

# ESD5Z2.5T1G Series, SZESD5Z2.5T1G Series

## Transient Voltage Suppressors

### Micro-Packaged Diodes for ESD Protection

The ESD5Z Series is designed to protect voltage sensitive components from ESD and transient voltage events. Excellent clamping capability, low leakage, and fast response time, make these parts ideal for ESD protection on designs where board space is at a premium. Because of its small size, it is suited for use in cellular phones, portable devices, digital cameras, power supplies and many other portable applications.

#### Specification Features:

- Low Clamping Voltage
- Small Body Outline Dimensions:  
0.047" x 0.032" (1.20 mm x 0.80 mm)
- Low Body Height: 0.028" (0.7 mm)
- Stand-off Voltage: 2.5 V – 12 V
- Peak Power up to 240 Watts @ 8 x 20  $\mu$ s Pulse
- Low Leakage
- Response Time is Typically < 1 ns
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- IEC61000-4-2 Level 4 ESD Protection
- IEC61000-4-4 Level 4 EFT Protection
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Packages are Available\*

#### 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

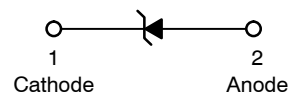


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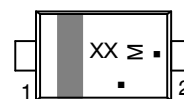
<http://onsemi.com>



SOD-523  
CASE 502  
PLASTIC  
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†
ESD5ZxxxT1G	SOD-523 Pb-Free	3,000 / Tape & Reel
SZESD5ZxxxT1G	SOD-523 Pb-Free	3,000 / 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.

#### DEVICE MARKING INFORMATION

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

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

## ESD5Z2.5T1G Series, SZESD5Z2.5T1G Series

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IEC 61000-4-2 (ESD) Contact Air		±30 ±30	kV
IEC 61000-4-4 (EFT)		40	A
ESD Voltage Per Human Body Model Per Machine Model		16 400	kV V
Total Power Dissipation on FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$	$P_D$	200	mW
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 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.

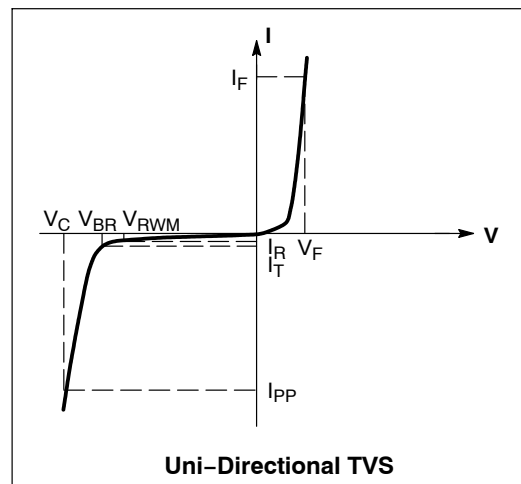
1. FR-5 = 1.0 x 0.75 x 0.62 in.

See Application Note AND8308/D for further description of survivability specs.

### ELECTRICAL CHARACTERISTICS

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

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
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$
$P_{pk}$	Peak Power Dissipation
C	Max. Capacitance @ $V_R = 0$ and $f = 1$ MHz



\*See Application Note AND8308/D for detailed explanations of datasheet parameters.

## ESD5Z2.5T1G Series, SZESD5Z2.5T1G Series

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 1.1\text{ V Max.}$  @  $I_F = 10\text{ mA}$  for all types)

Device*	Device Marking	$V_{RWM}$ (V)	$I_R$ ( $\mu\text{A}$ ) @ $V_{RWM}$	$V_{BR}$ (V) @ $I_T$ (Note 2)	$I_T$	$V_C$ (V) @ $I_{PP} = 5.0\text{ A}^\dagger$	$V_C$ (V) @ Max $I_{PP}^\dagger$	$I_{PP}$ (A) <sup>†</sup>	$P_{pk}$ (W) <sup>†</sup>	C (pF)	$V_C$
		Max	Max	Min	mA	Typ	Max	Max	Max	Max	Typ
ESD5Z2.5T1G	ZD	2.5	6.0	4.0	1.0	6.5	10.9	11.0	120	145	Figures 1 and 2 See Below (Note 4)
ESD5Z3.3T1G	ZE	3.3	0.05	5.0	1.0	8.4	14.1	11.2	158	105	
ESD5Z5.0T1G	ZF	5.0	0.05	6.2	1.0	11.6	18.6	9.4	174	80	
ESD5Z6.0T1G	ZG	6.0	0.01	6.8	1.0	12.4	20.5	8.8	181	70	
ESD5Z7.0T1G	ZH	7.0	0.01	7.5	1.0	13.5	22.7	8.8	200	65	
ESD5Z12T1G	ZM	12	0.01	14.1	1.0	17	25	9.6	240	55	

