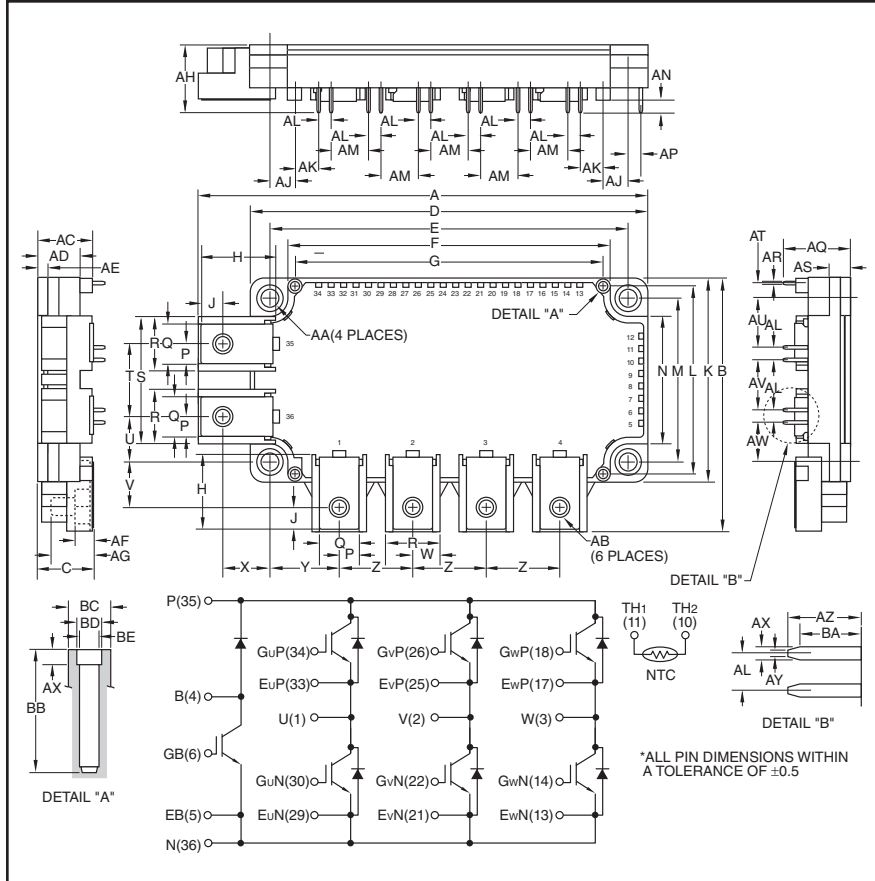




THE DATASHEET OF CM75RX-24S



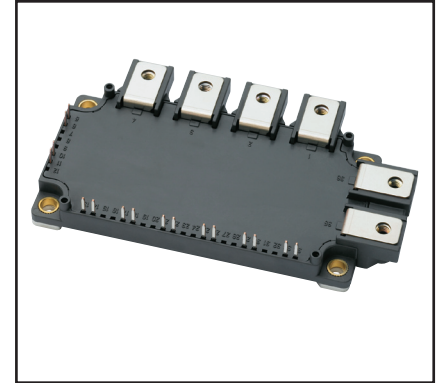
Six IGBTMOD™ + Brake NX-S Series Module 75 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|-----------|-------------|
| A | 5.39 | 136.9 |
| B | 3.03 | 77.1 |
| C | 0.67 | 17.0 |
| D | 4.79 | 121.7 |
| E | 4.33±0.02 | 110.0±0.5 |
| F | 3.89 | 99.0 |
| G | 3.72 | 94.5 |
| H | 0.83 | 21.14 |
| J | 0.37 | 6.5 |
| K | 2.44 | 62.0 |
| L | 2.26 | 57.5 |
| M | 1.97±0.02 | 50.0±0.5 |
| N | 1.53 | 39.0 |
| P | 0.24 | 6.0 |
| Q | 0.48 | 12.0 |
| R | 0.67 | 17.0 |
| S | 1.53 | 39.0 |
| T | 0.87 | 22.0 |
| U | 0.55 | 14.0 |
| V | 0.54 | 13.64 |
| W | 0.33 | 8.5 |
| X | 0.53 | 13.5 |
| Y | 0.81 | 20.71 |
| Z | 0.9 | 22.86 |
| AA | 0.22 Dia. | 5.5 Dia. |
| AB | M5 | M5 |
| AC | 0.67 | 17.0 |

