Features

- Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±30kV (Air)
    ±30kV (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - IEC 61000-4-5 (Surge) 20A (8/20μs)
- Package optimized for high-speed lines
- Provides protection for two line pairs
- Low capacitance: 4.5pF @ 2.5V (Typical)
- Low leakage current: 0.01uA @ V_{RWM} (Typical)
- Low operating and clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge
- ROHS compliant

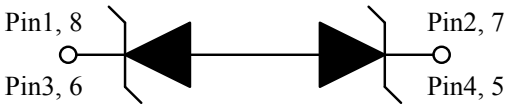
Applications

- 10/100/1000M Ethernet Ports
- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- Cellular Phones
- Switching Systems
- Audio/Video Inputs

Mechanical Characteristics

- DFN-8L package
- Flammability Rating: UL 94V-0
- Marking: Part number
- Packaging: Tape and Reel

Circuit Diagram

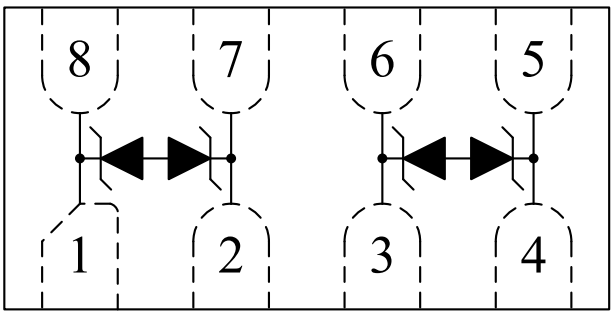


Description

TS2502PNX is a low-capacitance Transient Voltage Suppressor (TVS) array designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 4.5pF only, TS2502PNX 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), IEC 61000-4-5 (Surge) (20 A, 8/20μs), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TS2502PNX is in a DFN-8L package. Each TS2502PNX device can protect two high-speed line pairs. The "flow-thru" design minimizes trace inductance and reduces voltage overshoot associated with ESD events. The combined features of low capacitance and high ESD robustness make TS2502PNX ideal for high-speed data port and high-frequency line (e.g., Gigabit Ethernet Ports) applications. The low clamping voltage of the TS2502PNX guarantees a minimum stress on the protected IC.

Pin Configuration



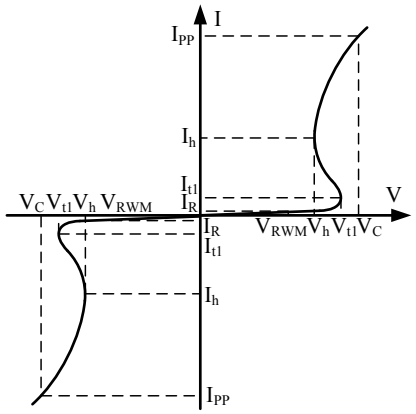
DFN-8L
(Top View)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current (8/20μs)	20	A
P_{PK}	Peak Pulse Power (8/20μs)	300	Watts
V_{ESD}	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	±30 ±30	kV
T_{OPT}	Operating Temperature	-45 to +85	°C
T_{STG}	Storage Temperature	-55 to +150	°C

Electrical Characteristics (T = 25°C)

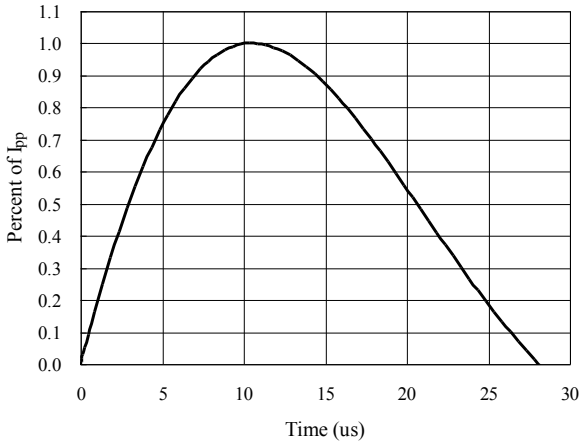
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{t1}	Trigger Voltage
I_{t1}	Trigger Current @ V_{t1}
V_h	Holding Voltage
I_h	Holding Current @ V_h
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
C_{ESD}	Parasitic Capacitance
C_Δ	Variation in C_{ESD} with Reverse Bias



