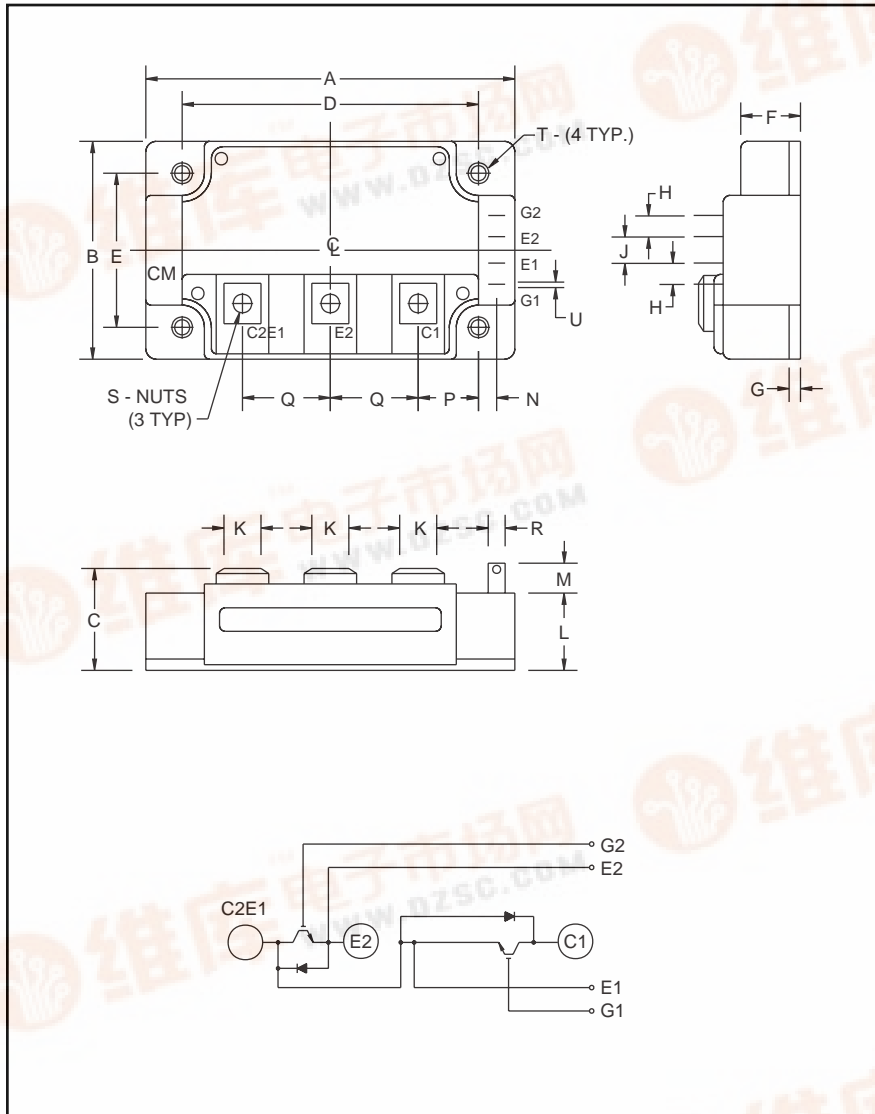




Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

## CM400DU-12NFH

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



### 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.

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
R	0.11	2.8
S	M6	M6
T	M6.5	M6.5
U	0.02	0.5

Type	Current Rating Amperes	$V_{CES}$ 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	$t_{d(on)}$	$V_{CC} = 300V, I_C = 400A,$	–	–	400	ns
Load	Rise Time	$t_r$	$V_{GE1} = V_{GE2} = 15V,$	–	–	200	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	$R_G = 3.1\Omega, \text{Inductive}$	–	–	700	ns
Times	Fall Time	$t_f$	Load Switching Operation	–	–	150	ns
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).



