

## Features

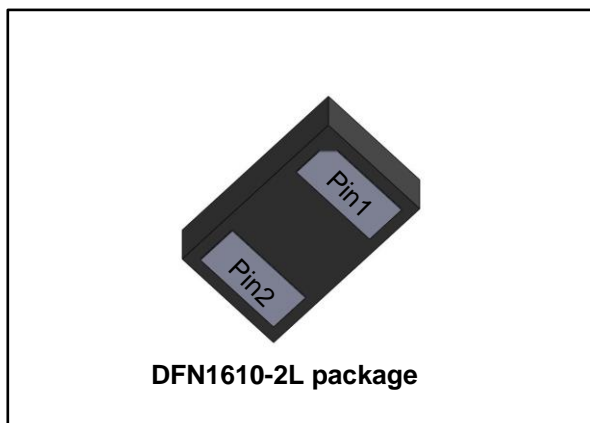
- Transient protection for high-speed data lines
 

IEC61000 -4-2 (ESD)	±15kV (Air)
	±15kV (Contact)
IEC 61000-4-5 (Lightning)	5.0A (8/20μs)
- Cable Discharge Event (CDE)
- Array of surge rated diodes with internal TVS diode
- Ultra-small package (1.6mm\*1.0mm\*0.55mm)
- Protects one I/O lines
- Low capacitance: 0.40pF@0V(Typical)(I/O-I/O)
- Low leakage current: 0.1μA @ VRWM (Typical)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge

## Description

TT0321SDX is an ultra-low capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.40pF only, is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC61000-4-2 (ESD), Level 4 (±15kV air, ±8kV contact discharge), IEC61000-4-4 (electrical fast transient-EFT)(40A, 5/50ns), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

TT0321SDX is in an DFN1610-2L package. The combined features of ultra-low capacitance and high ESD robustness make TT0321SDX ideal for applications where arrays are not practical. The low clamping voltage of the TT0321SDX guarantees a minimum stress on the protected IC.



## Applications

- HDMI 1.4/2.0, USB 3.0/3.1, MDDI, SATA ports
- Monitors and flat panel displays
- Set-top box
- Video graphics cards
- Digital Video Interface (DVI)
- Notebook computers

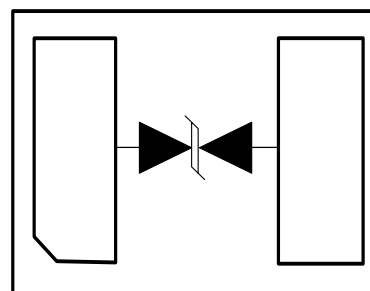
## Mechanical Characteristics

- Package: DFN1610-2L
- Marking: Part number
- Packaging: Tape and Reel
- ROHS compliant

## Circuit Diagram



## Pin Configuration



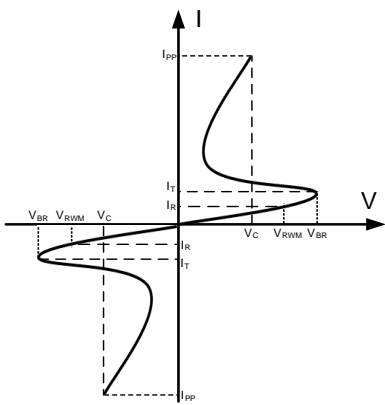
DFN1610-2L

(Top View)

## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current (8/20 $\mu$ s)	5	A
$P_{PK}$	Peak Pulse Power (8/20 $\mu$ s)	40	W
$V_{ESD}$	ESD per IEC61000-4-2 (Air) ESD per IEC61000-4-2 (Contact)	$\pm 15$ $\pm 15$	kV
$T_{OPT}$	Operating Temperature	-55/+125	$^{\circ}$ C
$T_{STG}$	Storage Temperature	-55/+150	$^{\circ}$ C

