MR750 SERIES

MR754 and MR760 are Preferred Devices

High Current Lead Mounted Rectifiers

- Current Capacity Comparable to Chassis Mounted Rectifiers
- Very High Surge Capacity
- Insulated Case

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
- Shipped 1000 units per plastic bag. Available Tape and Reeled, 800 units per reel by adding a "RL" suffix to the part number
- Marking: MR750 — R750
  MR751 — R751
  MR752 — R752
  MR754 — R754
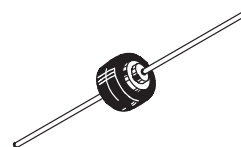 MR756 — R756
  MR758 — R758
  MR760 — R760

ON Semiconductor
Formerly a Division of Motorola
http://onsemi.com

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

**AXIAL LEAD
CASE 194
STYLE 1**

ORDERING INFORMATION

Device	Package	Shipping
MR750RL	Axial Lead	800/Tape & Reel
MR751RL	Axial Lead	800/Tape & Reel
MR752RL	Axial Lead	800/Tape & Reel
MR754RL	Axial Lead	800/Tape & Reel
MR756RL	Axial Lead	800/Tape & Reel
MR758RL	Axial Lead	800/Tape & Reel
MR760RL	Axial Lead	800/Tape & Reel

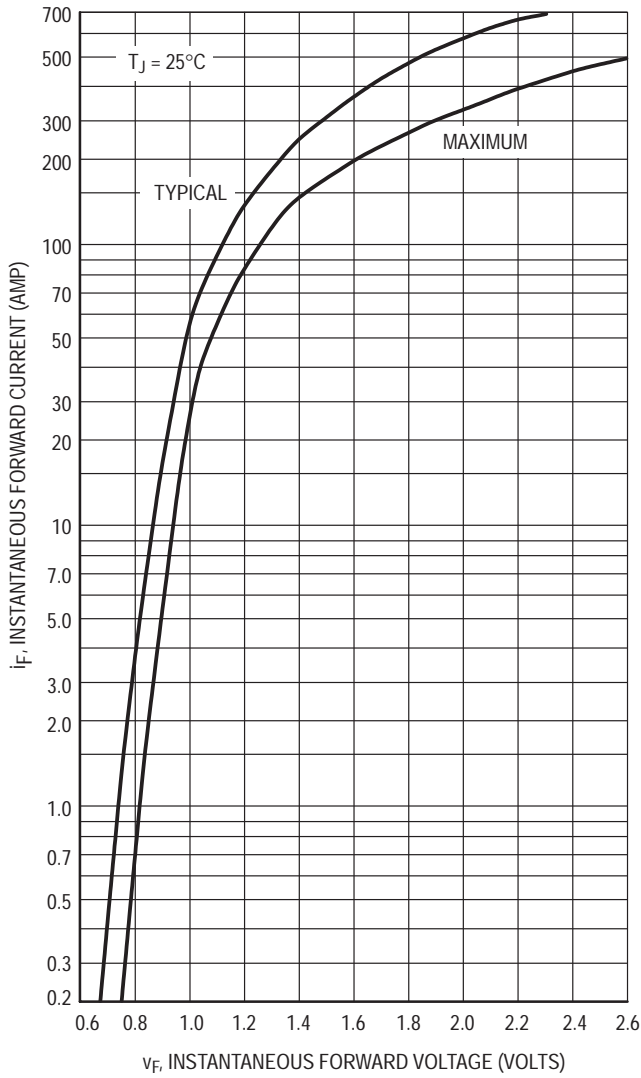**Preferred** devices are recommended choices for future use and best overall value.

MAXIMUM RATINGS

Characteristic	Symbol	MR750	MR751	MR752	MR754	MR756	MR758	MR760	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	50	100	200	400	600	800	1000	Volts
Non–Repetitive Peak Reverse Voltage (Halfwave, single phase, 60 Hz peak)	V_{RSM}	60	120	240	480	720	960	1200	Volts
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	140	280	420	560	700	Volts
Average Rectified Forward Current (Single phase, resistive load, 60 Hz) See Figures 5 and 6	I_O	22 ($T_L = 60°C$, 1/8″ Lead Lengths) 6.0 ($T_A = 60°C$, P.C. Board mounting)							Amps
Non–Repetitive Peak Surge Current (Surge applied at rated load conditions)	I_{FSM}	400 (for 1 cycle)							Amps
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to $+175$							°C

ELECTRICAL CHARACTERISTICS

Characteristic and Conditions		Symbol	Max	Unit
Maximum Instantaneous Forward Voltage Drop ($i_F = 100$ Amps, $T_J = 25°C$)		v_F	1.25	Volts
Maximum Forward Voltage Drop ($I_F = 6.0$ Amps, $T_A = 25°C$, 3/8″ leads)		V_F	0.90	Volts
Maximum Reverse Current (Rated dc Voltage)	$T_J = 25°C$ $T_J = 100°C$	I_R	25 1.0	μA mA

