

## Features

- ❑ Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD)  $\pm 25\text{kV}$  (Air)
  - $\pm 17\text{kV}$  (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - Cable Discharge Event (CDE)
- ❑ Protects five data lines
- ❑ Low capacitance: 0.6pF Typical (I/O-GND)
- ❑ Low leakage current: 0.1 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge
- ❑ Green Part

## Description

TT0515THX is a 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, TT0515TH is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  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.

TT0515THX uses small SOT563 package. Each TT0515THX device can protect five high-speed data lines. The combined features of low capacitance, small size and

high ESD robustness make TT0515THX ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the TT0515THX guarantees a minimum stress on the protected IC.

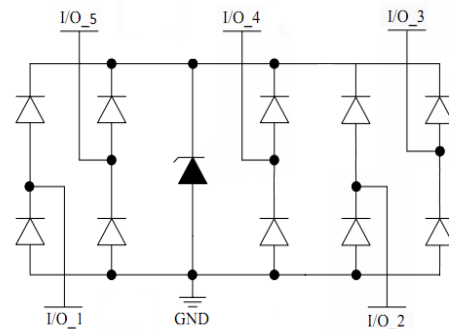
## Applications

- ❑ Video Graphics Cards
- ❑ Desktops, Servers and Notebooks
- ❑ IEEE 1394 Ports
- ❑ USB2.0 Power and Data Line Protection
- ❑ Display Ports
- ❑ SIM Ports

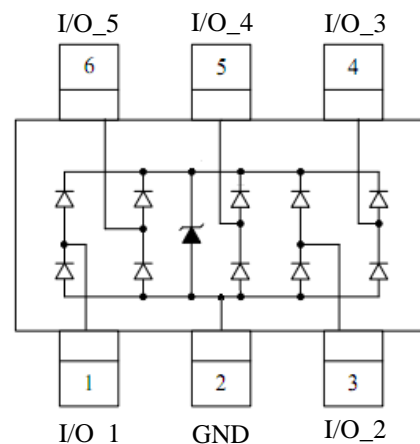
## Mechanical Characteristics

- ❑ SOT563 package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration



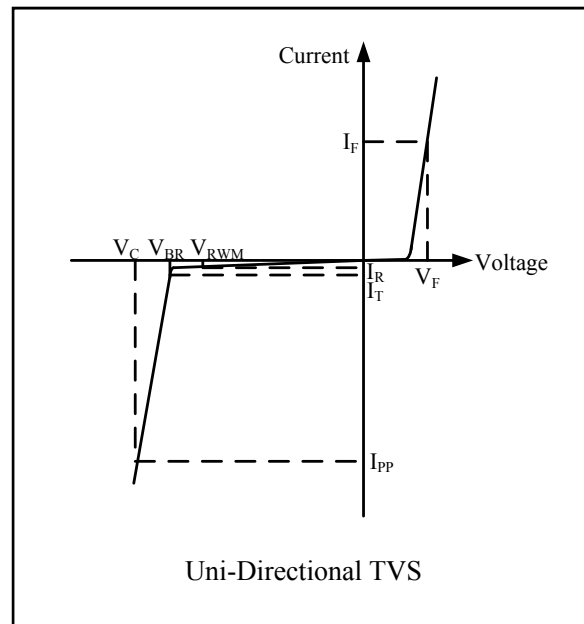
SOT-563  
(Top View)

### Absolute Maximum Rating

| Symbol    | Parameter   | Value                | Units |
|-----------|---|----------------------|-------|
| $I_{PP}$  | Peak Pulse Current( $t_p=8/20\mu s$ )                         | 4                    | A     |
| $V_{ESD}$ | ESD per IEC61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | $\pm 25$<br>$\pm 17$ | kV    |
| $T_{OPT}$ | Operating Temperature   | -55/+125             | °C    |
| $T_{STG}$ | Storage Temperature   | -55/+150             | °C    |

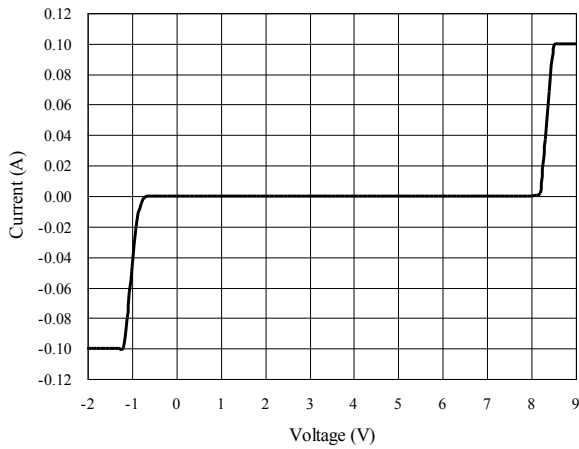
### Electrical Characteristics (T = 25°C)