| Dimensions | Inches | Millimeters |
|------------|-----------|-------------|
| AD | 0.51 | 13.0 |
| AE | 0.12 | 3.0 |
| AF | 0.21 | 5.4 |
| AG | 0.49 | 12.5 |
| AH | 0.81 | 20.5 |
| AJ | 0.30 | 7.75 |
| AK | 0.28 | 7.25 |
| AL | 0.15 | 3.81 |
| AM | 0.45 | 11.44 |
| AN | 0.14 | 3.5 |
| AP | 0.16 | 4.06 |
| AQ | 0.78 | 20.05 |
| AR | 0.03 | 0.8 |
| AS | 0.27 | 7.0 |
| AT | 0.16 | 4.2 |
| AU | 0.61 | 15.48 |
| AV | 0.60 | 15.24 |
| AW | 0.46 | 11.66 |
| AX | 0.04 | 1.15 |
| AY | 0.02 | 0.65 |
| AZ | 0.29 | 7.4 |
| BA | 0.24 | 6.2 |
| BB | 0.49 | 12.5 |
| BC | 0.17 Dia. | 4.3 Dia. |
| BD | 0.10 Dia. | 2.5 Dia. |
| BE | 0.08 Dia. | 2.1 Dia. |



Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration and a seventh IGBT with free-wheel diode for dynamic braking. 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 Free-Wheel Diode
- Isolated Baseplate for Easy Heat Sinking

Applications:

- AC Motor Control
- Motion/Servo Control
- Photovoltaic/Fuel Cell

Ordering Information:

Example: Select the complete module number you desire from the table below -i.e. CM75RX-24S is a 1200V (V_{CES}), 75 Ampere Six-IGBTMOD™ + Brake Power Module.

| Type | Current Rating Amperes | V_{CES} Volts (x 50) |
|------|---------------------------|---------------------------|
| CM | 75 | 24 |



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

CM75RX-24S
Six IGBTMOD™ + Brake NX-S Series Module
 75 Amperes/1200 Volts

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

| Characteristics | Symbol | CM75RX-24S | Units |
|---|--------------|------------|------------------|
| Maximum Junction Temperature | $T_{j(max)}$ | +175 | $^\circ\text{C}$ |
| Operating Power Device Junction Temperature | $T_{j(op)}$ | -40 to 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -40 to 125 | $^\circ\text{C}$ |
| Mounting Torque, M5 Mounting Screws | — | 31 | in-lb |
| Mounting Torque, M5 Main Terminal Screws | — | 31 | in-lb |
| Module Weight (Typical) | — | 330 | Grams |
| Isolation Voltage (Terminals to Baseplate, $f = 60\text{Hz}$, AC 1 minute) | V_{ISO} | 2500 | V_{rms} |

Inverter Sector

| | | | |
|--|----------------|----------|---------|
| Collector-Emitter Voltage ($V_{GE} = 0\text{V}$) | V_{CES} | 1200 | Volts |
| Gate-Emitter Voltage ($V_{CE} = 0\text{V}$) | V_{GES} | ± 20 | Volts |
| Collector Current (DC, $T_C = 121^\circ\text{C}$) ^{*1,*5} | I_C | 75 | Amperes |
| Collector Current (Pulse) ^{*4} | I_{CRM} | 150 | Amperes |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) ^{*1,*5} | P_{tot} | 600 | Watts |
| Emitter Current, Free Wheeling Diode Forward Current ($T_C = 25^\circ\text{C}$) ^{*1,*5} | I_E^{*3} | 75 | Amperes |
| Emitter Current, Free Wheeling Diode Forward Current (Pulse) ^{*4} | I_{ERM}^{*3} | 150 | Amperes |

