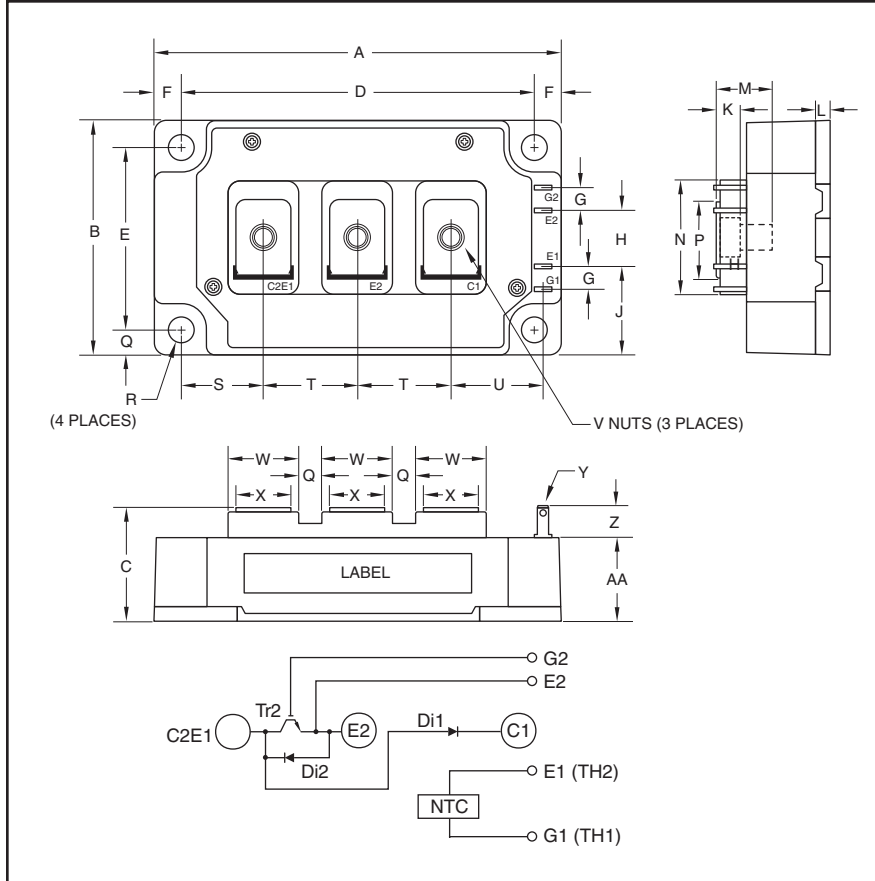


### Chopper IGBTMOD™ NFH-Series Module 300 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.25	108.0
B	2.44	62.0
C	1.18+0.4/-0.02	30.0+1.0/-0.5
D	3.66±0.01	93.0±0.25
E	1.89±0.01	48.0±0.25
F	0.29	7.5
G	0.24	6.0
J	0.689	17.5
H	0.59	15.0
K	0.244	6.2
L	0.16	4.0
M	0.56	14.2
N	1.18	30.0

Dimensions	Inches	Millimeters
P	0.79	20.0
Q	0.28	7.0
R	0.26 Dia.	Dia. 6.5
S	0.85	21.5
T	0.98	25.0
U	0.94	24.0
V	M6 Metric	M6
V	0.16	4.0
W	0.71	18.0
X	0.55	14.0
Y	0.02	0.5
Z	0.33	8.5
AA	0.87	22.2



#### Description:

Powerex IGBTMOD™ Modules are designed for use 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 ESW(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 module number you desire from the table below -i.e. CM300E3Y6-24NFH is a 1200V (V<sub>CES</sub>), 300 Ampere Chopper IGBTMOD™ Power Module.