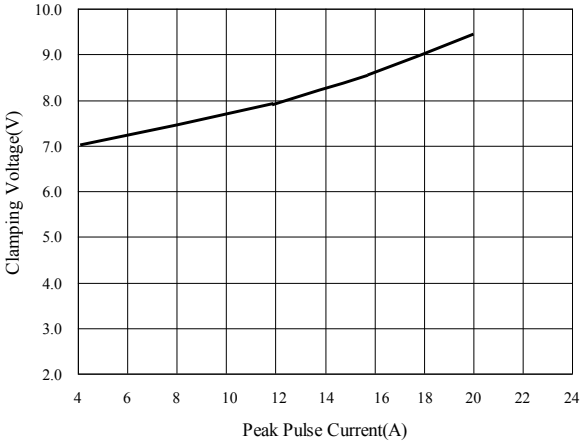
Bi-Directional TVS

Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				2.5	V
I_R	V_{RWM} = 2.5V, T = 25°C		0.01	0.05	uA
V_{t1}	I_{t1} = 1μA	6.0		7.5	V
V_h	I_h = 1mA	3.5		4.5	V
V_C	I_{PP} = 2A, t_p = 8/20μs (Each Line)			5.0	V
V_C	I_{PP} = 10A, t_p = 8/20μs (Each Line)			8.0	V
C_{ESD}	V_R = 2.5V, f = 1MHz (Each Line)		4.5	6.0	pF
C_Δ	Pin1, 8 to 2, 7 & Pin3, 6 to Pin4, 5 V_R = 0V ~ 2.5V, f = 1MHz		1.3		pF

