



Features

- ❑ Transient protection for high-speed data lines
 - IEC 61000-4-2 (ESD) ±25kV (Air)
 - ±17kV (Contact)
 - IEC 61000-4-4 (EFT) 40A (5/50 ns)
 - Cable Discharge Event (CDE)
- ❑ Package optimized for high-speed lines
- ❑ Ultra-small package (0.6mm×0.3mm×0.3mm)
- ❑ Protects one data, control or power line
- ❑ Low capacitance: 4.0 pF (Typical)
- ❑ Low leakage current: 0.1uA @ V_{RWM} (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge
- ❑ ROHS compliant

Description

TT2401MA is a low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 4.0 pF only, TT2401MA 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.

TT2401MA uses ultra-small DFN0603 package. Each TT2401MA device can protect one high-speed data line. It offers system designers flexibility to protect single data line where space is a premium concern.

Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ Cellular Phones
- ❑ MDDI Ports
- ❑ Display Ports
- ❑ Digital Visual Interfaces (DVI)

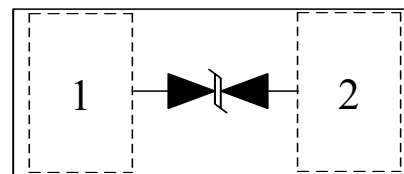
Mechanical Characteristics

- ❑ DFN0603-2L package
- ❑ Flammability Rating: UL 94V-0
- ❑ Marking: Part number
- ❑ Packaging: Tape and Reel

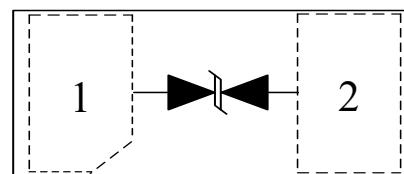
Circuit Diagram



Pin Configuration



OR



DFN0603-2L
(Top View)

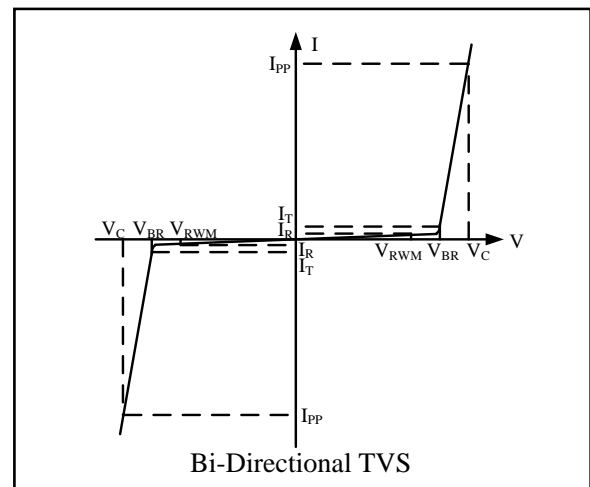


Absolute Maximum Rating

Symbol	Parameter	Value	Units
V_{ESD}	ESD per IEC 61000-4-2 (Air)	± 25	kV
	ESD per IEC 61000-4-2 (Contact)	± 17	
T_{OPT}	Operating Temperature	-55/+125	"C
T_{STG}	Storage Temperature	-55/+150	"C

Electrical Characteristics (T = 25°C)

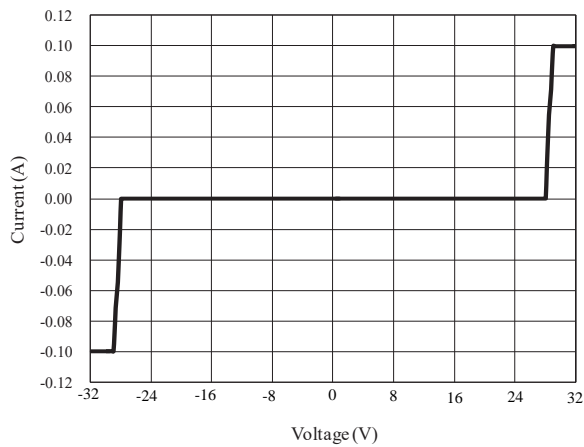
Symbol	Parameter
V_{RWM}	Nominal Reverse Working Voltage
I_R	Reverse Leakage Current @ V_{RWM}
V_{BR}	Reverse Breakdown Voltage @ I_T
I_T	Test Current for Reverse Breakdown
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Maximum Peak Pulse Current
C_{ESD}	Parasitic Capacitance
V_R	Reverse Voltage
f	Small Signal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



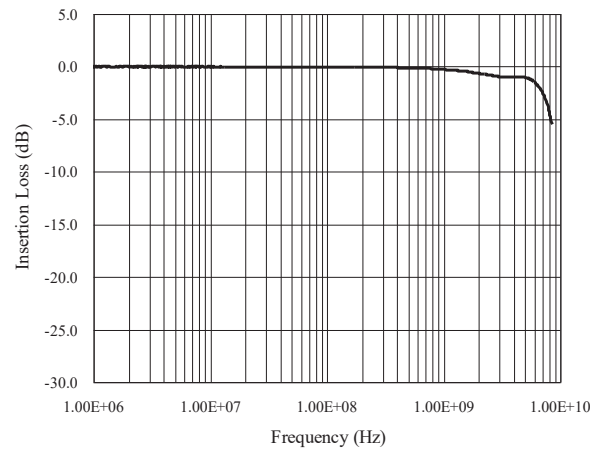
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				24.0	V
I_R	$V_{RWM} = 24V, T = 25^\circ C$ Between I/O and I/O		0.1	1.0	μA
V_{BR}	$I_T = 1mA$ Between I/O and I/O	26			V
V_C	$I_{PP} = 1A, t_p = 8/20\mu s$ Between I/O and I/O			40	V
C_{ESD}	$V_R = 0V, f = 1MHz$ Between I/O and I/O		4	6	pF



