Features

- Transient protection for high-speed data lines
  IEC61000-4-2 (ESD) ±15kV (Air)
  ±12kV (Contact)
  IEC61000-4-5 (Lightning) 6A (8/20μs)
- Small package saves board space
- Protects one I/O line (bidirectional)
- Low capacitance: 0.18pF@ 0V (Typical) (I/O-I/O)
- Low Insertion Loss: -0.61dB @10GHz (Typical) (I/O-I/O)
- Low leakage current: 10nA @ V_{RWM} (Maximum)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±12kV contact discharge

Applications

- Protable applications
- Communication systems
- Computers and peripherals
- High speed data lines:
  - USB 2.0/3.X/4.0
  - Thunderbolt
  - eSATA
  - DisplayPort
  - PCI-e
  - HDMI 1.4/2.0/2.1
  - 2.5G/5G/10GbE

Mechanical Characteristics

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

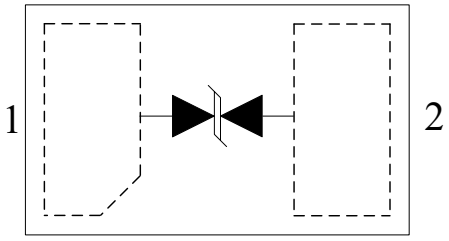
Description

TT0361SA-HFxX 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 0.18pF only, it is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC61000-4-2 (ESD), Level 4 (±8kV contact, ±15kV air discharge) and IEC61000-4-5 (Lightning) (6A, 8/20us.)

The TT0361SA-HFxX comes in a RoHS compliant and Halogen Free 0.6mm x 0.3mm x 0.3mm DFN0603-2L package.

Circuit Diagram

Pin Configuration



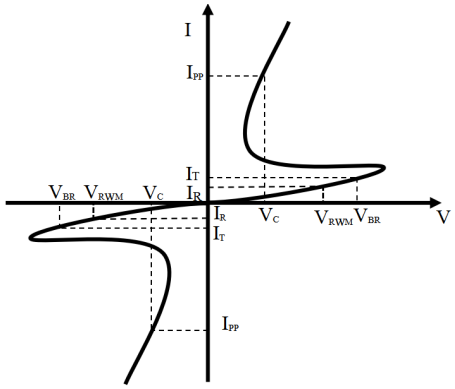
DFN0603-2L

(Top View)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current (8/20μs)	6	A
P_{PK}	Peak Pulse Power (8/20μs)	30	W
V_{ESD}	ESD per IEC61000-4-2 (Air) ESD per IEC61000-4-2 (Contact)	±15 ±12	kV
T_{OPT}	Operating Temperature	-55/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°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	
α_{IL}	Insertion Loss	

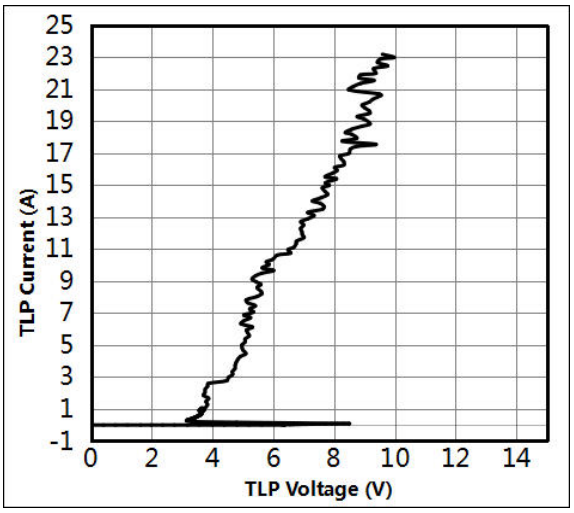
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				3.3	V
I_R	V_{RWM} = 3.3V , T = 25°C		1	10	nA
V_{BR}	I_T = 0.01mA	5.5	6.5		V
V_C	I_{PP} = 6A, t_p = 8/20μs		6.0		V
V_C	I_{PP} = 8.0A, t_p=100ns(1)		5.5		V
	I_{PP} = 16.0A, t_p=100ns(1)		8.0		V
R_{dyn}	I_{PP} = 12.0A, t_p= 100ns(1)		0.31		Ω