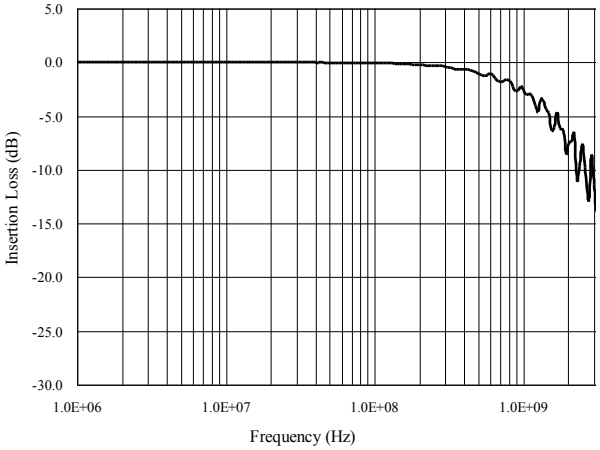
8/20μs Pulse Waveform



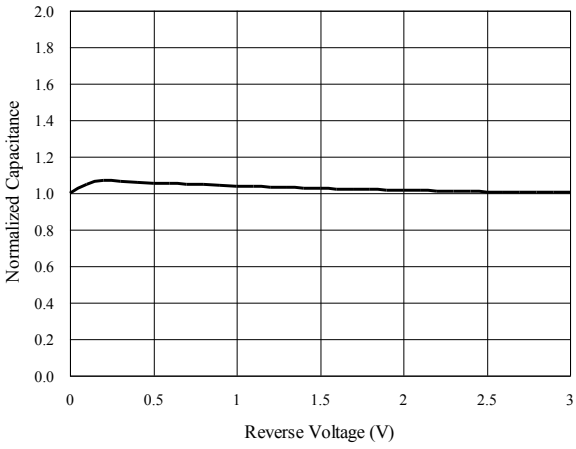
Clamping Voltage V_C vs. Current I_{PP}



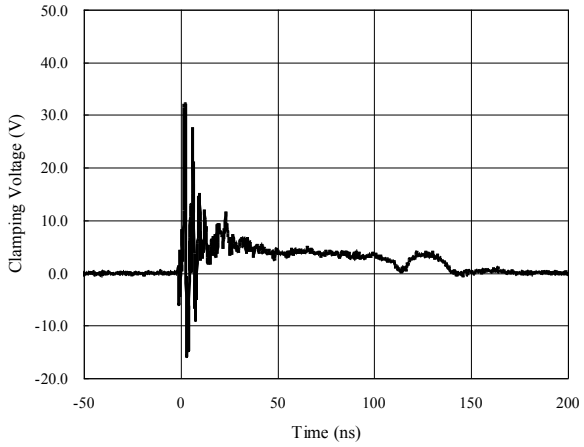
Insertion Loss S21



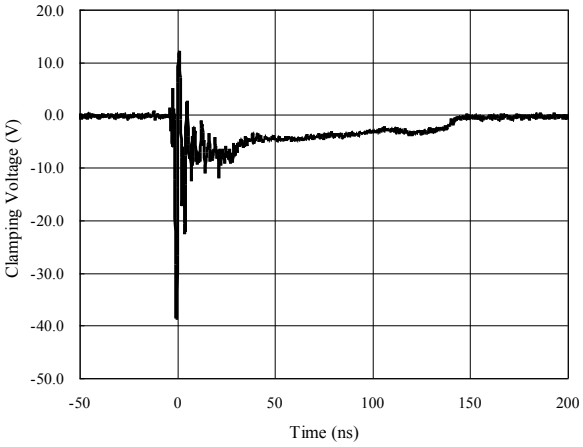
Normalized Capacitance vs. Voltage



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

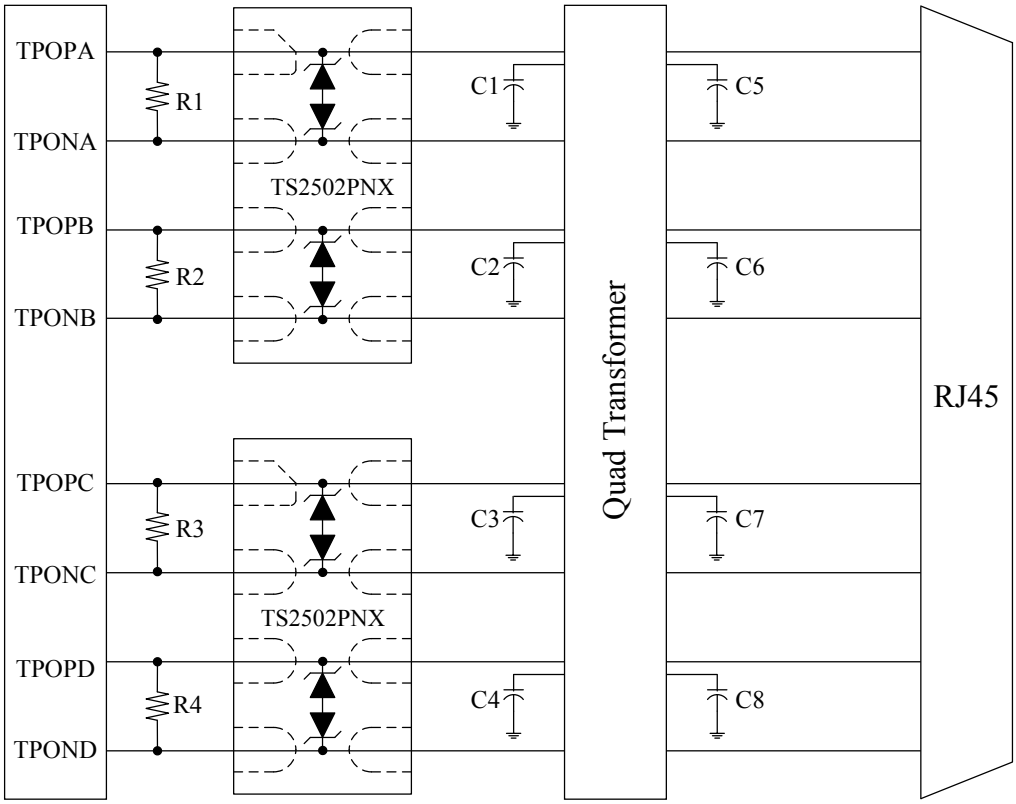


ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)



Application Information

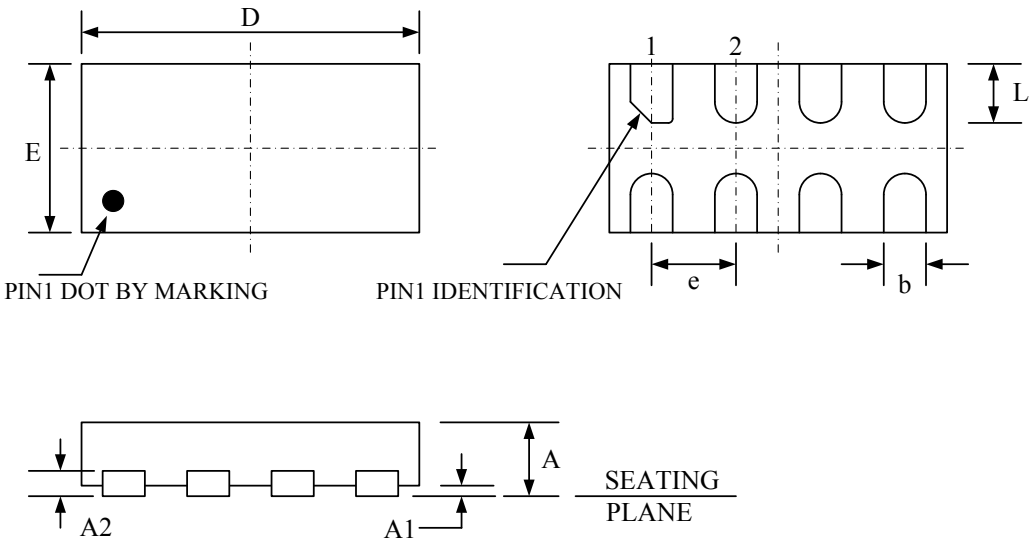
