

## 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)
- ❑ Package optimized for high-speed lines
- ❑ Ultra-small package (2.0mm×1.0mm×0.55mm)
- ❑ Protects four data lines
- ❑ Low capacitance: 0.2 pF 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

TT0564SNX 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 0.2 pF only, TT0564SNX 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.

TT0564SNX uses ultra-small DFN2010-5L package. Each TT0564SNX device can protect four high-speed data lines. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make TT0564SNX ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the TT 0564 SNX guarantees a minimum stress on the protected IC.

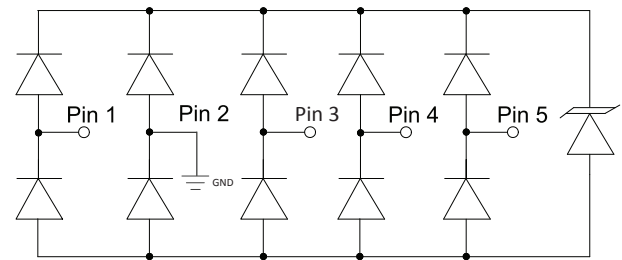
## Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ MDDI Ports
- ❑ USB 2.0/3.0/3.1 Power and Data Line Protection
- ❑ Display Ports
- ❑ High Definition Multi-Media Interface (HDMI 1.4/2.0)
- ❑ Digital Visual Interfaces (DVI)

