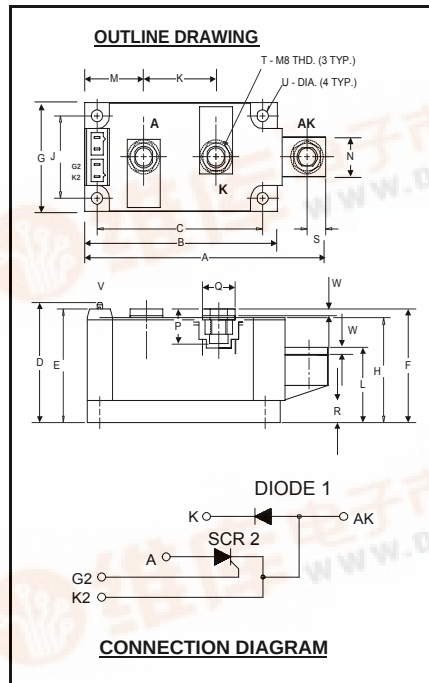




ND47\_\_25

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (724) 925-7272

**POW-R-BLOK™****Dual SCR/Diode Isolated Module**  
**250 Amperes / Up to 1600 Volts****ND47\_\_25****Dual SCR/Diode Isolated**  
**POW-R-BLOK™ Module**  
250 Amperes / 600-1600 Volts**Description:**

Powerex Dual SCR/Diode Modules are designed for use in applications requiring phase control and isolated packaging. The modules are isolated for easy mounting with other components on a common heatsink. **POW-R-BLOK™** has been tested and recognized by the Underwriters Laboratories.

**Features:**

- Electrically Isolated Heatsinking
- Aluminum Nitride Insulator
- Compression Bonded Elements
- Metal Baseplate
- Low Thermal Impedance for Improved Current Capability
- Quick Connect Gate Terminal with Provision for Keyed Mating Plug
- UL Recognized

**Benefits:**

- No Additional Insulation Components Required
- Easy Installation
- No Clamping Components Required
- Reduce Engineering Time

**Applications:**

- Bridge Circuits
- AC & DC Motor Drives
- Battery Supplies
- Power Supplies
- Large IGBT Circuit Front Ends

**ND47 Outline Dimensions**

| Dimension | Inches      | Millimeters |
|-----------|-------------|-------------|
| A         | 4.57        | 116         |
| B         | 3.66        | 93          |
| C         | 3.15        | 80.0        |
| D         | 2.17        | 55.1        |
| E         | 2.06        | 52.3        |
| F         | 2.07        | 52.0        |
| G         | 1.97        | 50.0        |
| H         | 1.90        | 48.3        |
| J         | 1.50        | 38.1        |
| K         | 1.38        | 35.0        |
| L         | 1.35        | 34.3        |
| M         | 1.122       | 28.5        |
| N         | .71         | 18.0        |
| P         | .57         | 14.5        |
| Q         | .625        | 15.9        |
| R         | .394        | 10.00       |
| S         | .350        | 8.9         |
| T         | M8 Metric   | M8          |
| U         | .22 Dia.    | 5.6 Dia.    |
| V         | .110 x .032 | 2.8 x 0.8   |
| W         | .12         | 3.0         |

Note: Dimensions are for reference only.

**Ordering Information:**

Select the complete eight digit module part number from the table below.

Example: ND471625 is a 1600Volt, 250 Ampere Dual SCR/Diode Isolated **POW-R-BLOK™** Module

| Type | Voltage<br>Volts<br>(x100)       | Current<br>Amperes<br>(x 10) |
|------|----------------------------------|------------------------------|
| ND47 | 06<br>08<br>10<br>12<br>14<br>16 | 25                           |



