

# MBR150, MBR160

MBR160 is a Preferred Device

## Axial Lead Rectifiers

The MBR150/160 series employs the Schottky Barrier principle in a large area metal-to-silicon power diode. State-of-the-art geometry features epitaxial construction with oxide passivation and metal overlap contact. Ideally suited for use as rectifiers in low-voltage, high-frequency inverters, free wheeling diodes, and polarity protection diodes.

### Features

- Low Reverse Current
- Low Stored Charge, Majority Carrier Conduction
- Low Power Loss/High Efficiency
- Highly Stable Oxide Passivated Junction
- These are Pb-Free Devices\*

### Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 0.4 Gram (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes:  
260°C Max. for 10 Seconds
- Polarity: Cathode Indicated by Polarity Band

### MAXIMUM RATINGS

| Rating   | Symbol             | Value                    | Unit       |
|--|--------------------|--------------------------|------------|
| Peak Repetitive Reverse Voltage<br>MBR150<br>MBR160  | $V_{RRM}$          | 50<br>60                 | V          |
| Working Peak Reverse Voltage<br>DC Blocking Voltage  | $V_{RWM}$<br>$V_R$ |                          |            |
| RMS Reverse Voltage<br>MBR150<br>MBR160  | $V_{R(RMS)}$       | 35<br>42                 | V          |
| Average Rectified Forward Current (Note 1)<br>( $V_{R(equiv)} \leq 0.2 V_R(dc)$ , $T_L = 90^\circ C$ ,<br>$R_{\theta JA} = 80^\circ C/W$ , P.C. Board Mounting, $T_A = 55^\circ C$ ) | $I_O$              | 1.0                      | A          |
| Nonrepetitive Peak Surge Current<br>(Surge applied at rated load conditions,<br>halfwave, single phase, 60 Hz, $T_L = 70^\circ C$ )  | $I_{FSM}$          | 25<br>(for one<br>cycle) | A          |
| Operating and Storage Junction Temperature<br>Range (Reverse Voltage Applied)  | $T_J$ , $T_{stg}$  | -65 to<br>+150           | $^\circ C$ |

### THERMAL CHARACTERISTICS (Notes 1 and 2)

| Characteristic                          | Symbol          | Max | Unit         |
|---|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 80  | $^\circ C/W$ |

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.

1. Lead Temperature reference is cathode lead 1/32" from case.
2. Pulse Test: Pulse Width = 300  $\mu s$ , Duty Cycle  $\leq 2.0\%$ .

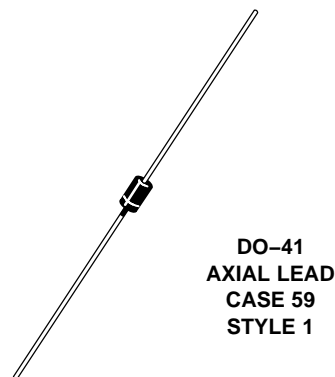
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



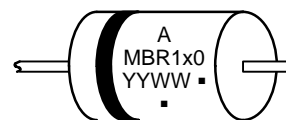
ON Semiconductor®

<http://onsemi.com>

## SCHOTTKY BARRIER RECTIFIERS 1.0 AMPERE – 50 AND 60 VOLTS



### MARKING DIAGRAM



A = Assembly Location  
MBR1x0 = Device Code  
x = 5 or 6  
Y = 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 4 of this data sheet.

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

# MBR150, MBR160

## ELECTRICAL CHARACTERISTICS ( $T_L = 25^\circ\text{C}$ unless otherwise noted) (Note 1)

| Characteristic   | Symbol | Max                     | Unit |
|--|--------|-------------------------|------|
| Maximum Instantaneous Forward Voltage (Note 2)<br>( $i_F = 0.1\text{ A}$ )<br>( $i_F = 1.0\text{ A}$ )<br>( $i_F = 3.0\text{ A}$ ) | $V_F$  | 0.550<br>0.750<br>1.000 | V    |
| Maximum Instantaneous Reverse Current @ Rated dc Voltage (Note 2)<br>( $T_L = 25^\circ\text{C}$ )<br>( $T_L = 100^\circ\text{C}$ ) | $i_R$  | 0.5<br>5.0              | mA   |

