

# Zener Voltage Regulators

## 500 mW SOD-323 Surface Mount

### Tight Tolerance Portfolio

## MM3ZxxxST1G Series, SZMM3ZxxxST1G Series

This series of Zener diodes is packaged in a SOD-323 surface mount package that has a power dissipation of 500 mW. They are designed to provide voltage regulation protection and are especially attractive in situations where space is at a premium. They are well suited for applications such as cellular phones, hand-held portables, and high density PC boards.

### Specification Features

- Standard Zener Breakdown Voltage Range – 3.3 V to 36 V
- Steady State Power Rating of 500 mW
- Small Body Outline Dimensions:  
– 0.067" x 0.049" (1.7 mm x 1.25 mm)
- Low Body Height: 0.035" (0.9 mm)
- Package Weight: 4.507 mg/unit
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- Tight Tolerance  $V_Z$
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant\*

### Mechanical Characteristics:

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

**FINISH:** All external surfaces are corrosion resistant

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

**LEADS:** Plated with Pb-Sn or Sn only (Pb-Free)

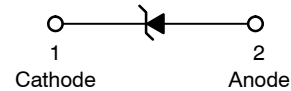
**POLARITY:** Cathode indicated by polarity band

**FLAMMABILITY RATING:** UL 94 V-0

**MOUNTING POSITION:** Any



SOD-323  
CASE 477  
STYLE 1



### MARKING DIAGRAM



XX = Specific Device Code

M = Date Code\*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device        | Package           | Shipping <sup>†</sup> |
|---------------|-------------------|-----------------------|
| MM3ZxxxST1G   | SOD-323 (Pb-Free) | 3,000 / Tape & Reel   |
| SZMM3ZxxxST1G | SOD-323 (Pb-Free) | 3,000 / Tape & Reel   |
| MM3ZxxxST3G   | SOD-323 (Pb-Free) | 10,000 / Tape & 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.

### DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 3 of this data sheet.

# MM3ZxxxST1G Series, SZMM3ZxxxST1G Series

## MAXIMUM RATINGS

| Rating                                                                                                                                                                                   | Symbol          | Max                      | Unit                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------|----------------------------------------------------------|
| Total Device Dissipation FR-4 Board,<br>(Note 1) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$<br>(Note 2) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4<br>500<br>4.0 | mW<br>mW/ $^\circ\text{C}$<br>mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance from Junction-to-Ambient (Note 1)<br>Thermal Resistance from Junction-to-Ambient (Note 2)                                                                             | $R_{\theta JA}$ | 416<br>250               | $^\circ\text{C/W}$<br>$^\circ\text{C/W}$                 |
| Junction and Storage Temperature Range                                                                                                                                                   | $T_J, T_{stg}$  | -65 to +150              | $^\circ\text{C}$                                         |

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.

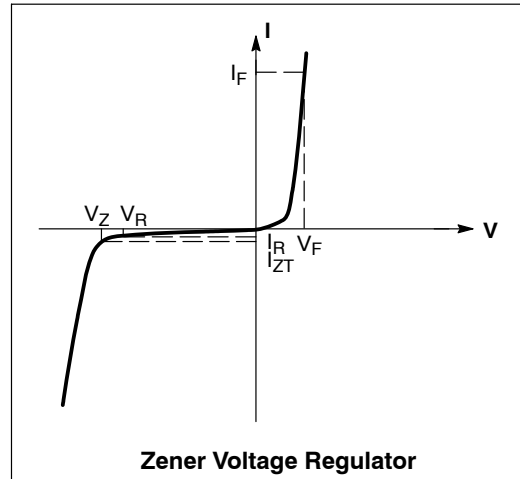
- FR-4 printed circuit board, single-sided copper, standard mounting pad, PCB  $1\text{ cm}^2$ .
- FR-4 printed circuit board, single-sided copper,  $0.72\text{ mm}^2$  mounting pad, PCB  $38\text{ mm}^2$ ,  $1\text{ in}^2$  copper heatsink.

