

## Features

- ❑ Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±25kV (Air)
  - ±17kV (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - Cable Discharge Event (CDE)
- ❑ Small package (1.6mm × 1.0mm × 0.50mm)
- ❑ Protects two data lines
- ❑ Low capacitance: 0.25pF Typical (I/O-I/O)
- ❑ Low leakage current: 0.1μA @ V<sub>RWM</sub> (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge

## Description

TT0512TDX 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 0.25pF only, TT0512TDX 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 (±15kV air, ±8kV 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.

TT0512TDX uses small DFN1610-6L package. Each TT0512TDX device can protect two high-speed data lines. The combined features of low capacitance, small size and high ESD robustness make TT0512TDX ideal for high-speed data ports and high-frequency lines (e.g., USB2.0 & DVI) applications. The low clamping voltage of the TT0512TDX guarantees a minimum stress on the protected IC.

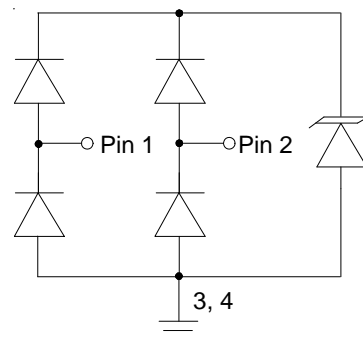
## Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ MDDI Ports
- ❑ USB2.0 Power and Data Line Protection
- ❑ Display Ports
- ❑ Digital Visual Interfaces (DVI)

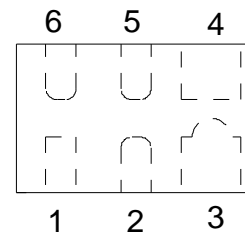
## Mechanical Characteristics

- ❑ DFN1610-6L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration



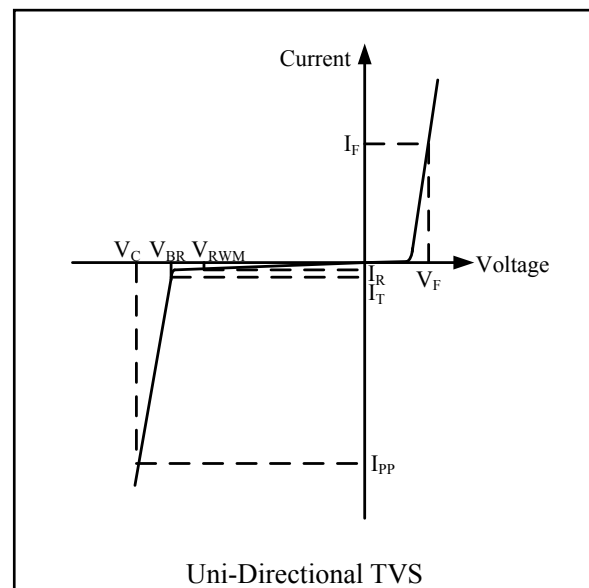
Pin	Identification
1 - 2	Input Lines
5 - 6	Output Lines (No Internal Connection)
3 - 4	Ground

## Absolute Maximum Rating

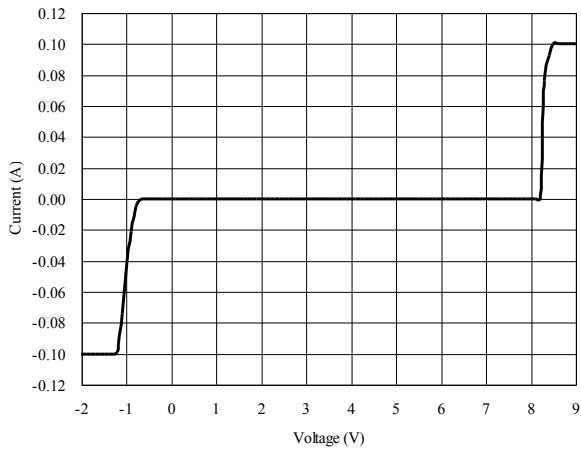
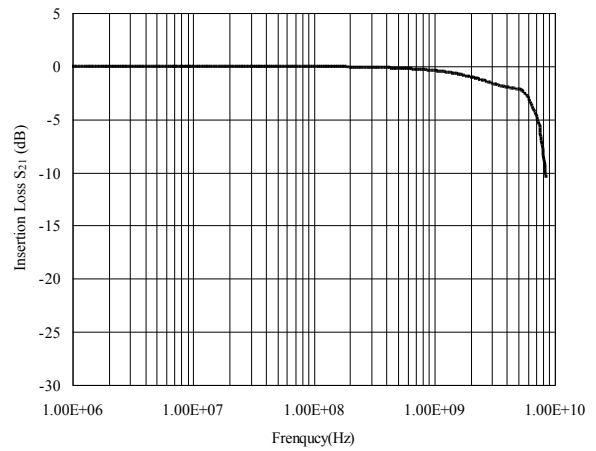
Symbol	Parameter	Value	Units
$V_{ESD}$	ESD per IEC 61000-4-2 (Air)	±25	kV
	ESD per IEC 61000-4-2 (Contact)	±17	
$T_{OPT}$	Operating Temperature	-55/+125	°C
$T_{STG}$	Storage Temperature	-55/+150	°C

