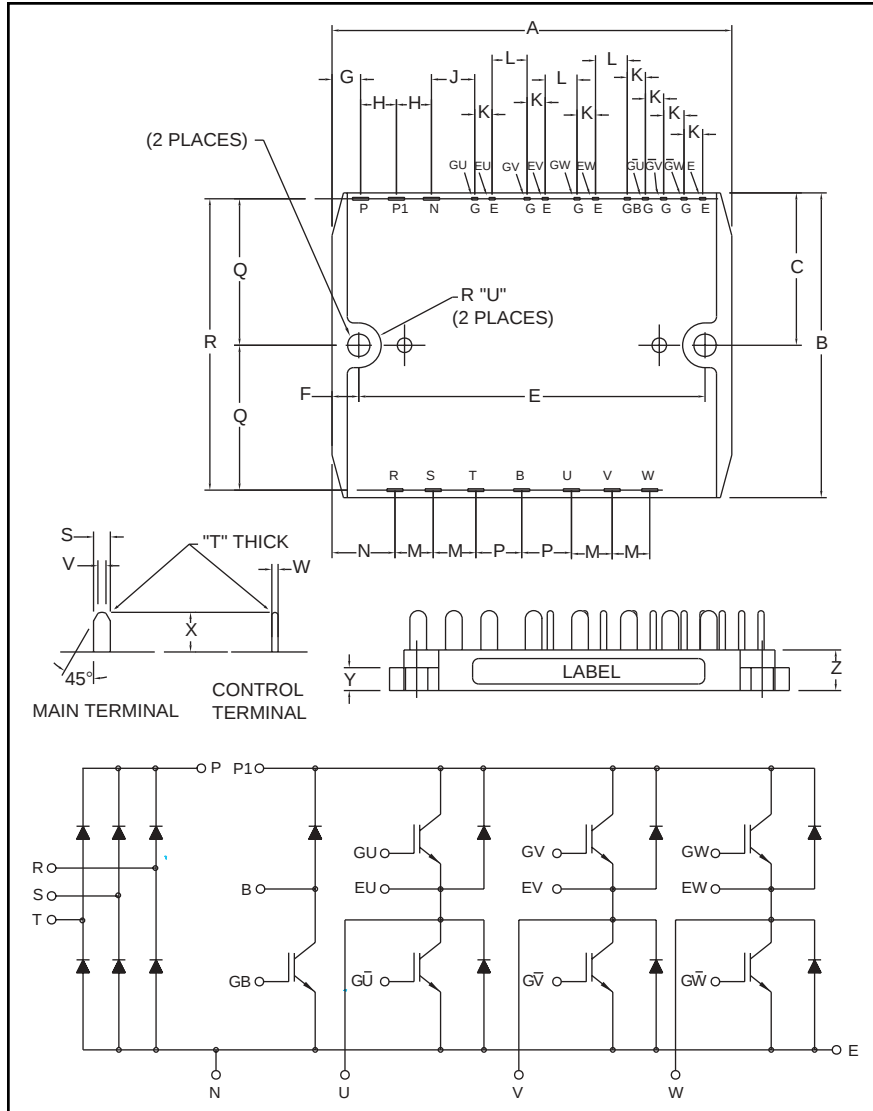


### CIB Module

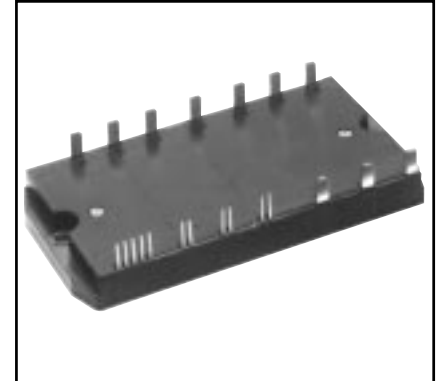
Three Phase Converter +  
Three Phase Inverter + Brake  
15 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| A          | 4.53   | 115.0       |
| B          | 2.36   | 60.0        |
| C          | 1.18   | 30.0        |
| D          | 0.18   | 4.5         |
| E          | 4.13   | 105.0       |
| F          | 0.20   | 5.0         |
| G          | 0.31   | 8.0         |
| H          | 0.59   | 15.0        |
| J          | 0.68   | 17.2        |
| K          | 0.10   | 2.54        |
| L          | 0.40   | 10.16       |
| M          | 0.49   | 12.5        |

