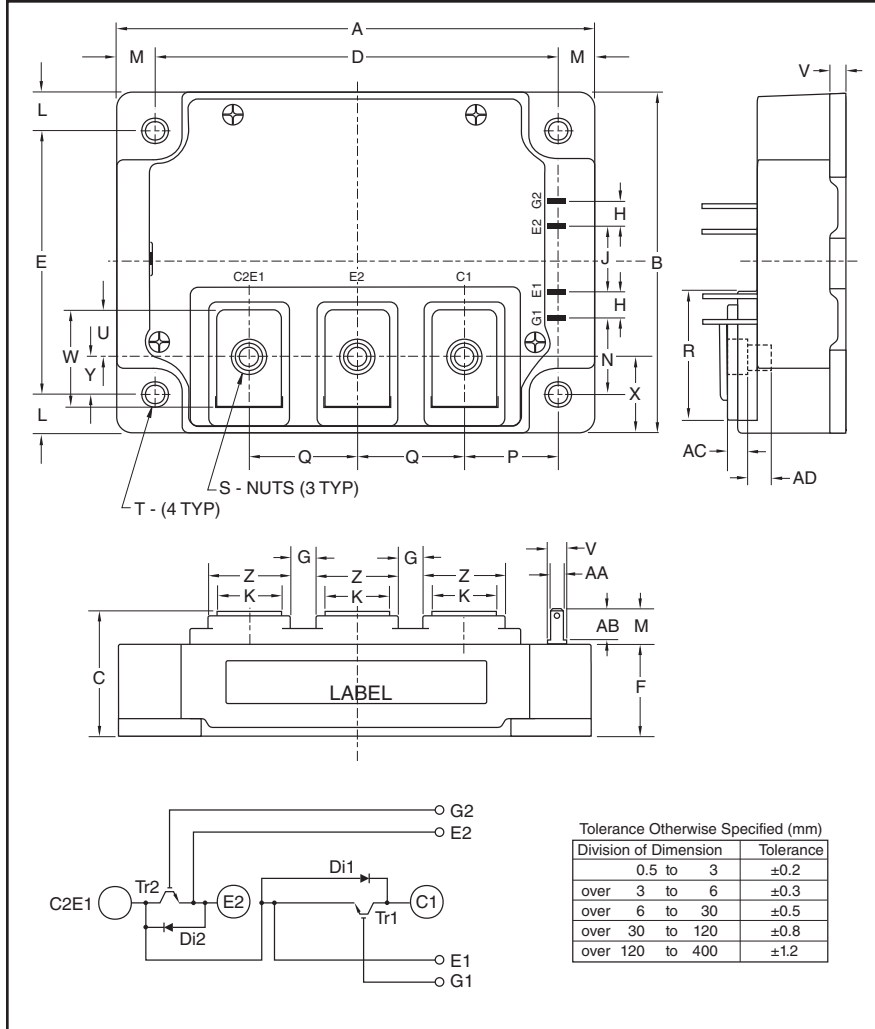


### Dual IGBTMOD™ NFH-Series Module 600 Amperes/600 Volts



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	0.28	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,  $T_j = 25\text{ }^\circ\text{C}$  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)	$V_{GES}$	$\pm 20$	Volts
Collector Current (Operation) <sup>*5</sup>	$I_C$	600	Amperes
Collector Current (Operation) <sup>*5</sup>	$I_{C(rms)}$	400	Amperes
Collector Current (Pulse, Repetitive) <sup>*4</sup>	$I_{CRM}$	1200	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) <sup>*2, *5</sup>	$P_{tot}$	1130	Watts
Total Power Dissipation ( $T_C' = 25^\circ\text{C}$ ) <sup>*3, *5</sup>	$P_{tot}'$	2350	Watts
Emitter Current (Free Wheeling Diode Forward Current, Operation) <sup>*5</sup>	$I_E^{*1}$	600	Amperes
Emitter Current (Free Wheeling Diode Forward Current, Operation) <sup>*5</sup>	$I_{E(rms)}^{*1}$	400	Amperes
Emitter Current (Free Wheeling Diode Forward Current, Operation, Pulse, Repetitive) <sup>*4</sup>	$I_{ERM}^{*1}$	1200	Amperes
Junction Temperature	$T_j$	-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to 125	$^\circ\text{C}$
Isolation Voltage (Terminals to Baseplate, RMS, $f = 60\text{Hz}$ , AC 1 min.)	$V_{ISO}$	2500	Volts

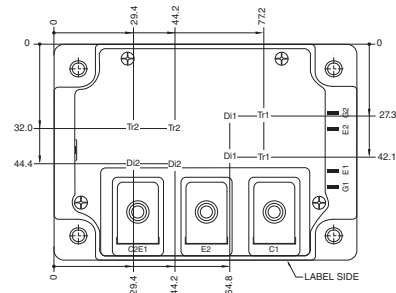
\*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWD).

