

# Zener Voltage Regulators

## 500 mW SOD-523, Tight Tolerance Series

### MM5ZxxxST1G Series, SZMM5ZxxxST1G Series

This series of Zener diodes is packaged in a SOD-523 surface mount package. 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 -2.4 V to 18 V
- Tight Tolerance Series
- Steady State Power Rating of 500 mW
- Small Body Outline Dimensions:  
0.047" x 0.032" (1.20 mm x 0.80 mm)  
Low Body Height: 0.028" (0.7 mm)
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- 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 and are RoHS Compliant\*

#### Mechanical Characteristics

**CASE:** Void-free, transfer-molded, thermosetting plastic  
Epoxy Meets UL 94, V-0

**LEAD FINISH:** 100% Matte Sn (Tin)

**MOUNTING POSITION:** Any

**QUALIFIED MAX REFLOW TEMPERATURE:** 260°C

Device Meets MSL 1 Requirements

#### MAXIMUM RATINGS

| Rating                                                                                                         | Symbol          | Max            | Unit        |
|----------------------------------------------------------------------------------------------------------------|-----------------|----------------|-------------|
| Total Device Dissipation FR-4 Board,<br>(Note 1) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 500<br>4.0     | mW<br>mW/°C |
| Thermal Resistance from<br>Junction-to-Ambient (Note 1)                                                        | $R_{\theta JA}$ | 250            | °C/W        |
| Operating Junction and Storage<br>Temperature Range                                                            | $T_J, T_{stg}$  | -65 to<br>+150 | °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. FR-4 printed circuit board, single-sided copper, mounting pad 1 cm<sup>2</sup>.

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

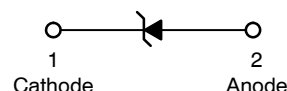


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SOD-523  
CASE 502  
STYLE 1



#### 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†              |
|---------------|----------------------|------------------------|
| MM5ZxxxST1G   | SOD-523<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| SZMM5ZxxxST1G | SOD-523<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| MM5ZxxxST5G   | SOD-523<br>(Pb-Free) | 8,000 /<br>Tape & Reel |
| SZMM5ZxxxST5G | SOD-523<br>(Pb-Free) | 8,000 /<br>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.

#### DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the Electrical Characteristics table on page 2 of this data sheet.

## MM5ZxxxST1G Series, SZMM5ZxxxST1G Series

### ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted,

V<sub>F</sub> = 0.9 V Max. @ I<sub>F</sub> = 10 mA for all types)

| Symbol          | Parameter                                           |
|-----------------|-----------------------------------------------------|
| V <sub>Z</sub>  | Reverse Zener Voltage @ I <sub>ZT</sub>             |
| I <sub>ZT</sub> | Reverse Current                                     |
| Z <sub>ZT</sub> | Maximum Zener Impedance @ I <sub>ZT</sub>           |
| I <sub>ZK</sub> | Reverse Current                                     |
| Z <sub>ZK</sub> | Maximum Zener Impedance @ I <sub>ZK</sub>           |
| I <sub>R</sub>  | Reverse Leakage Current @ V <sub>R</sub>            |
| V <sub>R</sub>  | Reverse Voltage                                     |
| I <sub>F</sub>  | Forward Current                                     |
| V <sub>F</sub>  | Forward Voltage @ I <sub>F</sub>                    |
| θV <sub>Z</sub> | Maximum Temperature Coefficient of V <sub>Z</sub>   |
| C               | Max. Capacitance @ V <sub>R</sub> = 0 and f = 1 MHz |



Figure 1. Zener Voltage Regulator

### ELECTRICAL CHARACTERISTICS – Tight Tolerance Series

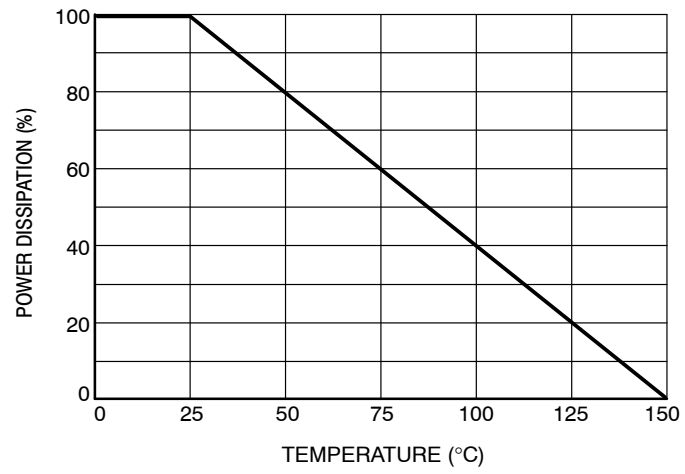
(V<sub>F</sub> = 0.9 Max @ I<sub>F</sub> = 10 mA for all types)