Brake Sector

| | | | |
|---|----------------|----------|---------|
| Collector-Emitter Voltage ($V_{GE} = 0\text{V}$) | V_{CES} | 1200 | Volts |
| Gate-Emitter Voltage ($V_{CE} = 0\text{V}$) | V_{GES} | ± 20 | Volts |
| Collector Current (DC, $T_C = 125^\circ\text{C}$) ^{*1,*5} | I_C | 50 | Amperes |
| Collector Current (Pulse) ^{*4} | I_{CRM} | 100 | Amperes |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) ^{*1,*5} | P_{tot} | 425 | Watts |
| Repetitive Peak Reverse Voltage | V_{RRM}^{*3} | 1200 | Volts |
| Forward Current ($T_C = 25^\circ\text{C}$) ^{*1,*5} | I_F^{*3} | 50 | Amperes |
| Forward Current (Pulse) ^{*4} | I_{FM}^{*3} | 100 | Amperes |

*1 Case temperature (T_C) and heatsink temperature (T_f) measured point is just under the chips.

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

*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.

CM75RX-24S
Six IGBTMOD™ + Brake NX-S Series Module
 75 Amperes/1200 Volts

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

Inverter Sector

| 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} | $\pm V_{GE} = V_{GES}, V_{CE} = 0V$ | — | — | 0.5 | μA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $I_C = 7.5\text{mA}, V_{CE} = 10V$ | 5.4 | 6 | 6.6 | Volts |
| Collector-Emitter Saturation Voltage (Chip) | $V_{CE(sat)}$ | $I_C = 75A, V_{GE} = 15V, T_j = 25^\circ\text{C}$ | — | 1.7 | 2.15 | Volts |
| | | $I_C = 75A, V_{GE} = 15V, T_j = 125^\circ\text{C}$ | — | 1.9 | — | Volts |
| | | $I_C = 75A, V_{GE} = 15V, T_j = 150^\circ\text{C}$ | — | 1.95 | — | Volts |
| Collector-Emitter Saturation Voltage (Terminal) | $V_{CE(sat)}$ | $I_C = 75A, V_{GE} = 15V, T_j = 25^\circ\text{C}^6$ | — | 1.8 | 2.25 | Volts |
| | | $I_C = 75A, V_{GE} = 15V, T_j = 125^\circ\text{C}^6$ | — | 2.0 | — | Volts |
| | | $I_C = 75A, V_{GE} = 15V, T_j = 150^\circ\text{C}^6$ | — | 2.05 | — | Volts |
| Input Capacitance | C_{ies} | | — | — | 7.5 | nF |
| Output Capacitance | C_{oes} | $V_{GE} = 0V, V_{CE} = 10V$ | — | — | 1.0 | nF |
| Reverse Transfer Capacitance | C_{res} | | — | — | 0.13 | nF |
| Total Gate Charge | Q_G | $V_{CC} = 600V, I_C = 75A, V_{GE} = 15V$ | — | 175 | — | nC |
| Inductive Load | Turn-on Delay Time | $V_{CC} = 600V, I_C = 75A, ^7$ | — | — | 300 | ns |
| | Turn-on Rise Time | | | | | |
| Switch Time | Turn-off Delay Time | $V_{GE} = \pm 15V,$ | — | — | 600 | ns |
| | Turn-off Fall Time | | | | | |
| Reverse Recovery Time | t_{rr}^{*3} | $R_G = 36\Omega, \text{ Inductive Load}$ | — | — | 300 | ns |
| Reverse Recovery Charge | Q_{rr}^{*3} | $I_E = 75A$ | — | — | 300 | ns |
| Reverse Recovery Loss per Pulse | E_{rec}^{*3} | $I_E = 75A$ | — | — | 300 | ns |
| Turn-on Switching Loss per Pulse | E_{on} | $V_{CC} = 600V, I_C (I_E) = 75A, ^7$ | — | 12.5 | — | mJ |
| Turn-off Switching Loss per Pulse | E_{off} | $V_{GE} = \pm 15V, R_G = 36\Omega,$ | — | 8 | — | mJ |
| Reverse Recovery Loss per Pulse | E_{rec}^{*3} | $T_j = 150^\circ\text{C}, \text{ Inductive Load}$ | — | 4.5 | — | mJ |
| Emitter-Collector Voltage (Chip) | V_{EC}^{*3} | $I_E = 75A, V_{GE} = 0V, T_j = 25^\circ\text{C}$ | — | 1.7 | 2.15 | Volts |
| | | $I_E = 75A, V_{GE} = 0V, T_j = 125^\circ\text{C}$ | — | 1.7 | — | Volts |
| | | $I_E = 75A, V_{GE} = 0V, T_j = 150^\circ\text{C}$ | — | 1.7 | — | Volts |
| Emitter-Collector Voltage (Terminal) | V_{EC}^{*3} | $I_E = 75A, V_{GE} = 0V, T_j = 25^\circ\text{C}^6$ | — | 1.8 | 2.25 | Volts |
| | | $I_E = 75A, V_{GE} = 0V, T_j = 125^\circ\text{C}^6$ | — | 1.8 | — | Volts |
| | | $I_E = 75A, V_{GE} = 0V, T_j = 150^\circ\text{C}^6$ | — | 1.8 | — | Volts |

