# THE DATASHEET OF

# MR751

# MR750 SERIES

**MR754 and MR760 are Preferred Devices**

# High Current Lead Mounted Rectifiers

**ON Semiconductor®**

**http://onsemi.com**

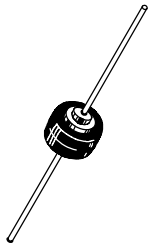
**HIGH CURRENT LEAD MOUNTED SILICON RECTIFIERS 50 − 1000 VOLTS DIFFUSED JUNCTION**

### Features

- Current Capacity Comparable to Chassis Mounted Rectifiers
- Very High Surge Capacity
- Insulated Case
- Pb−Free Packages are Available*

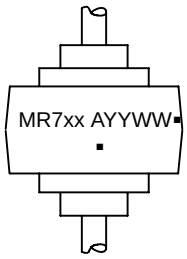
### Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 2.5 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Lead is Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Polarity: Cathode Polarity Band



**AXIAL LEAD**
**BUTTON**
**CASE 194**
**STYLE 1**

### MARKING DIAGRAM




| | |
|---|---|
| MR7 | = Device Code |
| xx | = 50, 51, 52, 54, 56 or 60 |
| A | = Location Code |
| YY | = Year |
| WW | = Work Week |
| ▪ | = Pb−Free Package |

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## MAXIMUM RATINGS

| Characteristic | Symbol | MR750 | MR751 | MR752 | MR754 | MR756 | MR760 | Unit |
|---|---|---|---|---|---|---|---|---|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 50 | 100 | 200 | 400 | 600 | 1000 | V |
| Non−Repetitive Peak Reverse Voltage<br>(Halfwave, single phase, 60 Hz peak) | $V_{RSM}$ | 60 | 120 | 240 | 480 | 720 | 1200 | V |
| RMS Reverse Voltage | $V_{R(RMS)}$ | 35 | 70 | 140 | 280 | 420 | 700 | V |
| Average Rectified Forward Current<br>(Single phase, resistive load, 60 Hz)<br>(See Figures 5 and 6) | $I_O$ | 22 ($T_L$ = 60°C, 1/8 in Lead Lengths)<br>6.0 ($T_A$ = 60°C, P.C. Board mounting) | | | | | | A |
| Non−Repetitive Peak Surge Current<br>(Surge applied at rated load conditions) | $I_{FSM}$ | 400 (for 1 cycle) | | | | | | A |
| Operating and Storage Junction<br>Temperature Range | $T_J$, $T_{stg}$ | −65 to +175 | | | | | | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

## ELECTRICAL CHARACTERISTICS

| Characteristic and Conditions | | Symbol | Max | Unit |
|---|---|---|---|---|
| Maximum Instantaneous Forward Voltage Drop ($i_F$ = 100 A, $T_J$ = 25°C) | | $v_F$ | 1.25 | V |
| Maximum Forward Voltage Drop ($I_F$ = 6.0 A, $T_A$ = 25°C, 3/8 in leads) | | $V_F$ | 0.90 | V |
| Maximum Reverse Current<br>(Rated DC Voltage) | $T_J$ = 25°C<br>$T_J$ = 100°C | $I_R$ | 25<br>1.0 | μA<br>mA |

