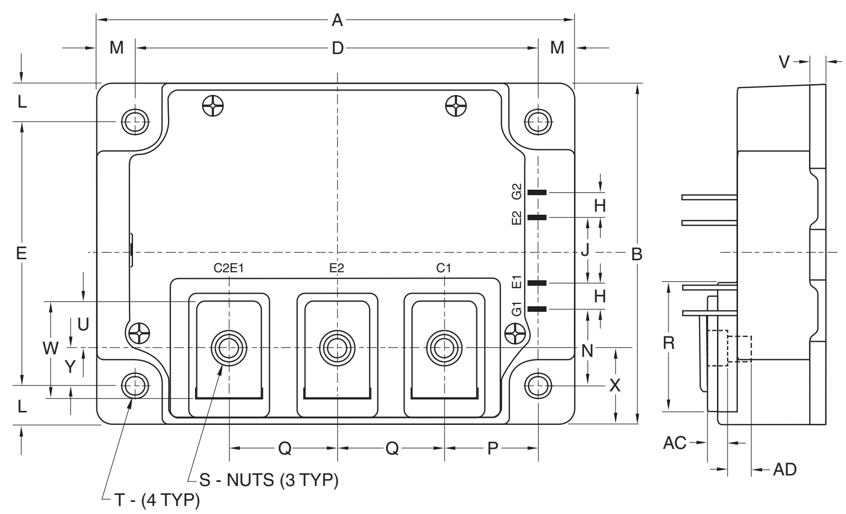
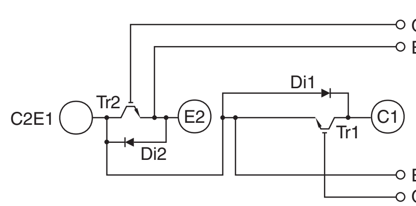
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
www.pwrx.com

Dual IGBTMOD™
NFH-Series Module
600 Amperes/600 Volts





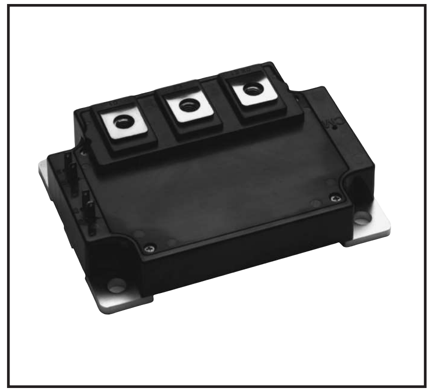
Tolerance Otherwise Specified (mm)

Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

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	0.28	7.0
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

Dimensions	Inches	Millimeters
Q	0.98	25.0
R	1.23	31.4
S	M6 Metric	M6
T	0.26 Dia.	6.5 Dia.
U	0.4	10.0
V	0.16	4.0
W	0.87	22.2
X	0.72	18.25
Y	0.36	9.25
Z	0.71	18.0
AA	0.11	2.8
AB	0.29	7.5
AC	0.21	5.3
AD	0.47	12.0



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 $V_{CE(sat)}$
- ☐ 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. CM600DU-12NFH is a 600V (V_{CES}), 600 Ampere Dual IGBTMOD™ Power Module.

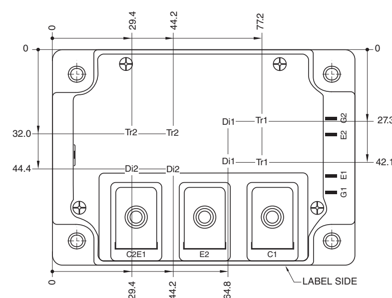
Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	600	12

CM600DU-12NFH
Dual IGBTMOD™ NFH-Series Module
600 Amperes/600 Volts

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

Item	Symbol	Rating	Units
Collector-Emitter Voltage (G-E Short-circuited)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short-circuited)	V_{GES}	±20	Volts
Collector Current (Operation)*5	I_C	600	Amperes
Collector Current (Operation)*5	$I_{C(rms)}$	400	Amperes
Collector Current (Pulse, Repetitive)*4	I_{CRM}	1200	Amperes
Total Power Dissipation (T_C = 25°C)*2,*5	P_{tot}	1130	Watts
Total Power Dissipation (T_C' = 25°C)*3,*5	P_{tot}'	2350	Watts
Emitter Current (Free Wheeling Diode Forward Current, Operation)*5	I_E*1	600	Amperes
Emitter Current (Free Wheeling Diode Forward Current, Operation)*5	$I_{E(rms)}$*1	400	Amperes
Emitter Current (Free Wheeling Diode Forward Current, Operation, Pulse, Repetitive)*4	I_{ERM}*1	1200	Amperes
Junction Temperature	T_j	–40 to 150	°C
Storage Temperature	T_{stg}	–40 to 125	°C
Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 min.)	V_{ISO}	2500	Volts

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*2 Case temperature (T_C) and heatsink temperature (T_S) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location.
*3 Case temperature (T_C') and heatsink temperature (T_S') is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance {$R_{th(s-a)}$} should be measured just under the chips.
*4 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*5 Junction temperature (T_j) should not increase beyond maximum junction temperature ($T_{j(max)}$) rating.



