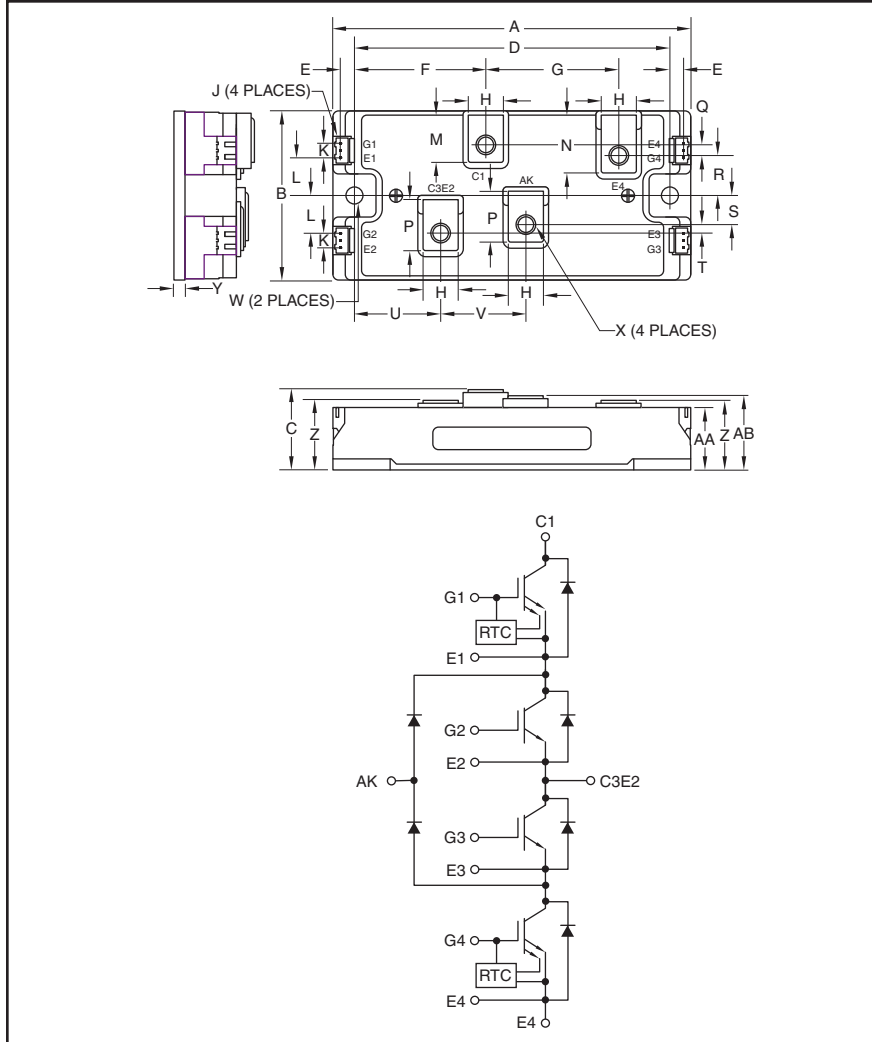


### TLI-Series (Three Level Inverter) IGBT 200 Amperes/600 Volts



Outline Drawing and Circuit Diagram

| Dim. | Inches          | Millimeters   | Dim. | Inches          | Millimeters   |
|------|-----------------|---------------|------|-----------------|---------------|
| A    | 4.92            | 125.0         | P    | 0.67            | 17.0          |
| B    | 2.32            | 59.0          | Q    | 0.16±0.02       | 4.0±0.5       |
| C    | 1.08+0.04/-0.02 | 27.5+1.0/-0.5 | R    | 0.55            | 14.0          |
| D    | 4.33±0.01       | 110.0±0.25    | S    | 0.39            | 10.0          |
| E    | 0.20            | 5.15          | T    | 0.12±0.2        | 3.0±0.5       |
| F    | 1.80            | 45.75         | U    | 1.20            | 30.5          |
| G    | 1.83            | 46.5          | V    | 1.16            | 29.5          |
| H    | 0.47            | 12.0          | W    | 0.22 Dia.       | 5.5 Dia.      |
| J    | 0.14 Min.       | 3.6 Min.      | X    | M5 Metric       | M5            |
| K    | 0.2             | 5.0           | Y    | 0.16            | 4.0           |
| L    | 0.51            | 12.95         | Z    | 0.93+0.04/-0.02 | 23.5+1.0/-0.5 |
| M    | 0.61            | 15.5          | AA   | 0.85+0.04/-0.02 | 21.5+1.0/-0.5 |
| N    | 0.77            | 19.5          | AB   | 1.00+0.04/-0.02 | 25.5+1.0/-0.5 |



#### Description:

The TLI-Series has been designed for three level (neutral point clamped) topologies in applications requiring high efficiency operation and improved output waveform quality. They also provide significant benefits in applications where low output noise using small filter components is required or where long motor leads create Standing Wave Ratio (SWR) voltage surge issues.

