

**MOTOROLA**  
**SEMICONDUCTOR TECHNICAL DATA**

*Designer's™ Data Sheet*  
**High Current Lead Mounted Rectifiers**

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

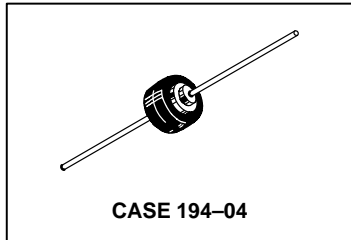
**Mechanical Characteristics:**

- 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: R750, R751, R752, R754, R758, R760

**MR750**  
**MR751**  
**MR752**  
**MR754**  
**MR756**  
**MR758**  
**MR760**

MR754 and MR760 are  
Motorola Preferred Devices

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



**MAXIMUM RATINGS**

| Characteristic  | Symbol                          | MR750   | MR751 | MR752 | MR754 | MR756 | MR758 | 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   | 800   | 1000  | Volts |
| Non-Repetitive Peak Reverse Voltage<br>(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<br>(Single phase, resistive load, 60 Hz)<br>See Figures 5 and 6 | $I_O$                           | ← 22 ( $T_L = 60^\circ\text{C}$ , 1/8" Lead Lengths) →<br>6.0 ( $T_A = 60^\circ\text{C}$ , P.C. Board mounting) |       |       |       |       |       |       | Amps  |
| Non-Repetitive Peak Surge Current<br>(Surge applied at rated load conditions)                     | $I_{FSM}$                       | ← 400 (for 1 cycle) →   |       |       |       |       |       |       | Amps  |
| Operating and Storage Junction<br>Temperature Range   | $T_J, T_{stg}$                  | ← -65 to +175 →   |       |       |       |       |       |       | °C    |

**ELECTRICAL CHARACTERISTICS**

| Characteristic and Conditions  | Symbol | Max       | Unit                |
|--|--------|-----------|---------------------|
| Maximum Instantaneous Forward Voltage Drop<br>( $i_F = 100$ Amps, $T_J = 25^\circ\text{C}$ ) | $v_F$  | 1.25      | Volts               |
| Maximum Forward Voltage Drop<br>( $I_F = 6.0$ Amps, $T_A = 25^\circ\text{C}$ , 3/8" leads)   | $V_F$  | 0.90      | Volts               |
| Maximum Reverse Current<br>(Rated dc Voltage)  | $I_R$  | 25<br>1.0 | $\mu\text{A}$<br>mA |

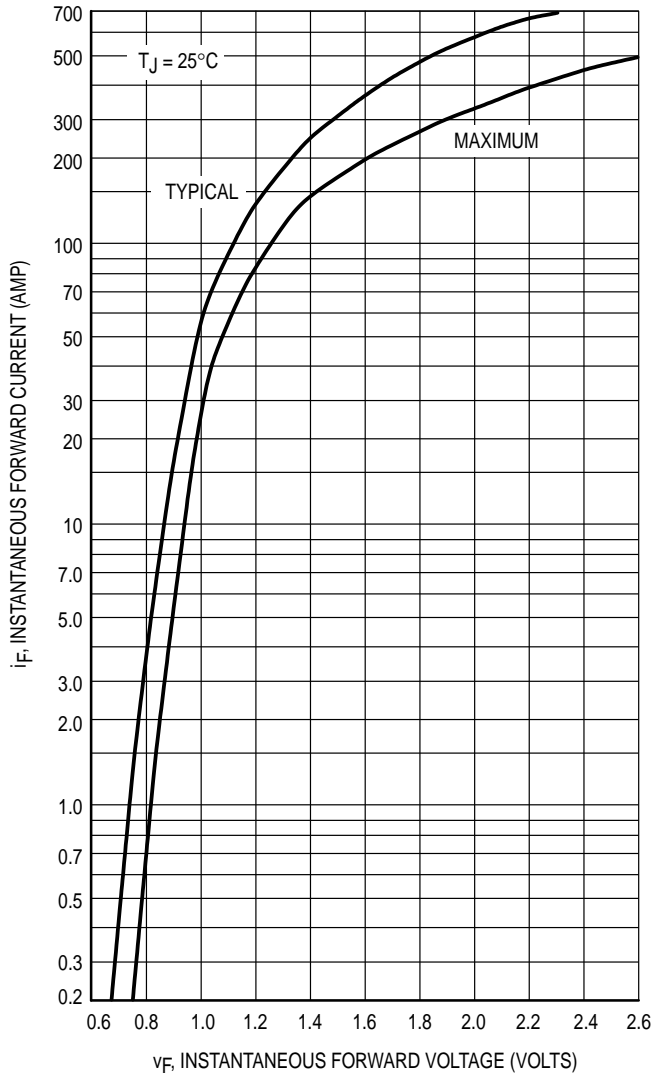
**Designer's Data for "Worst Case" Conditions** — The Designer's Data Sheet permits the design of most circuits entirely from the information presented. SOA Limit curves — representing boundaries on device characteristics — are given to facilitate "worst case" design.

