

## Features

- ❑ Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±25kV (Air)
  - ±20kV (Contact)
  - IEC 61000-4-4 (EFT) 40A (5/50 ns)
  - Cable Discharge Event (CDE)
- ❑ Package optimized for high-speed lines
- ❑ Ultra-small package (1.0mm×0.6mm×0.55mm)
- ❑ Protects one data, control or power line
- ❑ Low capacitance: 1.0pF (Typical)
- ❑ Low leakage current: 10nA @ V<sub>RWM</sub> (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge
- ❑ ROHS compliant

## Description

TT0301TBX is a low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 1.0pF only, TT0301TBX 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), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TT0301TBX uses ultra-small uDFN-2L package. Each TT0301TBX device can protect one high-speed data line. It offers system designers flexibility to protect single data line where space is a premium concern. The combined features of low capacitance, ultra-small size and high ESD robustness make TT0301TBX ideal for high-speed data port and high-frequency line (e.g., USB 2.0 & antenna line) applications, such as cellular phones and HD visual devices.

## Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ Cellular Phones
- ❑ MDDI Ports
- ❑ USB2.0/3.0 Power and Data Line Protection
- ❑ Display Ports
- ❑ Digital Visual Interfaces (DVI)
- ❑ HDMI 1.4/2.0

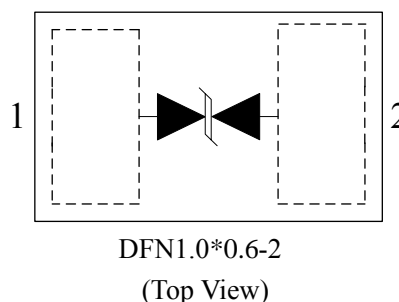
## Mechanical Characteristics

- ❑ DFN1.0\*0.6-2L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration

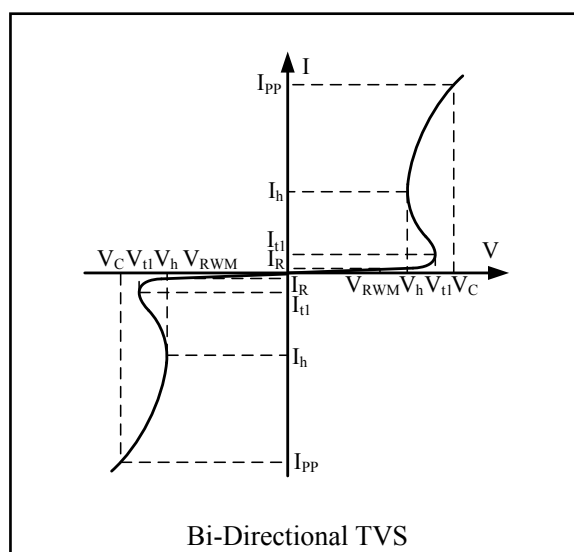


### Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current( $t_p=8/20\mu s$ )	3	A
$V_{ESD}$	ESD per IEC 61000-4-2(Air) ESD per IEC 61000-4-2 (Contact)	$\pm 25$ $\pm 20$	kV
$T_{OPT}$	Operating Temperature	-55/+125	°C
$T_{STG}$	Storage Temperature	-55/+150	°C

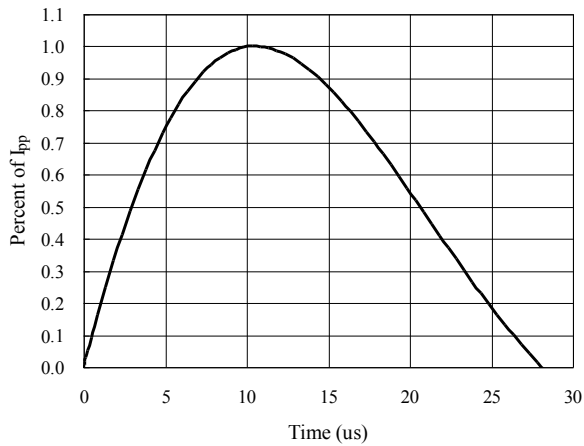
### Electrical Characteristics (T = 25°C)

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
$C_{\Delta}$	Variation in $C_{ESD}$ with Reverse Bias

