

# MMBZxxVxL, SZMMBZxxVxL Series

## 40 Watt Peak Power Zener Transient Voltage Suppressors

### SOT-23 Dual Common Cathode Zeners for ESD Protection

These dual monolithic silicon zener diodes are designed for applications requiring transient overvoltage protection capability. They are intended for use in voltage and ESD sensitive equipment such as computers, printers, business machines, communication systems, medical equipment and other applications. Their dual junction common cathode design protects two separate lines using only one package. These devices are ideal for situations where board space is at a premium.

The SZ/MMBZ27VCL can be used to protect a single wire communication network from EMI and ESD transient surge voltages.

The SZ/MMBZ27VCL is recommended by the Society of Automotive Engineers (SAE), February 2000, J2411 “Single Wire Can Network for Vehicle Applications” specification as a solution for transient voltage problems.

#### Specification Features:

- SOT-23 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Working Peak Reverse Voltage Range – 12.8 V, 22 V, 31.2 V
- Standard Zener Breakdown Voltage Range – 15 V, 27 V, 39 V
- Peak Power – 40 W @ 1.0 ms (Bidirectional), per Figure 5 Waveform
- ESD Rating of Class 3B (exceeding 16 kV) per the Human Body Model
- ESD Rating of IEC61000-4-2 Level 4, ±30 kV Contact Discharge
- Low Leakage < 100 nA
- Flammability Rating: UL 94 V-O
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

#### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded, thermosetting plastic case

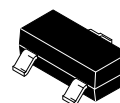
**FINISH:** Corrosion resistant finish, easily solderable

**MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:**  
260°C for 10 Seconds

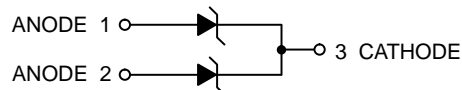


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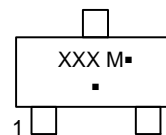
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SOT-23  
CASE 318  
STYLE 9



#### MARKING DIAGRAM



XXX = 15D, 27C or 39C

M = Date Code

■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping†
MMBZ15VDLT1G, SZMMBZ15VDLT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
MMBZ15VDLT3G, SZMMBZ15VDLT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
MMBZxxVCLT1G, SZMMBZxxVCLT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
MMBZxxVCLT3G, SZMMBZxxVCLT3G	SOT-23 (Pb-Free)	10,000 / 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.

# MMBZxxVxL, SZMMBZxxVxL Series

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Power Dissipation @ 1.0 ms (Note 1) @ $T_L \leq 25^\circ\text{C}$	$P_{pk}$	40	Watts
Total Power Dissipation on FR-5 Board (Note 2) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Power Dissipation on Alumina Substrate (Note 3) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to +150	$^\circ\text{C}$
Lead Solder Temperature - Maximum (10 Second Duration)	$T_L$	260	$^\circ\text{C}$

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.

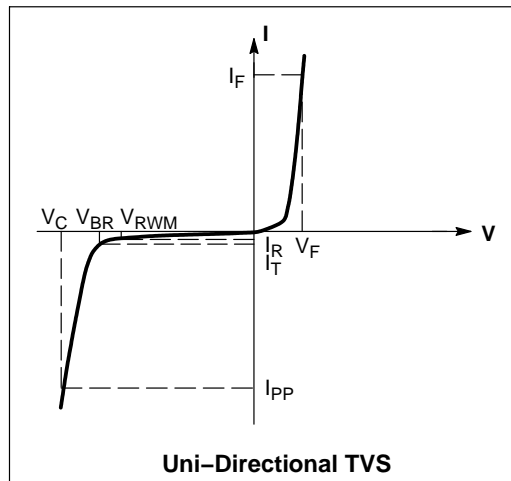
1. Nonrepetitive current pulse per Figure 5 and derate above  $T_A = 25^\circ\text{C}$  per Figure 6.
2. FR-5 = 1.0 x 0.75 x 0.62 in.
3. Alumina = 0.4 x 0.3 x 0.024 in., 99.5% alumina

## ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**UNIDIRECTIONAL** (Circuit tied to Pins 1 and 3 or 2 and 3)

Symbol	Parameter
$I_{PP}$	Maximum Reverse Peak Pulse Current
$V_C$	Clamping Voltage @ $I_{PP}$
$V_{RWM}$	Working Peak Reverse Voltage
$I_R$	Maximum Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Breakdown Voltage @ $I_T$
$I_T$	Test Current
$V_{BR}$	Maximum Temperature Coefficient of $V_{BR}$
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**UNIDIRECTIONAL** (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

( $V_F = 0.9\text{ V Max @ } I_F = 10\text{ mA}$ )

Device*	Device Marking	$V_{RWM}$ Volts	$I_R @ V_{RWM}$ nA	Breakdown Voltage				$V_C @ I_{PP}$ (Note 5)		$V_{BR}$ mV/ $^\circ\text{C}$
				$V_{BR}$ (Note 4) (V)			@ $I_T$	$V_C$ V	$I_{PP}$ A	
				Min	Nom	Max				
MMBZ15VDLT1G/T3G	15D	12.8	100	14.3	15	15.8	1.0	21.2	1.9	12

( $V_F = 1.1\text{ V Max @ } I_F = 200\text{ mA}$ )

Device*	Device Marking	$V_{RWM}$ Volts	$I_R @ V_{RWM}$ nA	Breakdown Voltage				$V_C @ I_{PP}$ (Note 5)		$V_{BR}$ mV/ $^\circ\text{C}$
				$V_{BR}$ (Note 4) (V)			@ $I_T$	$V_C$ V	$I_{PP}$ A	
				Min	Nom	Max				
MMBZ27VCLT1G/T3G	27C	22	50	25.65	27	28.35	1.0	38	1.0	26
MMBZ39VCLT1G/T3G	39C	31.2	50	37.05	39	40.95	1.0	55	0.76	35.3

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.

4.  $V_{BR}$  measured at pulse test current  $I_T$  at an ambient temperature of  $25^\circ\text{C}$ .

5. Surge current waveform per Figure 5 and derate per Figure 6

\*Include SZ-prefix devices where applicable.