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

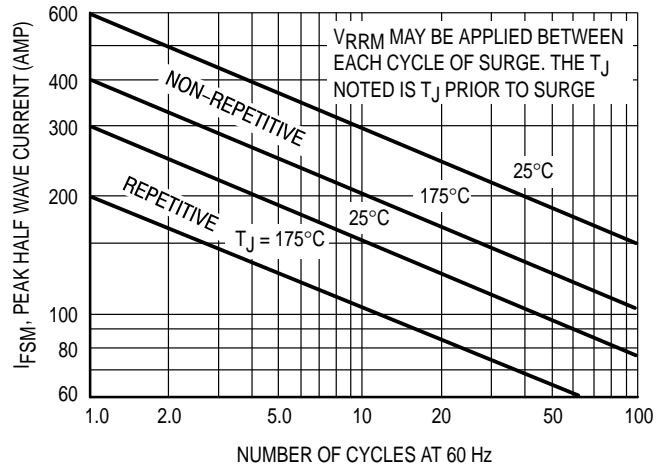
Rev 2



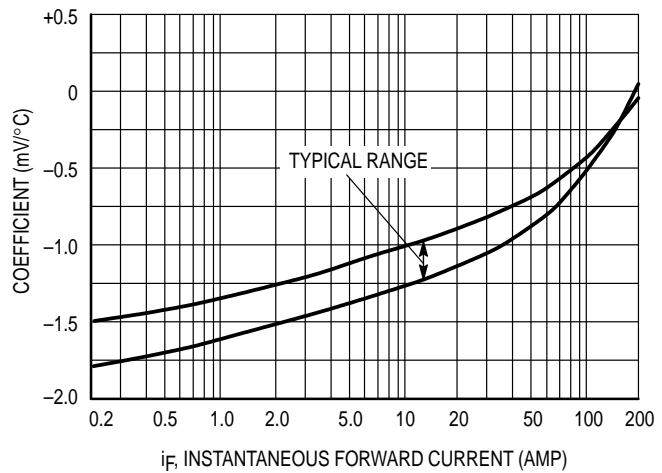
**MR750 MR751 MR752 MR754 MR756 MR758 MR760**



