

# 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:

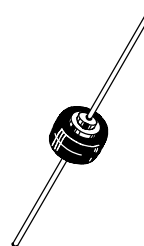
- Case: Epoxy, Molded
- Weight: 2.5 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Lead is Readily Solderable
- Lead Temperature for Soldering Purposes:  
260°C Max. for 10 Seconds
- Polarity: Cathode Polarity Band



**ON Semiconductor®**

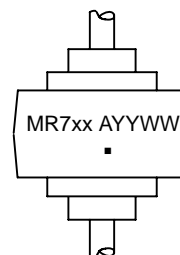
<http://onsemi.com>

**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 Working Peak Reverse Voltage DC Blocking Voltage	$V_{RRM}$ $V_{RWM}$ $V_R$	50	100	200	400	600	1000	V
Non-Repetitive Peak Reverse Voltage (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 (Single phase, resistive load, 60 Hz) (See Figures 5 and 6)	$I_O$	22 ( $T_L = 60^\circ\text{C}$ , 1/8 in Lead Lengths) 6.0 ( $T_A = 60^\circ\text{C}$ , P.C. Board mounting)						A
Non-Repetitive Peak Surge Current (Surge applied at rated load conditions)	$I_{FSM}$	400 (for 1 cycle)						A
Operating and Storage Junction 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 (Rated DC Voltage)	$I_R$	25 1.0	$\mu\text{A}$ mA
			$T_J = 25^\circ\text{C}$ $T_J = 100^\circ\text{C}$

