Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272
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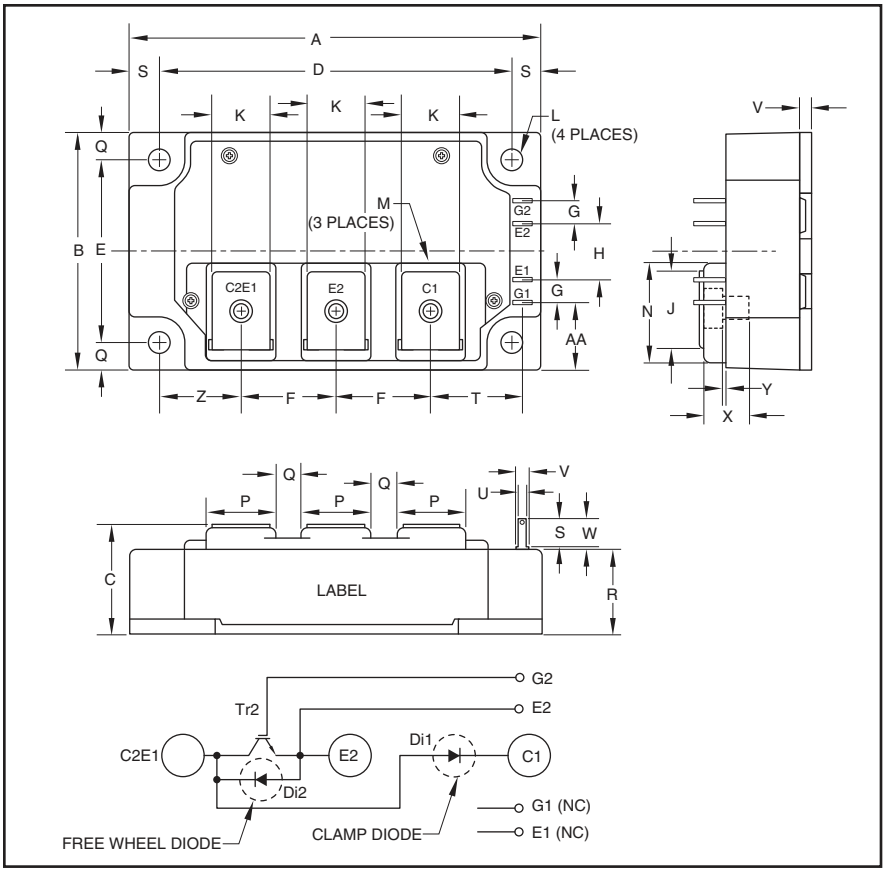
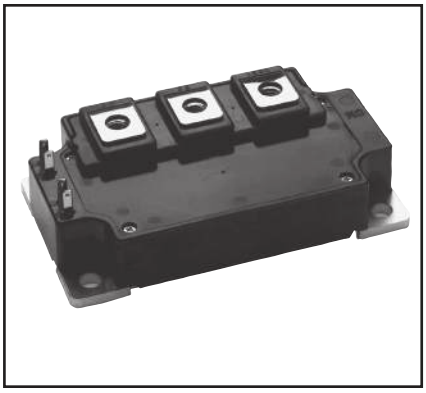
Chopper IGBTMOD™ NFH-Series Module
600 Amperes/600 Volts



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	0.98	25.0
G	0.24	6.0
H	0.59	15.0
J	0.7854	19.95
K	0.55	14.0
L	0.26 Dia.	6.5 Dia.
M	M6 Metric	M6
N	1.022	25.95

Dimensions	Inches	Millimeters
P	0.71	18.0
Q	0.28	7.0
R	0.874	22.2
S	0.30	7.5
T	0.94	24.0
U	0.11	2.8
V	0.16	4.0
W	0.33	8.5
X	0.46	11.75
Y	0.012 ~ 0	0.3 ~ 0
Z	0.85	21.5
AA	0.69	17.5



Description:
Powerex Chopper IGBTMOD™ 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.

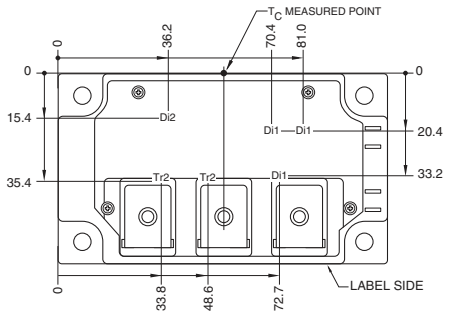
Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	600	12

CM600E3U-12NFH
Chopper IGBTMOD™ NFH-Series Module
600 Amperes/600 Volts

Absolute Maximum Ratings, T_j = 25 °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}	±20	Volts
Collector Current	I_C	600	Amperes
Collector Current (Pulse)*2	I_{CM}	1200	Amperes
Emitter Current (T_C = 25°C)*6	I_E*1	30	Amperes
Emitter Current (Pulse)*2	I_{EM}*1	60	Amperes
Maximum Power Dissipation (T_C = 25°C)*6	P_C*3	1420	Watts
Maximum Power Dissipation ($T_{C'}$ = 25°C)*8	$P_{C'}$*3	2460	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}	600	Volts
Forward Current (T_C = 25°C, Clamp Diode Part)	I_F	600	Amperes
Forward Current (Pulse, Clamp Diode Part)*2	I_{FM}	1200	Amperes
Isolation Voltage (Charged Part to Baseplate, AC 1 min.)	V_{iso}	2500	Volts
Junction Temperature	T_j	-40 ~ +150	°C
Storage Temperature	T_{stg}	-40 ~ +125	°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.



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

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

*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.

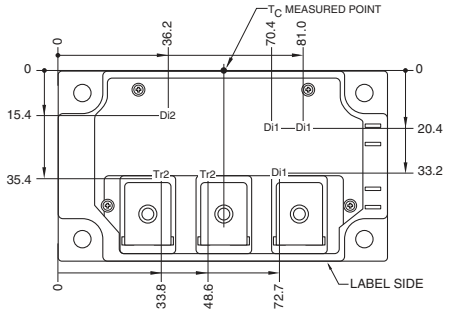
Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}Q$	IGBT Part*6	–	–	0.088	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}R$	Clamp Diode Part*6	–	–	0.08	°C/W
Contact Thermal Resistance	$R_{th(c-s)}$	Case to Heatsink,Per 1/2 Module, Thermal Grease Applied*7	–	0.04	–	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c')}Q$	IGBT Part*8	–	–	0.053	°C/W
Thermal Resistance, Junction to Case	$R_{th(j-c')}R$	Clamp Diode Part*8	–	–	0.052	°C/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 λ = 0.9 W/(m•K).
*8 Case temperature (T_s) measured point is just under the chips as shown in the following figure.



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