

Axial Lead Rectifiers

... employing 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.

- Low Reverse Current
- Low Stored Charge, Majority Carrier Conduction
- Low Power Loss/High Efficiency
- Highly Stable Oxide Passivated Junction

Mechanical Characteristics:

- Case: Epoxy, Molded
- Weight: 0.4 gram (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead and Mounting Surface Temperature for Soldering Purposes: 220°C Max. for 10 Seconds, 1/16" from case
- Shipped in plastic bags, 1000 per bag
- Available Tape and Reeled, 5000 per reel, by adding a "RL" suffix to the part number
- Polarity: Cathode Indicated by Polarity Band
- Marking: B150, B160

MBR150
MBR160

MBR160 is a
Motorola Preferred Device

**SCHOTTKY BARRIER
RECTIFIERS
1 AMPERE
50, 60 VOLTS**



CASE 59-04
PLASTIC

MAXIMUM RATINGS

| Rating | Symbol | MBR150 | MBR160 | Unit |
|--|---------------------------------|--------------------|--------|------------------|
| Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage | V_{RRM} V_{RWM} V_R | 50 | 60 | Volts |
| RMS Reverse Voltage | $V_{R(RMS)}$ | 35 | 42 | Volts |
| Average Rectified Forward Current (2) ($V_R(\text{equiv}) \leq 0.2 V_R(\text{dc})$, $T_L = 90^\circ\text{C}$, $R_{\theta JA} = 80^\circ\text{C/W}$, P.C. Board Mounting, see Note 3, $T_A = 55^\circ\text{C}$) | I_O | 1 | | Amp |
| Nonrepetitive Peak Surge Current (Surge applied at rated load conditions, halfwave, single phase, 60 Hz, $T_L = 70^\circ\text{C}$) | I_{FSM} | 25 (for one cycle) | | Amps |
| Operating and Storage Junction Temperature Range (Reverse Voltage applied) | T_J, T_{stg} | - 65 to +150 | | $^\circ\text{C}$ |
| Peak Operating Junction Temperature (Forward Current applied) | $T_{J(pk)}$ | 150 | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS (Notes 3 and 4)

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

ELECTRICAL CHARACTERISTICS ($T_L = 25^\circ\text{C}$ unless otherwise noted) (2)

| Characteristic | Symbol | Max | Unit |
|---|--------|-------------------------|------|
| Maximum Instantaneous Forward Voltage (1) ($i_F = 0.1 \text{ A}$) ($i_F = 1 \text{ A}$) ($i_F = 3 \text{ A}$) | v_F | 0.550 0.750 1.000 | Volt |
| Maximum Instantaneous Reverse Current @ Rated dc Voltage (1) ($T_L = 25^\circ\text{C}$) ($T_L = 100^\circ\text{C}$) | i_R | 0.5 5 | mA |

(1) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

(2) Lead Temperature reference is cathode lead 1/32" from case.