Each mark points to the center position of each chip.
Tr1 / Tr2 : IGBT Di1 / Di2 : FWDi

Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Leakage Current	I_{GES}	$\pm V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 60mA, V_{CE} = 10V	5.0	6.0	7.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 600A, V_{GE} = 15V, T_j = 25°C*6	—	2.0	2.7	Volts
		I_C = 600A, V_{GE} = 15V, T_j = 125°C*6	—	1.95	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	166	nF
Output Capacitance	C_{oes}		—	—	11	nF
Reverse Transfer Capacitance	C_{res}		—	—	6.0	nF
Gate Charge	Q_G	V_{CC} = 300V, I_C = 600A, V_{GE} = 15V	—	3720	—	nC
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 300V, I_C = 600A,	—	—	650	ns
Rise Time	t_r	V_{GE} = ±15V, R_G = 2.0Ω,	—	—	250	ns
Turn-off Delay Time	$t_{d(off)}$	Inductive Load Switching Operation	—	—	800	ns
Fall Time	t_f		—	—	150	ns
Emitter-Collector Voltage	V_{EC}*1	I_E = 600A, V_{GE} = 0V*6	—	2.0	2.6	Volts
Reverse Recovery Time	t_{rr}*1	V_{CC} = 300V, I_E = 600A, V_{GE} = ±15V	—	—	200	ns
Reverse Recovery Charge	Q_{rr}*1	R_G = 2.0Ω, Inductive Load	—	11	—	µC
Turn-on Switching Energy per Pulse	E_{on}	V_{CC} = 300V, $I_C = I_E$ = 600A,	—	11	—	mJ
Turn-off Switching Energy per Pulse	E_{off}	V_{GE} = ±15V, R_G = 2.0Ω,	—	27	—	mJ
Reverse Recovery Energy per Pulse	E_{rr}*1	T_j = 125°C, Inductive Load	—	6.3	—	mJ
Internal Gate Resistance	r_g	Per Switch	—	0.8	—	Ω

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*6 Pulse width and repetition rate should be such as to cause negligible temperature rise.

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Thermal Resistance Characteristics

Thermal Resistance, Junction to Case*2	$R_{th(j-c)}Q$	Per IGBT	—	—	0.11	K/W
Thermal Resistance, Junction to Case*2	$R_{th(j-c)}D$	Per FWDi	—	—	0.12	K/W
Contact Thermal Resistance, Case to Heatsink*2	$R_{th(c-f)}$	Thermal Grease Applied (Per 1 Module)*7	—	0.02	—	K/W
Thermal Resistance, Junction to Case*3	$R_{th(j-c')}Q$	Per IGBT	—	—	0.053	K/W
Thermal Resistance, Junction to Case*3	$R_{th(j-c')}D$	Per FWDi	—	—	0.078	K/W

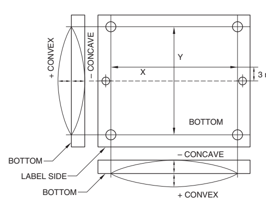
Mechanical Characteristics

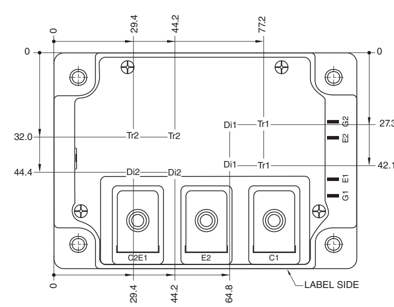
Mounting Torque	M_t	Main Terminals, M6 Screw	31	35	40	in-lb
	M_s	Mounting to Heatsink, M6 Screw	31	35	40	in-lb
Weight	m		—	580	—	Grams
Flatness of Baseplate	e_c	On Centerline X, Y*8	-100	—	+100	μm

Recommended Operating Conditons, T_a = 25°C

(DC) Supply Voltage	V_{CC}	Applied Across C1-E2	—	300	400	Volts
Gate (-Emitter Drive) Voltage	$V_{GE(on)}$	Applied Across G1-Es1 / G2-Es2	13.5	15.0	16.5	Volts
External Gate Resistance	R_G	Per Switch	1.0	—	10	Ω

*2 Case temperature (T_C) and heatsink temperature (T_S) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.
*3 Case temperature (T_C') and heatsink temperature (T_S') is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance {$R_{th(s-a)}$} should be measured just under the chips.
*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].
*8 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.