Electronic equipment is susceptible to damage caused by a variety of sources, including Electrostatic Discharge (ESD), Electrical Fast Transients (EFT) and Lightning strikes. The TS2502PNX was designed to protect the sensitive equipment from damage which may be induced by such transient events. This product can be configured in a connection to meet the requirement of differential line pairs as follows:



Schematic Diagram for Gigabit Ethernet ESD/Surge Protection

Package Outline

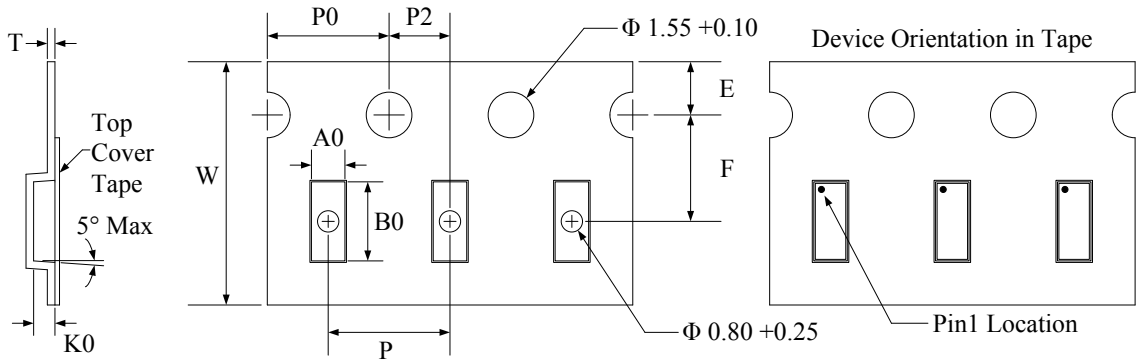
- ❑ DFN-8L Package
- ❑ Flow-Through
- ❑ MSL 1 & Thermally-Enhanced