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

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--|----------------|-----------------|------|------|------|----------|
| Thermal Resistance, Junction to Case ^{*1} | $R_{th(j-c)Q}$ | Per IGBT | — | — | 0.25 | K/W |
| Thermal Resistance, Junction to Case ^{*1} | $R_{th(j-c)D}$ | Per FWDi | — | — | 0.4 | K/W |
| Internal Gate Resistance | r_g | Per Switch | — | 0 | — | Ω |

^{*1} Case temperature (T_C) and heatsink temperature (T_I) measured point is just under the chips.

^{*3} 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.

^{*7} Recommended maximum collector supply voltage V_{CC} is 800V_{dc}.

CM75RX-24S
Six IGBTMOD™ + Brake NX-S Series Module
 75 Amperes/1200 Volts

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

Brake Sector

| 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} | ±V _{GE} = V _{GES} , V _{CE} = 0V | — | — | 0.5 | μA |
| Gate-Emitter Threshold Voltage | V _{GE(th)} | I _C = 5mA, V _{CE} = 10V | 5.4 | 6 | 6.6 | Volts |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} (Chip) | I _C = 50A, V _{GE} = 15V, T _j = 25°C | — | 1.7 | 2.15 | Volts |
| | | I _C = 50A, V _{GE} = 15V, T _j = 125°C | — | 1.9 | — | Volts |
| | | I _C = 50A, V _{GE} = 15V, T _j = 150°C | — | 1.95 | — | Volts |
| Collector-Emitter Saturation Voltage | V _{CE(sat)} (Terminal) | I _C = 50A, V _{GE} = 15V, T _j = 25°C ⁶ | — | 1.8 | 2.25 | Volts |
| | | I _C = 50A, V _{GE} = 15V, T _j = 125°C ⁶ | — | 2.0 | — | Volts |
| | | I _C = 50A, V _{GE} = 15V, T _j = 150°C ⁶ | — | 2.05 | — | Volts |
| | | I _C = 50A, V _{GE} = 15V, T _j = 150°C ⁶ | — | 2.05 | — | Volts |
| Input Capacitance | C _{ies} | | — | — | 5.0 | nF |
| Output Capacitance | C _{oes} | V _{GE} = 0V, V _{CE} = 10V | — | — | 1.0 | nF |
| Reverse Transfer Capacitance | C _{res} | | — | — | 0.08 | nF |
| Total Gate Charge | Q _G | V _{CC} = 600V, I _C = 50A, V _{GE} = 15V | — | 117 | — | nC |
| Repetitive Peak Reverse Current | I _{RRM} ^{*3} | V _R = V _{RRM} | — | — | 1 | mA |
| Forward Voltage Drop | V _{EC} ^{*3} (Chip) | I _E = 50A, V _{GE} = 0V, T _j = 25°C | — | 1.7 | 2.15 | Volts |
| | | I _E = 50A, V _{GE} = 0V, T _j = 125°C | — | 1.7 | — | Volts |
| | | I _E = 50A, V _{GE} = 0V, T _j = 150°C | — | 1.7 | — | Volts |
| Forward Voltage Drop | V _{EC} ^{*3} (Terminal) | I _E = 50A, V _{GE} = 0V, T _j = 25°C ⁶ | — | 1.8 | 2.25 | Volts |
