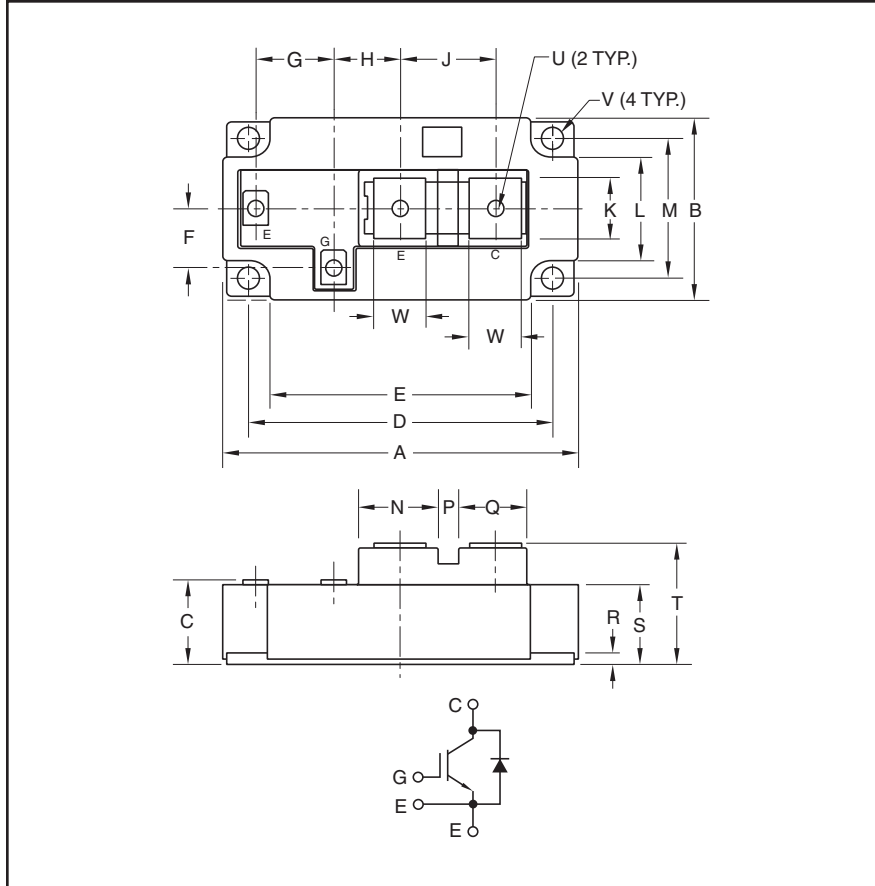


### Single IGBT NFM-Series Module 400 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dim.	Inches	Millimeters
A	4.25	108.0
B	2.44	62.0
C	1.016	25.8
D	3.66±0.01	93.0±0.25
E	3.15	80.0
F	0.79	20.0
G	0.94	24.0
H	0.79	20.0
J	1.14	29.0
K	0.80	20.4
L	1.38	35.0

Dim.	Inches	Millimeters
M	1.89	48.0
N	0.94	24.0
P	0.23	6.0
Q	0.85	21.5
R	0.14	3.5
S	0.96	24.4
T	1.45+0.04/-0.02	36.8+1.0/-0.5
U	M6	M6
V	0.26 Dia.	6.5 Dia.
W	0.62	15.8



#### Description:

Powerex NFM IGBT Modules are designed for use in hard switching (15-30 kHz) applications. Each module consists of one IGBT Transistor in a single configuration with 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 Drive Power
- Low  $E_{SW(off)}$
- Discrete Super-Fast Recovery Free-Wheel Diode
- Isolated Baseplate for Easy Heat Sinking

#### Applications:

- Power Supplies
- UPS
- Battery Powered Supplies
- Induction Heating

#### Ordering Information:

Example: Select the complete part module number you desire from the table below -i.e. CM400HC-24NFM is a 1200V ( $V_{CES}$ ), 400 Ampere Single IGBT Power Module.

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



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

**CM400HC-24NFM**  
**Single IGBT NFM-Series Module**  
 400 Amperes/1200 Volts

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

Ratings	Symbol	CM400HC-24NFM	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)	$V_{CES}$	1200	Volts
Gate-Emitter Voltage (C-E Short)	$V_{GES}$	$\pm 20$	Volts
Collector Current	$I_C$	400	Amperes
Peak Collector Current	$I_{CM}$	800*	Amperes
Emitter Current**	$I_E$	400	Amperes
Peak Emitter Current**	$I_{EM}$	800*	Amperes
Maximum Collector Dissipation*** ( $T_C = 25^\circ\text{C}$ )****	$P_C$	2710	Watts
Mounting Torque, M6 Main Terminal	—	40	in-lb
Mounting Torque, M6 Mounting	—	40	in-lb
Mounting Torque, G(E) Terminal M4	—	15	in-lb
Weight	—	370	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	VISO	2500	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 40\text{mA}, V_{CE} = 10V$	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage*****	$V_{CE(sat)}$	$I_C = 400\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}$	—	3.0	4.5	Volts
		$I_C = 400\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}$	—	3.0	—	Volts
Total Gate Charge	$Q_G$	$V_{CC} = 600V, I_C = 400\text{A}, V_{GE} = 15V$	—	1800	—	nC
Emitter-Collector Voltage**	$V_{EC}$	$I_E = 400\text{A}, V_{GE} = 0V$	—	2.0	3.0	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	$C_{ies}$		—	—	63	nF
Output Capacitance*****	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	—	—	5.3	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	1.2	nF
Inductive	Turn-on Delay Time	$t_{d(on)}$	—	—	300	ns
	Rise Time	$t_r$	—	—	100	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	—	—	500	ns
	Fall Time	$t_f$	—	60	200	ns
Diode Reverse Recovery Time**	$t_{rr}$	Switching Operation,	—	120	200	ns
Diode Reverse Recovery Charge**	$Q_{rr}$	$I_E = 400\text{A}$	—	24	—	$\mu\text{C}$

\*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).