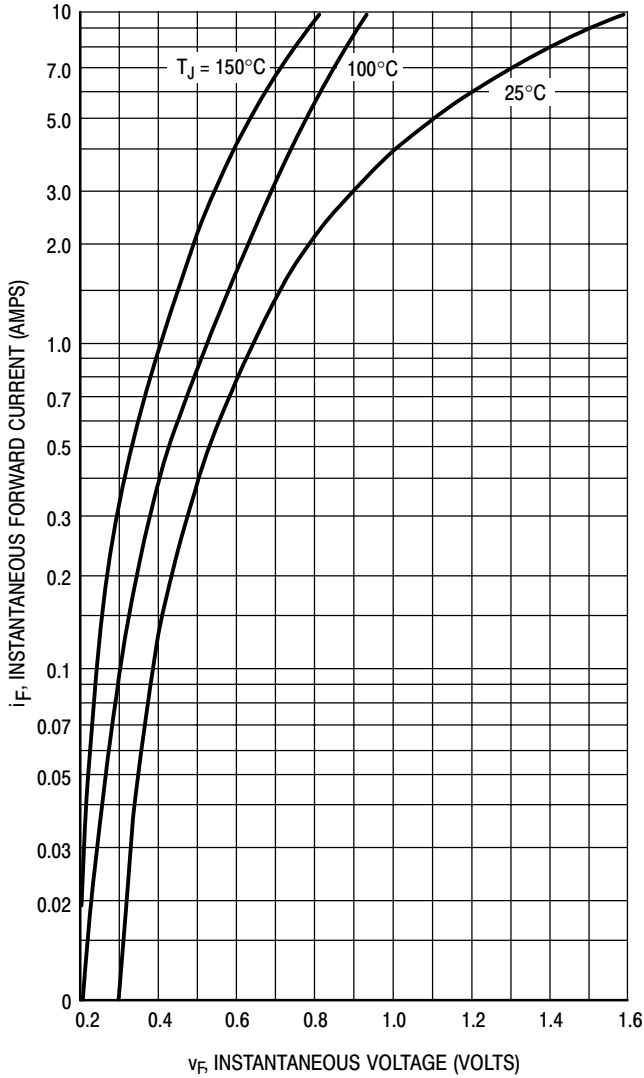


Figure 1. Typical Forward Voltage

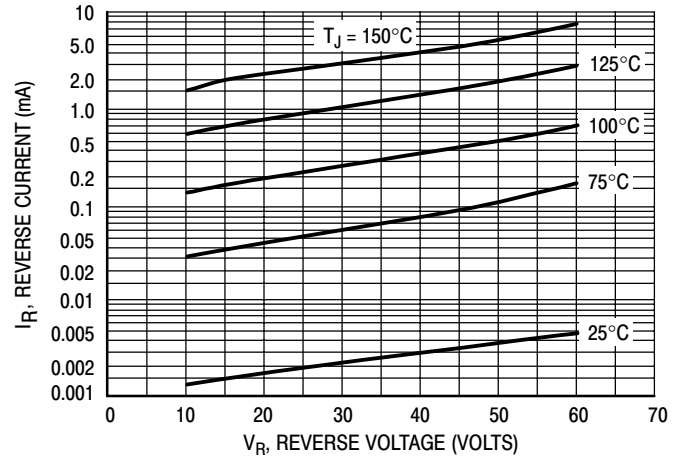


Figure 2. Typical Reverse Current\*

\*The curves shown are typical for the highest voltage device in the voltage grouping. Typical reverse current for lower voltage selections can be estimated from these same curves if  $V_R$  is sufficiently below rated  $V_R$ .