#### Features:

- ☐ Smaller Output Voltage Steps  
Reducing Surge Voltage
- ☐ Low Output Ripple Current
- ☐ Lower Modulation Frequency  
With Same Quality Output  
Waveform

#### Applications:

- ☐ Three Level Inverter Topologies
- ☐ Solar Power Inverters
- ☐ High Efficiency UPS
- ☐ Long Motor Lead Applications

#### Ordering Information:

Example: Select the complete module number you desire from the table - i.e. CM200YE4-12F is a 600V ( $V_{CES}$ ), 200 Ampere TLI-Series IGBT Power Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 200                       | 12                        |



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwr.com

#### CM200YE4-12F

#### TLI-Series (Three Level Inverter) IGBT

200 Amperes/600 Volts

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

| Ratings                                                   | Symbol    | CM200YE4-12F | Units            |
|-----------------------------------------------------------|-----------|--------------|------------------|
| Junction Temperature                                      | $T_j$     | -40 to 150   | $^\circ\text{C}$ |
| Storage Temperature                                       | $T_{stg}$ | -40 to 125   | $^\circ\text{C}$ |
| Mounting Torque, Main Terminals, M5 Screw (Max.)          | —         | 30           | in-lb            |
| Mounting Torque, Mounting Holes, M5 Screw (Max.)          | —         | 30           | in-lb            |
| Weight (Typical)                                          | —         | 430          | Grams            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.) | $V_{iso}$ | 2500         | $V_{rms}$        |

#### Inverter Part

|                                                            |               |          |         |
|------------------------------------------------------------|---------------|----------|---------|
| Collector-Emitter Voltage (G-E Short)                      | $V_{CES}$     | 600      | Volts   |
| Gate-Emitter Voltage (C-E Short)                           | $V_{GES}$     | $\pm 20$ | Volts   |
| Collector Current DC ( $T_C = 25^\circ\text{C}$ )          | $I_C$         | 200      | Amperes |
| Peak Collector Current (Pulse)* <sup>2</sup>               | $I_{CM}$      | 400      | Amperes |
| Emitter Current ( $T_C = 25^\circ\text{C}$ )               | $I_E^{*1}$    | 200      | Amperes |
| Peak Emitter Current (Pulse)* <sup>2</sup>                 | $I_{EM}^{*1}$ | 400      | Amperes |
| Maximum Collector Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_C^{*3}$    | 625      | Watts   |

#### Clamp Diode Part

|                                              |           |     |         |
|----------------------------------------------|-----------|-----|---------|
| Repetitive Peak Reverse Voltage              | $V_{RRM}$ | 600 | Volts   |
| Forward Current ( $T_C = 25^\circ\text{C}$ ) | $I_{FM}$  | 200 | Amperes |

\*<sup>1</sup>  $I_E$ ,  $I_{EM}$ ,  $V_{EC}$ ,  $t_{rr}$ , and  $Q_{rr}$  represent characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

\*<sup>2</sup> Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(max)}$  rating.

\*<sup>3</sup> Junction temperature ( $T_j$ ) should not increase beyond  $150^\circ\text{C}$ .



