

## Low Capacitance ESD/Surge Protection for Gigabit Ethernet Interfaces

### DESCRIPTION

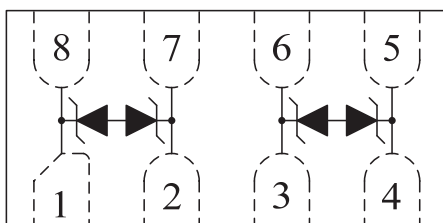
TEP2203-25LC is a low-capacitance Transient Voltage Suppressor (TVS) array designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 4.5pF only, TEP2203-25LC is designed to protect parasitic-sensitive systems against over-voltage and over-current 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), IEC 61000-4-5 (Surge) (10A, 8/20 $\mu\text{s}$ ), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

Each TEP2203-25LC 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 TEP2203-25LC ideal for high-speed data port and high-frequency line (e.g., Gigabit Ethernet Ports) applications. The low clamping voltage of the TEP2203-25LC guarantees a minimum stress on the protected IC.

### ORDERING INFORMATION

- ✧ Device: TEP2203-25LC
- ✧ Package: DFN-8L
- ✧ Marking: part number, date code
- ✧ Material: Halogen free
- ✧ Packing: Tape & Reel
- ✧ Quantity per reel: 3,000pcs

### PIN CONFIGURATION



### FEATURES

- ✧ Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (Air)
  - $\pm 30\text{kV}$  (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - IEC 61000-4-5 (Surge) 10A (8/20 $\mu\text{s}$ )
- ✧ Package optimized for high-speed lines
- ✧ Provides protection for two line pairs
- ✧ Low capacitance: 4.5pF @ 2.5V (Typical)
- ✧ Low leakage current: 10nA @ VRWM (Typical)
- ✧ Low operating and clamping voltage
- ✧ Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge

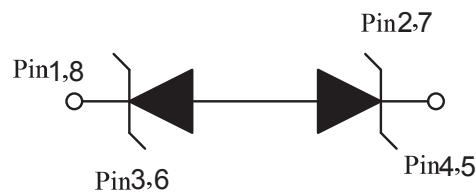
### MACHANICAL DATA

- ✧ DFN-8L package
- ✧ Flammability Rating: UL 94V-0
- ✧ MSL 1 & Thermally-Enhanced
- ✧ Flow-Through
- ✧ Packaging: Tape and Reel
- ✧ Reel size: 7 inch
- ✧ High temperature soldering guaranteed: 260 $^{\circ}\text{C}$ /10s

### APPLICATIONS

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

### CIRCUIT DIAGRAM



**ABSOLUTE MAXIMUM RATING**

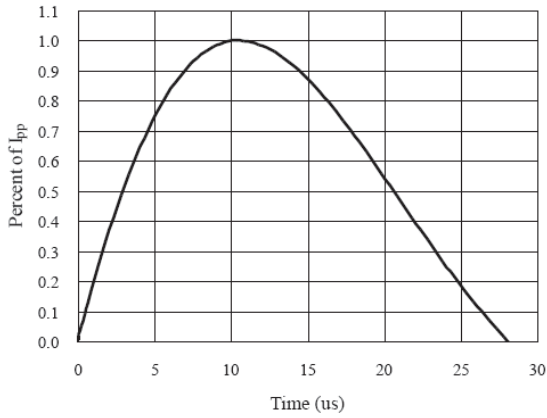
Symbol	Parameter	Value	Units
$P_{PP}$	Peak Pulse Power (8/20 $\mu$ s)	100	W
$I_{PP}$	Peak Pulse Current (8/20 $\mu$ s)	10	A
$V_{ESD}$	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$\pm 30$ $\pm 30$	kV
$T_{OPT}$	Operating Temperature	-45/+85	$^{\circ}$ C
$T_{STG}$	Storage Temperature	-55/+150	$^{\circ}$ C

**ELECTRICAL CHARACTERISTICS ( $T_{amb}=25^{\circ}$ C)**

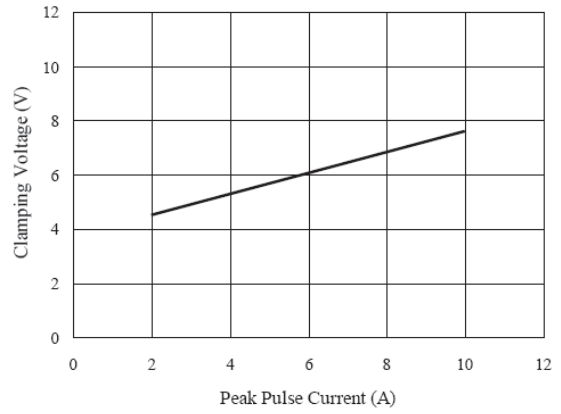
Symbol	Parameter	Test Condition	Min	Typ	Max	Units
$V_{RWM}$	Reverse Working Voltage				2.5	V
$I_R$	Reverse Leakage Current	$V_{RWM} = 2.5V$		10	50	nA
$V_{t1}$	Trigger Voltage	$I_{t1} = 1\mu A$	3.0	3.7	4.5	V
$V_h$	Holding Voltage	$I_h = 1mA$	3.0		4.0	V
$V_{C1}$	Clamping Voltage 1	$I_{PP} = 2A, t_p = 8/20\mu s$ (each line)			5.0	V
$V_{C2}$	Clamping Voltage 2	$I_{PP} = 10A, t_p = 8/20\mu s$ (each line)			8.0	V
$C_J$	Junction Capacitance	$V_R = 2.5V, f = 1MHz$ (each line)		4.5	6.0	pF
$C_{\Delta}$	Variation in $C_J$ with Reverse Bias	$V_R = 0\sim 2.5V, f = 1MHz$ Pin 1, 8 to Pin 2, 7 & Pin 3, 6 to Pin 4, 5		1.3		pF

