# Surface Mount Schottky Power Rectifier

## POWERMITE®
## Power Surface Mount Package

# MBRM120ET1G, NRVBM120ET1G, MBRM120ET3G, NRVBM120ET3G

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

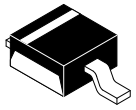
- Low Profile − Maximum Height of 1.1 mm
- Small Footprint − Footprint Area of 8.45 mm2
- Low $V_F$ Provides Higher Efficiency and Extends Battery Life
- ESD Ratings:
  - Machine Model = C (> 400 V)
  - Human Body Model = 3B (> 16,000 V)
- Supplied in 12 mm Tape and Reel
- Low Thermal Resistance with 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

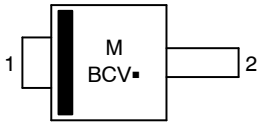
*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**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 |

**DISCONTINUED** (Note 1)

| | | |
|---|---|---|
| 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 Specification Brochure, BRD8011/D.

1. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

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## MAXIMUM RATINGS

| Symbol | Rating | Value | Unit |
|---|---|---|---|
| $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage | 20 | V |
| $I_O$ | Average Rectified Forward Current<br>(At Rated $V_R$, $T_C$ = 130°C) | 1.0 | A |
| $I_{FRM}$ | Peak Repetitive Forward Current<br>(At Rated $V_R$, Square Wave, 20 kHz, $T_C$ = 135°C) | 2.0 | A |
| $I_{FSM}$ | Non−Repetitive Peak Surge Current<br>(Non−Repetitive peak surge current, halfwave, single phase, 60 Hz) | 50 | A |
| $T_{stg}$ | Storage Temperature | −65 to 150 | °C |
| $T_J$ | Operating Junction Temperature | −65 to 150 | °C |
| dv/dt | Voltage Rate of Change<br>(Rated $V_R$, $T_J$ = 25°C) | 10,000 | V/μs |

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

| Symbol | Characteristic | Value | Unit |
|---|---|---|---|
| $R_{tjl}$<br>$R_{tjtab}$<br>$R_{tja}$ | Thermal Resistance − Junction−to−Lead (Anode) (Note 1)<br>Thermal Resistance − Junction−to−Tab (Cathode) (Note 1)<br>Thermal Resistance − Junction−to−Ambient (Note 1) | 35<br>23<br>277 | °C/W |

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

## ELECTRICAL CHARACTERISTICS

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

2. Pulse Test: Pulse Width ≤ 250 μs, Duty Cycle ≤ 2%.



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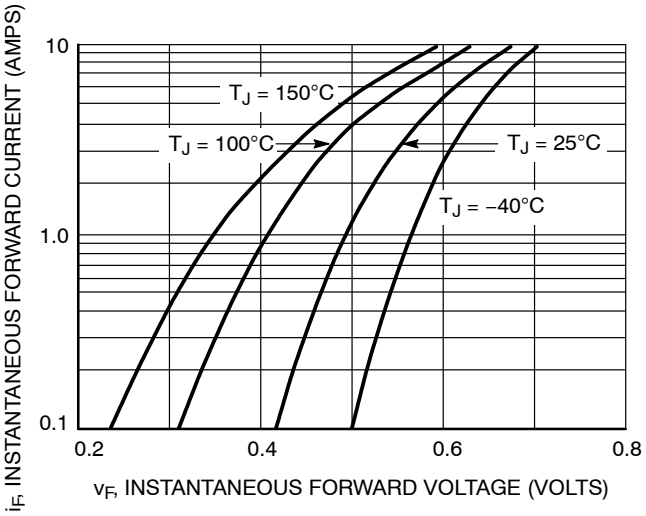



