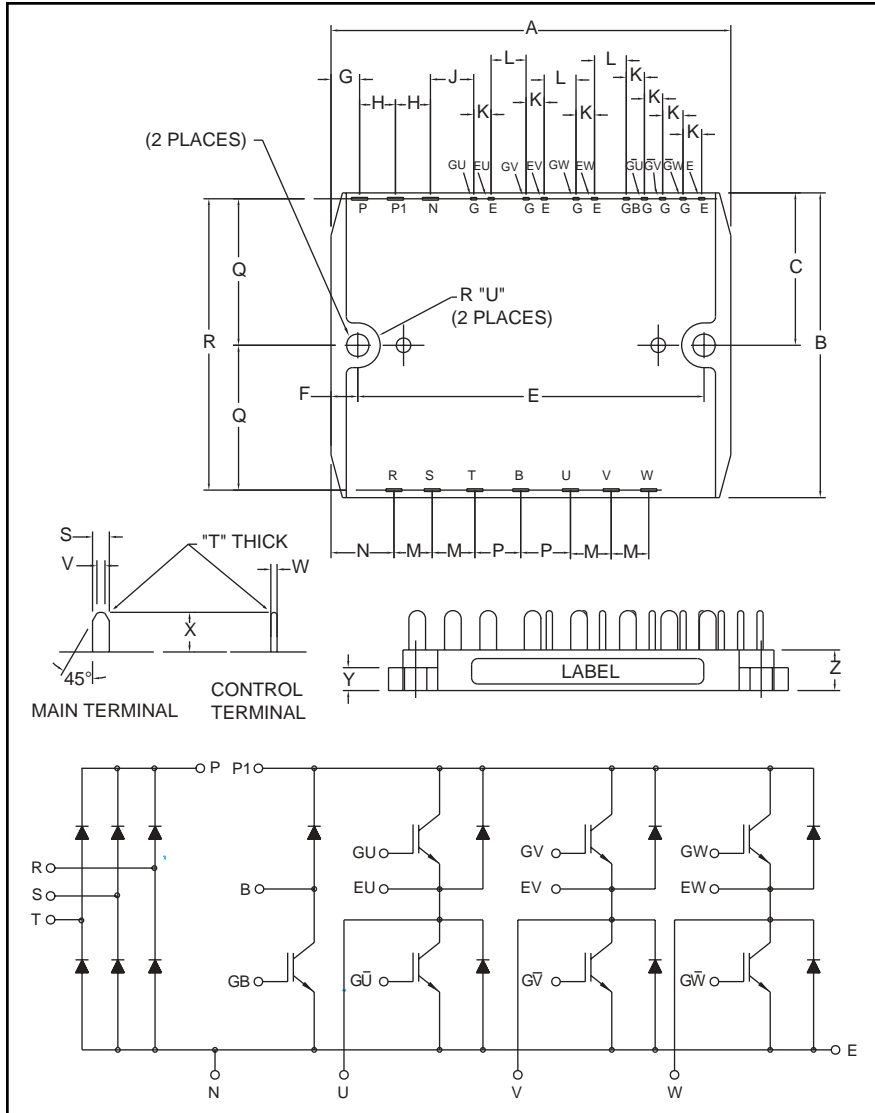


CIB Module

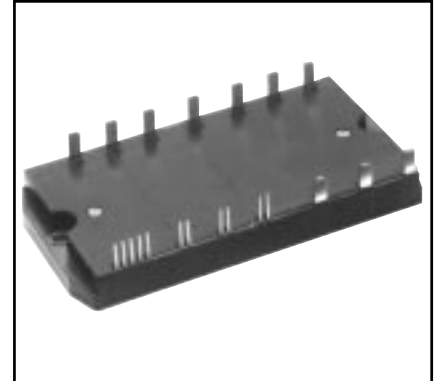
Three Phase Converter +
Three Phase Inverter + Brake
50 Amperes/600 Volts



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. CM50MD-12H is a 600V (V_{CES}), 50 Ampere CIB Power Module.

| Type | Current Rating Amperes | V_{CES} Volts (x 50) |
|------|------------------------|------------------------|
| CM | 50 | 12 |

CM50MD-12H

CIB Module

Three Phase Converter + Three Phase Inverter + Brake

50 Amperes/600 Volts

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

| Characteristics | Symbol | CM50MD-12H | Units |
|--------------------------------------|-----------|------------|------------------|
| Power Device Junction Temperature | T_j | -40 to 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{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_{RMS} | 2500 | Volts |

Converter Sector

| | | | |
|--|-----------|------|----------------------|
| Repetitive Peak Reverse Voltage | V_{RRM} | 800 | Volts |
| Recommended AC Input Voltage | E_a | 220 | Volts |
| DC Output Current | I_o | 50 | Amperes |
| Surge (Non-repetitive) Forward Current | I_{FSM} | 500 | Amperes |
| I^2t for Fusing | I^2t | 1000 | A^2s |