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwr.com

#### CM200YE4-12F

#### TLI-Series (Three Level Inverter) IGBT

200 Amperes/600 Volts

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

| Characteristics                      | Symbol        | Test Conditions                                     | Min. | Typ. | Max. | Units    |
|--------------------------------------|---------------|-----------------------------------------------------|------|------|------|----------|
| <b>Inverter Part</b>                 |               |                                                     |      |      |      |          |
| Collector-Cutoff Current             | $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$                     | –    | –    | 1    | mA       |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $I_C = 20mA, V_{CE} = 10V$                          | 5    | 6    | 7    | Volts    |
| Gate Leakage Current                 | $I_{GES}$     | $V_{GE} = V_{GES}, V_{CE} = 0V$                     | –    | –    | 20   | $\mu A$  |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 200A, V_{GE} = 15V, T_j = 25^\circ\text{C}$  | –    | 1.6  | 2.2  | Volts    |
|                                      |               | $I_C = 200A, V_{GE} = 15V, T_j = 125^\circ\text{C}$ | –    | 1.6  | –    | Volts    |
| Input Capacitance                    | $C_{ies}$     | $V_{CE} = 10V, V_{GE} = 0V$                         | –    | –    | 54   | nF       |
| Output Capacitance                   | $C_{oes}$     |                                                     | –    | –    | 3.6  | nF       |
| Reverse Transfer Capacitance         | $C_{res}$     |                                                     | –    | –    | 2.0  | nF       |
| Total Gate Charge                    | $Q_G$         | $V_{CC} = 300V, I_C = 200A, V_{GE} = 15V$           | –    | 1240 | –    | nC       |
| Turn-on Delay Time                   | $t_{d(on)}$   | $V_{CC} = 300V, I_C = 200A,$                        | –    | –    | 450  | ns       |
| Turn-on Rise Time                    | $t_r$         | $V_{GE1} = V_{GE2} = 15V,$                          | –    | –    | 200  | ns       |
| Turn-off Delay Time                  | $t_{d(off)}$  | $R_G = 9.3\Omega,$                                  | –    | –    | 900  | ns       |
| Turn-off Fall Time                   | $t_f$         | Inductive Load Switching Operation,                 | –    | –    | 300  | ns       |
| Reverse Recovery Time                | $t_{rr}^{*1}$ |                                                     | –    | –    | 200  | ns       |
| Reverse Recovery Charge              | $Q_{rr}^{*1}$ | $I_E = 200A$                                        | –    | 1.26 | –    | ns       |
| Emitter-Collector Voltage            | $V_{EC}^{*1}$ | $I_E = 200A, V_{GE} = 0V$                           | –    | –    | 2.8  | $\mu C$  |
| External Gate Resistance             | $R_G$         |                                                     | 9.3  | –    | 31   | $\Omega$ |

### Clamp Diode Part

| Characteristics            | Symbol    | Test Conditions                                                                   | Min. | Typ. | Max. | Units   |
|----------------------------|-----------|-----------------------------------------------------------------------------------|------|------|------|---------|
| Repetitive Reverse Current | $I_{RRM}$ | $V_R = V_{RRM}$                                                                   | –    | –    | 1    | mA      |
| Forward Voltage Drop       | $V_{FM}$  | $I_F = 200A$                                                                      | –    | –    | 2.8  | Volts   |
| Reverse Recovery Time      | $t_{rr}$  | $I_F = 200A, V_{CC} = 300V,$                                                      | –    | –    | 200  | ns      |
| Reverse Recovery Charge    | $Q_{rr}$  | $V_{GE1} = V_{GE2} = 15V, R_G = 9.3\Omega,$<br>Inductive Load Switching Operation | –    | 1.26 | –    | $\mu C$ |

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

| Characteristics                                    | Symbol         | Test Conditions                       | Min. | Typ.  | Max. | Units              |
|----------------------------------------------------|----------------|---------------------------------------|------|-------|------|--------------------|
| Thermal Resistance, Junction to Case <sup>*4</sup> | $R_{th(j-c)}Q$ | Inverter IGBT                         | –    | –     | 0.2  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case <sup>*4</sup> | $R_{th(j-c)}D$ | Inverter FWDi                         | –    | –     | 0.27 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case <sup>*4</sup> | $R_{th(c-f)}D$ | Clamp Diode Part                      | –    | –     | 0.27 | $^\circ\text{C/W}$ |
| Contact Thermal Resistance <sup>*4*5</sup>         | $R_{th(c-f)}$  | Thermal Grease Applied (per 1 Module) | –    | 0.087 | –    | $^\circ\text{C/W}$ |