## Electrical Characteristics (T = 25°C)

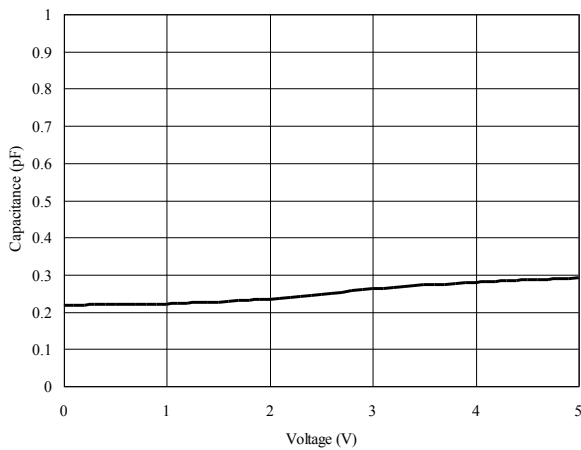
Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Reverse Breakdown Voltage @ $I_T$
$I_T$	Test Current for Reverse Breakdown
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$V_R$	Reverse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



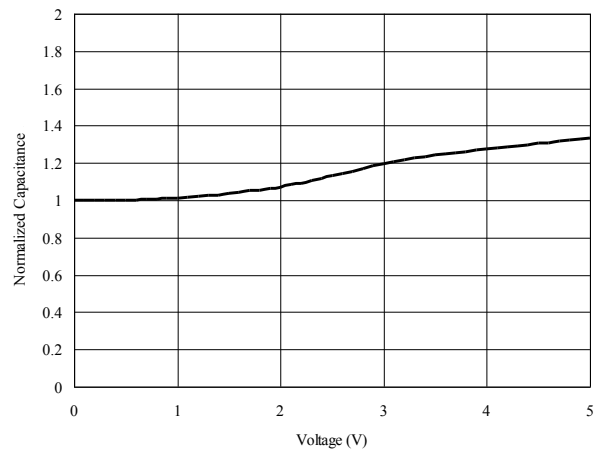
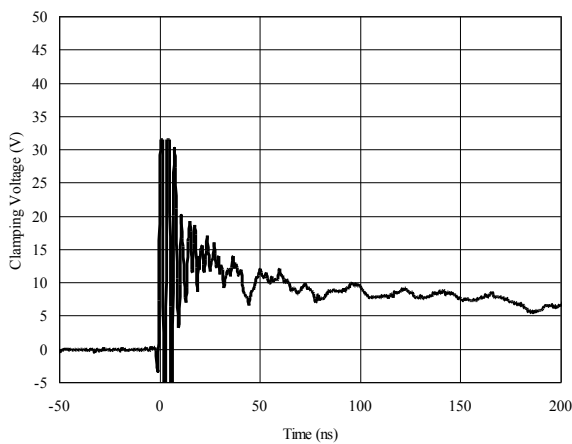
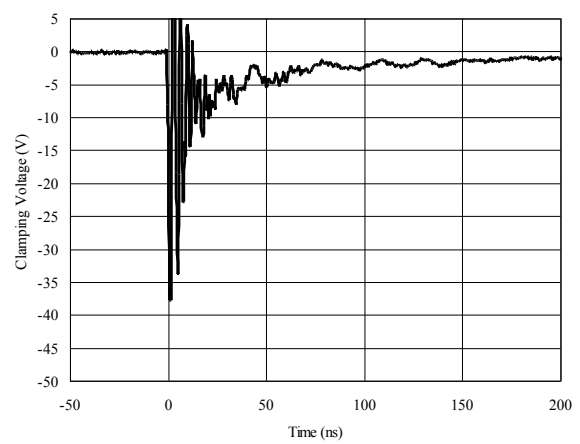
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				5.0	V
$I_R$	$V_{RWM} = 5V, T = 25^\circ C$ Between I/O and GND		0.1	1.0	μA
$V_{BR}$	$I_T = 1mA$ Between I/O and GND	6.0	8.0	10.0	V
$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s$ Between I/O and GND			12	V
$C_{ESD}$	$V_R = 0V, f = 1MHz$ Between I/O and GND		0.6	0.9	pF
$C_{ESD}$	$V_R = 0V, f = 1MHz$ Between I/O and I/O		0.25	0.5	pF