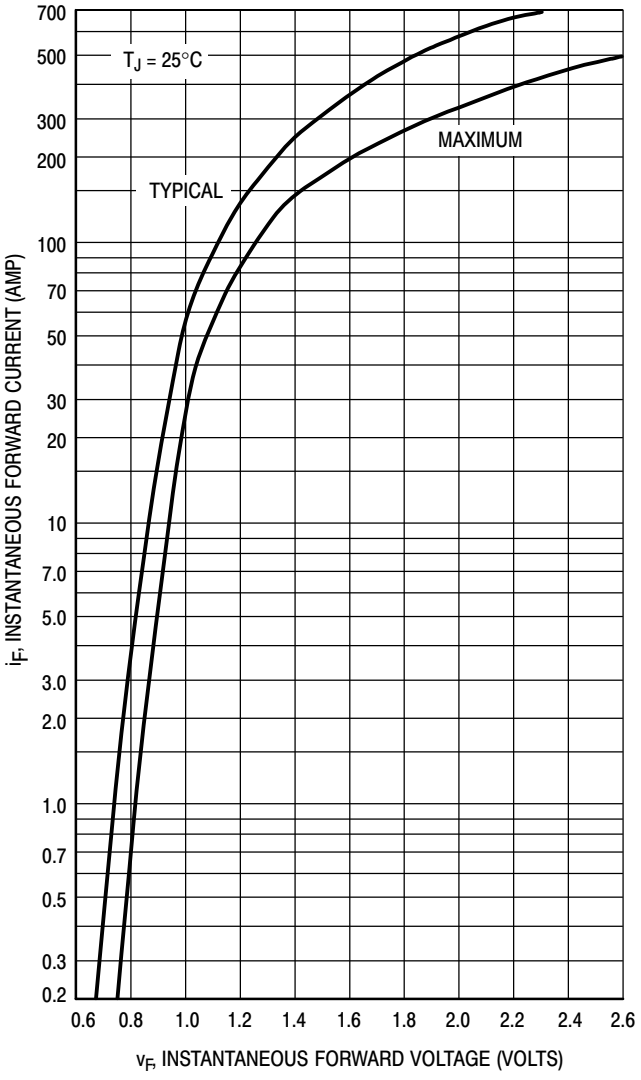



**Figure 1. Forward Voltage**

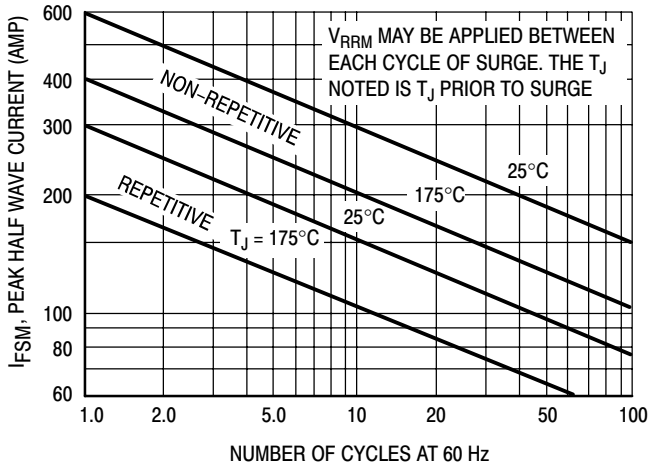



**Figure 2. Maximum Surge Capability**

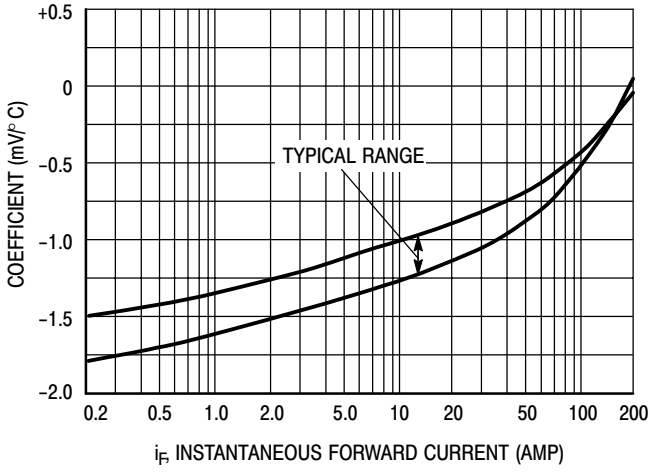



**Figure 3. Forward Voltage Temperature Coefficient**

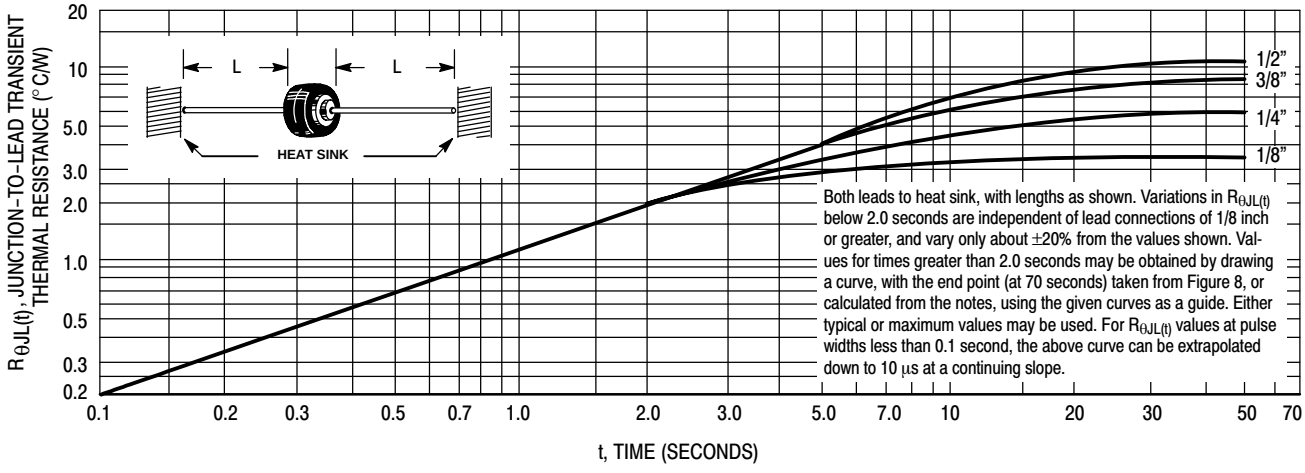



**Figure 4. Typical Transient Thermal Resistance**

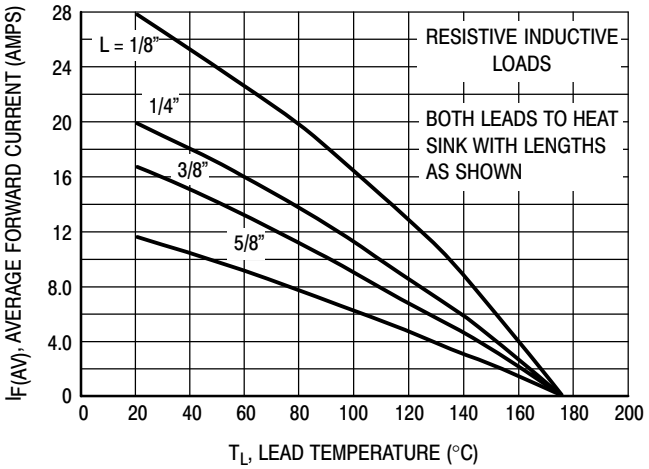



**Figure 5. Maximum Current Ratings**

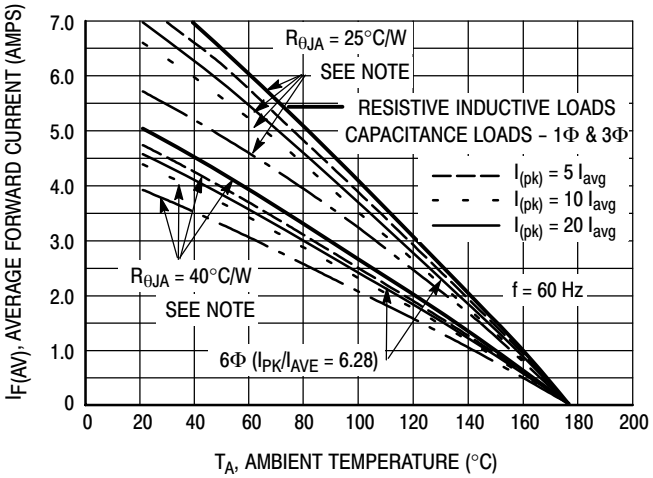



**Figure 6. Maximum Current Ratings**

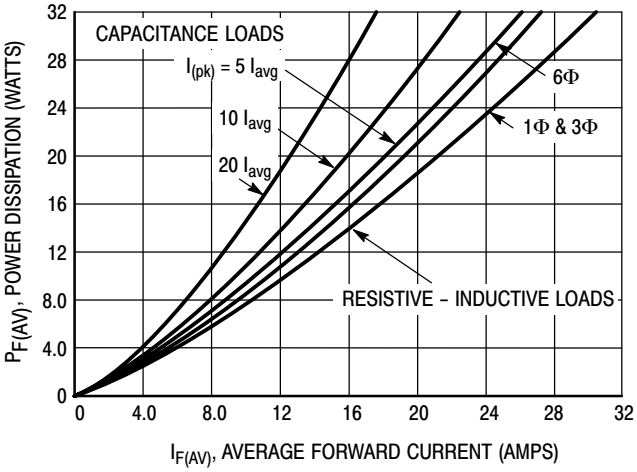



**Figure 7. Power Dissipation**

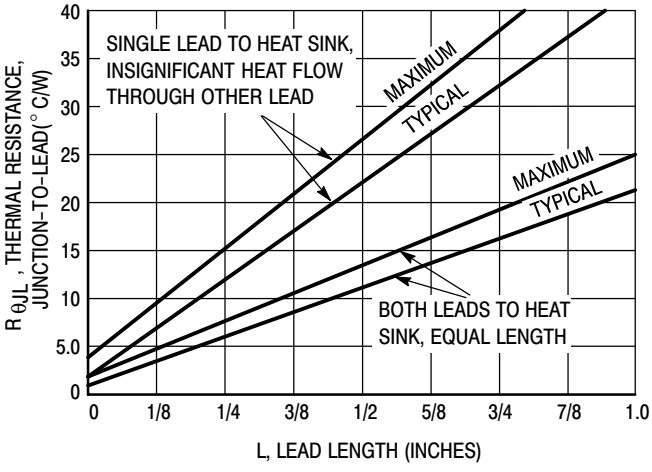
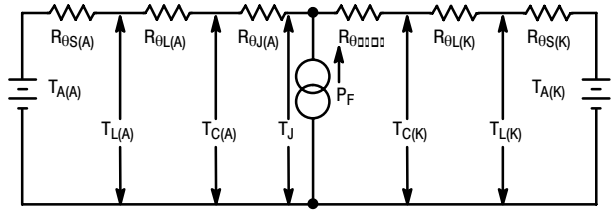



**Figure 8. Steady State Thermal Resistance**

NOTES

THERMAL CIRCUIT MODEL