# RATING AND CHARACTERISTICS CURVES (TEP2203-25LC)

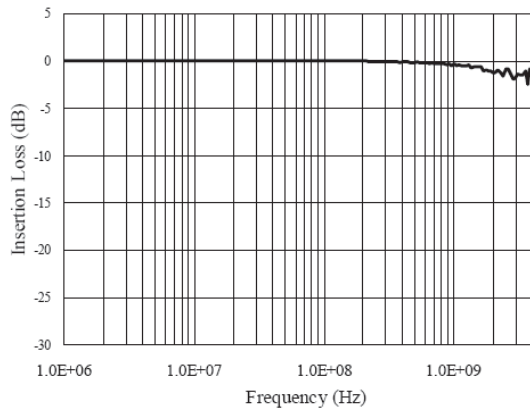
**8/20 $\mu$ s Pulse Waveform**



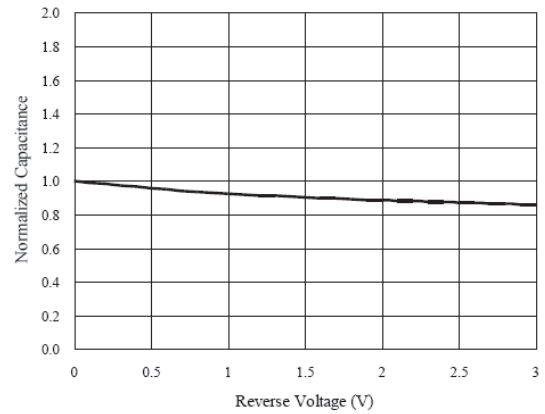
**Clamping Voltage  $V_C$  vs. Current  $I_{PP}$**



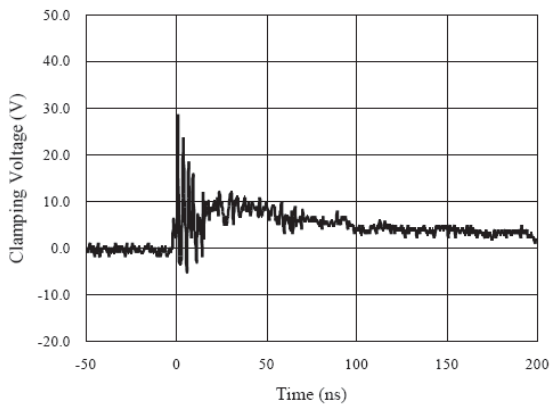
**Insertion Loss S21**



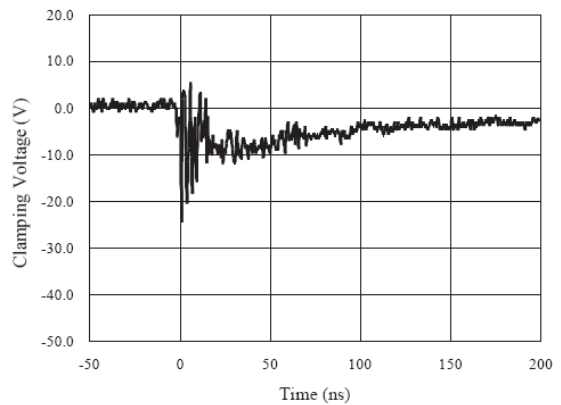
**Normalized Capacitance vs. Voltage**



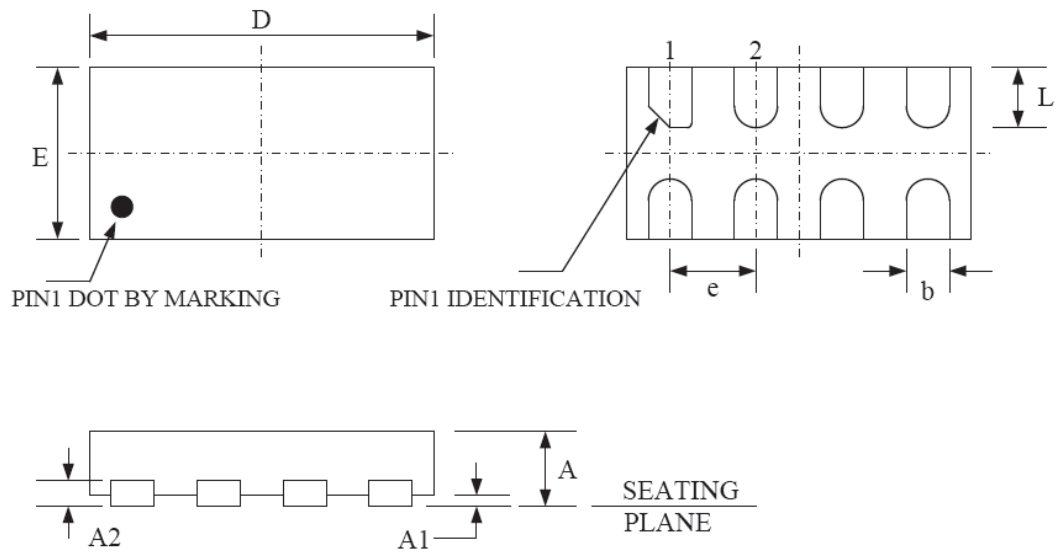
**ESD Clamping  
(+8kV Contact per IEC 61000-4-2)**



**ESD Clamping  
(-8kV Contact per IEC 61000-4-2)**



## DFN-8L PACKAGE OUTLINE DIMENSIONS



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		
$\square$	0.200	0.250	0.300	0.008	0.010	0.012
D	1.000	2.000	2.100	0.075	0.078	0.083
E	0.600	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

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