

## 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) 11A (8/20 $\mu\text{s}$ )
- ❑ Package optimized for high-speed lines
- ❑ Provides protection for one line pair
- ❑ Low capacitance: 2.0pF @ 0V (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

TS0501VB X 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 2.0pF only, TS0501VBX 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) (11 A, 8/20 $\mu\text{s}$ ), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TS0501VB X is in a uDFN-2L package. Each TS0501VB X 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 TS0501VB X ideal for portable applications such as cellular phones and MP3 players. The low clamping voltage of the TS0501VBX guarantees a minimum stress on the protected IC.

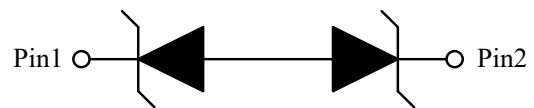
## Applications

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

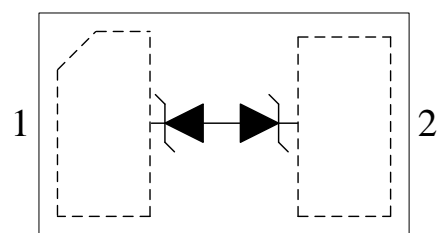
## Mechanical Characteristics

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

## Circuit Diagram



## Pin Configuration



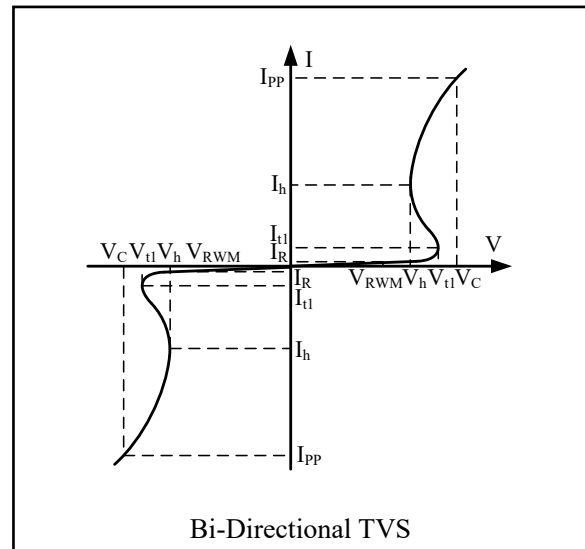
uDFN-2L  
(Top View)

## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current (8/20 $\mu$ s)	11	A
$P_{PK}$	Peak Pulse Power (8/20 $\mu$ s)	100	Watts
$V_{ESD}$	ESD per IEC 61000-4-2 (Air)	$\pm 30$	kV
	ESD per IEC 61000-4-2 (Contact)	$\pm 30$	
$T_{OPT}$	Operating Temperature	-45 to +85	$^{\circ}$ C
$T_{STG}$	Storage Temperature	-55 to +150	$^{\circ}$ C

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

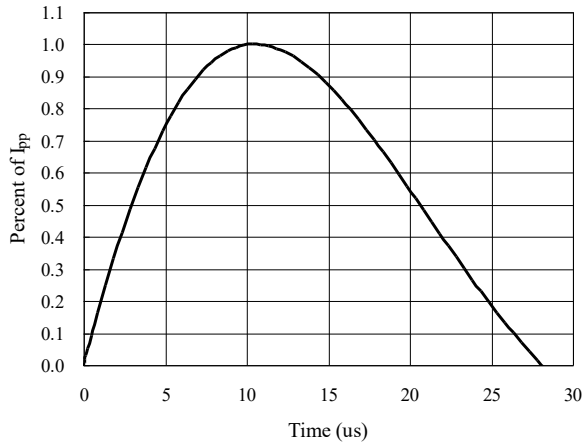
Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{t1}$	Trigger Voltage
$I_{t1}$	Trigger Current @ $V_{t1}$
$V_h$	Holding Voltage
$I_h$	Holding Current @ $V_h$
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic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



