

# MBR120ESF, NRVB120ESF

## Surface Mount Schottky Power Rectifier

### Plastic SOD-123 Package

This device uses the Schottky Barrier principle with a large area metal-to-silicon power diode. Ideally suited for low voltage, high frequency rectification or as free wheeling and polarity protection diodes in surface mount applications where compact size and weight are critical to the system. This package also provides an easy to work with alternative to leadless 34 package style. Because of its small size, it is ideal for use in portable and battery powered products such as cellular and cordless phones, chargers, notebook computers, printers, PDAs and PCMCIA cards. Typical applications are AC-DC and DC-DC converters, reverse battery protection, and “Oring” of multiple supply voltages and any other application where performance and size are critical.

#### Features

- Guardring for Stress Protection
- Low Leakage
- 150°C Operating Junction Temperature
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Package Designed for Optimal Automated Board Assembly
- ESD Rating:
  - ♦ Human Body Model = 3B
  - ♦ Machine Model = C
- NRVB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant\*

#### Mechanical Characteristics

- Device Marking: L2E
- Polarity Designator: Cathode Band
- Weight: 11.7 mg (approximately)
- Case: Epoxy, Molded
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead and Mounting Surface Temperature for Soldering Purposes: 260°C Max. for 10 Seconds

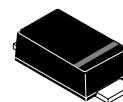
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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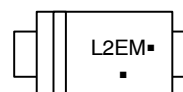
<http://onsemi.com>

**SCHOTTKY BARRIER  
RECTIFIER  
1.0 AMPERES  
20 VOLTS**



**SOD-123FL  
CASE 498**

#### MARKING DIAGRAM



L2E = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device        | Package                | Shipping <sup>†</sup>       |
|---------------|------------------------|-----------------------------|
| MBR120ESFT1G  | SOD-123FL<br>(Pb-Free) | 3,000/<br>Tape & Reel **    |
| NRVB120ESFT1G | SOD-123FL<br>(Pb-Free) | 3,000/<br>Tape & Reel **    |
| MBR120ESFT3G  | SOD-123FL<br>(Pb-Free) | 10,000 /<br>Tape & Reel *** |
| NRVB120ESFT3G | SOD-123FL<br>(Pb-Free) | 10,000 /<br>Tape & Reel *** |

\*\* 8 mm Tape, 7" Reel

\*\*\* 8 mm Tape, 13" 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.

# MBR120ESF, NRVB120ESF

## MAXIMUM RATINGS

| Rating                                                                                                  | Symbol                          | Value      | Unit             |
|---------------------------------------------------------------------------------------------------------|---------------------------------|------------|------------------|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage                  | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 20         | V                |
| Average Rectified Forward Current<br>(At Rated $V_R$ , $T_L = 140^\circ\text{C}$ )                      | $I_O$                           | 1.0        | A                |
| Peak Repetitive Forward Current<br>(At Rated $V_R$ , Square Wave, 20 kHz, $T_L = 125^\circ\text{C}$ )   | $I_{FRM}$                       | 2.0        | A                |
| Non-Repetitive Peak Surge Current<br>(Non-Repetitive peak surge current, halfwave, single phase, 60 Hz) | $I_{FSM}$                       | 40         | A                |
| Storage Temperature                                                                                     | $T_{stg}$                       | -65 to 150 | $^\circ\text{C}$ |
| Operating Junction Temperature                                                                          | $T_J$                           | -65 to 150 | $^\circ\text{C}$ |
| Voltage Rate of Change (Rated $V_R$ , $T_J = 25^\circ\text{C}$ )                                        | $dv/dt$                         | 10,000     | V/ $\mu\text{s}$ |

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.

## THERMAL CHARACTERISTICS

| Characteristic                                    | Symbol    | Value | Unit                      |
|---------------------------------------------------|-----------|-------|---------------------------|
| Thermal Resistance – Junction-to-Lead (Note 1)    | $R_{tjl}$ | 26    | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance – Junction-to-Lead (Note 2)    | $R_{tjl}$ | 21    |                           |
| Thermal Resistance – Junction-to-Ambient (Note 1) | $R_{tja}$ | 325   |                           |
| Thermal Resistance – Junction-to-Ambient (Note 2) | $R_{tja}$ | 82    |                           |

1. Mounted with minimum recommended pad size, PC Board FR4.
2. Mounted with 1 in. copper pad (Cu area 700 mm<sup>2</sup>).

