

# International **IOR** Rectifier

## 48CTQ060SPbF 48CTQ060-1PbF

SCHOTTKY RECTIFIER

40 Amp

$$I_{F(AV)} = 40\text{Amp}$$

$$V_R = 60\text{V}$$

### Major Ratings and Characteristics

| Characteristics                                 | Values     | Units            |
|---|------------|------------------|
| $I_{F(AV)}$ Rectangular waveform                | 40         | A                |
| $V_{RRM}$                                       | 60         | V                |
| $I_{FSM}$ @ tp = 5 $\mu$ s sine                 | 1000       | A                |
| $V_F$ @20Apk, $T_J=125^\circ\text{C}$ (per leg) | 0.58       | V                |
| $T_J$ range                                     | -55 to 150 | $^\circ\text{C}$ |

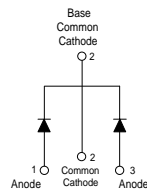
### Description/ Features

This center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 150°C junction temperature. Typical applications are in switching power supplies, converters, free-wheeling diodes, and reverse battery protection.

- 150° C  $T_J$  operation
- Center tap configuration
- Low forward voltage drop
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- High frequency operation
- Guard ring for enhanced ruggedness and long term reliability
- Lead-Free ("PbF" suffix)

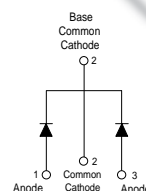
### Case Styles

48CTQ060SPbF



**D²PAK**

48CTQ060-1PbF



**TO-262**

## Voltage Ratings

| Parameters                                      | 48CTQ060SPbF<br>48CTQ060-1PbF |
|---|-------------------------------|
| $V_R$ Max. DC Reverse Voltage (V)               | 60                            |
| $V_{RWM}$ Max. Working Peak Reverse Voltage (V) |                               |

## Absolute Maximum Ratings

| Parameters   | Values      | Units | Conditions   |
|--|-------------|-------|--|
| $I_{F(AV)}$ Max. Average Forward (Per Leg)<br>Current * See Fig. 5 (Per Device)      | 20<br>40    | A     | 50% duty cycle @ $T_C = 111^\circ\text{C}$ , rectangular wave form   |
| $I_{FSM}$ Max. Peak One Cycle Non-Repetitive<br>Surge Current (Per Leg) * See Fig. 7 | 1000<br>260 | A     | 5 $\mu\text{s}$ Sine or 3 $\mu\text{s}$ Rect. pulse<br>10ms Sine or 6ms Rect. pulse<br>Following any rated load condition and with rated $V_{RRM}$ applied |
| $E_{AS}$ Non-Repetitive Avalanche Energy (Per Leg)                                   | 13          | mJ    | $T_J = 25^\circ\text{C}$ , $I_{AS} = 1.50$ Amps, $L = 11.5$ mH   |
| $I_{AR}$ Repetitive Avalanche Current (Per Leg)                                      | 1.50        | A     | Current decaying linearly to zero in 1 $\mu\text{sec}$<br>Frequency limited by $T_J$ max. $V_A = 1.5 \times V_R$ typical                                   |

## Electrical Specifications

| Parameters   | Values                       | Units            | Conditions  |
|--|------------------------------|------------------|---|
| $V_{FM}$ Max. Forward Voltage Drop (Per Leg) * See Fig. 1 (1)    | 0.61<br>0.83<br>0.58<br>0.75 | V                | @ 20A<br>@ 40A<br>@ 20A<br>@ 40A<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ |
| $I_{RM}$ Max. Reverse Leakage Current (Per Leg) * See Fig. 2 (1) | 2<br>89                      | mA               | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$<br>$V_R = \text{rated } V_R$        |
| $V_{F(TO)}$ Threshold Voltage                                    | 0.37                         | V                | $T_J = T_J \text{ max.}$  |
| $r_t$ Forward Slope Resistance                                   | 8.26                         | m $\Omega$       |   |
| $C_T$ Max. Junction Capacitance (Per Leg)                        | 1220                         | pF               | $V_R = 5V_{DC}$ (test signal range 100Khz to 1Mhz) $25^\circ\text{C}$                     |
| $L_S$ Typical Series Inductance (Per Leg)                        | 8.0                          | nH               | Measured lead to lead 5mm from package body   |
| dv/dt Max. Voltage Rate of Change                                | 10000                        | V/ $\mu\text{s}$ | (Rated $V_R$ )  |

