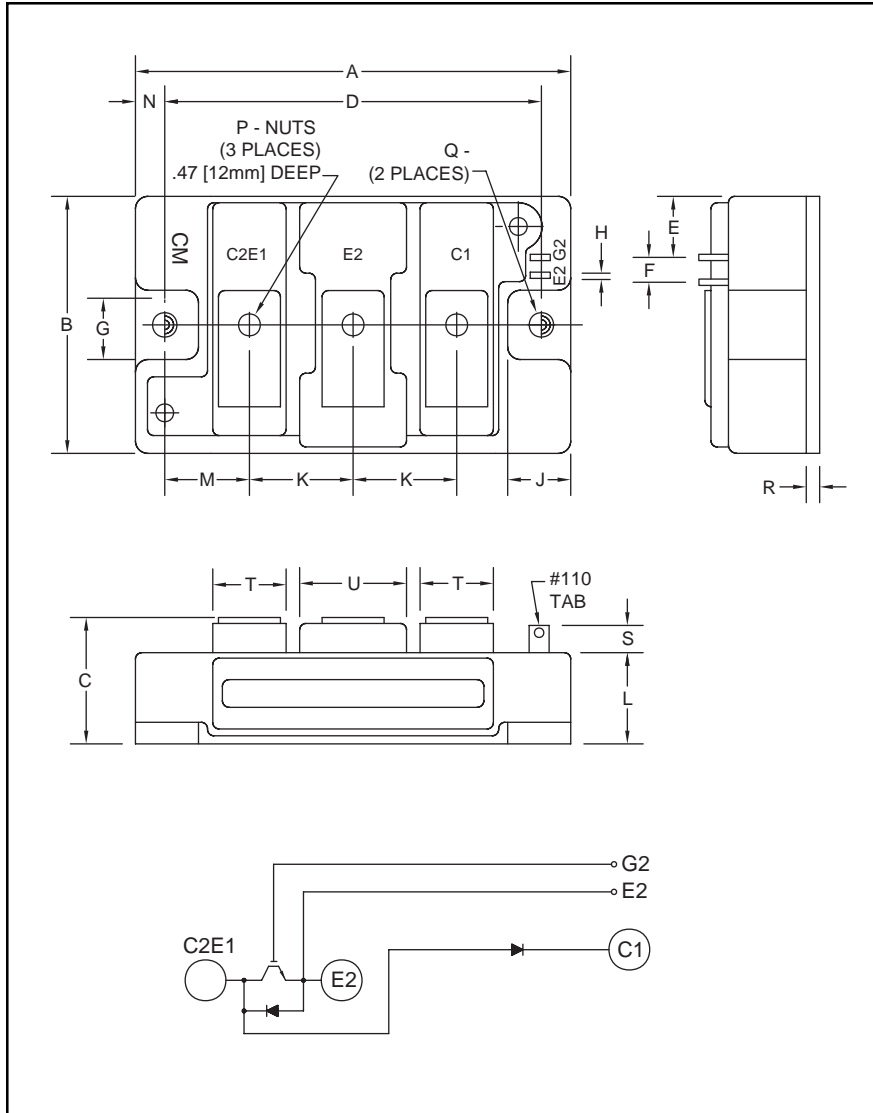


### Chopper IGBTMOD™ U-Series Module 100 Amperes/600 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches           | Millimeters    |
|------------|------------------|----------------|
| A          | 3.70             | 94.0           |
| B          | 1.89             | 48.0           |
| C          | 1.18 +0.04/-0.02 | 30.0 +1.0/-0.5 |
| D          | 3.15±0.01        | 80.0±0.25      |
| E          | 0.43             | 11.0           |
| F          | 0.16             | 4.0            |
| G          | 0.51             | 13.0           |
| H          | 0.02             | 0.5            |
| J          | 0.53             | 13.5           |
| K          | 0.91             | 23.0           |

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| L          | 0.84   | 21.2        |
| M          | 0.67   | 17.0        |
| N          | 0.28   | 7.0         |
| P          | M5     | M5          |
| Q          | 0.26   | 6.5         |
| R          | 0.02   | 4.0         |
| S          | 0.30   | 7.5         |
| T          | 0.63   | 16.0        |
| U          | 0.98   | 25.0        |



