ESD9C3.3ST5G SERIES

Transient Voltage Suppressors
Micro−Packaged Diodes for ESD Protection

The ESD9C3.3ST5G Series is designed to protect voltage sensitive components from ESD. 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 Capacitance 6.2 pF − 13 pF
- Low Clamping Voltage
- Small Body Outline Dimensions:
    0.039″ x 0.024″ (1.0 mm x 0.60 mm)
- Low Body Height: 0.016″ (0.40 mm) Max
- Stand−off Voltage: 3.3 V, 5 V
- Low Leakage
- Response Time < 1 ns
- ESD Rating of Class 3 (> 16 kV) per Human Body Model
- IEC61000−4−2 Level 4 ESD Protection
- AEC−Q101 Qualified and PPAP Capable
- These are Pb−Free Devices

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

ON Semiconductor®

1 ○——▷|——○ 2

PIN 1. CATHODE
2. ANODE

MARKING DIAGRAM

SOD−923
CASE 514AB

| X M |

X = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping[†]
ESD9CxxST5G	SOD−923 (Pb−Free)	8000/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 table on page 2 of this data sheet.

MAXIMUM RATINGS

Rating		Symbol	Value	Unit
IEC 61000−4−2 (ESD)	Contact Air		±8.0 ±15	kV
Total Power Dissipation on FR−5 Board (Note 1) @ T_A = 25°C		P_D	150	mW
Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +150	°C
Lead Solder Temperature − Maximum (10 Second Duration)		T_L	260	°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.
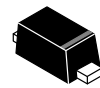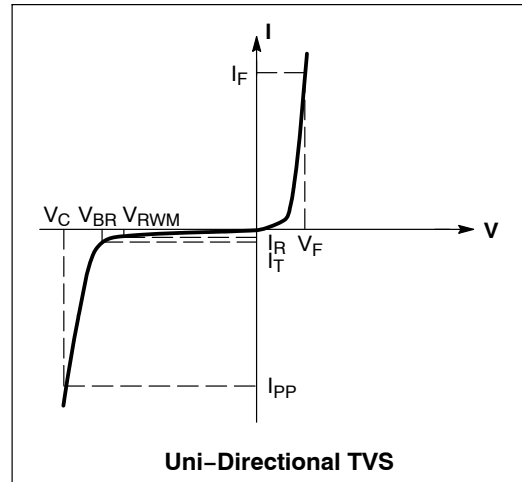
ELECTRICAL CHARACTERISTICS

(T_A = 25°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.

Uni−Directional TVS

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.1 V Max. @ I_F = 10 mA)

Device	Device Marking	V_{RWM} (V) Max	I_R (μA) @ V_{RWM} Max	V_{BR} (V) @ I_T (Note 2) Min	I_T mA	C (pF) (Note 3) Typ	C (pF) (Note 3) Max	V_C Per IEC61000−4−2 (Note 4)
ESD9C3.3ST5G	R	3.3	1.0	5.0	1.0	12.8	13	Figures 1 and 2 See Below (Note 5)
ESD9C5.0ST5G	P	5.0	0.5	11.0	1.0	6.0	6.2	

2. V_{BR} is measured with a pulse test current I_T at an ambient temperature of 25°C.
3. Capacitance at f = 1 MHz, V_R = 0 V, T_A = 25°C.
4. For test procedure see Figures 3 and 4 and Application Note AND8307/D.
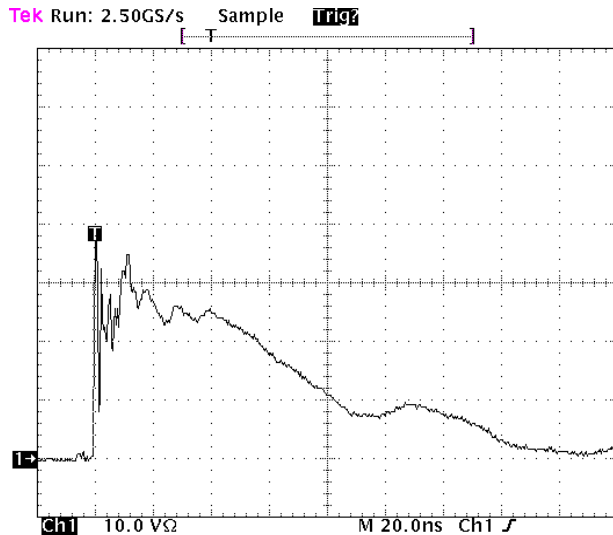5. ESD9C5.0ST5G shown below. Other voltages available upon request.

