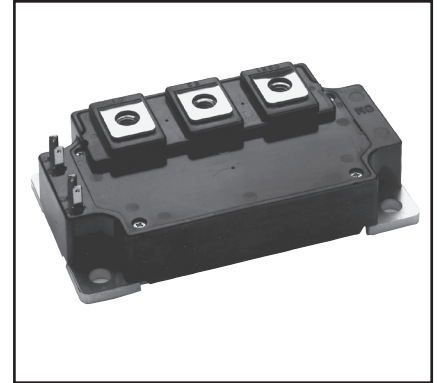
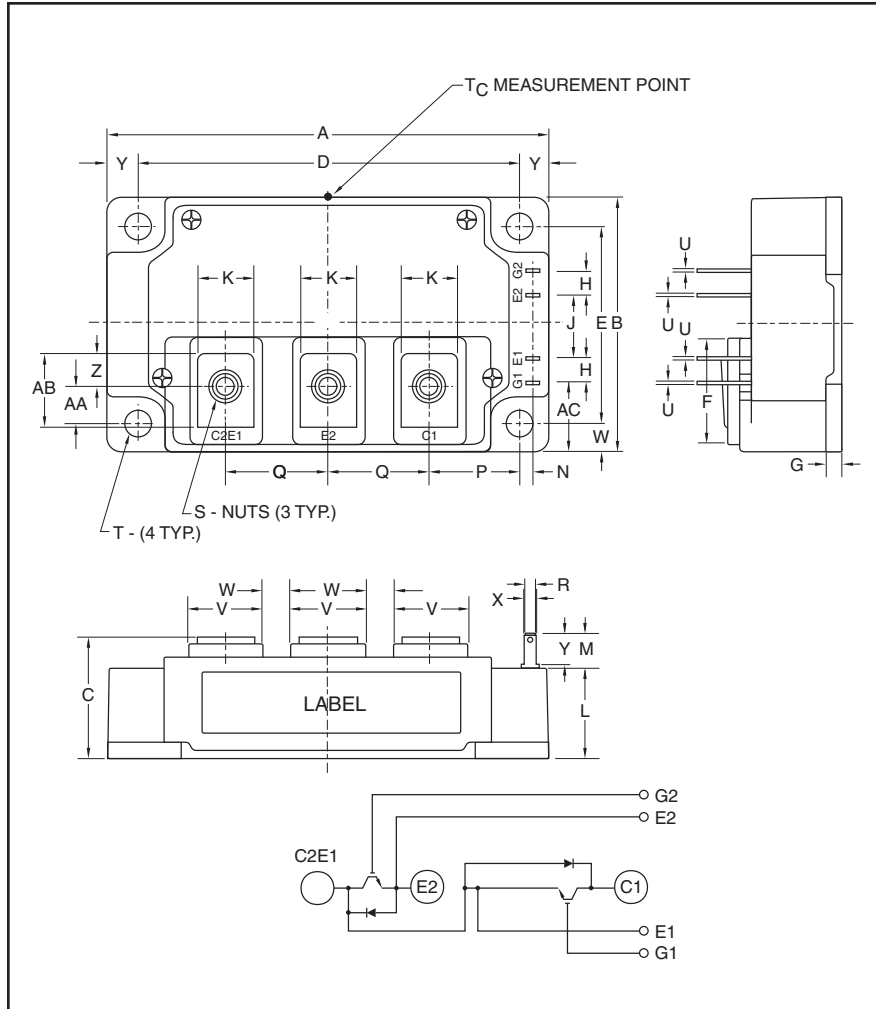


### Chopper IGBT NFH-Series Module 600 Amperes/600 Volts



#### Description:

Powerex Chopper IGBT Modules are designed for use in switching applications. Each module consists of one IGBT Transistor having a reverse-connected super-fast recovery free-wheel diode and an anode-collector 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  $V_{CE(sat)}$
- Discrete Super-Fast Recovery (150ns) Free-Wheel Diode
- High Frequency Operation (15-20kHz)
- Isolated Baseplate for Easy Heat Sinking

#### Applications:

- DC Motor Control
- Boost Regulator

#### Ordering Information:

Example: Select the complete module number you desire from the table - i.e. CM600E3U-12NFH is a 600V ( $V_{CES}$ ), 600 Ampere Chopper IGBTMOD™ Power Module.

#### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.25	108.0
B	2.44	62.0
C	1.14+0.04/-0.02	29.0+1.0/-0.5
D	3.66±0.01	93.0±0.25
E	1.89±0.01	48.0±0.25
F	1.012	25.7
G	0.16	4.0
H	0.24	6.0
J	0.59	15.0
K	0.55	14.0
L	0.87	22.0
M	0.33	8.5
N	0.10	2.5
P	0.85	21.5

Dimensions	Inches	Millimeters
Q	0.98	25.0
R	0.11	2.8
S	M6 Metric	M6
T	0.26 Dia.	6.5 Dia.
U	0.002	0.5
V	0.71	18.0
W	0.28	7.0
X	0.16	4.0
Y	0.3	7.5
Z	0.325	8.25
AA	0.35	8.85
AB	0.709	18.0
AC	0.69	17.5

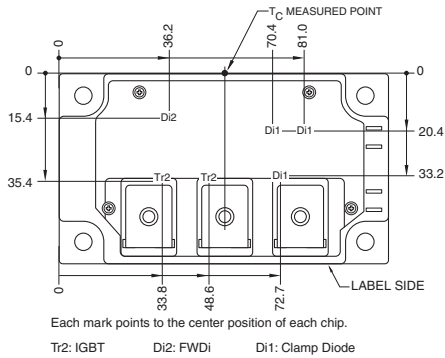
Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	600	12

**CM600E3U-12NFH**  
**Chopper IGBT NFH-Series Module**  
 600 Amperes/600 Volts

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

Ratings	Symbol	CM600E3U-12NFH	Units
Collector-Emitter Voltage (G-E SHORT)	$V_{CES}$	600	Volts
Gate-Emitter Voltage (C-E SHORT)	$V_{GES}$	$\pm 20$	Volts
Collector Current	$I_C$	600	Amperes
Collector Current (Pulse) <sup>*2</sup>	$I_{CM}$	1200	Amperes
Emitter Current ( $T_C = 25\text{ }^\circ\text{C}$ ) <sup>*6</sup>	$I_E^{*1}$	30	Amperes
Emitter Current (Pulse) <sup>*2</sup>	$I_{EM}^{*1}$	60	Amperes
Maximum Power Dissipation ( $T_C = 25\text{ }^\circ\text{C}$ ) <sup>*6</sup>	$P_C^{*3}$	1420	Watts
Maximum Power Dissipation ( $T_C = 25\text{ }^\circ\text{C}$ ) <sup>*8</sup>	$P_C^{*3}$	2460	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	$V_{RRM}$	600	Volts
Forward Current ( $T_C = 25\text{ }^\circ\text{C}$ , Clamp Diode Part)	$I_F$	600	Amperes
Forward Current (Pulse, Clamp Diode Part) <sup>*2</sup>	$I_{FM}$	1200	Amperes
Isolation Voltage (Charged Part to Baseplate, AC 1 min.)	$V_{iso}$	2500	Volts
Junction Temperature	$T_j$	-40 ~ +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 ~ +125	$^\circ\text{C}$

\*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).  
 \*2 Pulse width and repetition rate should be such that device junction temperature ( $T_j$ ) does not exceed  $T_{j(max)}$  rating.  
 \*3 Junction temperature ( $T_j$ ) should not increase beyond maximum junction temperature ( $T_{j(max)}$ ) rating.  
 \*6 Case temperature ( $T_C$ ) measured point is baseplate side.  
 \*8 Case temperature ( $T_s$ ) measured point is just under the chips as shown in the following figure.



