

## Features

- Transient protection for high-speed data lines
 

IEC61000-4-2 (ESD)	±10kV (Air)
	±10kV (Contact)
IEC61000-4-5 (Lightning)	3.0A (8/20μs)
- Small package saves board space
- Protects one I/O line (bidirectional)
- Low capacitance: 0.15pF@0V (Typical) (I/O-I/O)
- Low leakage current: 0.1μA @  $V_{RWM}$ (Maximum)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±10kV contact discharge

## Description

TT0421SAX 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 0.15pF only, it is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events.

The TT0421SAX comes in a RoHS compliant and Halogen Free 0.6mm x 0.3mm x 0.3mm DFN0603-2L package.

## Applications

- Portable applications
- Communication systems
- Computers and peripherals
- High speed data lines:
  - USB 2.0/3.0/3.1
  - HDMI 1.4/2.0

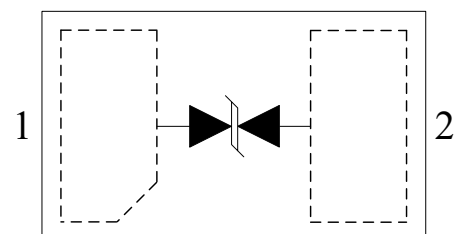
## Mechanical Characteristics

- Package: DFN0603-2L
- Marking: Part number
- Packaging: Tape and Reel
- ROHS compliant

## Circuit Diagram



## Pin Configuration

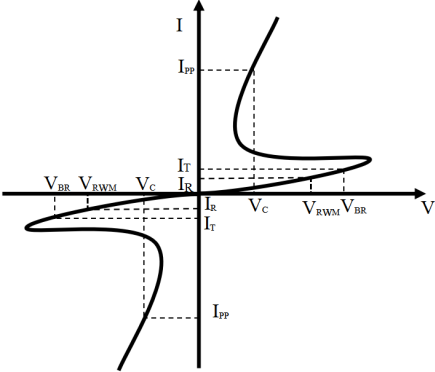


DFN0603-2L  
(Top View)

## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current (8/20 $\mu$ s)	3	A
$V_{ESD}$	ESD per IEC61000-4-2 (Air) ESD per IEC61000-4-2 (Contact)	$\pm 10$ $\pm 10$	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	
$R_{dyn}$	Dynamic Resistance	
$\alpha_{IL}$	Insertion Loss	

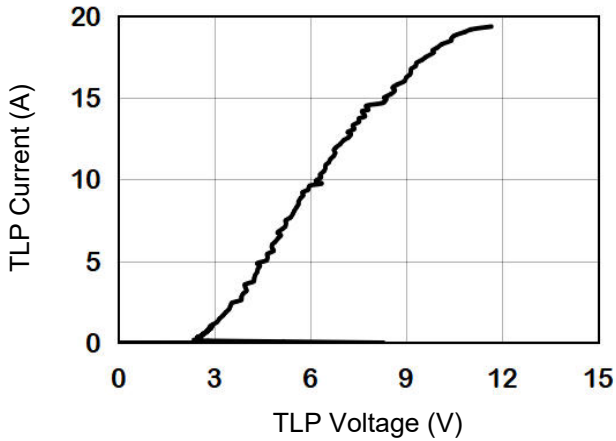
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$			3.3	4.5	V
$I_R$	$V_{RWM} = 4.5V, T = 25^{\circ}C$			100	nA
$V_{BR}$	$I_T = 100\mu A$	5.0		9.0	V
$V_C$	$I_{PP} = 3A, t_p = 8/20\mu s$		4.5		V
$V_C$	$I_{PP} = 8.0A, t_p = 100ns^{(1)}$		5.2		V
	$I_{PP} = 16.0A, t_p = 100ns^{(1)}$		8.3		V
$R_{dyn}$	$I_{PP} = 12.0A, t_p = 100ns^{(1)}$		0.39		$\Omega$

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

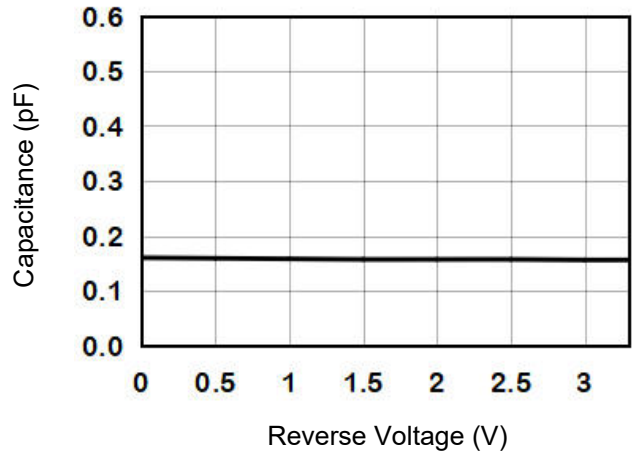
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$C_{ESD}$	$V_R = 0V, f = 1MHz$		0.15		pF
	$V_R = 1V, f = 1GHz$		0.12		pF
$Q_{IL}$	$f = 5GHz$		-0.04		dB
	$f = 10GHz$		-0.63		dB

