

# MBRM120ET1G, NRVBM120ET1G, MBRM120ET3G, NRVBM120ET3G



ON Semiconductor®

<http://onsemi.com>

## Surface Mount Schottky Power Rectifier

### POWERMITE® Power Surface Mount Package

The Schottky POWERMITE® employs the Schottky Barrier principle with a barrier metal and epitaxial construction that produces optimal forward voltage drop–reverse current tradeoff. The advanced packaging techniques provide for a highly efficient micro miniature, space saving surface mount Rectifier. With its unique heatsink design, the POWERMITE® has the same thermal performance as the SMA while being 50% smaller in footprint area, and delivering one of the lowest height profiles, < 1.1 mm in the industry. 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

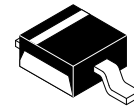
- Low Profile – Maximum Height of 1.1 mm
- Small Footprint – Footprint Area of 8.45 mm<sup>2</sup>
- Low V<sub>F</sub> Provides Higher Efficiency and Extends Battery Life
- ESD Ratings:
  - ◆ Machine Model = C (> 400 V)
  - ◆ Human Body Model = 3B (> 16,000 V)
- Supplied in 12 mm Tape and Reel
- Low Thermal Resistance with Direct Thermal Path of Die on Exposed Cathode Heat Sink
- AEC–Q101 Qualified and PPAP Capable
- NRVB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- All Packages are Pb–Free\*

#### Mechanical Characteristics

- POWERMITE® is JEDEC Registered as DO–216AA
- Case: Molded Epoxy
- Epoxy Meets UL 94 V–0 @ 0.125 in
- Weight: 16.3 mg (approximately)
- Lead and Mounting Surface Temperature for Soldering Purposes 260°C Maximum for 10 Seconds

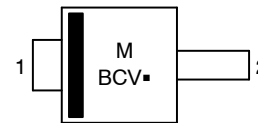
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

### SCHOTTKY BARRIER RECTIFIER 1.0 AMPERES, 20 VOLTS



POWERMITE  
CASE 457  
STYLE 1

#### MARKING DIAGRAM



BCV = Device Code  
M = Date Code  
▪ = Pb–Free Package

#### ORDERING INFORMATION

Device	Package	Shipping†
MBRM120ET1G	POWERMITE (Pb–Free)	3,000 / Tape & Reel
NRVBM120ET1G	POWERMITE (Pb–Free)	3,000 / Tape & Reel
MBRM120ET3G	POWERMITE (Pb–Free)	12,000 / Tape & Reel
NRVBM120ET3G	POWERMITE (Pb–Free)	12,000 / Tape & Reel

†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.

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## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	$V_{RRM}$ $V_{RWM}$ $V_R$	20	V
Average Rectified Forward Current (At Rated $V_R$ , $T_C = 130^\circ\text{C}$ )	$I_O$	1.0	A
Peak Repetitive Forward Current (At Rated $V_R$ , Square Wave, 20 kHz, $T_C = 135^\circ\text{C}$ )	$I_{FRM}$	2.0	A
Non-Repetitive Peak Surge Current (Non-Repetitive peak surge current, halfwave, single phase, 60 Hz)	$I_{FSM}$	50	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 (Anode) (Note 1)	$R_{tjl}$	35	$^\circ\text{C}/\text{W}$
Thermal Resistance – Junction-to-Tab (Cathode) (Note 1)	$R_{tjtab}$	23	
Thermal Resistance – Junction-to-Ambient (Note 1)	$R_{tja}$	277	