Figure 1. Forward Voltage

V_{RRM} MAY BE APPLIED BETWEEN EACH CYCLE OF SURGE. THE T_J NOTED IS T_J PRIOR TO SURGE
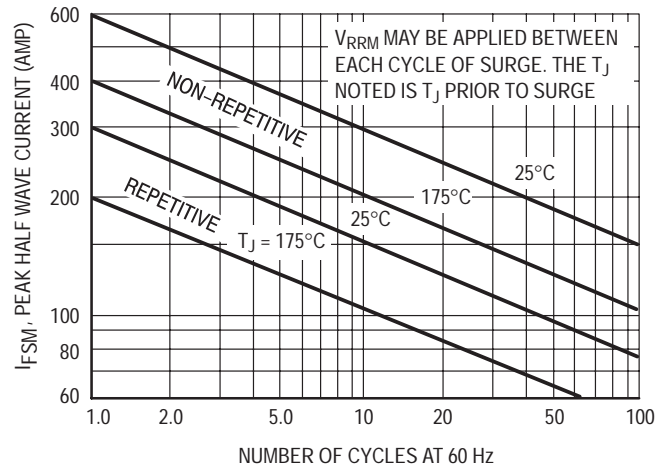
Figure 2. Maximum Surge Capability
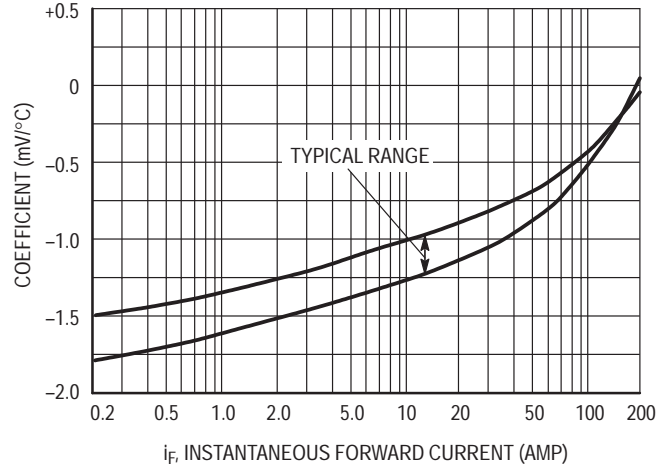
Figure 3. Forward Voltage Temperature Coefficient

Both leads to heat sink, with lengths as shown. Variations in $R_{\theta JL(t)}$ below 2.0 seconds are independent of lead connections of 1/8 inch or greater, and vary only about ±20% from the values shown. Values for times greater than 2.0 seconds may be obtained by drawing a curve, with the end point (at 70 seconds) taken from Figure 8, or calculated from the notes, using the given curves as a guide. Either typical or maximum values may be used. For $R_{\theta JL(t)}$ values at pulse widths less than 0.1 second, the above curve can be extrapolated down to 10 μs at a continuing slope.