IGBT Inverter Sector

| | | | |
|---------------------------------------|-----------|----------|---------|
| Collector-Emitter Voltage (G-E Short) | V_{CES} | 600 | Volts |
| Gate-Emitter Voltage (C-E Short) | V_{GES} | ± 20 | Volts |
| Collector Current | I_C | 50 | Amperes |
| Collector Current (Pulse)* | I_{CM} | 100 | Amperes |
| Emitter Current** | I_E | 50 | Amperes |
| Emitter Current** (Pulse)* | I_{EM} | 100 | Amperes |
| Maximum Collector Dissipation | P_C | 104 | Watts |

Brake Sector

| | | | |
|--|-----------|----------|---------|
| Collector-Emitter Voltage (G-E Short) | V_{CES} | 600 | Volts |
| Gate-Emitter Voltage (C-E Short) | V_{GES} | ± 20 | Volts |
| Collector Current | I_C | 50 | Amperes |
| Collector Current (Pulse)* | I_{CM} | 100 | Amperes |
| Collector Dissipation | P_C | 104 | Watts |
| Repetitive Peak Reverse Voltage (Clamp Diode Part) | V_{RRM} | 600 | Volts |
| Forward Current (Clamp Diode Part) | I_{FM} | 50 | 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.

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

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--------------------------------------|---------------|--|------|------|------|--------------------|
| Converter Sector | | | | | | |
| Repetitive Reverse Current | I_{RRM} | $V_R = V_{RRM}, T_j = 150^\circ\text{C}$ | — | — | 8 | mA |
| Forward Voltage Drop | V_{FM} | $I_F = 50\text{A}$ | — | — | 1.5 | Volts |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per Diode | — | — | 1.7 | $^\circ\text{C/W}$ |
| Brake Sector | | | | | | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE} = 15\text{V}, I_C = 50\text{A}, T_j = 25^\circ\text{C}$ | — | 2.2 | 2.8 | Volts |
| | | $V_{GE} = 15\text{V}, I_C = 50\text{A}, T_j = 150^\circ\text{C}$ | — | — | — | Volts |
| Collector Cutoff Current | I_{CES} | $V_{CE} = V_{CES}, V_{GE} = 0\text{V}$ | — | — | 1 | mA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $I_C = 5.0\text{mA}, V_{CE} = 10\text{V}$ | 4.5 | 6.0 | 7.5 | Volts |
| Gate-Emitter Cutoff Current | I_{GES} | $V_{GE} = V_{GES}, V_{CE} = 0\text{V}$ | — | — | 0.5 | μA |
| Input Capacitance | C_{ies} | | — | — | 5.0 | nF |
| Output Capacitance | C_{oes} | $V_{GE} = 0\text{V}, V_{CE} = 10\text{V}$ | — | — | 3.8 | nF |
| Reverse Transfer Capacitance | C_{res} | | — | — | 1.0 | nF |
| Total Gate Charge | Q_G | $V_{CC} = 300\text{V}, I_C = 50\text{A}, V_{GE} = 15\text{V}$ | — | 150 | — | nC |
| Forward Voltage Drop | V_{FM} | $I_F = 50\text{A}$ | — | — | 1.5 | Volts |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per IGBT | — | — | 1.2 | $^\circ\text{C/W}$ |
| | | Per Clamp Diode | — | — | 1.7 | $^\circ\text{C/W}$ |