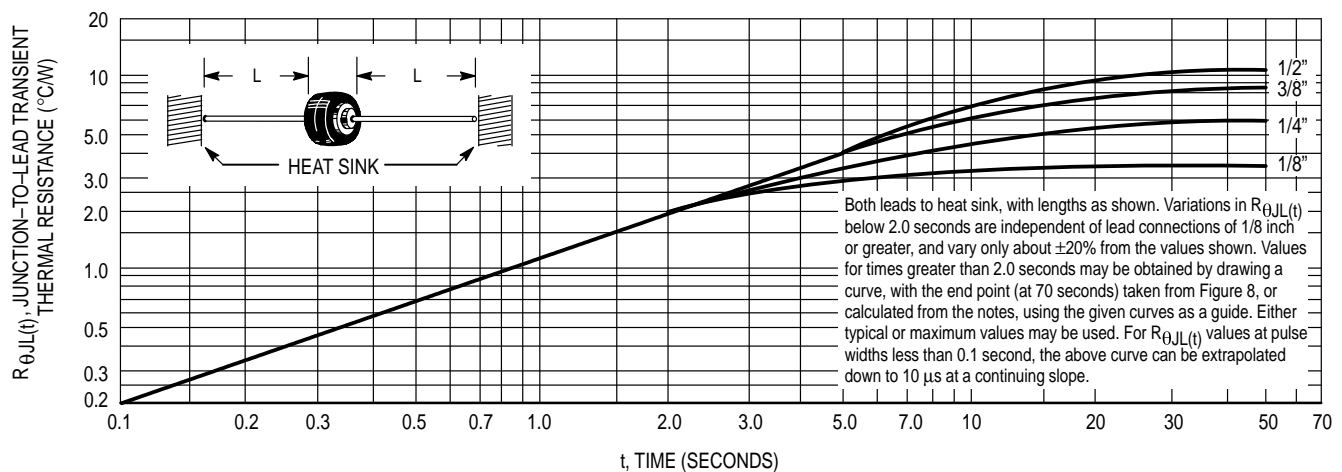
**Figure 1. Forward Voltage**



**Figure 2. Maximum Surge Capability**

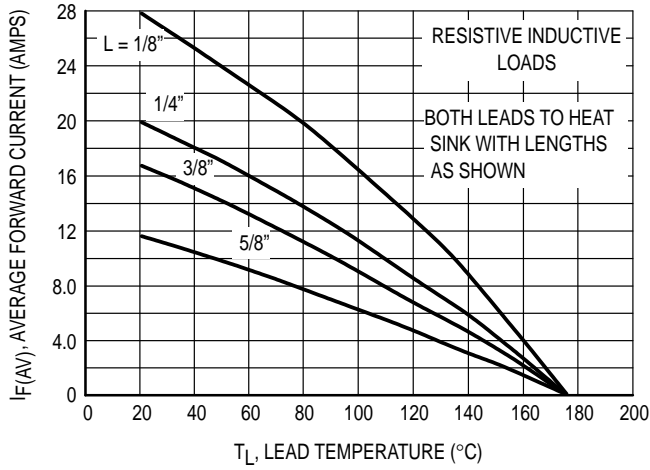


**Figure 3. Forward Voltage Temperature Coefficient**

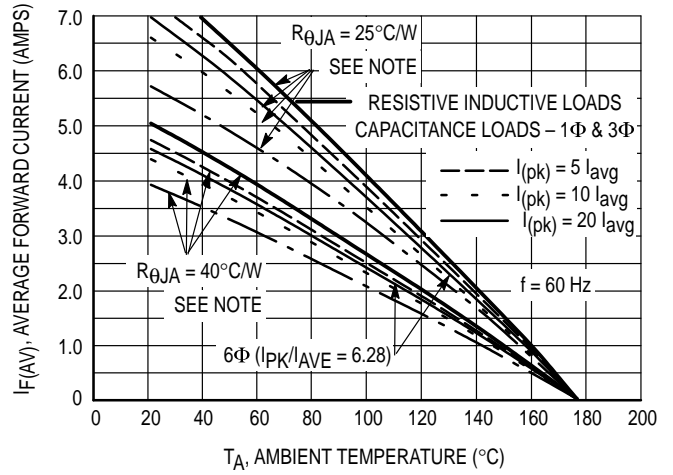


**Figure 4. Typical Transient Thermal Resistance**

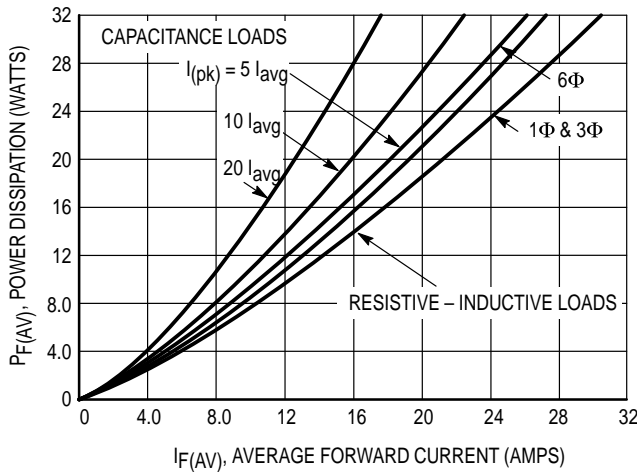
**MR750 MR751 MR752 MR754 MR756 MR758 MR760**



