

# MR750 SERIES

MR754 and MR760 are Preferred Devices

## High Current Lead Mounted Rectifiers

### Features

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

### Mechanical Characteristics:

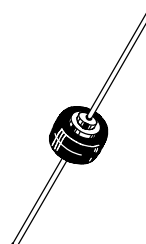
- Case: Epoxy, Molded
- Weight: 2.5 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Lead is Readily Solderable
- Lead Temperature for Soldering Purposes:  
260°C Max. for 10 Seconds
- Polarity: Cathode Polarity Band



**ON Semiconductor®**

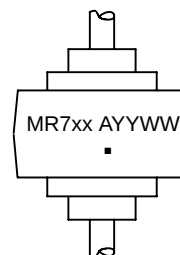
<http://onsemi.com>

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



**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.

## MR750 SERIES

### 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 ( $T_L = 60^\circ\text{C}$ , 1/8 in Lead Lengths)<br>6.0 ( $T_A = 60^\circ\text{C}$ , 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                                                                                                  |       |       |       |       |       | $^\circ\text{C}$ |

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 ( $I_F = 100\text{ A}$ , $T_J = 25^\circ\text{C}$ ) | $V_F$  | 1.25      | V                   |
| Maximum Forward Voltage Drop ( $I_F = 6.0\text{ A}$ , $T_A = 25^\circ\text{C}$ , 3/8 in leads) | $V_F$  | 0.90      | V                   |
| Maximum Reverse Current<br>(Rated DC Voltage)                                                  | $I_R$  | 25<br>1.0 | $\mu\text{A}$<br>mA |
|                                                                                                |        |           |                     |

