

## 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 one line pair
- ❑ Low capacitance: 2.5pF @ 2.5V (Typical)
- ❑ Low leakage current: 0.01 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Typical)
- ❑ Low operating and clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge
- ❑ ROHS compliant

## Description

TS2501PBX 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 2.5pF only, TS2501PBX 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) (10 A, 8/20  $\mu\text{s}$ ), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TS2501PBX is in a uDFN-2L package. Each TS2501PBX device can protect one high-speed line pair. 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 TS2501PBX ideal for portable applications such as cellular phones and MP3 players. The low clamping voltage of the TS2501PBX guarantees a minimum stress on the protected IC.

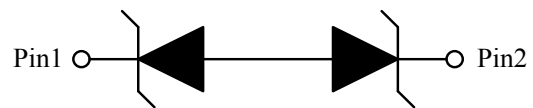
## Applications

- ❑ Portable instruments
- ❑ Desktops, Servers and Notebooks
- ❑ Cellular Phones
- ❑ MP3 Players
- ❑ Keypads, Side Keys

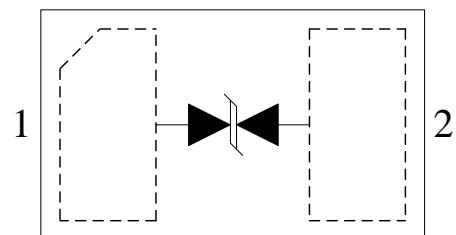
## Mechanical Characteristics

- ❑ DFN1006-2L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration



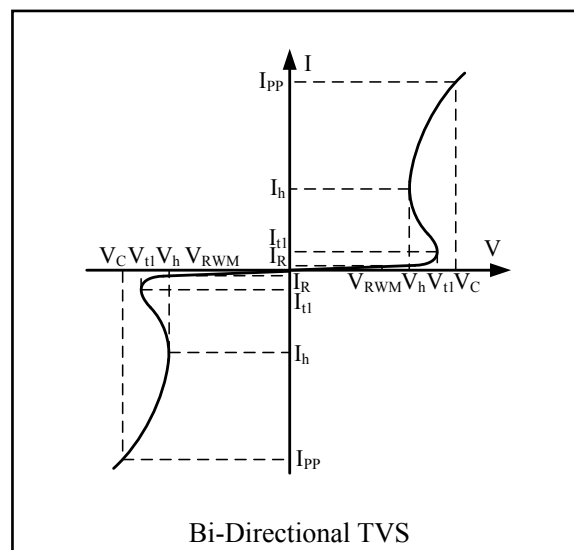
DFN1006-2L  
(Top View)

## Absolute Maximum Rating

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

## Electrical Characteristics (T = 25 $^{\circ}$ C)

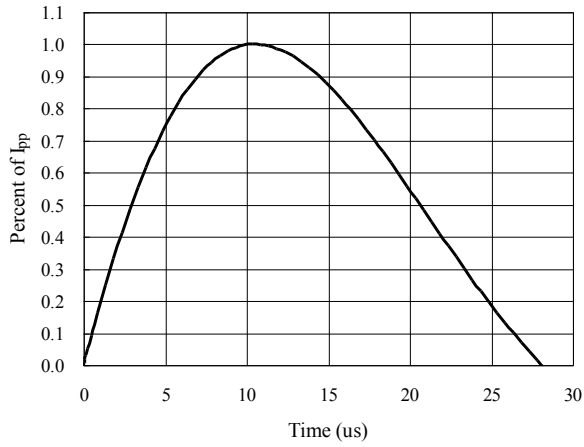
Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{tl}$	Trigger Voltage
$I_{tl}$	Trigger Current @ $V_{tl}$
$V_h$	Holding Voltage
$I_h$	Holding Current @ $V_h$
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic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



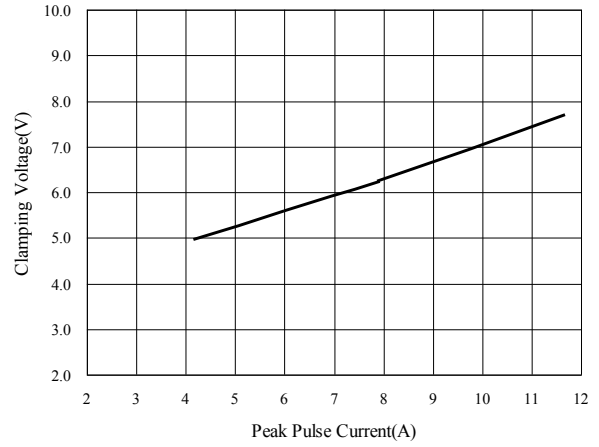
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$			2.5	5.0	V
$V_{DC}$	Operating Voltage(IO-IO)			3.3	V
$I_R$	$V_{RWM} = 2.5V, T = 25^{\circ}C$		0.01	0.05	$\mu$ A
$V_{tl}$	$I_{tl} = 100nA$	6.0		7.5	V
$V_h$	$I_h = 10mA$	3.5		4.5	V
$V_C$	$I_{PP} = 2A, t_p = 8/20\mu s$			7.0	V
$V_C$	$I_{PP} = 10A, t_p = 8/20\mu s$			10.0	V
$C_{ESD}$	$V_R = 2.5V, f = 1MHz$		2.5	4.0	pF
$C_{\Delta}$	$V_R = 0V \sim 2.5V, f = 1MHz$		2.5		pF