# MR750 SERIES

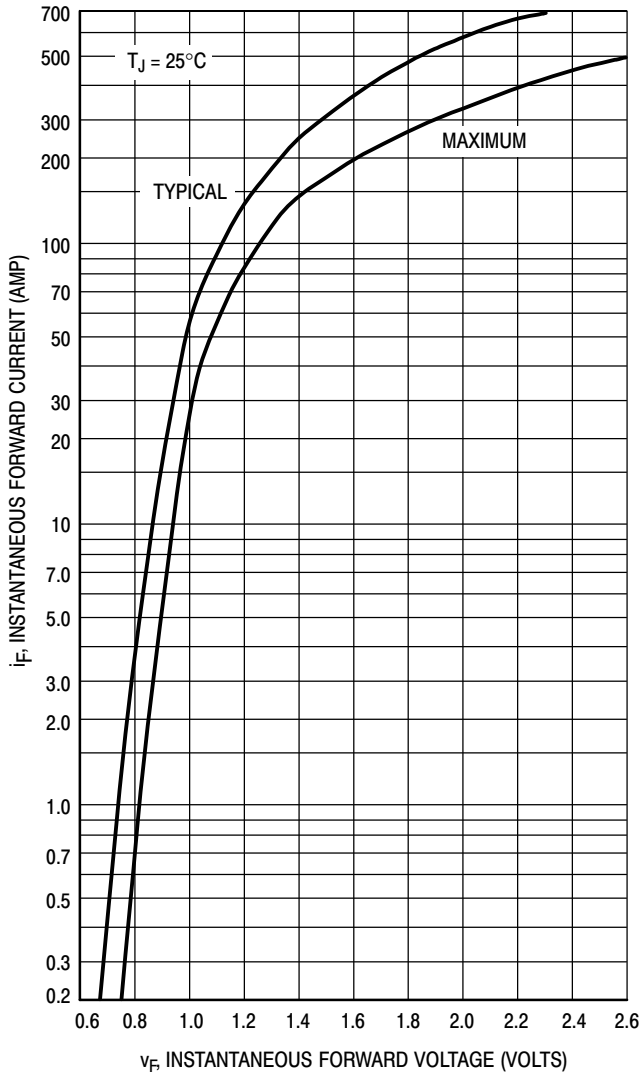


Figure 1. Forward Voltage

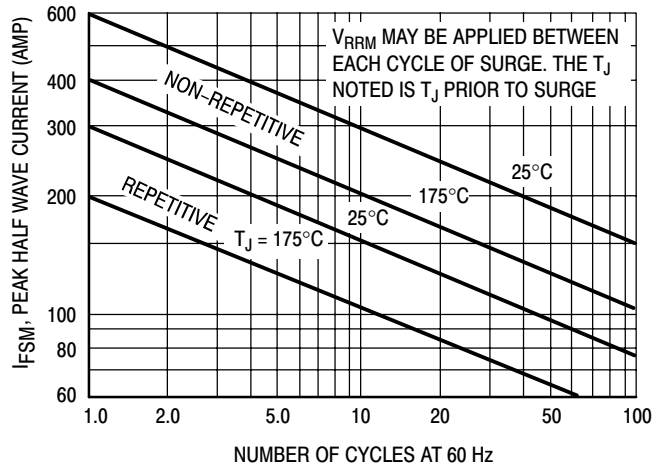


Figure 2. Maximum Surge Capability

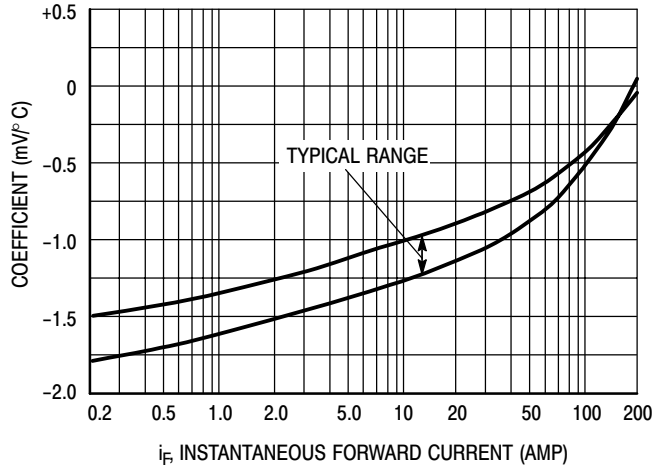


Figure 3. Forward Voltage Temperature Coefficient

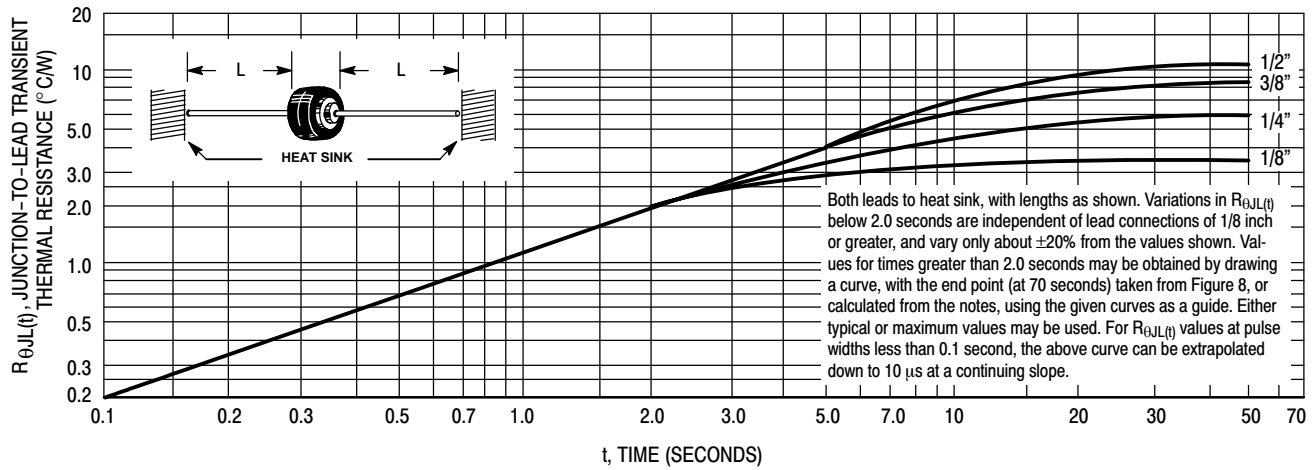


Figure 4. Typical Transient Thermal Resistance

# MR750 SERIES

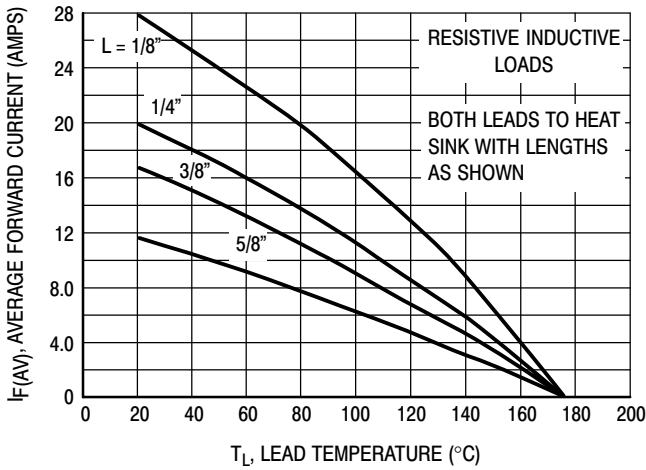


Figure 5. Maximum Current Ratings