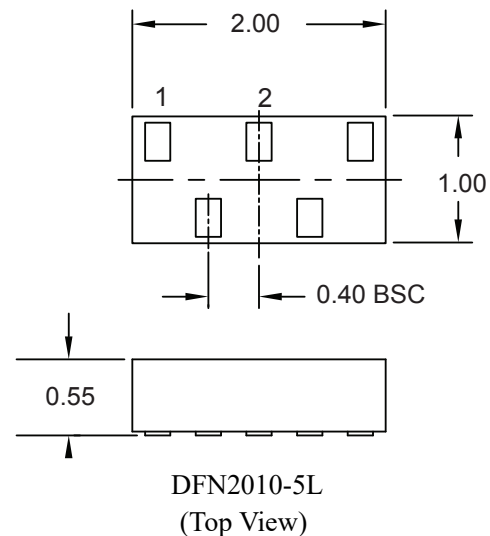
## Mechanical Characteristics

- ❑ DFN2010-5L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration

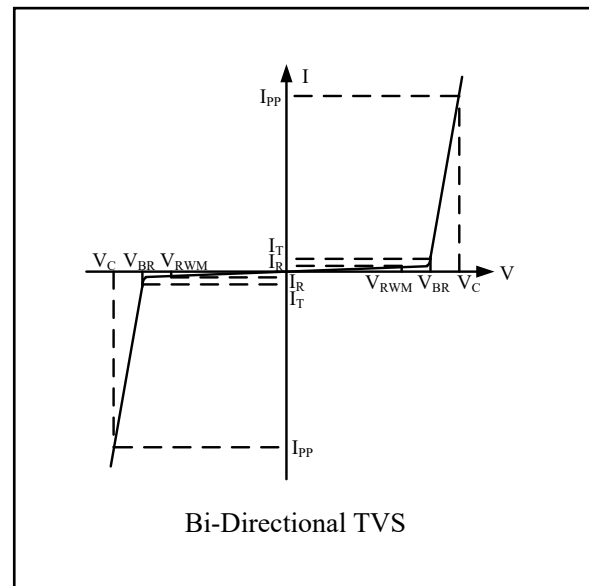


## Absolute Maximum Rating

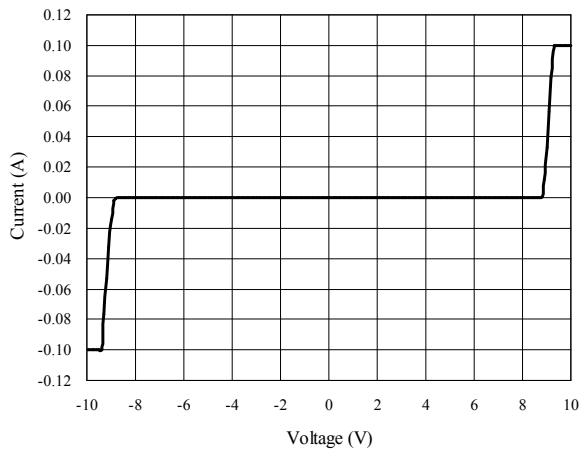
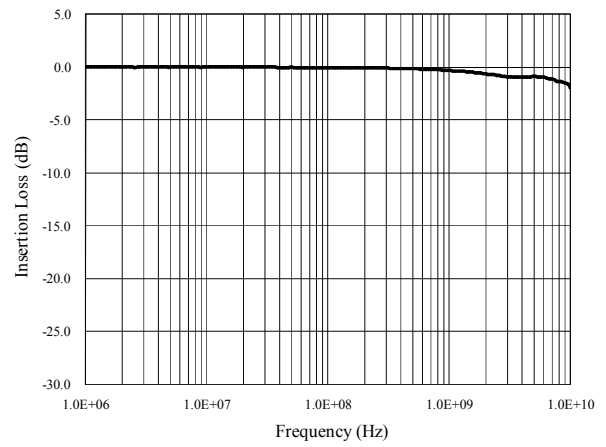
Symbol	Parameter	Value	Units
$V_{ESD}$	ESD per IEC 61000-4-2 (Air)	±25	kV
	ESD per IEC 61000-4-2 (Contact)	±17	
$T_{OPT}$	Operating Temperature	-55/+125	°C
$T_{STG}$	Storage Temperature	-55/+150	°C

## Electrical Characteristics (T = 25°C)

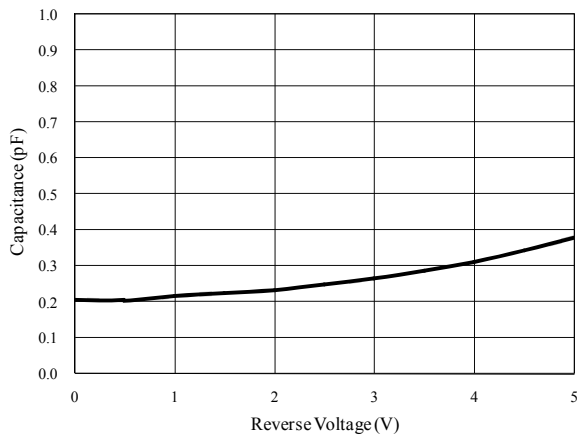
Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{BR}$	Reverse Breakdown Voltage @ $I_T$
$I_T$	Test Current for Reverse Breakdown
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$V_R$	Reverse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



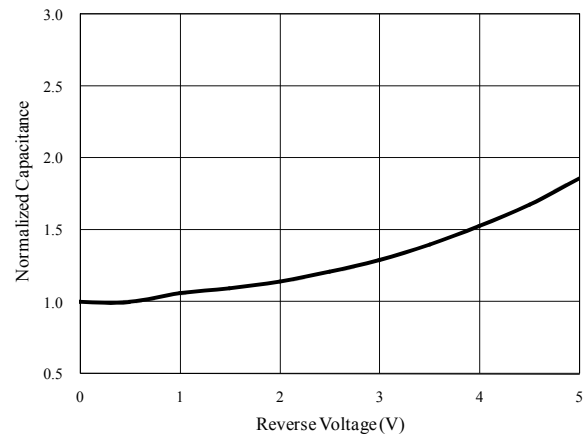
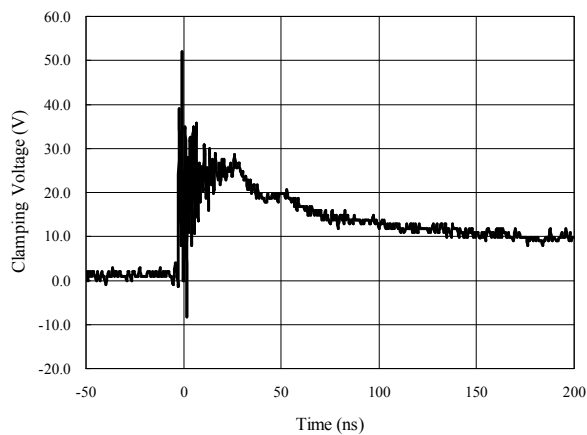
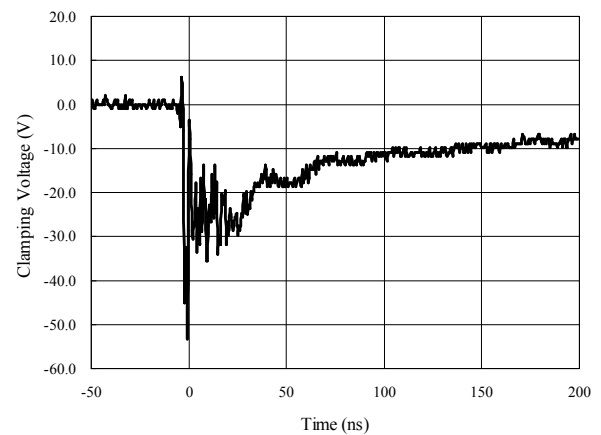
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				5.0	V
$I_R$	$V_{RWM} = 5V, T = 25^\circ C$ Between I/O and GND		0.1	1.0	μA
$V_{BR}$	$I_T = 1mA$ Between I/O and GND	7.0	9.0	11.0	V
$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s$ Between I/O and GND			12	V
$C_{ESD}$	$V_R = 0V, f = 1MHz$ Between I/O and GND		0.2	0.3	pF
$C_{ESD}$	$V_R = 0V, f = 1MHz$ Between I/O and I/O		0.2	0.3	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)**