1. Mounted with minimum recommended pad size, PC Board FR4, See Figures 9 and 10.

## ELECTRICAL CHARACTERISTICS

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

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

# MBRM120ET1G, NRVBM120ET1G, MBRM120ET3G, NRVBM120ET3G

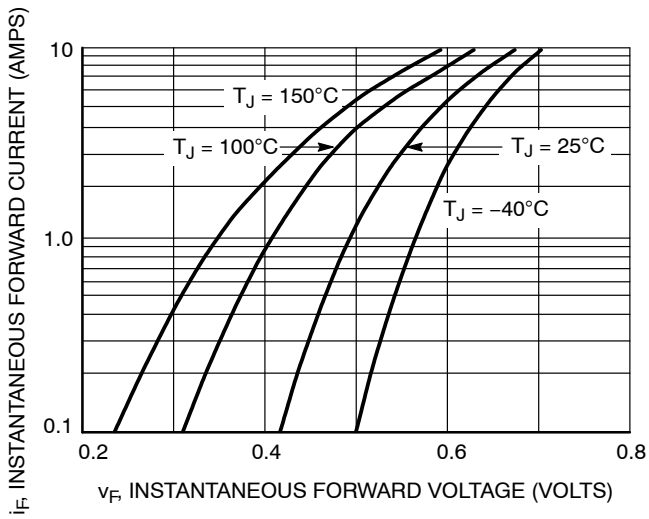


Figure 1. Typical Forward Voltage