## ELECTRICAL CHARACTERISTICS

| Characteristic                                                                                                                                       | Symbol | Value                    |                           | Unit          |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------|---------------------------|---------------|
| Maximum Instantaneous Forward Voltage (Note 3), See Figure 2<br><br>( $I_F = 0.1\text{ A}$ )<br>( $I_F = 1.0\text{ A}$ )<br>( $I_F = 2.0\text{ A}$ ) | $V_F$  | $T_J = 25^\circ\text{C}$ | $T_J = 100^\circ\text{C}$ | V             |
|                                                                                                                                                      |        | 0.455                    | 0.360                     |               |
|                                                                                                                                                      |        | 0.530                    | 0.455                     |               |
|                                                                                                                                                      |        | 0.595                    | 0.540                     |               |
| Maximum Instantaneous Reverse Current (Note 3), See Figure 4<br><br>( $V_R = 20\text{ V}$ )<br>( $V_R = 10\text{ V}$ )<br>( $V_R = 5.0\text{ V}$ )   | $I_R$  | $T_J = 25^\circ\text{C}$ | $T_J = 100^\circ\text{C}$ | $\mu\text{A}$ |
|                                                                                                                                                      |        | 10                       | 1600                      |               |
|                                                                                                                                                      |        | 1.0                      | 500                       |               |
|                                                                                                                                                      |        | 0.5                      | 300                       |               |

3. Pulse Test: Pulse Width  $\leq 250\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

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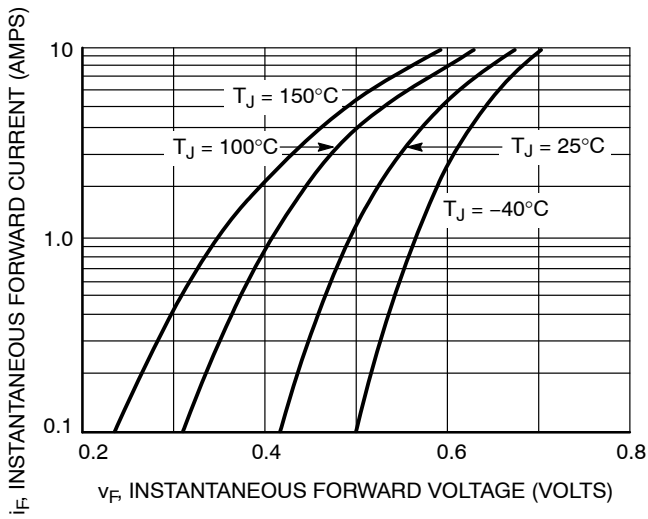