## Application Information

### Pin Connection in PCB

TT0564SNX provides ESD protection for four data lines simultaneously. The pin connection is shown in the figure below.

Four parallel data lines, from inner IC to I/O port connector, could connect to TT0564SNX four I/O pins directly. Pin 3 of TT0564SNX is the GND pin, which should connect to the GND of PCB. The wire should be as short as possible in order to minimize the parasitic inductance.

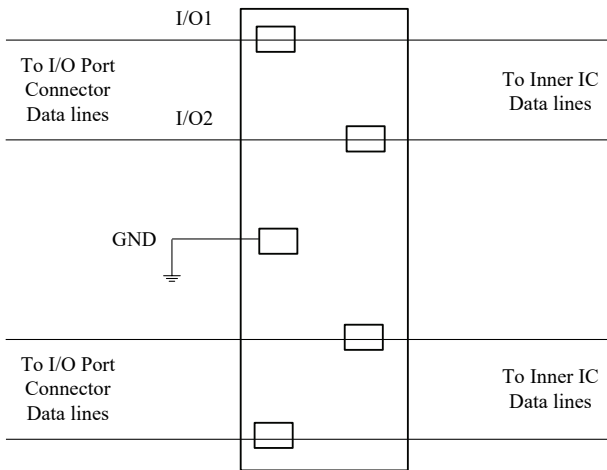


Figure 1 TT0564SNX in connection in PCB

### PCB Layout Guidelines

For optimum ESD protection and the whole circuit performance, the following PCB layout guidelines are recommended:

- ❑ TT0564SNX GND pin to the PCB GND rail path should be as short as possible. It could reduce the ESD transient return path to GND.
- ❑ The vias connecting TT0564SNX GND pins to the PCB GND should be wide.
- ❑ Place TT0564SNX as close to the connector port as possible. It could reduce the parasitic inductance and restrict ESD coupling into adjacent traces.
- ❑ Avoid running critical signals near board edges.

