

# MBRAF260T3G, NRVBAF260T3G

## Surface Mount Schottky Power Rectifier

This device 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 overlay contact. 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.

### Features

- Low Profile Package for Space Constrained Applications
- Rectangular Package for Automated Handling
- Highly Stable Oxide Passivated Junction
- 150°C Operating Junction Temperature
- Guard-Ring for Stress Protection
- NRVB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free and Halide-Free Devices

### Mechanical Characteristics

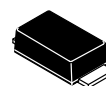
- Case: Epoxy, Molded, Epoxy Meets UL 94, V-0
- Weight: 95 mg (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead and Mounting Surface Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Cathode Polarity Band
- Device Meets MSL 1 Requirements
- ESD Ratings: Machine Model = C  
Human Body Model = 3B



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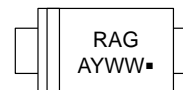
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## SCHOTTKY BARRIER RECTIFIER 2.0 AMPERE 60 VOLTS



SMA-FL  
CASE 403AA  
STYLE 6

### MARKING DIAGRAM



RAG = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

### ORDERING INFORMATION

| Device       | Package             | Shipping†          |
|--------------|---------------------|--------------------|
| MBRAF260T3G  | SMA-FL<br>(Pb-Free) | 5000 / Tape & Reel |
| NRVBAF260T3G | SMA-FL<br>(Pb-Free) | 5000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# MBRAF260T3G, NRVBAF260T3G

## 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>$V_R$ | 60          | V                |
| Average Rectified Forward Current<br>(At Rated $V_R$ , $T_L = 120^\circ\text{C}$ )                          | $I_O$                           | 2.0         | A                |
| Peak Repetitive Forward Current<br>(Rated $V_R$ , Square Wave, 20 kHz) $T_L = 90^\circ\text{C}$             | $I_{FRM}$                       | 4.0         | A                |
| Non-Repetitive Peak Surge Current<br>(Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz) | $I_{FSM}$                       | 60          | A                |
| Storage Temperature Range   | $T_{stg}$                       | -55 to +150 | $^\circ\text{C}$ |
| Operating Junction Temperature  | $T_J$                           | -55 to +150 | $^\circ\text{C}$ |
| Voltage Rate of Change<br>(Rated $V_R$ , $T_J = 25^\circ\text{C}$ )   | dv/dt                           | 10,000      | V/ $\mu\text{s}$ |
| Controlled Avalanche Energy (see test conditions in Figures 6 and 7)  | $W_{AVAL}$                      | 10          | mJ               |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Value | Unit               |
|--|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Lead (Note 1)    | $R_{\theta JL}$ | 25    | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 90    |                    |

1. 1 inch square pad size (1 x 0.5 inch for each lead) on FR4 board.

## ELECTRICAL CHARACTERISTICS

| Characteristic   | Symbol | Value                    |                           | Unit |
|--|--------|--------------------------|---------------------------|------|
| Maximum Instantaneous Forward Voltage (Note 2)<br><br>( $I_F = 1.0\text{ A}$ )<br>( $I_F = 2.0\text{ A}$ ) | $V_F$  | $T_J = 25^\circ\text{C}$ | $T_J = 125^\circ\text{C}$ | V    |
|  |        | 0.51<br>0.63             | 0.475<br>0.55             |      |
| Maximum Instantaneous Reverse Current (Note 2)<br><br>( $V_R = 60\text{ V}$ )                              | $I_R$  | $T_J = 25^\circ\text{C}$ | $T_J = 125^\circ\text{C}$ | mA   |
|  |        | 0.2                      | 20                        |      |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Pulse Test: Pulse Width  $\leq 250\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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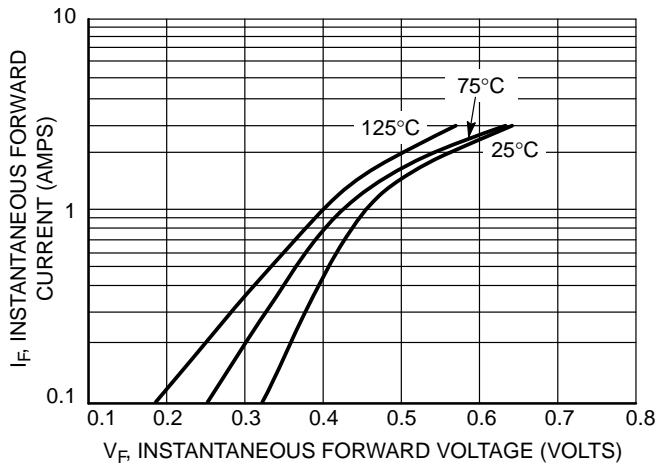


