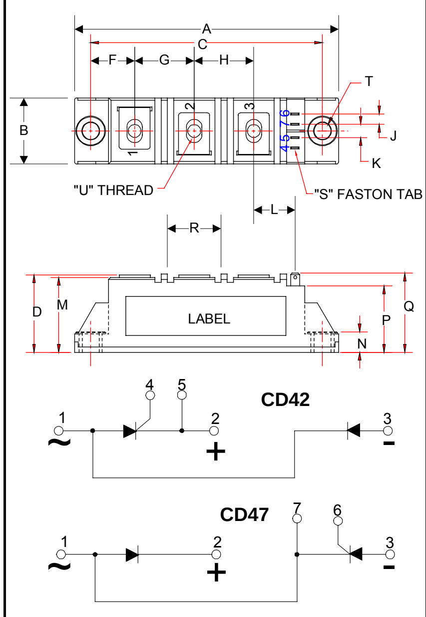
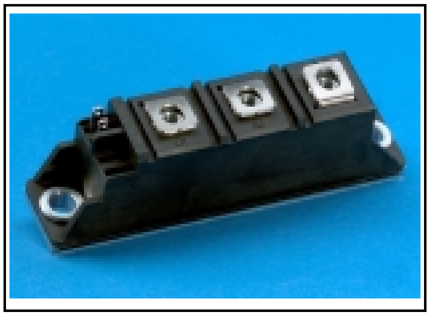
# CD42__40A
# CD47__40A

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

***POW-R-BLOK™***
**Dual SCR/Diode Isolated Module**
***40 Amperes / Up to 1600 Volts***

OUTLINE DRAWING



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**POW-R-BLOK™ Module**
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## Description:

Powerex 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
- DBC Alumina ($Al_2O_3$) Insulator
- Copper Baseplate
- Low Thermal Impedance for Improved Current Capability
- UL Recognized (E78240)

## 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
- Lighting Control
- Heat & Temperature Control
- Welders

## CD42, CD47 Outline Dimensions

| Dimension | Inches | Millimeters |
|---|---|---|
| A | 3.62 | 92 |
| B | 0.83 | 21 |
| C | 3.15 | 80 |
| D | 1.18 | 30 |
| F | 0.59 | 15 |
| G | 0.79 | 20 |
| H | 0.79 | 20 |
| J | 0.16 | 4 |
| K | 0.23 | 5.8 |
| L | 0.61 | 15.5 |
| M | 1.14 | 29 |
| N | 0.25 | 6.3 |
| P | 0.94 | 24 |
| Q | 1.18 | 30 |
| R | 0.71 | 18 |
| S | 0.11 x .03 | 2.8 x 0.8 |
| T | 0.25 | 6.3 |
| U | M5 | M5 |

Note: Dimensions are for reference only.

## Ordering Information:

Select the complete nine digit module part number from the table below.
Example: CD421640A is a 1600Volt, 40 Ampere Dual SCR/Diode Isolated *POW-R-BLOK™* Module

| Type | Voltage Volts (x100) | Current Amperes (x 1) |
|---|---|---|
| CD42<br>CD47 | 08<br>12<br>16 | 40 |