**Application Information**

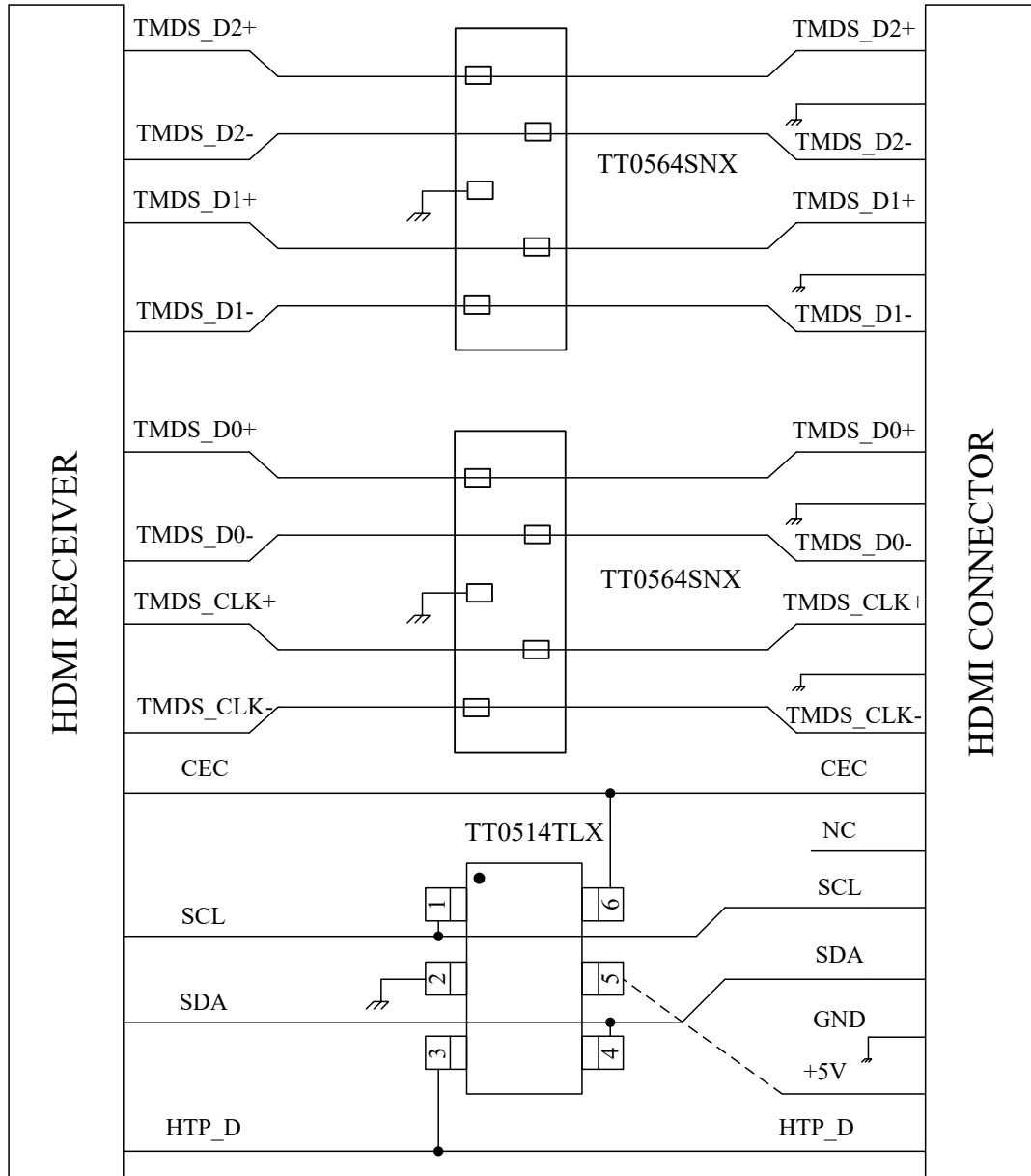
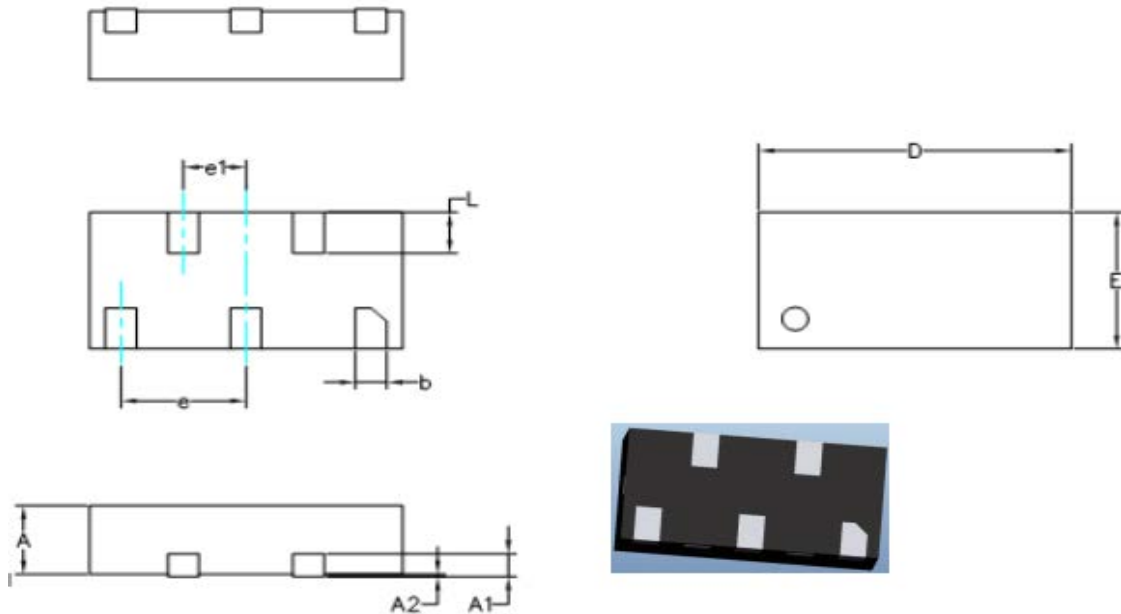