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

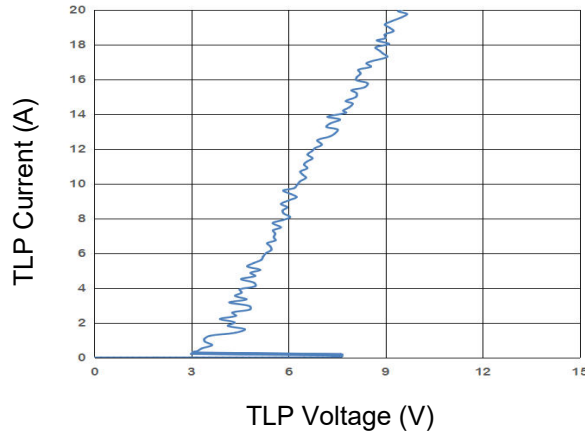
Symbol	Parameter	Diagram
$V_{RWM}$	Nominal Reverse Working Voltage	
$I_R$	Reverse Leakage Current @ $V_{RWM}$	
$V_{BR}$	Reverse Breakdown Voltage @ $I_T$	
$I_T$	Test Current for Reverse Breakdown	
$V_C$	Clamping Voltage @ $I_{PP}$	
$I_{PP}$	Maximum Peak Pulse Current	
$C_{ESD}$	Parasitic Capacitance	

Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				3.3	V
$I_R$	$V_{RWM} = 3.3V, T = 25^{\circ}C$		0.1	1.0	$\mu$ A
$V_{BR}$	$I_T = 1mA$	5.0	6.0		V
$V_C$	$I_{PP} = 5A, t_p = 8/20\mu s$		5.0		V
$V_C$	$I_{PP} = 8.0A, t_p = 100ns^{(1)}$		5.80		V
	$I_{PP} = 16.0A, t_p = 100ns^{(1)}$		8.00		V
$R_{dyn}$	$I_{PP} = 12.0A, t_p = 100ns^{(1)}$		0.27		$\Omega$
$C_{ESD}$	$V_R = 0V, f = 1MHz$		0.40		pF

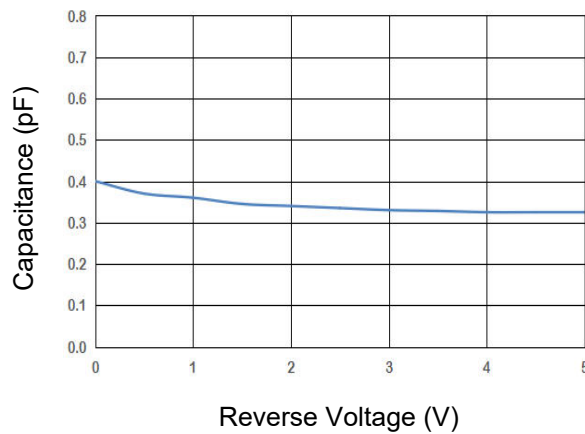
Notes:(1)Measurements performed using a 100ns Transmission Line Pulse(TLP) system.