# MMBZxxVxL, SZMMBZxxVxL Series

## TYPICAL CHARACTERISTICS

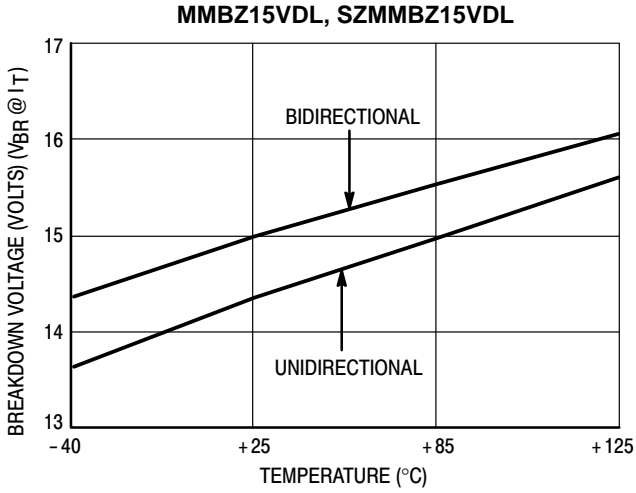


Figure 1. Typical Breakdown Voltage versus Temperature

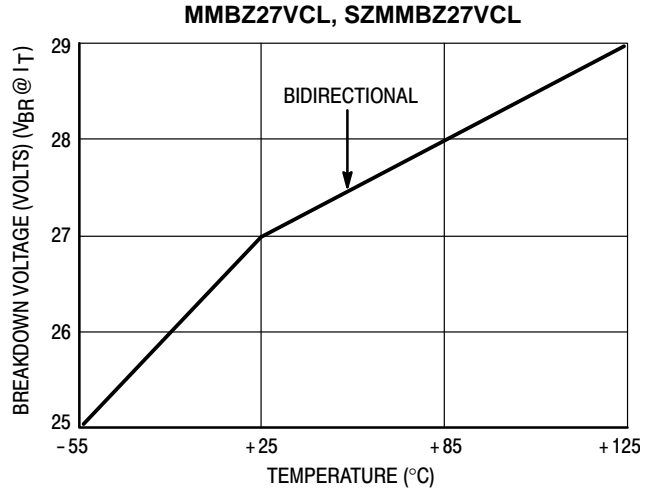


Figure 2. Typical Breakdown Voltage versus Temperature

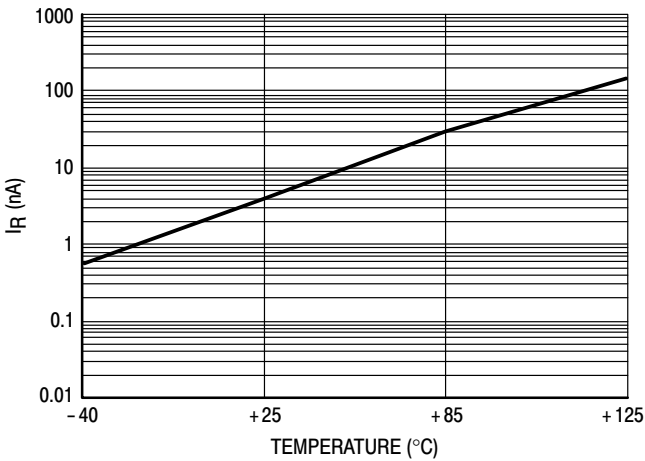


Figure 3. Typical Leakage Current versus Temperature

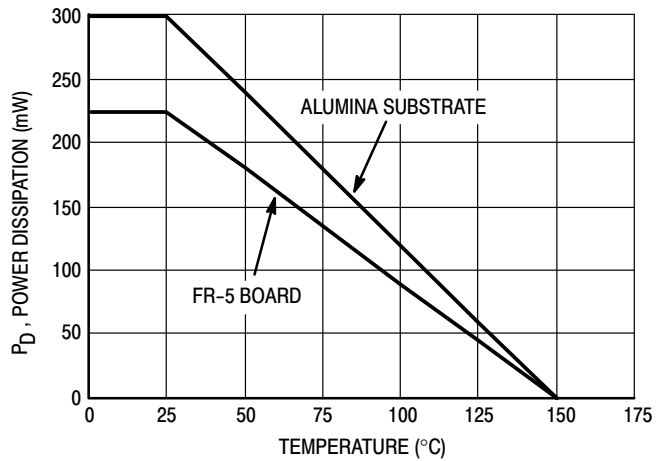


Figure 4. Steady State Power Derating Curve

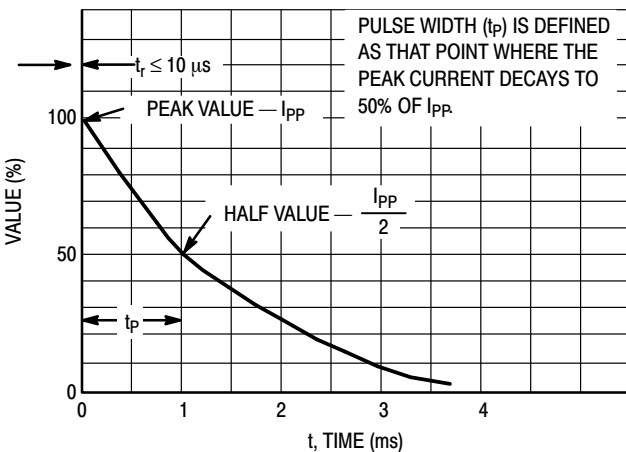


Figure 5. Pulse Waveform

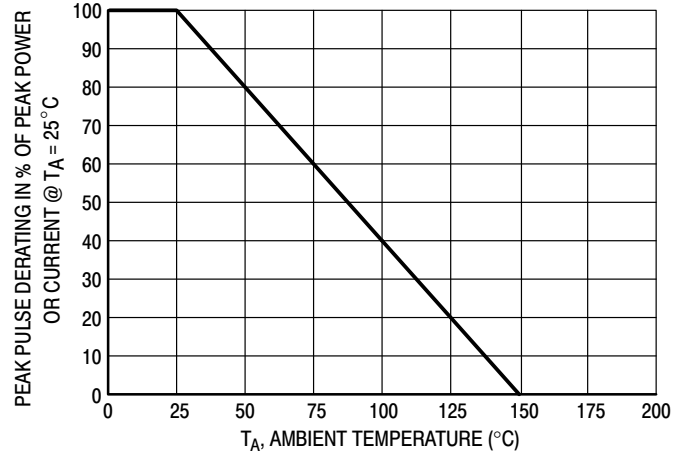
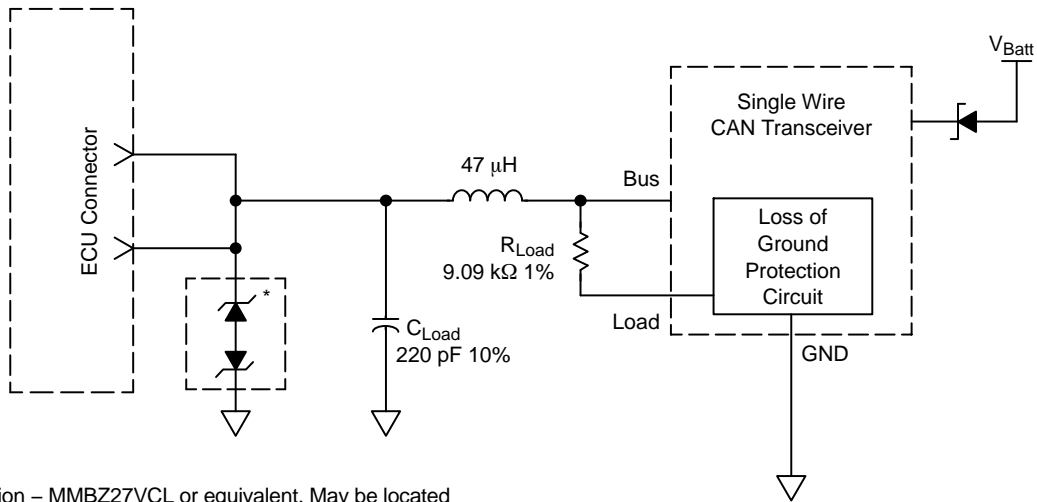


Figure 6. Pulse Derating Curve

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## TYPICAL APPLICATIONS



\*ESD Protection – MMBZ27VCL or equivalent. May be located in each ECU ( $C_{Load}$  needs to be reduced accordingly) or at a central point near the DLC.