#### Description:

Powerex Chopper IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor having a reverse-connected super-fast recovery free-wheel diode and an anode-collector connected super-fast recovery free-wheel diode. 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 (150ns) Free-Wheel Diode
- High Frequency Operation (15-20kHz)
- Isolated Baseplate for Easy Heat Sinking

#### Applications:

- DC Motor Control
- Boost Regulator

#### Ordering Information:

Example: Select the complete module number you desire from the table - i.e. CM100E3U-12H is a 600V ( $V_{CES}$ ), 100 Ampere Chopper IGBTMOD™ Power Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 100                       | 12                        |

**CM100E3U-12H**  
**Chopper IGBTMOD™ U-Series Module**  
 100 Amperes/600 Volts

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

| Ratings   | Symbol           | CM100E3U-12H | Units            |
|---|------------------|--------------|------------------|
| Junction Temperature  | $T_j$            | -40 to 150   | $^\circ\text{C}$ |
| Storage Temperature   | $T_{\text{stg}}$ | -40 to 125   | $^\circ\text{C}$ |
| 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 ( $T_c = 25^\circ\text{C}$ )  | $I_c$            | 100          | Amperes          |
| Peak Collector Current  | $I_{\text{CM}}$  | 200*         | Amperes          |
| Emitter Current** ( $T_c = 25^\circ\text{C}$ )  | $I_E$            | 100          | Amperes          |
| Peak Emitter Current**  | $I_{\text{EM}}$  | 200*         | Amperes          |
| Maximum Collector Dissipation ( $T_c = 25^\circ\text{C}$ , $T_j \leq 150^\circ\text{C}$ ) | $P_c$            | 400          | Watts            |
| Mounting Torque, M5 Main Terminal   | –                | 31           | in-lb            |
| Mounting Torque, M6 Mounting  | –                | 40           | in-lb            |
| Weight  | –                | 310          | Grams            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)                                 | $V_{\text{iso}}$ | 2500         | Volts            |

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

\*\*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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

| Characteristics                      | Symbol               | Test Conditions  | Min. | Typ. | Max. | Units         |
|--------------------------------------|----------------------|--|------|------|------|---------------|
| Collector-Cutoff Current             | $I_{\text{CES}}$     | $V_{\text{CE}} = V_{\text{CES}}$ , $V_{\text{GE}} = 0\text{V}$                     | –    | –    | 1    | mA            |
| Gate Leakage Voltage                 | $I_{\text{GES}}$     | $V_{\text{GE}} = V_{\text{GES}}$ , $V_{\text{CE}} = 0\text{V}$                     | –    | –    | 0.5  | $\mu\text{A}$ |
| Gate-Emitter Threshold Voltage       | $V_{\text{GE(th)}}$  | $I_c = 10\text{mA}$ , $V_{\text{CE}} = 10\text{V}$                                 | 4.5  | 6    | 7.5  | Volts         |
| Collector-Emitter Saturation Voltage | $V_{\text{CE(sat)}}$ | $I_c = 100\text{A}$ , $V_{\text{GE}} = 15\text{V}$ , $T_j = 25^\circ\text{C}$      | –    | 2.4  | 3.0  | Volts         |
|                                      |                      | $I_c = 100\text{A}$ , $V_{\text{GE}} = 15\text{V}$ , $T_j = 125^\circ\text{C}$     | –    | 2.6  | –    | Volts         |
| Total Gate Charge                    | $Q_G$                | $V_{\text{CC}} = 300\text{V}$ , $I_c = 100\text{A}$ , $V_{\text{GE}} = 15\text{V}$ | –    | 200  | –    | nC            |
| Emitter-Collector Voltage**          | $V_{\text{EC}}$      | $I_E = 100\text{A}$ , $V_{\text{GE}} = 0\text{V}$                                  | –    | –    | 2.6  | Volts         |
| Emitter-Collector Voltage            | $V_{\text{FM}}$      | $I_F = 100\text{A}$ , Clamp Diode Part   | –    | –    | 2.6  | Volts         |

\*\*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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

