



Features

- ❑ Transient protection for high-speed data lines
 - IEC 61000-4-2 (ESD) $\pm 17\text{kV}$ (Air)
 $\pm 8\text{kV}$ (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: 0.6pF (Typical)
- ❑ Low leakage current: 10nA @ V_{RWM} (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for $\pm 8\text{kV}$ contact discharge
- ❑ ROHS compliant

Description

TT0401TB is a low -capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.6pF only, TT0401TB 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), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TT0401TB uses ultra-small uDFN-2L package. Each TT0401TB 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 TT0401TB 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

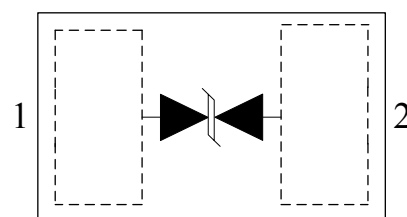
Mechanical Characteristics

- ❑ DFN10*06-2L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

Circuit Diagram



Pin Configuration



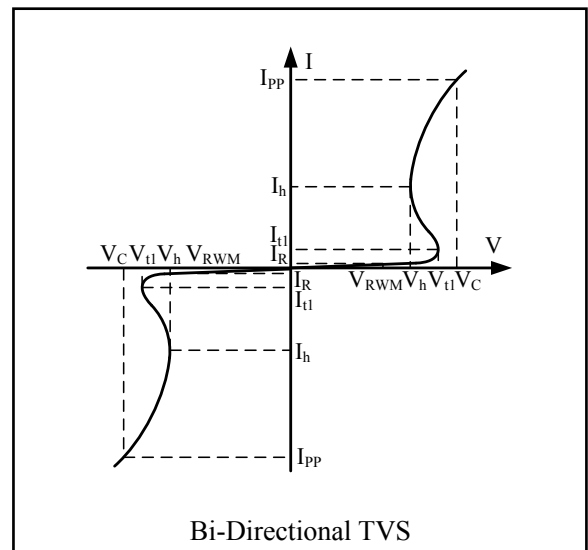
DFN1.0*0.6-2L
(Top View)

**Absolute Maximum Rating**

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current($t_p=8/20\mu s$)	2	A
V_{ESD}	ESD per IEC 61000-4-2(Air) ESD per IEC 61000-4-2 (Contact)	± 17 ± 8	kV
T_{OPT}	Operating Temperature	-55/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°C)

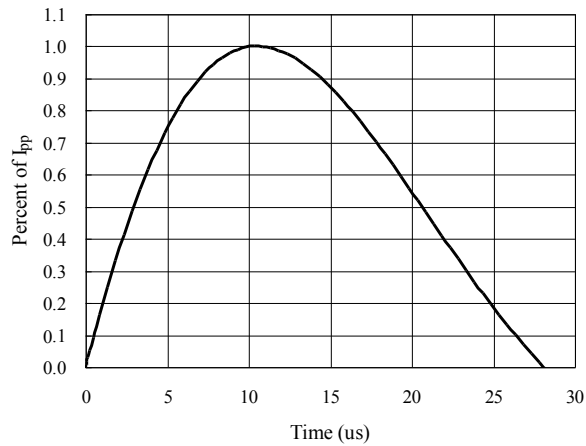
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{tl}	Trigger Voltage
I_{tl}	Trigger Current @ V_{tl}
V_h	Holding Voltage
I_h	Holding Current @ V_h
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
C_{ESD}	Parasitic Capacitance
C_Δ	Variation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



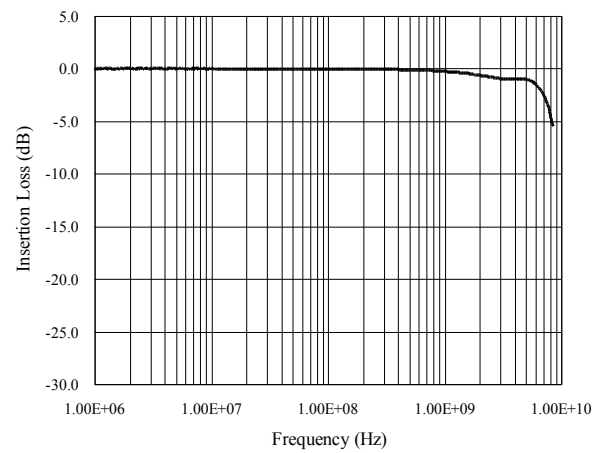
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				4.0	V
I_R	$V_{RWM} = 4.0V, T = 25^\circ C$		10	100	nA
V_{tl}	$I_{tl} = 1\mu A$		6.5		V
V_h	$I_h = 10mA$		4.2		V
V_C	$I_{PP} = 1A, t_p = 8/20\mu s$		6.0		V
V_C	$I_{PP} = 2A, t_p = 8/20\mu s$		9.0		V
C_{ESD}	$V_R = 0V, f = 1MHz$		0.6		pF