Figure 1. Typical Forward Voltage

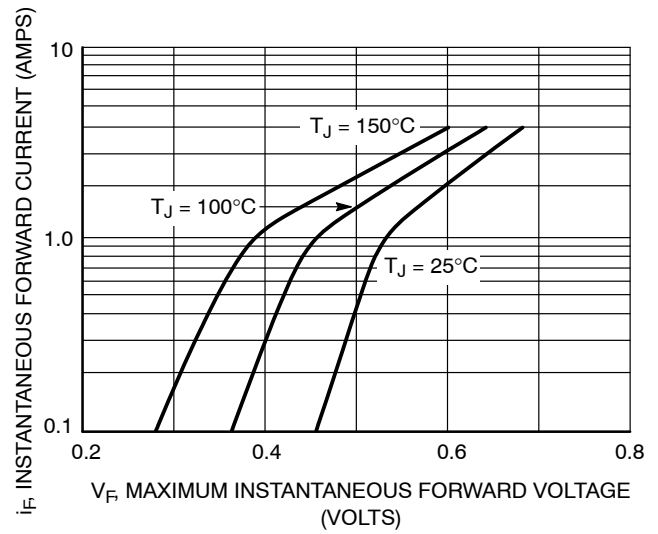


Figure 2. Maximum Forward Voltage

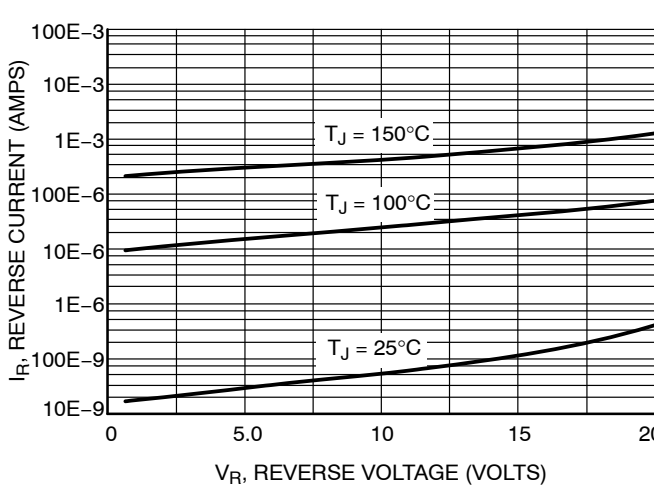


Figure 3. Typical Reverse Current

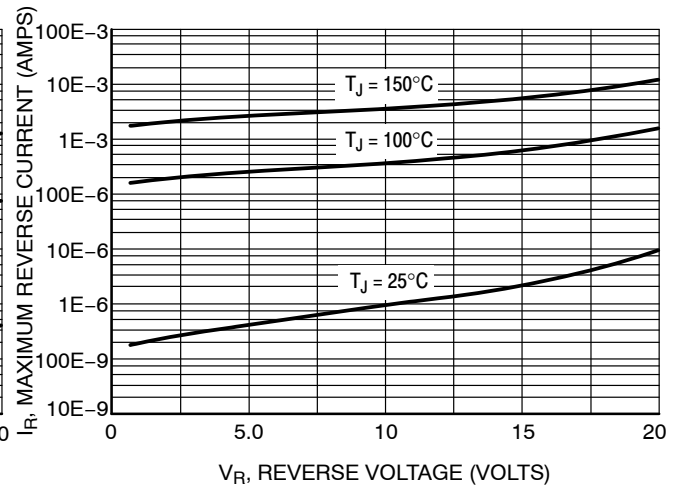


Figure 4. Maximum Reverse Current

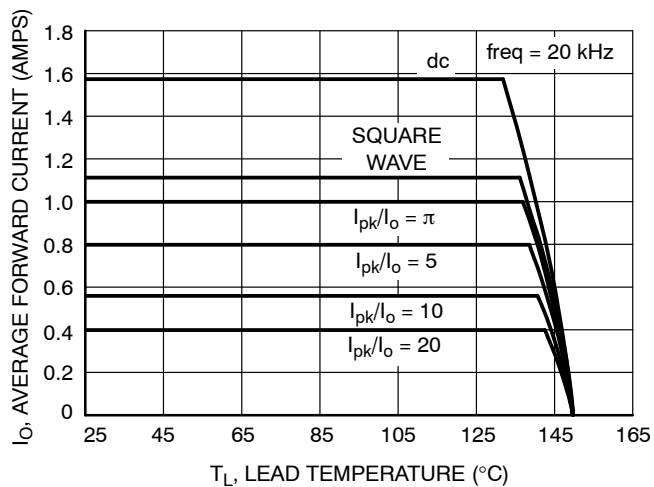


Figure 5. Current Derating

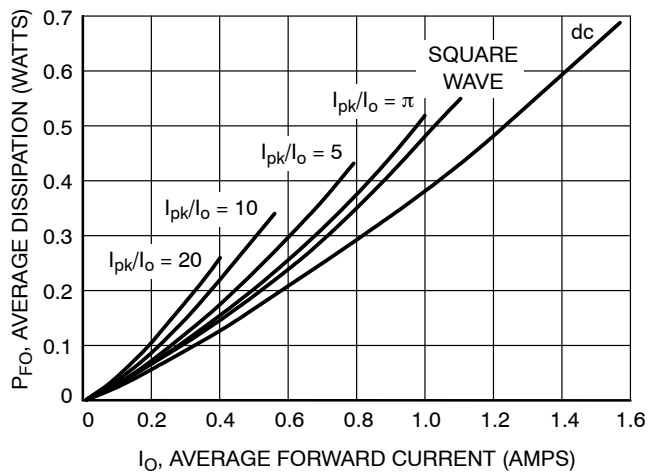


Figure 6. Forward Power Dissipation

# MBR120ESF, NRVB120ESF

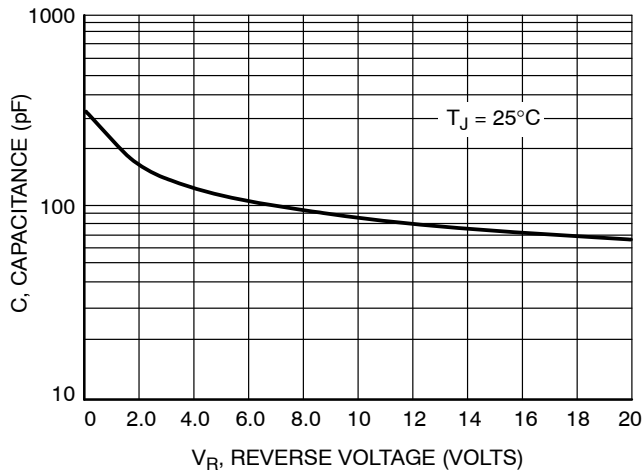


Figure 7. Capacitance

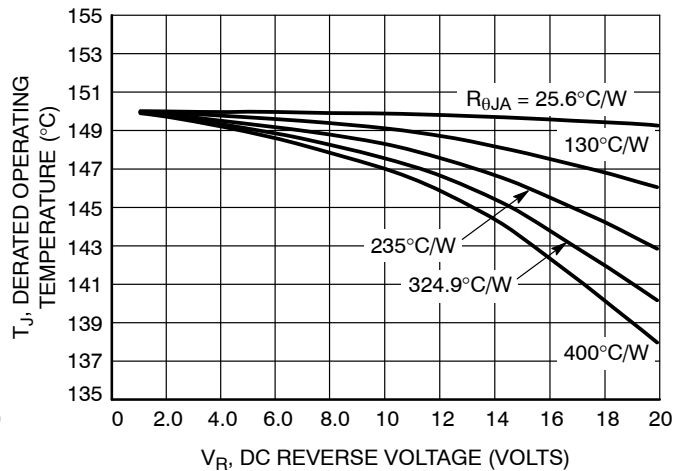


Figure 8. Typical Operating Temperature Derating\*

\* Reverse power dissipation and the possibility of thermal runaway must be considered when operating this device under any reverse voltage conditions. Calculations of  $T_J$  therefore must include forward and reverse power effects. The allowable operating  $T_J$  may be calculated from the equation:

$$T_J = T_{Jmax} - r(t)(P_f + P_r) \text{ where}$$

$r(t)$  = thermal impedance under given conditions,  
 $P_f$  = forward power dissipation, and  
 $P_r$  = reverse power dissipation

This graph displays the derated allowable  $T_J$  due to reverse bias under DC conditions only and is calculated as  $T_J = T_{Jmax} - r(t)P_r$ , where  $r(t) = R_{thja}$ . For other power applications further calculations must be performed.

