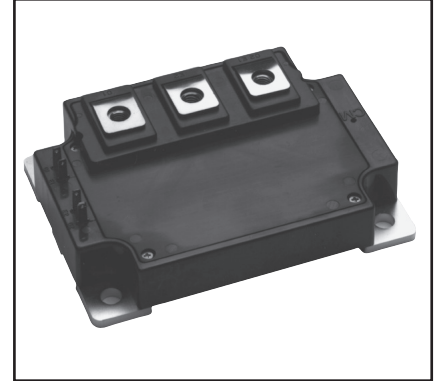
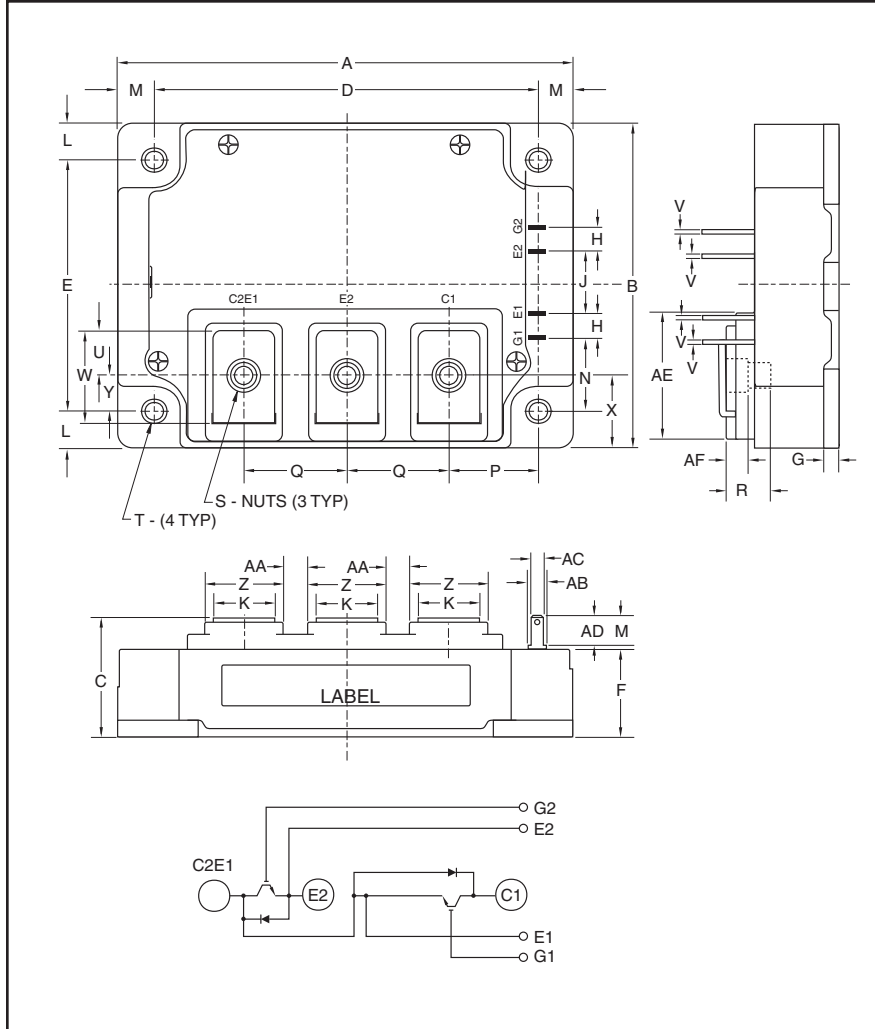


Dual IGBTMOD™ NFJ-Series Module 400 Amperes/1200 Volts



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 ESW(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-24NFJ is a 1200V (V_{CEs}), 400 Ampere Dual IGBTMOD™ Power Module.

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
P	0.85	21.5
Q	0.98	25.0

Dimensions	Inches	Millimeters
R	0.47	12.0
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
AB	0.16	4.0
AC	0.11	2.8
AD	0.3	7.5
AE	1.23	31.4
AF	0.21	5.3

Type	Current Rating Amperes	V _{CEs} Volts (x 50)
CM	400	24

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

Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	± 20	Volts
Collector Current (Operation) ^{*2}	I_C	400	Amperes
Collector Current (Pulse) ^{*2}	I_{CM}	800	Amperes
Maximum Power Dissipation ($T_C = 25^\circ\text{C}$) ^{*2,*4}	P_C	2450	Watts
Emitter Current (Operation) ^{*2}	I_E^{*1}	400	Amperes
Emitter Current (Pulse) ^{*2}	I_{EM}^{*1}	800	Amperes
Isolation Voltage (Charged Part to Baseplate, $f = 60$ Hz, AC 1 Minute)	V_{ISO}	2500	V_{rms}
Junction Temperature	T_j	-40 ~ +150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 ~ +125	$^\circ\text{C}$