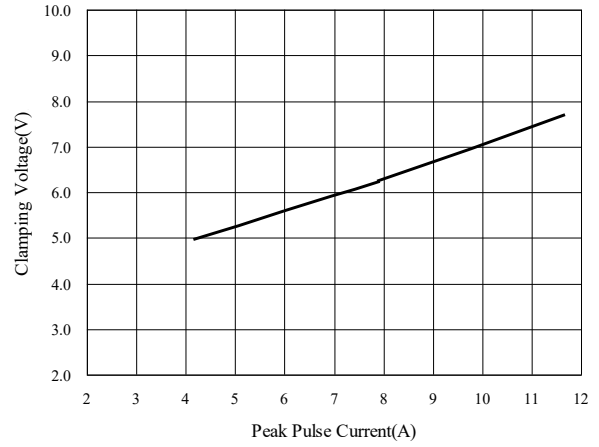
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				5.0	V
$I_R$	$V_{RWM} = 5V, T = 25^{\circ}C$			0.1	$\mu$ A
$V_{t1}$	$I_{t1} = 100nA$	6.0		7.5	V
$V_h$	$I_h = 10mA$	3.5		4.5	V
$V_C$	$I_{PP} = 2A, t_p = 8/20\mu s$			7.0	V
$V_C$	$I_{PP} = 11A, t_p = 8/20\mu s$			10.0	V
$C_{ESD}$	$V_R = 0V, f = 1MHz$		2.0		pF



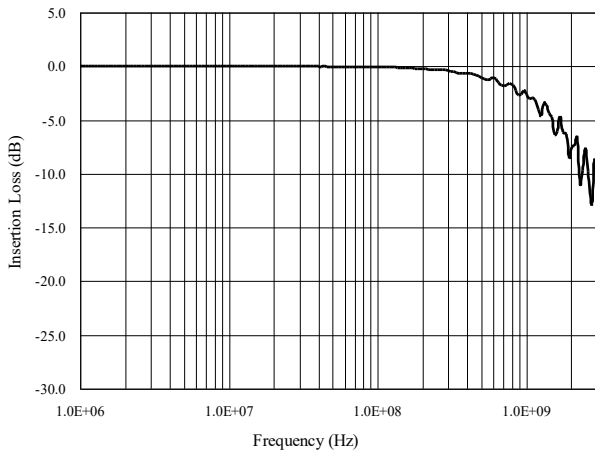
#### 8/20 $\mu$ s Pulse Waveform



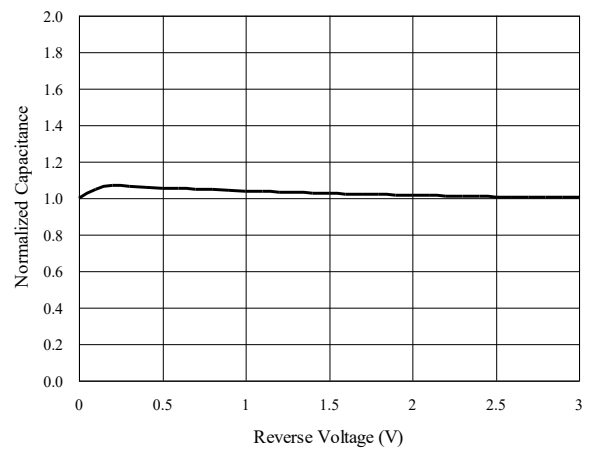
#### Clamping Voltage $V_C$ vs. Current $I_{PP}$