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| N          | 0.51   | 13.0        |
| P          | 0.59   | 15.0        |
| Q          | 1.14   | 29.0        |
| R          | 2.28   | 58.0        |
| S          | 0.16   | 4.0         |
| T          | 0.02   | 0.6         |
| U          | 0.22   | 5.5         |
| V          | 0.08   | 2.0         |
| W          | 0.02   | 0.6         |
| X          | 0.35   | 9.0         |
| Y          | 0.25   | 6.3         |
| Z          | 0.47   | 12.0        |



### Description:

Powerex CIB Modules are designed for use in switching applications. Each module consists of a three phase diode converter section, a three phase IGBT inverter section and a brake 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. CM15MD-24H is a 1200V ( $V_{CES}$ ), 15 Ampere CIB Power Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 15                        | 24                        |



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

**CM15MD-24H**

**CIB Module**

**Three Phase Converter + Three Phase Inverter + Brake**

15 Amperes/1200 Volts

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

| Characteristics                      | Symbol           | CM15MD-24H | 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)              | —                | 100        | Grams            |
| Isolation Voltage, AC 1 minute, 60Hz | $V_{\text{RMS}}$ | 2500       | Volts            |

**Converter Sector**

|                                        |                  |      |                      |
|----------------------------------------|------------------|------|----------------------|
| Repetitive Peak Reverse Voltage        | $V_{\text{RRM}}$ | 1600 | Volts                |
| Recommended AC Input Voltage           | $E_a$            | 440  | Volts                |
| DC Output Current                      | $I_o$            | 15   | Amperes              |
| Surge (Non-repetitive) Forward Current | $I_{\text{FSM}}$ | 150  | Amperes              |
| $I^2t$ for Fusing                      | $I^2t$           | 93   | $\text{A}^2\text{s}$ |

**IGBT Inverter Sector**

|                                       |                  |          |         |
|---------------------------------------|------------------|----------|---------|
| Collector-Emitter Voltage (G-E Short) | $V_{\text{CES}}$ | 1200     | 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         | $P_C$            | 66       | Watts   |

**Brake Sector**

|                                                    |                  |          |         |
|----------------------------------------------------|------------------|----------|---------|
| Collector-Emitter Voltage (G-E Short)              | $V_{\text{CES}}$ | 1200     | 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 |
| Collector Dissipation                              | $P_C$            | 66       | Watts   |
| Repetitive Peak Reverse Voltage (Clamp Diode Part) | $V_{\text{RRM}}$ | 1200     | Volts   |
| Forward Current (Clamp Diode Part)                 | $I_{\text{FM}}$  | 15       | Amperes |

\* 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.



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

**CM15MD-24H**

**CIB Module**

**Three Phase Converter + Three Phase Inverter + Brake**

**15 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>Converter Sector</b>              |               |                                                                        |      |      |      |                    |
| Repetitive Reverse Current           | $I_{RRM}$     | $V_R = V_{RRM}$ , $T_j = 150^\circ\text{C}$                            | —    | —    | 8    | mA                 |
| Forward Voltage Drop                 | $V_{FM}$      | $I_F = 15\text{A}$                                                     | —    | —    | 1.5  | Volts              |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per Diode                                                              | —    | —    | 1.7  | $^\circ\text{C/W}$ |
| <b>Brake Sector</b>                  |               |                                                                        |      |      |      |                    |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE} = 15\text{V}$ , $I_C = 15\text{A}$ , $T_j = 25^\circ\text{C}$  | —    | 2.7  | 3.4  | Volts              |
|                                      |               | $V_{GE} = 15\text{V}$ , $I_C = 15\text{A}$ , $T_j = 150^\circ\text{C}$ | —    | 2.45 | —    | Volts              |
| Collector Cutoff Current             | $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0\text{V}$                              | —    | —    | 1    | mA                 |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $I_C = 1.5\text{mA}$ , $V_{CE} = 10\text{V}$                           | 4.5  | 6.0  | 7.5  | Volts              |
| Gate-Emitter Cutoff Current          | $I_{GES}$     | $V_{GE} = V_{GES}$ , $V_{CE} = 0\text{V}$                              | —    | —    | 0.5  | $\mu\text{A}$      |
| Input Capacitance                    | $C_{ies}$     | $V_{GE} = 0\text{V}$ , $V_{CE} = 10\text{V}$                           | —    | —    | 3.0  | nF                 |
| Output Capacitance                   | $C_{oes}$     |                                                                        | —    | —    | 2.4  | nF                 |
| Reverse Transfer Capacitance         | $C_{res}$     |                                                                        | —    | —    | 0.6  | nF                 |
| Total Gate Charge                    | $Q_G$         | $V_{CC} = 600\text{V}$ , $I_C = 15\text{A}$ , $V_{GE} = 15\text{V}$    | —    | 75   | —    | nC                 |
| Forward Voltage Drop                 | $V_{FM}$      | $I_F = 15\text{A}$                                                     | —    | —    | 1.5  | Volts              |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per IGBT                                                               | —    | —    | 1.9  | $^\circ\text{C/W}$ |
|                                      |               | Per Clamp Diode                                                        | —    | —    | 1.7  | $^\circ\text{C/W}$ |

