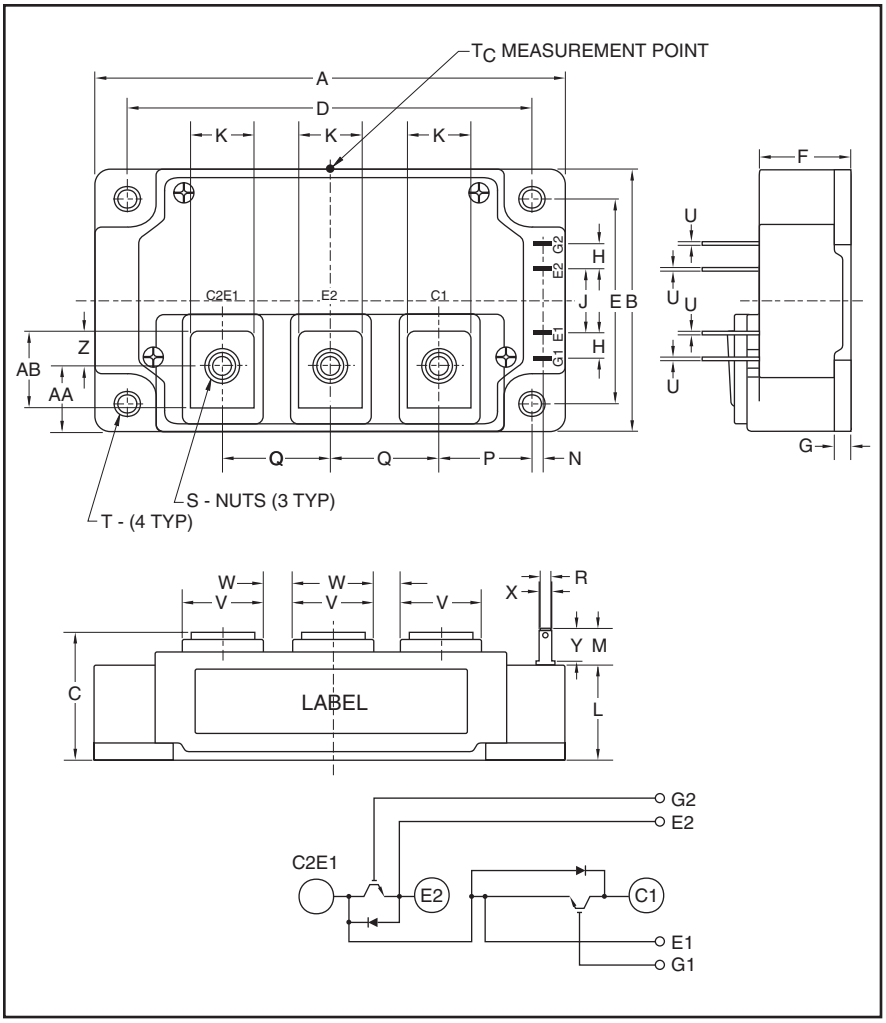
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

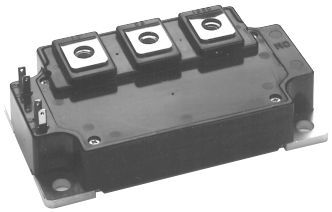
# Dual IGBTMOD™ NFH-Series Module
## 200 Amperes/1200 Volts




**Outline Drawing and Circuit Diagram**

| Dimensions | Inches | Millimeters |
|---|---|---|
| A | 4.25 | 108.0 |
| B | 2.44 | 62.0 |
| C | 1.14+0.04/-0.01 | 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 |
| L | 0.87 | 22.0 |
| M | 0.33 | 8.5 |
| N | 0.10 | 2.5 |

| Dimensions | Inches | Millimeters |
|---|---|---|
| P | 0.85 | 21.5 |
| Q | 0.98 | 25.0 |
| R | 0.11 | 2.8 |
| S | M6 Metric | M6 |
| T | 0.26 Dia. | Dia. 6.5 |
| U | 0.002 | 0.5 |
| V | 0.71 | 18.0 |
| W | 0.28 | 7.0 |
| X | 0.16 | 4.0 |
| Y | 0.3 | 7.5 |
| Z | 0.325 | 8.25 |
| AA | 0.624 | 15.85 |
| AB | 0.709 | 18.0 |



**Description:**
Powerex IGBTMOD™ Modules are designed for use in high frequency applications; 30 kHz for hard switching applications and 60 to 70 kHz for soft 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 baseplate, offering simplified system assembly and thermal management.