\*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      D1 / D2 : FWD



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

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

**Electrical Characteristics,  $T_j = 25\text{ }^\circ\text{C}$  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	$\mu A$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 60mA, V_{CE} = 10V$	5.0	6.0	7.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 600A, V_{GE} = 15V, T_j = 25^\circ C^{*6}$	—	2.0	2.7	Volts
		$I_C = 600A, V_{GE} = 15V, T_j = 125^\circ C^{*6}$	—	1.95	—	Volts
Input Capacitance	$C_{ies}$		—	—	166	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	—	—	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	$t_{d(on)}$		—	—	650	ns
Rise Time	$t_r$	$V_{CC} = 300V, I_C = 600A,$	—	—	250	ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GE} = \pm 15V, R_G = 2.0\Omega,$	—	—	800	ns
Fall Time	$t_f$	Inductive Load Switching Operation	—	—	150	ns
Emitter-Collector Voltage	$V_{EC}^{*1}$	$I_E = 600A, V_{GE} = 0V^{*6}$	—	2.0	2.6	Volts
Reverse Recovery Time	$t_{rr}^{*1}$	$V_{CC} = 300V, I_E = 600A, V_{GE} = \pm 15V$	—	—	200	ns
Reverse Recovery Charge	$Q_{rr}^{*1}$	$R_G = 2.0\Omega, \text{ Inductive Load}$	—	11	—	$\mu C$
Turn-on Switching Energy per Pulse	$E_{on}$	$V_{CC} = 300V, I_C = I_E = 600A,$	—	11	—	mJ
Turn-off Switching Energy per Pulse	$E_{off}$	$V_{GE} = \pm 15V, R_G = 2.0\Omega,$	—	27	—	mJ
Reverse Recovery Energy per Pulse	$E_{rr}^{*1}$	$T_j = 125^\circ C, \text{ Inductive Load}$	—	6.3	—	mJ
Internal Gate Resistance	$r_g$	Per Switch	—	0.8	—	$\Omega$

\*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.

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

### Thermal Resistance Characteristics

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

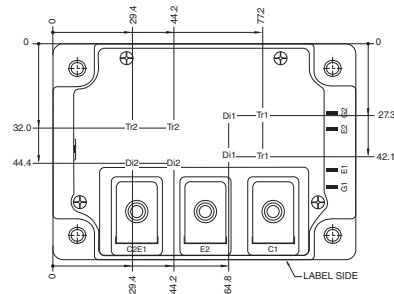
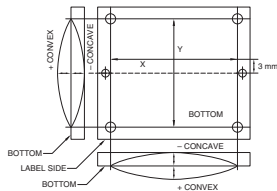
### Mechanical Characteristics

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 <sup>*8</sup>	-100	—	+100	$\mu\text{m}$