## Typical Performance Characteristics

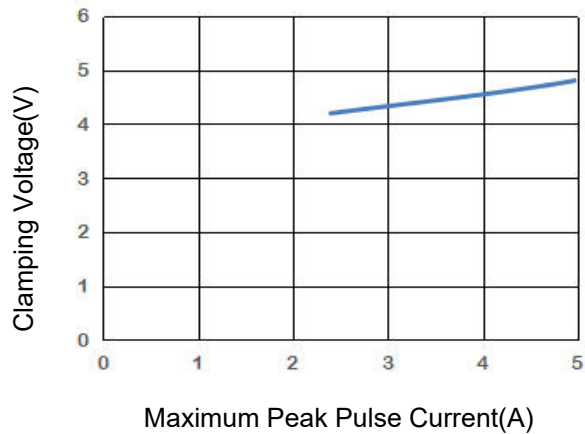
**TLP Measurement of I/O to I/O**



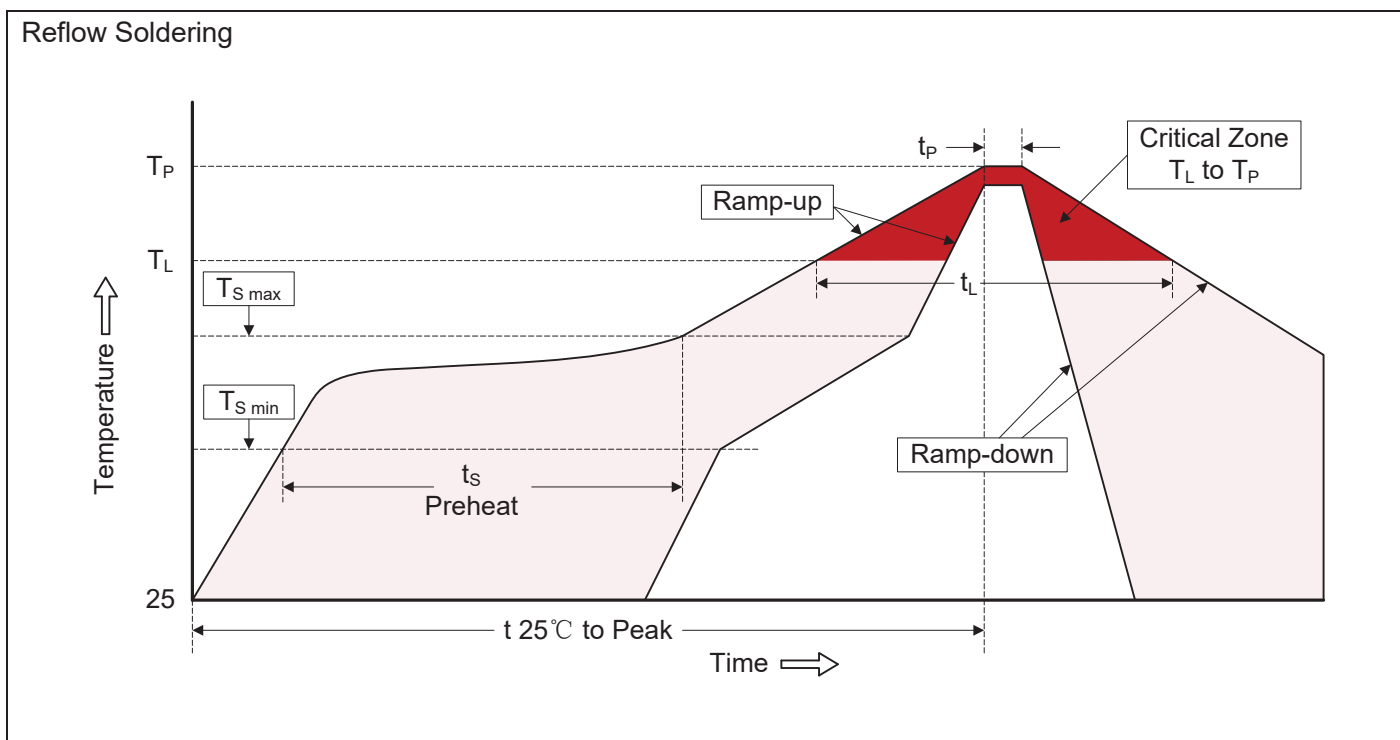
**Capacitance vs Reverse Voltage I/O to I/O**



**8/20us Current I/O to I/O**



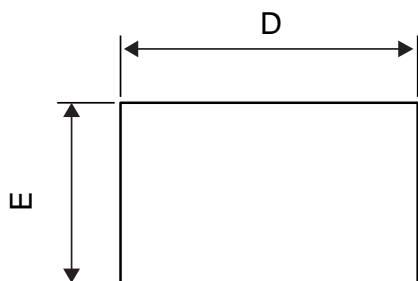
## Recommended Soldering Conditions



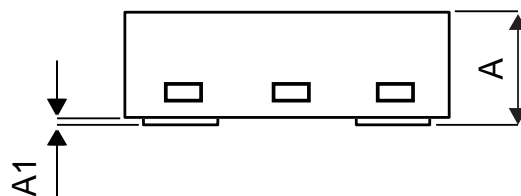
### Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second max.
Preheat -Temperature Min ( $T_{S\ min}$ ) -Temperature Max ( $T_{S\ max}$ ) -Time (min to max) ( $t_s$ )	150°C 200°C 60-180 seconds
$T_{S\ max}$ to $T_L$ -Ramp-up Rate	3°C/second max.
Time maintained above: -Temperature ( $T_L$ ) -Time ( $t_L$ )	217°C 60-150 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_P$ )	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