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

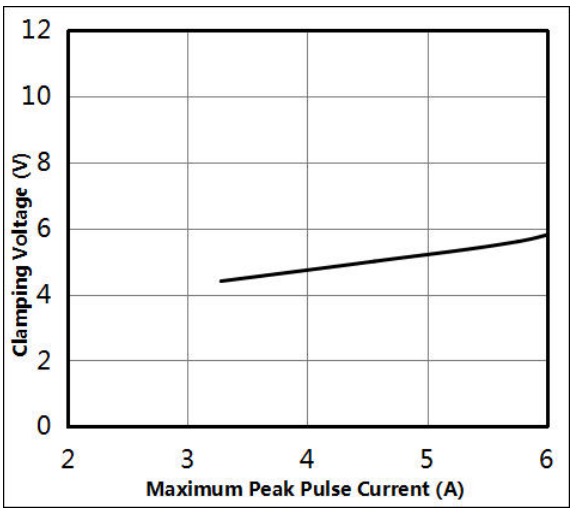
Symbol	Test Condition	Minimum	Typical	Maximum	Units
C_{ESD}	V_R = 0V, f = 1MHz		0.18		pF
	V_R = 0V, f = 5GHz		0.16		pF
α_{IL}	f = 10GHz		-0.61		dB

Typical Performance Characteristics

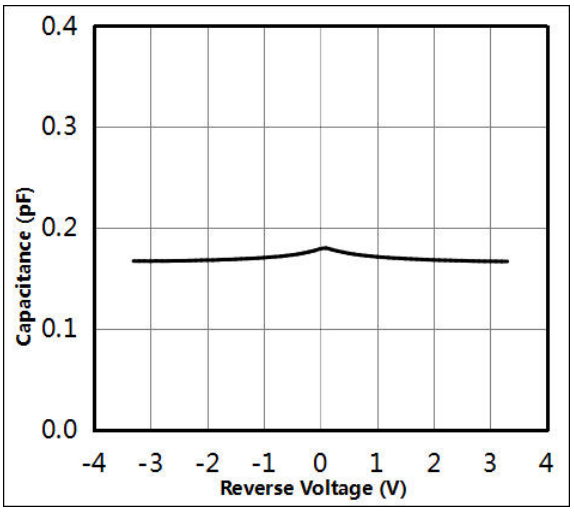
TLP Measurement of I/O to I/O



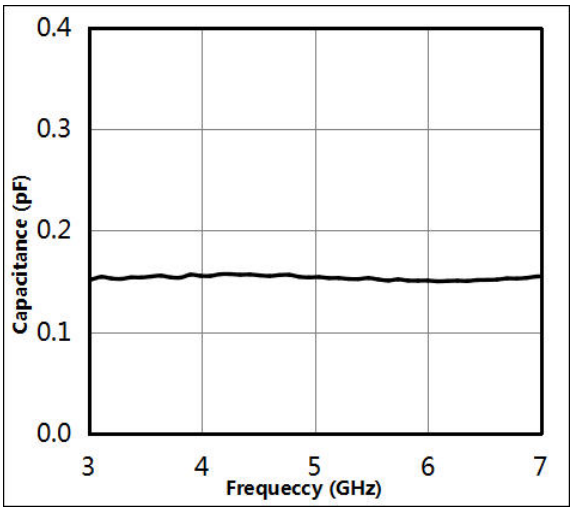
8/20us Current of I/O to I/O



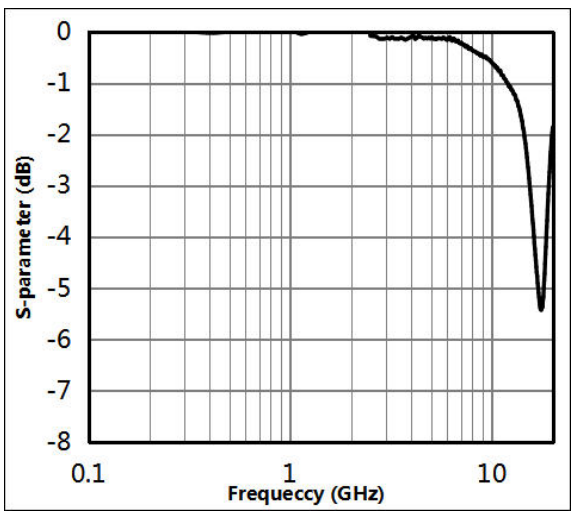
Capacitance vs Reverse Voltage of I/O to I/O