Figure 1. Typical Forward Voltage

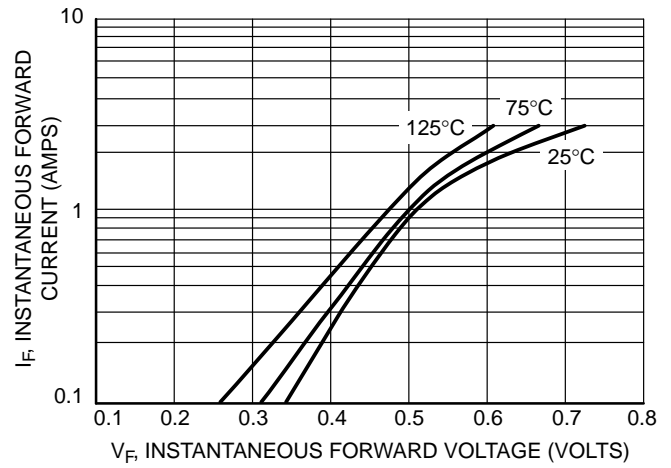


Figure 2. Maximum Forward Voltage

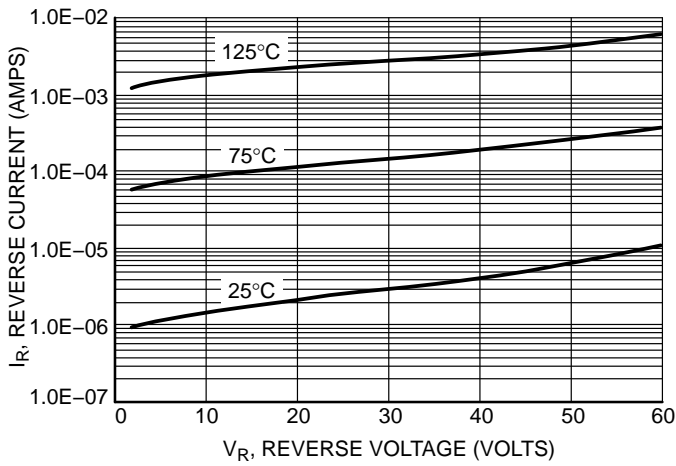


Figure 3. Typical Reverse Current

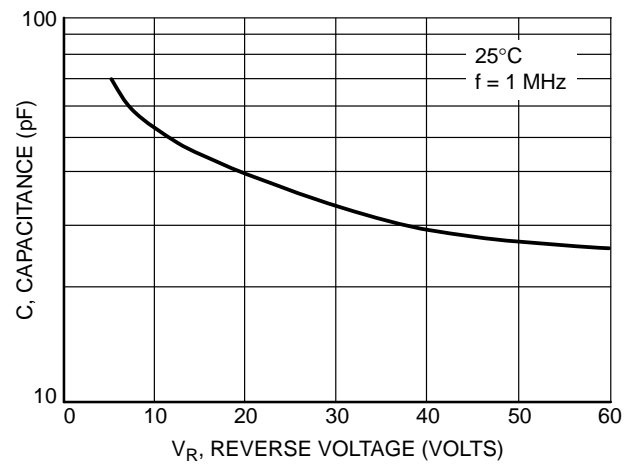


Figure 4. Typical Capacitance

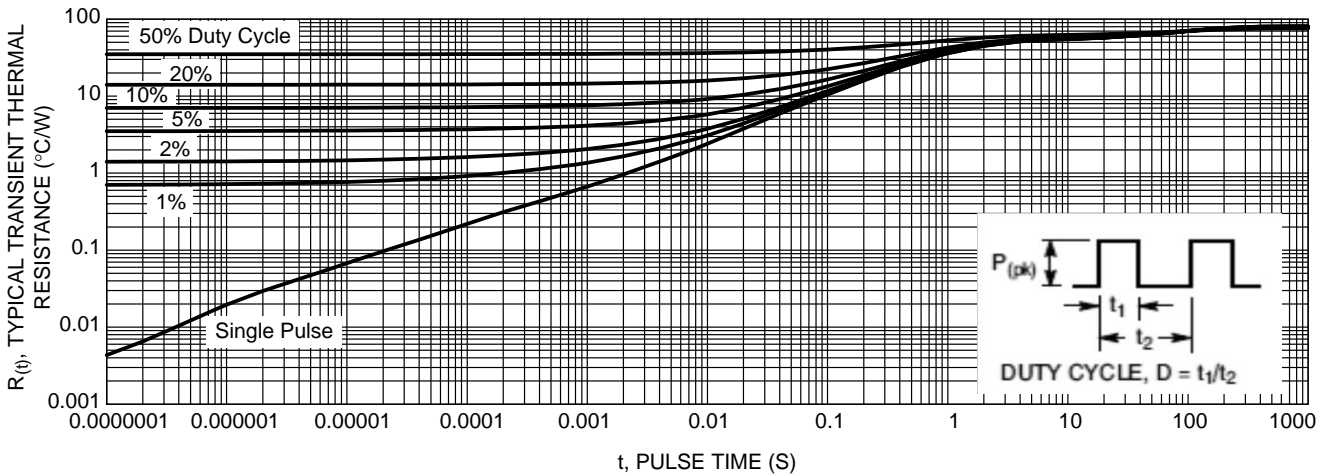


Figure 5. Typical Transient Thermal Response, Junction-to-Ambient

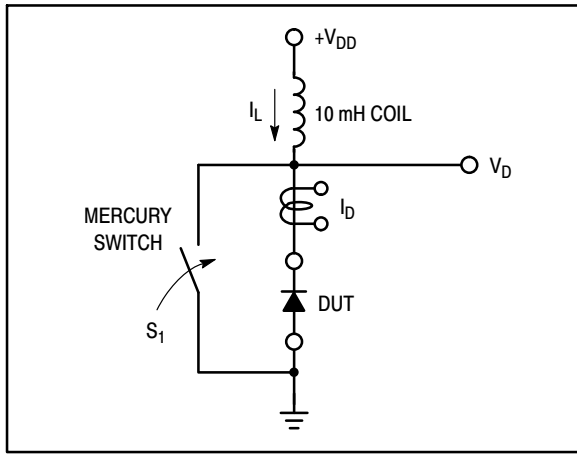


Figure 6. Test Circuit

The unclamped inductive switching circuit shown in Figure 6 was used to demonstrate the controlled avalanche capability of this device. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When  $S_1$  is closed at  $t_0$  the current in the inductor  $I_L$  ramps up linearly; and energy is stored in the coil. At  $t_1$  the switch is opened and the voltage across the diode under test begins to rise rapidly, due to  $di/dt$  effects, when this induced voltage reaches the breakdown voltage of the diode, it is clamped at  $BV_{DUT}$  and the diode begins to conduct the full load current which now starts to decay linearly through the diode, and goes to zero at  $t_2$ .

By solving the loop equation at the point in time when  $S_1$  is opened; and calculating the energy that is transferred to the diode it can be shown that the total energy transferred is equal to the energy stored in the inductor plus a finite amount of energy from the  $V_{DD}$  power supply while the diode is in breakdown (from  $t_1$  to  $t_2$ ) minus any losses due to finite component resistances. Assuming the component resistive