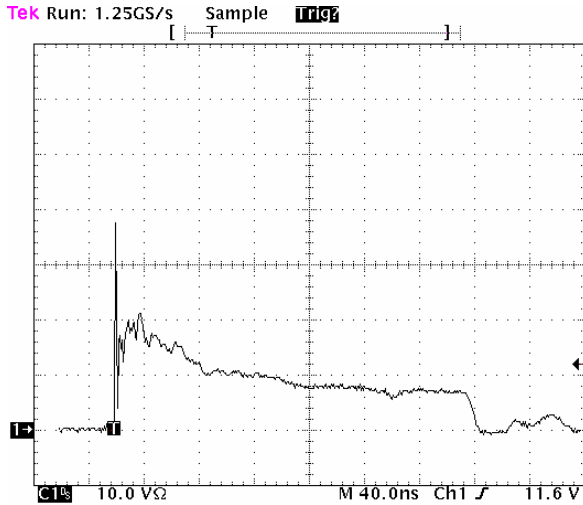
\* Include SZ-prefix devices where applicable.

† Surge current waveform per Figure 5.

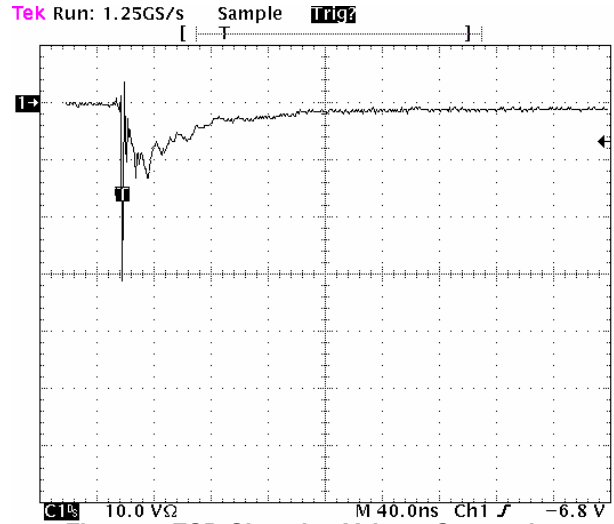
2.  $V_{BR}$  is measured with a pulse test current  $I_T$  at an ambient temperature of  $25^\circ\text{C}$ .