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

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

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

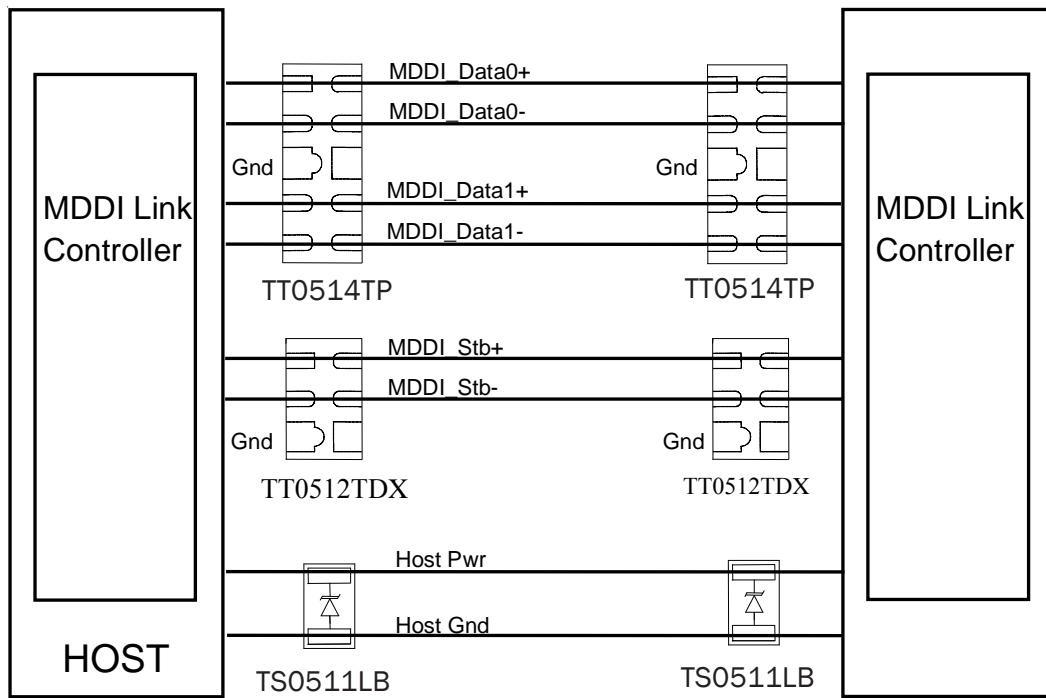
Capacitance vs. Reverse Voltage



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)**


### Application Information



MDDI Port Protection

### Universal Serial Bus ESD Protection

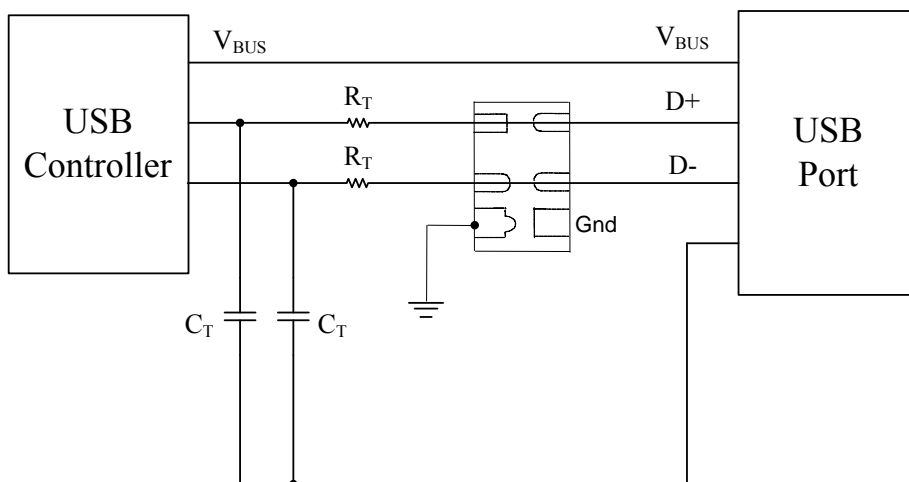
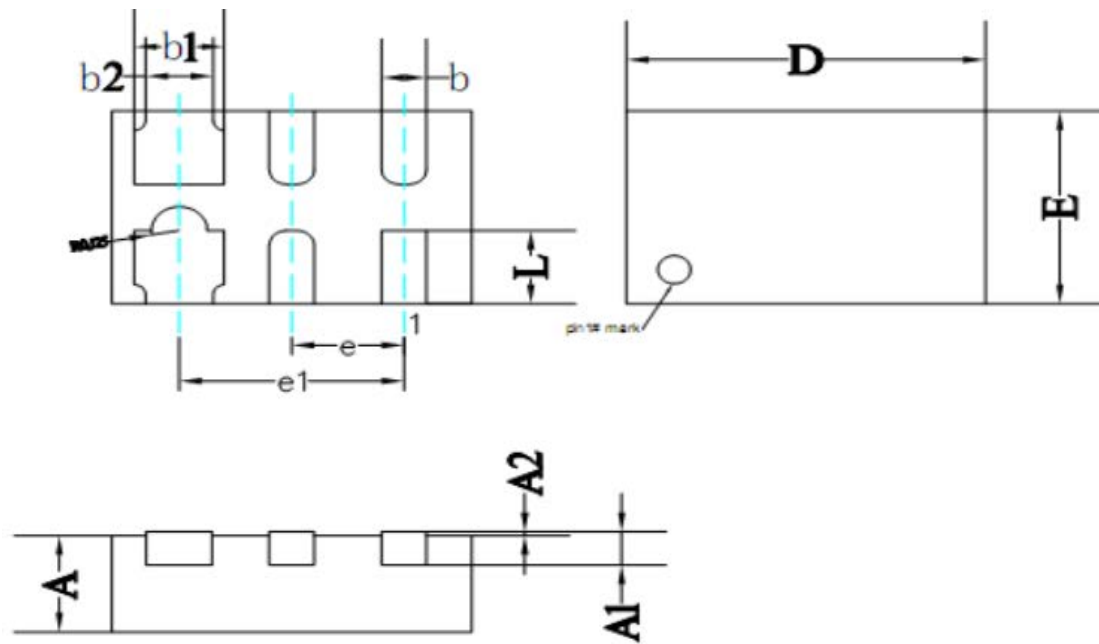