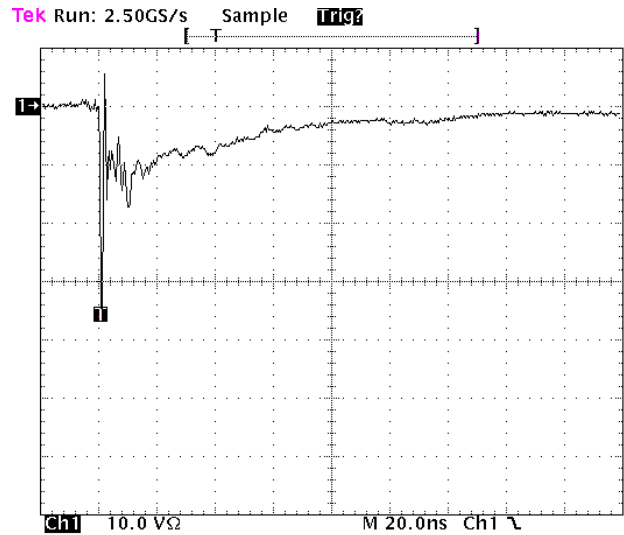**Figure 1. ESD Clamping Voltage Screenshot Positive 8 kV Contact per IEC61000−4−2**

Figure 2. ESD Clamping Voltage Screenshot Negative 8 kV Contact per IEC61000−4−2

IEC 61000−4−2 Spec.

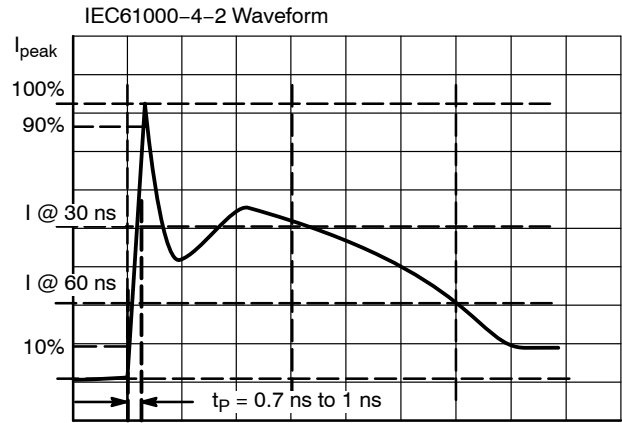| Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

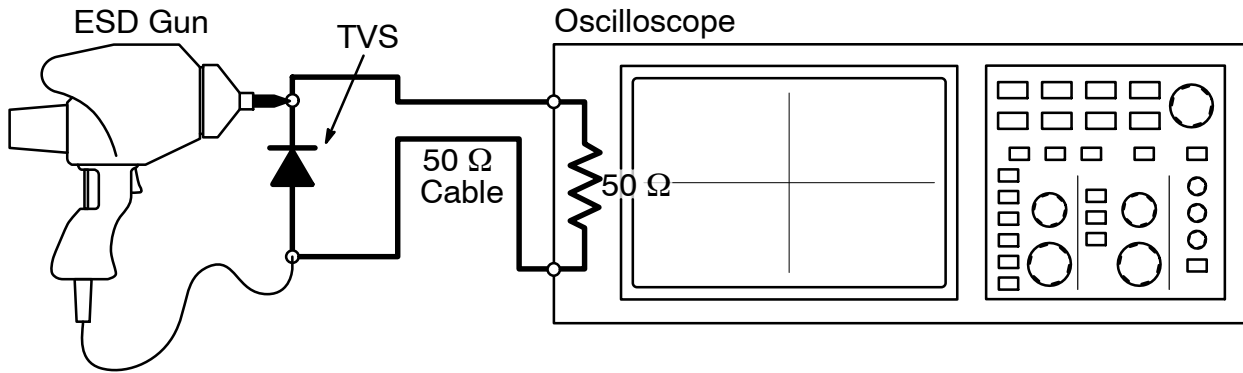IEC61000−4−2 Waveform

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.

ESD9C3.3ST5G SERIES

PACKAGE DIMENSIONS

SOD−923
CASE 514AB
ISSUE C

TOP VIEW

SIDE VIEW

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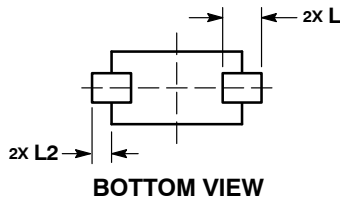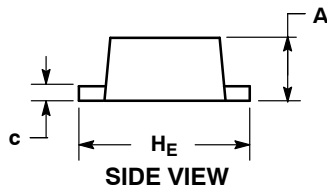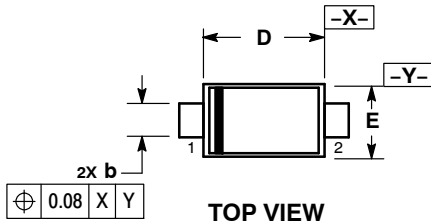
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.34	0.37	0.40	0.013	0.015	0.016
b	0.15	0.20	0.25	0.006	0.008	0.010
c	0.07	0.12	0.17	0.003	0.005	0.007
D	0.75	0.80	0.85	0.030	0.031	0.033
E	0.55	0.60	0.65	0.022	0.024	0.026
H_E	0.95	1.00	1.05	0.037	0.039	0.041
L	0.19 REF			0.007 REF		
L2	0.05	0.10	0.15	0.002	0.004	0.006

SOLDERING FOOTPRINT*

PACKAGE OUTLINE

DIMENSIONS: MILLIMETERS
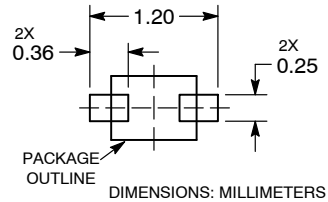
See Application Note AND8455/D for more mounting details

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

ESD9C3.3S/D

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