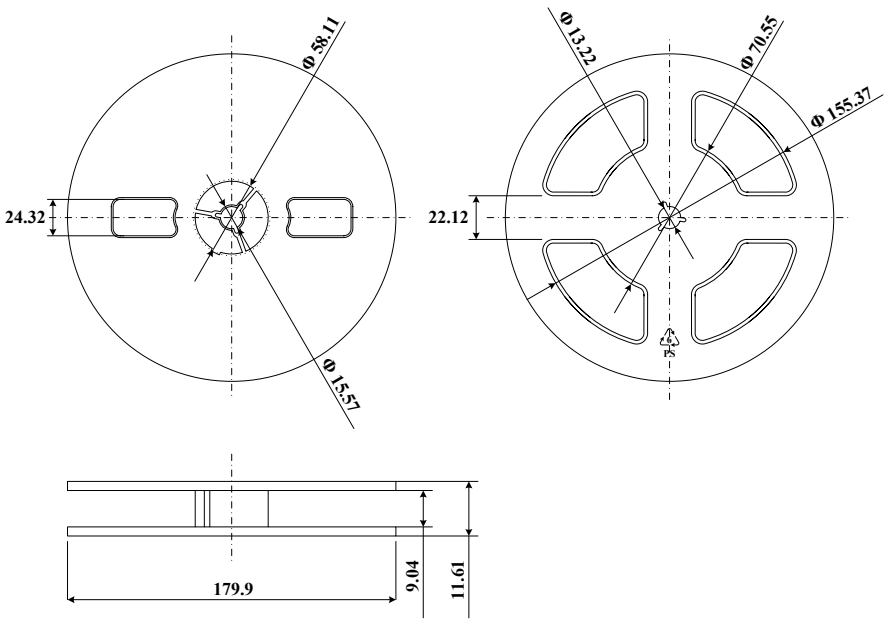
Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions (mm)			Dimensions (Inches)		
	Minimum	Typical	Maximum	Minimum	Typical	Maximum
A	0.370	0.400	0.430	0.015	0.016	0.017
A1	0.000	0.020	0.050	0.000	0.001	0.002
A2	0.130			0.005		
b	0.200	0.250	0.300	0.008	0.010	0.012
D	1.900	2.000	2.100	0.075	0.079	0.083
E	0.900	1.000	1.100	0.035	0.039	0.043
e	0.500 BSC			0.020 BSC		
L	0.300	0.350	0.400	0.012	0.014	0.016
R	0.050	0.100	0.150	0.002	0.004	0.006

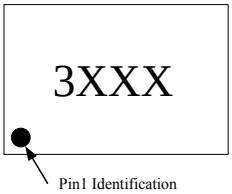
Tape and Reel Specification



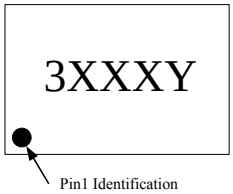
Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	8.00+0.3 -0.1	1.15±0.05	2.15±0.05	0.48±0.05	1.75±0.1	3.5±0.10	4.0±0.1	4.0±0.1	2.0±0.05	0.2±0.03



Marking Codes



Or



Note:

(1) "3" is the part number, fixed.

(2) "XXX" is internal code.

Note:

(1) "3" is the part number, fixed.

(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
TS2502PNX	2.5V	3,000	7 Inch