

Features

- ❑ Transient protection for high-speed data lines IEC 61000-4-2 (ESD) $\pm 10\text{kV}$ (Air) $\pm 8\text{kV}$ (Contact) IEC 61000-4-4 (EFT) 40A (5/50 ns) Cable Discharge Event (CDE)
- ❑ Package optimized for high-speed lines
- ❑ Ultra-small package (2.5mm×1.0mm×0.55mm)
- ❑ Protects four data lines
- ❑ Low capacitance: 0.18pF(Typical IO to GND)
- ❑ Low leakage current: 0.1 μA @ V_{RWM} (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for $\pm 8\text{kV}$ contact discharge
- ❑ ROHS compliant

Description

TT3304SPX 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 0.18pF only, TT3304SPX is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events.

TT3304SPX uses ultra-small DFN2510-10L package. Each TT3304SPX device can protect four high-speed data lines. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make TT3304SPX ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the TT3304SPX guarantees a minimum stress on the protected IC.

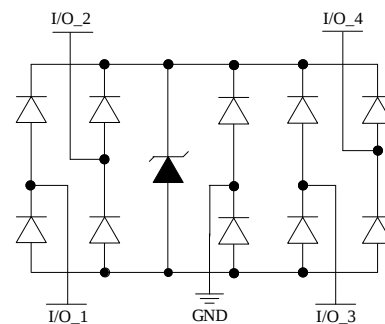
Applications

- ❑ 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)
- ❑ Digital Visual Interfaces (DVI)

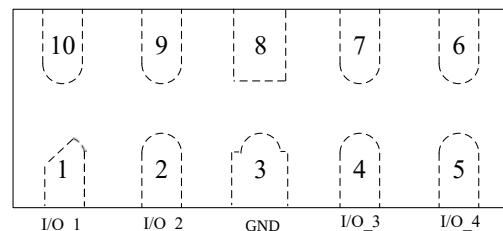
Mechanical Characteristics

- ❑ DFN2510-10L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

Circuit Diagram



Pin Configuration



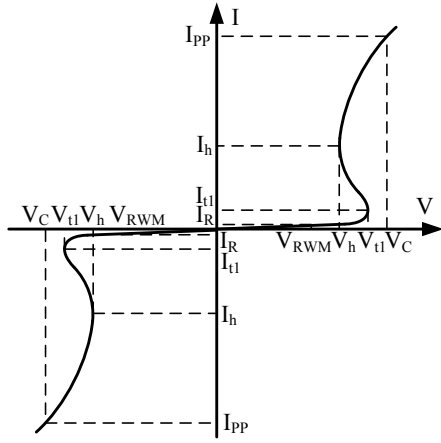
DFN2510-10L
(Top View)



Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current($t_p=8/20\mu s$)	6	A
V_{ESD}	ESD per IEC 61000-4-2(Air) ESD per IEC 61000-4-2 (Contact)	± 10 ± 8	kV
T_{OPT}	Operating Temperature	-55/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°C)

Symbol	Parameter	 Bi-Directional TVS
V_{RWM}	Nominal Reverse Working Voltage	
I_R	Reverse Leakage Current @ V_{RWM}	
V_{tl}	Trigger Voltage	
I_{tl}	Trigger Current @ V_{tl}	
V_h	Holding Voltage	
I_h	Holding Current @ V_h	
V_C	Clamping Voltage @ I_{pp}	
I_{pp}	Maximum Peak Pulse Current	
V_F	Forward Voltage @ I_F	
C_{ESD}	Parasitic Capacitance	
α_{IL}	Insertion Loss	
f_{3db}	Cut-off frequency at -3dB	