**Figure 1. Typical Forward Voltage**

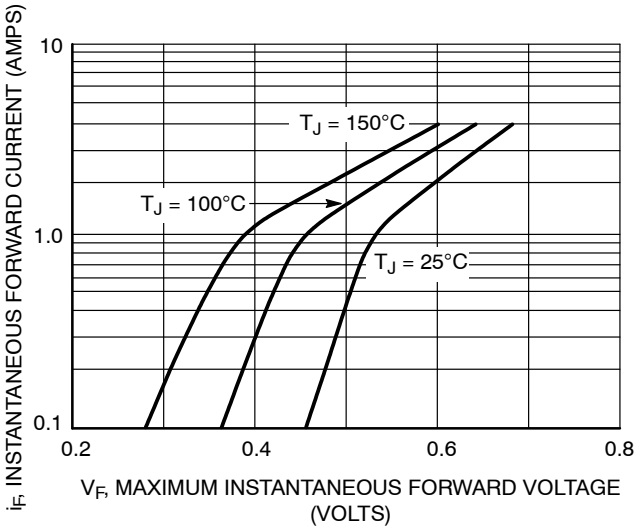



**Figure 2. Maximum Forward Voltage**

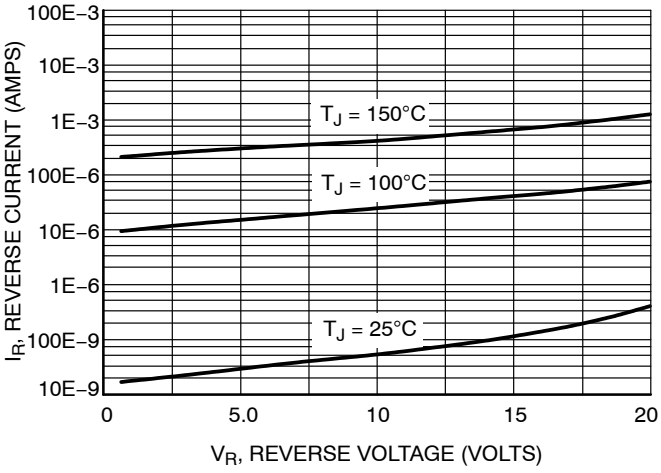



**Figure 3. Typical Reverse Current**

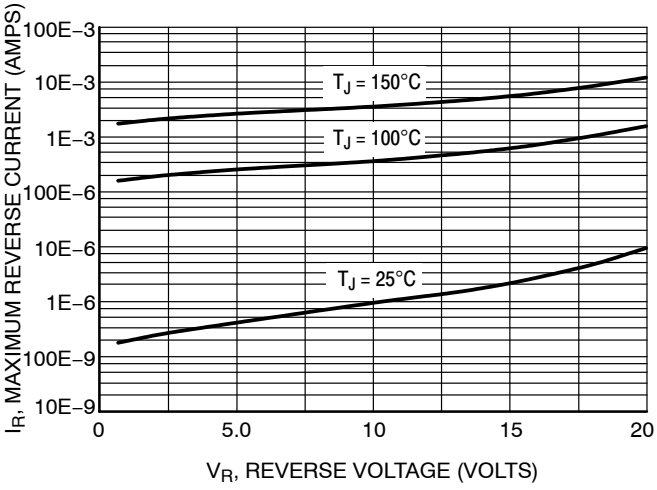



**Figure 4. Maximum Reverse Current**

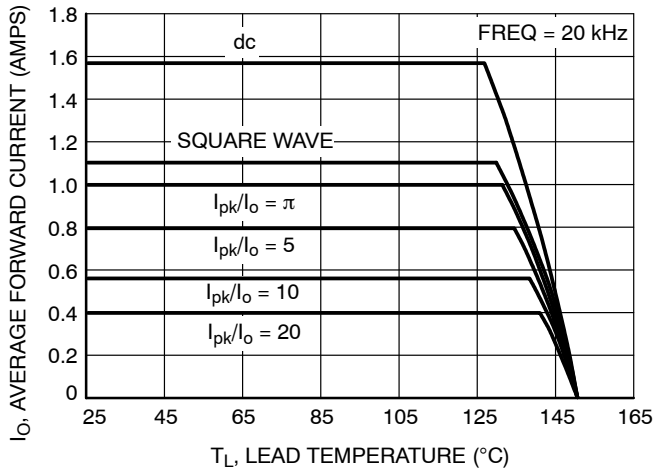



**Figure 5. Current Derating**

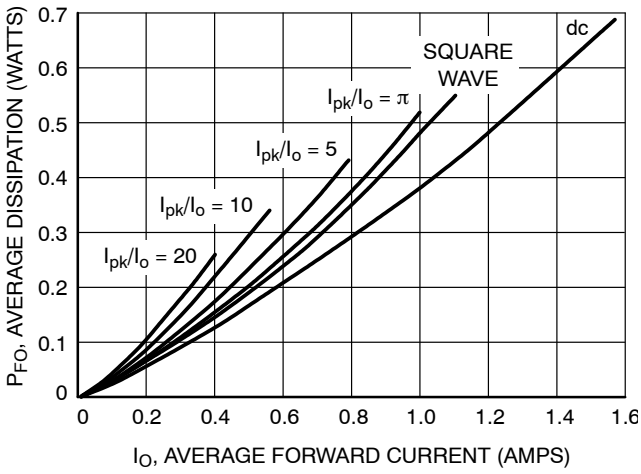