## ELECTRICAL CHARACTERISTICS

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

$V_F = 0.9\text{ V}$  Max. @  $I_F = 10\text{ mA}$  for all types)

| Symbol       | Parameter                                           |
|--------------|-----------------------------------------------------|
| $V_Z$        | Reverse Zener Voltage @ $I_{ZT}$                    |
| $I_{ZT}$     | Reverse Current                                     |
| $Z_{ZT}$     | Maximum Zener Impedance @ $I_{ZT}$                  |
| $I_{ZK}$     | Reverse Current                                     |
| $Z_{ZK}$     | Maximum Zener Impedance @ $I_{ZK}$                  |
| $I_R$        | Reverse Leakage Current @ $V_R$                     |
| $V_R$        | Reverse Voltage                                     |
| $I_F$        | Forward Current                                     |
| $V_F$        | Forward Voltage @ $I_F$                             |
| $\Theta V_Z$ | Maximum Temperature Coefficient of $V_Z$            |
| C            | Max. Capacitance @ $V_R = 0$ and $f = 1\text{ MHz}$ |



## MM3ZxxxST1G Series, SZMM3ZxxxST1G Series

### ELECTRICAL CHARACTERISTICS ( $V_F = 0.9 \text{ Max}$ @ $I_F = 10 \text{ mA}$ for all types)

| Device*     | Device Marking | Test Current $I_{zt}$ mA | Zener Voltage VZ |       | $Z_{ZK} I_Z = 0.5 \text{ mA } \Omega \text{ Max}$ | $Z_{ZT} I_Z = I_{ZT} @ 10\% \text{ Mod } \Omega \text{ Max}$ | Max IR @ VR   |      | $dV_Z/dt$ (mV/k) @ $I_{ZT1} = 5 \text{ mA}$ |      | C pF Max @ $V_R = 0$ f = 1 MHz |
|-------------|----------------|--------------------------|------------------|-------|---------------------------------------------------|--------------------------------------------------------------|---------------|------|---------------------------------------------|------|--------------------------------|
|             |                |                          | Min              | Max   |                                                   |                                                              | $\mu\text{A}$ | V    | Min                                         | Max  |                                |
| MM3Z2V4ST1G | T2             | 5.0                      | 2.29             | 2.51  | 1000                                              | 100                                                          | 50            | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z2V7ST1G | T3             | 5.0                      | 2.59             | 2.81  | 1000                                              | 100                                                          | 20            | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z3V0ST1G | T4             | 5.0                      | 2.90             | 3.11  | 1000                                              | 100                                                          | 10            | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z3V3ST1G | T5             | 5.0                      | 3.32             | 3.53  | 1000                                              | 95                                                           | 5.0           | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z3V6ST1G | T6             | 5.0                      | 3.49             | 3.71  | 1000                                              | 90                                                           | 5.0           | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z3V9ST1G | T7             | 5.0                      | 3.89             | 4.16  | 1000                                              | 90                                                           | 3.0           | 1.0  | -3.5                                        | -2.5 | 450                            |
| MM3Z4V3ST1G | T8             | 5.0                      | 4.17             | 4.43  | 1000                                              | 90                                                           | 3.0           | 1.0  | -3.5                                        | 0    | 450                            |
| MM3Z4V7ST1G | T9             | 5.0                      | 4.55             | 4.75  | 800                                               | 80                                                           | 3.0           | 2.0  | -3.5                                        | 0.2  | 260                            |
| MM3Z5V1ST1G | TA             | 5.0                      | 4.98             | 5.2   | 500                                               | 60                                                           | 2.0           | 2.0  | -2.7                                        | 1.2  | 225                            |
| MM3Z5V6ST1G | TC             | 5.0                      | 5.49             | 5.73  | 200                                               | 40                                                           | 1.0           | 2.0  | -2.0                                        | 2.5  | 200                            |
| MM3Z6V2ST1G | TE             | 5.0                      | 6.06             | 6.33  | 100                                               | 10                                                           | 3.0           | 4.0  | 0.4                                         | 3.7  | 185                            |
| MM3Z6V8ST1G | TF             | 5.0                      | 6.65             | 6.93  | 160                                               | 15                                                           | 2.0           | 4.0  | 1.2                                         | 4.5  | 155                            |