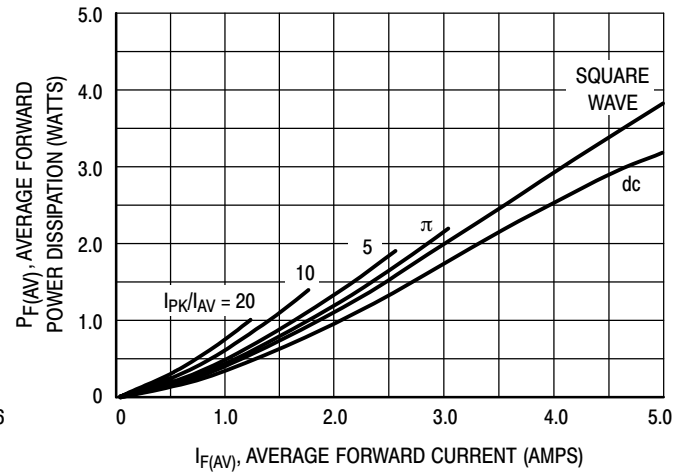


Figure 3. Forward Power Dissipation

# MBR150, MBR160

## THERMAL CHARACTERISTICS

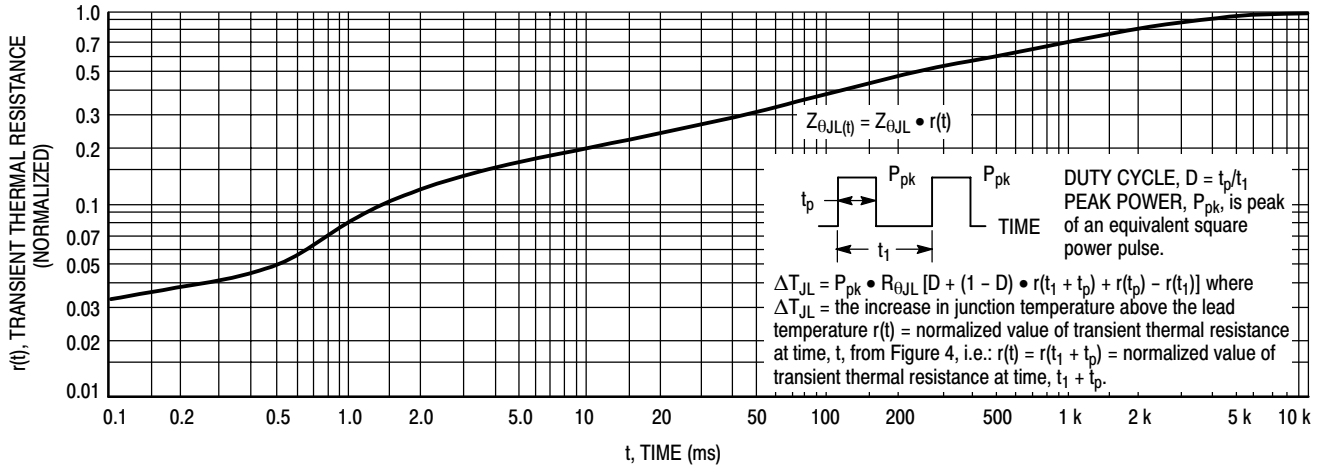


Figure 4. Thermal Response

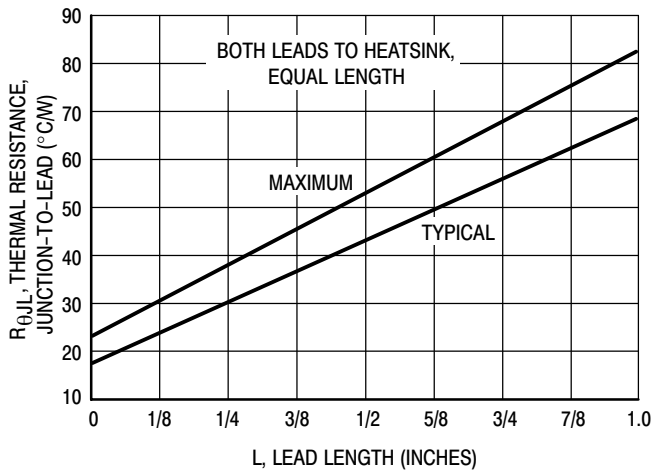


Figure 5. Steady-State Thermal Resistance

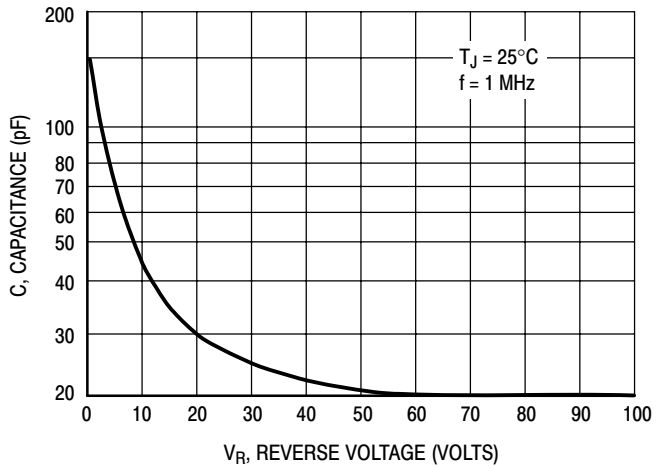


Figure 6. Typical Capacitance

### NOTE 1. — MOUNTING DATA:

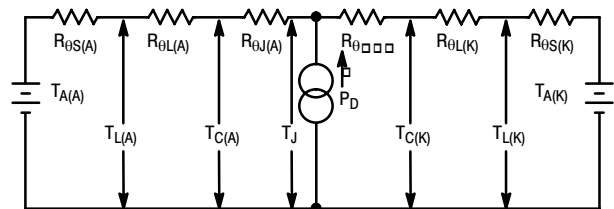
Data shown for thermal resistance junction-to-ambient ( $R_{\theta JA}$ ) for the mounting shown is to be used as a typical guideline values for preliminary engineering or in case the tie point temperature cannot be measured.

#### Typical Values for $R_{\theta JA}$ in Still Air

| Mounting Method | Lead Length, L (in) |     |     |     | $R_{\theta JA}$      |
|-----------------|---------------------|-----|-----|-----|----------------------|
|                 | 1/8                 | 1/4 | 1/2 | 3/4 |                      |
| 1               | 52                  | 65  | 72  | 85  | $^{\circ}\text{C/W}$ |
| 2               | 67                  | 80  | 87  | 100 | $^{\circ}\text{C/W}$ |
| 3               | —                   | 50  |     |     | $^{\circ}\text{C/W}$ |

### NOTE 2. — THERMAL CIRCUIT MODEL:

(For heat conduction through the leads)



