CM400DU-24NFH

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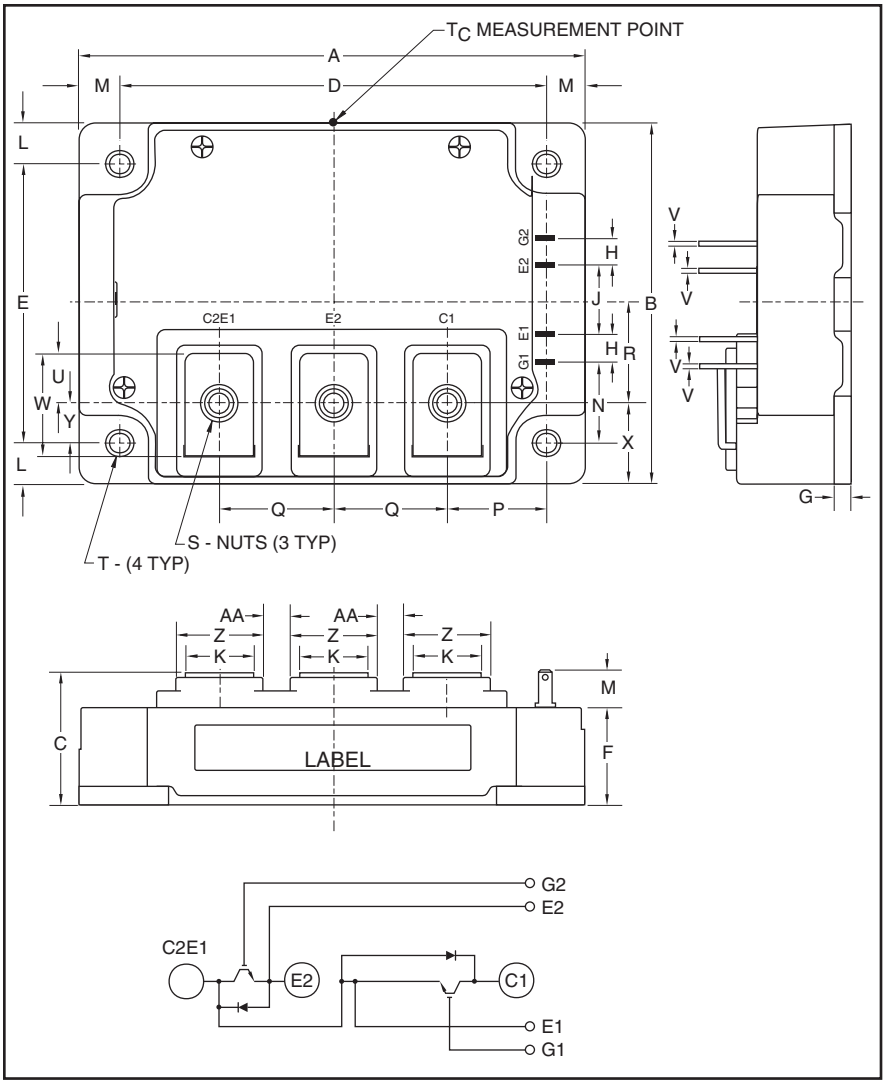
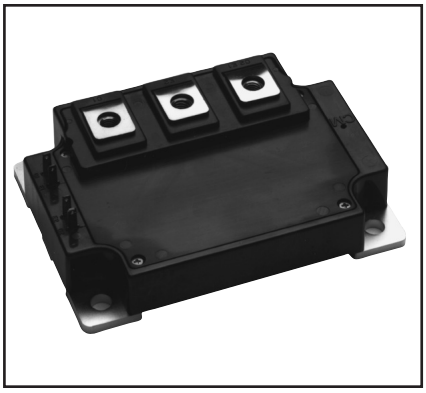
Dual IGBTMOD™
NFH-Series Module
400 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.15	80.0
C	1.14+0.04/-0.01	29.0+1.0/-0.5
D	3.66±0.01	93.0±0.25
E	2.44±0.01	62.0±0.25
F	0.83	21.2
G	0.16	4.0
H	0.24	6.0
J	0.59	15.0
K	0.55	14.0
L	0.35	9.0
M	0.33	8.5
N	0.69	17.5

Dimensions	Inches	Millimeters
P	0.85	21.5
Q	0.98	25.0
R	0.86	21.75
S	M6 Metric	M6
T	0.26 Dia.	6.5 Dia.
U	0.4	10.0
V	0.02	0.5
W	0.87	22.2
X	0.72	18.25
Y	0.36	9.25
Z	0.71	18.0
AA	0.28	7.0



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. CM400DU-24NFH is a 1200V (V_{CES}), 400 Ampere Dual IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	400	24