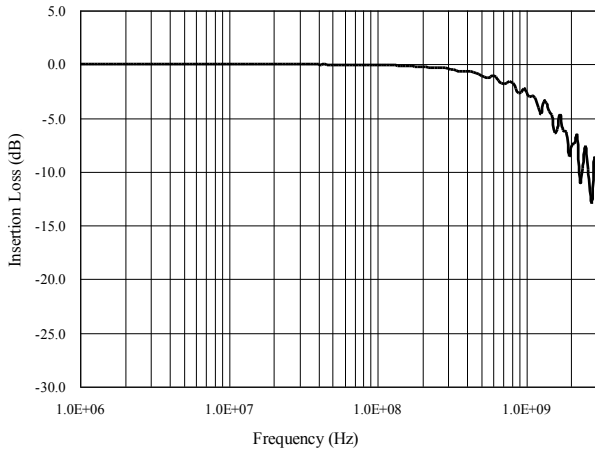
#### 8/20µs Pulse Waveform



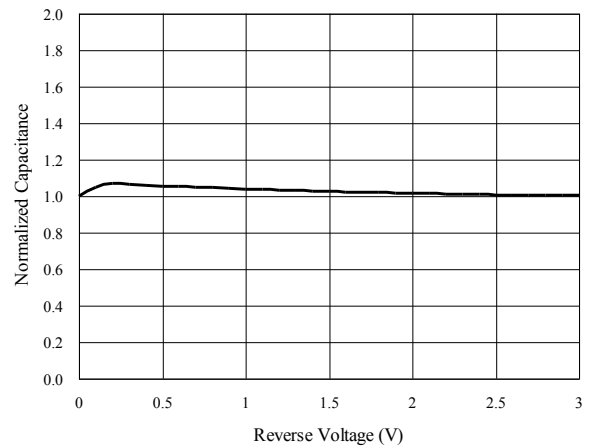
#### Clamping Voltage $V_C$ vs. Current $I_{PP}$