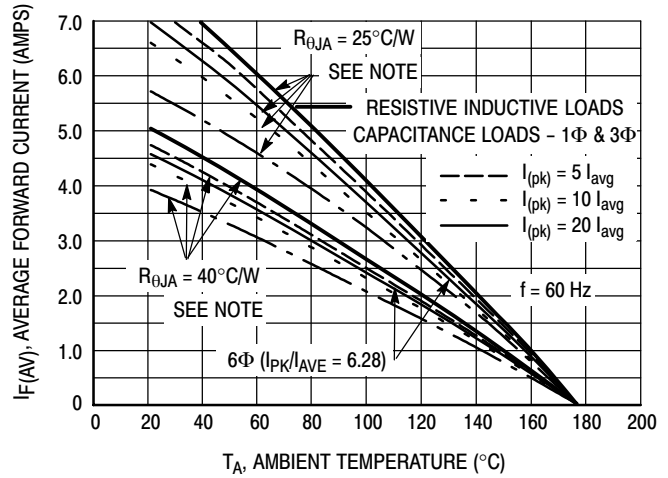


Figure 6. Maximum Current Ratings

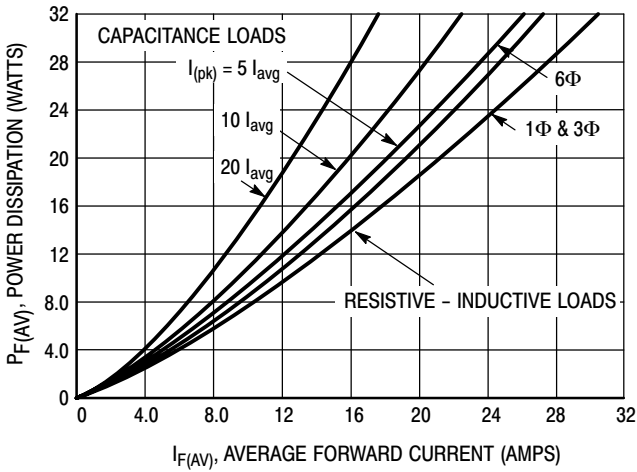


Figure 7. Power Dissipation

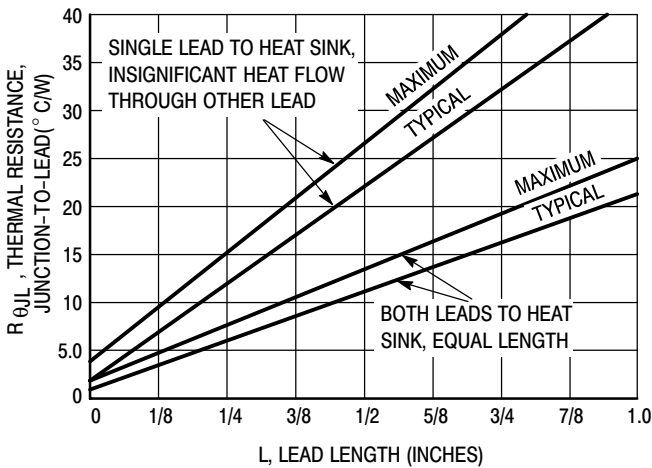
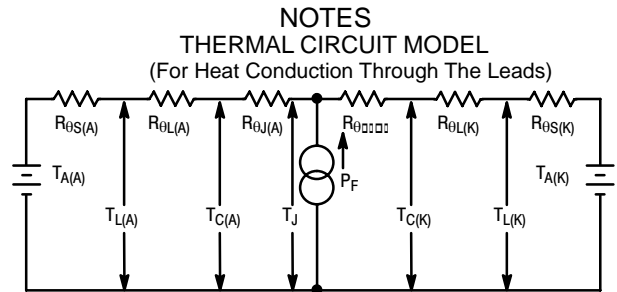


Figure 8. Steady State Thermal Resistance



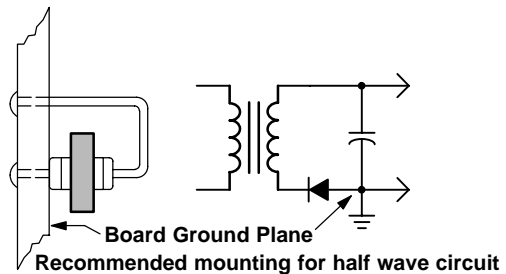
Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. Lowest values occur when one side of the rectifier is brought as close as possible to the heat sink as shown below. Terms in the model signify:

- $T_A$  = Ambient Temperature
  - $T_L$  = Lead 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
  - $T_C$  = Case Temperature
  - $T_J$  = Junction Temperature
- (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  $T_{J(ave)}$ . 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  $1-1/2'' \times 1-1/2''$  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