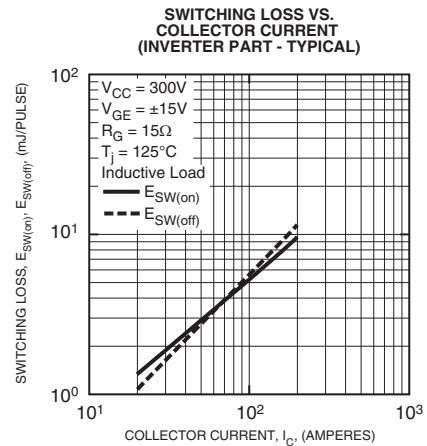
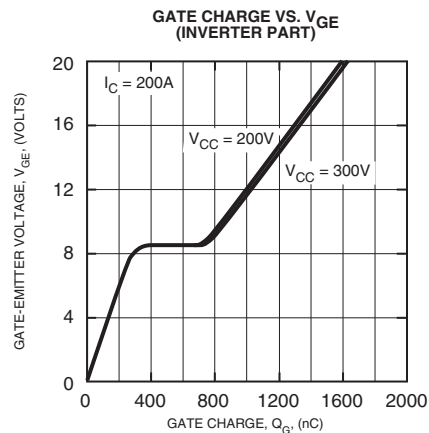
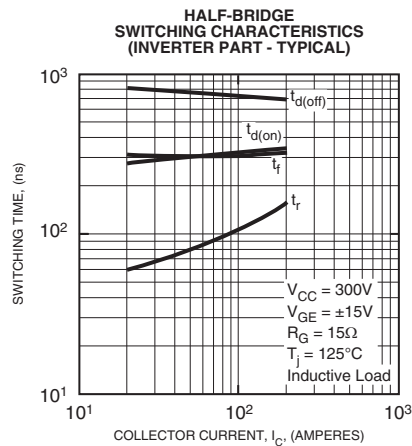
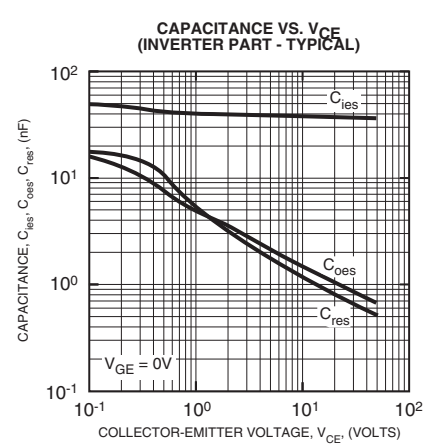
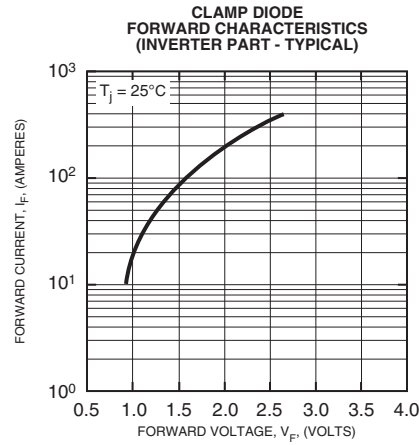
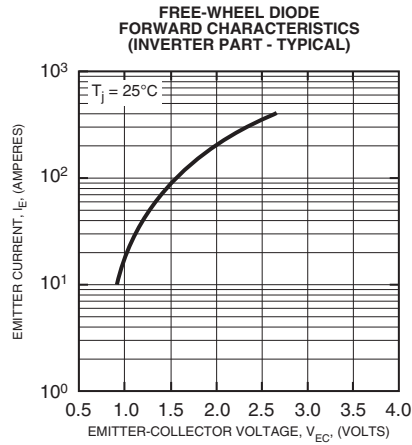
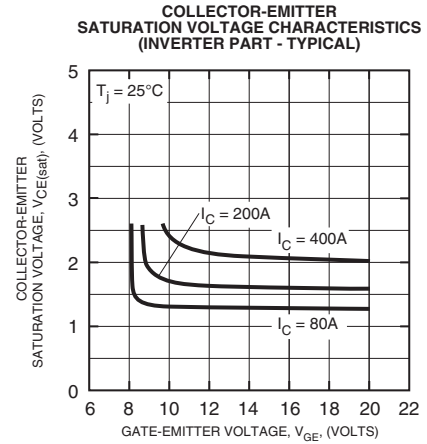
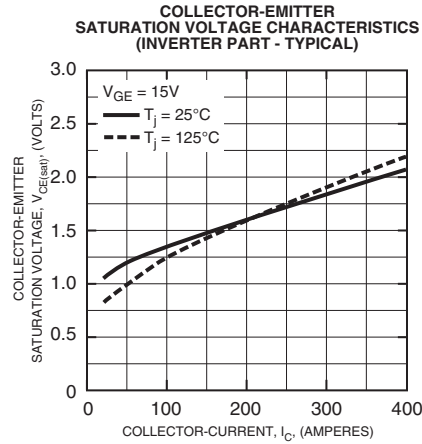
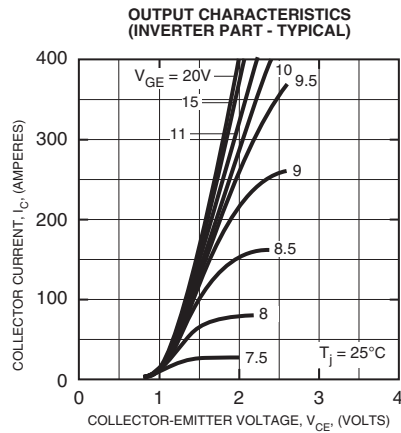
<sup>\*4</sup>  $T_C$  measured point is just under the chips. If using this value,  $R_{th(f-a)}$  should be measured just under the chips.

<sup>\*5</sup> Typical value is measured by using thermally conductive grease of  $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$ .

## CM200YE4-12F

### TLI-Series (Three Level Inverter) IGBT

200 Amperes/600 Volts



## CM200YE4-12F

### TLI-Series (Three Level Inverter) IGBT

200 Amperes/600 Volts