## Typical Performance Characteristics

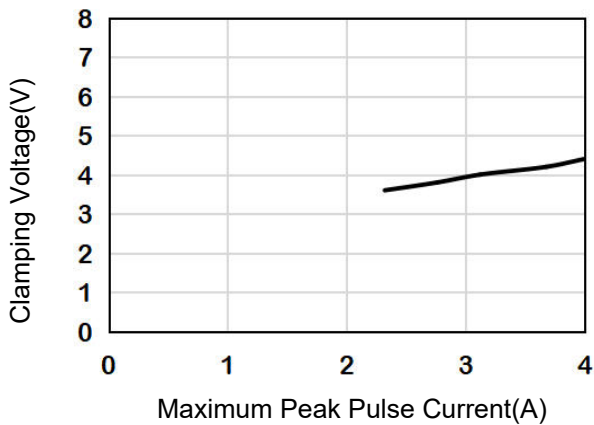
TLP Measurement of I/O to I/O



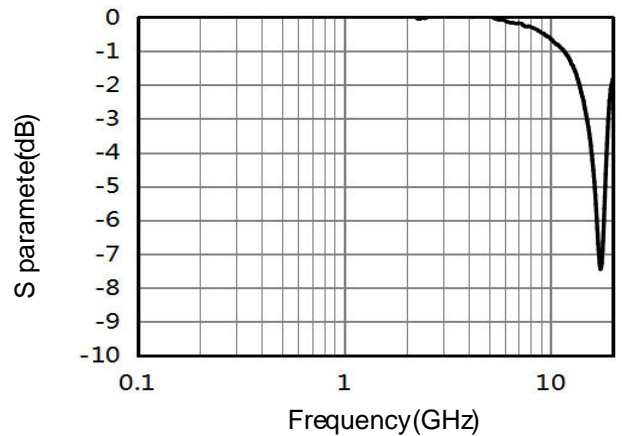
Capacitance vs Reverse Voltage IO to IO



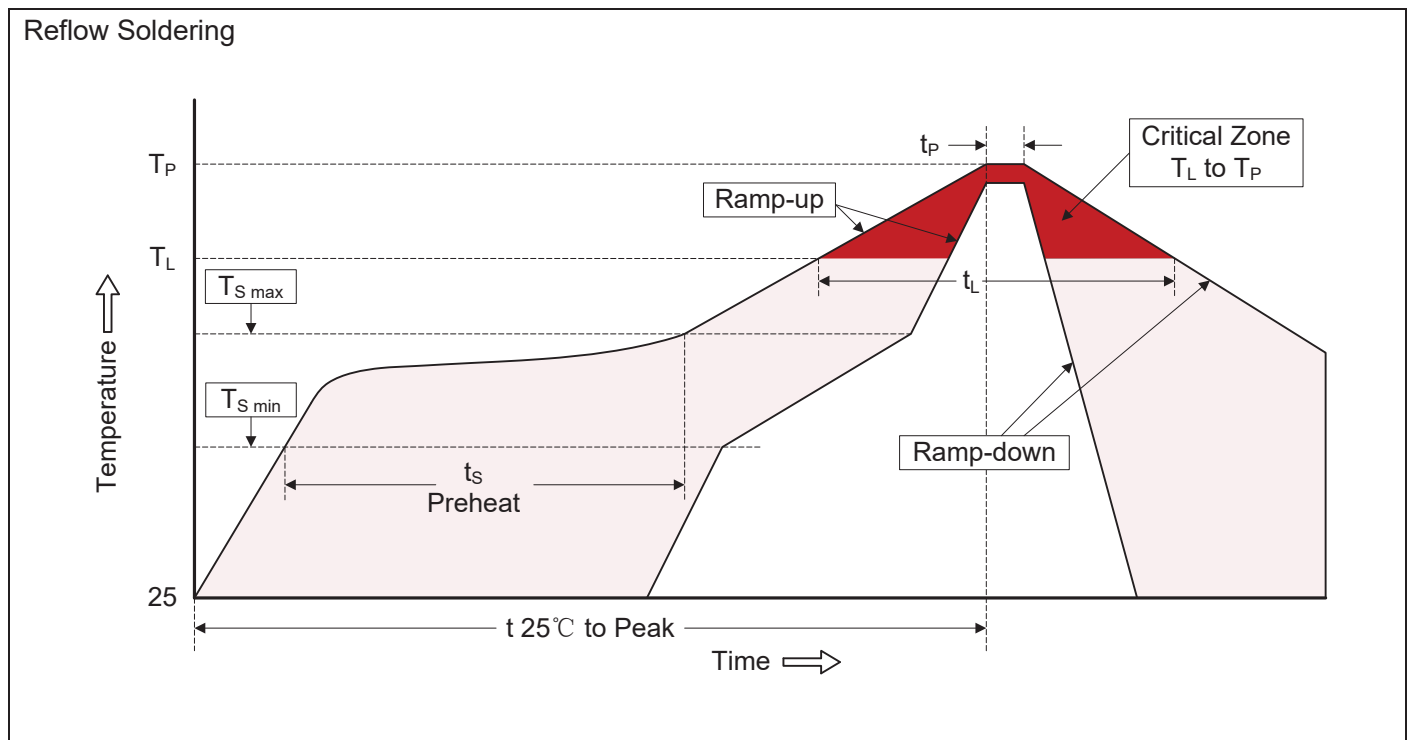