**Features:**
- ☐ Low $E_{SW(off)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

**Applications:**
- ☐ Power Supplies
- ☐ Induction Heating
- ☐ Welders

**Ordering Information:**
Example: Select the complete part module number you desire from the table below -i.e. CM200DU-24NFH is a 1200V ($V_{CES}$), 200 Ampere Dual IGBTMOD™ Power Module.

| Type | Current Rating Amperes | $V_{CES}$ Volts (x 50) |
|---|---|---|
| CM | 200 | 24 |

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## Absolute Maximum Ratings, $T_j$ = 25 °C unless otherwise specified

| Ratings | Symbol | CM200DU-24NF | Units |
|---|---|---|---|
| Junction Temperature | $T_j$ | –40 to 150 | °C |
| Storage Temperature | $T_{stg}$ | –40 to 125 | °C |
| Collector-Emitter Voltage (G-E Short) | $V_{CES}$ | 1200 | Volts |
| Gate-Emitter Voltage (C-E Short) | $V_{GES}$ | ±20 | Volts |
| Collector Current ($T_C$ = 25°C) | $I_C$ | 200* | Amperes |
| Peak Collector Current | $I_{CM}$ | 400* | Amperes |
| Emitter Current** ($T_C$ = 25°C) | $I_E$ | 200* | Amperes |
| Peak Emitter Current** | $I_{EM}$ | 400* | Amperes |
| Maximum Collector Dissipation ($T_C$ = 25°C, $T_j \leq$ 150°C) | $P_C$ | 830 | Watts |
| Maximum Collector Dissipation ($T_{C'}$ = 25°C, $T_{j'} \leq$ 150°C) | $P_C$ | 1300 | 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 |

## Static Electrical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Collector-Cutoff Current | $I_{CES}$ | $V_{CE} = V_{CES}$, $V_{GE}$ = 0V | — | — | 1.0 | mA |
| Gate Leakage Current | $I_{GES}$ | $V_{GE} = V_{GES}$, $V_{CE}$ = 0V | — | — | 0.7 | µA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $I_C$ = 20mA, $V_{CE}$ = 10V | 4.5 | 6.0 | 7.5 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 200A, $V_{GE}$ = 15V, $T_j$ = 25°C | — | 5.0 | 6.5 | Volts |
| | | $I_C$ = 200A, $V_{GE}$ = 15V, $T_j$ = 125°C | — | 5.0 | — | Volts |
| Total Gate Charge | $Q_G$ | $V_{CC}$ = 600V, $I_C$ = 200A, $V_{GE}$ = 15V | — | 900 | — | nC |
| Emitter-Collector Voltage** | $V_{EC}$ | $I_E$ = 200A, $V_{GE}$ = 0V | — | — | 3.5 | Volts |

## Dynamic Electrical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Input Capacitance | | $C_{ies}$ | $V_{CE}$ = 10V, $V_{GE}$ = 0V | — | — | 32 | nf |
| Output Capacitance | | $C_{oes}$ | | — | — | 2.7 | nf |
| Reverse Transfer Capacitance | | $C_{res}$ | | — | — | 0.6 | nf |
| Inductive | Turn-on Delay Time | $t_{d(on)}$ | $V_{CC}$ = 600V, $I_C$ = 200A, $V_{GE1} = V_{GE2}$ = 15V, $R_G$ = 1.6Ω, Inductive Load Switching Operation, $I_E$ = 200A | — | — | 300 | ns |
| Load | Rise Time | $t_r$ | | — | — | 80 | ns |
| Switch | Turn-off Delay Time | $t_{d(off)}$ | | — | — | 500 | ns |
| Time | Fall Time | $t_f$ | | — | — | 150 | ns |
| Diode Reverse Recovery Time** | | $t_{rr}$ | | — | — | 250 | ns |
| Diode Reverse Recovery Charge** | | $Q_{rr}$ | | — | 7.5 | — | µC |

* Pulse width and repetition rate should be such that 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).