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

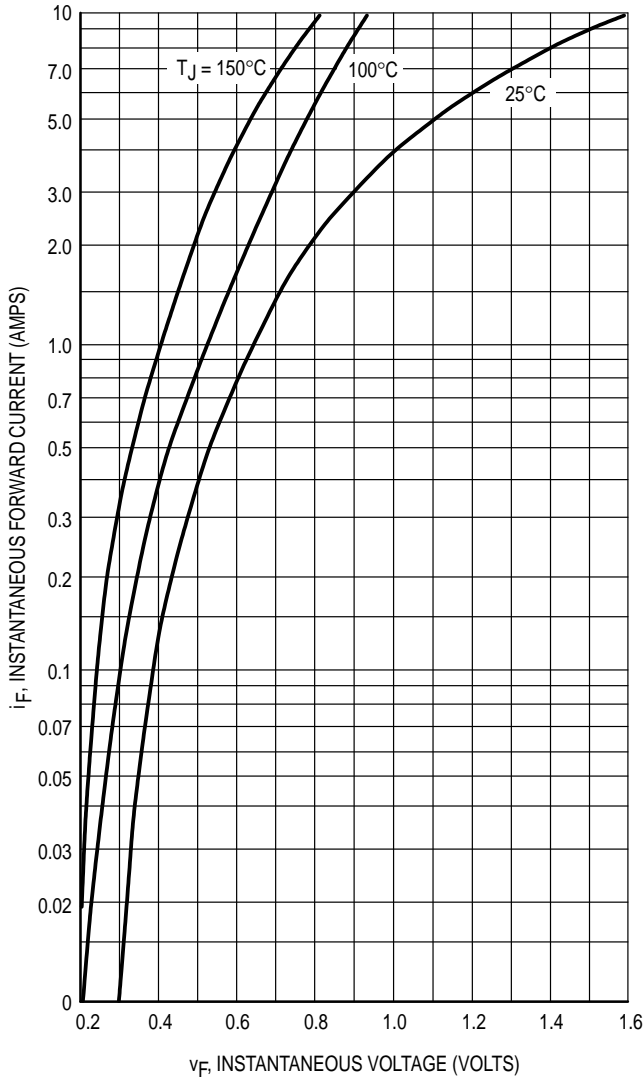


Figure 1. Typical Forward Voltage

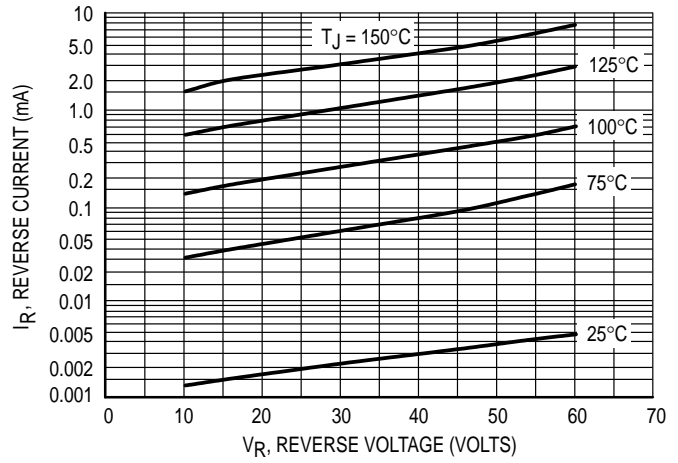


Figure 2. Typical Reverse Current*

*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 .