8/20us Current IO to IO



Insertion loss



## Recommended Soldering Conditions

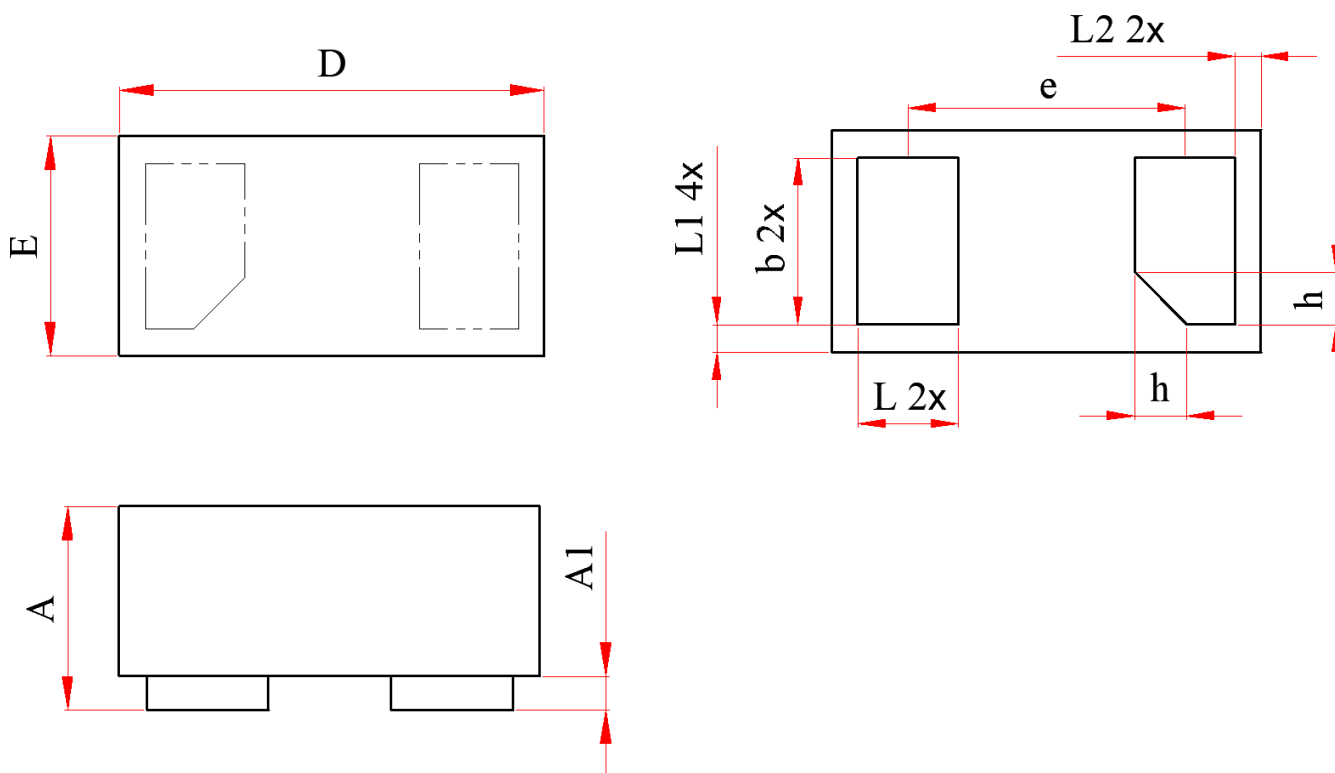


Recommended Conditions

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.