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

Ratings	Symbol	CM400DU-24NFH	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	400*	Amperes
Peak Collector Current	I_{CM}	800*	Amperes
Emitter Current** (T_C = 25°C)	I_E	400*	Amperes
Peak Emitter Current**	I_{EM}	800*	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j ≤ 150°C)	P_C	1040	Watts
Maximum Collector Dissipation ($T_{C'}$ = 25°C, $T_{j'}$ ≤ 150°C)	P_C	2500	Watts
Mounting Torque, M6 Main Terminal	—	40	in-lb
Mounting Torque, M6 Mounting	—	40	in-lb
Weight	—	580	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	—	—	1.4	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 40mA, V_{CE} = 10V	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 400A, V_{GE} = 15V, T_j = 25°C	—	5.0	6.5	Volts
		I_C = 400A, V_{GE} = 15V, T_j = 125°C	—	5.0	—	Volts
Total Gate Charge	Q_G	V_{CC} = 600V, I_C = 400A, V_{GE} = 15V	—	1800	—	nC
Emitter-Collector Voltage**	V_{EC}	I_E = 400A, 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	—	—	63	nF
Output Capacitance		C_{oes}		—	—	5.3	nF
Reverse Transfer Capacitance		C_{res}		—	—	1.2	nF
Inductive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 400A, $V_{GE1} = V_{GE2}$ = 15V, R_G = 0.78Ω, Inductive Load Switching Operation, I_E = 400A	—	—	300	ns
Load	Rise Time	t_r		—	—	100	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}		—	16	—	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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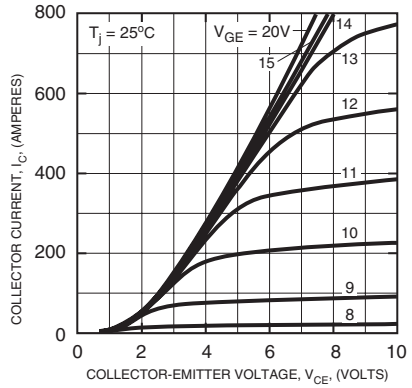
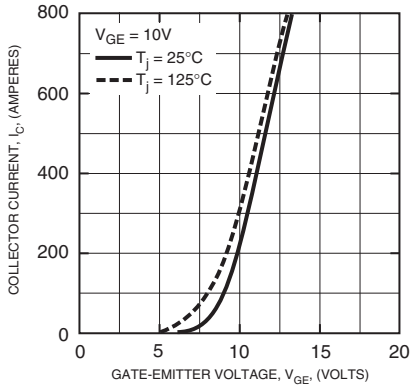
Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

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	—	—	0.12	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}D$	Per FWDi 1/2 Module, T_C Reference Point per Outline Drawing	—	—	0.23	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}'Q$	Per IGBT 1/2 Module, T_C Reference Point Under Chips	—	—	0.051	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}'D$	Per FWDi 1/2 Module, T_C Reference Point per Outline Drawing	—	—	0.093	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per 1/2 Module, Thermal Grease Applied	—	0.02	—	°C/W
External Gate Resistance	R_G		0.78	—	7.8	Ω

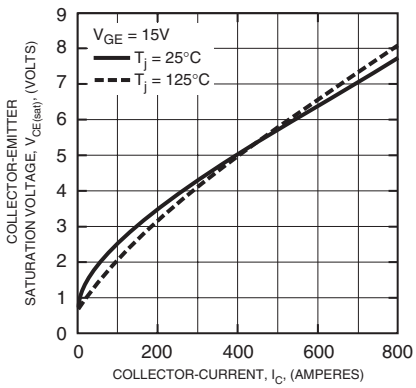
OUTPUT CHARACTERISTICS (TYPICAL)



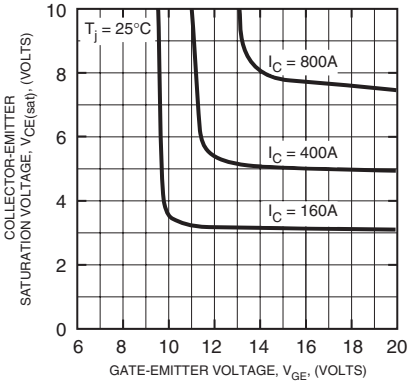
TRANSFER CHARACTERISTICS (TYPICAL)



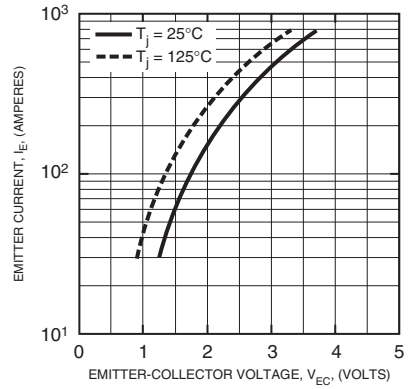
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