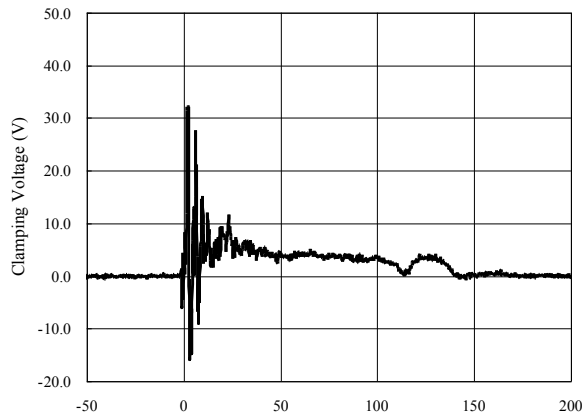
#### Insertion Loss S21



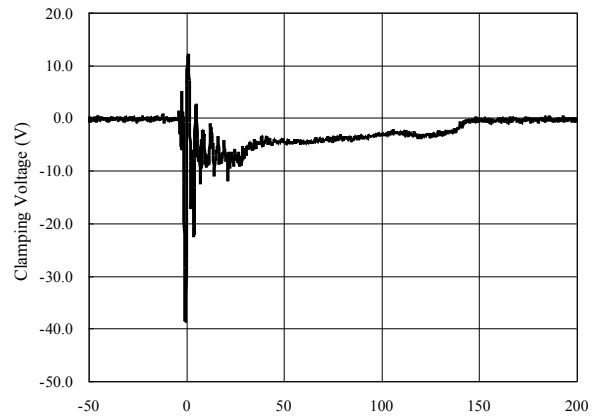
#### Normalized Capacitance vs. Voltage



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



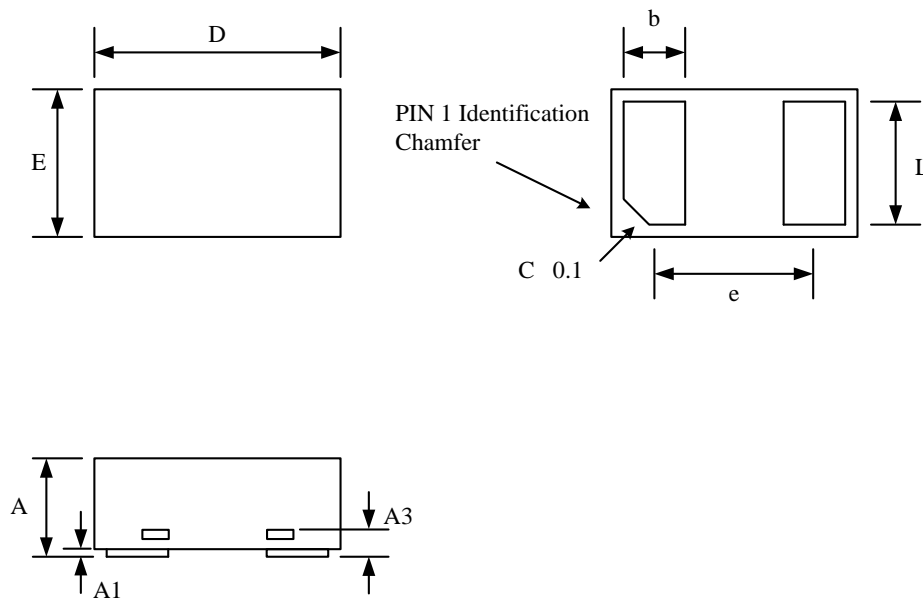
#### ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)





### Package Outline

- uDFN-2L package
- 2 leads, very small package
- MSL-1

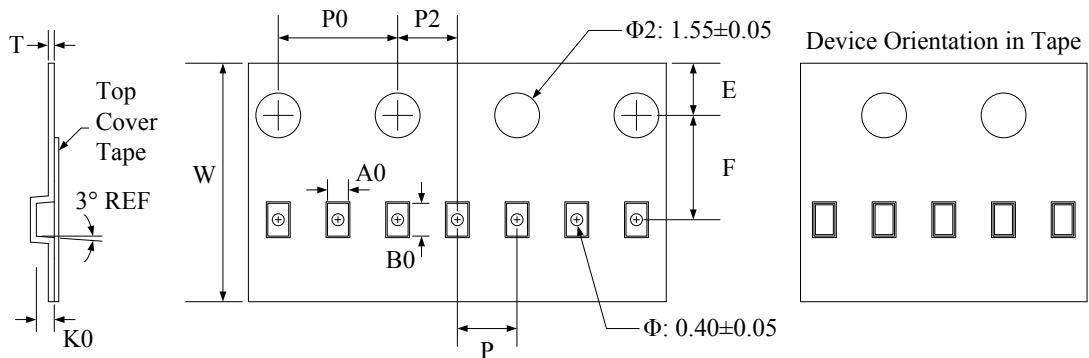


Package Dimensions (Controlling dimensions are in millimeters)

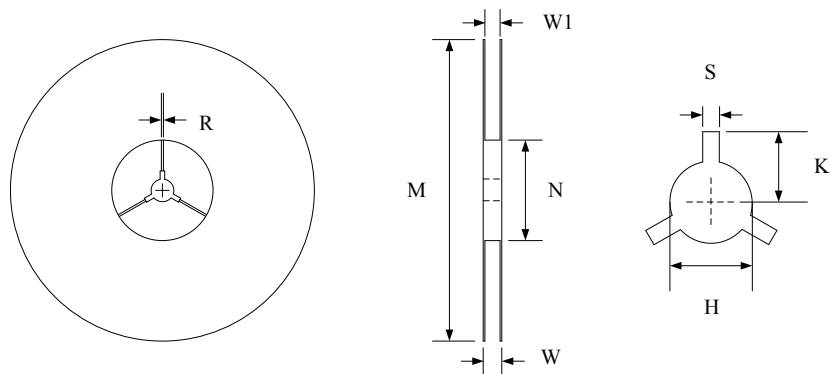
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.400	0.550	0.016	0.022
A1	0.000	0.050	0.000	0.002
A3	0.125 REF		0.005 REF	
D	0.950	1.050	0.037	0.041
E	0.550	0.650	0.022	0.026
b	0.200	0.300	0.008	0.012
e	0.650 BSC		0.026 BSC	
L	0.450	0.550	0.018	0.022



### Tape and Reel Specification



Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	8.00±0.1	0.7±0.05	1.15±0.05	0.55±0.05	1.75±0.1	3.5±0.05	2.0±0.1	4.0±0.1	2.0±0.05	0.2±0.05



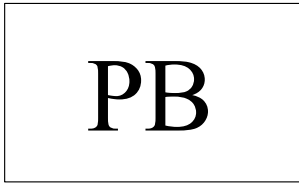
Symbol	Reel Size	M	N	W	W1	H	S	K	R
Dimensions (mm)	Φ178	178.0±1.0	60.0±1.0	11.5±0.5	9.0±0.5	13.0±0.5	2.0±0.1	11.0±0.2	1.0±0.05

### Ordering Information

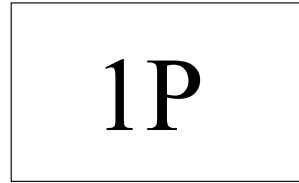
Part Number	Working Voltage	Quantity Per Reel	Reel Size
TS2501PBX	2.5V	10,000	7 Inch



**Marking Codes**



Or



**Note:**

(1) "PB" is part number, fixed

**Note:**

(1) "1P" is part number, fixed

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