| Device*         | Device Marking | Test Current I <sub>zt</sub> mA | Zener Voltage V <sub>Z</sub> |       | Z <sub>ZK</sub> I <sub>Z</sub> = 1.0 mA Ω Max | Z <sub>ZT</sub> I <sub>Z</sub> = I <sub>ZT</sub> @ 10% Mod Ω Max | Max IR @ V <sub>R</sub> |      | dV <sub>Z</sub> /dt (mV/k) @ I <sub>ZT1</sub> = 5 mA |      | C pF Max @ V <sub>R</sub> = 0 f = 1 MHz |
|-----------------|----------------|---------------------------------|------------------------------|-------|-----------------------------------------------|------------------------------------------------------------------|-------------------------|------|------------------------------------------------------|------|-----------------------------------------|
|                 |                |                                 | Min                          | Max   |                                               |                                                                  | μA                      | V    | Min                                                  | Max  |                                         |
| MM5Z2V4ST1G/T5G | T2             | 5.0                             | 2.43                         | 2.63  | 1000                                          | 100                                                              | 120                     | 1.0  | -3.5                                                 | 0    | 450                                     |
| MM5Z2V7ST1G     | T3             | 5.0                             | 2.67                         | 2.91  | 1000                                          | 100                                                              | 100                     | 1.0  | -3.5                                                 | 0    | 450                                     |
| MM5Z3V3ST1G     | T5             | 5.0                             | 3.32                         | 3.53  | 1000                                          | 95                                                               | 5.0                     | 1.0  | -3.5                                                 | 0    | 450                                     |
| MM5Z3V6ST1G     | T6             | 5.0                             | 3.60                         | 3.85  | 1000                                          | 90                                                               | 5.0                     | 1.0  | -3.5                                                 | 0    | 450                                     |
| MM5Z3V9ST1G     | T7             | 5.0                             | 3.89                         | 4.16  | 1000                                          | 90                                                               | 3.0                     | 1.0  | -3.5                                                 | -2.5 | 450                                     |
| MM5Z4V3ST1G     | T8             | 5.0                             | 4.17                         | 4.43  | 1000                                          | 90                                                               | 3.0                     | 1.0  | -3.5                                                 | 0    | 450                                     |
| MM5Z4V7ST1G/T5G | T9             | 5.0                             | 4.55                         | 4.75  | 800                                           | 80                                                               | 3.0                     | 2.0  | -3.5                                                 | 0.2  | 260                                     |
| MM5Z5V1ST1G/T5G | TA             | 5.0                             | 4.98                         | 5.2   | 500                                           | 60                                                               | 2.0                     | 2.0  | -2.7                                                 | 1.2  | 225                                     |
| MM5Z5V6ST1G/T5G | TC             | 5.0                             | 5.49                         | 5.73  | 200                                           | 40                                                               | 1.0                     | 2.0  | -2.0                                                 | 2.5  | 200                                     |
| MM5Z6V2ST1G/T5G | TE             | 5.0                             | 6.06                         | 6.33  | 100                                           | 10                                                               | 3.0                     | 4.0  | 0.4                                                  | 3.7  | 185                                     |
| MM5Z6V8ST1G/T5G | TF             | 5.0                             | 6.65                         | 6.93  | 160                                           | 15                                                               | 2.0                     | 4.0  | 1.2                                                  | 4.5  | 155                                     |
| MM5Z7V5ST1G     | TG             | 5.0                             | 7.28                         | 7.6   | 160                                           | 15                                                               | 1.0                     | 5.0  | 2.5                                                  | 5.3  | 140                                     |
| MM5Z8V2ST1G/T5G | TH             | 5.0                             | 8.02                         | 8.36  | 160                                           | 15                                                               | 0.7                     | 5.0  | 3.2                                                  | 6.2  | 135                                     |
| MM5Z9V1ST1G/T5G | TK             | 5.0                             | 8.85                         | 9.23  | 160                                           | 15                                                               | 0.5                     | 6.0  | 3.8                                                  | 7.0  | 130                                     |
| MM5Z12VST1G     | TN             | 5.0                             | 11.74                        | 12.24 | 80                                            | 25                                                               | 0.1                     | 8.0  | 6.0                                                  | 10   | 130                                     |
| MM5Z16VST1G     | TU             | 5.0                             | 15.85                        | 16.51 | 80                                            | 40                                                               | 0.05                    | 11.2 | 10.4                                                 | 14   | 105                                     |
| MM5Z18VST1G     | TW             | 5.0                             | 17.56                        | 18.35 | 80                                            | 45                                                               | 0.05                    | 12.6 | 12.4                                                 | 16   | 100                                     |

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.

\*Includes SZ-prefix devices where applicable.

**TYPICAL CHARACTERISTICS**



**Figure 2. Steady State Power Derating**

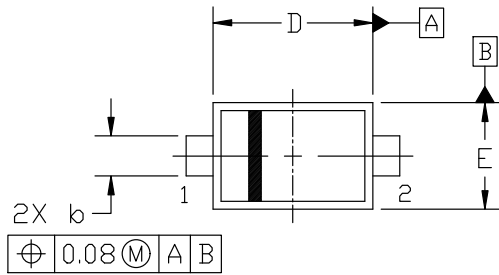


### SOD-523 1.20x0.80x0.60

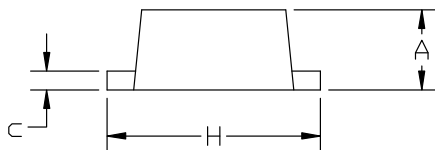
#### CASE 502

#### ISSUE F

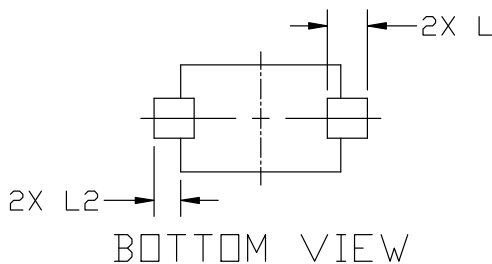
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TOP VIEW



SIDE VIEW



BOTTOM VIEW

#### 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

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH, MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.50        | 0.60 | 0.70 |
| b   | 0.25        | 0.30 | 0.35 |
| c   | 0.07        | 0.14 | 0.20 |
| D   | 1.10        | 1.20 | 1.30 |
| E   | 0.70        | 0.80 | 0.90 |
| H   | 1.50        | 1.60 | 1.70 |
| L   | 0.30 REF    |      |      |
| L2  | 0.15        | 0.20 | 0.25 |



#### RECOMMENDED MOUNTING 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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