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 50)
CM	300	24

**CM300E3Y6-24NFH**  
**Chopper IGBTMOD™ NFH-Series Module**  
 300 Amperes/1200 Volts

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

**Inverter IGBT/FWDi Part**

Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage ( $V_{GE} = 0V$ )	$V_{CES}$	1200	Volts
Gate-Emitter Voltage ( $V_{CE} = 0V$ )	$V_{GES}$	$\pm 20$	Volts
Collector Current (Operation, $T_C = 25^\circ\text{C}$ ) <sup>*3</sup>	$I_C$	300	Amperes
Collector Current (Pulse, Repetitive) <sup>*2</sup>	$I_{CRM}$	600	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) <sup>*2,*3</sup>	$P_{tot}$	1760	Watts
Emitter Current (Operation, $T_C = 25^\circ\text{C}$ ) <sup>*3</sup>	$I_E^{*1}$	50	Amperes
Emitter Current (Pulse, Repetitive) <sup>*2</sup>	$I_{ERM}^{*1}$	100	Amperes

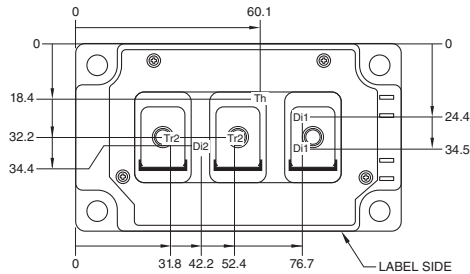
**Clamp Diode Part**

Characteristics	Symbol	Rating	Units
Repetitive Peak Reverse Voltage	$V_{RRM}$	1200	Volts
Forward Current (Operation, $T_C = 25^\circ\text{C}$ ) <sup>*3</sup>	$I_F$	300	Amperes
Forward Current (Pulse, Repetitive) <sup>*2</sup>	$I_{FRM}$	600	Amperes

**Module**

Characteristics	Symbol	Rating	Units
Isolation Voltage (Charged Part to Baseplate, $f = 60\text{ Hz}$ , AC 1 Minute)	$V_{ISO}$	2500	$V_{rms}$
Maximum Junction Temperature	$T_{j(max)}$	+150	$^\circ\text{C}$
Operating Junction Temperature	$T_{j(op)}$	-40 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to +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 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.



Each mark points to the center position of each chip.  
 Tr2: IGBT Di2: FWDi  
 Di1: ClampDi Th: NTC Thermistor

**CM300E3Y6-24NFH**  
**Chopper IGBTMOD™ NFH-Series Module**  
 300 Amperes/1200 Volts

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

**Inverter IGBT/FWDi Part**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA
Gate-Emitter Leakage Current	$I_{GES}$	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	1	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 30\text{mA}, V_{CE} = 10V$	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 300\text{A}, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*4}$	—	5.0	6.5	Volts
		$I_C = 300\text{A}, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*4}$	—	5.0	—	Volts
Input Capacitance	$C_{ies}$		—	—	47	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	—	—	4.0	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	0.9	nF
Total Gate Charge	$Q_G$	$V_{CC} = 600V, I_C = 300\text{A}, V_{GE} = 15V$	—	1350	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	300	ns
Rise Time	$t_r$	$V_{CC} = 600V, I_C = 300\text{A}, V_{GE} = \pm 15V,$	—	—	80	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 1.0\Omega, \text{Inductive Load}$	—	—	500	ns
Fall Time	$t_f$		—	—	150	ns
Emitter-Collector Voltage	$V_{EC}^{*1}$	$I_E = 50\text{A}, V_{GE} = 0V^{*4}$	—	2.8	3.8	Volts
Internal Lead Resistance	$R_{CC' + EE'}$	$I_C = 300\text{A}, T_C = 25^\circ\text{C},$ Chip - Terminals	—	0.53	—	m $\Omega$
Internal Gate Resistance	$r_g$	$T_C = 25^\circ\text{C}$	—	0.8	—	$\Omega$
External Gate Resistance	$R_G$		1.0	—	10	$\Omega$