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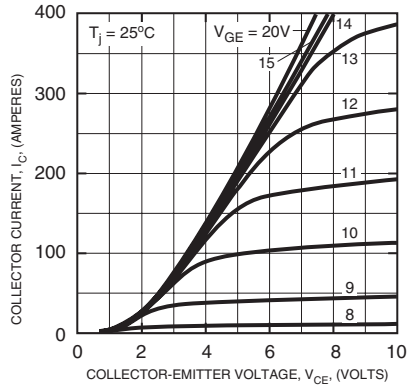
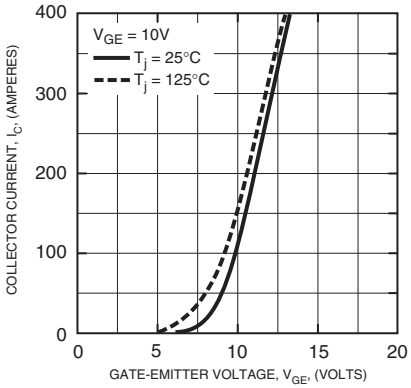
## Thermal and Mechanical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{th(j-c)}Q$ | Per IGBT 1/2 Module, $T_C$ Reference Point per Outline Drawing | — | — | 0.15 | °C/W |
| Thermal Resistance, Junction to Case | $R_{th(j-c)}D$ | Per FWDi 1/2 Module, $T_C$ Reference Point per Outline Drawing | — | — | 0.24 | °C/W |
| Thermal Resistance, Junction to Case | $R_{th(j-c)'}Q$ | Per IGBT 1/2 Module, $T_C$ Reference Point Under Chips | — | — | 0.095 | °C/W |
| Thermal Resistance, Junction to Case | $R_{th(j-c)'}D$ | Per FWDi 1/2 Module, $T_C$ Reference Point Under Chips | — | — | 0.14 | °C/W |
| Contact Thermal Resistance | $R_{th(c-f)}$ | Per 1/2 Module, Thermal Grease Applied | — | 0.04 | — | °C/W |
| External Gate Resistance | $R_G$ | | 1.6 | — | 16 | Ω |

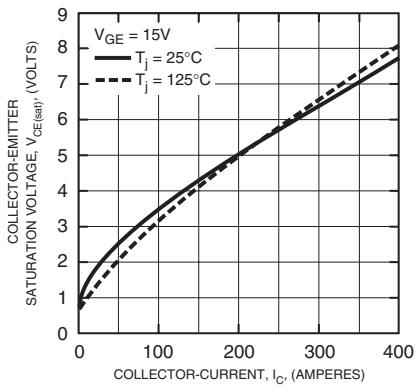
**OUTPUT CHARACTERISTICS (TYPICAL)**




**TRANSFER CHARACTERISTICS (TYPICAL)**




**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**

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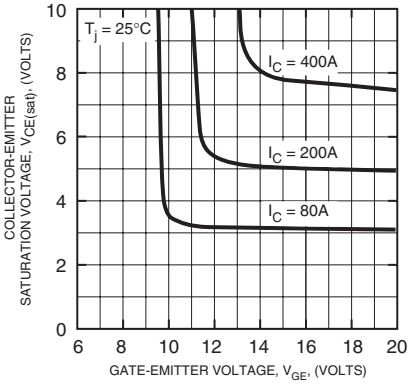
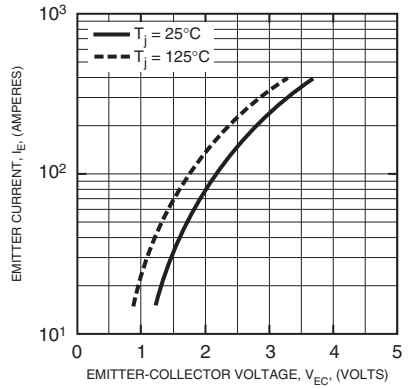
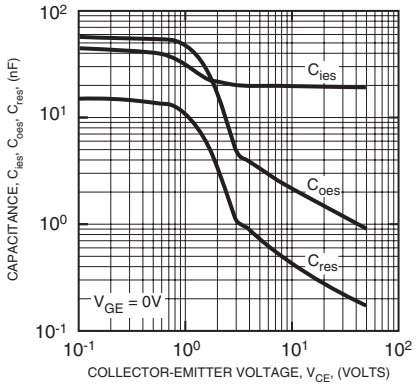



