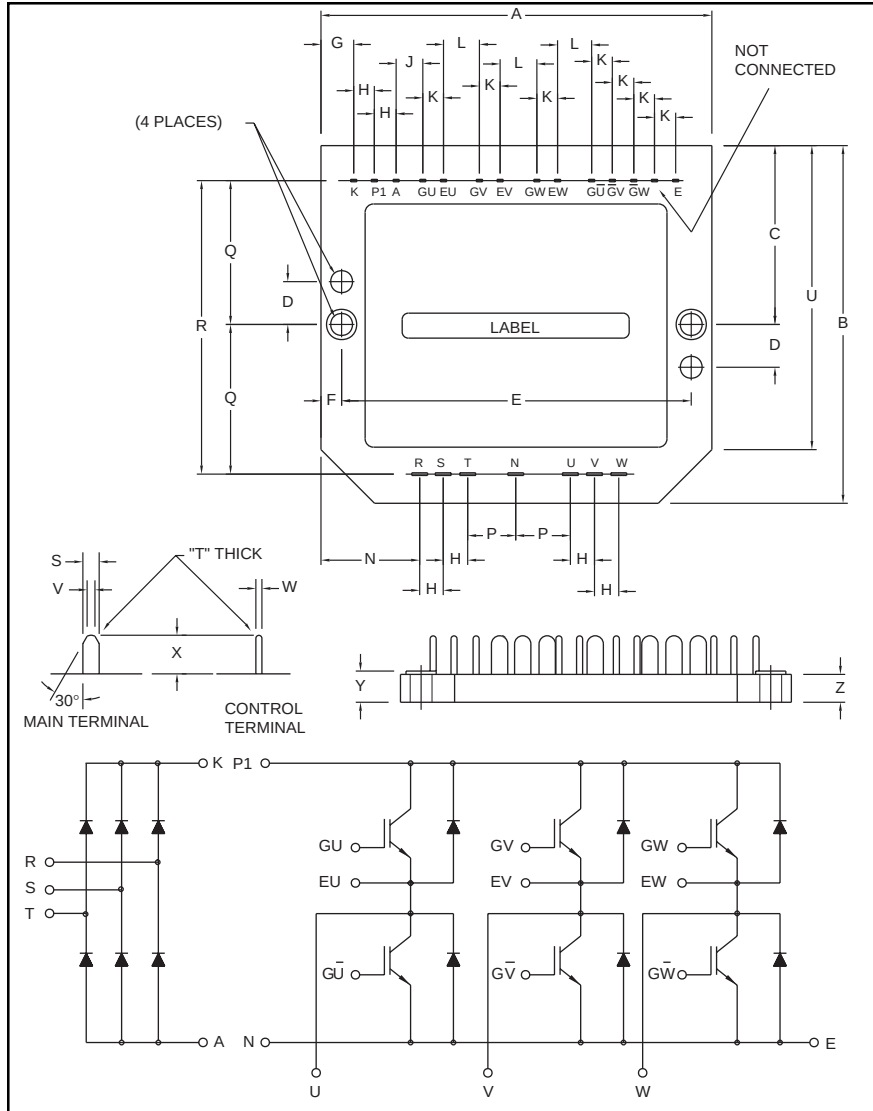


### CI Module

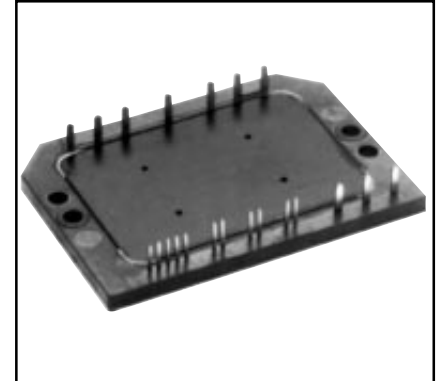
**Three Phase Converter +  
Three Phase Inverter  
15 Amperes/600 Volts**



Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| A          | 3.54   | 90.0        |
| B          | 2.52   | 64.0        |
| C          | 1.26   | 32.0        |
| D          | 0.35   | 9.0         |
| E          | 3.15   | 80.0        |
| F          | 0.20   | 5.0         |
| G          | 0.30   | 7.5         |
| H          | 0.32   | 8.0         |
| J          | 0.48   | 12.28       |
| K          | 0.10   | 2.54        |
| L          | 0.30   | 7.62        |
| M          | 0.19   | 4.8         |

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| N          | 0.65   | 16.5        |
| P          | 0.49   | 12.5        |
| Q          | 1.04   | 26.5        |
| R          | 2.09   | 53.0        |
| S          | 0.08   | 2.0         |
| T          | 0.02   | 0.5         |
| U          | 2.13   | 54.0        |
| V          | 0.04   | 1.0         |
| W          | 0.03   | 0.8         |
| X          | 0.32   | 8.0         |
| Y          | 0.21   | 5.3         |
| Z          | 0.20   | 5.0         |



### Description:

Powerex CI Modules are designed for use in switching applications. Each module consists of a three phase diode converter section and a three phase IGBT inverter section. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

### Features:

- ☐ Low Drive Power
- ☐ Low  $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery (70ns) Free-Wheel Diodes
- ☐ High Frequency Operation (20-25 kHz)
- ☐ Isolated Baseplate for Easy Heat Sinking

### Applications:

- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ General Purpose Inverters
- ☐ Robotics

### Ordering Information:

Example: Select the complete nine digit module part number you desire from the table below - i.e. CM15MD1-12H is a 600V ( $V_{CES}$ ), 15 Ampere CI Power Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 15                        | 12                        |

## CM15MD1-12H

### CI Module

### Three Phase Converter + Three Phase Inverter

15 Amperes/600 Volts

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

| Characteristics                        | Symbol           | CM15MD1-12H | Units                |
|----------------------------------------|------------------|-------------|----------------------|
| Power Device Junction Temperature      | $T_j$            | -40 to 150  | $^\circ\text{C}$     |
| Storage Temperature                    | $T_{\text{stg}}$ | -40 to 125  | $^\circ\text{C}$     |
| Mounting Torque, M4 Mounting Screws    | —                | 13          | in-lb                |
| Module Weight (Typical)                | —                | 60          | Grams                |
| Isolation Voltage, AC 1 minute, 60Hz   | $V_{\text{RMS}}$ | 2500        | Volts                |
| <b>Converter Part</b>                  |                  |             |                      |
| Repetitive Peak Reverse Voltage        | $V_{\text{RRM}}$ | 800         | Volts                |
| Recommended AC Input Voltage           | $E_a$            | 220         | Volts                |
| DC Output Current                      | $I_o$            | 20          | Amperes              |
| Surge (Non-repetitive) Forward Current | $I_{\text{FSM}}$ | 300         | Amperes              |
| $I^2t$ for Fusing                      | $I^2t$           | 375         | $\text{A}^2\text{s}$ |
| <b>IGBT Inverter Part</b>              |                  |             |                      |
| Collector-Emitter Voltage (G-E Short)  | $V_{\text{CES}}$ | 600         | Volts                |
| Gate-Emitter Voltage (C-E Short)       | $V_{\text{GES}}$ | $\pm 20$    | Volts                |
| Collector Current                      | $I_C$            | 15          | Amperes              |
| Collector Current (Pulse)*             | $I_{\text{CM}}$  | 30          | Amperes              |
| Emitter Current**                      | $I_E$            | 15          | Amperes              |
| Emitter Current** (Pulse)*             | $I_{\text{EM}}$  | 30          | Amperes              |
| Maximum Collector Dissipation          | $P_C$            | 45          | Watts                |