| | | I _E = 50A, V _{GE} = 0V, T _j = 125°C ⁶ | — | 1.8 | — | Volts |
| | | I _E = 50A, V _{GE} = 0V, T _j = 150°C ⁶ | — | 1.8 | — | Volts |
| | | I _E = 50A, V _{GE} = 0V, T _j = 150°C ⁶ | — | 1.8 | — | Volts |

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

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--|------------------------|-----------------|------|------|------|-------|
| Thermal Resistance, Junction to Case ^{*1} | R _{th(j-c)} Q | Per IGBT | — | — | 0.35 | K/W |
| Thermal Resistance, Junction to Case ^{*1} | R _{th(j-c)} D | Per Clamp Diode | — | — | 0.63 | K/W |
| Internal Gate Resistance | R _g | Per Switch | — | 0 | — | Ω |

NTC Thermistor Sector, T_j = 25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|-------------------------|----------------------|---|------|------|------|-------|
| Zero Power Resistance | R | T _C = 25°C | 4.85 | 5.00 | 5.15 | kΩ |
| Deviation of Resistance | ΔR/R | T _C = 100°C, R ₁₀₀ = 493Ω | -7.3 | — | +7.8 | % |
| B Constant | B _(25/50) | Approximate by Equation ^{*9} | — | 3375 | — | K |
| Power Dissipation | P ₂₅ | T _C = 25°C | — | — | 10 | mW |

^{*1} Case temperature (T_C) and heatsink temperature (T_H) measured point is just under the chips.

^{*2} Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

^{*3} 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.

^{*9} B_(25/50) = ln($\frac{R_{25}}{R_{50}}$) / ($\frac{1}{T_{25}} - \frac{1}{T_{50}}$) R₂₅: Resistance at Absolute Temperature T₂₅ [K], R₅₀: resistance at Absolute Temperature T₅₀ [K],
 T₂₅ = 25 [°C] + 273.15 = 298.15 [K], T₅₀ = 50 [°C] + 273.15 = 323.15 [K]



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CM75RX-24S
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75 Amperes/1200 Volts

Module, $T_j = 25^\circ\text{C}$ unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|--|----------------------|--|------|-------|------|------------|
| Lead Resistance (Main Terminals-Chip) | R_{lead} | $T_C = 25^\circ\text{C}$ (Per Switch) | — | — | 2.4 | m Ω |
| Contact Thermal Resistance* ¹ (Case to Heatsink) | $R_{\text{th(c-f)}}$ | Thermal Grease Applied (Per 1 Module)* ² | — | 0.015 | — | K/W |

*¹ Case temperature (T_C) and heatsink temperature (T_f) measured point is just under the chips.

*² Typical value is measured by using thermally conductive grease of $\lambda = 0.9$ [W/(m • K)].

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