8/20 μ s Pulse Waveform

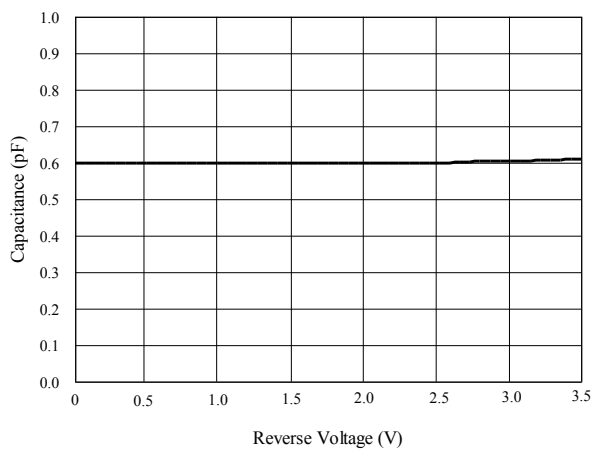


Insertion Loss S21 of I/O to I/O

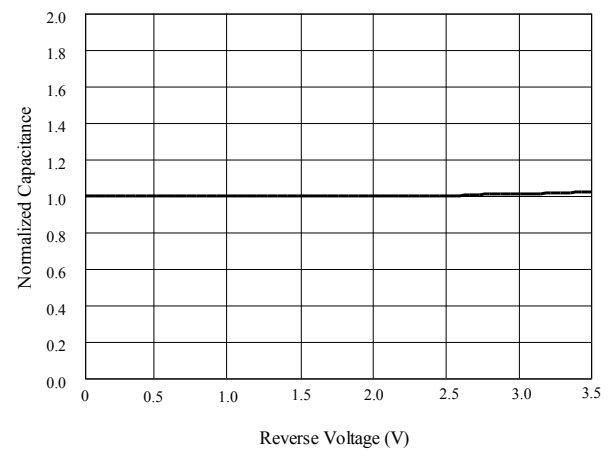


Capacitance vs. Voltage of I/O to I/O ($f = 1\text{MHz}$)

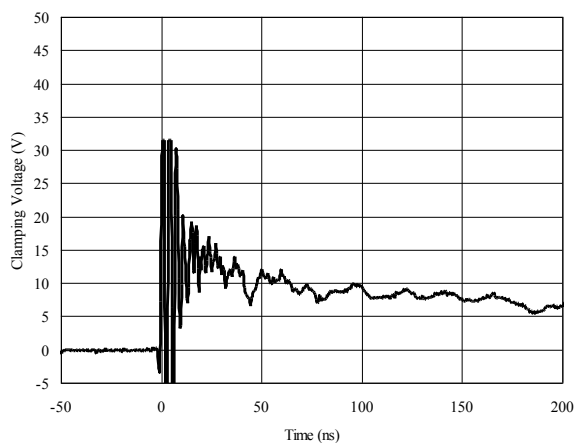
Capacitance vs. Reverse Voltage



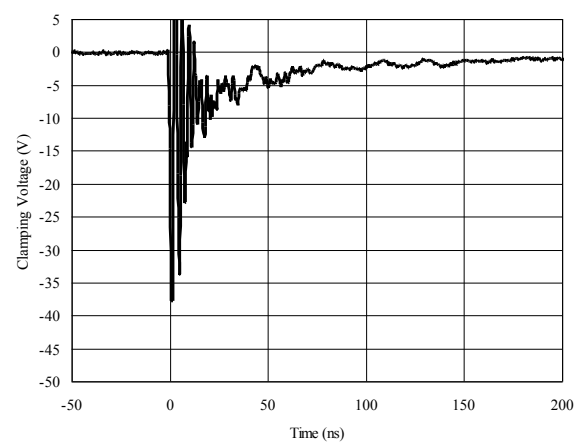
Normalized Capacitance vs. Reverse Voltage