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

| Characteristics                      | Symbol               | Test Conditions                                                                                                                            | Min. | Typ. | Max. | Units              |
|--------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|--------------------|
| <b>Converter Sector</b>              |                      |                                                                                                                                            |      |      |      |                    |
| Repetitive Reverse Current           | $I_{\text{RRM}}$     | $V_R = V_{\text{RRM}}, T_j = 150^\circ\text{C}$                                                                                            | —    | —    | 8    | mA                 |
| Forward Voltage Drop                 | $V_{\text{FM}}$      | $I_F = 20\text{A}$                                                                                                                         | —    | —    | 1.5  | Volts              |
| Thermal Resistance (Junction-to-Fin) | $R_{\text{th(j-f)}}$ | Per Diode                                                                                                                                  | —    | —    | 3.6  | $^\circ\text{C/W}$ |
| <b>IGBT Inverter Sector</b>          |                      |                                                                                                                                            |      |      |      |                    |
| Collector Cutoff Current             | $I_{\text{CES}}$     | $V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$                                                                                | —    | —    | 1    | mA                 |
| Gate-Emitter Threshold Voltage       | $V_{\text{GE(th)}}$  | $V_{\text{CE}} = 10\text{V}, I_C = 1.5\text{mA}$                                                                                           | 4.5  | 6.0  | 7.5  | Volts              |
| Gate-Emitter Cutoff Current          | $I_{\text{GES}}$     | $V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$                                                                                | —    | —    | 0.5  | $\mu\text{A}$      |
| Collector-Emitter Saturation Voltage | $V_{\text{CE(sat)}}$ | $V_{\text{GE}} = 15\text{V}, I_C = 15\text{A}, T_j = 25^\circ\text{C}$                                                                     | —    | 2.1  | 2.8  | Volts              |
|                                      |                      | $V_{\text{GE}} = 15\text{V}, I_C = 15\text{A}, T_j = 150^\circ\text{C}$                                                                    | —    | 2.15 | —    | Volts              |
| Input Capacitance                    | $C_{\text{ies}}$     | $V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = 10\text{V}$                                                                                    | —    | —    | 1.5  | nF                 |
| Output Capacitance                   | $C_{\text{oes}}$     |                                                                                                                                            | —    | —    | 1.2  | nF                 |
| Reverse Transfer Capacitance         | $C_{\text{res}}$     |                                                                                                                                            | —    | —    | 0.3  | nF                 |
| Total Gate Charge                    | $Q_G$                | $V_{\text{CC}} = 300\text{V}, I_C = 15\text{A}, V_{\text{GE}} = 15\text{V}$                                                                | —    | 45   | —    | nC                 |
| Resistive                            | Turn-on Delay Time   | $V_{\text{GE1}} = V_{\text{GE2}} = 15\text{V},$<br>$V_{\text{CC}} = 300\text{V}, I_C = 15\text{A},$<br>$R_g = 42\Omega,$<br>Resistive Load | —    | —    | 120  | nS                 |
| Load                                 | Rise Time            |                                                                                                                                            | —    | —    | 300  | nS                 |
| Switching                            | Turn-off Delay Time  |                                                                                                                                            | —    | —    | 200  | nS                 |
| Times                                | Fall Time            |                                                                                                                                            | —    | —    | 300  | nS                 |
| Emitter-Collector Voltage            | $V_{\text{EC}}$      | $I_E = 15\text{A}, V_{\text{GE}} = 0\text{V}$                                                                                              | —    | —    | 2.8  | Volts              |
| Reverse Recovery Time                | $t_{\text{rr}}$      | $I_E = 15\text{A}, V_{\text{GE}} = 0\text{V},$                                                                                             | —    | —    | 110  | nS                 |
| Reverse Recovery Charge              | $Q_{\text{rr}}$      | $di_E/dt = -30\text{A}/\mu\text{s}$                                                                                                        | —    | 0.04 | —    | $\mu\text{C}$      |
| Thermal Resistance (Junction-to-Fin) | $R_{\text{th(j-f)}}$ | Per IGBT                                                                                                                                   | —    | —    | 2.8  | $^\circ\text{C/W}$ |
|                                      |                      | Per FWDi                                                                                                                                   | —    | —    | 3.5  | $^\circ\text{C/W}$ |

\*Pulse width and repetition rate should be such that device junction temperature does not exceed maximum rating.