(For Heat Conduction Through The Leads)




Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. Lowest values occur when one side of the rectifier is brought as close as possible to the heat sink as shown below. Terms in the model signify:

$T_A$ = Ambient Temperature $T_C$ = Case Temperature

$T_L$ = Lead Temperature $T_J$ = Junction Temperature

$R_{\theta S}$ = Thermal Resistance, Heat Sink to Ambient

$R_{\theta L}$ = Thermal Resistance, Lead to Heat Sink

$R_{\theta J}$ = Thermal Resistance, Junction to Case

$P_F$ = Power Dissipation

(Subscripts A and K refer to anode and cathode sides, respectively.)

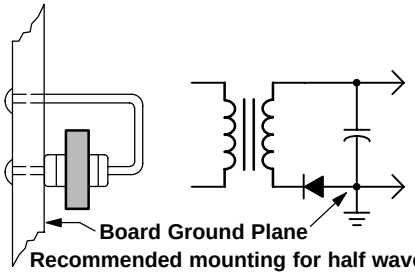
Values for thermal resistance components are:

$R_{\theta L}$ = 40°C/W/in. Typically and 44°C/W/in Maximum.

$R_{\theta J}$ = 2°C/W typically and 4°C/W Maximum.

Since $R_{\theta J}$ is so low, measurements of the case temperature, $T_C$, will be approximately equal to junction temperature in practical lead mounted applications. When used as a 60 Hz rectifierm the slow thermal response holds $T_{J(PK)}$ close to $T_{J(AVG)}$. Therefore maximum lead temperature may be found from: $T_L = 175° - R_{\theta JL} P_F$. $P_F$ may be found from Figure 7.

The recommended method of mounting to a P.C. board is shown on the sketch, where $R_{\theta JA}$ is approximately 25°C/W for a 1-1/2" x 1-1/2" copper surface area. Values of 40°C/W are typical for mounting to terminal strips or P.C. boards where available surface area is small.