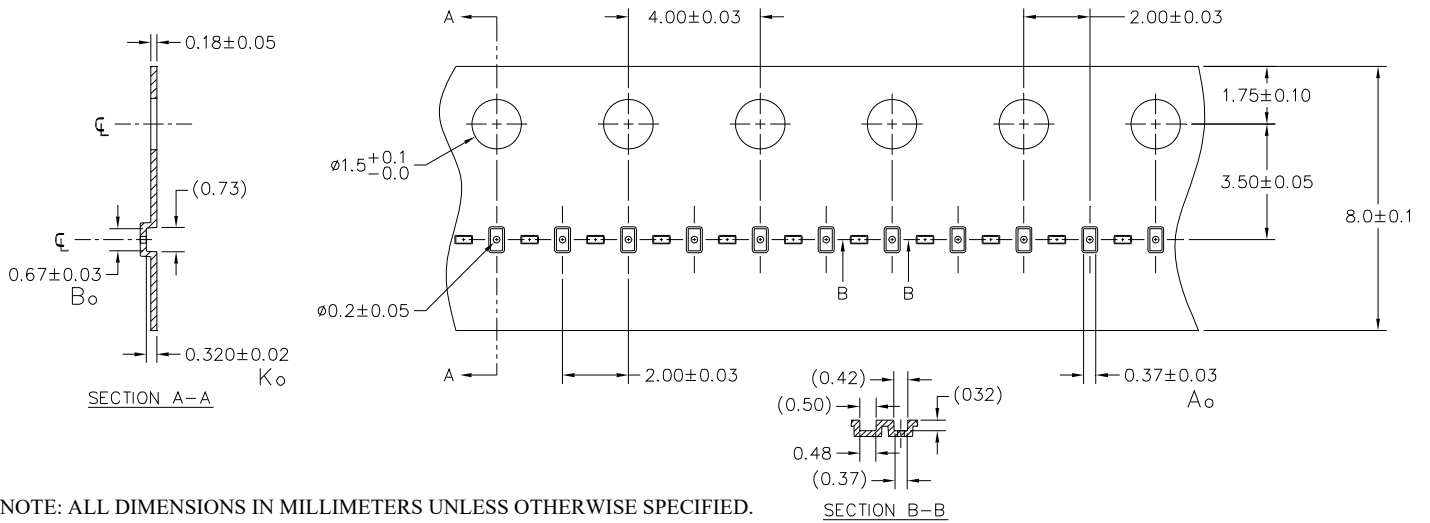
## Package Outline

- DFN0603-2L package
- 2 leads, very small package
- MSL-1



Symbol	Dimension In Millimeters			Dimension In Inches		
	Normal	Min	Max	Normal	Min	Max
A	--	0.270	0.330	--	0.011	0.013
A1	--	--	0.050	--	--	0.002
D	0.620	0.600	0.640	0.024	0.023	0.025
E	0.320	0.300	0.340	0.012	0.011	0.013
b	0.245	0.215	0.275	0.010	0.008	0.011
L	0.145	0.115	0.175	0.006	0.005	0.007
L1	0.038 REF			0.001 REF		
L2	0.038 REF			0.001 REF		
h	0.075 REF			0.003 REF		
e	0.400 BSC			0.016 BSC		

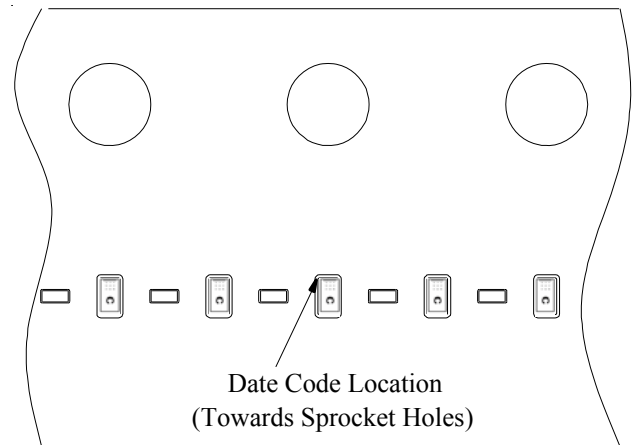
## Carries Tape Specification



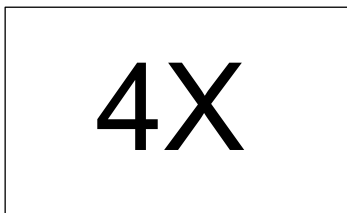
### Device Orientation in Tape

A0	B0	K0
0.37 +/-0.03	0.67 +/-0.03	0.32 +/-0.02 mm

Note: All dimensions in mm unless otherwise specified



### Marking Codes



OR



### Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0421SAX	4.5V	10,000	7 Inch

#### Note:

- (1) "4" and "A" is part number.
- (2) "X" is the internal code.

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