Figure 2. Maximum Forward Voltage

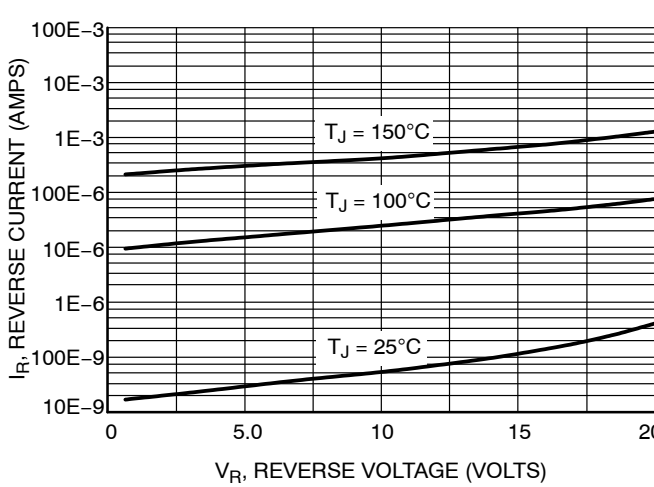


Figure 3. Typical Reverse Current

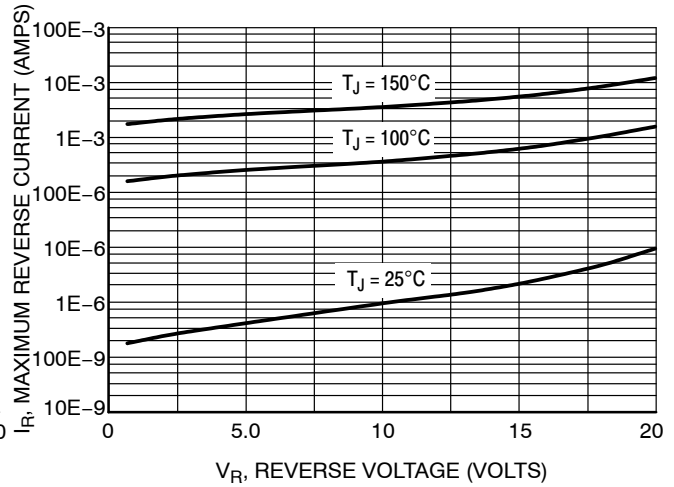


Figure 4. Maximum Reverse Current

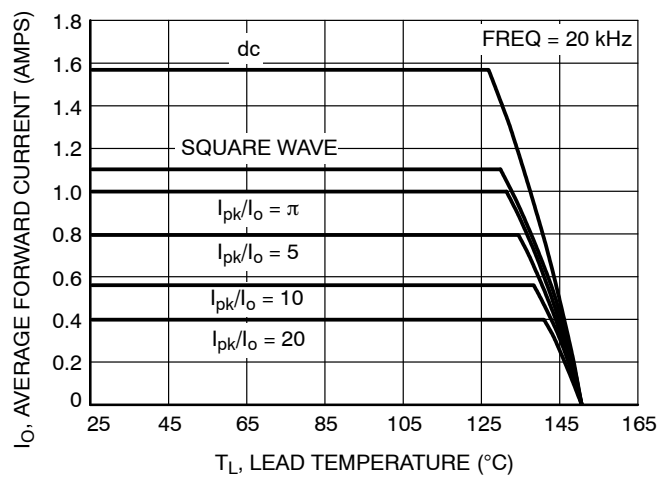


Figure 5. Current Derating

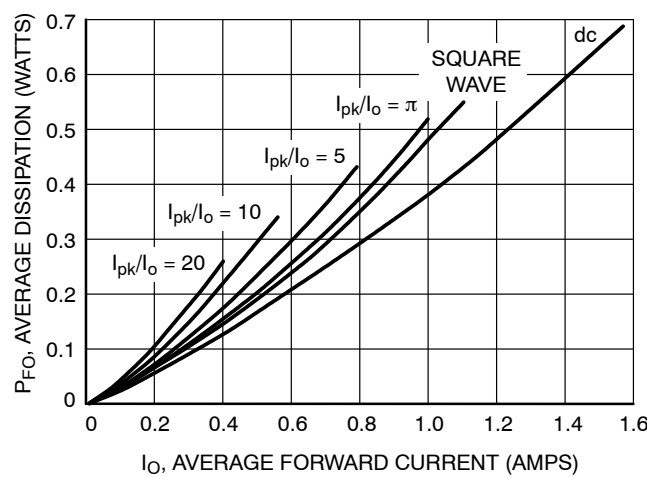
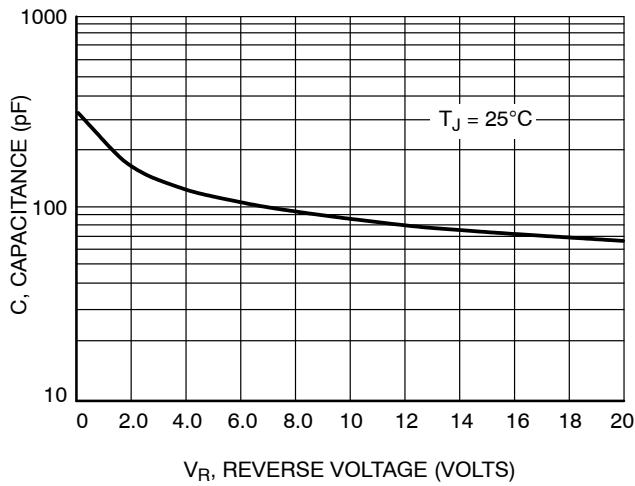
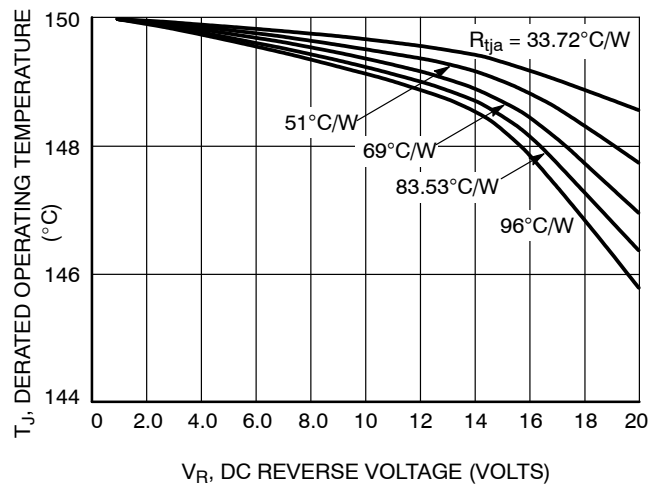