**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**




**CAPACITANCE VS. $V_{CE}$ (TYPICAL)**



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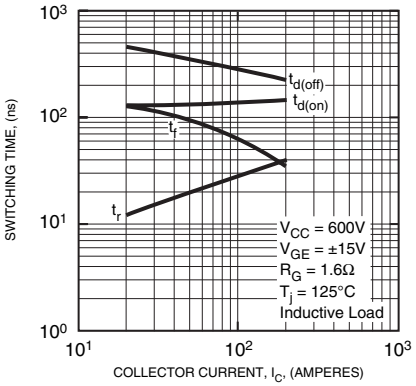
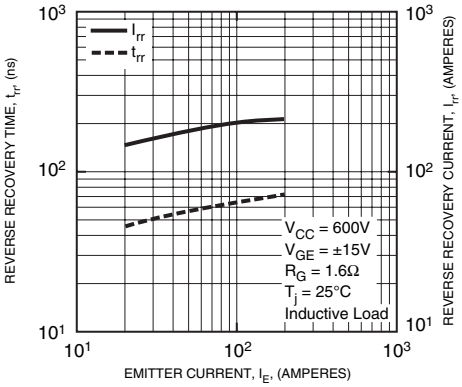
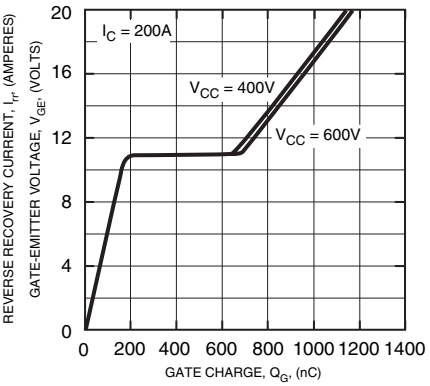
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



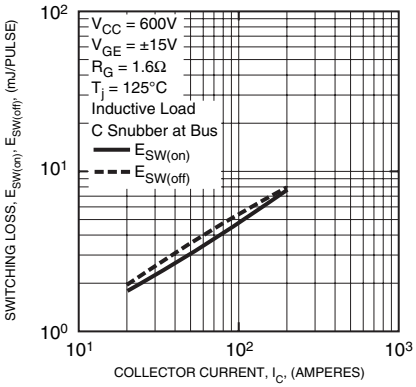

**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



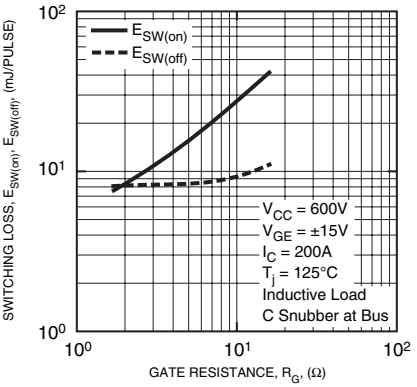

**GATE CHARGE VS. $V_{GE}$**



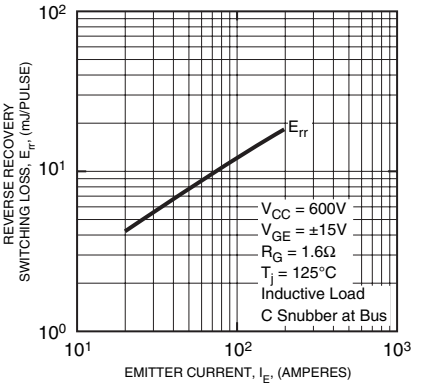

**SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)**



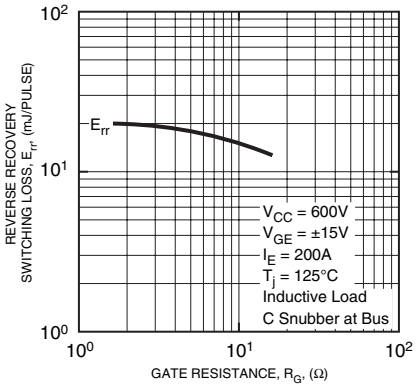

**SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)**




**REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (TYPICAL)**




**REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)**




**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)**