

# ESD Protection Diode

## Micro-Packaged Diodes for ESD Protection

### ESD5B5.0S, SZESD5B5.0S

The ESD5B Series is designed to protect voltage sensitive components from ESD. Excellent clamping capability, low leakage, and fast response time provide best in class protection on designs that are exposed to ESD. Because of its small size and bi-directional design, it is ideal for use in cellular phones, MP3 players, and portable applications that require audio line protection.

#### Specification Features

- Low Capacitance 32 pF
- Low Clamping Voltage
- Small Body Outline Dimensions: nom 0.063" x 0.032" (1.6x0.8 mm)
- Low Body Height: nom 0.024" (0.6 mm)
- Reverse Working (Stand-off) Voltage: 5.0 V
- Peak Power up to 50 W @ 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
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- This is a Pb-Free Device

#### 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         | Value                | Unit    |
|-----------------------------------------------------------------------------------------------------------|----------------|----------------------|---------|
| IEC 61000-4-2 (ESD) Contact Air                                                                           |                | $\pm 30$<br>$\pm 30$ | kV      |
| ESD Voltage Per Human Body Model<br>Per Machine Model                                                     |                | 16<br>400            | kV<br>V |
| Peak Power (Figure 1) Per 8 x 20 $\mu$ s Waveform<br>Peak Power (Figure 2) Per 10 x 1000 $\mu$ s Waveform | $P_{PK}$       | 50<br>10             | W       |
| Total Power Dissipation on FR-5 Board (Note 1)<br>@ $T_A = 25^\circ\text{C}$                              | $P_D$          | 200                  | mW      |
| Junction and Storage Temperature Range                                                                    | $T_J, T_{stg}$ | -55 to<br>+150       | °C      |
| Lead Solder Temperature – Maximum<br>(10 Second Duration)                                                 | $T_L$          | 260                  | °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.

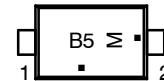
1. FR-5 = 1.0 x 0.75 x 0.62 in.

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



SOD-523  
CASE 502

#### MARKING DIAGRAM



B5 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

#### ORDERING INFORMATION

| Device         | Package           | Shipping <sup>†</sup> |
|----------------|-------------------|-----------------------|
| ESD5B5.0ST1G   | SOD-523 (Pb-Free) | 3000 / Tape & Reel    |
| ESD5B5.0ST5G   | SOD-523 (Pb-Free) | 8000 / Tape & Reel    |
| SZESD5B5.0ST1G | SOD-523 (Pb-Free) | 3000 / Tape & Reel    |
| SZESD5B5.0ST5G | SOD-523 (Pb-Free) | 8000 / 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.

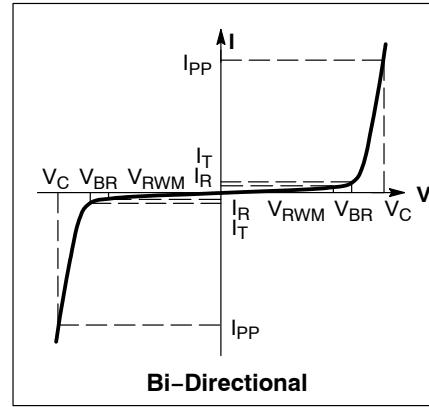
# ESD5B5.0S, SZESD5B5.0S

## ELECTRICAL CHARACTERISTICS

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

| Symbol    | Parameter                           |
|-----------|-------------------------------------|
| $I_{PP}$  | Reverse Peak Pulse Current          |
| $V_C$     | Clamping Voltage @ $I_{PP}$         |
| $V_{RWM}$ | Working Peak Reverse Voltage        |
| $I_R$     | Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$  | Breakdown Voltage @ $I_T$           |
| $I_T$     | Test Current                        |