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**250 Amperes / Up to 1600 Volts****Absolute Maximum Ratings**

| Characteristics                                                 | Conditions                                                                                                                                                    | Symbol                |             | Units                  |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------|------------------------|
| Repetitive Peak Forward and Reverse Blocking Voltage            |                                                                                                                                                               | $V_{DRM}$ & $V_{RRM}$ | up to 1600  | V                      |
| Non-Repetitive Peak Reverse Blocking Voltage<br>( $t < 5$ msec) |                                                                                                                                                               | $V_{RSM}$             | 1600        | V                      |
| RMS Forward Current                                             | 180° Conduction, $T_C=89^\circ\text{C}$                                                                                                                       | $I_{T(RMS)}$          | 393         | A                      |
| Average Forward Current                                         | 180° Conduction, $T_C=89^\circ\text{C}$                                                                                                                       | $I_{T(AV)}/I_{F(AV)}$ | 250         | A                      |
| Peak One Cycle Surge Current, Non-Repetitive                    | 60 Hz, 100% $V_{RRM}$ reapplied                                                                                                                               | $I_{TSM}/I_{FSM}$     | 8800        | A                      |
| Peak Three Cycle Surge Current, Non-Repetitive                  | 60 Hz, 100% $V_{RRM}$ reapplied                                                                                                                               | $I_{TSM}/I_{FSM}$     | 4685        | A                      |
| Peak Ten Cycle Surge Current, Non-Repetitive                    | 60 Hz, 100% $V_{RRM}$ reapplied                                                                                                                               | $I_{TSM}/I_{FSM}$     | 4040        | A                      |
| $I^2t$ for Fusing for One Cycle, 8.3 milliseconds               |                                                                                                                                                               | $I^2t$                | 320,000     | $\text{A}^2\text{sec}$ |
| Maximum Rate-of-Rise of On-State Current,<br>(Non-Repetitive)   | $T_J=25^\circ\text{C}$ , $I_G=500\text{mA}$ ,<br>$V_D=0.67 V_{DRM}(\text{Rated})$ , $I_{TM}=\pi I_{T(AV)}$ ,<br>$T_r < 0.5\mu\text{s}$ , $t_p > 6\mu\text{s}$ | $di/dt$               | 800         | $\text{A}/\mu\text{s}$ |
| Peak Gate Power Dissipation                                     |                                                                                                                                                               | $P_{GM}$              | 16          | W                      |
| Average Gate Power Dissipation                                  |                                                                                                                                                               | $P_{G(AV)}$           | 3           | W                      |
| Peak Forward Gate Current                                       |                                                                                                                                                               | $I_{GFM}$             | 4           | A                      |
| Peak Forward Gate Voltage                                       |                                                                                                                                                               | $V_{GFM}$             | 10          | V                      |
| Peak Reverse Gate Voltage                                       |                                                                                                                                                               | $V_{GRM}$             | 5           | V                      |
| Operating Temperature                                           |                                                                                                                                                               | $T_J$                 | -40 to +130 | $^\circ\text{C}$       |
| Storage Temperature                                             |                                                                                                                                                               | $T_{stg}$             | -40 to +150 | $^\circ\text{C}$       |
| Max. Mounting Torque, M6 Mounting Screw                         |                                                                                                                                                               |                       | 45<br>5     | in.-Lb.<br>Nm          |
| Max. Mounting Torque, M8 Terminal Screw                         |                                                                                                                                                               |                       | 110<br>12   | in.-Lb.<br>Nm          |
| Module Weight, Typical                                          |                                                                                                                                                               |                       | 840<br>1.85 | g<br>lb                |
| V Isolation @ 25C                                               |                                                                                                                                                               | $V_{rms}$             | 2500        | V                      |

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**250 Amperes / Up to 1600 Volts****Electrical Characteristics, T<sub>J</sub>=25°C unless otherwise specified**