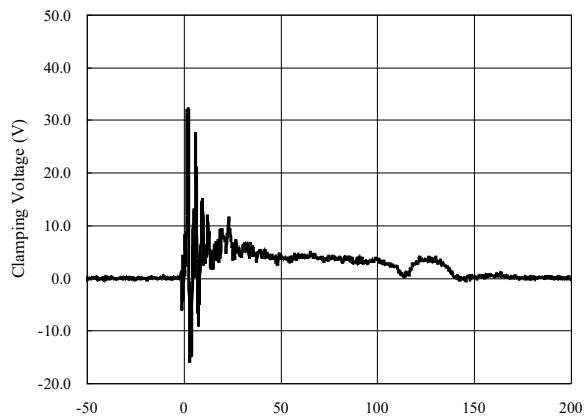
#### Insertion Loss S21



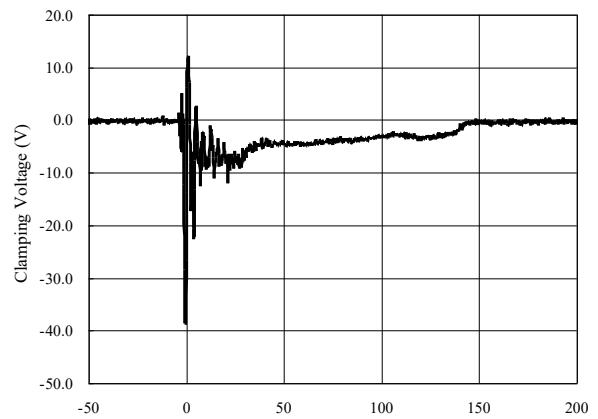
#### Normalized Capacitance vs. Voltage



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

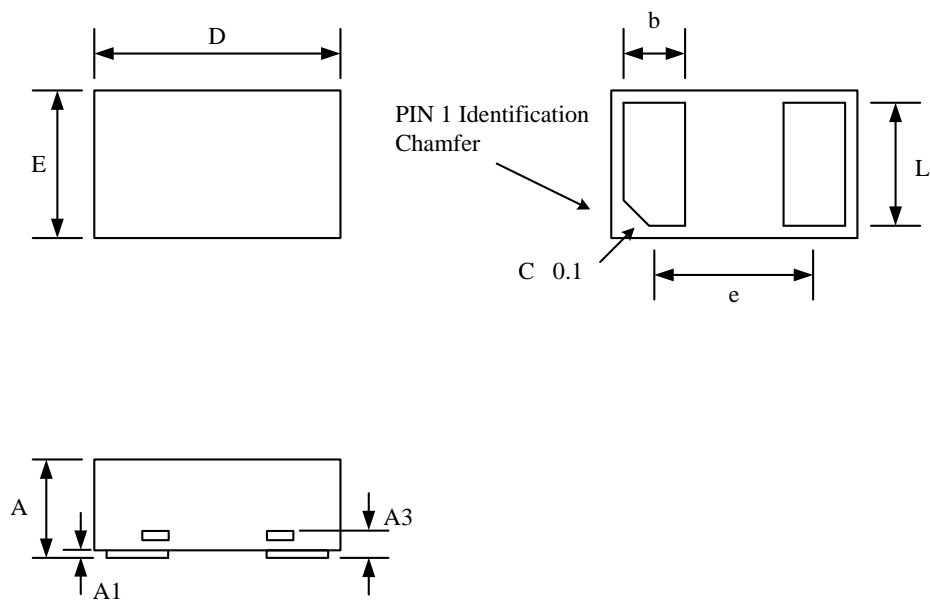


#### ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)



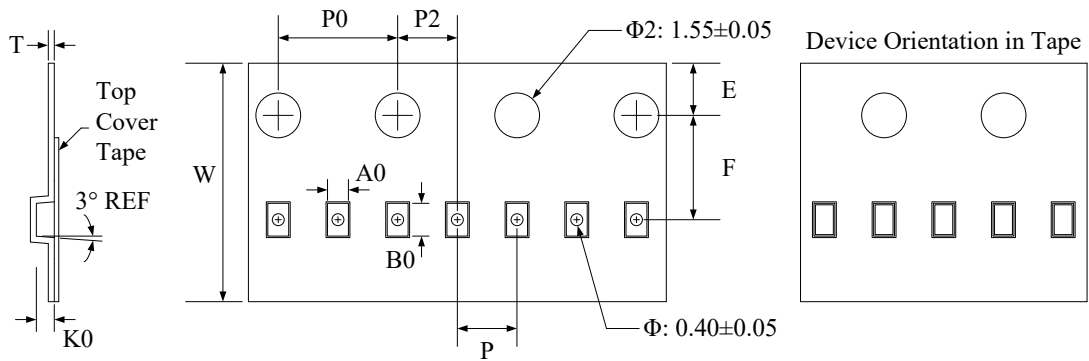
## Package Outline

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

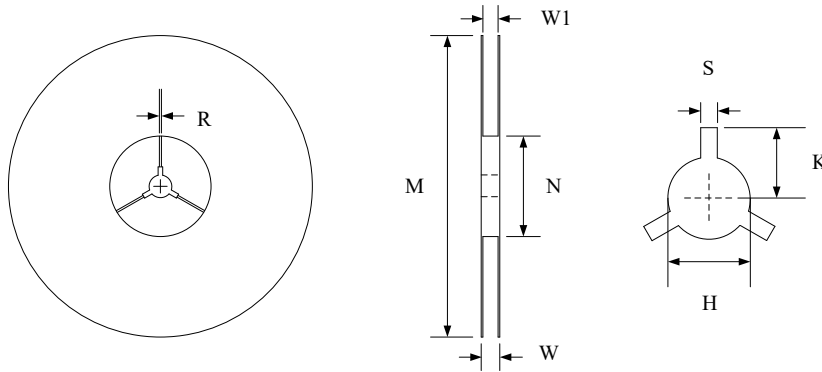


Package Dimensions (Controlling dimensions are in millimeters)

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

**Marking Codes**


Note:  
 (1) "5V" is part number, fixed  
 (2) no cathode line and date c

**Ordering Information**

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TS0501VBX	5V	10,000	7 Inch



Note:  
 (1) "PB" is part number, fixed  
 (2) no cathode line and date c