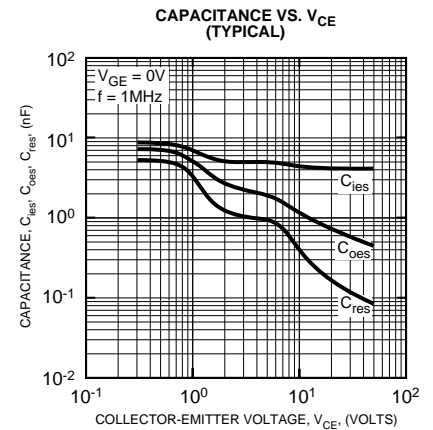
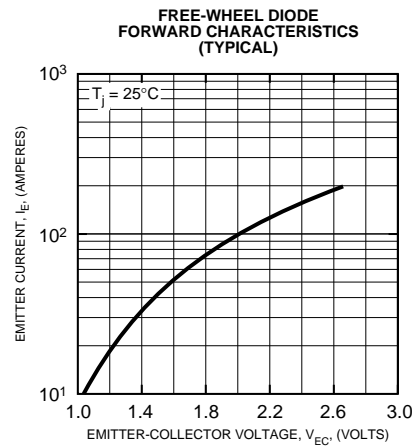
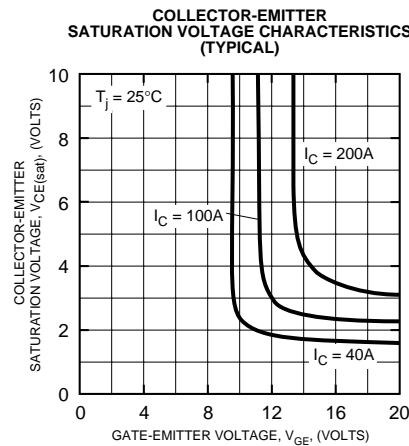
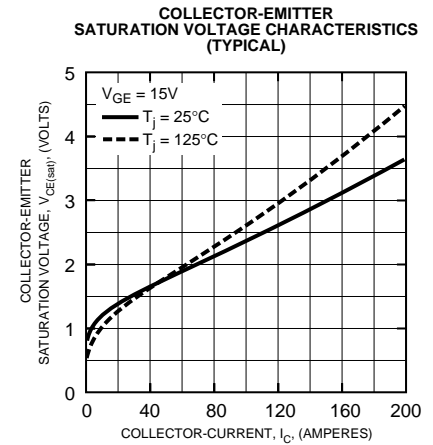
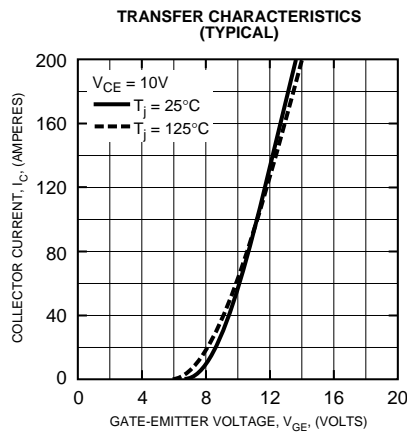
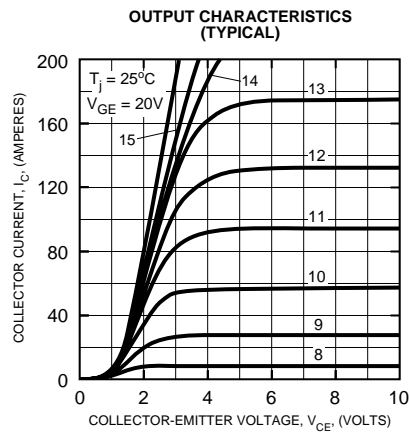
| Characteristics                 | Symbol              | Test Conditions  | Min.  | Typ. | Max. | Units         |    |
|---------------------------------|---------------------|--|---|------|------|---------------|----|
| Input Capacitance               | $C_{\text{ies}}$    |  | –   | –    | 8.8  | nf            |    |
| Output Capacitance              | $C_{\text{oes}}$    | $V_{\text{CE}} = 10\text{V}$ , $V_{\text{GE}} = 0\text{V}$ | –   | –    | 4.8  | nf            |    |
| Reverse Transfer Capacitance    | $C_{\text{res}}$    |  | –   | –    | 1.3  | nf            |    |
| Resistive                       | Turn-on Delay Time  | $t_{\text{d(on)}}$   | $V_{\text{CC}} = 300\text{V}$ , $I_c = 100\text{A}$ , | –    | –    | 100           | ns |
|                                 |                     |  |   |      |      |               |    |
| Load                            | Rise Time           | $t_r$  |   | –    | –    | 250           | ns |
| Switch                          | Turn-off Delay Time | $t_{\text{d(off)}}$  | $R_G = 6.3\Omega$ , Resistive                         | –    | –    | 200           | ns |
|                                 |                     |  |   |      |      |               |    |
| Times                           | Fall Time           | $t_f$  |   | –    | –    | 300           | ns |
| Diode Reverse Recovery Time**   | $t_{\text{rr}}$     | $I_E = 100\text{A}$ , $di_E/dt = -200\text{A}/\mu\text{s}$ | –   | –    | 160  | ns            |    |
| Diode Reverse Recovery Charge** | $Q_{\text{rr}}$     | $I_E = 100\text{A}$ , $di_E/dt = -200\text{A}/\mu\text{s}$ | –   | 0.24 | –    | $\mu\text{C}$ |    |
| Diode Reverse Recovery Time     | $t_{\text{rr}}$     | $I_F = 100\text{A}$ , Clamp Diode Part                     | –   | –    | 160  | ns            |    |
| Diode Reverse Recovery Charge   | $Q_{\text{rr}}$     | $di_F/dt = -200\text{A}/\mu\text{s}$                       | –   | 0.24 | –    | $\mu\text{C}$ |    |