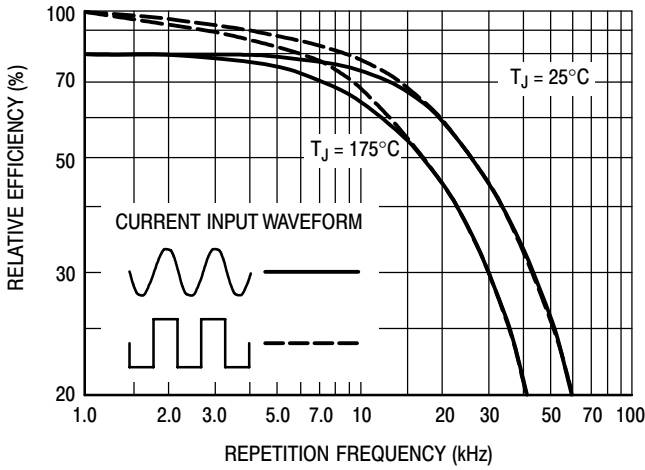


Figure 9. Rectification Efficiency

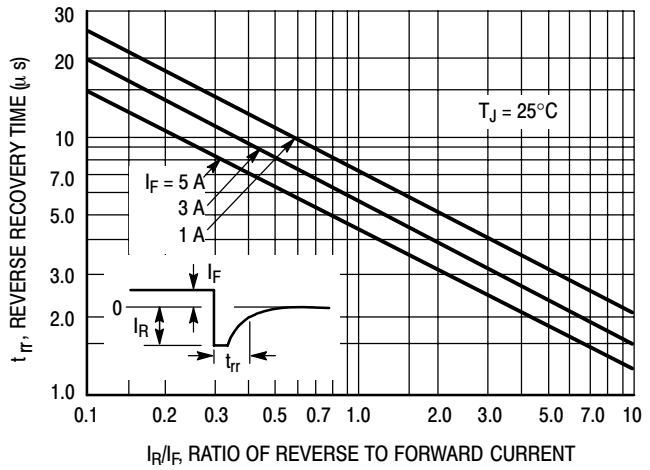


Figure 10. Reverse Recovery Time

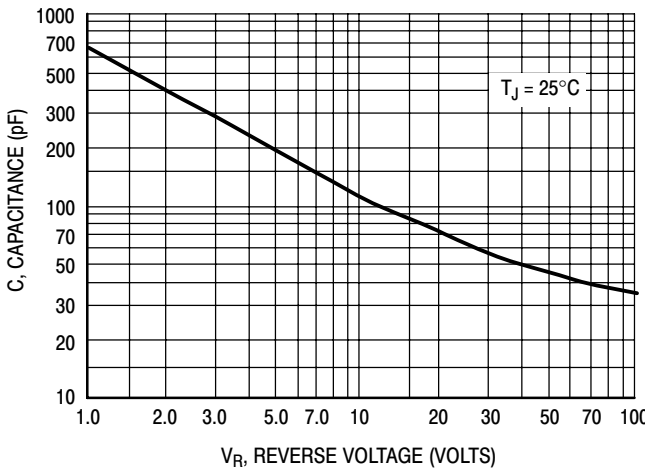


Figure 11. Junction Capacitance

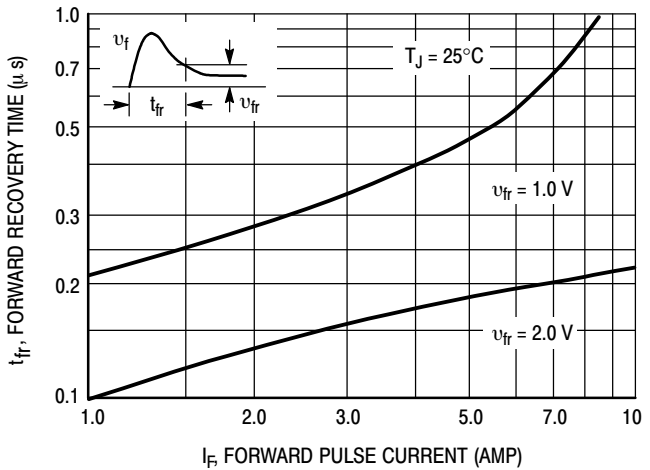


Figure 12. Forward Recovery Time

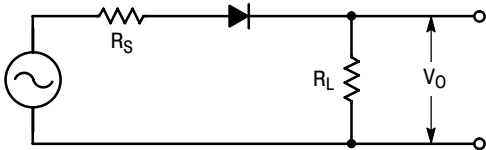


Figure 13. Single-Phase Half-Wave Rectifier Circuit

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

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

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

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

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

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

(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  $\sigma$ , 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  $V_o$  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.

# MR750 SERIES

## ORDERING INFORMATION

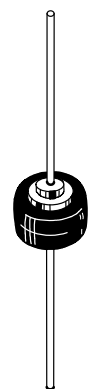
Device	Package	Shipping†
MR750	Axial Lead	1000 Units / Box
MR750G	Axial Lead (Pb-Free)	
MR750RL	Axial Lead	800 / Tape & Reel
MR750RLG	Axial Lead (Pb-Free)	
MR751	Axial Lead	1000 Units / Box
MR751G	Axial Lead (Pb-Free)	
MR751RL	Axial Lead	800 / Tape & Reel
MR751RLG	Axial Lead (Pb-Free)	
MR752	Axial Lead	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.

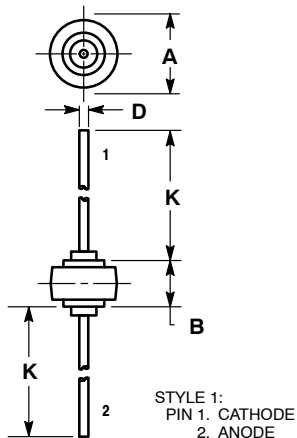


**MICRODE AXIAL  
CASE 194-04  
ISSUE H**

**DATE 09 SEP 2003**



SCALE 1:1

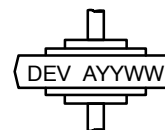


NOTES:

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

**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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