| Characteristics                          | Symbol                           | Test Conditions                                                                                                                           | Min.                     | Max.                                    | Units |
|------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------|-------|
| Repetitive Peak Forward Leakage Current  | I <sub>DRM</sub>                 | Up to 1600V, T <sub>J</sub> =130°C                                                                                                        |                          | 50                                      | mA    |
| Repetitive Peak Reverse Leakage Current  | I <sub>RRM</sub>                 | Up to 1600V, T <sub>J</sub> =130°C                                                                                                        |                          | 50                                      | mA    |
| Peak On-State Voltage                    | V <sub>TM</sub> /V <sub>FM</sub> | I <sub>TM</sub> /I <sub>FM</sub> =625A                                                                                                    |                          | 1.30                                    | V     |
| Threshold Voltage, Low-level             | V <sub>(TO)1</sub>               | T <sub>J</sub> = 130°C, I = 15%I <sub>T(AV)</sub> to $\pi$ I <sub>T(AV)</sub>                                                             |                          | 0.819                                   | V     |
| Slope Resistance, Low-level              | r <sub>T1</sub>                  |                                                                                                                                           |                          | 0.589                                   | mΩ    |
| Threshold Voltage, High-level            | V <sub>(TO)2</sub>               | T <sub>J</sub> = 130°C, I = $\pi$ I <sub>T(AV)</sub> to I <sub>TSM</sub>                                                                  |                          | 0.47                                    | V     |
| Slope Resistance, High-level             | r <sub>T2</sub>                  |                                                                                                                                           |                          | 0.731                                   | mΩ    |
| V <sub>TM</sub> Coefficients, Full Range |                                  | T <sub>J</sub> = 130°C, I = 15%I <sub>T(AV)</sub> to I <sub>TSM</sub><br><br>V <sub>TM</sub> /V <sub>FM</sub> = A+ B Ln I +C I + D Sqrt I | A =<br>B =<br>C =<br>D = | 0.5849<br>0.1060<br>9.25 E-4<br>-0.0286 |       |
| Minimum dV/dt                            | dV/dt                            | Exponential to 2/3 V <sub>DRM</sub><br>T <sub>J</sub> =130°C, Gate Open                                                                   | 500                      |                                         | V/μs  |
| Turn-On Time (Typical)                   | t <sub>on</sub>                  | I <sub>TM</sub> = 100A, V <sub>D</sub> = 100V                                                                                             | 7                        | (Typical)                               | μs    |
| Turn-Off Time (Typical)                  | t <sub>off</sub>                 | T <sub>J</sub> = 130°C, I <sub>T</sub> = 250A<br>Re-Applied dV/dt = 20V/μs<br>Linear to 0.8 V <sub>DRM</sub>                              | 150                      | (Typical)                               | μs    |
| Gate Trigger Current                     | I <sub>GT</sub>                  | T <sub>J</sub> =25°C, V <sub>D</sub> =12V                                                                                                 |                          | 150                                     | mA    |
| Gate Trigger Voltage                     | V <sub>GT</sub>                  | T <sub>J</sub> =25°C, V <sub>D</sub> =12V                                                                                                 |                          | 3.0                                     | Volts |
| Non-Triggering Gate Voltage              | V <sub>GDM</sub>                 | T <sub>J</sub> =130°C, V <sub>D</sub> = ½ V <sub>DRM</sub>                                                                                |                          | 0.15                                    | Volts |

