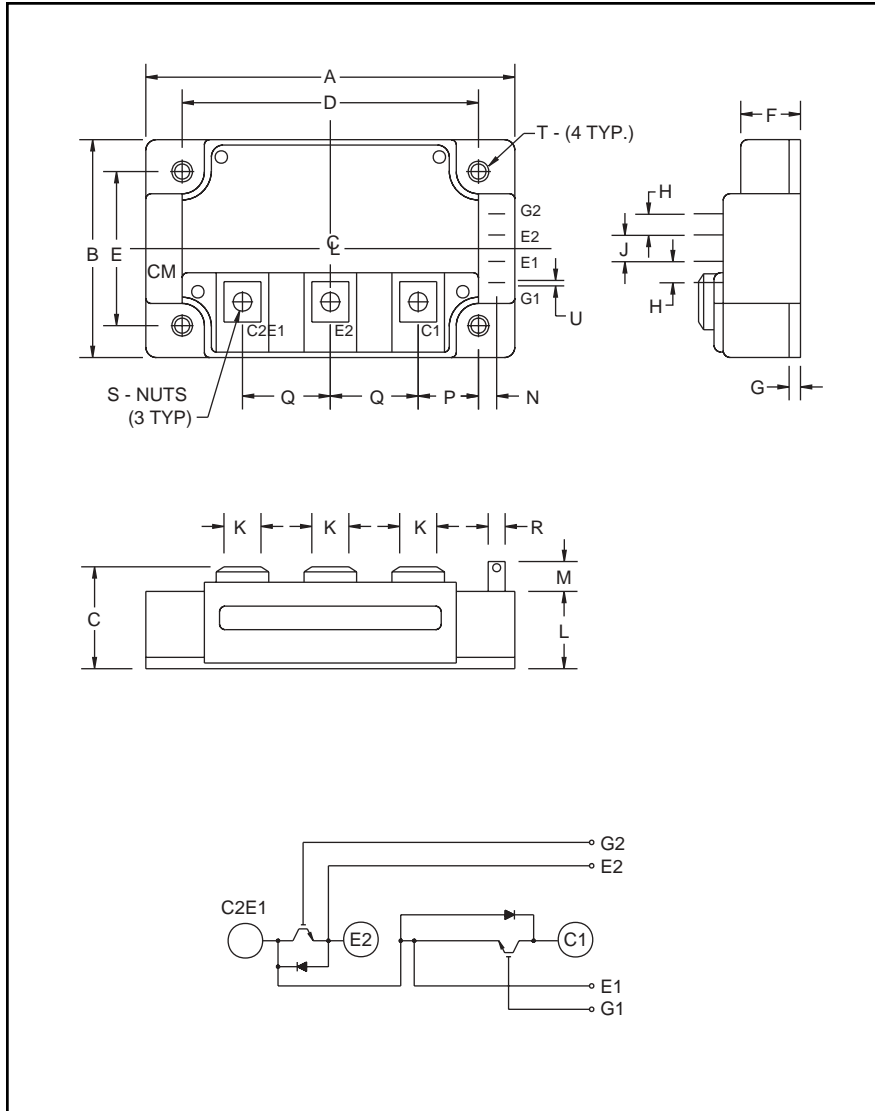


### High Frequency Dual IGBTMOD™ 400 Amperes/600 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches           | Millimeters    |
|------------|------------------|----------------|
| A          | 4.25             | 108.0          |
| B          | 2.44             | 62.0           |
| C          | 1.14 +0.04/-0.02 | 29.0 +1.0/-0.5 |
| D          | 3.66±0.01        | 93.0±0.25      |
| E          | 1.88±0.01        | 48.0±0.25      |
| F          | 0.67             | 17.0           |
| G          | 0.16             | 4.0            |
| H          | 0.24             | 6.0            |
| J          | 0.59             | 15.0           |
| K          | 0.55             | 14.0           |

| Dimensions | Inches | Millimeters |
|------------|--------|-------------|
| L          | 0.87   | 22.0        |
| M          | 0.33   | 8.5         |
| N          | 0.10   | 2.5         |
| P          | 0.85   | 21.5        |
| Q          | 0.98   | 25.0        |
| R          | 0.11   | 2.8         |
| S          | M6     | M6          |
| T          | M6.5   | M6.5        |
| U          | 0.02   | 0.5         |



#### Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-bridge configuration with each transistor having a reverse-connected super-fast recovery free-wheel diode. All components and interconnects are isolated from the heat sinking base plate, offering simplified system assembly and thermal management.