**Figure 6. Forward Power Dissipation**



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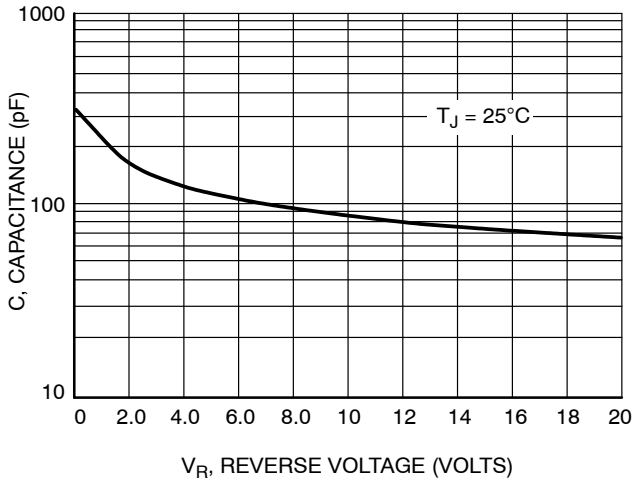



**Figure 7. Capacitance**

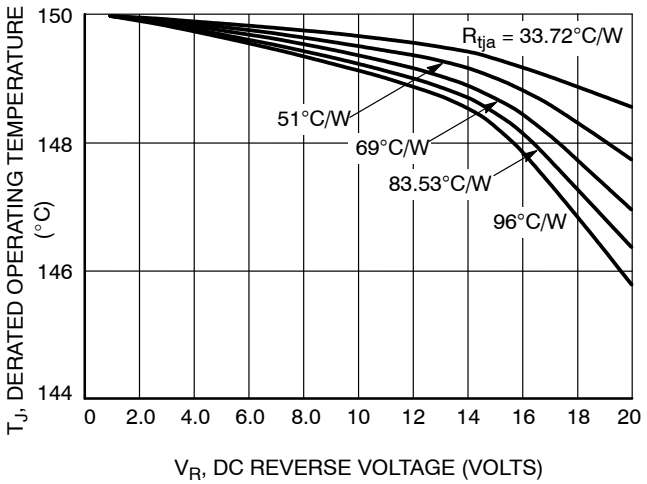



**Figure 8. Typical Operating Temperature Derating***

* 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: $T_J = T_{Jmax} - r(t)(Pf + Pr)$ where

r(t) = thermal impedance under given conditions,
Pf = forward power dissipation, and
Pr = reverse power dissipation