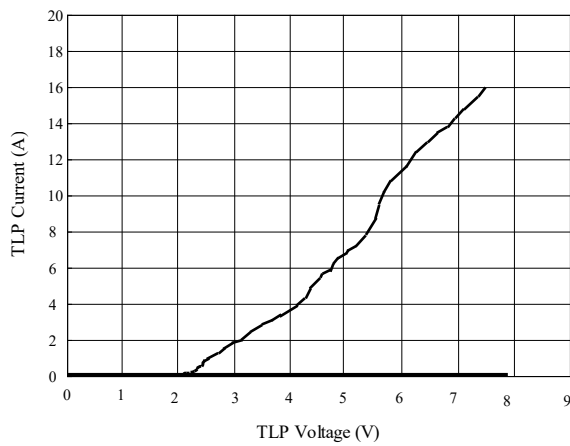
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				3.3	V
I_R	$V_{RWM} = 3.3V, T = 25^\circ C$		0.1	1.0	μA
V_{tl}	$I_{tl} = 1mA$	6		9	V
V_h	$I_h = 50mA$	2.0		3.0	V
V_C	$I_{pp} = 6.0A, t_p = 8/20\mu s$		5.0		V
V_C	$I_{pp} = 8.0A, t_p = 100ns^{(1)}$		5.2		V
	$I_{pp} = 16.0A, t_p = 100ns^{(1)}$		7.5		V
R_{dyn}	IEC61000-4-2 0-6KV, T=25°C Contact, I/O to GND		0.25		Ω

Notes: (1) Measurements performed using a 100ns Transmission Line Pulse(TLP) system.

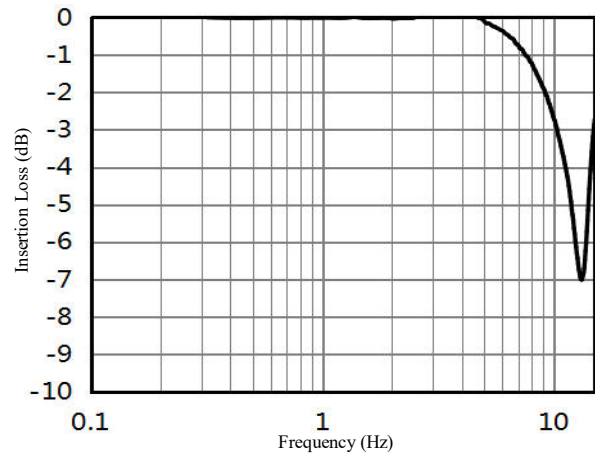


Symbol	Test Condition	Minimum	Typical	Maximum	Units
C_{ESD}	$V_R = 0V$, $f = 1MHz$ Between I/O and GND		0.18	0.33	pF
	$V_R = 0V$, $f = 1MHz$ Between I/O and I/O		0.1	0.2	pF
f_{-3db}	$\alpha_{IL} = -3db$		10.4		GHz