| MM3Z7V5ST1G | TG             | 5.0                      | 7.28             | 7.6   | 160                                               | 15                                                           | 1.0           | 5.0  | 2.5                                         | 5.3  | 140                            |
| MM3Z8V2ST1G | TH             | 5.0                      | 8.02             | 8.36  | 160                                               | 15                                                           | 0.7           | 5.0  | 3.2                                         | 6.2  | 135                            |
| MM3Z9V1ST1G | TK             | 5.0                      | 8.85             | 9.23  | 160                                               | 15                                                           | 0.5           | 6.0  | 3.8                                         | 7.0  | 130                            |
| MM3Z10VST1G | WB             | 5.0                      | 9.80             | 10.20 | 160                                               | 15                                                           | 0.5           | 6.0  | 4.5                                         | 8.0  | 130                            |
| MM3Z11VST1G | WC             | 5.0                      | 10.78            | 11.22 | 160                                               | 20                                                           | 0.1           | 8.0  | 5.4                                         | 9.0  | 130                            |
| MM3Z12VST1G | TN             | 5.0                      | 11.74            | 12.24 | 80                                                | 25                                                           | 0.1           | 8.0  | 6.0                                         | 10   | 130                            |
| MM3Z13VST1G | TQ             | 5.0                      | 12.91            | 13.49 | 160                                               | 30                                                           | 0.1           | 8.0  | 7.0                                         | 11   | 120                            |
| MM3Z15VST1G | TP             | 5.0                      | 14.34            | 14.98 | 80                                                | 40                                                           | 0.1           | 11   | 8.8                                         | 12.7 | 130                            |
| MM3Z16VST1G | TU             | 5.0                      | 15.85            | 16.51 | 80                                                | 40                                                           | 0.05          | 11.2 | 10.4                                        | 14   | 105                            |
| MM3Z18VST1G | TW             | 5.0                      | 17.56            | 18.35 | 80                                                | 45                                                           | 0.05          | 12.6 | 12.4                                        | 16   | 100                            |
| MM3Z20VST1G | U8             | 5.0                      | 19.48            | 20.46 | 100                                               | 55                                                           | 0.05          | 14.0 | 14.4                                        | 18   | 85                             |
| MM3Z22VST1G | WP             | 5.0                      | 21.54            | 22.47 | 100                                               | 55                                                           | 0.05          | 15.4 | 16.4                                        | 20   | 85                             |
| MM3Z24VST1G | WT             | 5.0                      | 23.72            | 24.78 | 120                                               | 70                                                           | 0.05          | 16.8 | 18.4                                        | 22   | 80                             |
| MM3Z27VST1G | WQ             | 5.0                      | 26.19            | 27.53 | 300                                               | 80                                                           | 0.05          | 18.9 | 21.4                                        | 25.3 | 70                             |
| MM3Z30VST1G | WV             | 5.0                      | 29.19            | 30.69 | 300                                               | 80                                                           | 0.05          | 21.0 | 24.4                                        | 29.4 | 70                             |
| MM3Z33VST1G | WR             | 5.0                      | 32.15            | 33.79 | 300                                               | 80                                                           | 0.05          | 23.2 | 27.4                                        | 33.4 | 70                             |
| MM3Z36VST1G | WU             | 5.0                      | 35.07            | 36.87 | 500                                               | 90                                                           | 0.05          | 25.2 | 30.4                                        | 37.4 | 70                             |
| MM3Z39VST1G | WN             | 2.0                      | 38.22            | 39.78 | 500                                               | 130                                                          | 0.05          | 27.3 | 33.4                                        | 41.2 | 45                             |

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.

\*Include SZ-prefix devices where applicable.