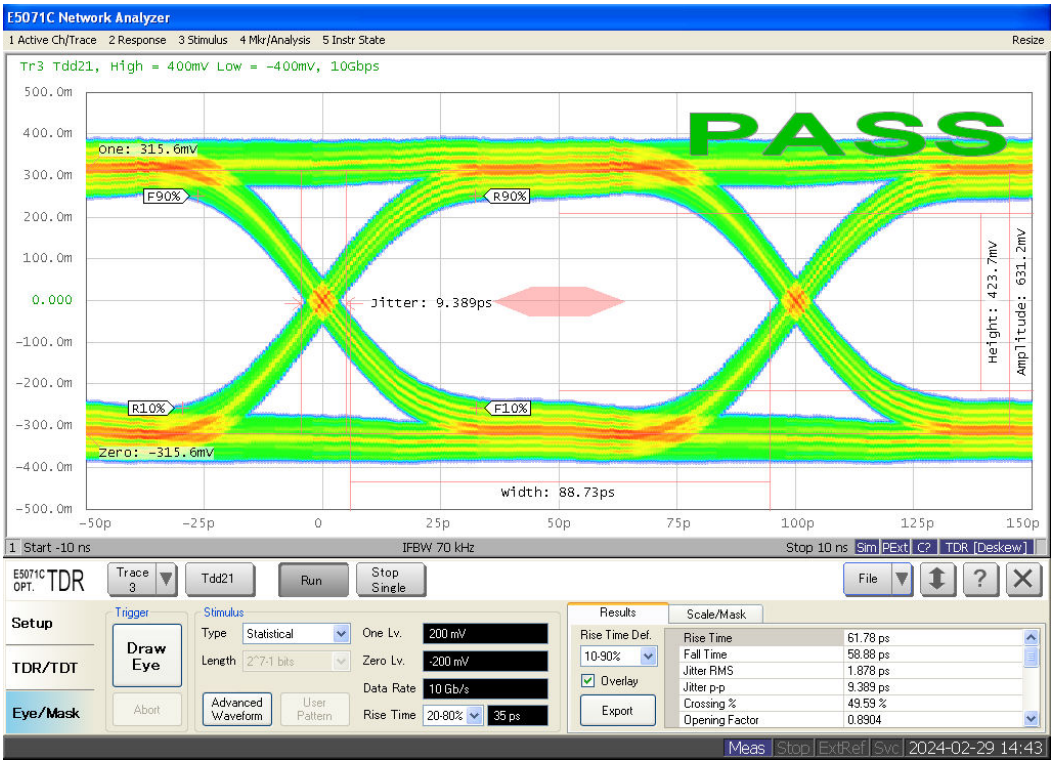
Capacitance vs Frequency of I/O to I/O



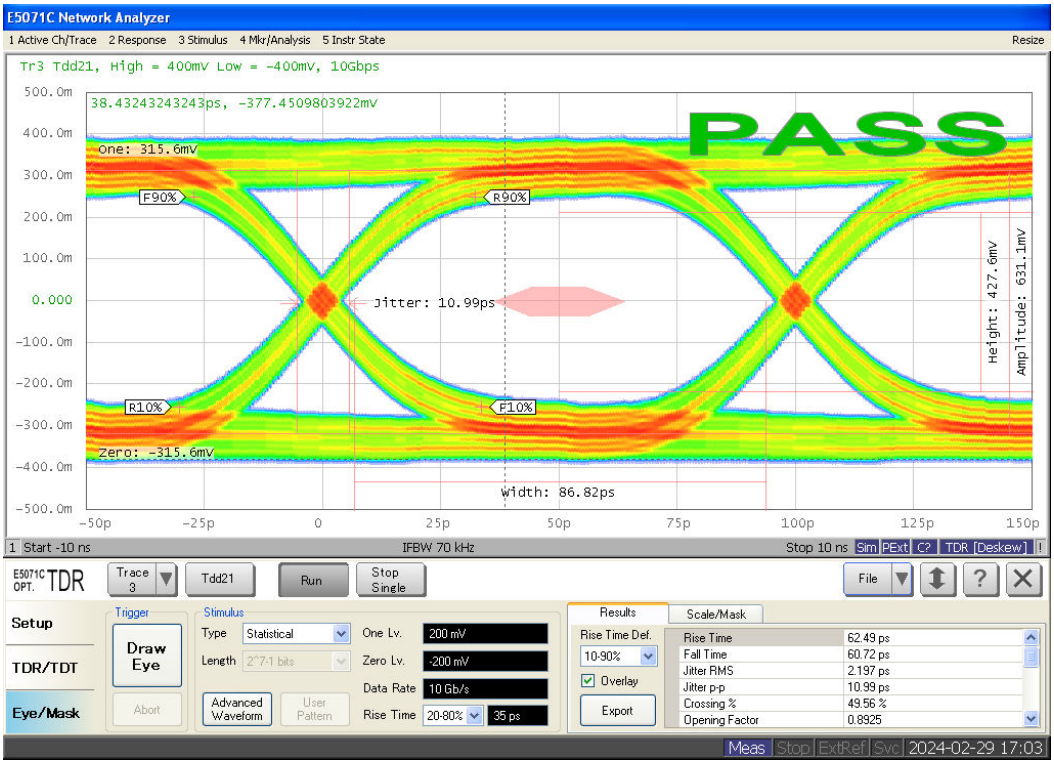