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

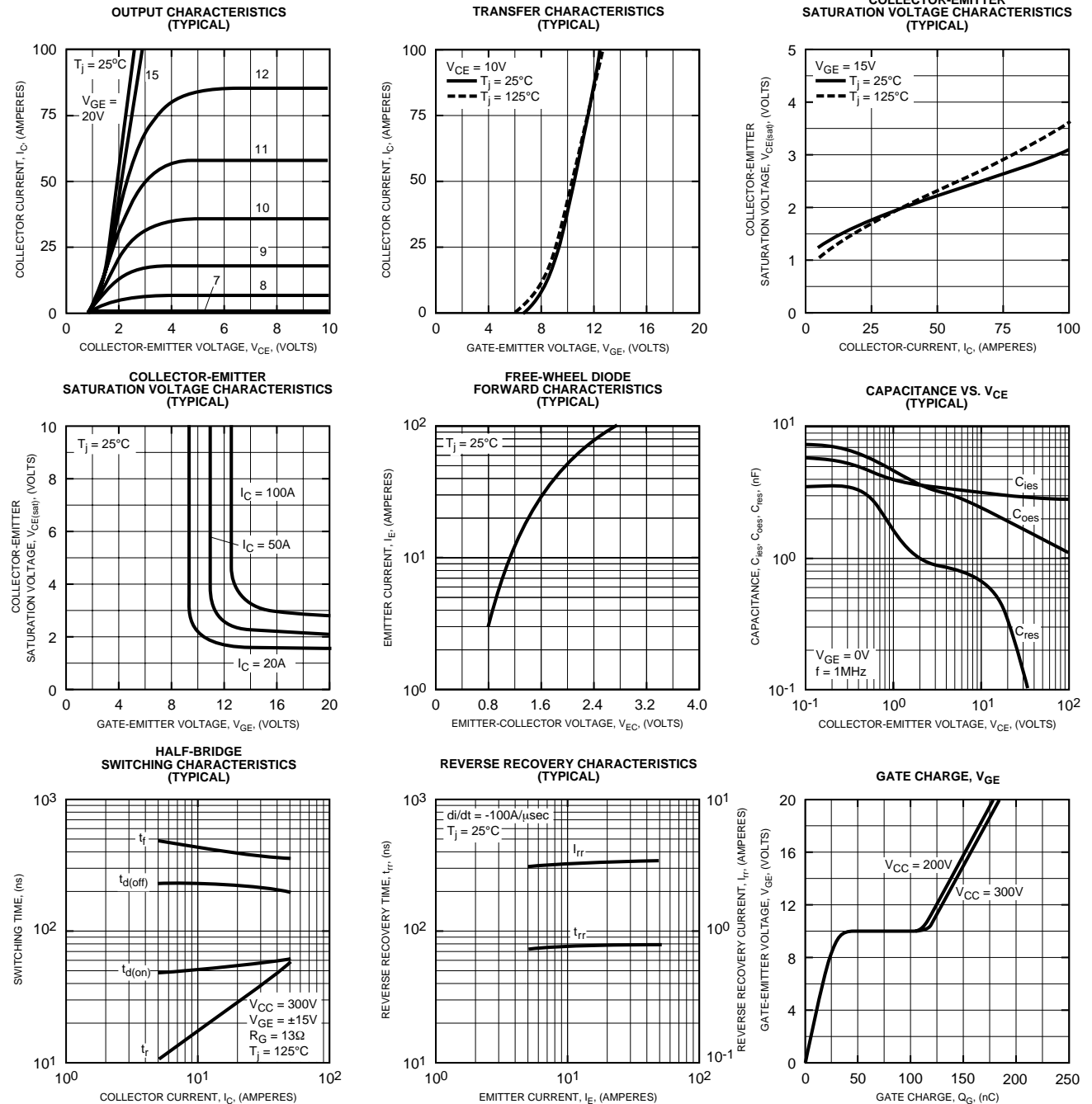
| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units | |
|--------------------------------------|--------------------|--|-----------------------------|------|------|--------------------|----|
| IGBT Inverter Sector | | | | | | | |
| Collector Cutoff Current | I_{CES} | $V_{CE} = V_{CES}, V_{GE} = 0V$ | — | — | 1 | mA | |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE} = 10V, I_C = 5.0mA$ | 4.5 | 6.0 | 7.5 | Volts | |
| Gate-Emitter Cutoff Current | I_{GES} | $V_{GE} = V_{GES}, V_{CE} = 0V$ | — | — | 0.5 | μA | |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE} = 15V, I_C = 50A, T_j = 25^\circ\text{C}$ | — | 2.2 | 2.8 | Volts | |
| | | $V_{GE} = 15V, I_C = 50A, T_j = 150^\circ\text{C}$ | — | — | — | Volts | |
| Input Capacitance | C_{ies} | | — | — | 5.0 | nF | |
| Output Capacitance | C_{oes} | $V_{GE} = 0V, V_{CE} = 10V$ | — | — | 3.8 | nF | |
| Reverse Transfer Capacitance | C_{res} | | — | — | 1.0 | nF | |
| Total Gate Charge | Q_G | $V_{CC} = 300V, I_C = 50A, V_{GE} = 15V$ | — | 150 | — | nC | |
| Resistive Load | Turn-on Delay Time | $t_{d(on)}$ | $V_{GE1} = V_{GE2} = 15V,$ | | — | 120 | nS |
| | Rise Time | t_r | $V_{CC} = 300V, I_C = 50A,$ | | — | 300 | nS |
| Switching Times | Turn-off Time | $t_{d(off)}$ | $R_g = 13\Omega,$ | | — | 200 | nS |
| | Fall Time | t_f | Resistive Load | | — | 300 | nS |
| Emitter-Collector Voltage | V_{EC} | $I_E = 50A, V_{GE} = 0V$ | — | — | 2.8 | Volts | |
| Reverse Recovery Time | t_{rr} | $I_E = 50A, V_{GE} = 0V,$ | — | — | 110 | nS | |
| Reverse Recovery Charge | Q_{rr} | $di_E/dt = -100A/\mu\text{s}$ | — | 0.14 | — | μC | |
| Thermal Resistance (Junction-to-Fin) | $R_{th(j-f)}$ | Per IGBT | — | — | 1.2 | $^\circ\text{C/W}$ | |
| | | Per FWDi | — | — | 1.9 | $^\circ\text{C/W}$ | |

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