**CM600E3U-12NFH**  
**Chopper IGBT NFH-Series Module**  
 600 Amperes/600 Volts

**Static 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	mA
Gate Leakage Current	$I_{GES}$	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	–	–	1	$\mu\text{A}$
Repetitive Peak Reverse Current	$I_{RRM}$	$V_{RM} = V_{RRM}$ , Clamp Diode Part	–	–	1	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 60\text{mA}, V_{CE} = 10V$	5	6	7	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 600\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*3}$	–	2.0	2.7	Volts
		$I_C = 600\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*3}$	–	1.95	–	Volts
Forward Transfer Admittance	$ y_{fs} $	$I_C = 600\text{A}, V_{CE} = 10V^{*3}$	420	–	–	S
Input Capacitance	$C_{ies}$		–	–	166	nF
Output Capacitance	$C_{oes}$	$V_{GE} = 0V, V_{CE} = 10V$	–	–	11	nF
Reverse Transfer Capacitance	$C_{res}$		–	–	6.0	nF
Total Gate Charge	$Q_G$	$V_{CC} = 300V, I_C = 600\text{A}, V_{GE} = 15V$	–	3720	–	nC
Turn-on Delay Time	$t_{d(on)}$	$V_{CC} = 300V,$	–	–	800	ns
Turn-on Rise Time	$t_r$	$I_C = 600\text{A}, I_E = 30\text{A},$	–	–	400	ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GE1} = V_{GE2} = 15V,$	–	–	1100	ns
Turn-off Fall Time	$t_f$	$R_G = 2.0\Omega,$	–	–	200	ns
Reverse Recovery Time	$t_{rr}^{*1}$	Inductive Load	–	–	110	ns
Reverse Recovery Charge	$Q_{rr}^{*1}$	Switching Operation	–	0.08	–	$\mu\text{C}$
Emitter-Collector Voltage	$V_{EC}^{*1}$	$I_E = 30\text{A}, V_{GE} = 0V$	–	–	2.8	Volts
Forward Voltage Drop	$V_{FM}$	$I_F = 600\text{A}$ , Clamp Diode Part	–	–	2.5	Volts
Reverse Recovery Time	$t_{rr}$	Clamp Diode Part	–	–	200	ns
Reverse Recovery Charge	$Q_{rr}$	$V_{CC} = 300V, I_F = 600\text{A},$	–	10	–	$\mu\text{C}$
		$V_{GE1} = V_{GE2} = 15V, R_G = 2.0\Omega,$ Inductive Load Switching Operation				
External Gate Resistance	$R_G$		0.2	–	2	$\Omega$

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

\*3 Junction temperature ( $T_j$ ) should not increase beyond maximum junction temperature ( $T_{j(max)}$ ) rating.

**CM600E3U-12NFH**  
**Chopper IGBT NFH-Series Module**  
 600 Amperes/600 Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	IGBT Part*6	–	–	0.088	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c)R}$	Clamp Diode Part*6	–	–	0.08	$^\circ\text{C}/\text{W}$
Contact Thermal Resistance	$R_{th(c-s)}$	Case to Heatsink, Per 1/2 Module, Thermal Grease Applied*7	–	0.04	–	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c')Q}$	IGBT Part*8	–	–	0.053	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Case	$R_{th(j-c')R}$	Clamp Diode Part*8	–	–	0.052	$^\circ\text{C}/\text{W}$

**Mechanical Characteristics**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Mounting Torque	$M_t$	Main Terminals, M6 Screw	31	35	40	in-lb
	$M_s$	Mounting Holes, M6 Screw	31	35	40	in-lb
Weight			–	400	–	Grams

\*6 Case temperature ( $T_C$ ) measured point is baseplate side.

\*7 Typical value is measured by using thermally conductive grease of  $\lambda = 0.9\text{ W}/(\text{m}\cdot\text{K})$ .

\*8 Case temperature ( $T_s$ ) measured point is just under the chips as shown in the following figure.