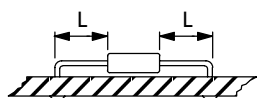
## MBR150, MBR160

Use of the above model permits junction to lead thermal resistance for any mounting configuration to be found. For a given total lead length, lowest values occur when one side of the rectifier is brought as close as possible to the heatsink. Terms in the model signify:

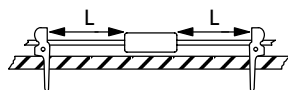
$T_A$  = Ambient Temperature     $T_C$  = Case Temperature  
 $T_L$  = Lead Temperature     $T_J$  = Junction Temperature  
 $R_{\theta S}$  = Thermal Resistance, Heatsink-to-Ambient  
 $R_{\theta L}$  = Thermal Resistance, Lead-to-Heatsink  
 $R_{\theta J}$  = Thermal Resistance, Junction-to-Case  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

Mounting Method 1

P.C. Board with  
 1-1/2" x 1-1/2"  
 copper surface.



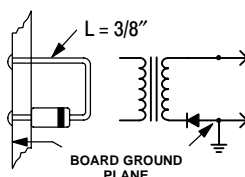
Mounting Method 2



VECTOR PIN MOUNTING

Mounting Method 3

P.C. Board with  
 1-1/2" x 1-1/2"  
 copper surface.



(Subscripts A and K refer to anode and cathode sides, respectively.) Values for thermal resistance components are:  
 $R_{\theta L} = 100^\circ\text{C/W/in}$  typically and  $120^\circ\text{C/W/in}$  maximum.  
 $R_{\theta J} = 36^\circ\text{C/W}$  typically and  $46^\circ\text{C/W}$  maximum.