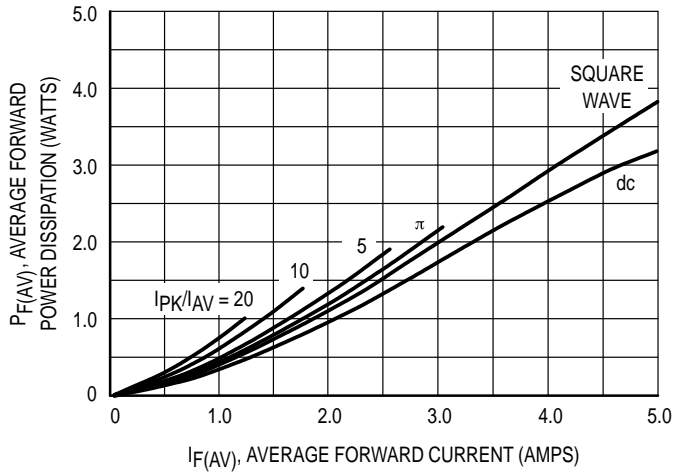


Figure 3. Forward Power Dissipation

THERMAL CHARACTERISTICS

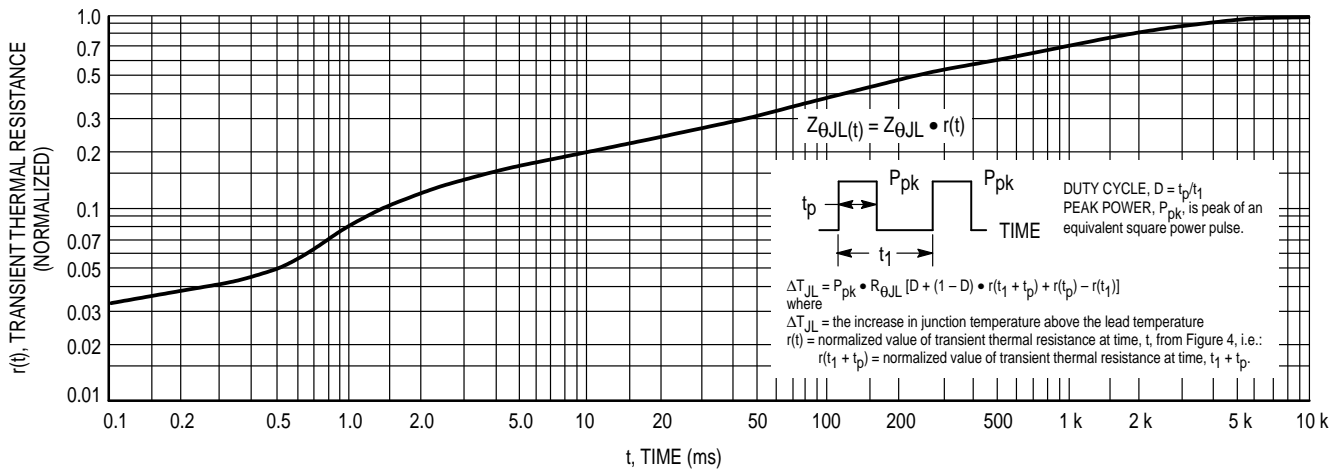


Figure 4. Thermal Response

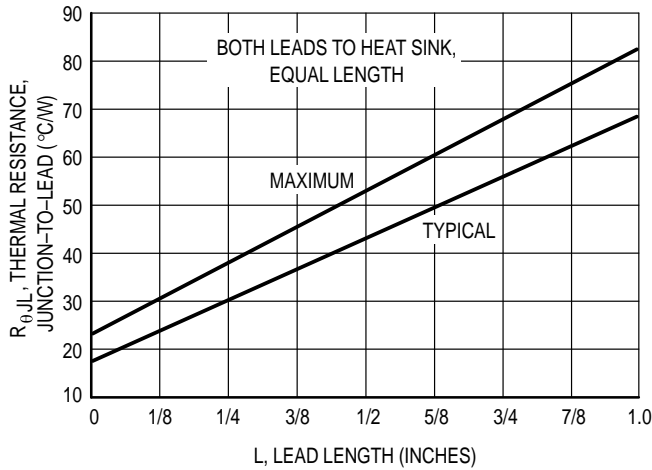


Figure 5. Steady-State Thermal Resistance

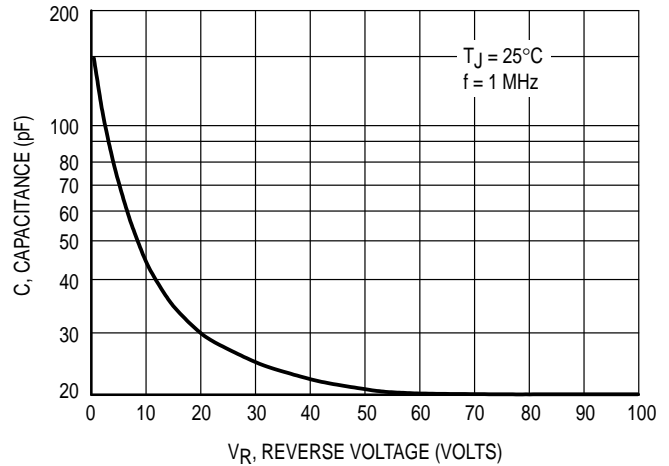


Figure 6. Typical Capacitance

NOTE 3 — MOUNTING DATA:

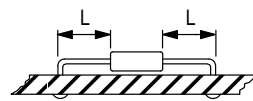
Data shown for thermal resistance junction-to-ambient ($R_{\theta JA}$) for the mounting shown is to be used as a typical guideline values for preliminary engineering or in case the tie point temperature cannot be measured.

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 | $^{\circ}C/W$ |
| 2 | 67 | 80 | 87 | 100 | $^{\circ}C/W$ |
| 3 | — | 50 | | | $^{\circ}C/W$ |

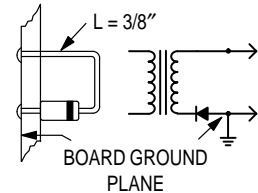
Mounting Method 1

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

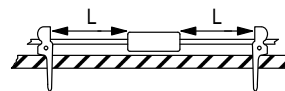


Mounting Method 3

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



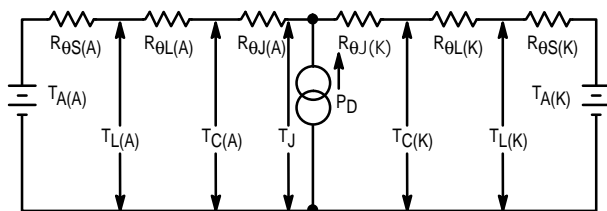
Mounting Method 2



VECTOR PIN MOUNTING

NOTE 4 — 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. For a given total lead length, lowest values occur when one side of the rectifier is brought as close as possible to the heat sink. 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_D = Power Dissipation
- T_C = Case Temperature
- T_J = Junction Temperature

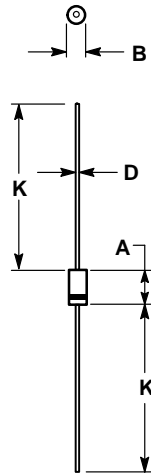
(Subscripts A and K refer to anode and cathode sides, respectively.) Values for thermal resistance components are: $R_{\theta L} = 100^{\circ}C/W/in$ typically and $120^{\circ}C/W/in$ maximum. $R_{\theta J} = 36^{\circ}C/W$ typically and $46^{\circ}C/W$ maximum.

NOTE 5 — 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.


PACKAGE DIMENSIONS



- NOTES:
1. ALL RULES AND NOTES ASSOCIATED WITH JEDEC DO-41 OUTLINE SHALL APPLY.
 2. POLARITY DENOTED BY CATHODE BAND.
 3. LEAD DIAMETER NOT CONTROLLED WITHIN F DIMENSION.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 5.97 | 6.60 | 0.235 | 0.260 |
| B | 2.79 | 3.05 | 0.110 | 0.120 |
| D | 0.76 | 0.86 | 0.030 | 0.034 |
| K | 27.94 | — | 1.100 | — |

CASE 59-04
ISSUE M

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