Figure 6. Forward Power Dissipation

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**Figure 7. Capacitance**



**Figure 8. Typical Operating Temperature Derating\***

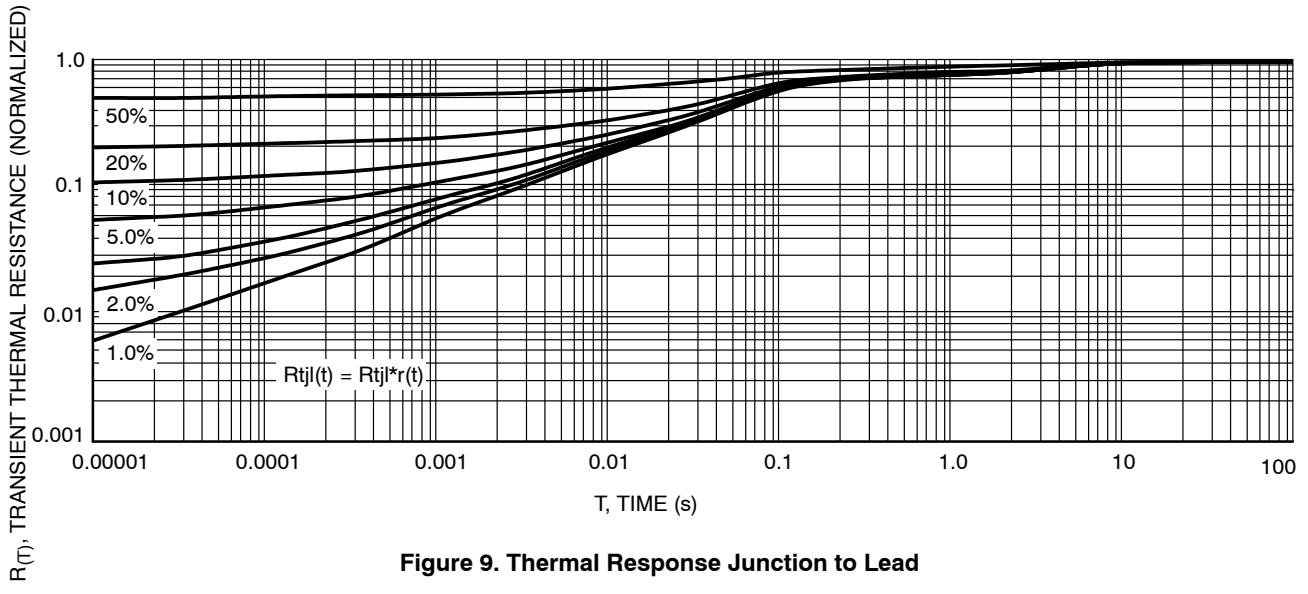
\* Reverse power dissipation and the possibility of thermal runaway must be considered when operating this device under any reverse voltage conditions. Calculations of  $T_J$  therefore must include forward and reverse power effects. The allowable operating  $T_J$  may be calculated from the equation:

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

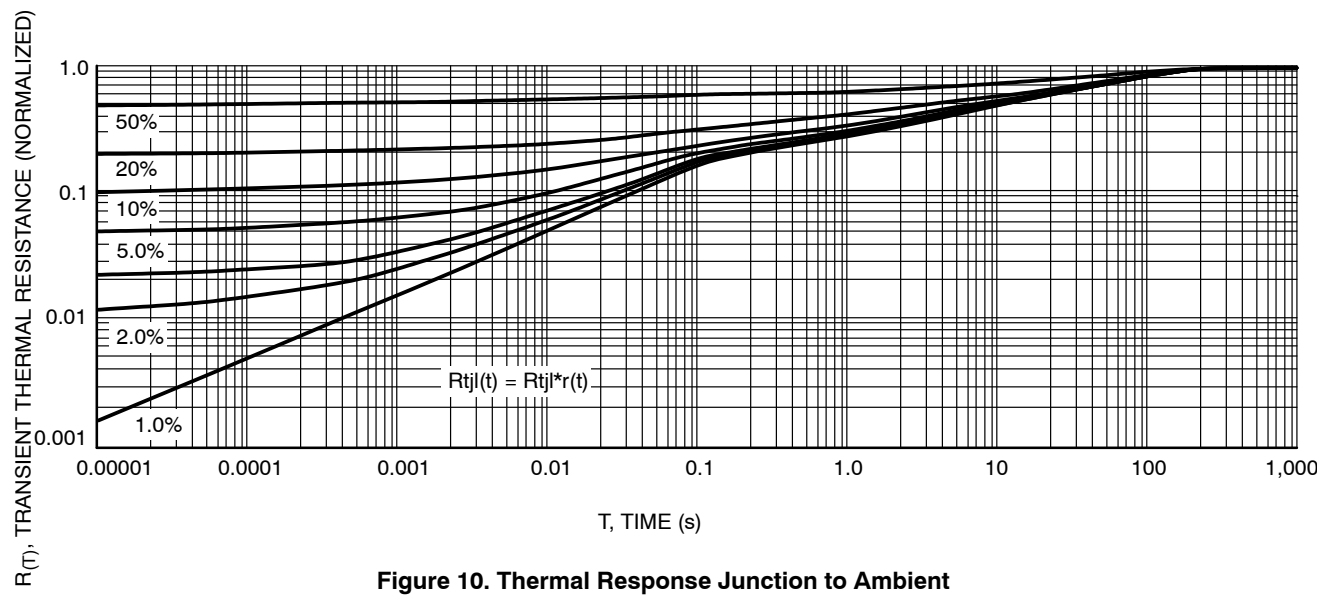
$r(t)$  = thermal impedance under given conditions,  
 $P_f$  = forward power dissipation, and  
 $P_r$  = reverse power dissipation