# MM3ZxxxST1G Series, SZMM3ZxxxST1G Series

## TYPICAL CHARACTERISTICS

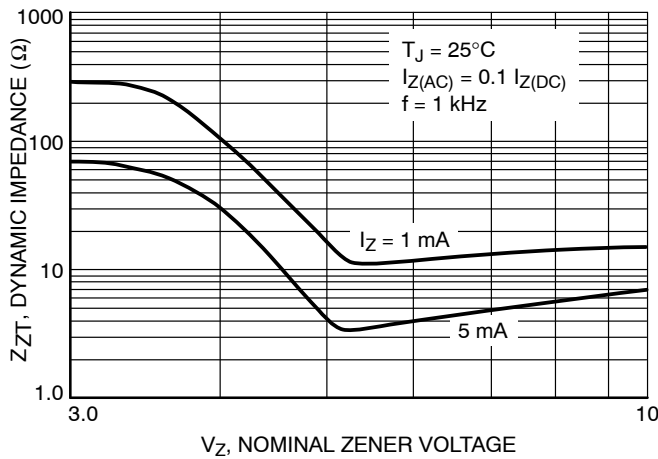


Figure 1. Effect of Zener Voltage on Zener Impedance

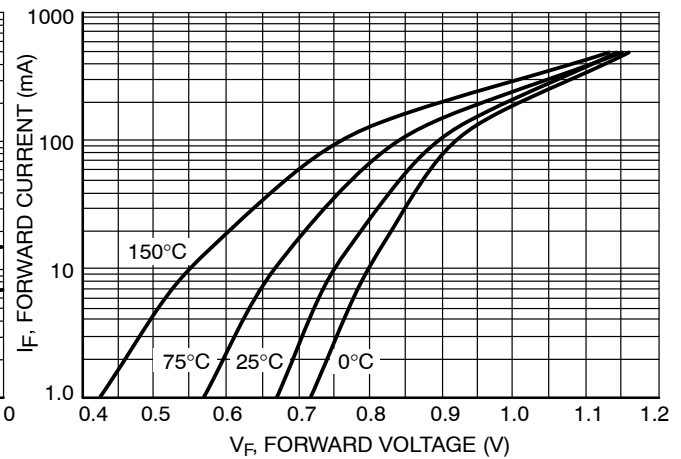


Figure 2. Typical Forward Voltage

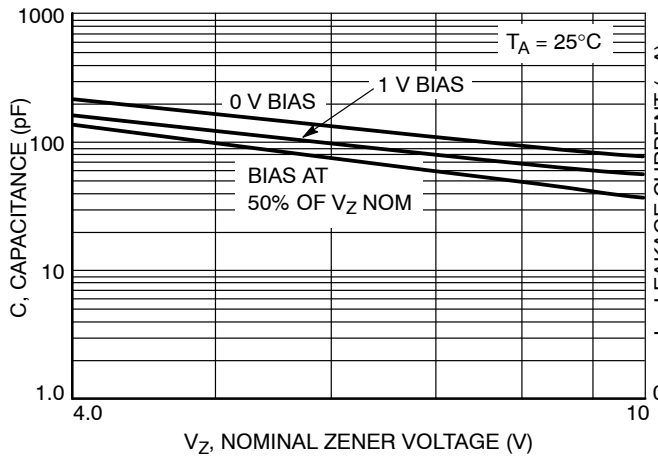


Figure 3. Typical Capacitance

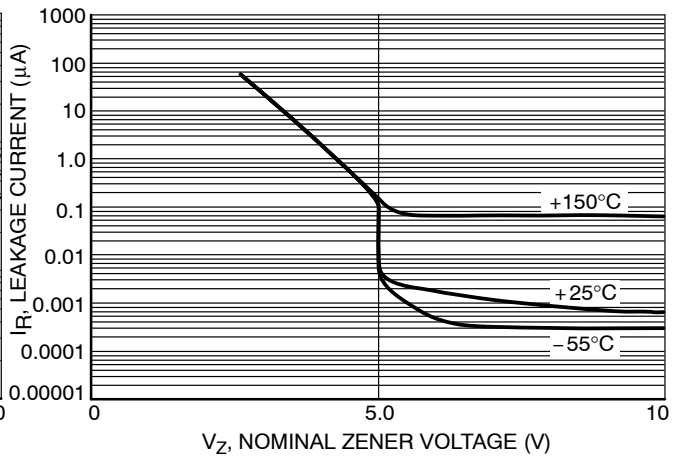


Figure 4. Typical Leakage Current

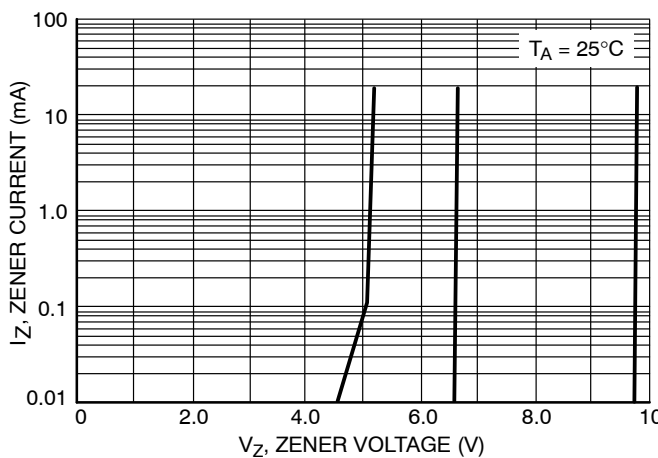


Figure 5. Zener Voltage versus Zener Current ( $V_Z$  Up to 9 V)