# MR750 SERIES

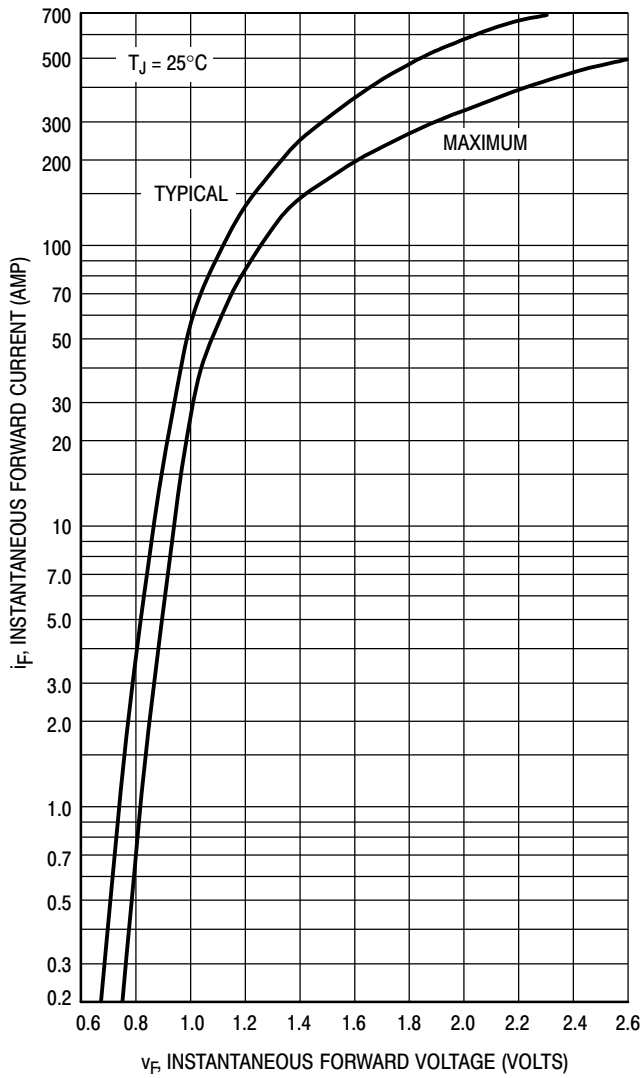


Figure 1. Forward Voltage

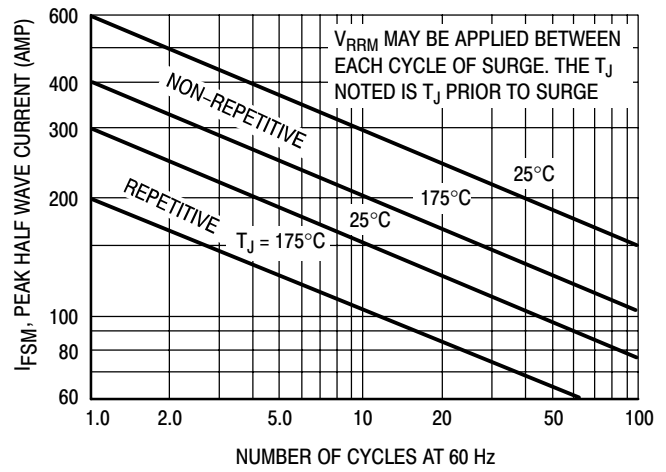


Figure 2. Maximum Surge Capability

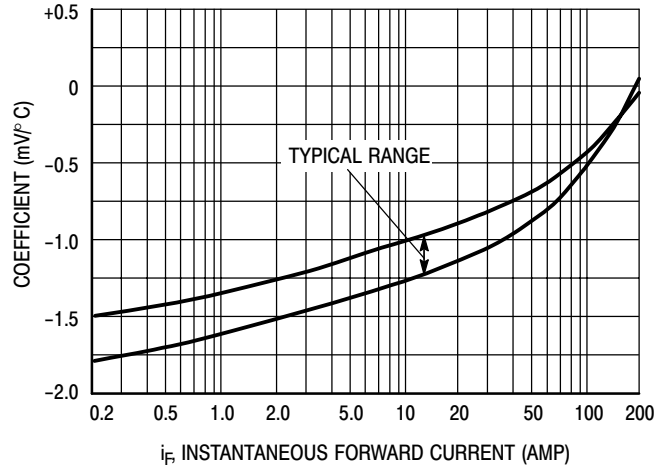


Figure 3. Forward Voltage Temperature Coefficient

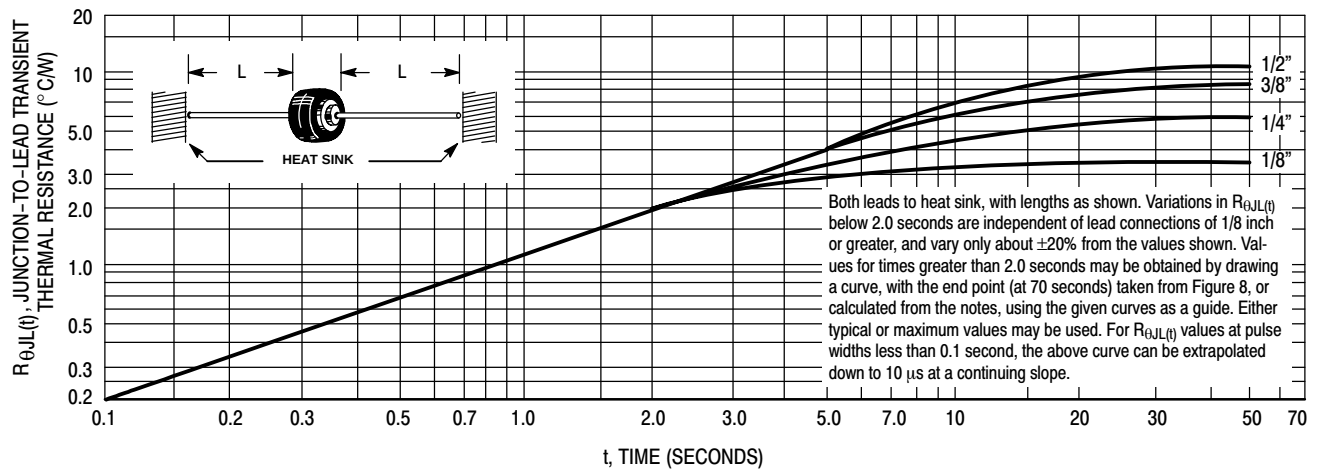


Figure 4. Typical Transient Thermal Resistance

# MR750 SERIES

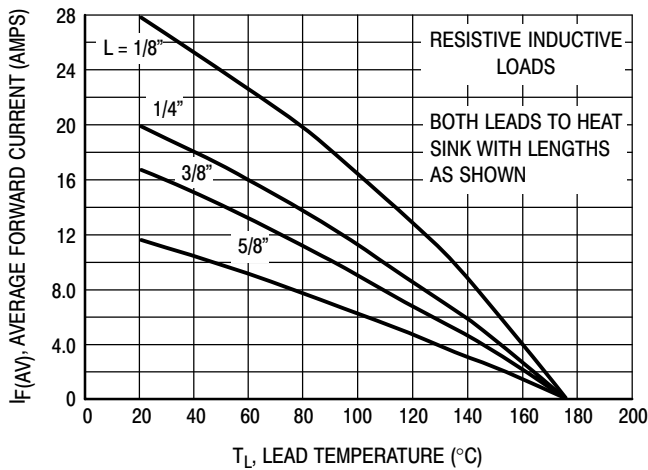


Figure 5. Maximum Current Ratings

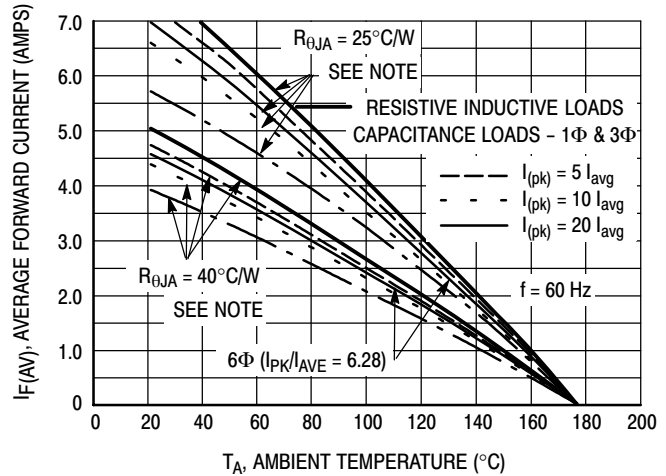