**Recommended mounting for half wave circuit**

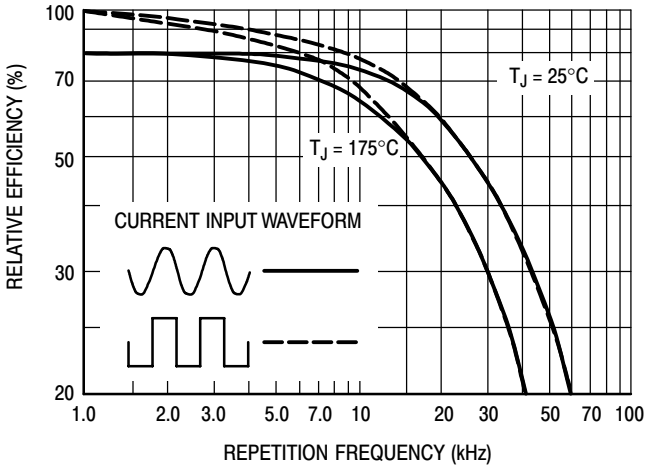



**Figure 9. Rectification Efficiency**

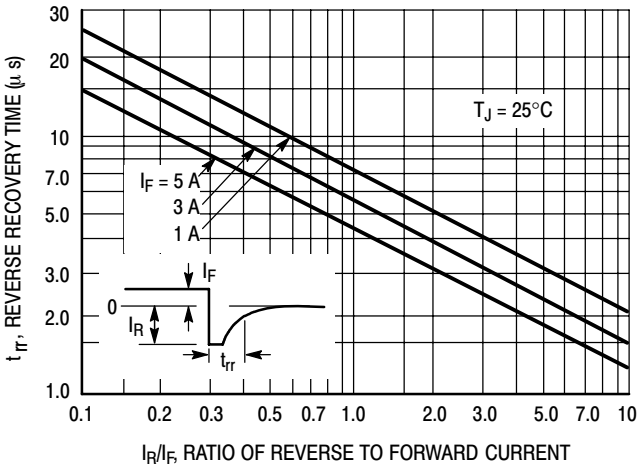



**Figure 10. Reverse Recovery Time**

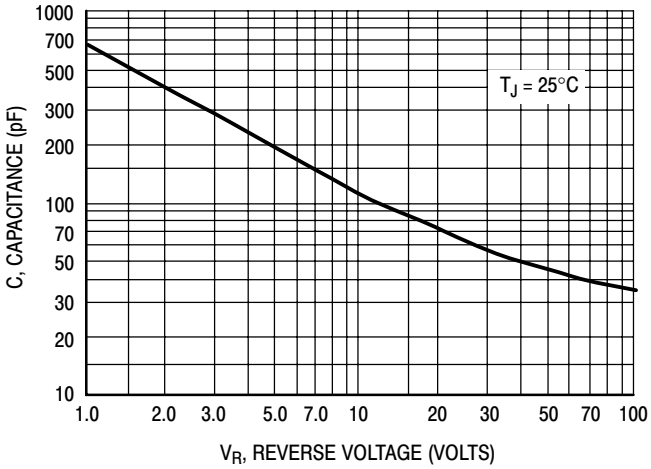



**Figure 11. Junction Capacitance**

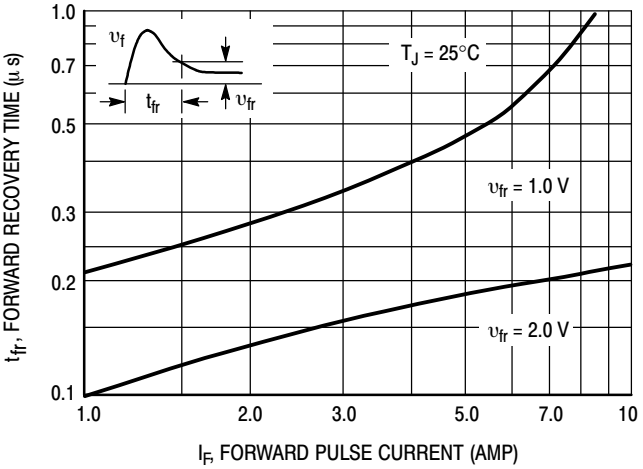



**Figure 12. Forward Recovery Time**

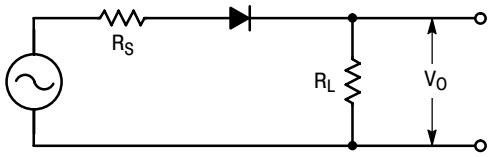



**Figure 13. Single−Phase Half−Wave Rectifier Circuit**

The rectification efficiency factor σ shown in Figure 9 was calculated using the formula:

$$\sigma = \frac{P_{(dc)}}{P_{(rms)}} = \frac{\frac{V^2_{O(dc)}}{R_L}}{\frac{V^2_{O(rms)}}{R_L}} \cdot 100\% = \frac{V^2_{O(dc)}}{V^2_{O(ac)} + V^2_{O(dc)}} \cdot 100\% \quad (1)$$