3. For test procedure see Figures 3 and 4 and Application Note AND8307/D.

4. ESD5Z5.0T1G shown below. Other voltages available upon request.



**Figure 1. ESD Clamping Voltage Screenshot**  
Positive 8 kV contact per IEC 61000-4-2



**Figure 2. ESD Clamping Voltage Screenshot**  
Negative 8 kV contact per IEC 61000-4-2

# ESD5Z2.5T1G Series, SZESD5Z2.5T1G Series

## IEC 61000-4-2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8



Figure 3. IEC61000-4-2 Spec

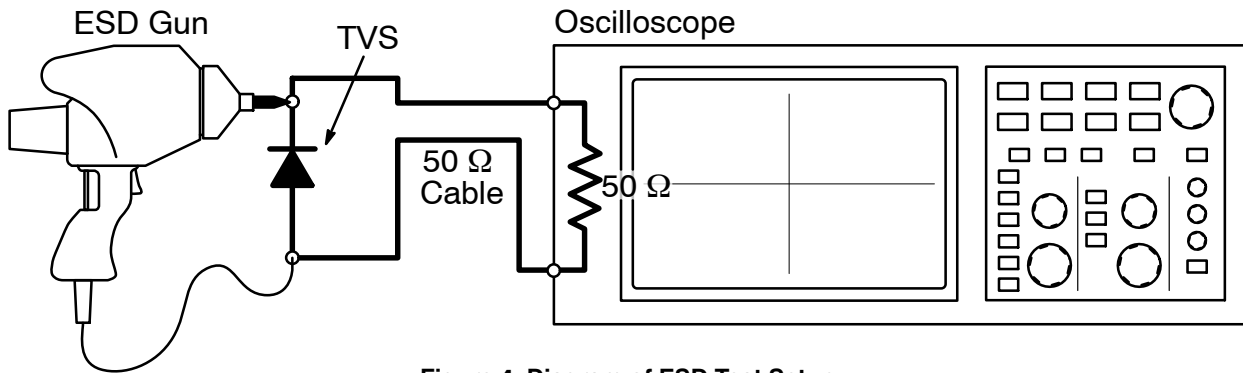


Figure 4. Diagram of ESD Test Setup

The following is taken from Application Note AND8308/D – Interpretation of Datasheet Parameters for ESD Devices.

### ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger

systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage at the device level. ON Semiconductor has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the datasheets for all ESD protection diodes. For more information on how ON Semiconductor creates these screenshots and how to interpret them please refer to AND8307/D.

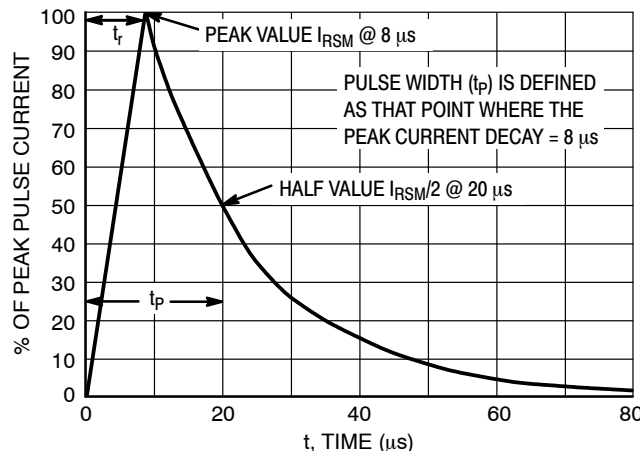
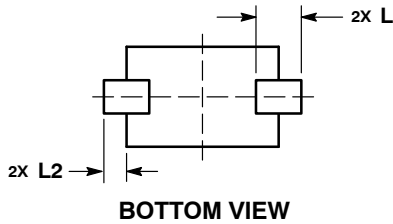
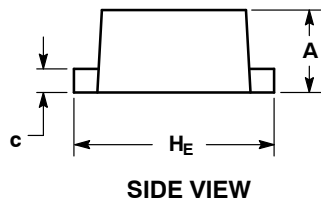
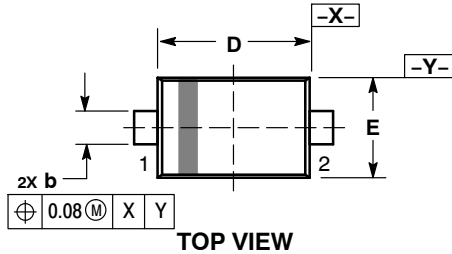


Figure 5. 8 X 20 μs Pulse Waveform

# ESD5Z2.5T1G Series, SZESD5Z2.5T1G Series

## PACKAGE DIMENSIONS

**SOD-523**  
CASE 502-01  
ISSUE E



**NOTES:**

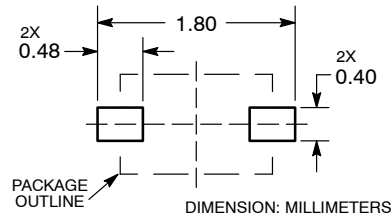
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

MILLIMETERS			
DIM	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 E	1.50	1.60	1.70
L	0.30 REF		
L2	0.15	0.20	0.25

**STYLE 1:**

- PIN 1: CATHODE (POLARITY BAND)
- ANODE

**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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