Revision Date: 01/26/2002

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**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 (t < 5 msec) | | $V_{RSM}$ | $V_{RRM}$ + 100 | V |
| RMS Forward Current | 180° Conduction, $T_C$=91°C | $I_{T(RMS)}$ | 63 | A |
| | 180° Conduction, $T_C$=91°C (AC Switch) | $I_{T(RMS)}$ | 93 | A |
| Average Forward Current | 180° Conduction, $T_C$=91°C | $I_{T(AV)}$ | 40 | A |
| Peak One Cycle Surge Current, Non-Repetitive | 60 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 750 | A |
| | 60 Hz, No $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 890 | A |
| | 60 Hz, No $V_{RRM}$ reapplied, $T_j$=25°C | $I_{TSM}$ | 985 | A |
| | 50 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 715 | A |
| | 50 Hz, No $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 850 | A |
| | 50 Hz, No $V_{RRM}$ reapplied, $T_j$=25°C | $I_{TSM}$ | 940 | A |
| Peak Three Cycle Surge Current, Non-Repetitive | 60 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 570 | A |
| | 50 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 545 | A |
| Peak Ten Cycle Surge Current, Non-Repetitive | 60 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 460 | A |
| | 50 Hz, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I_{TSM}$ | 445 | A |
| $I^2t$ for Fusing for One Cycle, 8.3 milliseconds | 8.3 ms, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I^2t$ | 2,330 | $A^2$ sec |
| | 8.3 ms, No $V_{RRM}$ reapplied, $T_j$=125°C | $I^2t$ | 3,300 | $A^2$ sec |
| | 8.3 ms, No $V_{RRM}$ reapplied, $T_j$=25°C | $I^2t$ | 4,030 | $A^2$ sec |
| | 10 ms, 100% $V_{RRM}$ reapplied, $T_j$=125°C | $I^2t$ | 2,560 | $A^2$ sec |
| | 10 ms, No $V_{RRM}$ reapplied, $T_j$=125°C | $I^2t$ | 3,610 | $A^2$ sec |
| | 10 ms, No $V_{RRM}$ reapplied, $T_j$=25°C | $I^2t$ | 4,420 | $A^2$ sec |
| Maximum Rate-of-Rise of On-State Current, (Non-Repetitive) | $T_j$=25°C, $I_G$=0.5 A, $V_D$=0.67 $V_{DRM\ (Rated)}$, $I_{TM}$=300A, $T_r$ < 0.5µs, $t_p$ > 6µs | di/dt | 150 | A/µs |
| Peak Gate Power Dissipation | $T_p$ < 5 ms, $T_j$ = 125°C | $P_{GM}$ | 10 | W |
| Average Gate Power Dissipation | F = 50 Hz, $T_j$ = 125°C | $P_{G(AV)}$ | 2.5 | W |
| Peak Forward Gate Current | $T_p$ < 5 ms, $T_j$ = 125°C | $I_{GFM}$ | 2.5 | A |
| Peak Reverse Gate Voltage | $T_p$ < 5 ms, $T_j$ = 125°C | $V_{GRM}$ | 10 | V |
| Operating Temperature | | $T_J$ | -40 to +125 | °C |
| Storage Temperature | | $T_{stg}$ | -40 to +125 | °C |
| Max. Mounting Torque, M5 Mounting Screw on Terminals | | | 25<br>3 | in.-Lb.<br>Nm |
| Max. Mounting Torque, Module to Heatsink | | | 44<br>5 | in.-Lb.<br>Nm |
| Module Weight, Typical | | | 110<br>3.88 | g<br>oz. |
| V Isolation @ 25C | 50 – 60 Hz, 1 minute | $V_{rms}$ | 2500 | V |
| Circuit to base, all terminals shorted together | 50 – 60 Hz, 1 second | $V_{rms}$ | 3500 | V |