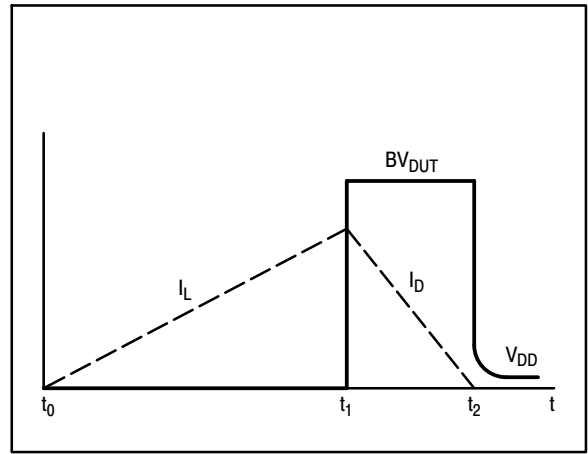


Figure 7. Current-Voltage Waveforms

elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the  $V_{DD}$  voltage is low compared to the breakdown voltage of the device, the amount of energy contributed by the supply during breakdown is small and the total energy can be assumed to be nearly equal to the energy stored in the coil during the time when  $S_1$  was closed, Equation (2).

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2 \left( \frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

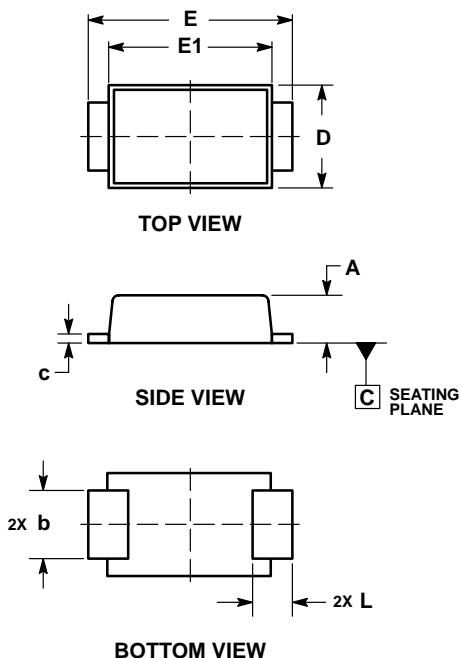
EQUATION (2):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^2$$

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## PACKAGE DIMENSIONS

**SMA-FL**  
CASE 403AA  
ISSUE A

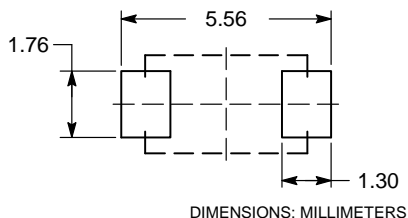


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.

| MILLIMETERS |      |      |
|-------------|------|------|
| DIM         | MIN  | MAX  |
| A           | 0.90 | 1.10 |
| b           | 1.25 | 1.65 |
| c           | 0.15 | 0.30 |
| D           | 2.40 | 2.80 |
| E           | 4.80 | 5.40 |
| E1          | 4.00 | 4.60 |
| L           | 0.70 | 1.10 |

### RECOMMENDED SOLDER FOOTPRINT\*



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

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