

## 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
- Guard-Ring for Stress Protection
- Low Forward Voltage
- 150°C Operating Junction Temperature
- High Surge Capacity

### 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: B170, B180, B190, B1100

**MBR170**  
**MBR180**  
**MBR190**  
**MBR1100**

MBR1100 is a  
Motorola Preferred Device

**SCHOTTKY BARRIER**  
**RECTIFIERS**  
**1 AMPERE**  
**70, 80, 90, 100 VOLTS**



CASE 59-04  
PLASTIC

### MAXIMUM RATINGS

Rating	Symbol	MBR170	MBR180	MBR190	MBR1100	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	$V_{RRM}$ $V_{RWM}$ $V_R$	70	80	90	100	Volts
Average Rectified Forward Current ( $V_{R(equiv)} \leq 0.2 V_R(dc)$ , $R_{\theta JA} = 50^\circ C/W$ , P.C. Board Mounting, see Note 1, $T_A = 120^\circ C$ )	$I_O$	1				Amp
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions, half-wave, single phase, 60 Hz)	$I_{FSM}$	50				Amps
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150				°C
Voltage Rate of Change (Rated $V_R$ )	$dv/dt$	10				V/ns

### THERMAL CHARACTERISTICS (See Note 2)

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	See Note 1	°C/W

### ELECTRICAL CHARACTERISTICS ( $T_L = 25^\circ C$ unless otherwise noted)

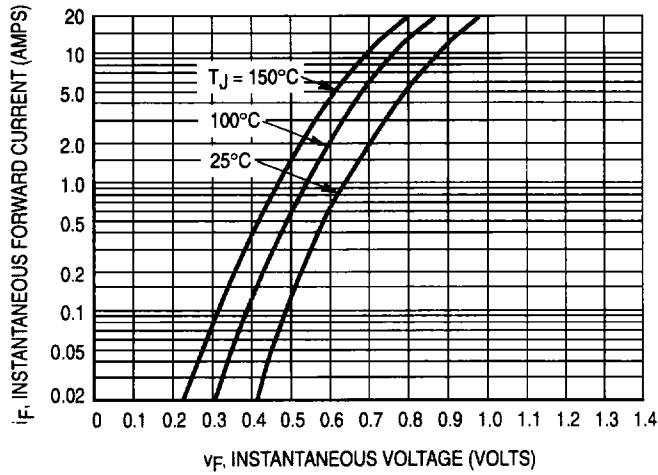
Characteristic	Symbol	Max	Unit
Maximum Instantaneous Forward Voltage (1) ( $i_F = 1 A, T_L = 25^\circ C$ ) ( $i_F = 1 A, T_L = 100^\circ C$ )	$V_F$	0.79 0.69	Volt
Maximum Instantaneous Reverse Current @ Rated dc Voltage (1) ( $T_L = 25^\circ C$ ) ( $T_L = 100^\circ C$ )	$i_R$	0.5 5	mA

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

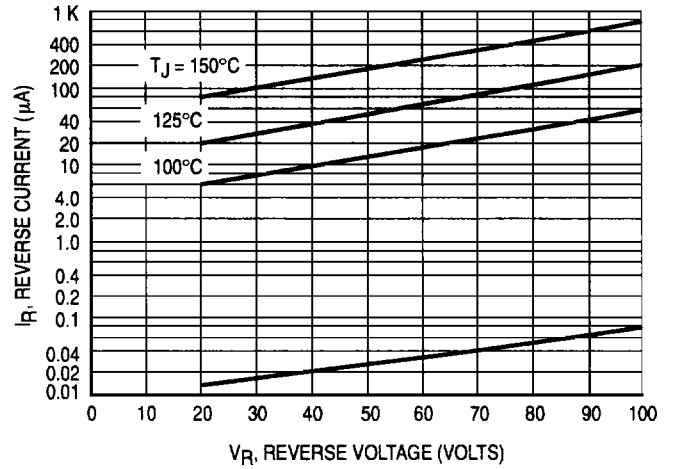
Preferred devices are Motorola recommended choices for future use and best overall value.