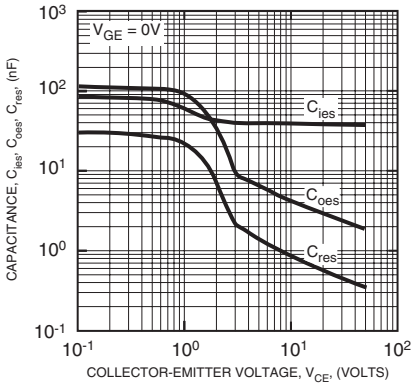
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE VS. V_{CE} (TYPICAL)



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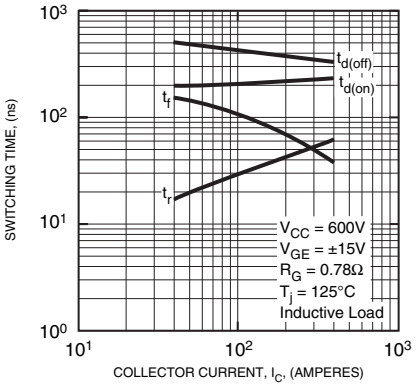
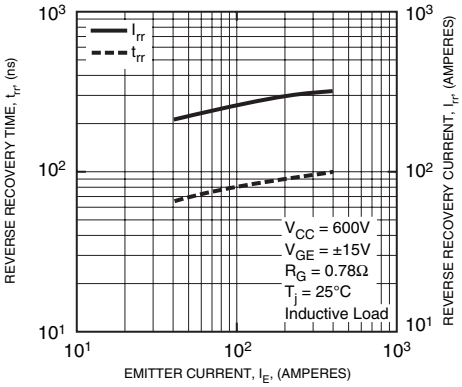
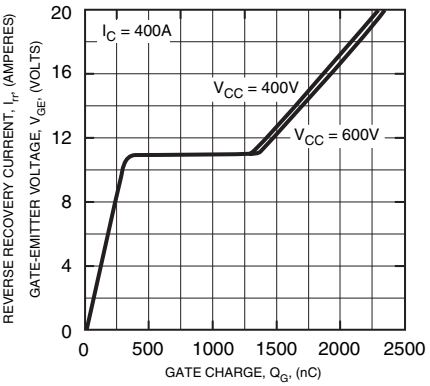
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



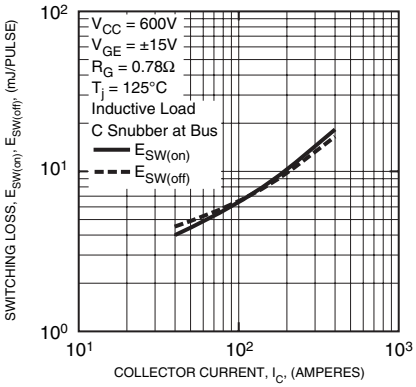
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



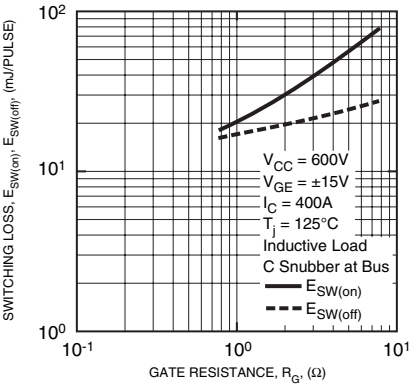
GATE CHARGE VS. V_{GE}



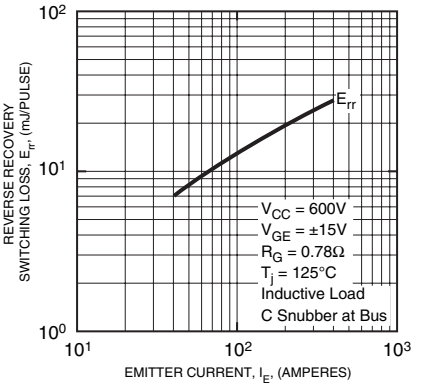
SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



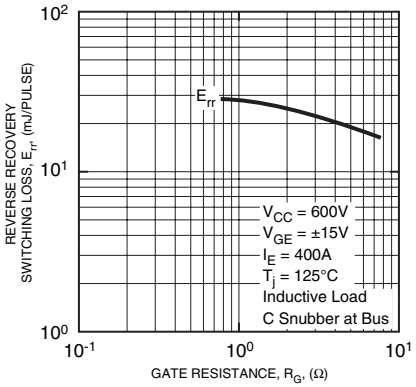
SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)