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.

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**Figure 9. Thermal Response Junction to Lead**

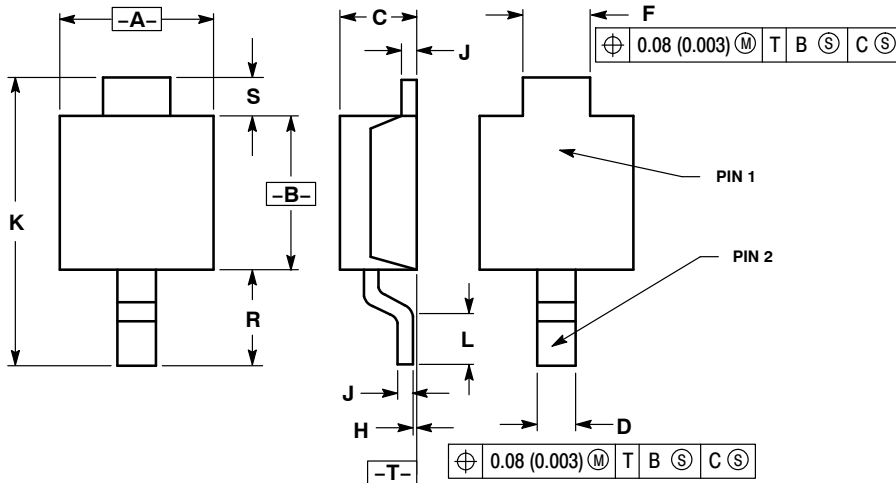


**Figure 10. Thermal Response Junction to Ambient**

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## PACKAGE DIMENSIONS

### POWERMITE CASE 457-04 ISSUE E



#### NOTES:

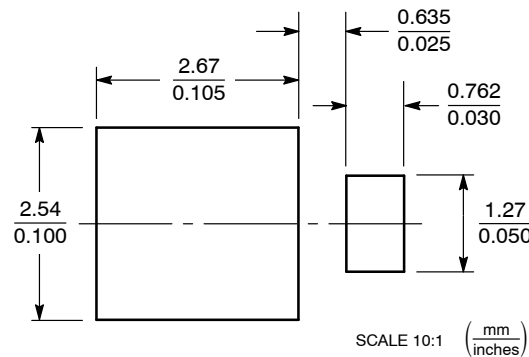
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.75	2.05	0.069	0.081
B	1.75	2.18	0.069	0.086
C	0.85	1.15	0.033	0.045
D	0.40	0.69	0.016	0.027
F	0.70	1.00	0.028	0.039
H	-0.05	+0.10	-0.002	+0.004
J	0.10	0.25	0.004	0.010
K	3.60	3.90	0.142	0.154
L	0.50	0.80	0.020	0.031
R	1.20	1.50	0.047	0.059
S	0.50 REF		0.019 REF	

#### STYLE 1:

1. CATHODE
2. ANODE

### SOLDERING FOOTPRINT\*



\*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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