#### Features:

- Low Drive Power
- Low  $V_{CE(sat)}$
- High Frequency Switching (50kHz to 60kHz)
- Isolated Base Plate for Easy Heat Sinking

#### Applications:

- AC Motor Control
- Motion/Servo Control
- UPS
- Welding Power Supplies
- Laser Power Supplies

#### Ordering Information:

Example: Select the complete module number you desire from the table - i.e. CM400DU-12NFH is a 600V ( $V_{CES}$ ), 400 Ampere High Power Dual Module.

| Type | Current Rating<br>Amperes | $V_{CES}$<br>Volts (x 50) |
|------|---------------------------|---------------------------|
| CM   | 400                       | 12                        |



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

**CM400DU-12NFH**  
**High Frequency Dual IGBTMOD™**  
 400 Amperes/600 Volts

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

| Ratings   | Symbol    | CM400DU-12NFH | Units            |
|---|-----------|---------------|------------------|
| Junction Temperature  | $T_j$     | -40 to 150    | $^\circ\text{C}$ |
| Storage Temperature   | $T_{stg}$ | -40 to 125    | $^\circ\text{C}$ |
| Collector-Emitter Voltage (G-E SHORT)                       | $V_{CES}$ | 600           | Volts            |
| Gate-Emitter Voltage (C-E SHORT)                            | $V_{GES}$ | $\pm 20$      | Volts            |
| Collector Current ( $T_c = 25^\circ\text{C}$ )              | $I_C$     | 400           | Amperes          |
| Peak Collector Current                                      | $I_{CM}$  | 800*          | Amperes          |
| Emitter Current** ( $T_c = 25^\circ\text{C}$ )              | $I_E$     | 400           | Amperes          |
| Peak Emitter Current**                                      | $I_{EM}$  | 800*          | Amperes          |
| Maximum Collector Dissipation ( $T_j < 150^\circ\text{C}$ ) | $P_C$     | 960           | Watts            |
| Maximum Collector Dissipation ( $T_j < 150^\circ\text{C}$ ) | $P_C'$    | 1640          | Watts            |
| Mounting Torque, M6 Main Terminal                           | –         | 40            | in-lb            |
| Mounting Torque, M6 Mounting                                | –         | 40            | in-lb            |
| Weight  | –         | 400           | Grams            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)   | $V_{ISO}$ | 2500          | Volts            |

\* Pulse width and repetition rate should be such that the device junction temperature ( $T_j$ ) does not exceed  $T_{j(max)}$  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             | $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$                     | –    | –    | 1    | mA            |
| Gate Leakage Current                 | $I_{GES}$     | $V_{GE} = V_{GES}, V_{CE} = 0V$                     | –    | –    | 0.5  | $\mu\text{A}$ |
| Gate-Emitter Threshold Voltage       | $V_{GE(th)}$  | $I_C = 40\text{mA}, V_{CE} = 10V$                   | 5    | 6    | 7    | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 400A, V_{GE} = 15V, T_j = 25^\circ\text{C}$  | –    | 2.0  | 2.7  | Volts         |
|                                      |               | $I_C = 400A, V_{GE} = 15V, T_j = 125^\circ\text{C}$ | –    | 1.95 | –    | Volts         |
| Total Gate Charge                    | $Q_G$         | $V_{CC} = 300V, I_C = 400A, V_{GE} = 15V$           | –    | 2480 | –    | nC            |
| Emitter-Collector Voltage*           | $V_{EC}$      | $I_E = 400A, V_{GE} = 0V$                           | –    | –    | 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              | $C_{ies}$           |  | –    | –    | 110  | nF            |
| Output Capacitance             | $C_{oes}$           | $V_{CE} = 10V, V_{GE} = 0V$                                      | –    | –    | 7.2  | nF            |
| Reverse Transfer Capacitance   | $C_{res}$           |  | –    | –    | 4.0  | nF            |
| Resistive                      | Turn-on Delay Time  | $V_{CC} = 300V, I_C = 400A,$<br>$V_{GE1} = V_{GE2} = 15V,$       | –    | –    | 400  | ns            |
|                                | Rise Time           |  |      |      |      |               |
| Load                           | Turn-off Delay Time | $R_G = 3.1\Omega, \text{ Inductive}$<br>Load Switching Operation | –    | –    | 700  | ns            |
|                                | Fall Time           |  |      |      |      |               |
| Diode Reverse Recovery Time*   | $t_{rr}$            | $I_E = 400A$   | –    | –    | 200  | ns            |
| Diode Reverse Recovery Charge* | $Q_{rr}$            |  | –    | 7.7  | –    | $\mu\text{C}$ |