\*\*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

**CM100E3U-12H**  
**Chopper IGBTMOD™ U-Series Module**  
 100 Amperes/600 Volts

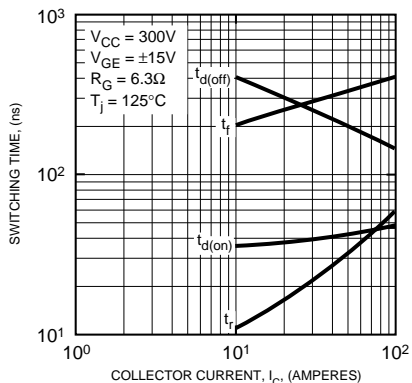
**Thermal and Mechanical Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

| Characteristics                      | Symbol         | Test Conditions                    | Min. | Typ.  | Max. | Units              |
|--------------------------------------|----------------|------------------------------------|------|-------|------|--------------------|
| Thermal Resistance, Junction to Case | $R_{th(j-c)Q}$ | Per IGBT                           | –    | –     | 0.31 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{th(j-c)D}$ | Per FWDi                           | –    | –     | 0.7  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$  | Clamp Diode Part                   | –    | –     | 0.7  | $^\circ\text{C/W}$ |
| Contact Thermal Resistance           | $R_{th(c-f)}$  | Per Module, Thermal Grease Applied | –    | 0.035 | –    | $^\circ\text{C/W}$ |

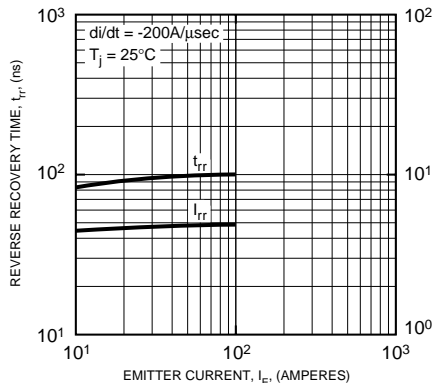


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**Chopper IGBTMOD™ U-Series Module**  
 100 Amperes/600 Volts

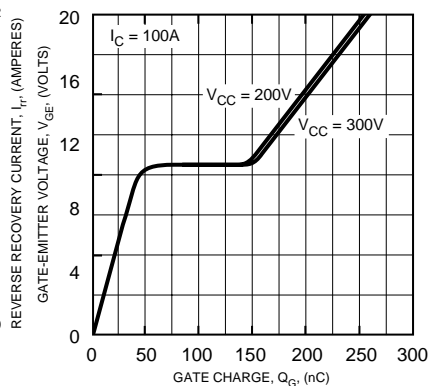
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



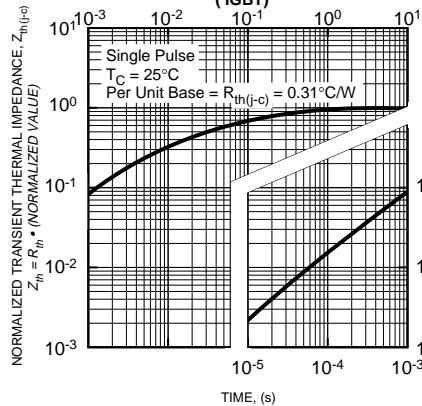
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



**GATE CHARGE,  $V_{GE}$**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)**