\*\*\*Junction temperature ( $T_j$ ) should not increase beyond  $150^\circ\text{C}$ .

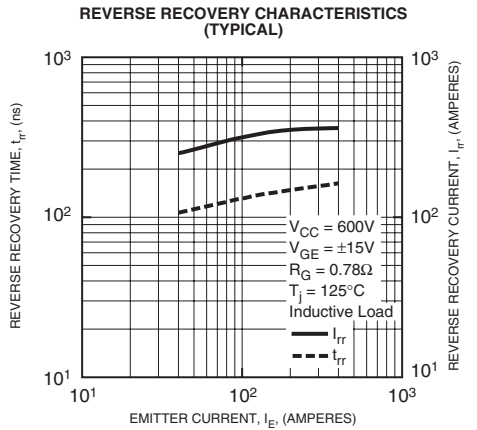
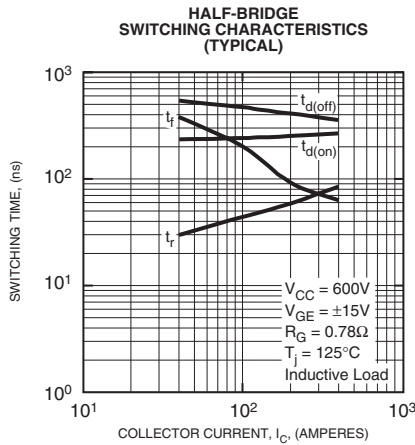
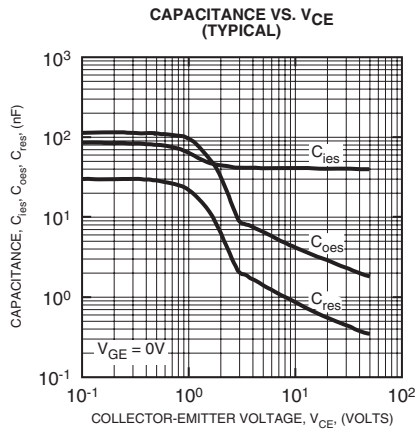
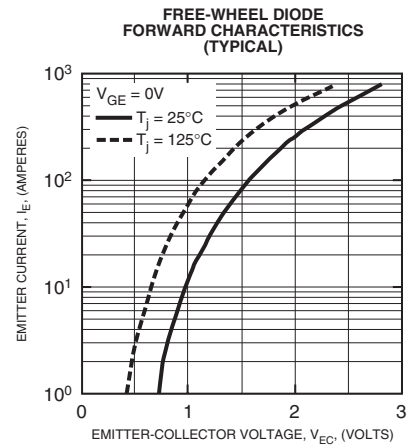
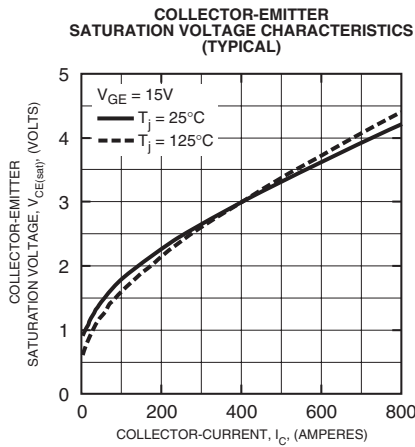
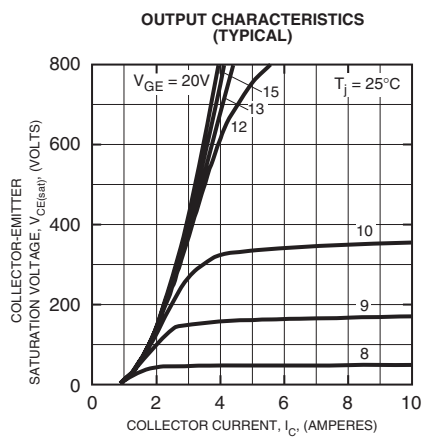
\*\*\*\* $T_C$ ,  $T_f$  measured point is just under the chips.

\*\*\*\*\*Pulse width and repetition rate should be such as to cause negligible temperature rise.

**CM400HC-24NFM**  
**Single IGBT NFM-Series Module**  
 400 Amperes/1200 Volts

**Thermal and Mechanical 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 1/2 Module, $T_C$ Measured Point Just Under Chips	—	—	0.046	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per FWDi 1/2 Module, $T_C$ Measured Point Just Under Chips	—	—	0.07	$^\circ\text{C/W}$
Contact Thermal Resistance, Case to Fin	$R_{th(c-f)}$	Per 1/2 Module, Thermal Grease Applied	—	0.02	—	$^\circ\text{C/W}$
External Gate Resistance	$R_G$		0.78	—	7.8	$\Omega$



**CM400HC-24NFM**  
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