(1) Pulse Width < 300 $\mu\text{s}$ , Duty Cycle <2%

## Thermal-Mechanical Specifications

| Parameters  | Values                     | Units              | Conditions   |
|---|----------------------------|--------------------|--|
| $T_J$ Max. Junction Temperature Range                             | -55 to 150                 | $^\circ\text{C}$   |  |
| $T_{stg}$ Max. Storage Temperature Range                          | -55 to 150                 | $^\circ\text{C}$   |  |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Leg)     | 2.0                        | $^\circ\text{C/W}$ | DC operation   |
| $R_{thJC}$ Max. Thermal Resistance Junction to Case (Per Package) | 1.0                        | $^\circ\text{C/W}$ | DC operation   |
| $R_{thCS}$ Typical Thermal Resistance, Case to Heatsink           | 0.50                       | $^\circ\text{C/W}$ | Mounting surface, smooth and greased (only for TO-220) |
| wt Approximate Weight   | 2 (0.07)                   | g (oz.)            |  |
| T Mounting Torque   | Min. 6 (5)<br>Max. 12 (10) | Kg-cm<br>(lbf-in)  |  |
| Marking Device  | 48CTQ060S                  |                    | Case style D <sup>2</sup> Pak                          |
|   | 48CTQ060-1                 |                    | Case style TO-262                                      |

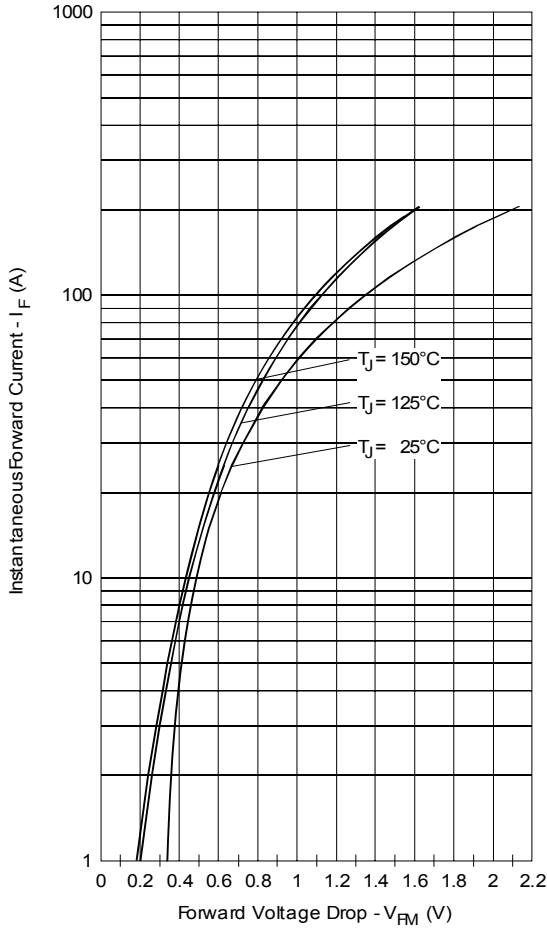


Fig. 1 - Max. Forward Voltage Drop Characteristics (Per Leg)