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## Electrical Characteristics, $T_J$=25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Max. | Units |
|---|---|---|---|---|---|
| Repetitive Peak Forward Leakage Current | $I_{DRM}$ | Up to 1600V, $T_J$=125°C | | 15 | mA |
| Repetitive Peak Reverse Leakage Current | $I_{RRM}$ | Up to 1600V, $T_J$=125°C | | 15 | mA |
| Peak On-State Voltage | $V_{TM}$ / $V_{FM}$ | $I_{TM}$ / $I_{FM}$ = 140A | | 1.81 | V |
| Threshold Voltage, Low-level<br>Slope Resistance, Low-level | $V_{(TO)1}$<br>$r_{T1}$ | $T_J$ = 125°C, I = 16.7% x $\pi I_{T(AV)}$ to $\pi I_{T(AV)}$ | | 0.88<br>5.90 | V<br>mΩ |
| Threshold Voltage, High-level<br>Slope Resistance, High-level | $V_{(TO)2}$<br>$r_{T2}$ | $T_J$ = 125°C, I = $\pi I_{T(AV)}$ to $I_{TSM}$ | | 0.91<br>5.74 | V<br>mΩ |
| $V_{TM}$ Coefficients, Full Range | | $T_J$ = 125°C, I = 15% x $I_{T(AV)}$ to $I_{TSM}$<br><br>$V_{TM}$ = A+ B Ln I +C I + D Sqrt I | A =<br>B =<br>C =<br>D = | 0.872<br>-1.86 E-3<br>5.65 E-3<br>4.33 E-3 | |
| Minimum dV/dt | dV/dt | Linear to 2/3 $V_{DRM}$<br>$T_j$=125°C, Gate Open Circuit | 500 | | V/µs |
| Turn-Off Time (Typical) | $t_{off}$ | $T_J$ = 25°C, $I_T$ = 2 A<br>$V_r$ = 50V, -dI/dt = 10 A/µs<br>Re-Applied dV/dt = 200 V/µs,<br>Linear to 900 V | 40 - 100 | (Typical) | µs |
| Gate Trigger Current | $I_{GT}$ | $T_j$= -40°C, $V_D$=6V, Resistive Load<br>$T_j$= 25°C, $V_D$=6V, Resistive Load<br>$T_j$=125°C, $V_D$=6V, Resistive Load | | 270<br>150<br>80 | mA<br>mA<br>mA |
| Gate Trigger Voltage | $V_{GT}$ | $T_j$= -40°C, $V_D$=6V, Resistive Load<br>$T_j$= 25°C, $V_D$=6V, Resistive Load<br>$T_j$=125°C, $V_D$=6V, Resistive Load | | 4.0<br>2.5<br>1.7 | Volts<br>Volts<br>Volts |
| Non-Triggering Gate Voltage | $V_{GDM}$ | $T_j$=125°C, $V_D$=$V_{DRM}$ | | 0.25 | Volts |
| Non-Triggering Gate Current | $I_{GDM}$ | $T_j$=125°C, $V_D$=$V_{DRM}$ | | 6 | mA |
| Holding Current | $I_H$ | $V_D$=6V, Resistive Load, Gate Open | | 200 | mA |
| Latching Current | $I_L$ | $V_D$=6V, Resistive Load | | 400 | mA |

## Thermal Characteristics

| Characteristics | Symbol | | | Max. | Units |
|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case<br>DC Operation | $R_{\Theta J\text{-}C}$ | Per Module, both conducting<br>Per Junction, both conducting | | 0.230<br>0.460 | °C/W<br>°C/W |
| Thermal Impedance Coefficients | $Z_{\Theta J\text{-}C}$ | $Z_{\Theta J\text{-}C}$= $K_1$ (1-exp(-t/$\tau_1$))<br>+ $K_2$ (1-exp(-t/$\tau_2$))<br>+ $K_3$ (1-exp(-t/$\tau_3$))<br>+ $K_4$ (1-exp(-t/$\tau_4$)) | $K_1$ = 1.77 E-2<br>$K_2$ = -1.00 E-2<br>$K_3$ = 1.46 E-1<br>$K_4$ = 3.07 E-1 | $\tau_1$ = 4.73 E-4<br>$\tau_2$ = 1.67 E-3<br>$\tau_3$ = 9.77 E-3<br>$\tau_4$ = 8.76 E-2 | |
| Thermal Resistance, Case to Sink Lubricated | $R_{\Theta C\text{-}S}$ | Per Module | | 0.1 | °C/W |