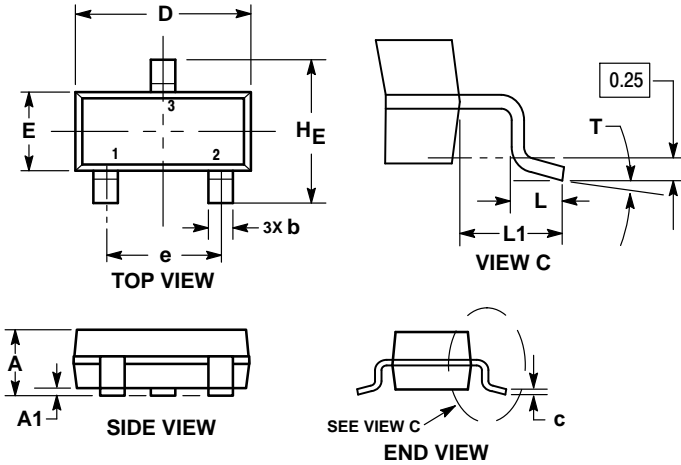
**Figure 7. Single Wire CAN Network**

Figure is the recommended solution for transient EMI/ESD protection. This circuit is shown in the Society of Automotive Engineers February, 2000 J2411 “Single Wire CAN Network for Vehicle Applications” specification (Figure 6, page 11). Note: the dual common anode zener configuration shown above is electrically equivalent to a dual common cathode zener configuration.

# MMBZxxVxL, SZMMBZxxVxL Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AR



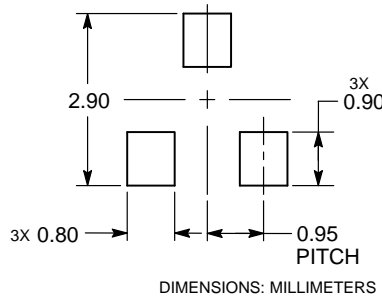
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	—	10°	0°	—	10°

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

### RECOMMENDED 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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