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



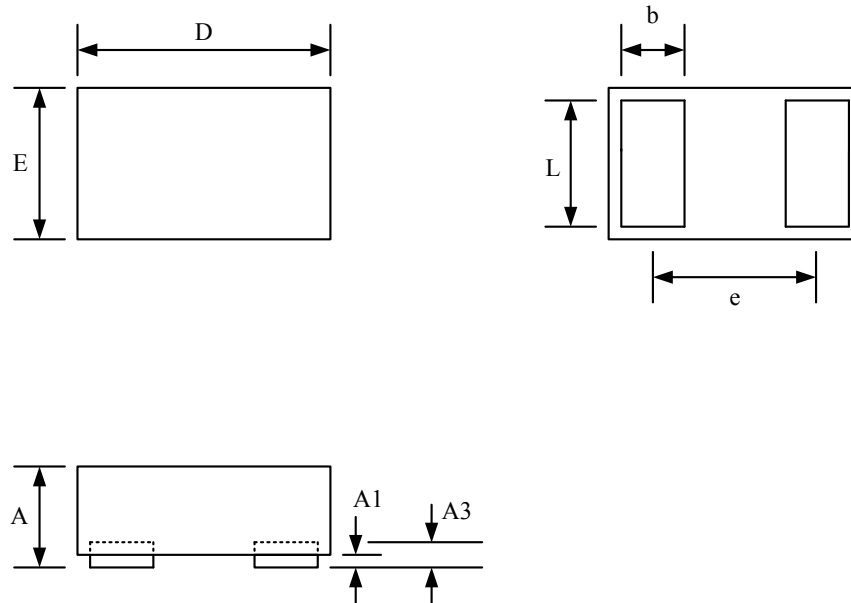
ESD Clamping of I/O to I/O (-8kV Contact per IEC 61000-4-2)





Package Outline

- DFN10*06-2L package
- 2 leads, very small package
- MSL-1

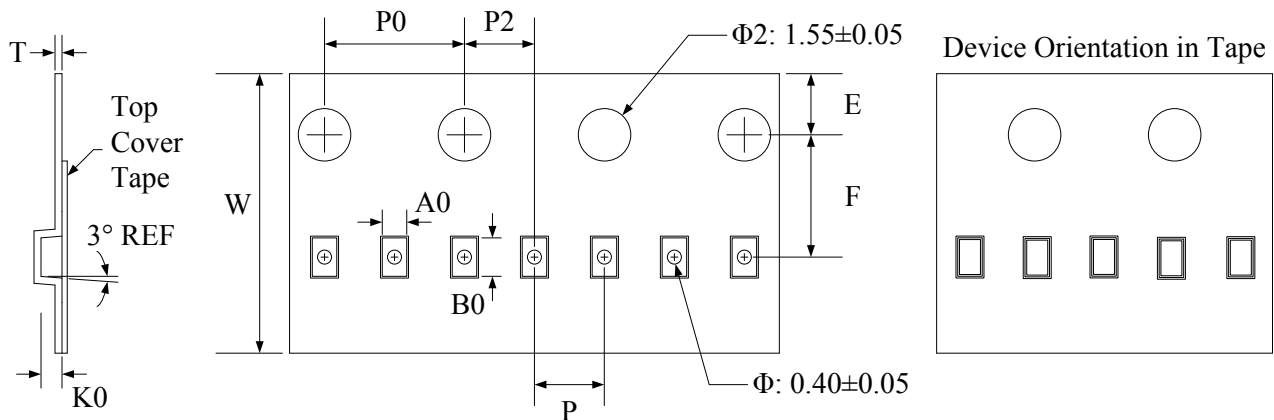


Package Dimensions (Controlling dimensions are in millimeters)

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

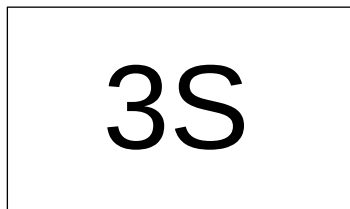


Tape and Reel Specification



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



Note:

(1) “3S” is part number, fixed

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0401TB	4.0V	10,000	7 Inch