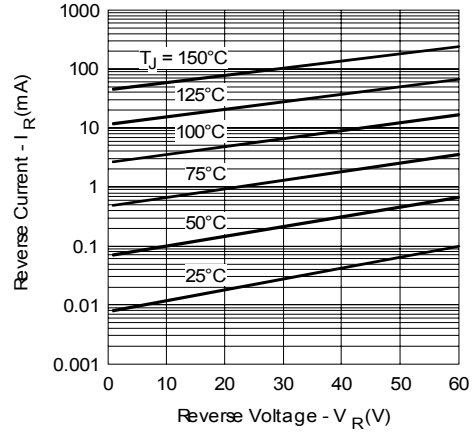


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage (Per Leg)

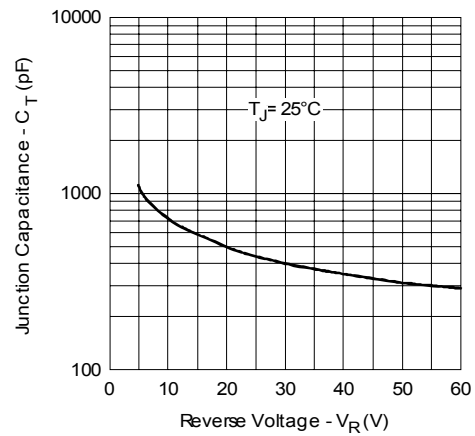


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage (Per Leg)

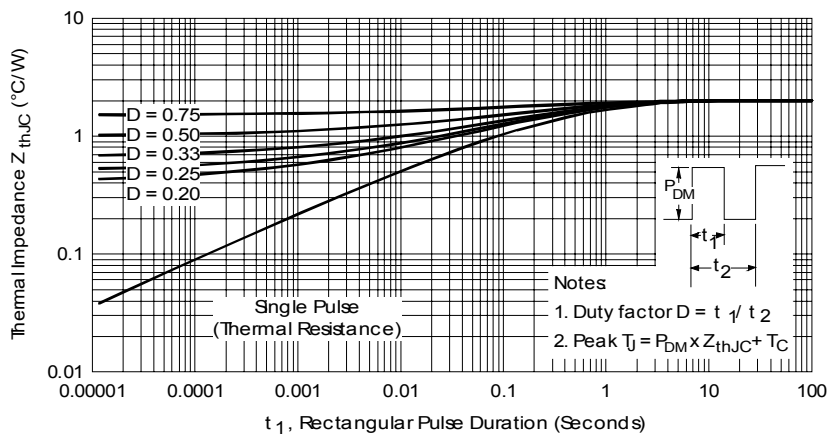


Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

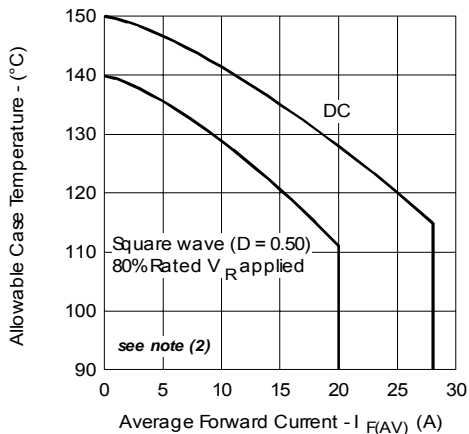


Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current (Per Leg)