For a sine wave input $V_m$ sin (wt) to the diode, assumed lossless, the maximum theoretical efficiency factor becomes:

$$\sigma_{(sine)} = \frac{\frac{V^2_m}{\pi^2 R_L}}{\frac{V^2_m}{4R_L}} \cdot 100\% = \frac{4}{\pi^2} \cdot 100\% = 40.6\% \quad (2)$$

For a square wave input of amplitude $V_m$, the efficiency factor becomes:

$$\sigma_{(square)} = \frac{\frac{V^2_m}{2R_L}}{\frac{V^2_m}{R_L}} \cdot 100\% = 50\% \quad (3)$$

(A full wave circuit has twice these efficiencies)

As the frequency of the input signal is increased, the reverse recovery time of the diode (Figure 10) becomes significant, resulting in an increasing AC voltage component across $R_L$ which is opposite in polarity to the forward current, thereby reducing the value of the efficiency factor σ, as shown on Figure 9.

It should be emphasized that Figure 9 shows waveform efficiency only; it does not provide a measure of diode losses. Data was obtained by measuring the AC component of $V_o$ with a true rms AC voltmeter and the DC component with a DC voltmeter. The data was used in Equation 1 to obtain points for Figure 9.

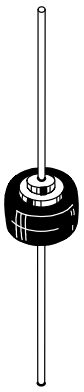
**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| MR750 | Axial Lead | 1000 Units / Box |
| MR750G | Axial Lead (Pb−Free) | |
| MR750RL | Axial Lead | 800 / Tape & Reel |
| MR750RLG | Axial Lead (Pb−Free) | |
| MR751 | Axial Lead | 1000 Units / Box |
| MR751G | Axial Lead (Pb−Free) | |
| MR751RL | Axial Lead | 800 / Tape & Reel |
| MR751RLG | Axial Lead (Pb−Free) | |
| MR752 | Axial Lead | 1000 Units / Box |
| MR752G | Axial Lead (Pb−Free) | |
| MR752RL | Axial Lead | 800 / Tape & Reel |
| MR752RLG | Axial Lead (Pb−Free) | |
| MR754 | Axial Lead | 1000 Units / Box |
| MR754G | Axial Lead (Pb−Free) | |
| MR754RL | Axial Lead | 800 / Tape & Reel |
| MR754RLG | Axial Lead (Pb−Free) | |
| MR756 | Axial Lead | 1000 Units / Box |
| MR756G | Axial Lead (Pb−Free) | |
| MR756RL | Axial Lead | 800 / Tape & Reel |
| MR756RLG | Axial Lead (Pb−Free) | |
| MR760 | Axial Lead | 1000 Units / Box |
| MR760G | Axial Lead (Pb−Free) | |
| MR760RL | Axial Lead | 800 / Tape & Reel |
| MR760RLG | Axial Lead (Pb−Free) | |

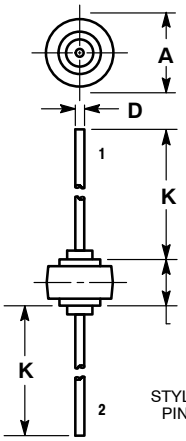
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**MICRODE AXIAL**
**CASE 194–04**
**ISSUE H**

**DATE 09 SEP 2003**



**SCALE 1:1**

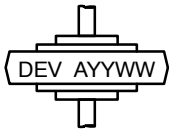



STYLE 1:
PIN 1. CATHODE
2. ANODE

NOTES:
1. CATHODE SYMBOL ON PACKAGE.
2. 194–01 OBSOLETE, 194–04 NEW STANDARD.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 8.43 | 8.69 | 0.332 | 0.342 |
| B | 5.94 | 6.25 | 0.234 | 0.246 |
| D | 1.27 | 1.35 | 0.050 | 0.053 |
| K | 25.15 | 25.65 | 0.990 | 1.010 |

**GENERIC MARKING DIAGRAM***




DEV = Specific Device Code
A = Assembly Location
YY = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking.

| | | |
|---|---|---|
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