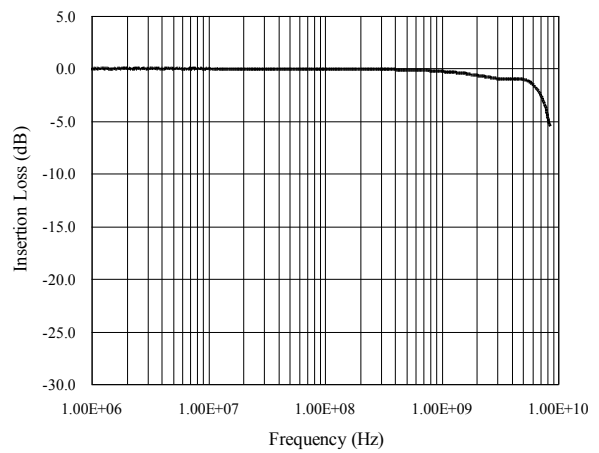


Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				3.3	V
$I_R$	$V_{RWM} = 3.3V, T = 25^{\circ}C$		10	100	nA
$V_{t1}$	$I_{t1} = 1\mu A$		6.0		V
$V_h$	$I_h = 10mA$		4.0		V
$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s$		6.0		V
$V_C$	$I_{PP} = 3A, t_p = 8/20\mu s$		8.0		V
$C_{ESD}$	$V_R = 0V, f = 1MHz$		1.0		pF

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

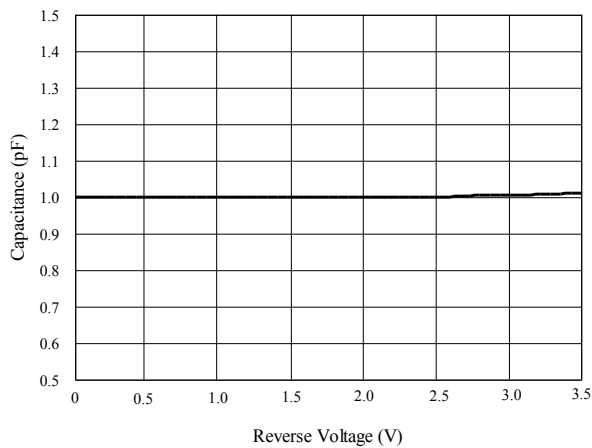


**Insertion Loss S21 of I/O to I/O**

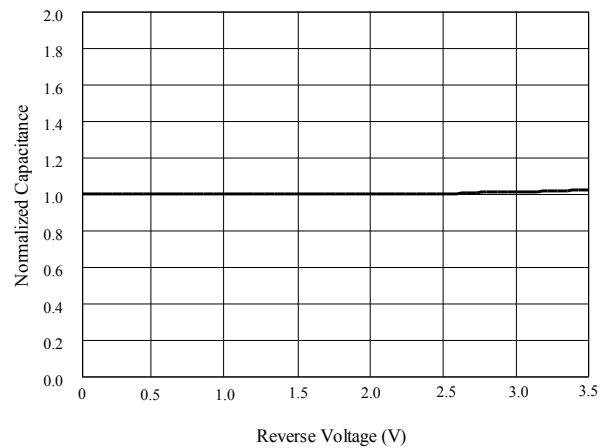


**Capacitance vs. Voltage of I/O to I/O (f = 1MHz)**

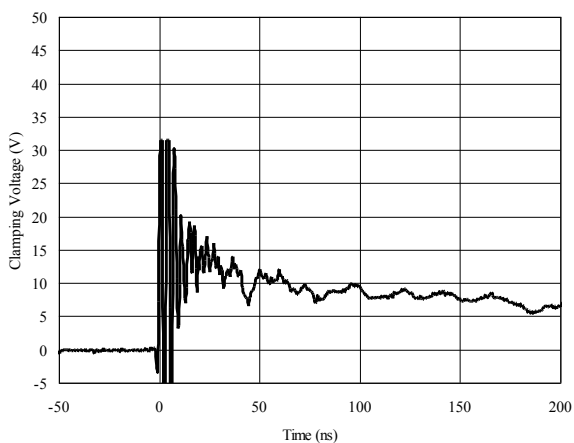
Capacitance vs. Reverse Voltage



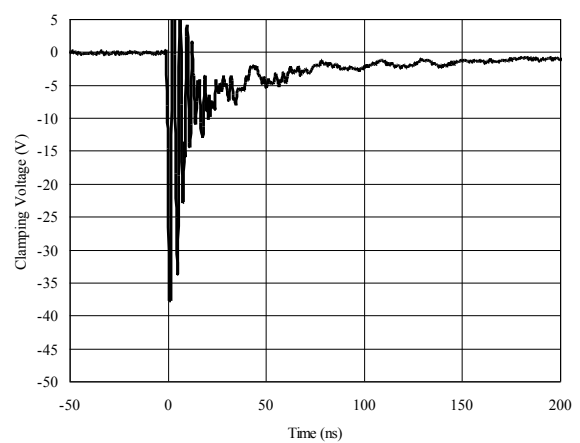
Normalized Capacitance vs. Reverse Voltage