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



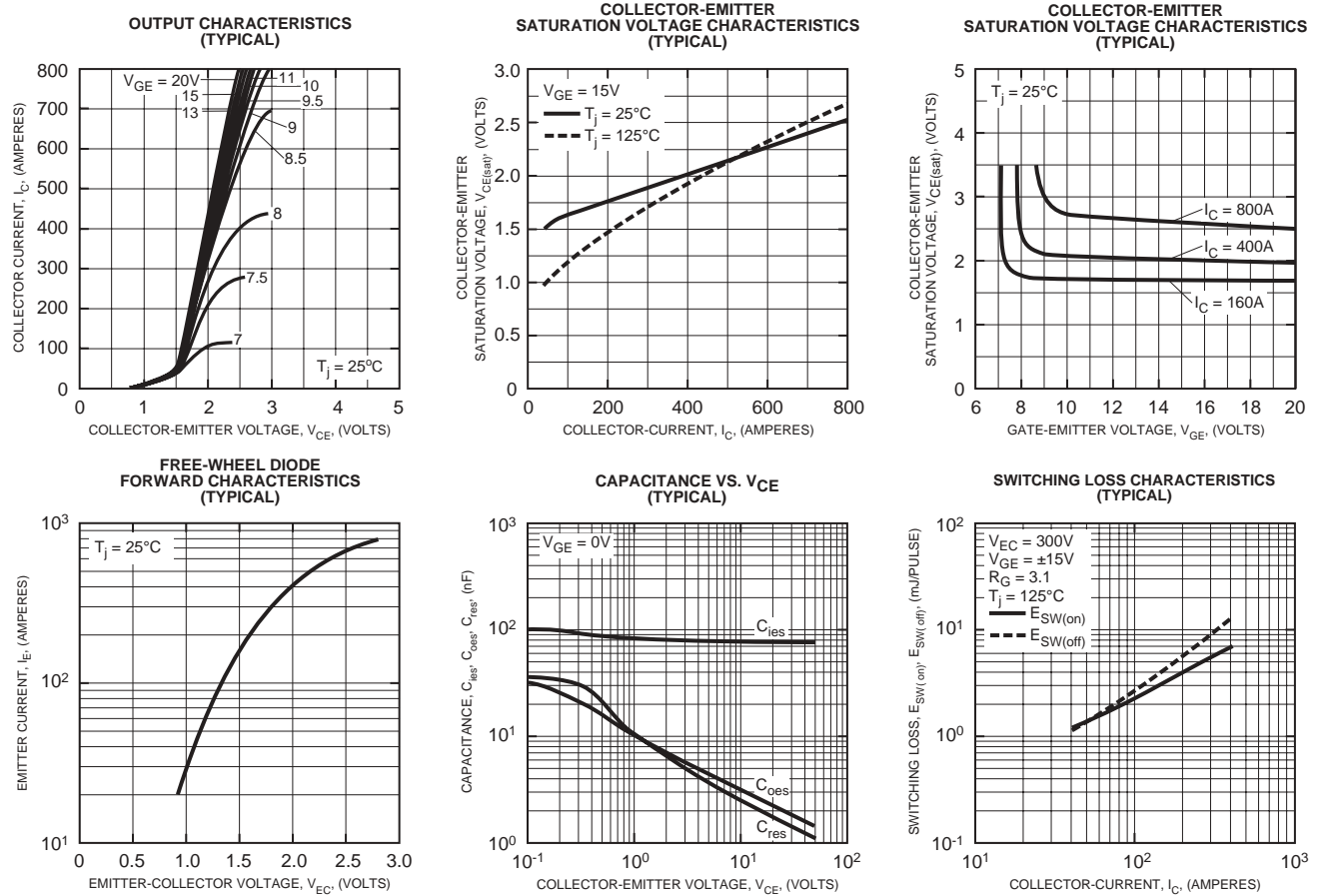
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