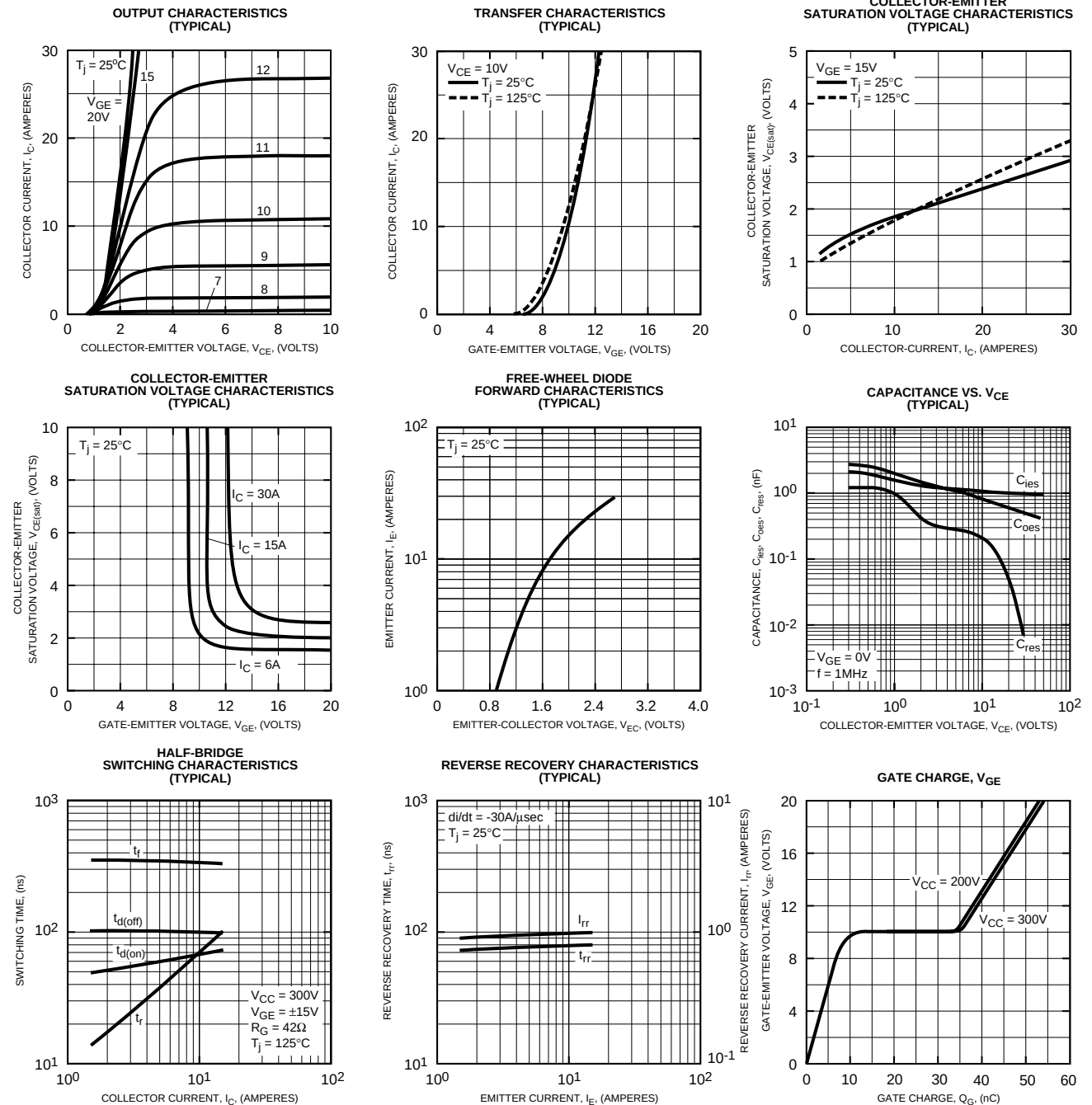
\*\*Characteristics of the anti-parallel emitter-collector free-wheel diode.

## CM15MD1-12H

### CI Module

### Three Phase Converter + Three Phase Inverter

15 Amperes/600 Volts



**CM15MD1-12H**  
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