Figure 2 Layout Top View for HDMI Interface with TT0564SNX & TT0514TLX

## Package Outline

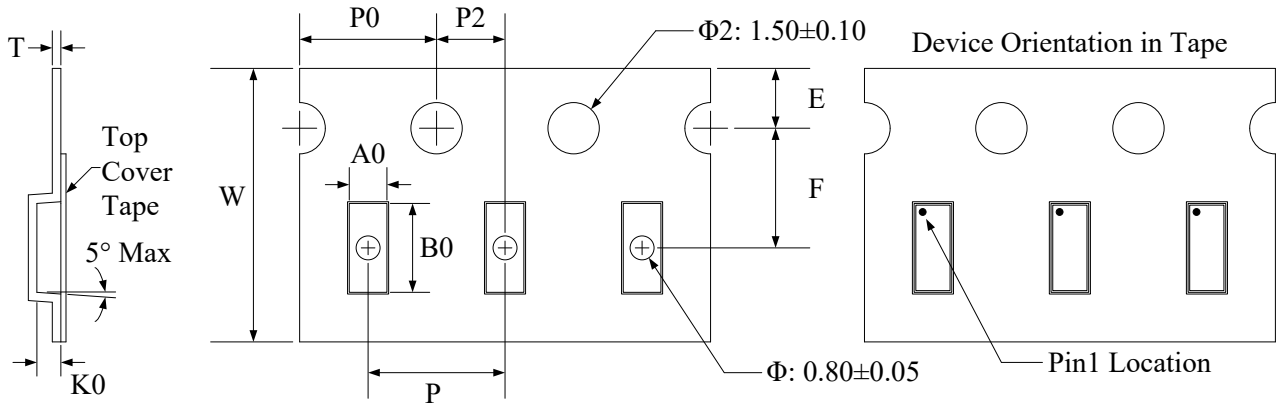
- DFN2010-5L package
- Thermally-Enhanced
- MSL-1 Level



### ALL DIMENSIONS IN MM

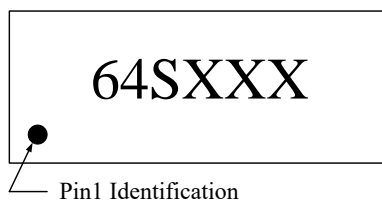
	MIN	NOM	MAX
D	1.95	2.00	2.05
E	0.95	1.00	1.05
b	0.15	0.20	0.25
L	0.25	0.30	0.35
e	0.80BSC		
e1	0.40BSC		
A	0.45	0.5	0.55
A1			
A2	0.00	-	0.05

## Tape and Reel Specification

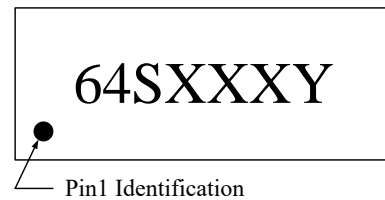


Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	$8.00 \pm 0.3$ $-0.1$	$1.23 \pm 0.05$	$2.7 \pm 0.05$	$0.7 \pm 0.05$	$1.75 \pm 0.1$	$3.5 \pm 0.05$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$2.0 \pm 0.05$	$0.25 \pm 0.02$

## Marking Codes



Or



### Note:

(1) "64S" is part number, while "XXX" is internal code.

### Note:

(1) "64S" is part number.

(2) "XXX" is the last 3 characters of the wafer's Lot No.,  
 "Y" is the internal code.

## Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0564SNX	5V	3,000	7 Inch

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