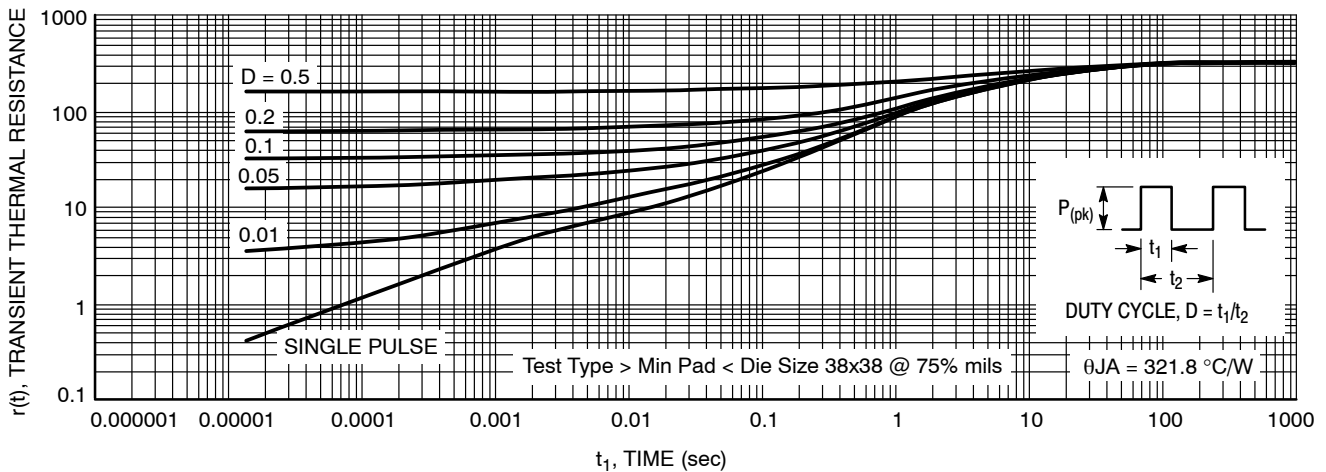
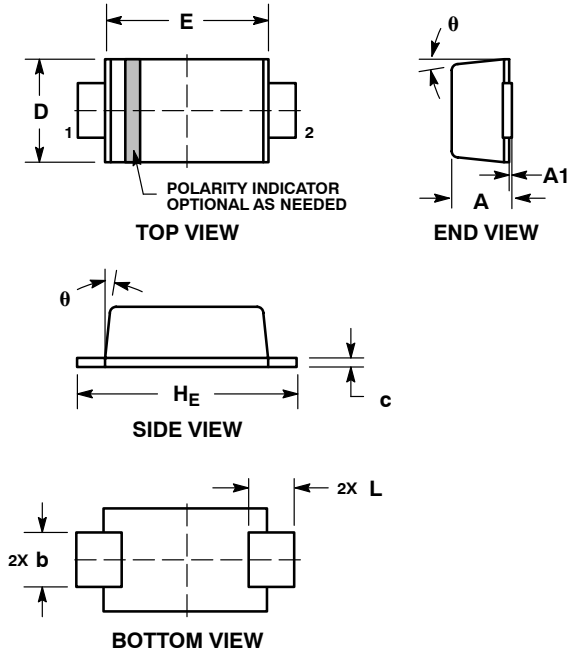


Figure 9. Thermal Response

# MBR120ESF, NRVB120ESF

## PACKAGE DIMENSIONS

SOD-123FL  
CASE 498  
ISSUE D

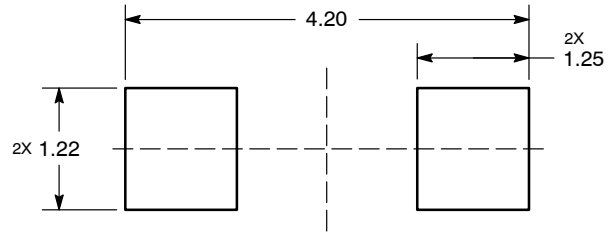


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH.
4. DIMENSIONS D AND J ARE TO BE MEASURED ON FLAT SECTION OF THE LEAD: BETWEEN 0.10 AND 0.25 MM FROM THE LEAD TIP.

| DIM            | MILLIMETERS |      |      | INCHES |       |       |
|----------------|-------------|------|------|--------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A              | 0.90        | 0.95 | 0.98 | 0.035  | 0.037 | 0.039 |
| A1             | 0.00        | 0.05 | 0.10 | 0.000  | 0.002 | 0.004 |
| b              | 0.70        | 0.90 | 1.10 | 0.028  | 0.035 | 0.043 |
| c              | 0.10        | 0.15 | 0.20 | 0.004  | 0.006 | 0.008 |
| D              | 1.50        | 1.65 | 1.80 | 0.059  | 0.065 | 0.071 |
| E              | 2.50        | 2.70 | 2.90 | 0.098  | 0.106 | 0.114 |
| L              | 0.55        | 0.75 | 0.95 | 0.022  | 0.030 | 0.037 |
| H <sub>E</sub> | 3.40        | 3.60 | 3.80 | 0.134  | 0.142 | 0.150 |
| $\theta$       | 0°          | —    | 8°   | 0°     | —     | 8°    |

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

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