Insertion loss



Application Curves

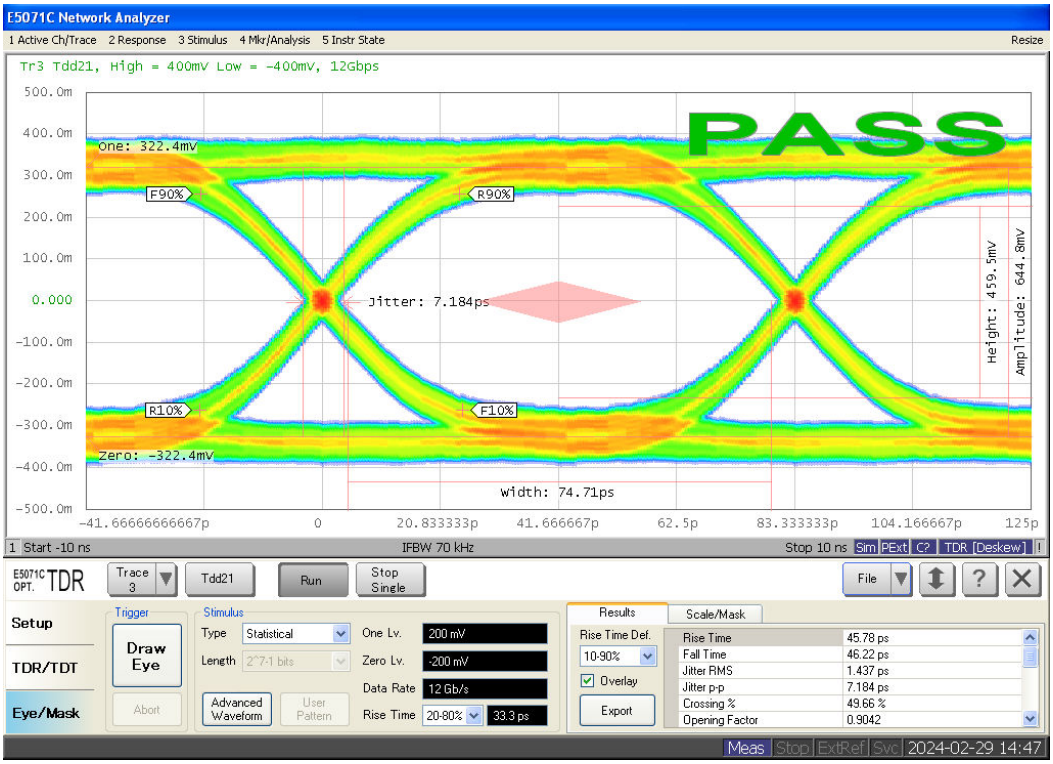


USB3.1 Gen2 Eye Diagram W/O Device(10Gbps)

