V <sub>WPC</sub> , U <sub>N</sub> - V <sub>N</sub> - W <sub>N</sub> -V <sub>NC</sub> | 1.7  | 2.0  | 2.3  | Volts   |
| Fault Output Current*                   | I <sub>FO(H)</sub>    | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                                                                                            | —    | —    | 0.01 | mA      |
|                                         | I <sub>FO(L)</sub>    | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                                                                                            | —    | 10   | 15   | mA      |
| Fault Output Pulse Width*               | t <sub>FO</sub>       | V <sub>D</sub> = 15V                                                                                                                    | 1.0  | 1.8  | —    | ms      |

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



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

**PM300CLA060**  
**Intellimod™ L-Series**  
**Three Phase IGBT Inverter**  
**300 Amperes/600 Volts**

### Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|-----------------|--------|-----------------|------|------|------|-------|
|-----------------|--------|-----------------|------|------|------|-------|

#### Thermal Characteristics

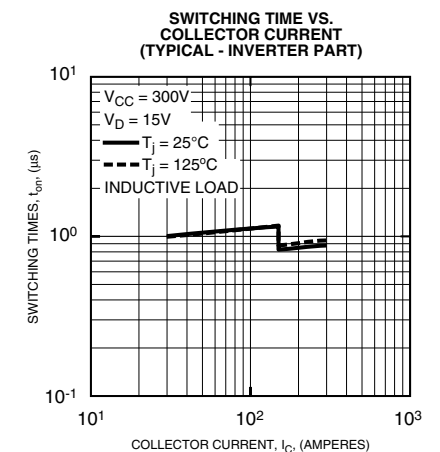
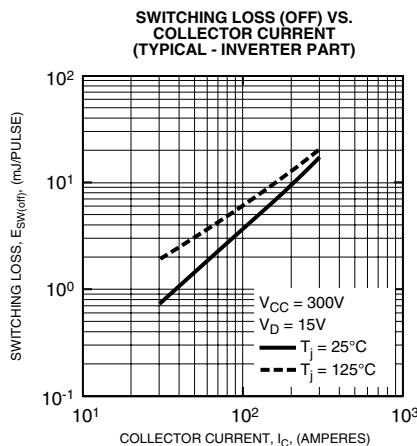
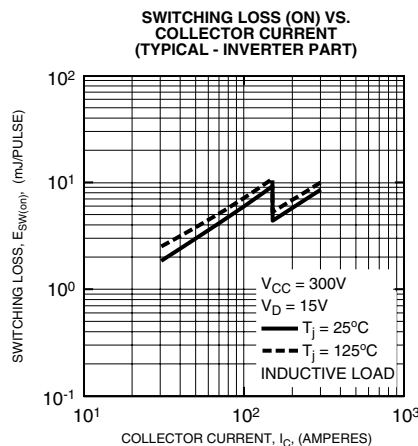
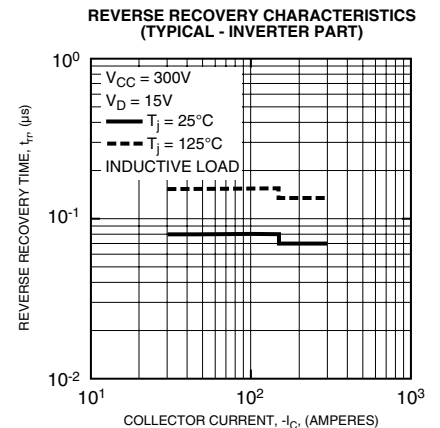
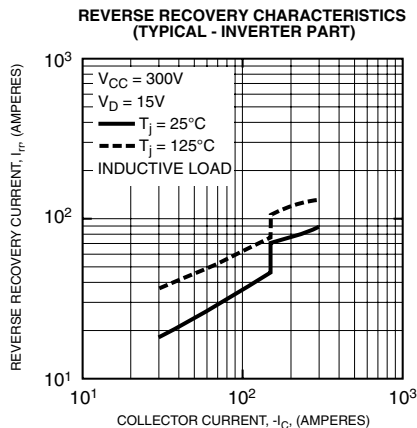
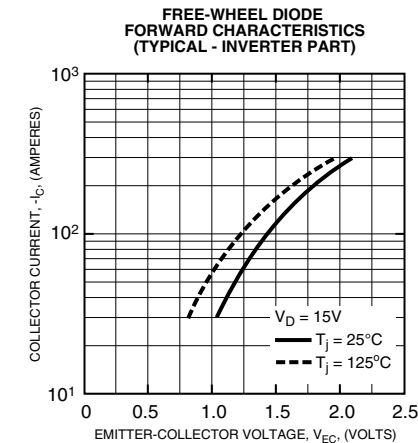
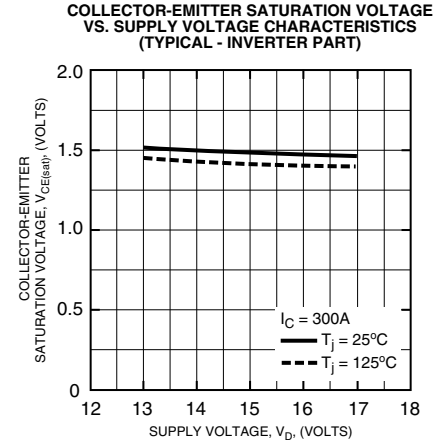
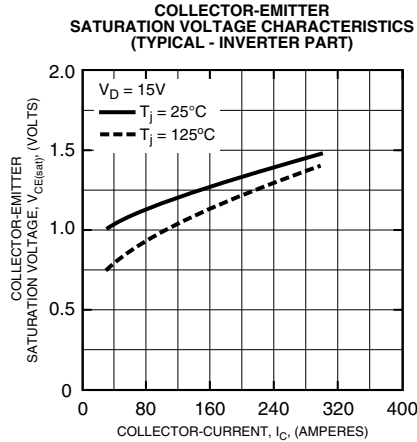
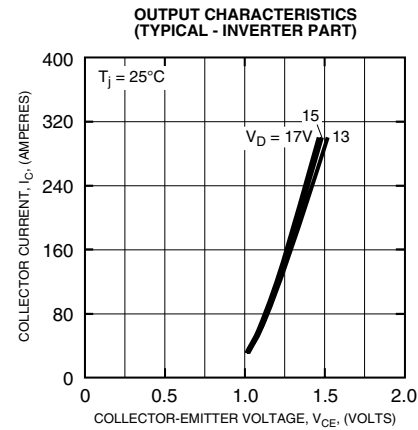
| Characteristic                      | Symbol         | Condition                                         | Min. | Typ. | Max.  | Units                 |