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



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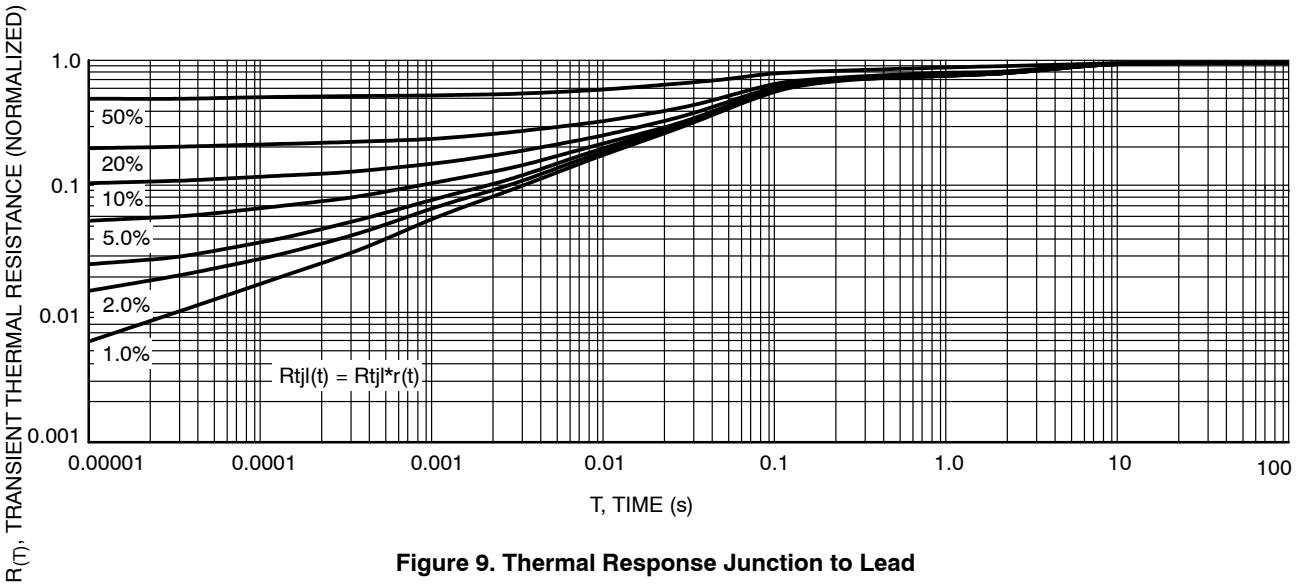