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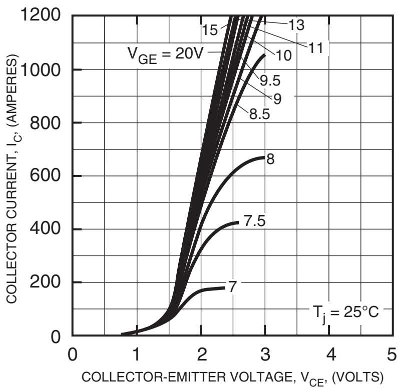
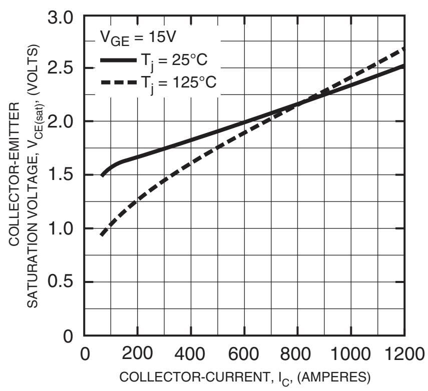
OUTPUT CHARACTERISTICS (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



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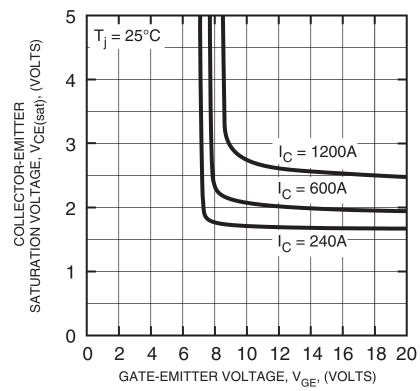
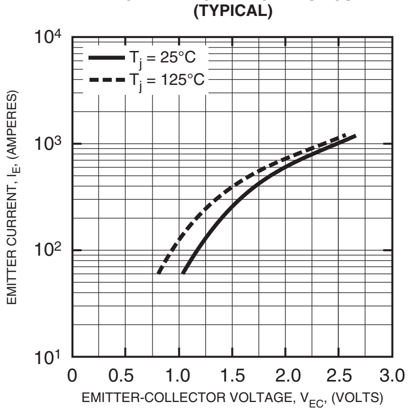
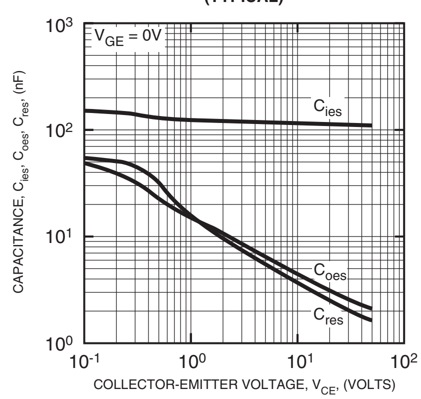


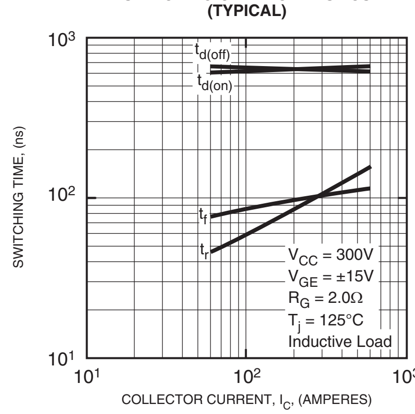
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



CAPACITANCE VS. V_{CE} (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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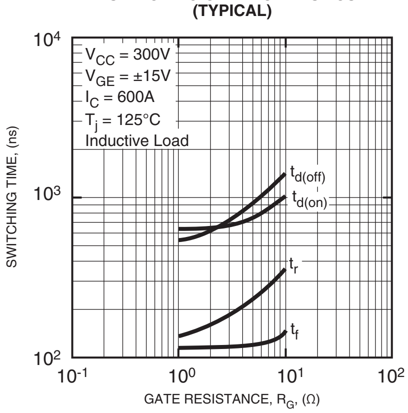
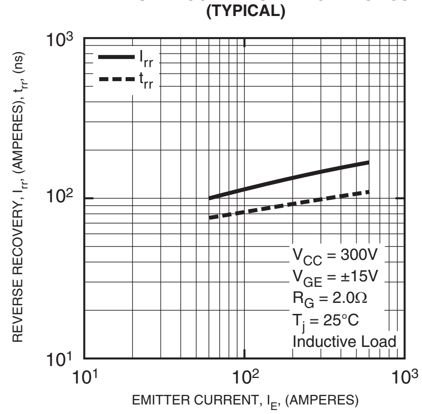
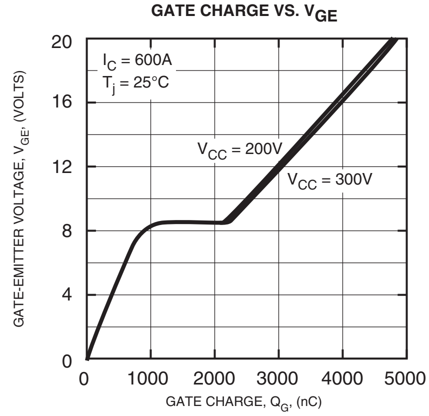


REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE VS. V_{GE}



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