

## Features

- ❑ Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±25kV (Air)
  - ±20kV (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - Cable Discharge Event (CDE)
- ❑ Package optimized for high-speed lines
- ❑ Protects one data, control or power line
- ❑ Low capacitance: 0.6pF (Typical)
- ❑ Low leakage current: 0.1µA @  $V_{RWM}$  (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge

## Description

TT0511TDX is an ultra low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.6pF only, TT0511TDX is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD) (±10kV air, ±10kV contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 ns), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TT0511TDX uses ultra-small SOD-523 package. Each TT0511TDX device can protect one high-speed data line. It offers system designers flexibility to protect single data line where space is a premium concern. The combined features of low capacitance, ultra-small size and high ESD robustness make TT0511TDX ideal for high-speed data port and high-frequency line (e.g., HDMI & antenna line) applications, such as cellular phones and HD visual devices.

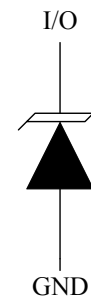
## Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ Cellular Phones
- ❑ MDDI Ports
- ❑ USB2.0/3.0 Power and Data Line Protection
- ❑ Display Ports
- ❑ High Definition Multi-Media Interface (HDMI)
- ❑ Digital Visual Interfaces (DVI)

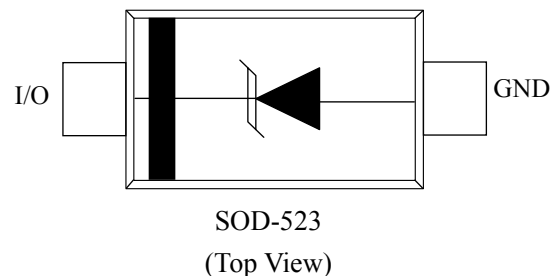
## Mechanical Characteristics

- ❑ SOD-523 package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration



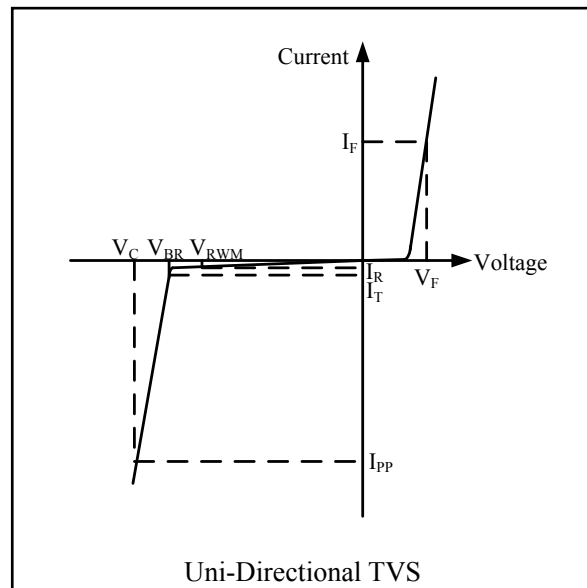


### Absolute Maximum Rating

| Symbol    | Parameter                       | Value    | Units |
|-----------|---------------------------------|----------|-------|
| $V_{ESD}$ | ESD per IEC 61000-4-2 (Air)     | ±25      | kV    |
|           | ESD per IEC 61000-4-2 (Contact) | ±20      |       |
| $T_{OPT}$ | Operating Temperature           | -55/+125 | °C    |
| $T_{STG}$ | Storage Temperature             | -55/+150 | °C    |

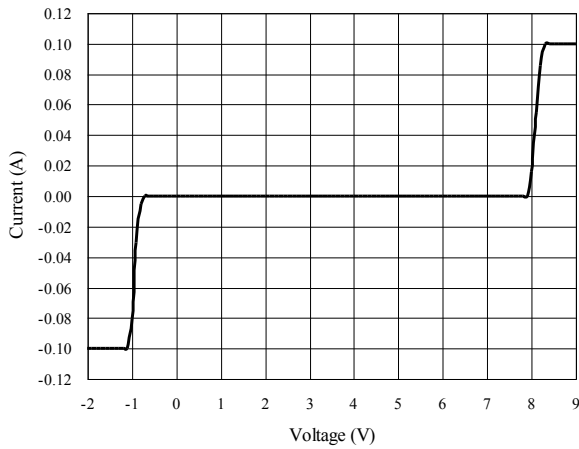
### Electrical Characteristics (T = 25°C)

| Symbol    | Parameter                           |
|-----------|-------------------------------------|
| $V_{RWM}$ | Nominal Reverse Working Voltage     |
| $I_R$     | Reverse Leakage Current @ $V_{RWM}$ |
| $V_{BR}$  | Reverse Breakdown Voltage @ $I_T$   |
| $I_T$     | Test Current for Reverse Breakdown  |
| $V_C$     | Clamping Voltage @ $I_{PP}$         |
| $I_{PP}$  | Maximum Peak Pulse Current          |
| $C_{ESD}$ | Parasitic Capacitance               |
| $V_R$     | Reverse Voltage                     |
| f         | Small Signal Frequency              |
| $I_F$     | Forward Current                     |
| $V_F$     | Forward Voltage @ $I_F$             |