Figure 6. Maximum Current Ratings

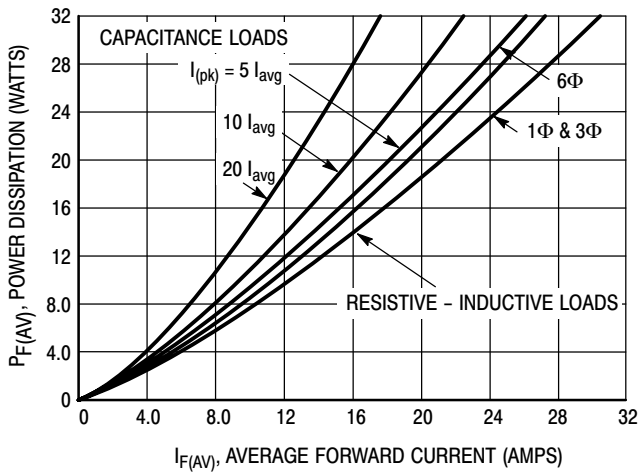


Figure 7. Power Dissipation

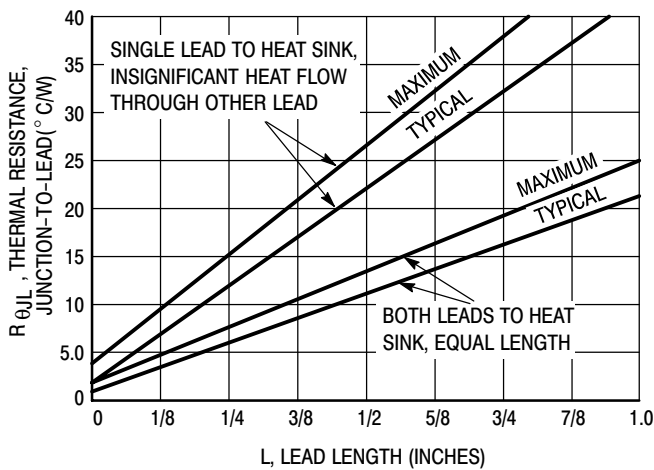
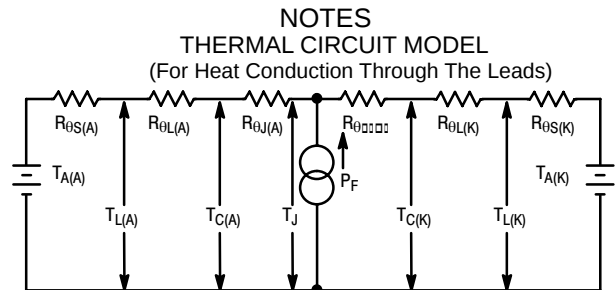


Figure 8. Steady State Thermal Resistance



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.)

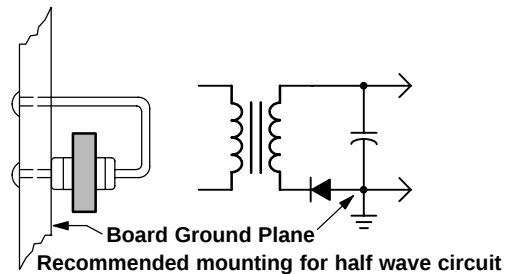
Values for thermal resistance components are:

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

$R_{\theta J} = 2^\circ\text{C/W}$  typically and  $4^\circ\text{C/W}$  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 rectifier the slow thermal response holds  $T_{J(PK)}$  close to  $T_{J(AVG)}$ . Therefore maximum lead temperature may be found from:  $T_L = 175^\circ - R_{\theta JL} P_F$ .  $P_F$  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  $25^\circ\text{C/W}$  for a  $1\text{-}1/2'' \times 1\text{-}1/2''$  copper surface area. Values of  $40^\circ\text{C/W}$  are typical for mounting to terminal strips or P.C. boards where available surface area is small.



