

ESD Protection Diode

Ultra-Low Capacitance

ESD7M5.0DT5G

The ESD7M5.0DT5G is designed to protect voltage sensitive components from damage due to ESD in applications that require ultra low capacitance to preserve signal integrity. Excellent clamping capability, low leakage and fast response time are combined with an ultra low diode capacitance of 2.5 pF to provide best in class protection from IC damage due to ESD. The ultra small SOT-723 package is ideal for designs where board space is at a premium. The ESD7M5.0DT5G can be used to protect two uni-directional lines or one bi-directional line. When used to protect one bi-directional line, the effective capacitance is 1.25 pF. Because of its low capacitance, it is well suited for protecting high frequency signal lines such as USB2.0 high speed and antenna line applications.

Specification Features:

- Low Capacitance 2.5 pF Max
- Low Clamping Voltage
- Small Body Outline Dimensions:
0.047" x 0.047" (1.20 mm x 1.20 mm)
- Low Body Height: 0.020" (0.5 mm)
- Stand-off Voltage: 5 V
- Low Leakage
- Response Time is Typically < 1.0 ns
- IEC61000-4-2 Level 4 ESD Protection
- 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

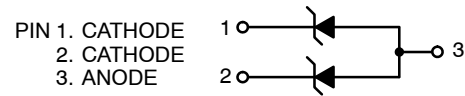
Device Meets MSL 1 Requirements

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|------------------------------------------------------------------------|------------------|-------------|------|
| IEC 61000-4-2 (ESD) Contact | | ±10 | kV |
| Total Power Dissipation on FR-5 Board (Note 1) @ T _A = 25°C | P _D | 150 | mW |
| Storage Temperature Range | T _{stg} | -55 to +150 | °C |
| Junction Temperature Range | T _J | -55 to +125 | °C |
| Lead Solder Temperature - Maximum (10 Second Duration) | T _L | 260 | °C |

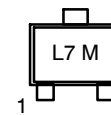
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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



SOT-723
CASE 631AA

MARKING DIAGRAM



L7 = Specific Device Code
M = Date Code

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|-------------------|------------------|
| ESD7M5.0DT5G | SOT-723 (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 Electrical Characteristics tables starting on page 2 of this data sheet.

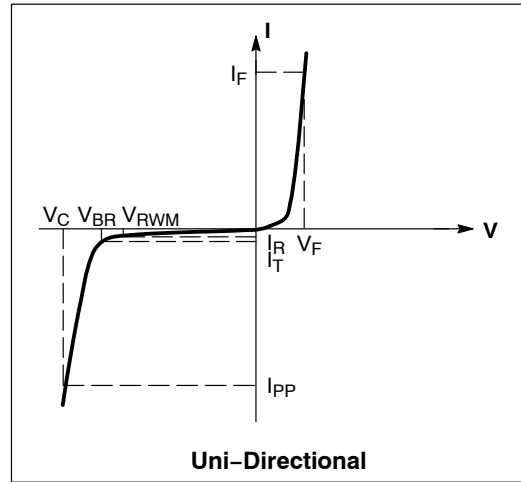
See Application Note AND8308/D for further description of survivability specs.

ESD7M5.0DT5G

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 | Capacitance @ $V_R = 0$ and $f = 1.0$ MHz |



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

| Device | Device Marking | V_{RWM} (V) | I_R (μA) @ V_{RWM} | V_{BR} (V) @ I_T (Note 2) | I_T | C (pF), uni-directional (Note 3) | C (pF), bi-directional (Note 4) | V_C (V) @ $I_{PP} = 1$ A (Note 5) | V_C |
|--------------|----------------|---------------|-------------------------------------|-------------------------------|-------|----------------------------------|---------------------------------|-------------------------------------|---------------------------|
| | | Max | Max | Min | mA | Max | Max | Max | Per IEC61000-4-2 (Note 6) |
| ESD7M5.0DT5G | L7 | 5.0 | 1.0 | 5.4 | 1.0 | 2.5 | 1.25 | 10.4 | Figures 1 and 2 |

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.

- V_{BR} is measured with a pulse test current I_T at an ambient temperature of 25°C .
- Uni-directional capacitance at $f = 1$ MHz, $V_R = 0$ V, $T_A = 25^\circ\text{C}$ (pin1 to pin 3; pin 2 to pin 3).
- Bi-directional capacitance at $f = 1$ MHz, $V_R = 0$ V, $T_A = 25^\circ\text{C}$ (pin1 to pin 2).
- Surge current waveform per Figure 5.
- For test procedure see Figures 3 and 4 and Application Note AND8307/D.

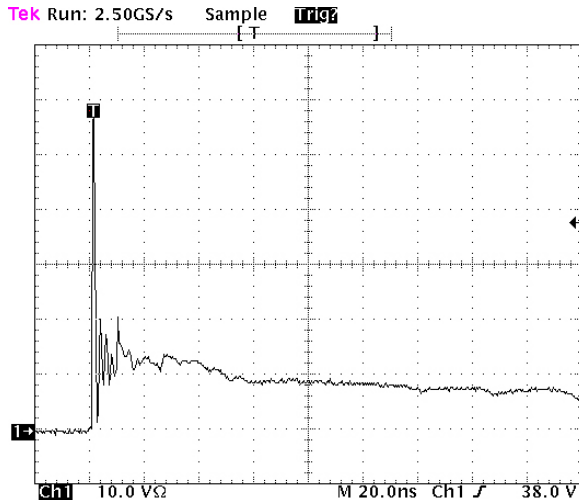


Figure 1. ESD Clamping Voltage Screenshot Positive 8 kV contact per IEC 61000-4-2