**Figure 9. Thermal Response Junction to Lead**

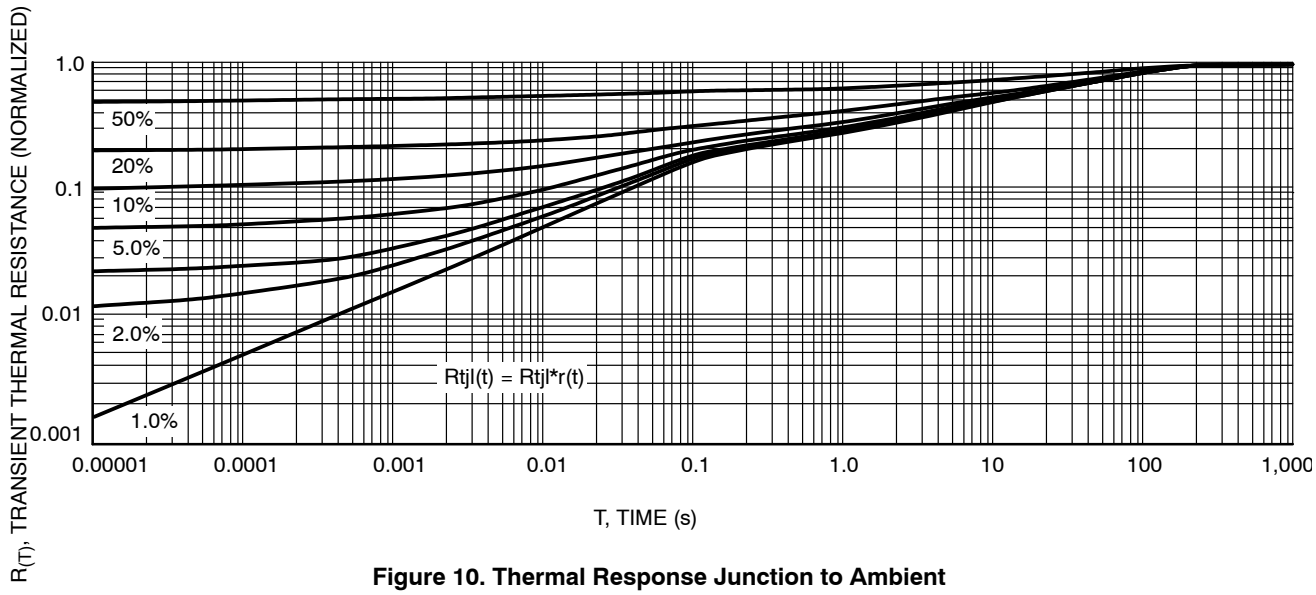



**Figure 10. Thermal Response Junction to Ambient**

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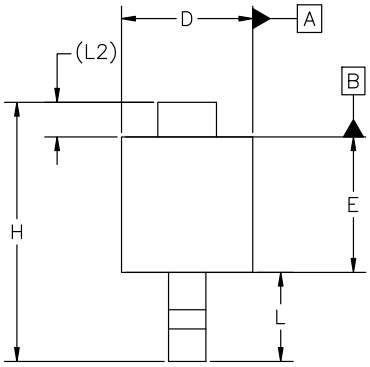


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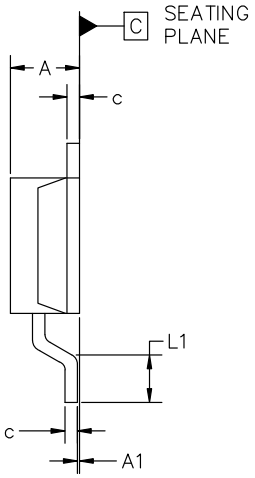


**POWERMITE 1.90x1.96x1.00**
CASE 457
ISSUE H

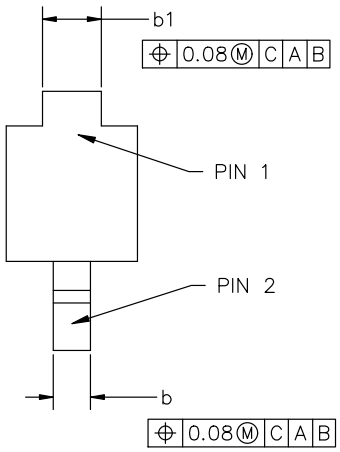
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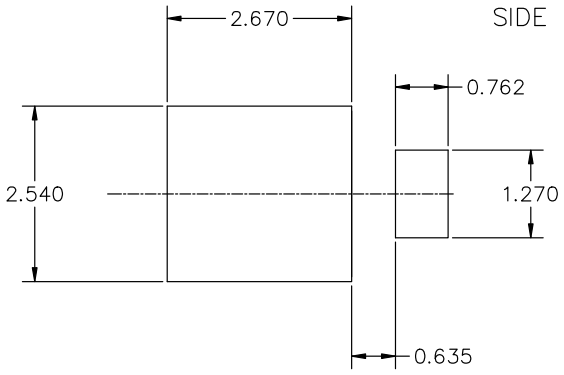

TOP VIEW




SIDE VIEW




BOTTOM VIEW



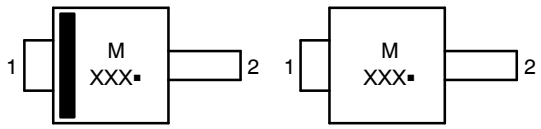

RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb−Free Strategy and Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

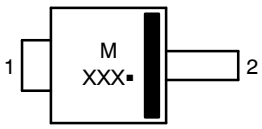
| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 0.85 | 1.00 | 1.15 |
| A1 | 0.00 | 0.05 | 0.10 |
| b | 0.40 | 0.55 | 0.69 |
| b1 | 0.70 | 0.85 | 1.00 |
| c | 0.10 | 0.18 | 0.25 |
| D | 1.75 | 1.90 | 2.05 |
| E | 1.75 | 1.96 | 2.18 |
| H | 3.60 | 3.75 | 3.90 |
| L | 1.20 | 1.35 | 1.50 |
| L1 | 0.50 | 0.65 | 0.80 |
| L2 | 0.50 REF | | |

NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

**GENERIC MARKING DIAGRAMS***




**STYLE 1** **STYLE 2**




**STYLE 3**

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

STYLE 1:
PIN 1. CATHODE
2. ANODE

STYLE 2:
PIN 1. ANODE OR CATHODE
2. CATHODE OR ANODE
(BI−DIRECTIONAL)

STYLE 3:
PIN 1. ANODE
2. CATHODE

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

| | | | |
|---|---|---|---|
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