### Recommended Operating Conditions, $T_a = 25^\circ\text{C}$

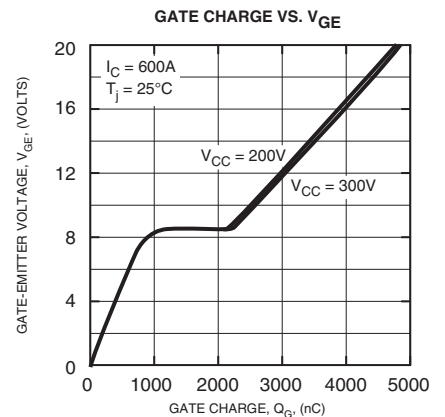
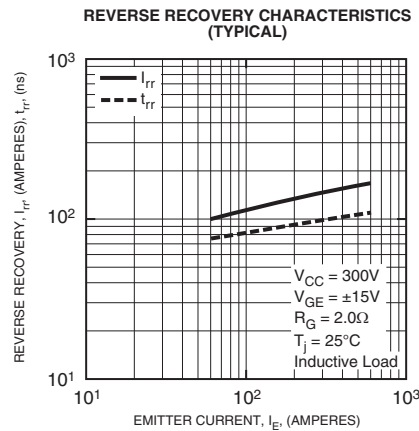
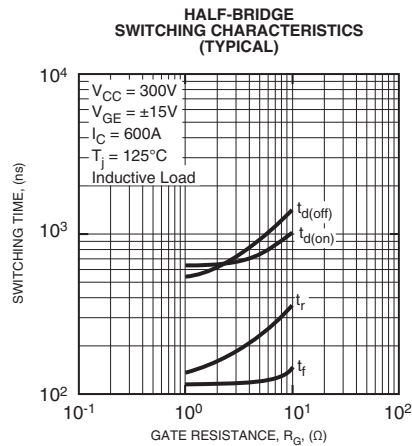
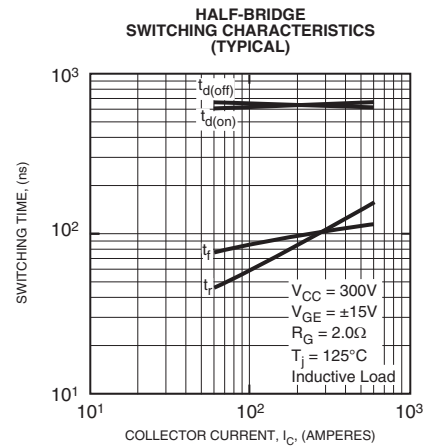
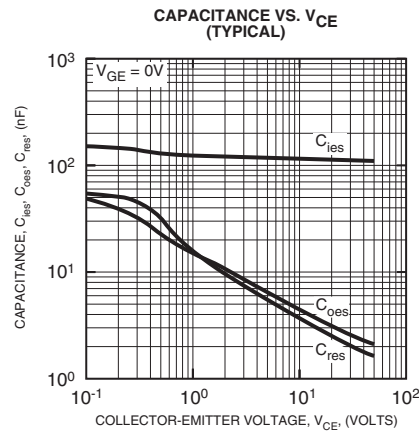
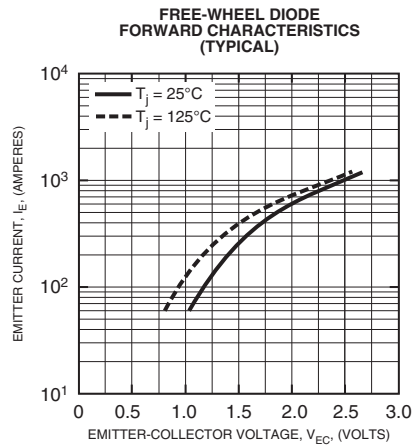
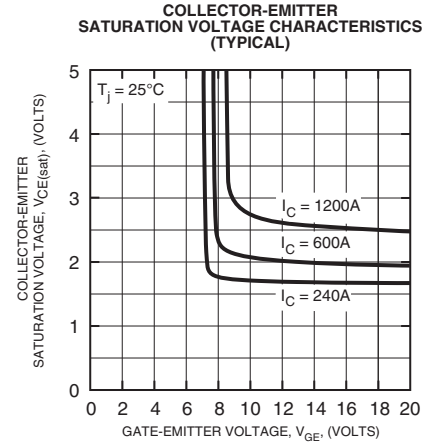
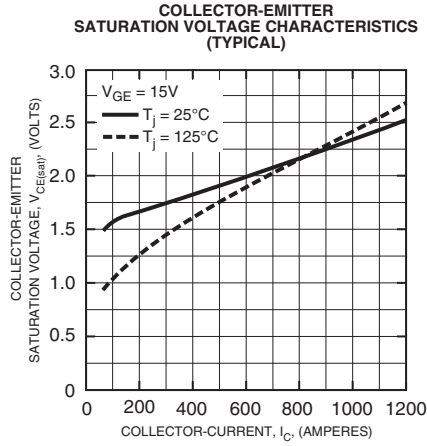
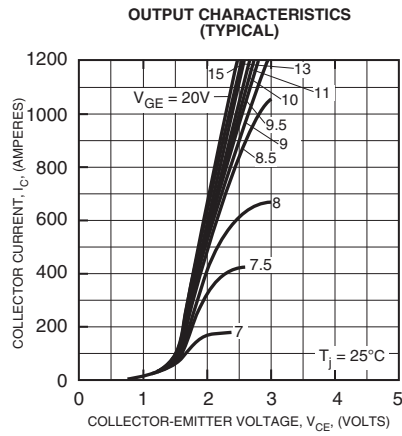
(DC) Supply Voltage	$V_{CC}$	Applied Across C1-E2	—	300	400	Volts
Gate (-Emitter Drive) Voltage	$V_{GE(on)}$	Applied Across G1-Es1 / G2-Es2	13.5	15.0	16.5	Volts
External Gate Resistance	$R_G$	Per Switch	1.0	—	10	$\Omega$

- \*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  $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$ .
- \*8 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.



Each mark points to the center position of each chip.  
 Tr1 / Tr2 : IGBT      D1 / D2 : FWDi

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