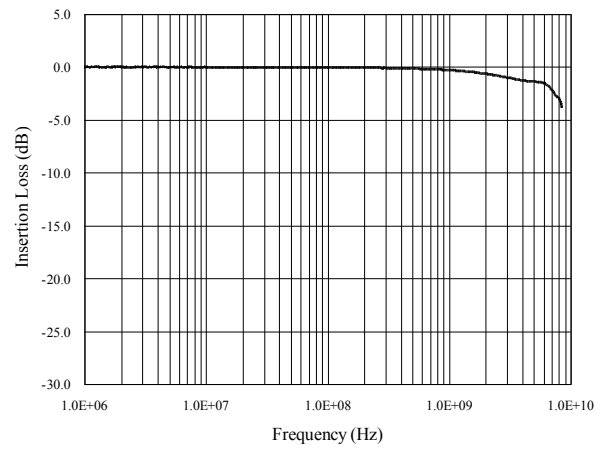


| Symbol    | Test Condition                                        | Minimum | Typical | Maximum | Units |
|-----------|-------------------------------------------------------|---------|---------|---------|-------|
| $V_{RWM}$ |                                                       |         |         | 5.0     | V     |
| $I_R$     | $V_{RWM} = 5V, T = 25^\circ C$<br>Between I/O and GND |         | 0.1     | 1.0     | μA    |
| $V_{BR}$  | $I_T = 1mA$<br>Between I/O and GND                    | 6.0     | 8.0     | 9.0     | V     |
| $V_C$     | $I_{PP} = 1A, t_p = 8/20\mu s$<br>Between I/O and GND |         |         | 10      | V     |
| $C_{ESD}$ | $V_R = 0V, f = 1MHz$<br>Between I/O and GND           |         | 0.6     |         | pF    |