| 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 @ $I_F$             |

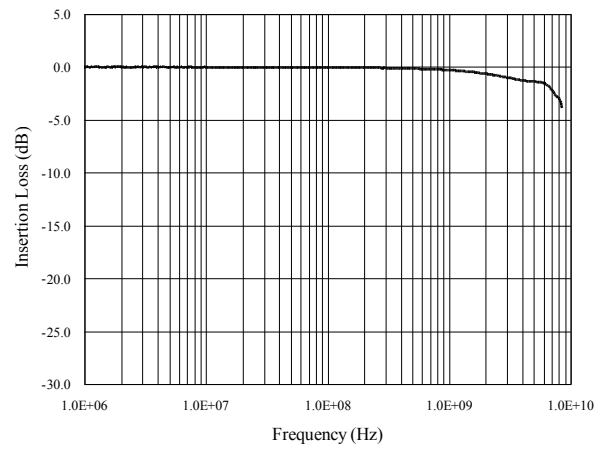


| Symbol    | Test Condition  | Minimum | Typical | Maximum | Units   |
|-----------|---|---------|---------|---------|---------|
| $V_{RWM}$ |   |         |         | 3.3     | V       |
| $I_R$     | $V_{RWM} = 5V, T = 25^\circ C$<br>Between I/O and GND |         | 0.1     | 1.0     | $\mu A$ |
| $V_{BR}$  | $I_T = 1mA$<br>Between I/O and GND                    | 6.0     |         |         | V       |
| $V_C$     | $I_{PP} = 1A, t_p = 8/20\mu s$<br>Between I/O and GND |         |         | 9.0     | V       |
| $V_C$     | $I_{PP} = 4A, t_p = 8/20\mu s$<br>Between I/O and GND |         |         | 11.0    | V       |
| $C_{ESD}$ | $V_R = 0V, f = 1MHz$<br>Between I/O and GND           |         | 0.6     | 0.8     | pF      |
| $C_{ESD}$ | $V_R = 0V, f = 1MHz$<br>Between I/O and I/O           |         | 0.3     | 0.4     | pF      |

### Voltage Sweeping of I/O to GND

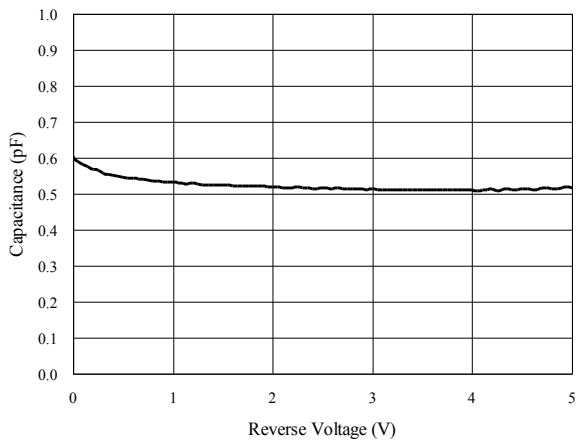


### Insertion Loss S21 of I/O to GND

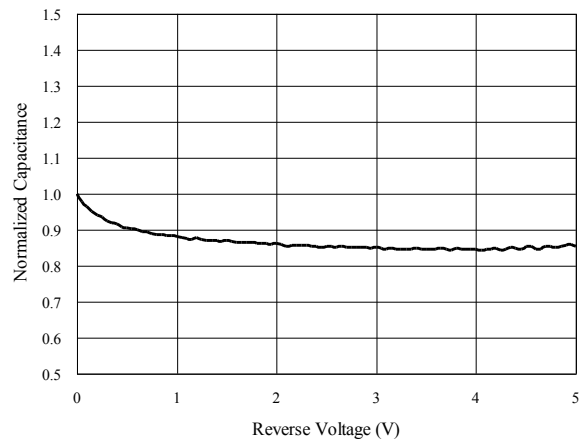


### Capacitance vs. Voltage of I/O to GND (f = 1MHz)

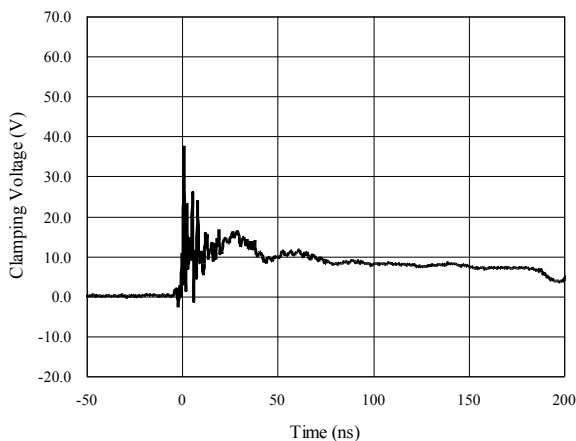
Capacitance vs. Reverse Voltage



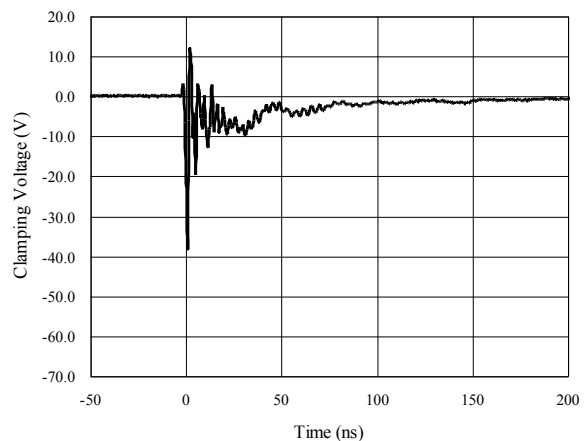
Normalized Capacitance vs. Reverse Voltage