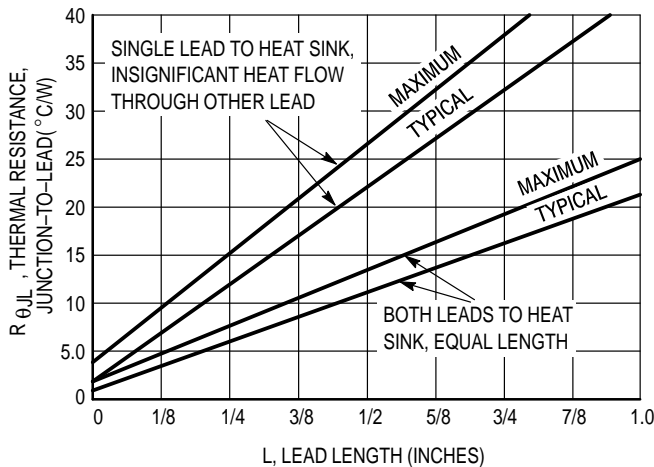
**Figure 5. Maximum Current Ratings**



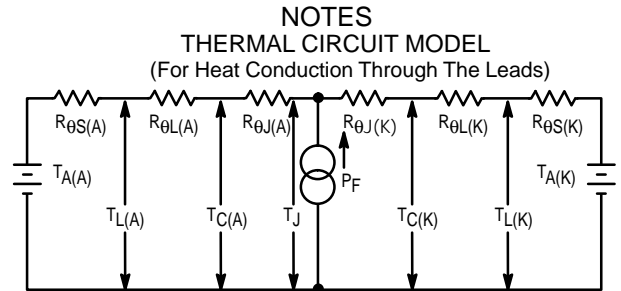
**Figure 6. Maximum Current Ratings**



**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:

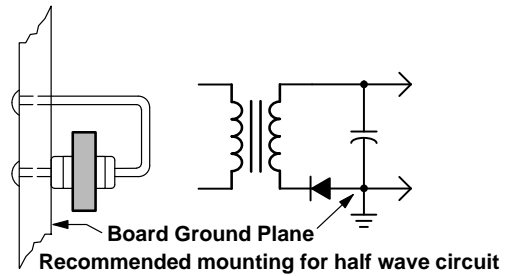
- $T_A$  = Ambient Temperature
- $T_L$  = Lead Temperature
- $R_{\theta S}$  = Thermal Resistance, Heat Sink to Ambient
- $R_{\theta L}$  = Thermal Resistance, Lead to Heat Sink
- $R_{\theta J}$  = Thermal Resistance, Junction to Case
- $P_F$  = Power Dissipation
- $T_C$  = Case Temperature
- $T_J$  = Junction Temperature

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

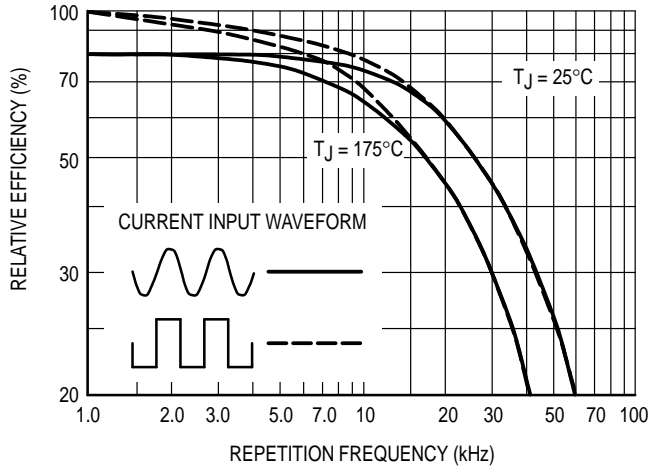
Values for thermal resistance components are:  
 $R_{\theta L}$  = 40°C/W/in. Typically and 44°C/W/in Maximum.  
 $R_{\theta J}$  = 2°C/W typically and 4°C/W Maximum.

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 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.