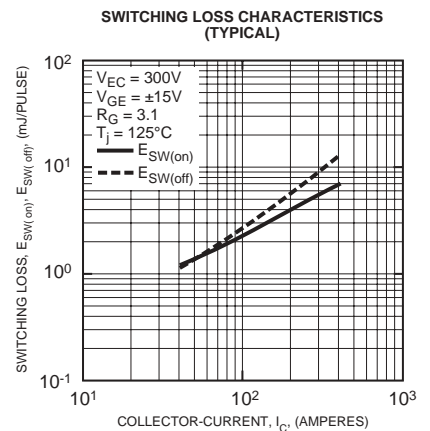
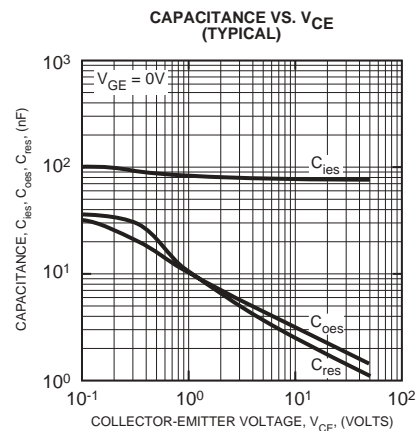
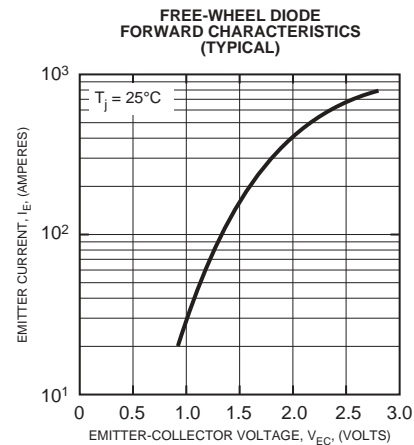
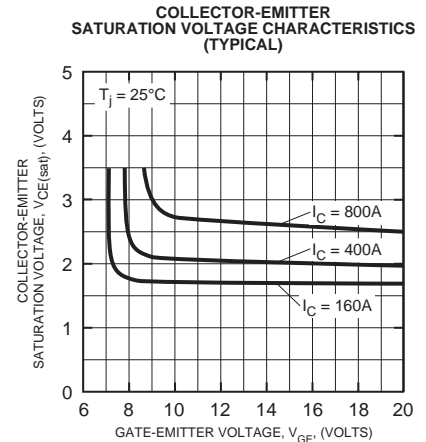
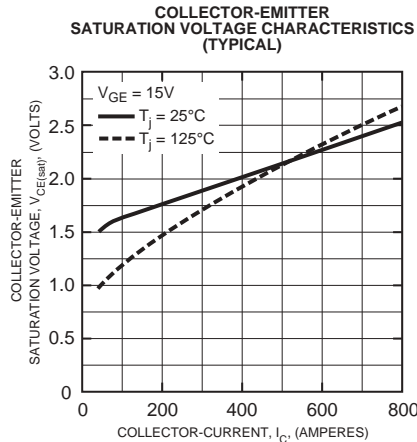
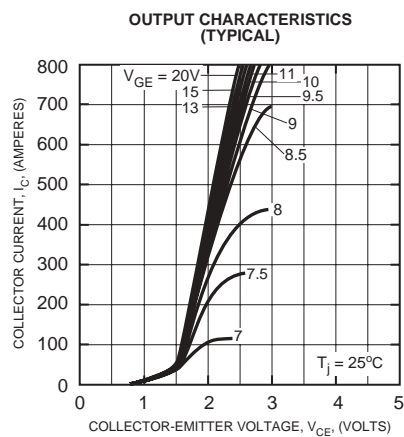
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

**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.

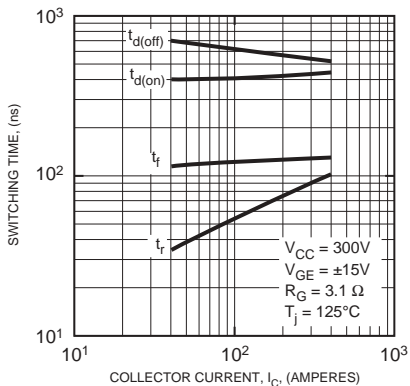




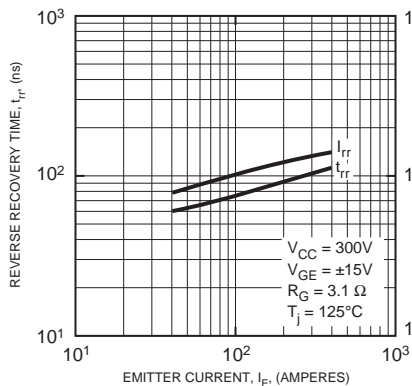
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

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

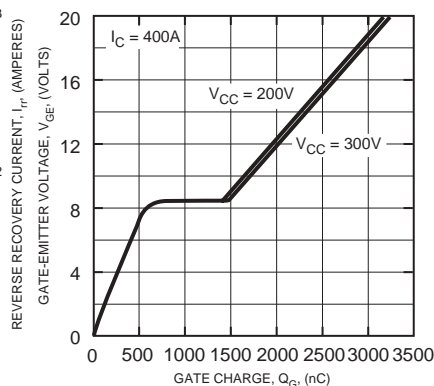
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



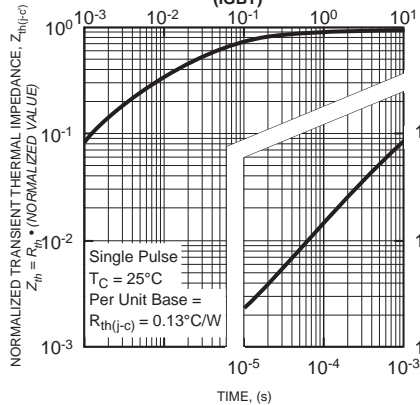
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



**GATE CHARGE CHARACTERISTICS (TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDI)**