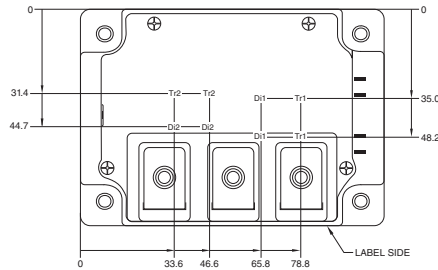
Mechanical Characteristics

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Torque Strength	M	Main Terminals, M6 Screw	31	35	40	in-lb
	M	Mounting, M6 Screw	31	35	40	in-lb
Weight			—	580	—	Grams

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWD).

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

*4 Case temperature (T_C) is measured point is just under the chips.



Each mark points to the center position of each chip.
 T1 / T2: IGBT D1 / D2: FWD. Tolerance ± 1 mm

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate Leakage Current	I_{GES}	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	1.4	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 40\text{mA}, V_{CE} = 10V$	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 400A, V_{GE} = 15V, T_j = 25^\circ\text{C}^3$	—	5.0	6.5	Volts
		$I_C = 400A, V_{GE} = 15V, T_j = 125^\circ\text{C}^3$	—	5.0	—	Volts
Forward Transfer Admittance	$ y_{fs} $	$I_C = 400A, V_{CE} = 10V^3$	120	—	—	S
Input Capacitance	C_{ies}		—	—	63	nF
Output Capacitance	C_{oes}	$V_{CE} = 10V, V_{GE} = 0V$	—	—	5.3	nF
Reverse Transfer Capacitance	C_{res}		—	—	1.2	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 400A, V_{GE} = 15V$	—	1800	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	300	ns
Turn-on Rise Time	t_r	$V_{CC} = 600V, I_C = 400A,$	—	—	100	ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V, R_G = 0.78\Omega,$	—	—	500	ns
Turn-off Fall Time	t_f	Inductive Load,	—	—	150	ns
Reverse Recovery Time	t_{rr}^{*1}	$I_E = 400A$	—	—	100	ns
Reverse Recovery Charge	Q_{rr}^{*1}		—	7.0	—	μC
Emitter-Collector Voltage	V_{EC}^{*1}	$I_E = 400A, V_{GE} = 0V^3$	—	5.5	7.0	Volts
Internal Gate Resistance	R_{Gint}	$T_C = 25^\circ\text{C}, \text{Per Switch}$	—	3.0	—	Ω
External Gate Resistance	R_G		0.78	—	7.8	Ω

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

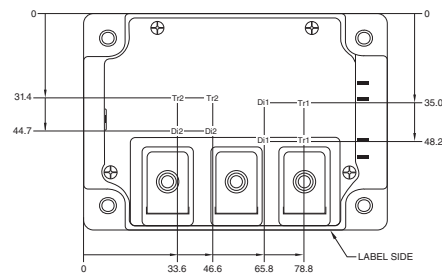
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	Per IGBT Part ^{*4}	—	—	0.051	K/W
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per FWDi Part ^{*4}	—	—	0.093	K/W
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Heatsink, Thermal Grease Applied ^{*4*5}	—	0.02	—	K/W

^{*1} Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

^{*3} Pulse width and repetition rate should be such as to cause negligible temperature rise.