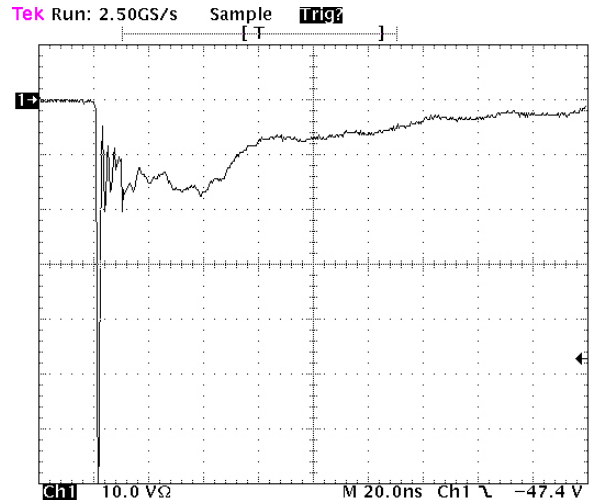


Figure 2. ESD Clamping Voltage Screenshot Negative 8 kV contact per IEC 61000-4-2

ESD7M5.0DT5G

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

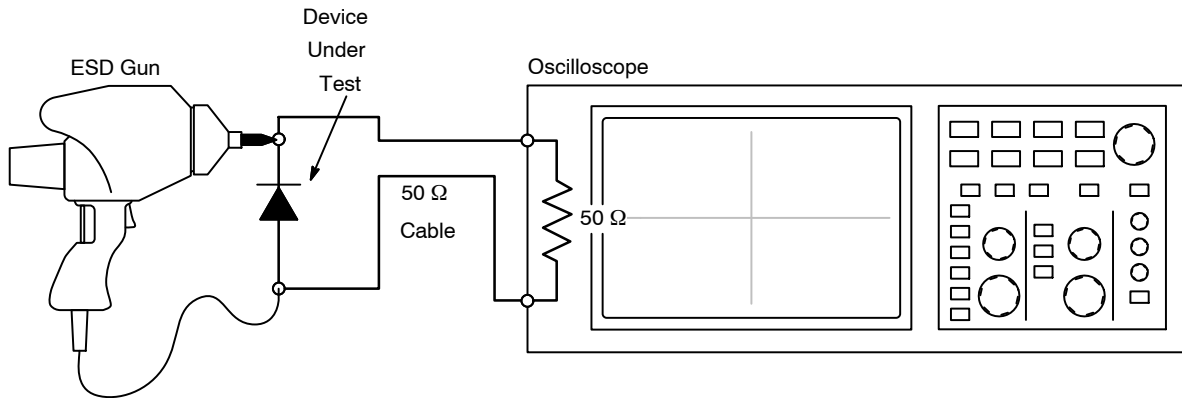


Figure 4. Diagram of ESD Test Setup

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.

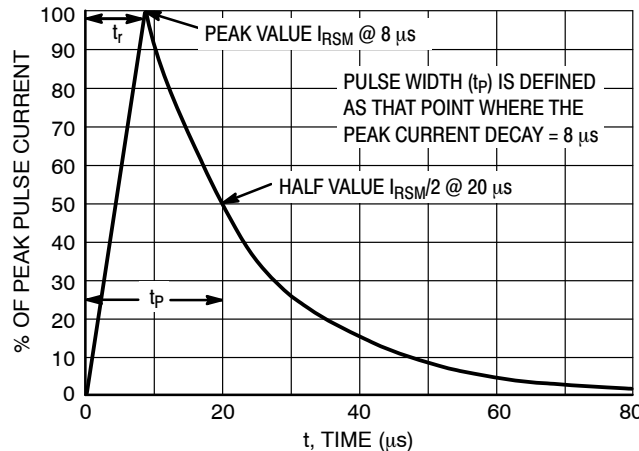


Figure 5. 8 X 20 μs Pulse Waveform

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



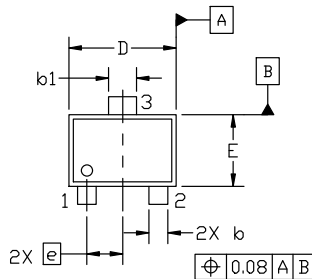
SOT-723 1.20x0.80x0.50, 0.40P
CASE 631AA
ISSUE E

DATE 24 JAN 2024

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 | 0.45 | 0.50 | 0.55 |
| b | 0.15 | 0.21 | 0.27 |
| b1 | 0.25 | 0.31 | 0.37 |
| c | 0.07 | 0.12 | 0.17 |
| D | 1.15 | 1.20 | 1.25 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.40 BSC | | |
| H | 1.15 | 1.20 | 1.25 |
| L | 0.29 REF | | |
| L2 | 0.15 | 0.20 | 0.25 |



TOP VIEW



SIDE VIEW



BOTTOM VIEW



RECOMMENDED MOUNTING FOOTPRINT

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.

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

| STYLE 1: | STYLE 2: | STYLE 3: | STYLE 4: | STYLE 5: |
|--------------|--------------|--------------|----------------|-------------|
| PIN 1. BASE | PIN 1. ANODE | PIN 1. ANODE | PIN 1. CATHODE | PIN 1. GATE |
| 2. EMITTER | 2. N/C | 2. ANODE | 2. CATHODE | 2. SOURCE |
| 3. COLLECTOR | 3. CATHODE | 3. CATHODE | 3. ANODE | 3. DRAIN |

| | | |
|-------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION: | SOT-723 1.20x0.80x0.50, 0.40P | PAGE 1 OF 1 |

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