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



## 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)

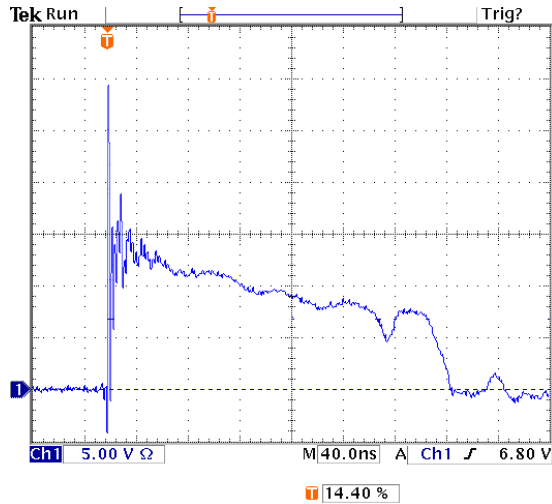
| Device*                          | $V_{RWM}$ (V) | $I_R$ ( $\mu\text{A}$ ) @ $V_{RWM}$ | $V_{BR}$ (V) @ $I_T$ (Note 2) |     | $I_T$ | $C$ (pF) @ $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ | $V_C$                     |
|----------------------------------|---------------|-------------------------------------|-------------------------------|-----|-------|----------------------------------------------------|---------------------------|
|                                  | Max           | Max                                 | Min                           | Max | mA    | Typ                                                | Per IEC61000-4-2 (Note 3) |
| ESD5B5.0ST1G/T5G, SZESD5B5.0ST1G | 5.0           | 1.0                                 | 5.8                           | 7.8 | 1.0   | 32                                                 | Figures 1 and 2 See Below |

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.

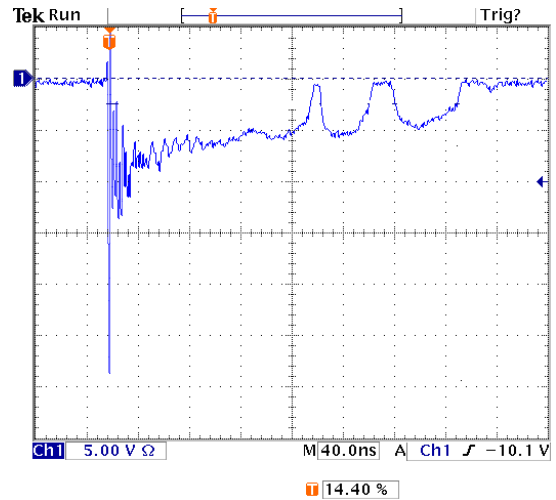
\*Other voltages available upon request.

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.



**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**

## ESD5B5.0S, SZESD5B5.0S

### 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

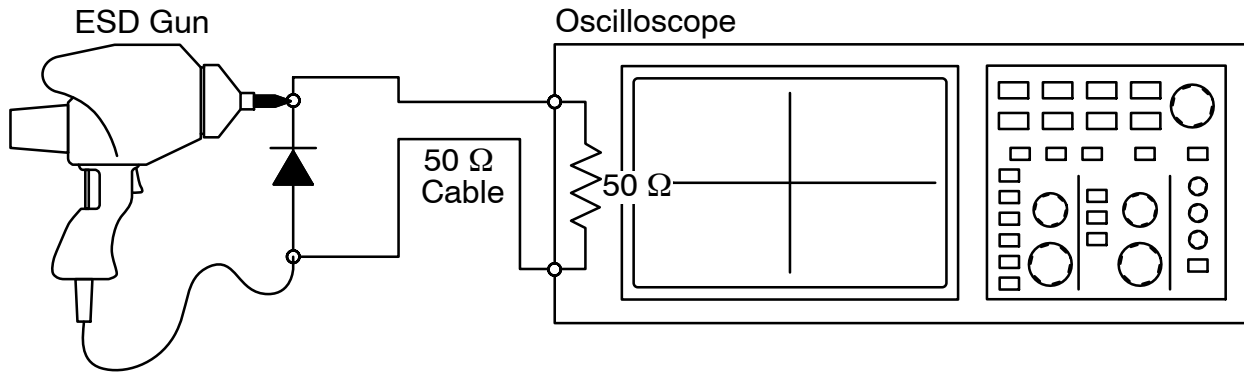


Figure 4. Diagram of ESD Test Setup

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. **onsemi** 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 **onsemi** creates these screenshots and how to interpret them please refer to AND8307/D.

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