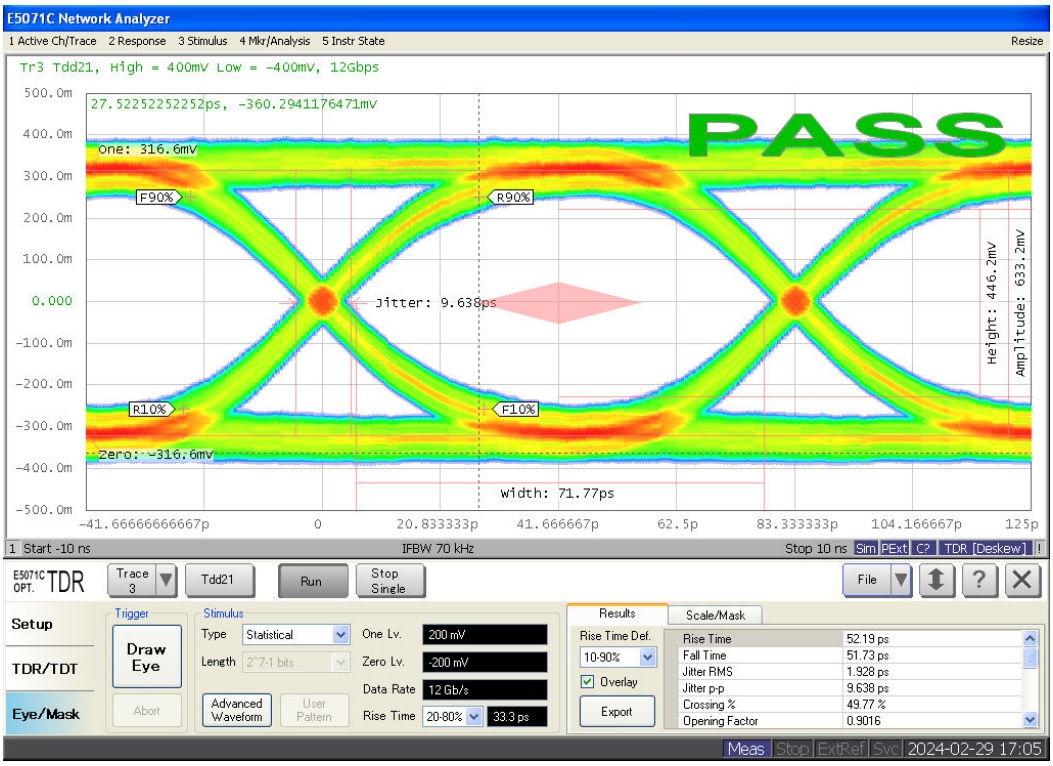


USB3.1 Gen2 Eye Diagram W/I Device(10Gbps)