TLP Measurement of I/O to GND

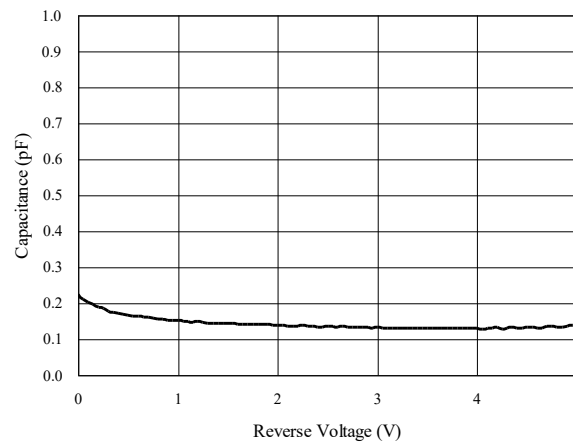


Insertion Loss S21 of I/O to GND



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

Capacitance vs. Reverse Voltage

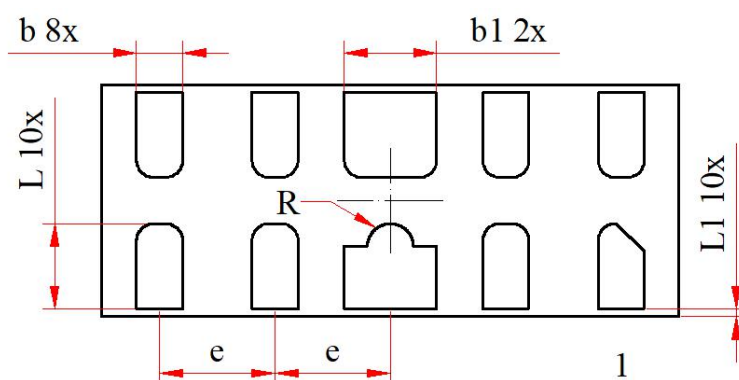




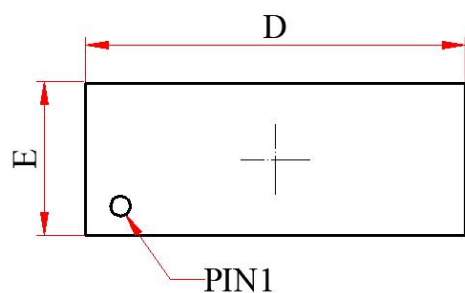
Package Outline

- DFN2510-10L package
- Thermally-Enhanced
- MSL-1 Level

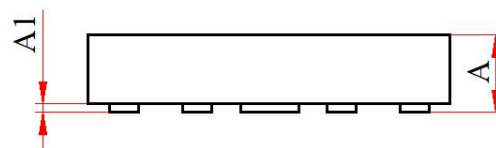
Symbol	Dimension In Millimeters			Dimension In Inches		
	Normal	Min	Max	Normal	Min	Max
A	--	0.450	0.550	--	0.018	0.026
A1	0.050	0.025	0.075	0.002	0.001	0.003
D	2.500	2.450	2.550	0.098	0.096	0.100
E	1.000	0.950	1.050	0.039	0.037	0.041
b	0.200	0.150	0.250	0.008	0.006	0.010
b1	0.400	0.350	0.450	0.016	0.014	0.018
L	0.370	0.320	0.420	0.015	0.013	0.017
L1	0.030	0.000	0.060	0.001	0.000	0.002
R	0.100 REF			0.004 REF		
e	0.500 BSC			0.020 BSC		



Bottom View



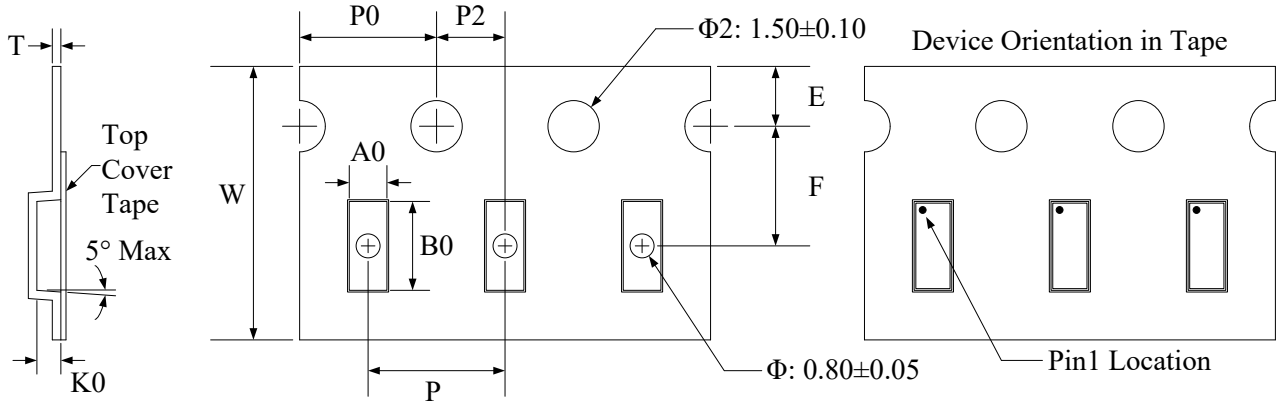
Top View



Side View

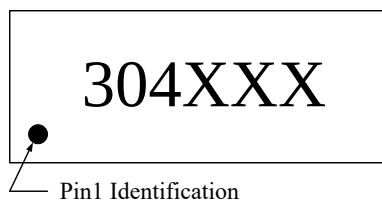


Tape and Reel Specification



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

Marking Codes



Note:

- (1) "304" is part number fixed.
- (2) "XXX" is the last 3 characters of the wafer's Lot No.

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT3304SPX	3.3V	3,000	7 Inch