Figure 3 Schematic and Diagram for USB 2.0 Protection using TT0512TDX

## Package Outline

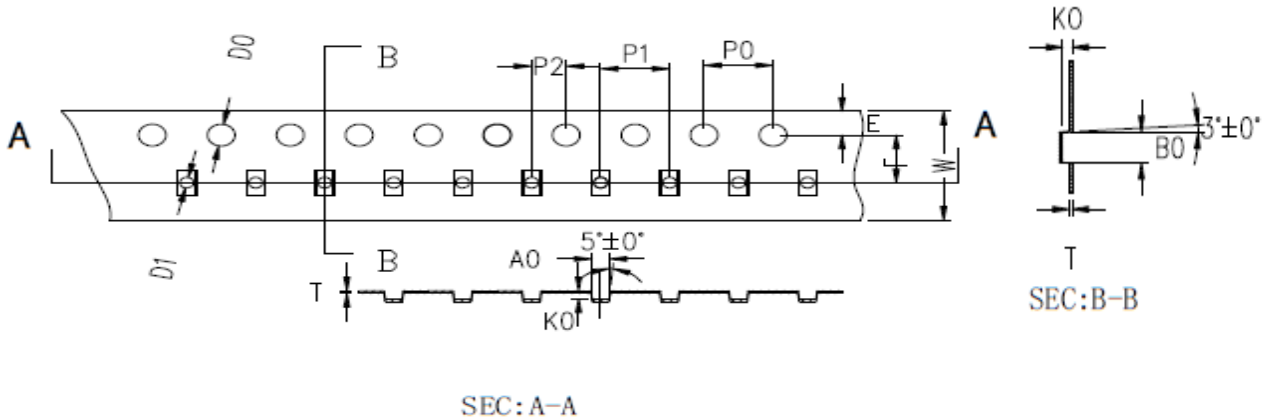
- DFN1610-6L package



ALL DIMENSIONS IN MM

	MIN	NOM	MAX
D	1.55	1.60	1.65
E	0.95	1.00	1.05
L	0.33	0.38	0.43
b	0.15	0.20	0.25
b1	0.35	0.40	0.45
b2	0.25	0.30	0.35
e	0.50BSC		
e1	1.00BSC		
A	0.45	0.5	0.55
A1			
A2	0.00	-	0.05

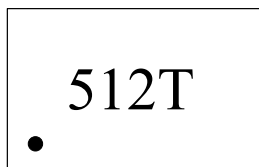
### Tape and Reel Specification



ITEM	SPECIFICATION	TOL.(±)
W	8.00	±0.20
E	1.75	±0.1
F	3.50	±0.1
D0	1.55	±0.05
D1	0.8	±0.1
P0	4.00	±0.1
P1	4.00	±0.1
P2	2.00	±0.05
P0*10	40.00	±0.20

ITEM	SPECIFICATION	TOL.(±)
T	0.20	±0.05
A0	1.15	±0.1
B0	1.85	±0.1
K0	0.85	±0.1

### Marking Codes



Note:

(1) "512T" is part number, fixed.

### Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0512TDX	5V	3,000	7 Inch