**CM400DU-12NFH**  
**High Frequency Dual IGBTMOD™**  
 400 Amperes/600 Volts

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

| Characteristics                      | Symbol         | Test Conditions                              | Min. | Typ. | Max.   | Units              |
|--------------------------------------|----------------|--|------|------|--------|--------------------|
| External Gate Resistance             | $R_G$          |  | 1.6  | —    | 16     | $\Omega$           |
| Thermal Resistance, Junction to Case | $R_{th(j-c)Q}$ | Per IGBT 1/2 Module                          | —    | —    | 0.13   | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{th(j-c)Q}$ | $T_C$ measured Point is just Under the Chips | —    | —    | 0.076* | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{th(j-c)D}$ | Per FWDi 1/2 Module                          | —    | —    | 0.18   | $^\circ\text{C/W}$ |
| Contact Thermal Resistance           | $R_{th(c-f)}$  | Per Module, Thermal Grease Applied           | —    | 0.04 | —      | $^\circ\text{C/W}$ |

\* If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

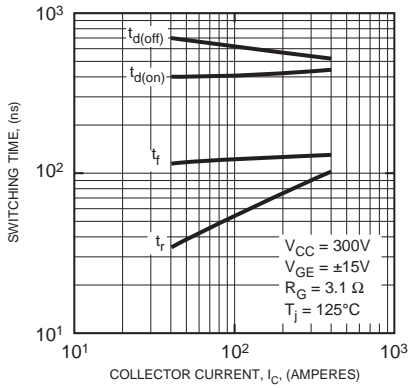




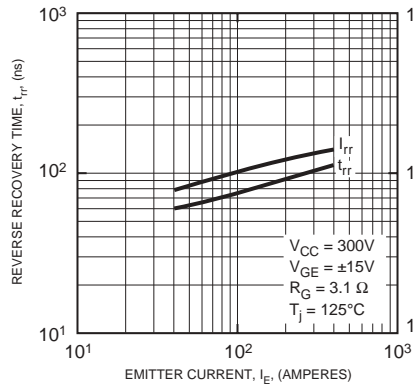
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

**CM400DU-12NFH**  
**High Frequency Dual IGBTMOD™**  
 400 Amperes/600 Volts

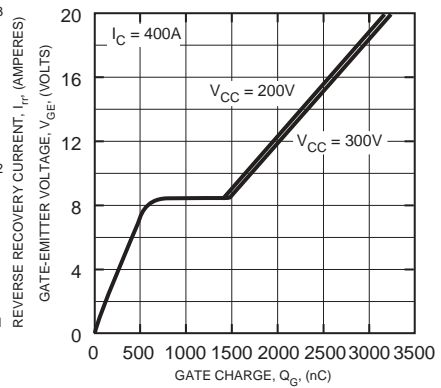
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



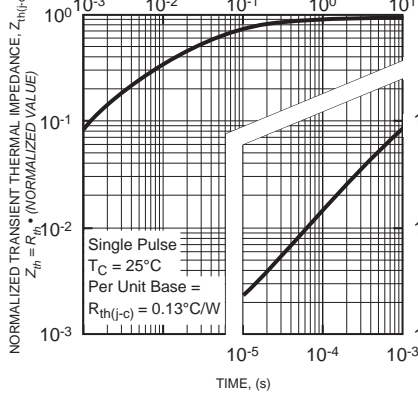
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



**GATE CHARGE CHARACTERISTICS (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)**