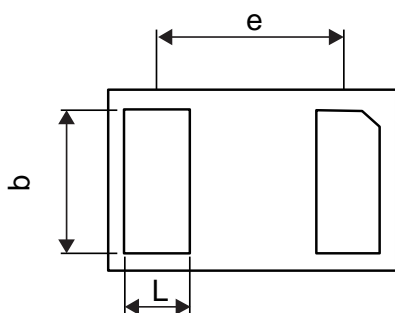
### Package Outline, DFN1610-2L



Top View



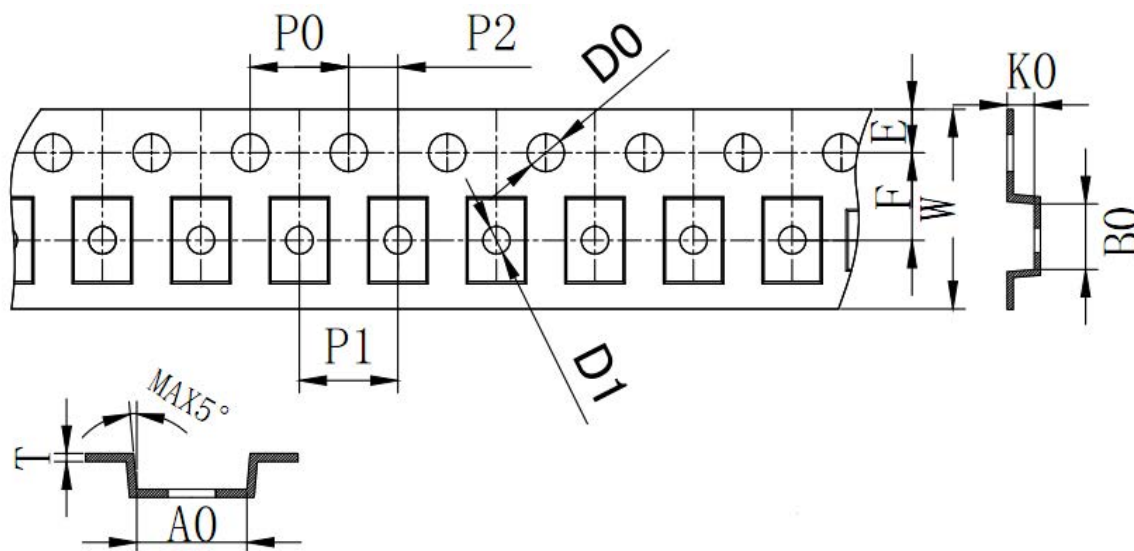
Side View



Bottom View

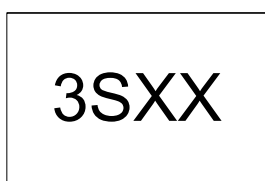
Symbol	Dimension In Millimeters			Dimension In Inches		
	Normal	Min	Max	Normal	Min	Max
A	0.550	0.500	0.600	0.022	0.020	0.024
A1	0.000	--	0.050	0.000	--	0.002
D	1.600	1.550	1.650	0.064	0.062	0.066
E	1.000	0.950	1.050	0.040	0.038	0.042
b	0.800	0.750	0.850	0.032	0.030	0.034
L	0.400	0.350	0.450	0.016	0.014	0.018
e	1.100 BSC			0.044 BSC		

## Tape and Reel Specification



SYMBOL	A0	B0	K0	P0	P1	P2
SPEC	1.15±0.05	1.80±0.05	0.63±0.05	4.00±0.10	2.00±0.10	2.00±0.05
SYMBOL	T	E	F	D0	D1	W
SPEC	0.20±0.05	1.75±0.10	3.50±0.05	1.55±0.05	0.60 <sup>+0.10</sup> <sub>-0</sub>	8.00 <sup>+0.30</sup> <sub>-0.10</sub>

## Marking Codes



### Note:

- (1) "3S" is part number, fixed.
- (2) "XX" is the identification number.

## Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0321SDX	3.3V	3,000	7 Inch