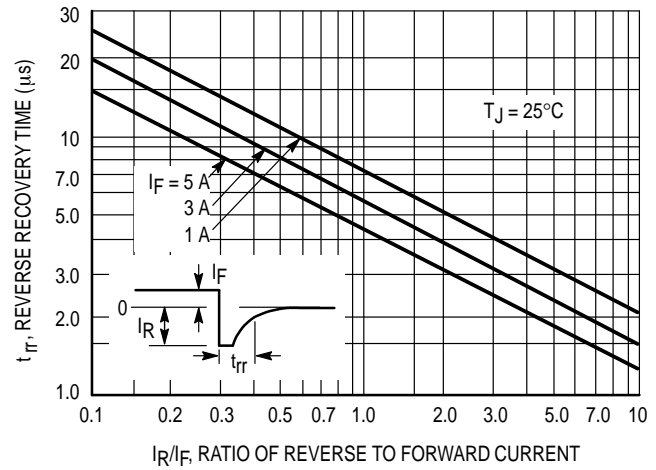
The recommended method of mounting to a P.C. board is shown on the sketch, where  $R_{\theta JA}$  is approximately 25°C/W for a 1-1/2" x 1-1/2" copper surface area. Values of 40°C/W are typical for mounting to terminal strips or P.C. boards where available surface area is small.



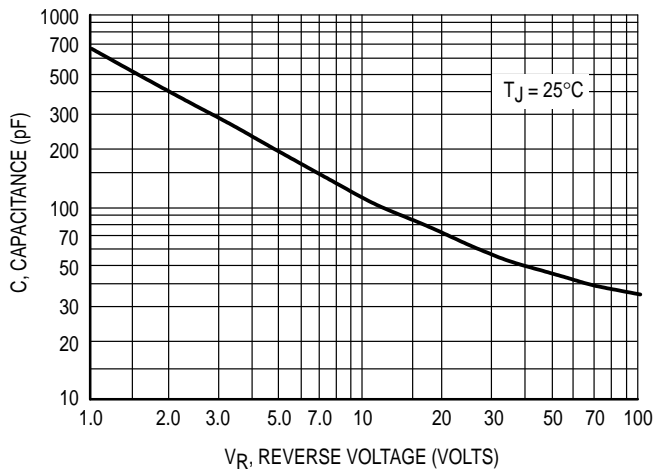
**MR750 MR751 MR752 MR754 MR756 MR758 MR760**



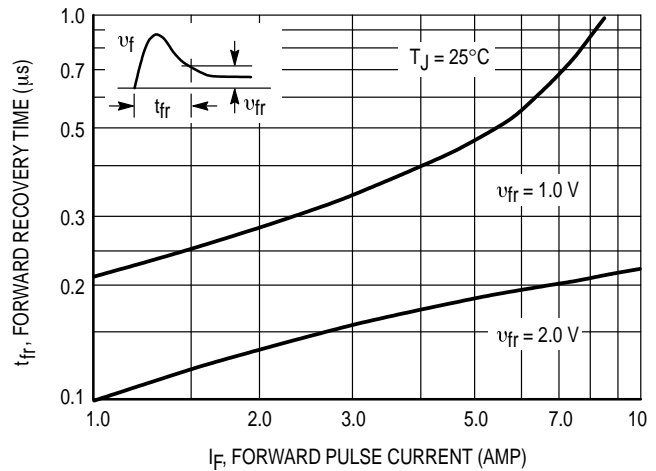
**Figure 9. Rectification Efficiency**



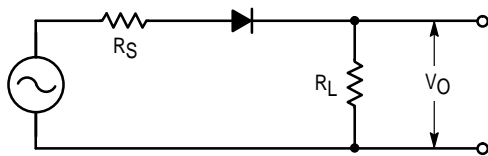
**Figure 10. Reverse Recovery Time**



**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:

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

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

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

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

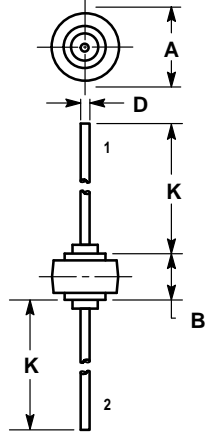
$$\sigma_{(square)} = \frac{\frac{V_{2m}}{2R_L}}{\frac{V_{2m}}{R_L}} \cdot 100\% = 50\% \quad (3)$$

(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 MR751 MR752 MR754 MR756 MR758 MR760**  
**PACKAGE DIMENSIONS**




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 |
| E   | 25.15       | 25.65 | 0.990  | 1.010 |

STYLE 1:  
PIN 1. CATHODE  
2. ANODE

**CASE 194-04**  
**ISSUE F**

**MR750 MR751 MR752 MR754 MR756 MR758 MR760**

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