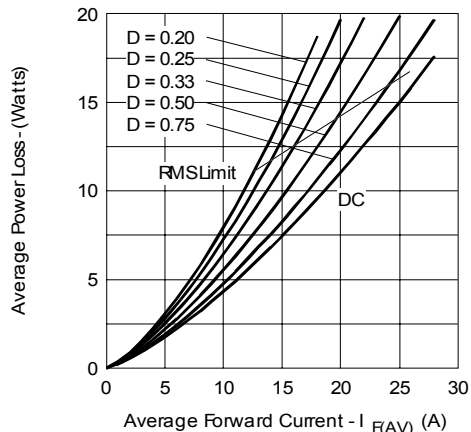


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

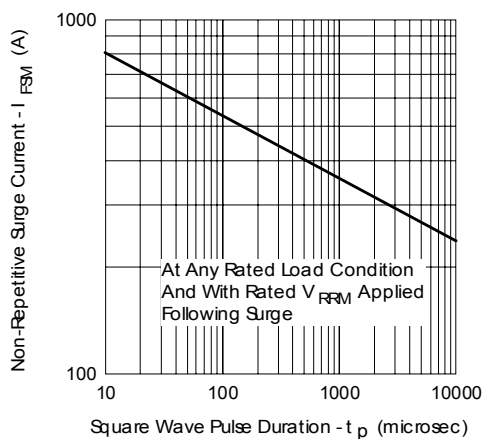


Fig. 7 - Max. Non-Repetitive Surge Current (Per Leg)