**Clamp Diode Part**

Collector Cutoff Current	$I_{RRM}$	$V_R = V_{RRM}$	—	—	1	mA
Reverse Recovery Time	$t_{rr}$	$V_{CC} = 600V, I_F = 300\text{A}, V_{GE} = \pm 15V,$	—	—	100	ns
Reverse Recovery Charge	$Q_{rr}$	$R_G = 1.0\Omega, \text{Inductive Load}$	—	6.0	—	$\mu\text{C}$
Emitter-Collector Voltage	$V_{FM}$	$I_F = 300\text{A}^{*4}$	—	5.5	7.0	Volts
Internal Lead Resistance	$R_{CC' + EE'}$	$I_F = 300\text{A}, T_C = 25^\circ\text{C},$ Chip - Terminals	—	0.53	—	m $\Omega$

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

\*4 Pulse width and repetition rate should be such as to cause negligible temperature rise.

**CM300E3Y6-24NFH**  
**Chopper IGBTMOD™ NFH-Series Module**  
 300 Amperes/1200 Volts

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

**NTC Thermistor Part**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	$R_{25}$	$T_C = 25^\circ\text{C}^{*3}$	4.85	5.00	5.15	$k\Omega$
Deviation of Resistance	$\Delta R/R$	$R_{100} = 493\Omega, T_C = 100^\circ\text{C}^{*3}$	-7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	Approximate by Equation <sup>*5</sup>	—	3375	—	K
Power Dissipation	$P_{25}$	$T_C = 25^\circ\text{C}^{*3}$	—	—	10	mW

**Mechanical Characteristics**

Mounting Torque	$M_t$	Main Terminals, M6 Screw	31	35	40	in-lb
Mounting Torque	$M_s$	Mounting, M6 Screw	31	35	40	in-lb
Weight	m		—	400	—	Grams
Flatness of Baseplate	$e_c$	On Centerline X, Y <sup>*6</sup>	-100	—	+100	$\mu\text{m}$

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

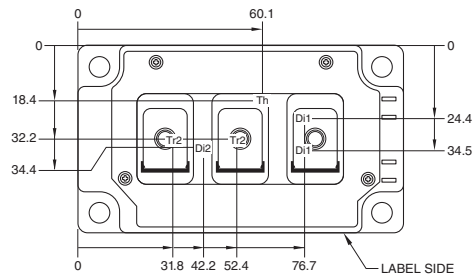
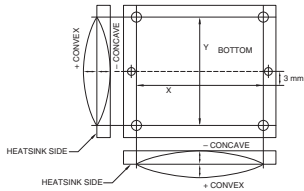
Thermal Resistance, Junction to Case	$R_{th(j-c)Q}$	Per Inverter IGBT <sup>*3</sup>	—	—	0.071	K/W
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per Inverter FWDi <sup>*3</sup>	—	—	0.43	K/W
Thermal Resistance, Junction to Case	$R_{th(j-c)D}$	Per ClampDi <sup>*3</sup>	—	—	0.11	K/W
Contact Thermal Resistance, Case to Heatsink <sup>*2</sup>	$R_{th(c-s)}$	Thermal Grease Applied, per 1/2 Module <sup>*3,*7</sup>	—	0.02	—	K/W

<sup>\*3</sup> Case temperature ( $T_C$ ) is measured on the surface (mounting side) of the baseplate just under the chips. Refer to the figure to the right for chip location.

<sup>\*5</sup>  $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$

$R_{25}$ ; Resistance at Absolute Temperature  $T_{25}$  [K];  $T_{25} = 25 [^\circ\text{C}] + 273.15 = 298.15$  [K]  
 $R_{50}$ ; Resistance at Absolute Temperature  $T_{50}$  [K];  $T_{50} = 50 [^\circ\text{C}] + 273.15 = 323.15$  [K]

<sup>\*6</sup> Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure.



Each mark points to the center position of each chip.

Tr2: IGBT D2: FWDi

D1: ClampDi Th: NTC Thermistor

<sup>\*7</sup> Typical value is measured by using thermally conductive grease of  $\lambda = 0.9$  [W/(m • K)].