# MR750 SERIES

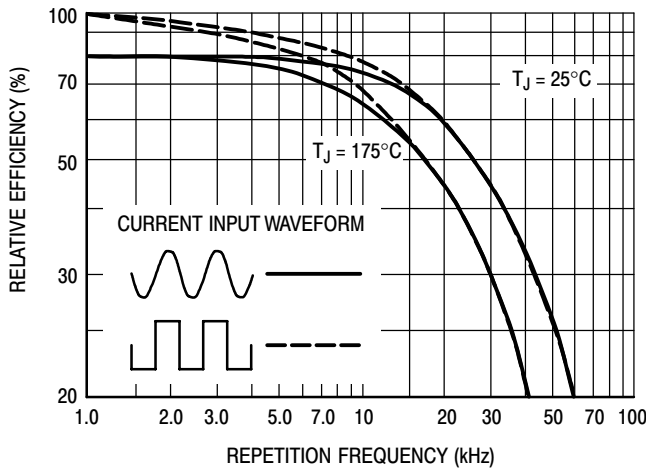


Figure 9. Rectification Efficiency

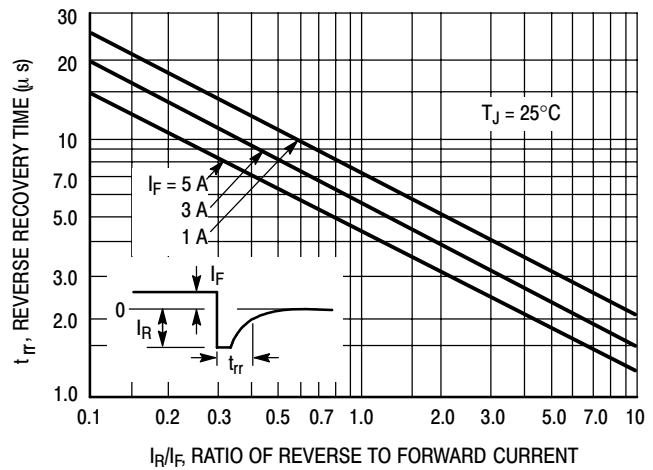


Figure 10. Reverse Recovery Time

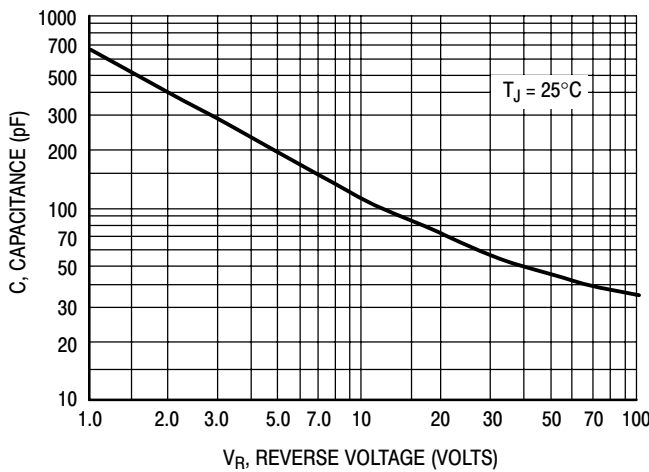


Figure 11. Junction Capacitance

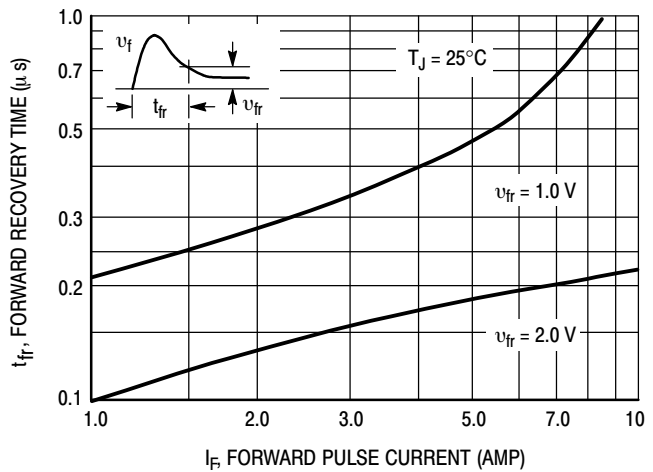


Figure 12. Forward Recovery Time

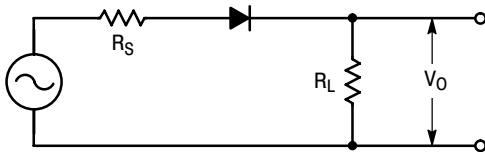


Figure 13. Single-Phase Half-Wave Rectifier Circuit

The rectification efficiency factor  $\sigma$  shown in Figure 9 was calculated using the formula:

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

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

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

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

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

(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  $\sigma$ , 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  $V_0$  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.

## MR750 SERIES

### ORDERING INFORMATION

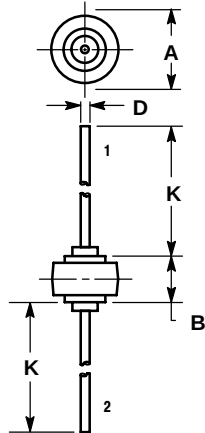
| Device   | Package              | Shipping <sup>†</sup> |
|----------|----------------------|-----------------------|
| MR750    | Axial Lead           | 1000 Units / Box      |
| MR750G   | Axial Lead (Pb-Free) |                       |
| MR750RL  | Axial Lead           | 800 / Tape & Reel     |
| 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) |                       |

<sup>†</sup>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.

# MR750 SERIES

## PACKAGE DIMENSIONS

### AXIAL LEAD BUTTON CASE 194-04 ISSUE H



#### NOTES:

1. CATHODE SYMBOL ON PACKAGE.
2. 194-01 OBSOLETE, 194-04 NEW STANDARD.

| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | 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 |

#### STYLE 1:

- PIN 1. CATHODE  
2. ANODE

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