Application Curves



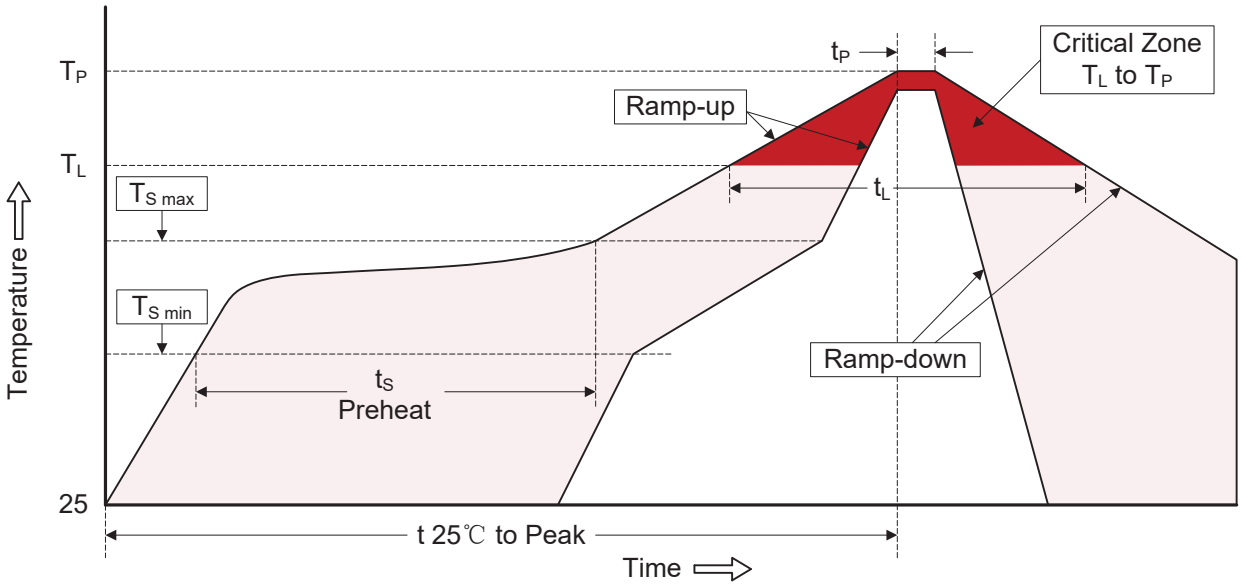
HDMI2.1 Eye Diagram W/O Device(12Gbps)



HDMI2.1 Eye Diagram W/I Device(12Gbps)