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



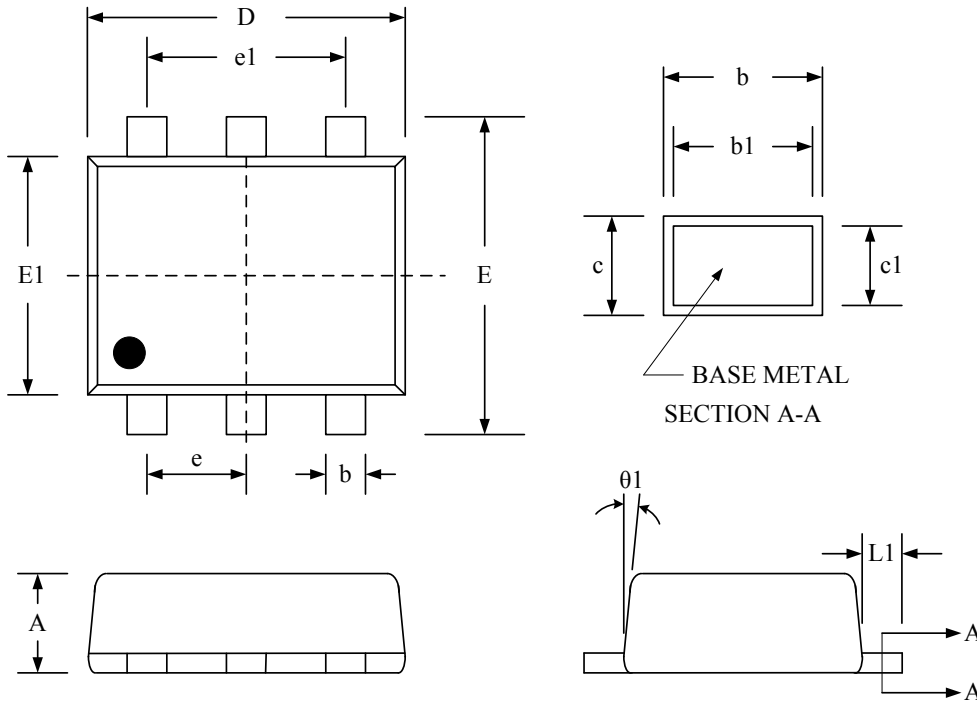
### ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)





### Package Outline

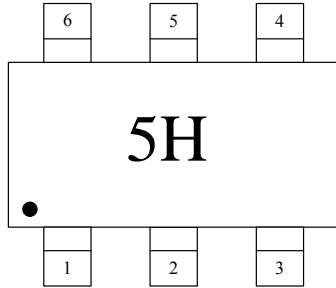
- SOT-563 package
- Plastic surface-mounted package
- MSL-3 Level



Package Dimensions (Controlling dimensions are in millimeters)

| Symbol | Dimensions (mm) |         |         | Dimensions (Inches) |         |         |
|--------|-----------------|---------|---------|---------------------|---------|---------|
|        | Minimum         | Typical | Maximum | Minimum             | Typical | Maximum |
| A      | 0.50            | 0.55    | 0.60    | 0.020               | 0.022   | 0.024   |
| b      | 0.17            | -       | 0.27    | 0.007               | -       | 0.011   |
| b1     | 0.17            | 0.20    | 0.23    | 0.007               | 0.008   | 0.009   |
| c      | 0.08            | -       | 0.18    | 0.003               | -       | 0.007   |
| c1     | 0.08            | 0.10    | 0.15    | 0.003               | 0.004   | 0.006   |
| D      | 1.60 BSC        |         |         | 0.063 BSC           |         |         |
| E      | 1.50            | 1.60    | 1.70    | 0.059               | 0.063   | 0.067   |
| E1     | 1.20 BSC        |         |         | 0.047 BSC           |         |         |
| e      | 0.50 BSC        |         |         | 0.020 BSC           |         |         |
| e1     | 1.00 BSC        |         |         | 0.040 BSC           |         |         |
| θ1     | 0°              | -       | 10°     | 0°                  | -       | 10°     |
| L1     | 0.14            | 0.20    | 0.27    | 0.006               | 0.008   | 0.011   |

### Marking Codes



**Note:**

(1) “5H” is part number, fixed.

### Ordering Information

| Part Number | Working Voltage | Quantity Per Reel | Reel Size |
|-------------|-----------------|-------------------|-----------|
| TT0515THX   | 3.3V            | 3,000             | 7 Inch    |