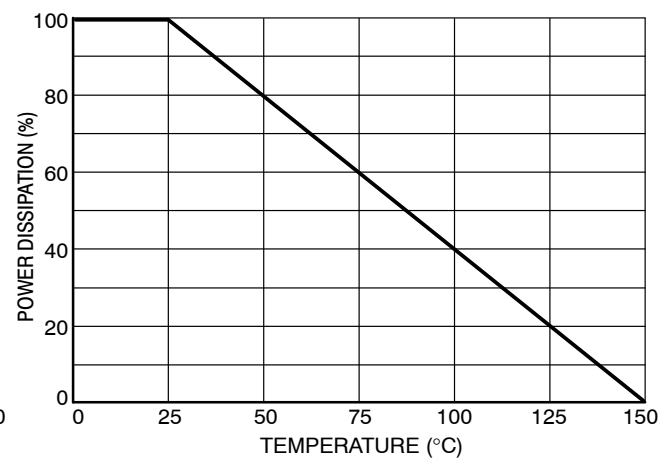
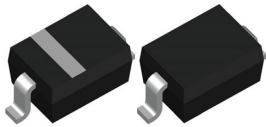
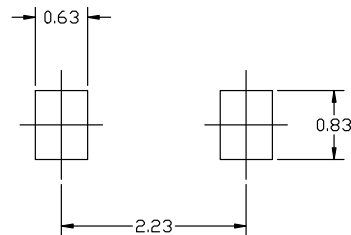
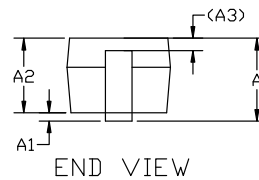
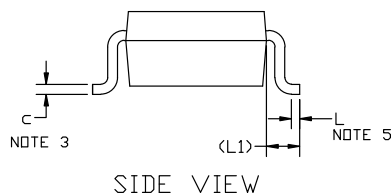
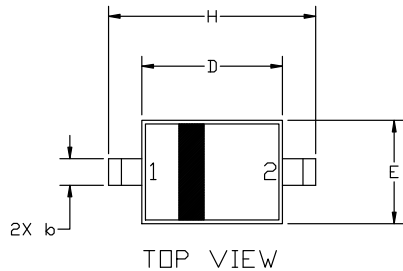


Figure 6. Steady State Power Derating


**SOD-323 1.70x1.25x0.85**  
**CASE 477**  
**ISSUE K**

DATE 11 MAR 2024

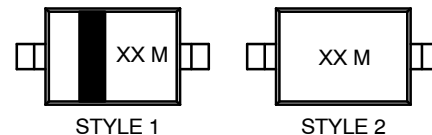


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference manual, SOLDERRM/D.

## NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS SPECIFIED PER L/F DRAWING WITH SOLDER PLATING.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DIMENSION L IS MEASURE FROM END OF RADIUS.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.80        | 0.90 | 1.00 |
| A1  | 0.00        | 0.05 | 0.10 |
| A2  | 0.75        | 0.85 | 0.95 |
| A3  | 0.15 (REF)  |      |      |
| b   | 0.25        | 0.32 | 0.4  |
| c   | 0.09        | 0.12 | 0.18 |
| D   | 1.60        | 1.70 | 1.80 |
| E   | 1.15        | 1.25 | 1.35 |
| H   | 2.30        | 2.50 | 2.70 |
| L   | 0.08        | ---  | ---  |
| L1  | 0.40 (REF)  |      |      |

**GENERIC MARKING DIAGRAM\***


XX = Specific Device Code  
M = Date Code

\*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.

STYLE 1:  
PIN 1: CATHODE (POLARITY BAND)  
2: ANODE

STYLE 2:  
NO POLARITY

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