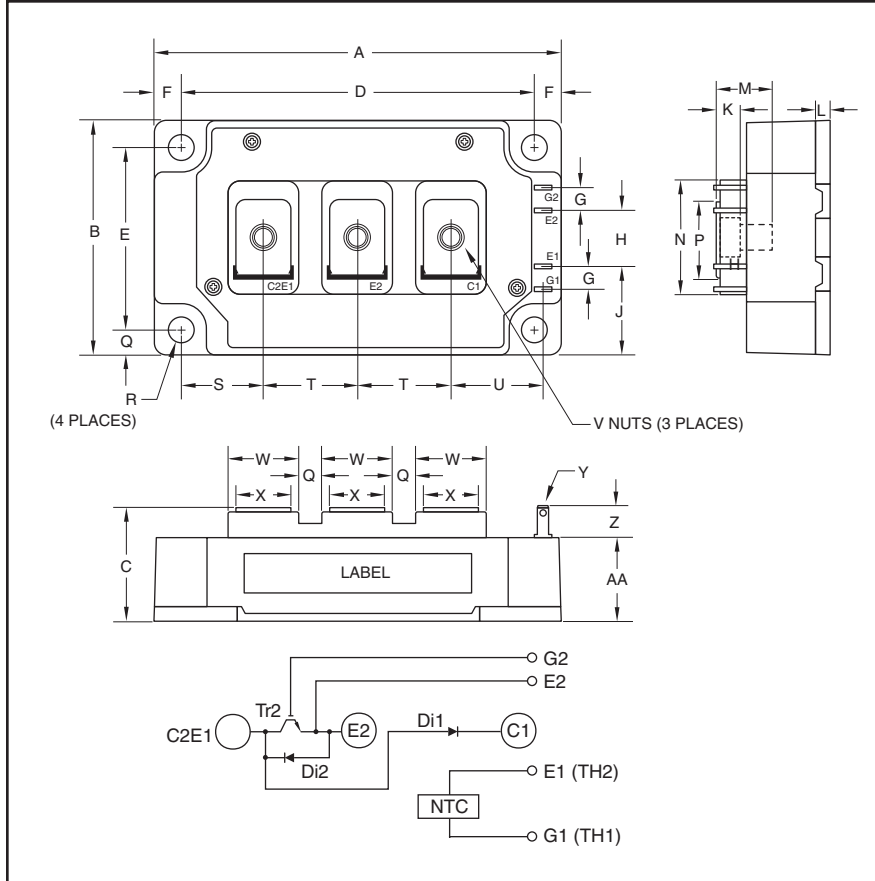


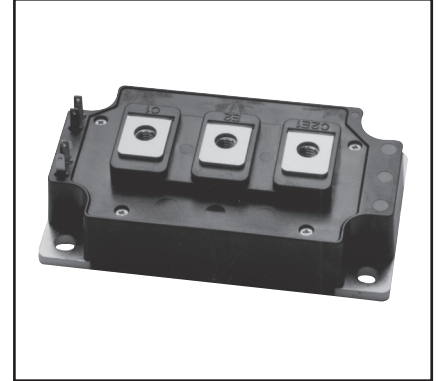
Chopper IGBTMOD™ NFH-Series Module 300 Amperes/1200 Volts



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_{CES}), 300 Ampere Chopper IGBTMOD™ Power Module.

| Type | Current Rating Amperes | V _{CES} 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} | ± 20 | Volts |
| Collector Current (Operation, $T_C = 25^\circ\text{C}$)* ³ | I_C | 300 | Amperes |
| Collector Current (Pulse, Repetitive)* ² | I_{CRM} | 600 | Amperes |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$)* ^{2,3} | P_{tot} | 1760 | Watts |
| Emitter Current (Operation, $T_C = 25^\circ\text{C}$)* ³ | I_E^{*1} | 50 | Amperes |
| Emitter Current (Pulse, Repetitive)* ² | I_{ERM}^{*1} | 100 | Amperes |

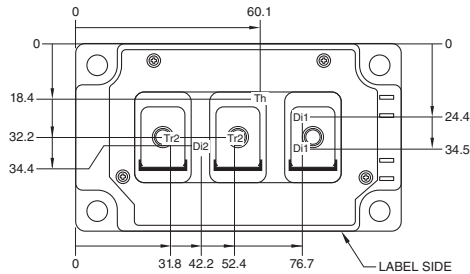
Clamp Diode Part

| Characteristics | Symbol | Rating | Units |
|--|-----------|--------|---------|
| Repetitive Peak Reverse Voltage | V_{RRM} | 1200 | Volts |
| Forward Current (Operation, $T_C = 25^\circ\text{C}$)* ³ | I_F | 300 | Amperes |
| Forward Current (Pulse, Repetitive)* ² | 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 | μA |
| 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 | $V_{CC} = 600V, I_C = 300A, V_{GE} = 15V$ | — | 1350 | — | nC |
| Turn-on Delay Time | $t_{d(on)}$ | | — | — | 300 | ns |
| Rise Time | t_r | $V_{CC} = 600V, I_C = 300A, V_{GE} = \pm 15V,$ | — | — | 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} | $I_E = 50A, V_{GE} = 0V^{*4}$ | — | 2.8 | 3.8 | Volts |
| Internal Lead Resistance | $R_{CC' + EE'}$ | $I_C = 300A, T_C = 25^\circ\text{C},$ Chip - Terminals | — | 0.53 | — | m Ω |
| Internal Gate Resistance | r_g | $T_C = 25^\circ\text{C}$ | — | 0.8 | — | Ω |
| External Gate Resistance | R_G | | 1.0 | — | 10 | Ω |

Clamp Diode Part

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

*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
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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 ^{*5} | — | 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 ^{*6} | -100 | — | +100 | μm |

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

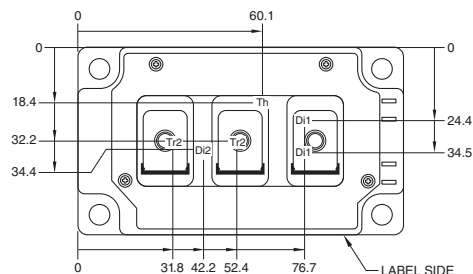
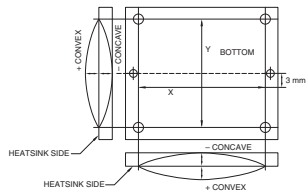
| | | | | | | |
|--|----------------|---|---|------|-------|-----|
| Thermal Resistance, Junction to Case | $R_{th(j-c)Q}$ | Per Inverter IGBT ^{*3} | — | — | 0.071 | K/W |
| Thermal Resistance, Junction to Case | $R_{th(j-c)D}$ | Per Inverter FWDi ^{*3} | — | — | 0.43 | K/W |
| Thermal Resistance, Junction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

^{*3} 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.

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

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]

^{*6} 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 D1: FWDi

D1: ClampDi Th: NTC Thermistor

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