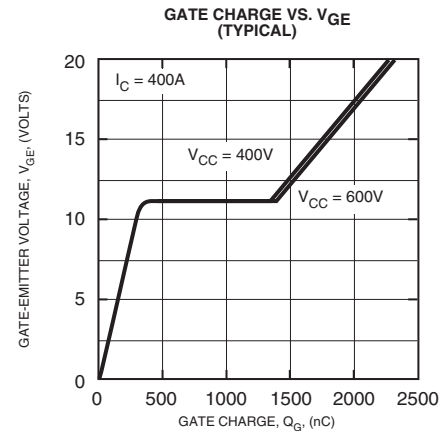
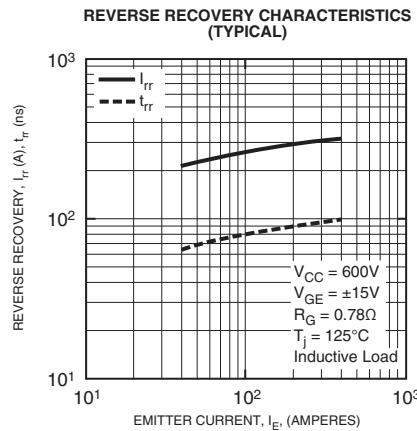
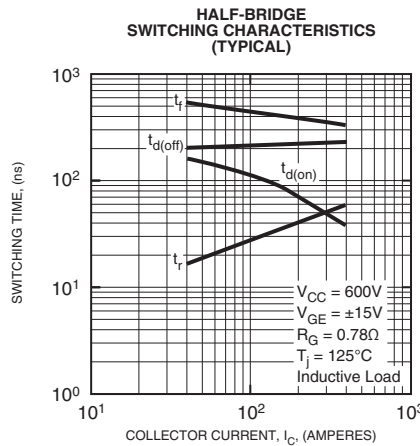
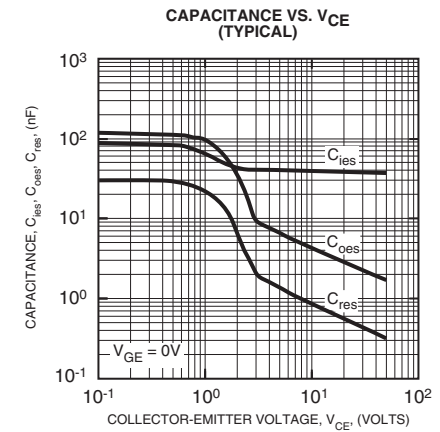
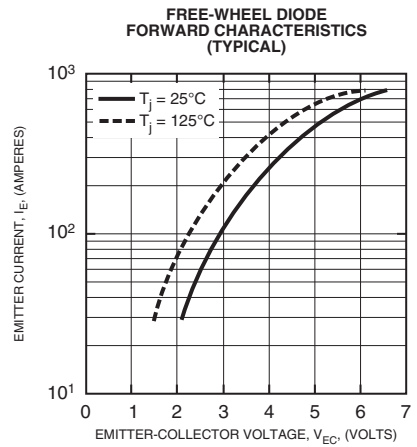
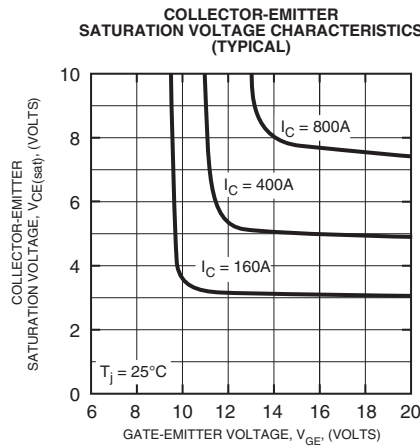
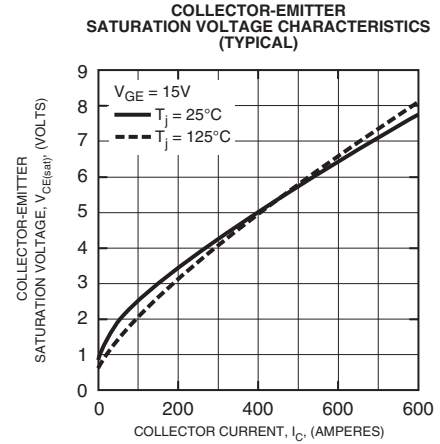
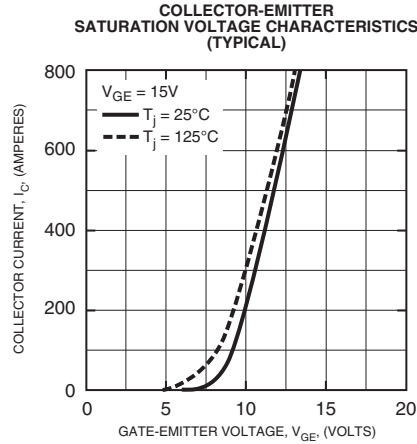
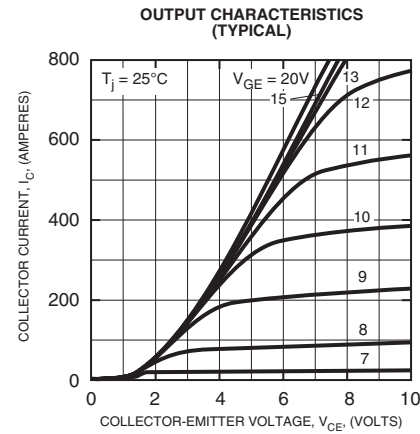
^{*4} Case temperature (T_C) and heatsink temperature (T_f) measured point is just under the chips.

If using this value, thermal resistance of heatsink, $R_{th(f-a)}$, should be measured just under the chips.



^{*5} Typical value is measured by using thermally conductive grease of $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$.

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