Figure 4. Typical Transient Thermal Resistance
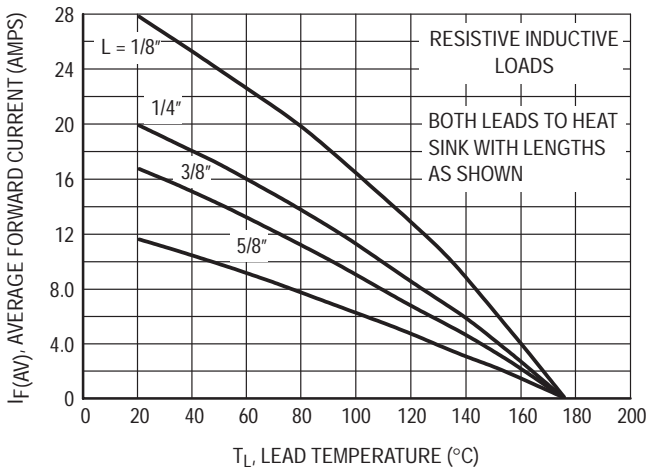
Figure 5. Maximum Current Ratings
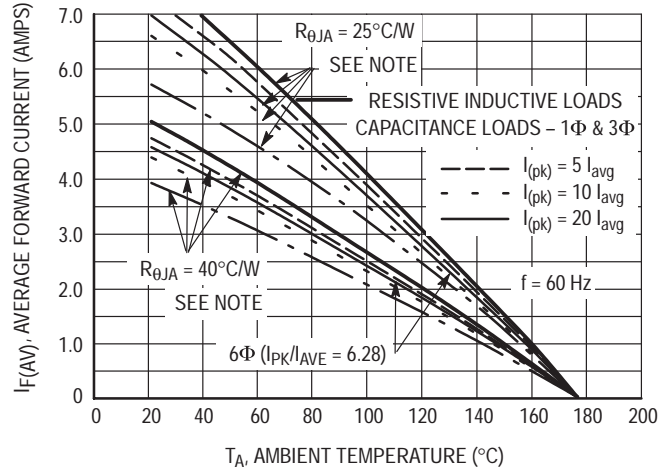
Figure 6. Maximum Current Ratings
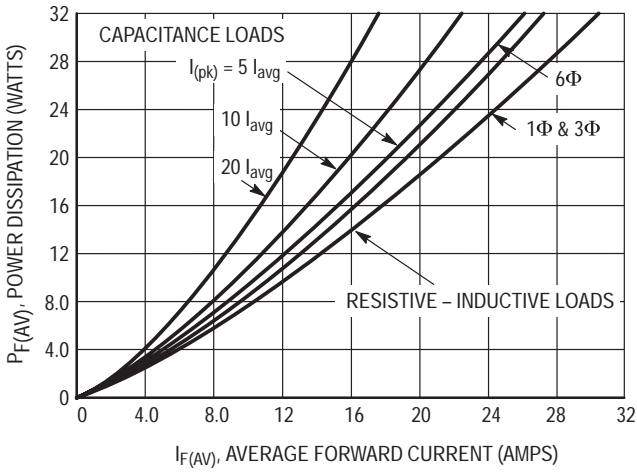
Figure 7. Power Dissipation
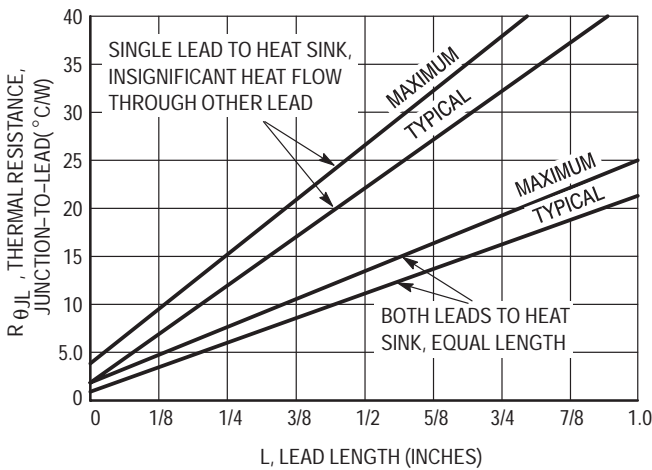
Figure 8. Steady State Thermal Resistance

NOTES
THERMAL CIRCUIT MODEL
(For Heat Conduction Through The Leads)
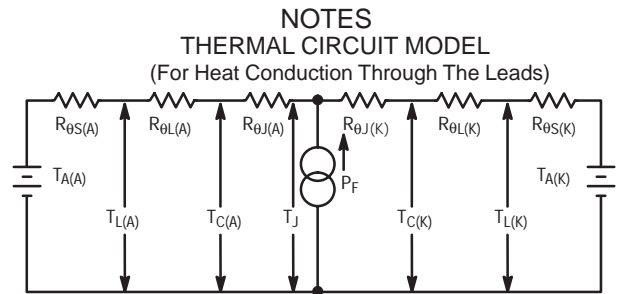
Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. Lowest values occur when one side of the rectifier is brought as close as possible to the heat sink as shown below. Terms in the model signify:

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.