\*MOTOROLA 90\*

**MBR170 MBR180 MBR190 MBR1100**

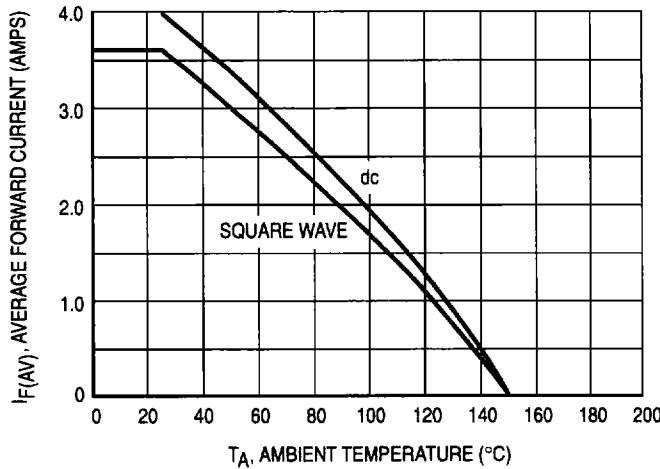


**Figure 1. Typical Forward Voltage**

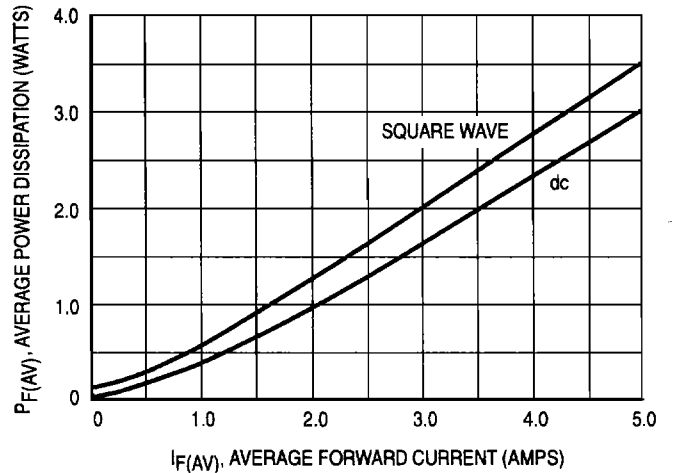


**Figure 2. Typical Reverse Current\***

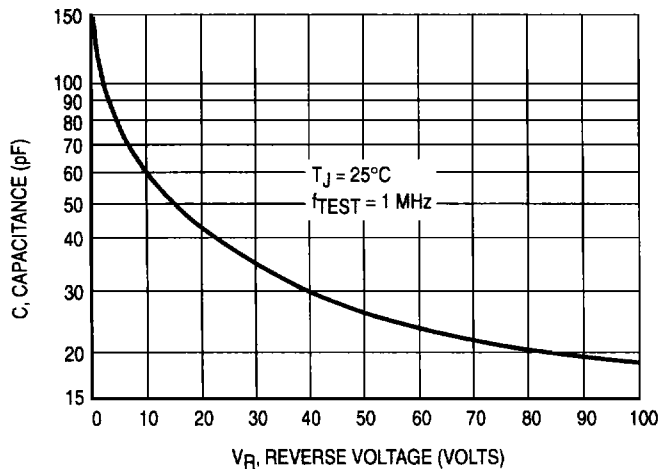
\*The curves shown are typical for the highest voltage device in the voltage grouping. Typical reverse current for lower voltage selections can be estimated from these same curves if  $V_R$  is sufficiently below rated  $V_R$ .



**Figure 3. Current Derating (Mounting method 3 per note 1.)**



**Figure 4. Power Dissipation**



**Figure 5. Typical Capacitance**

**NOTE 1 — MOUNTING DATA:**

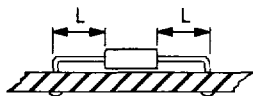
Data shown for thermal resistance junction-to-ambient ( $R_{\theta JA}$ ) for the mountings shown is to be used as typical guideline values for preliminary engineering or in case the tie point temperature cannot be measured.

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

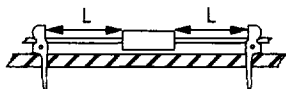
Mounting Method	Lead Length, L (in)				$R_{\theta JA}$
	1/8	1/4	1/2	3/4	
1	52	65	72	85	$^{\circ}\text{C}/\text{W}$
2	67	80	87	100	$^{\circ}\text{C}/\text{W}$
3	—	50			$^{\circ}\text{C}/\text{W}$

**Mounting Method 1**

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



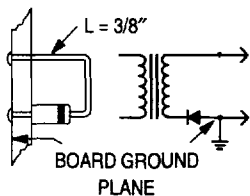
**Mounting Method 2**



VECTOR PIN MOUNTING

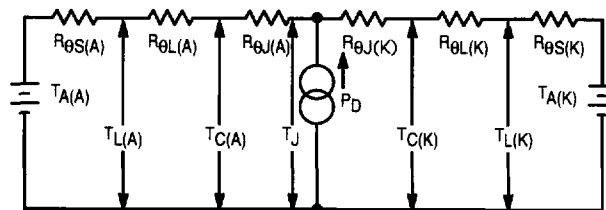
**Mounting Method 3**

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



**NOTE 2 — 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       $T_C$  = 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
- $P_D$  = Power Dissipation

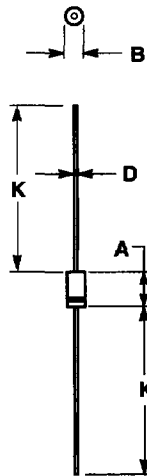
(Subscripts A and K refer to anode and cathode sides, respectively.) Values for thermal resistance components are:  $R_{\theta L} = 100^{\circ}\text{C}/\text{W}/\text{in}$  typically and  $120^{\circ}\text{C}/\text{W}/\text{in}$  maximum.  $R_{\theta J} = 36^{\circ}\text{C}/\text{W}$  typically and  $46^{\circ}\text{C}/\text{W}$  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 5.)

Rectification efficiency measurements show that operation will be satisfactory up to several megahertz. For example, relative waveform rectification efficiency is approximately 70 percent at 2.0 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 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**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447 or 602-303-5454

**MFAX:** RMFAX0@email.sps.mot.com - TOUCHTONE 602-244-6609  
**INTERNET:** http://Design-NET.com

**JAPAN:** Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-81-3521-8315

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park, 51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



**MOTOROLA**

◇ CODELINE TO BE PLACED HERE

**MBR170/D**