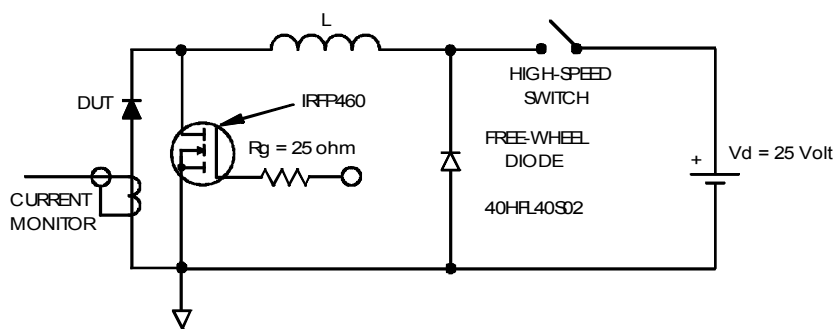


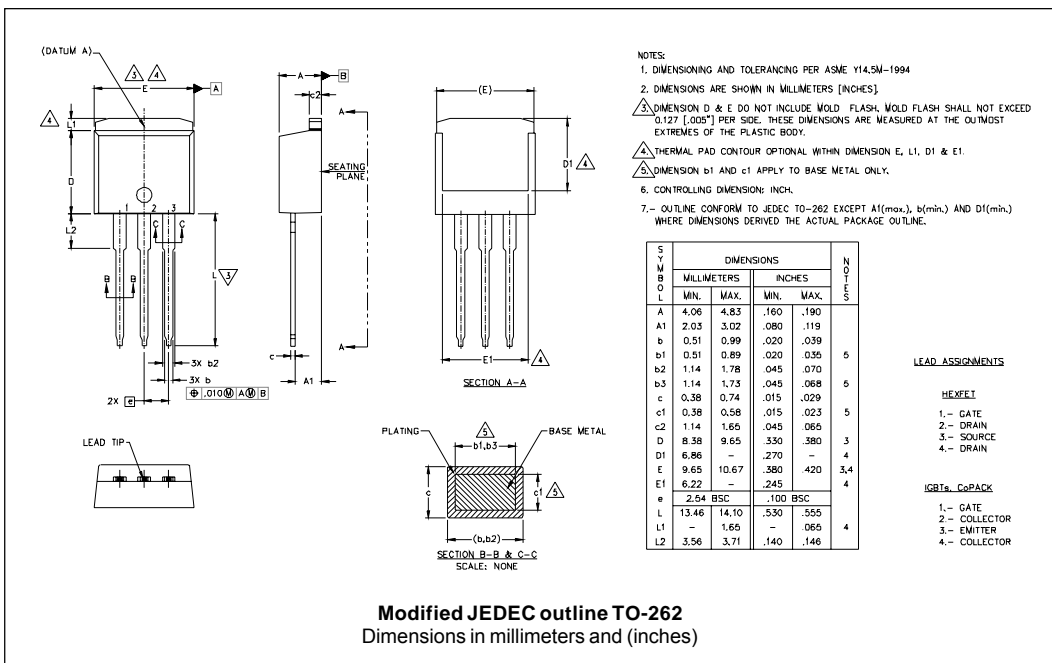
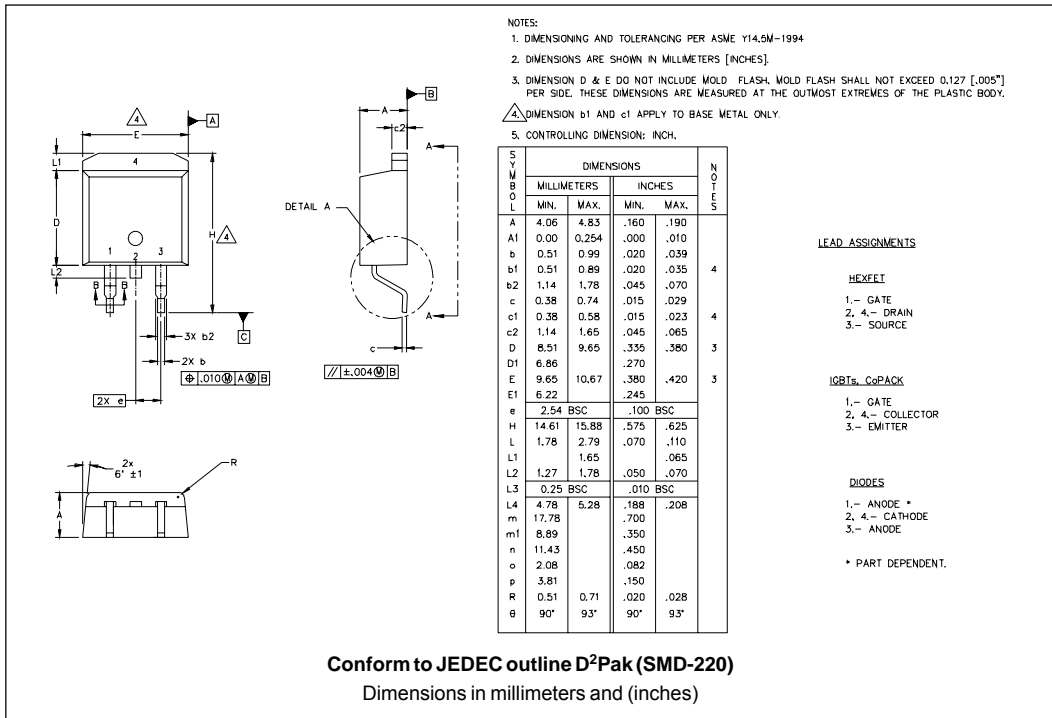
Fig. 8 - Unclamped Inductive Test Circuit

(2) Formula used:  $T_c = T_j - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;

$P_d = \text{Forward Power Loss} = I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);

$P_{d_{REV}} = \text{Inverse Power Loss} = V_{R1} \times I_{R1} (1 - D)$ ;  $I_{R1} @ V_{R1} = 10V$

Outlines Table



Part Marking Information

**D<sup>2</sup>PAK**

EXAMPLE: THIS IS A 48CTQ060S  
LOT CODE 8024  
ASSEMBLED ON WW 02, 2000

Note: "P" in assembly line position indicates "Lead-Free"

INTERNATIONAL RECTIFIER LOGO  
ASSEMBLY LOT CODE  
PART NUMBER  
DATE CODE  
YEAR 0 = 2000  
WEEK 02  
P = LEAD-FREE

**TO-262**

EXAMPLE: THIS IS A 48CTQ060-1  
LOT CODE 1789  
ASSEMBLED ON WW 19, 2002

Note: "P" in assembly line position indicates "Lead-Free"

INTERNATIONAL RECTIFIER LOGO  
ASSEMBLY LOT CODE  
PART NUMBER  
DATE CODE  
YEAR 2 = 2002  
WEEK 19  
P = LEAD-FREE

Tape & Reel Information

SECTION Y-Y

|    |       |     |     |
|----|-------|-----|-----|
| Ao | 10.50 | +/- | 0.1 |
| Bo | 15.80 | +/- | 0.1 |
| B2 | 10.25 | +/- | 0.1 |
| Ko | 4.90  | +/- | 0.1 |
| F  | 11.50 | +/- | 0.1 |
| P1 | 16.00 | +/- | 0.1 |
| W  | 24.00 | +/- | 0.3 |