Board Ground Plane
Recommended mounting for half wave circuit
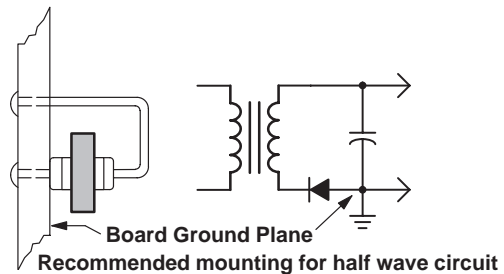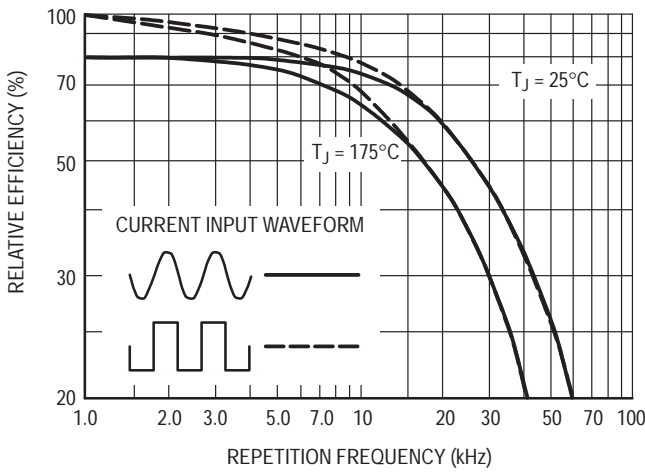
Figure 9. Rectification Efficiency
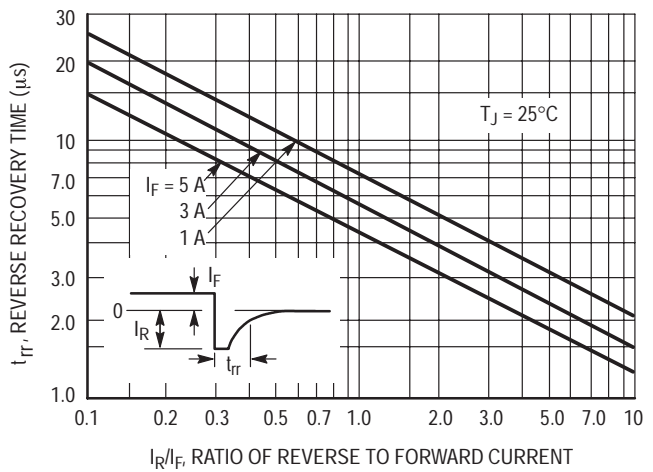
Figure 10. Reverse Recovery Time
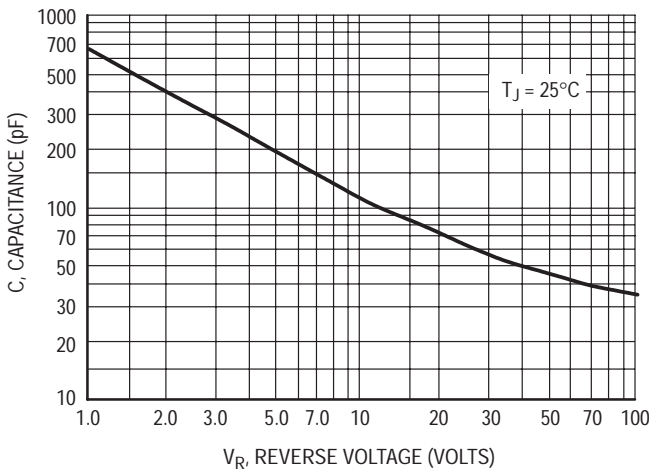
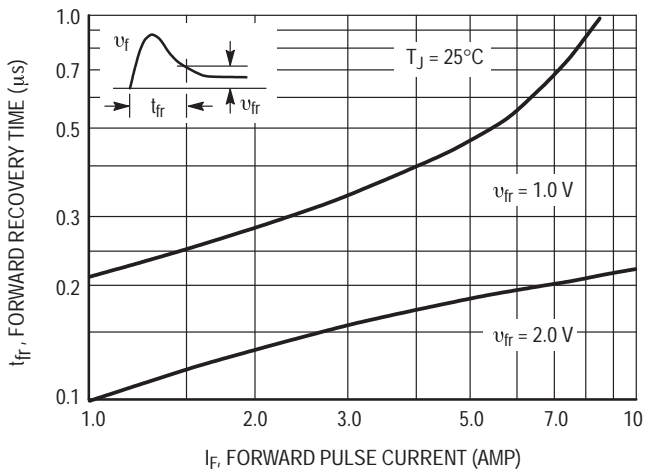**Figure 11. Junction Capacitance**
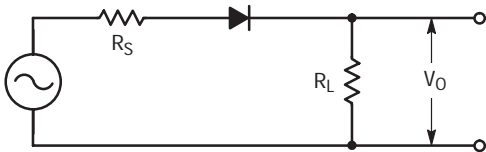

Figure 12. Forward Recovery Time

Figure 13. Single–Phase Half–Wave Rectifier Circuit

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

$$\sigma = \frac{P_{(dc)}}{P_{(rms)}} = \frac{\dfrac{V^2{}_O(dc)}{R_L}}{\dfrac{V^2{}_O(rms)}{R_L}} \cdot 100\% = \frac{V^2{}_O(dc)}{V^2{}_O(ac) + V^2{}_O(dc)} \cdot 100\% \qquad (1)$$

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

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

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

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

(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.

PACKAGE DIMENSIONS

AXIAL LEAD
CASE 194–04
ISSUE F
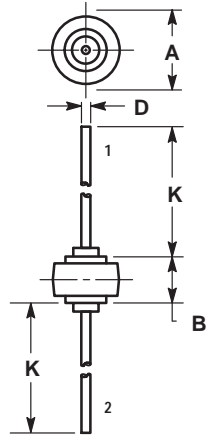
NOTES:
1. CATHODE SYMBOL ON PACKAGE.

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

<u>**Notes**</u>

PUBLICATION ORDERING INFORMATION