|-------------------------------------|----------------|---------------------------------------------------|------|------|-------|-----------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | IGBT (Per 1/6 Module) (Note 1)                    | —    | —    | 0.16  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)D}$ | FWDi (Per 1/6 Module) (Note 1)                    | —    | —    | 0.25  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)Q}$ | IGBT (Per 1/6 Module)                             | —    | —    | 0.12  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)D}$ | FWDi (Per 1/6 Module)                             | —    | —    | 0.19  | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.023 | $^\circ\text{C/Watt}$ |

#### 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 $V_{UP1}$ - $V_{UPC}$ ,<br>$V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ , $V_{N1}$ - $V_{NC}$ | $15.0 \pm 1.5$ | Volts         |
| Input ON Voltage                | $V_{CIN(on)}$  | Applied between $U_P$ - $V_{UPC}$ .                                                                            | $\leq 0.8$     | Volts         |
| Input OFF Voltage               | $V_{CIN(off)}$ | $V_P$ - $V_{VPC}$ , $W_P$ - $V_{WPC}$ , $U_N$ - $V_{NC}$ , $W_N$ - $V_{NC}$                                    | $\geq 9.0$     | Volts         |
| PWM Input Frequency             | $f_{PWM}$      | —                                                                                                              | $\leq 20$      | kHz           |
| Arm Shoot-through Blocking Time | $t_{DEAD}$     | Input Signal                                                                                                   | $\geq 2.0$     | $\mu\text{s}$ |

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

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