**Thermal Characteristics**

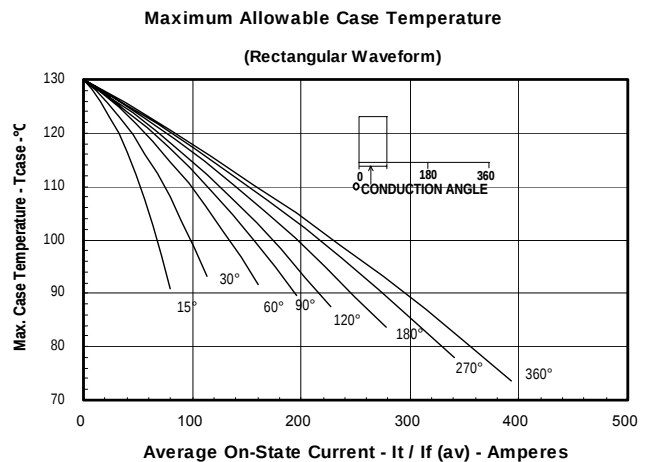
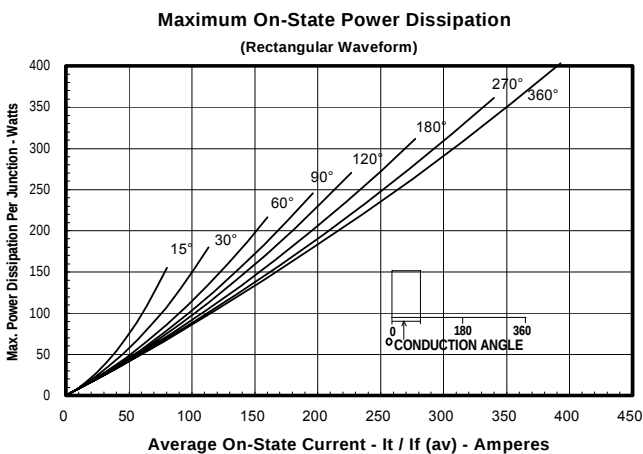
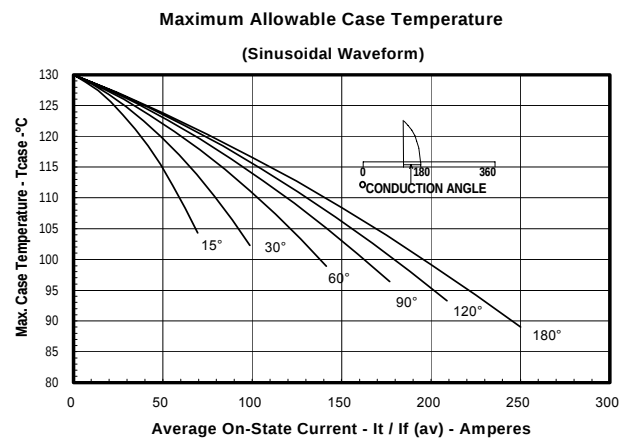
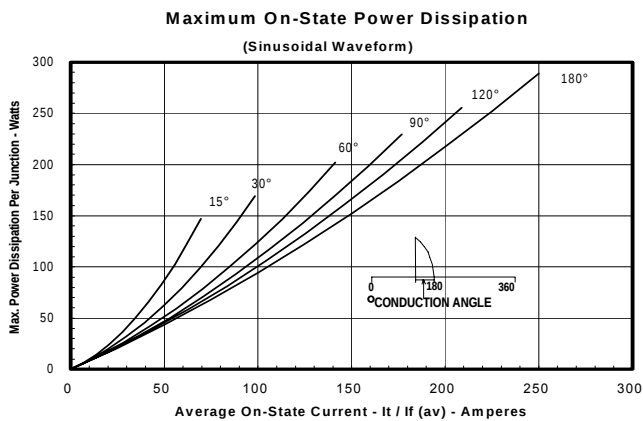
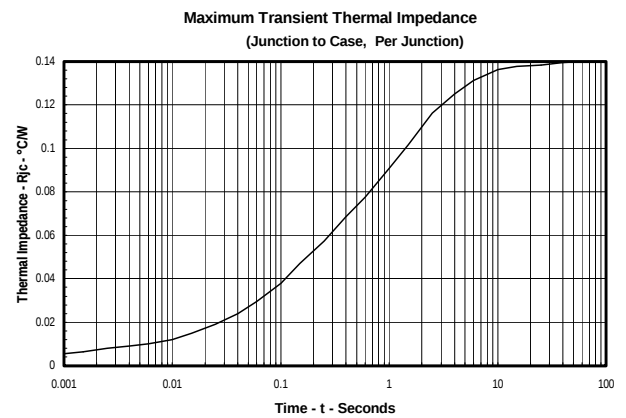
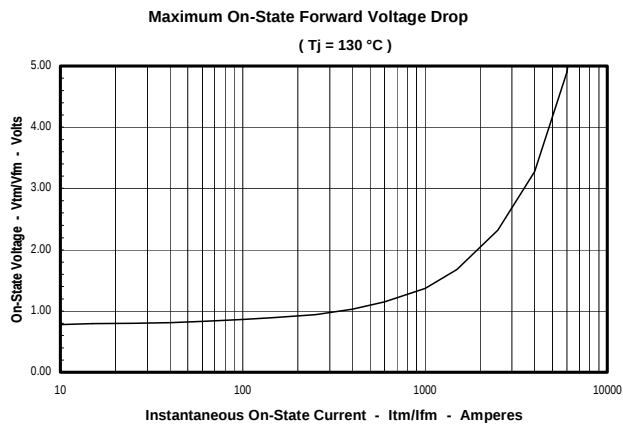
| Characteristics                             | Symbol            |                                                                                                                                                                                                                | Max.                                                                                                         | Units                                                                                                     |
|---------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Thermal Resistance, Junction to Case        | R <sub>ΘJ-C</sub> | Per Module, both conducting<br>Per Junction both conducting                                                                                                                                                    | 0.07<br>0.14                                                                                                 | °C/W<br>°C/W                                                                                              |
| Thermal Impedance Coefficients              | Z <sub>ΘJ-C</sub> | Z <sub>ΘJ-C</sub> = K <sub>1</sub> (1-exp(-t/τ <sub>1</sub> ))<br>+ K <sub>2</sub> (1-exp(-t/τ <sub>2</sub> ))<br>+ K <sub>3</sub> (1-exp(-t/τ <sub>3</sub> ))<br>+ K <sub>4</sub> (1-exp(-t/τ <sub>4</sub> )) | K <sub>1</sub> = 5.27E-3<br>K <sub>2</sub> = 1.17E-2<br>K <sub>3</sub> = 5.26E-2<br>K <sub>4</sub> = 6.97E-2 | τ <sub>1</sub> = 1.69E-4<br>τ <sub>2</sub> = 2.07E-2<br>τ <sub>3</sub> = 2.37E-1<br>τ <sub>4</sub> = 2.46 |
| Thermal Resistance, Case to Sink Lubricated | R <sub>ΘC-S</sub> | Per Module                                                                                                                                                                                                     | 0.03                                                                                                         | °C/W                                                                                                      |