NOTES:

- 1.0 10 SPROCKET HOLE PITH CUMULATIVE TOLERANCE ±.02
- 2.0 CAMBER NOT TO EXCEED 1mm in 100mm
- 3.0 MATERIAL: CONDUCTIVE BLACK STYRENIC ALLOY
- 4.0 Ko MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
- 5.0 MEASURED FROM CENTRELINE OF SPROCKET HOLE TO CENTRELINE OF POCKET
- 6.0 VENDOR: (OPTIONAL)
- 7.0 MUST ALSO MEET REQUIREMENTS OF EIA STANDAR #EIA-481A TAPING OF SURFACE MOUNT COMPONENTS FOR AUTOMATIC PLACEMENT
- 8.0 SURFACE RESISTIVITY OF MOLDED MATL. MUST MEASURE LESS OR EQUAL TO 10<sup>6</sup> OHMS PER SQUARE, MEASURED IN ACCORDANCE TO PROCEDURE GIVEN IN ASTM D-257 & ASTM D-991
- 9.0 TOTAL LENGTH PER REEL MUST BE 45 METERS
- 10.0 Ⓢ CRITICAL

Dimensions in millimeters and (inches)

Ordering Information Table

| Device Code |   |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
|-------------|---|----|---|-----|---|-----|-----|-----|-----|---|---|---|---|---|---|---|---|
|             | <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="background-color: black; color: white;">48</td> <td style="background-color: black; color: white;">C</td> <td style="background-color: black; color: white;">T</td> <td style="background-color: black; color: white;">Q</td> <td style="background-color: black; color: white;">060</td> <td style="background-color: black; color: white;">S</td> <td style="background-color: black; color: white;">TRL</td> <td style="background-color: black; color: white;">PbF</td> </tr> <tr> <td style="text-align: center;">①</td> <td style="text-align: center;">②</td> <td style="text-align: center;">③</td> <td style="text-align: center;">④</td> <td style="text-align: center;">⑤</td> <td style="text-align: center;">⑥</td> <td style="text-align: center;">⑦</td> <td style="text-align: center;">⑧</td> </tr> </table> | 48 | C | T   | Q | 060 | S   | TRL | PbF | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |
| 48          | C   | T  | Q | 060 | S | TRL | PbF |     |     |   |   |   |   |   |   |   |   |
| ①           | ②   | ③  | ④ | ⑤   | ⑥ | ⑦   | ⑧   |     |     |   |   |   |   |   |   |   |   |
| <b>1</b>    | - Current Rating (40A)  |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>2</b>    | - Circuit Configuration<br>C = Common Cathode   |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>3</b>    | - T = TO-220  |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>4</b>    | - Schottky "Q" Series   |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>5</b>    | - Voltage Rating (060 = 60V)  |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>6</b>    | - <ul style="list-style-type: none"> <li>• S = D<sup>2</sup>Pak</li> <li>• -1= TO-262</li> </ul>  |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>7</b>    | - <ul style="list-style-type: none"> <li>• none = Tube (50 pieces)</li> <li>• TRL = Tape &amp; Reel (Left Oriented - for D<sup>2</sup>Pak only)</li> <li>• TRR = Tape &amp; Reel (Right Oriented - for D<sup>2</sup>Pak only)</li> </ul>  |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |
| <b>8</b>    | - <ul style="list-style-type: none"> <li>• none = Standard Production</li> <li>• PbF = Lead-Free</li> </ul>   |    |   |     |   |     |     |     |     |   |   |   |   |   |   |   |   |

Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level and Lead-Free.  
Qualification Standards can be found on IR's Web site.