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

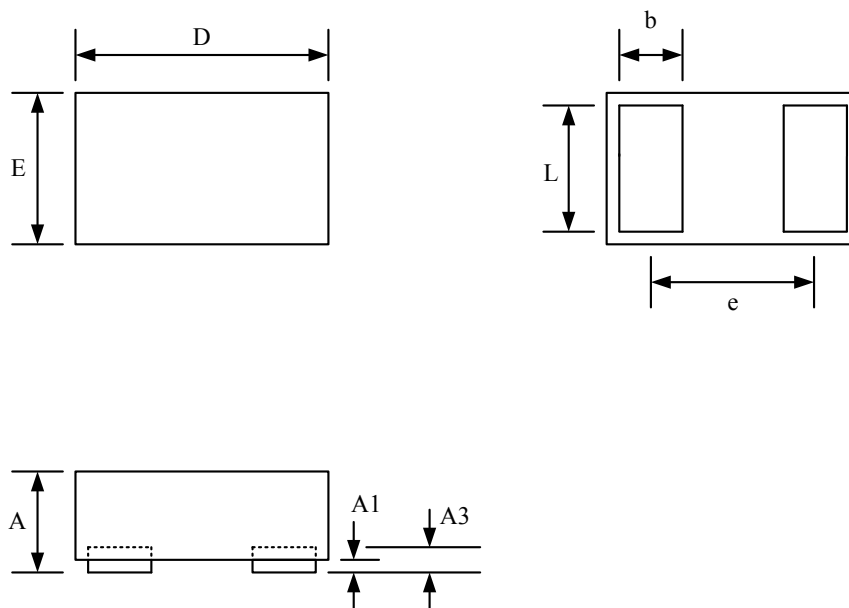


**ESD Clamping of I/O to GND  
(-8kV Contact per IEC 61000-4-2)**



## Package Outline

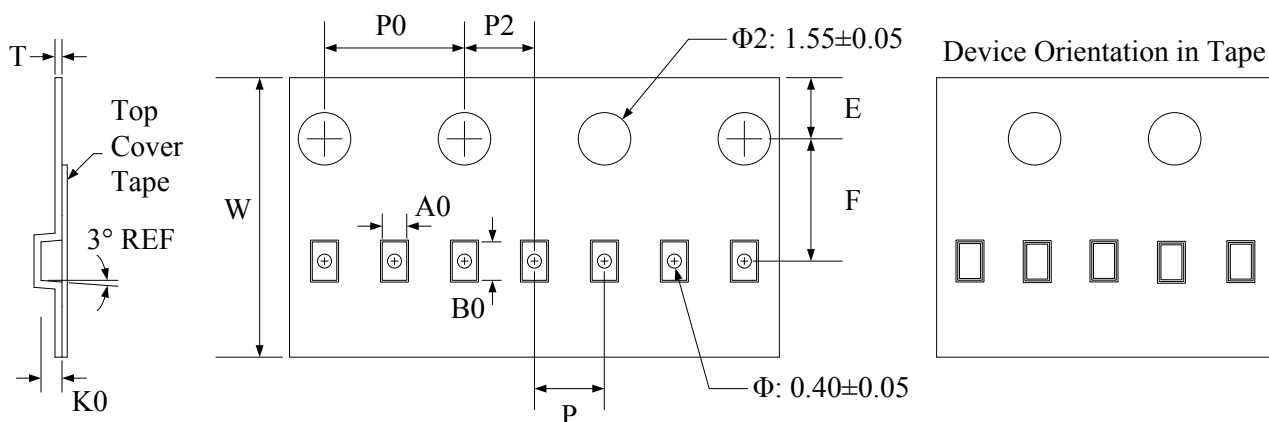
- ❑ DFN1.0\*0.6-2L package
- ❑ 2 leads, very small package
- ❑ MSL-1



Package Dimensions (Controlling dimensions are in millimeters)

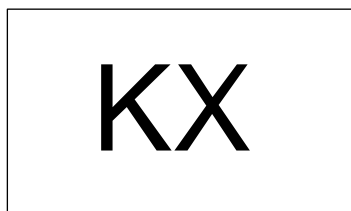
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.400	0.550	0.016	0.022
A1	0.000	0.050	0.000	0.002
A3	0.125 REF		0.005 REF	
D	0.950	1.050	0.037	0.041
E	0.550	0.650	0.022	0.026
b	0.200	0.300	0.008	0.012
e	0.650 BSC		0.026 BSC	
L	0.450	0.550	0.018	0.022

### 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

### Marking Codes



### Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0301TBX	3.3V	10,000	7 Inch

Note:

- (1) "K" is part number, fixed
- (2) "X" is date code, which is the assembly month in three years, changing as (1~9, 0, A~Z)