## CM15MD-24H

### CIB Module

#### Three Phase Converter + Three Phase Inverter + Brake

15 Amperes/1200 Volts

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

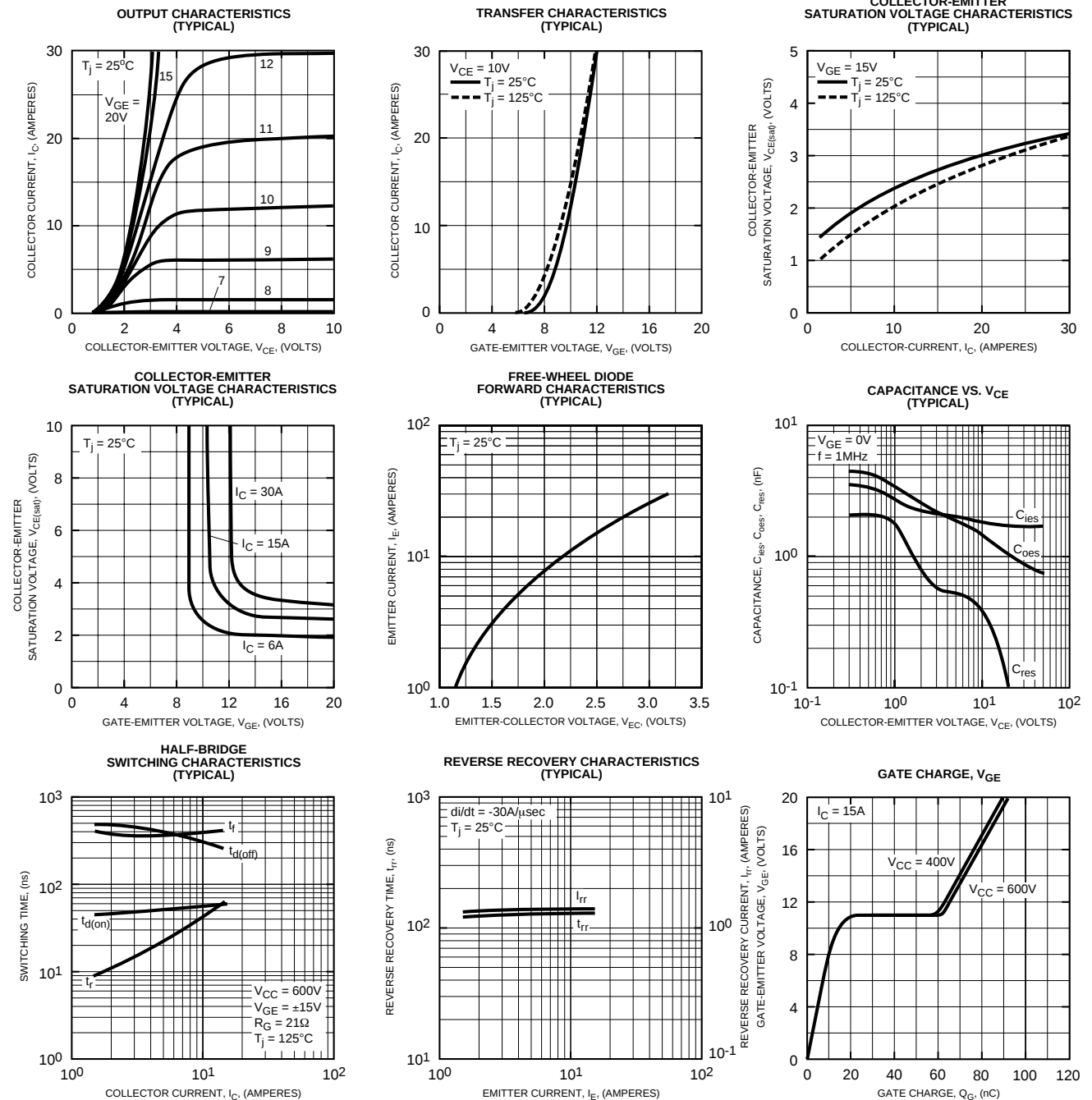
| Characteristics                      | Symbol        | Test Conditions                                           | Min. | Typ. | Max. | Units              |
|--------------------------------------|---------------|-----------------------------------------------------------|------|------|------|--------------------|
| <b>IGBT Inverter Sector</b>          |               |                                                           |      |      |      |                    |
| Collector Cutoff Current             | $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$                           | —    | —    | 1    | mA                 |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $V_{CE} = 10V, I_C = 1.5mA$                               | 4.5  | 6.0  | 7.5  | Volts              |
| Gate-Emitter Cutoff Current          | $I_{GES}$     | $V_{GE} = V_{GES}, V_{CE} = 0V$                           | —    | —    | 0.5  | $\mu A$            |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE} = 15V, I_C = 15A, T_j = 25^\circ\text{C}$         | —    | 2.7  | 3.4  | Volts              |
|                                      |               | $V_{GE} = 15V, I_C = 15A, T_j = 150^\circ\text{C}$        | —    | 2.45 | —    | Volts              |
| Input Capacitance                    | $C_{ies}$     | $V_{GE} = 0V, V_{CE} = 10V$                               | —    | —    | 3.0  | nF                 |
| Output Capacitance                   | $C_{oes}$     |                                                           | —    | —    | 2.4  | nF                 |
| Reverse Transfer Capacitance         | $C_{res}$     |                                                           | —    | —    | 0.6  | nF                 |