### NOTE 3. — HIGH FREQUENCY OPERATION:

Since current flow in a Schottky rectifier is the result of majority carrier conduction, it is not subject to junction diode forward and reverse recovery transients due to minority carrier injection and stored charge. Satisfactory circuit analysis work may be performed by using a model consisting of an ideal diode in parallel with a variable capacitance. (See Figure 6)

Rectification efficiency measurements show that operation will be satisfactory up to several megahertz. For example, relative waveform rectification efficiency is approximately 70 percent at 2 MHz, e.g., the ratio of dc power to RMS power in the load is 0.28 at this frequency, whereas perfect rectification would yield 0.406 for sine wave inputs. However, in contrast to ordinary junction diodes, the loss in waveform efficiency is not indicative of power loss: it is simply a result of reverse current flow through the diode capacitance, which lowers the dc output voltage.

### ORDERING INFORMATION

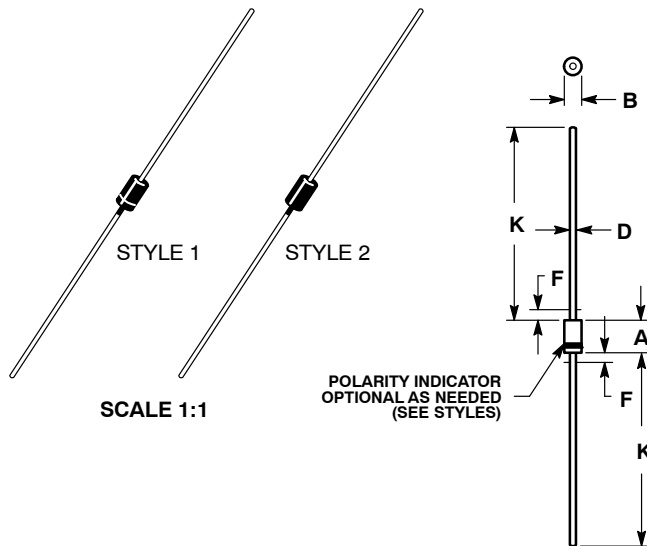
| Device    | Package     | Shipping <sup>†</sup> |
|-----------|-------------|-----------------------|
| MBR150    | Axial Lead* | 1000 Units / Bag      |
| MBR150G   | Axial Lead* | 1000 Units / Bag      |
| MBR150RL  | Axial Lead* | 5000 / Tape & Reel    |
| MBR150RLG | Axial Lead* | 5000 / Tape & Reel    |
| MBR160    | Axial Lead* | 1000 Units / Bag      |
| MBR160G   | Axial Lead* | 1000 Units / Bag      |
| MBR160RL  | Axial Lead* | 5000 / Tape & Reel    |
| MBR160RLG | Axial Lead* | 5000 / Tape & Reel    |

<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.

\*This package is inherently Pb-Free.

### AXIAL LEAD CASE 59-10 ISSUE U

DATE 15 FEB 2005



STYLE 1:  
PIN 1: CATHODE (POLARITY BAND)  
2: ANODE

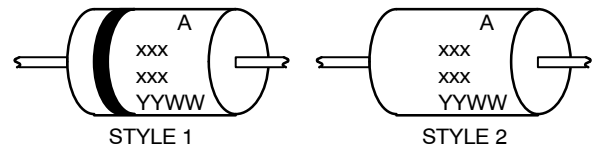
STYLE 2:  
NO POLARITY

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
4. POLARITY DENOTED BY CATHODE BAND.
5. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.161  | 0.205 | 4.10        | 5.20 |
| B   | 0.079  | 0.106 | 2.00        | 2.70 |
| D   | 0.028  | 0.034 | 0.71        | 0.86 |
| F   | ---    | 0.050 | ---         | 1.27 |
| K   | 1.000  | ---   | 25.40       | ---  |

#### GENERIC MARKING DIAGRAM\*



xxx = 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.  
Pb-Free indicator, "G" or microdot "▪", may or may not be present.

|                  |             |   |
|------------------|-------------|---|
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| DESCRIPTION:     | AXIAL LEAD  | PAGE 1 OF 1   |

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