**Voltage Sweeping of I/O to GND**

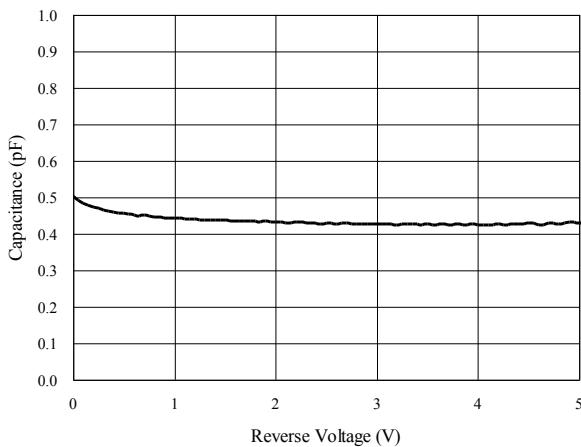


**Insertion Loss S21 of I/O to GND**

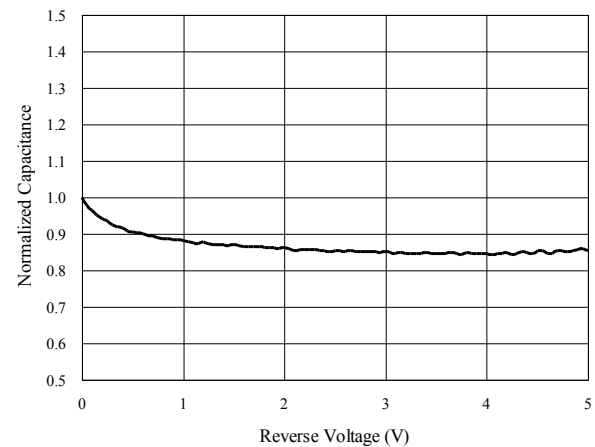


**Capacitance vs. Voltage of I/O to GND (f = 1MHz)**

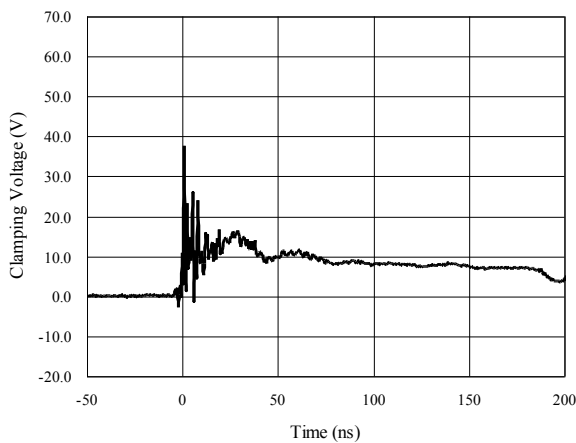
Capacitance vs. Reverse Voltage



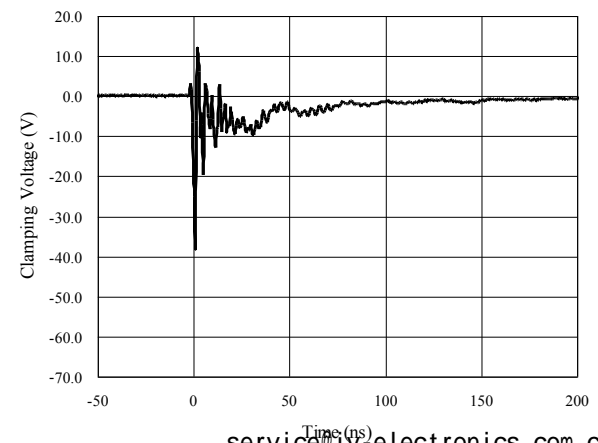
Normalized Capacitance vs. Reverse Voltage



**ESD Clamping of I/O to GND (+8kV Contact per IEC 61000-4-2)**

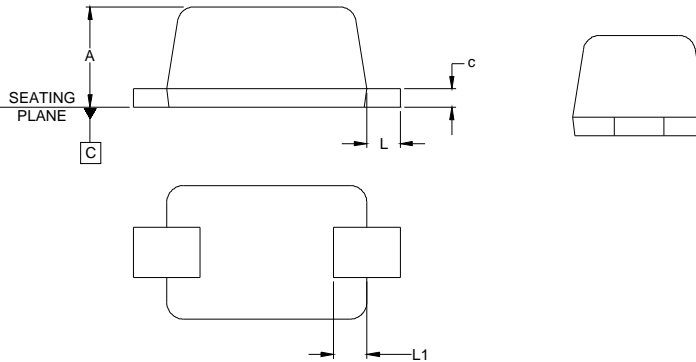
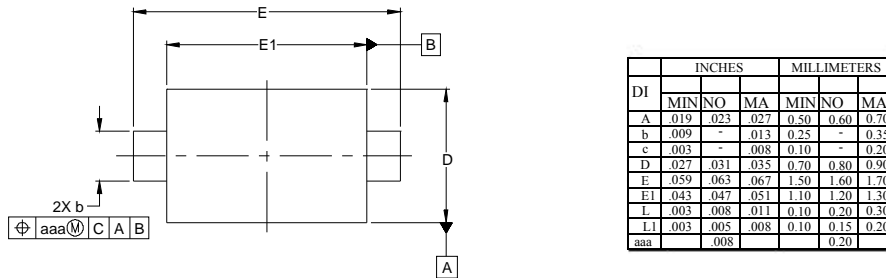


**ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)**



## Package Outline

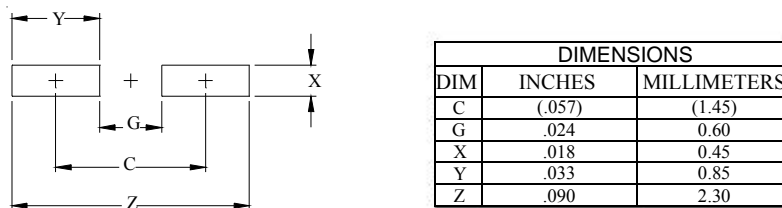
### Outline Drawing (SOD-523)



NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

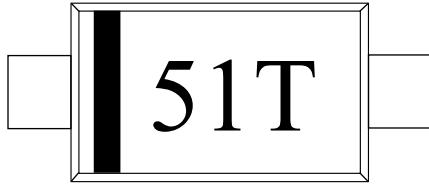
### Land Pattern



NOTES:

1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY  
CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR  
COMPANY'S MANUFACTURING GUIDELINES ARE MET

**Marking Codes**



Note:

(1) "51T" is part number, fixed.

**Ordering Information**

| Part Number | Working Voltage | Quantity Per Reel | Reel Size |
|-------------|-----------------|-------------------|-----------|
| TT0511TDX   | 5V              | 3,000             | 7 Inch    |