| Total Gate Charge                    | $Q_G$         | $V_{CC} = 600V, I_C = 15A, V_{GE} = 15V$                  | —    | 75   | —    | nC                 |
| Resistive                            | Turn-on Time  | $V_{GE1} = V_{GE2} = 15V,$<br>$V_{CC} = 600V, I_C = 15A,$ | —    | —    | 100  | nS                 |
| Load                                 | Rise Time     |                                                           | —    | —    | 200  | nS                 |
| Switching                            | Turn-off Time | $R_g = 21\Omega,$<br>Resistive Load                       | —    | —    | 150  | nS                 |
| Times                                | Fall Time     |                                                           | —    | —    | 350  | nS                 |
| Emitter-Collector Voltage            | $V_{EC}$      | $I_E = 15A, V_{GE} = 0V$                                  | —    | —    | 3.5  | Volts              |
| Reverse Recovery Time                | $t_{rr}$      | $I_E = 15A, V_{GE} = 0V,$                                 | —    | —    | 250  | nS                 |
| Reverse Recovery Charge              | $Q_{rr}$      | $di_E/dt = -30A/\mu s$                                    | —    | 0.11 | —    | $\mu C$            |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per IGBT                                                  | —    | —    | 1.9  | $^\circ\text{C/W}$ |
|                                      |               | Per FWDi                                                  | —    | —    | 2.4  | $^\circ\text{C/W}$ |

## CM15MD-24H

### CIB Module

### Three Phase Converter + Three Phase Inverter + Brake

15 Amperes/1200 Volts



**CM15MD-24H**

**CIB Module**

**Three Phase Converter + Three Phase Inverter + Brake**

**15 Amperes/1200 Volts**