Recommended Soldering Conditions

Reflow Soldering

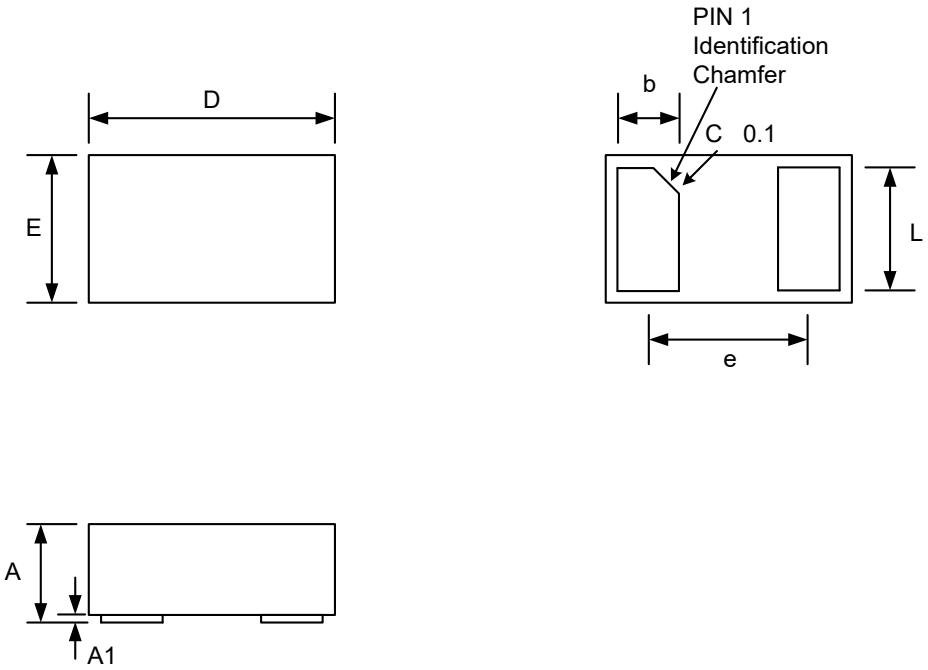


Recommended Conditions

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

Package Outline

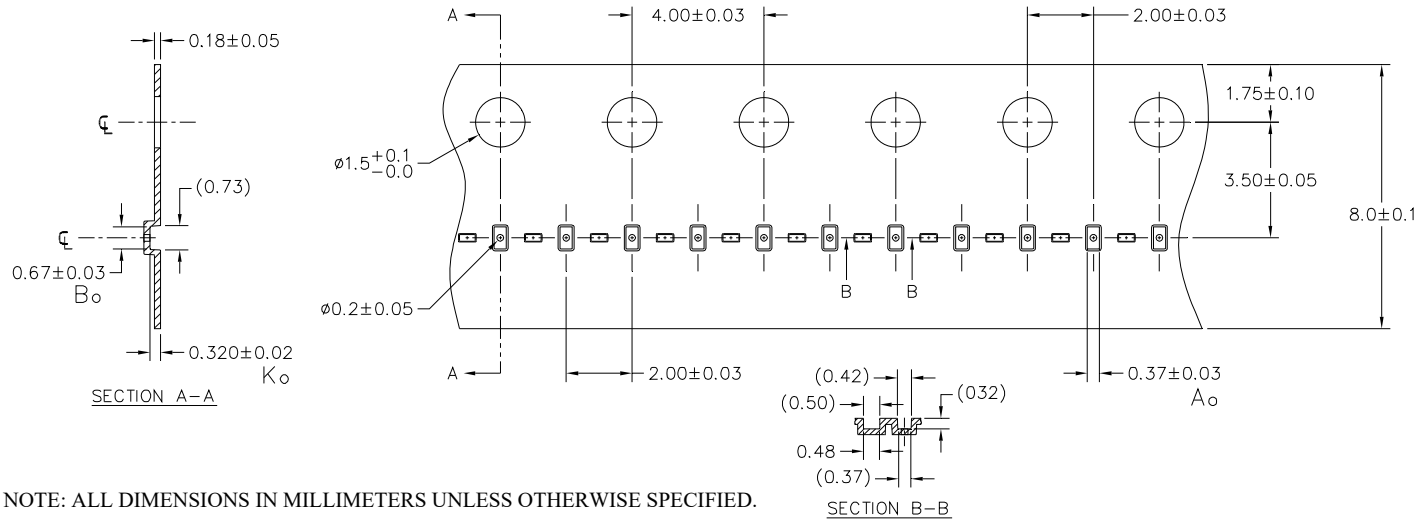
- ❑ DFN0603-2L package
- ❑ 2 leads, very small package
- ❑ MSL-1



Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.270	0.330	0.011	0.013
A1	0.000	0.050	0.000	0.002
D	0.600	0.640	0.023	0.025
E	0.300	0.340	0.011	0.013
b	0.115	0.175	0.005	0.007
e	0.400 BSC		0.016 BSC	
L	0.215	0.275	0.008	0.011

Carries Tape Specification

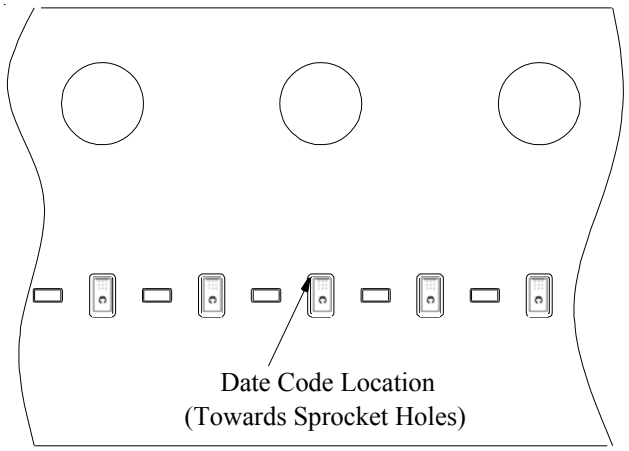


NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

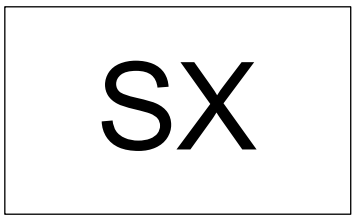
A0	B0	K0
0.37 +/-0.03	0.67 +/-0.03	0.32 +/-0.02 mm

Note: All dimensions in mm unless otherwise specified

Device Orientation in Tape



Marking Codes



Note:
(1) "S" is part number.
(2) "X" is the internal code.

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT0361SA-HFxX	3.3V	10,000	7 Inch