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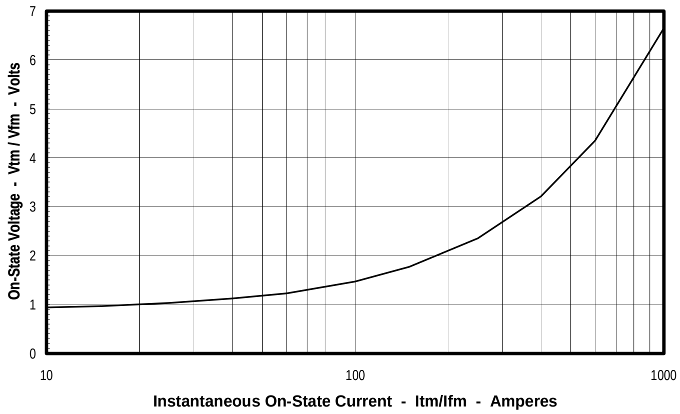
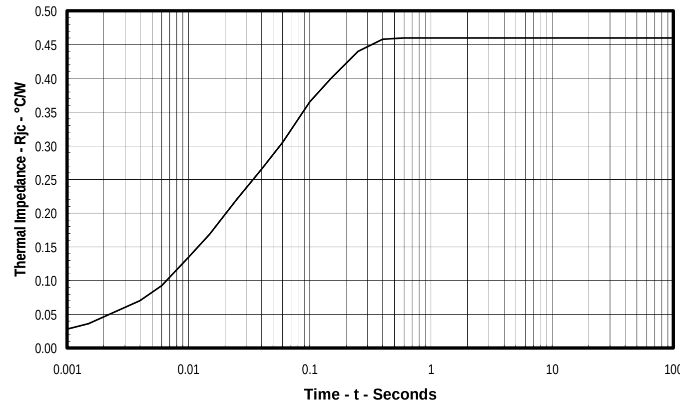
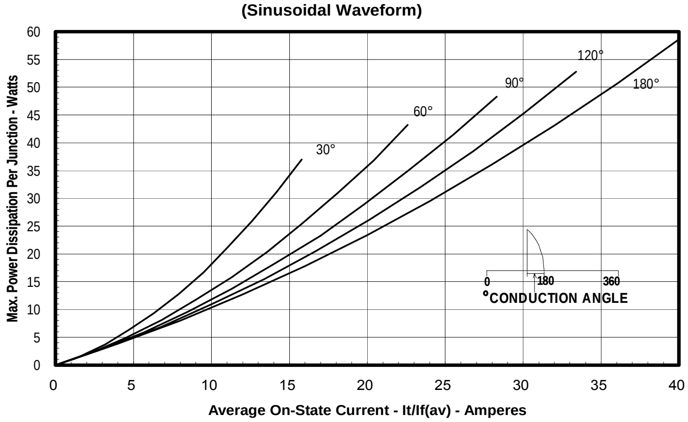
**Maximum On-State Forward Voltage Drop**
**( Tj = 125 °C )**



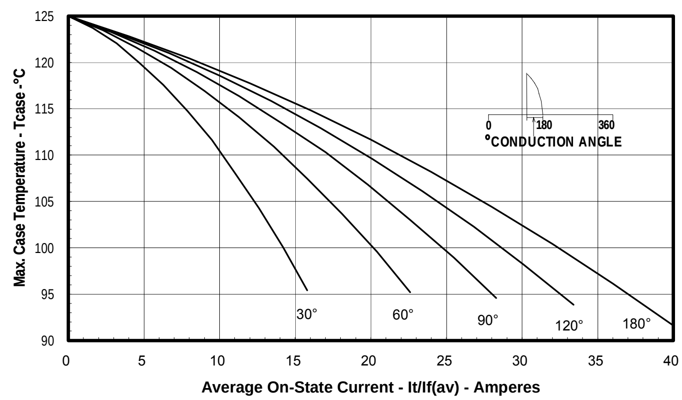

**Maximum Transient Thermal Impedance**
**(Junction to Case)**



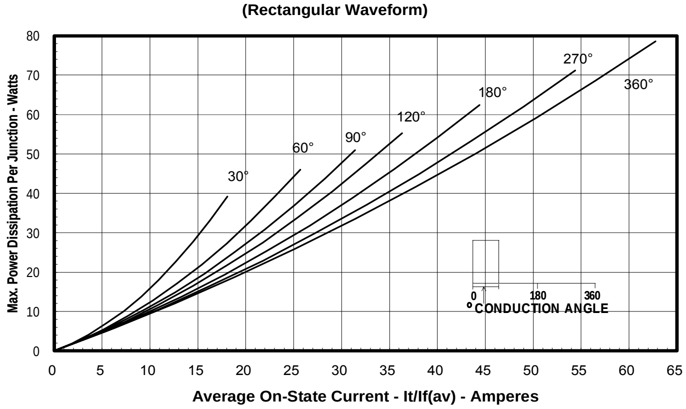

**Maximum On-State Power Dissipation**
**(Sinusoidal Waveform)**




**Maximum Allowable Case Temperature**
**(Sinusoidal Waveform)**




**Maximum On-State Power Dissipation**
**(Rectangular Waveform)**




**Maximum Allowable Case Temperature**
**(Rectangular Waveform)**