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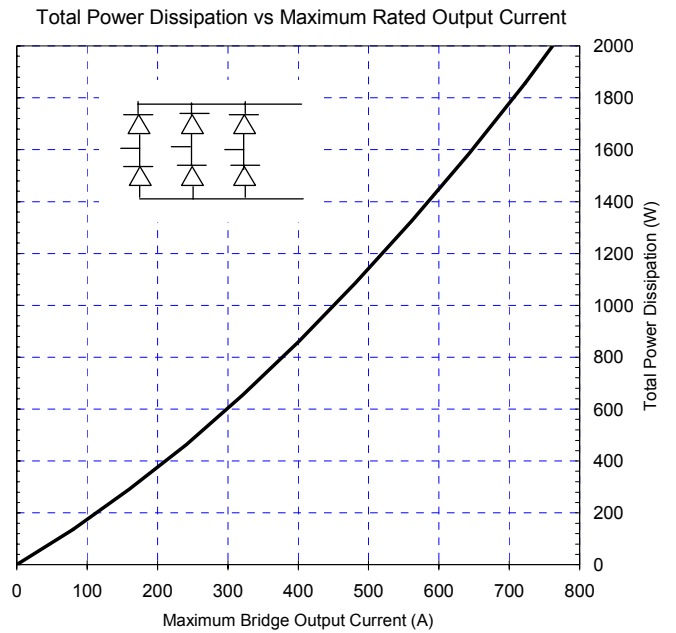
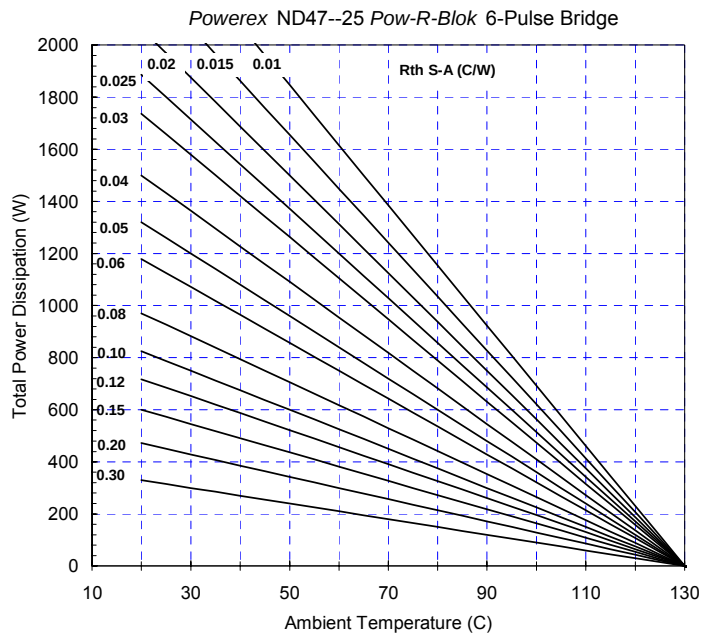




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Six-Pulse Bridge Circuit Total Power Dissipation & Maximum Rated Output Current With Sink to Ambient Resistance of Heatsink as a Parameter.