Voltage Sweeping of I/O to I/O

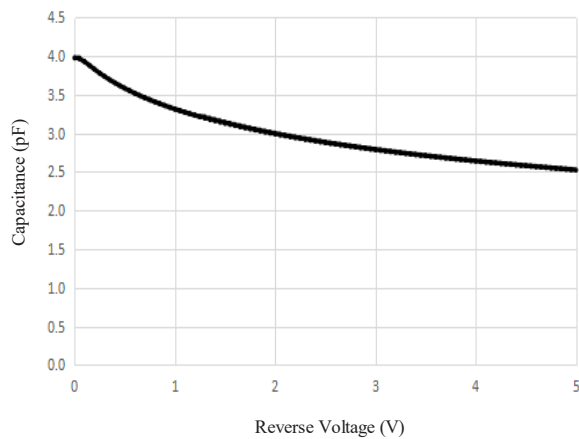


Insertion Loss S21 of I/O to I/O

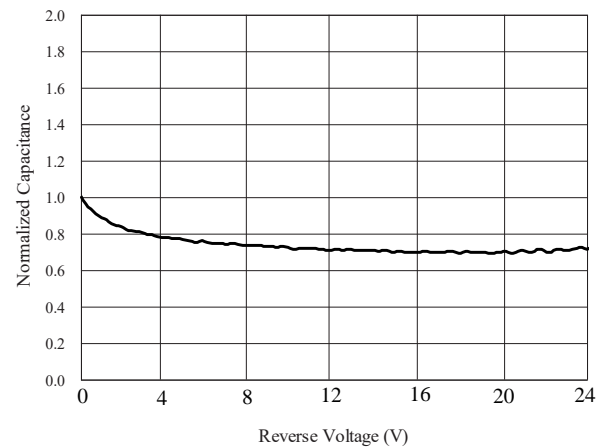


Capacitance vs. Voltage of I/O to I/O (f = 1MHz)

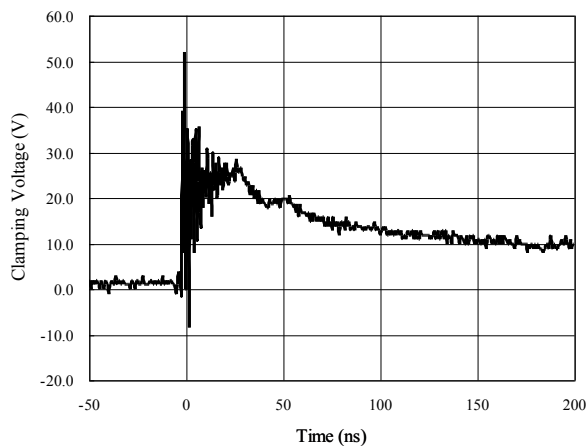
Capacitance vs. Reverse Voltage



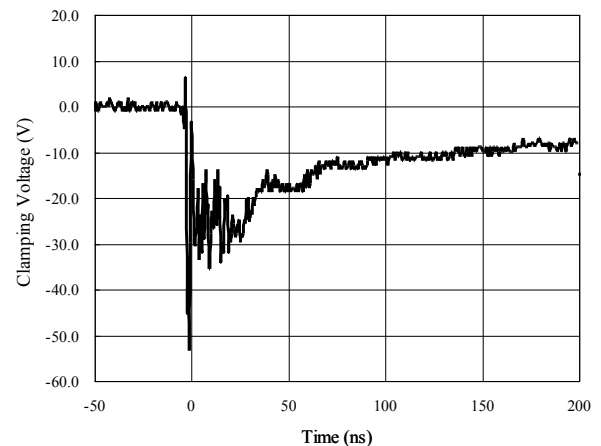
Normalized Capacitance vs. Reverse Voltage



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



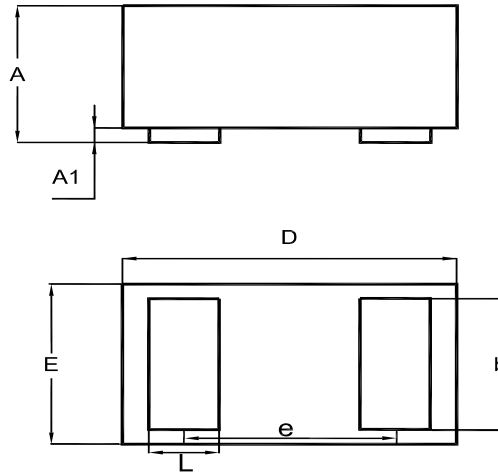
ESD Clamping of I/O to I/O (-8kV Contact per IEC 61000-4-2)





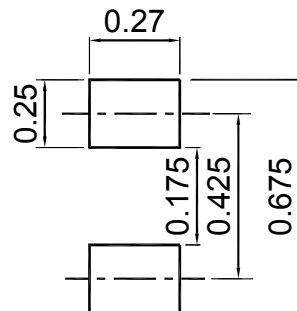
Package Outline

- DFN0603-2L package
- MSL-1



UNIT	A	A1	b	D	E	e	L
mm	0.27	0	0.21	0.57	0.28	0.355	0.14
	0.33	0.025	0.29	0.65	0.35		0.22

Recommended Soldering Footprint



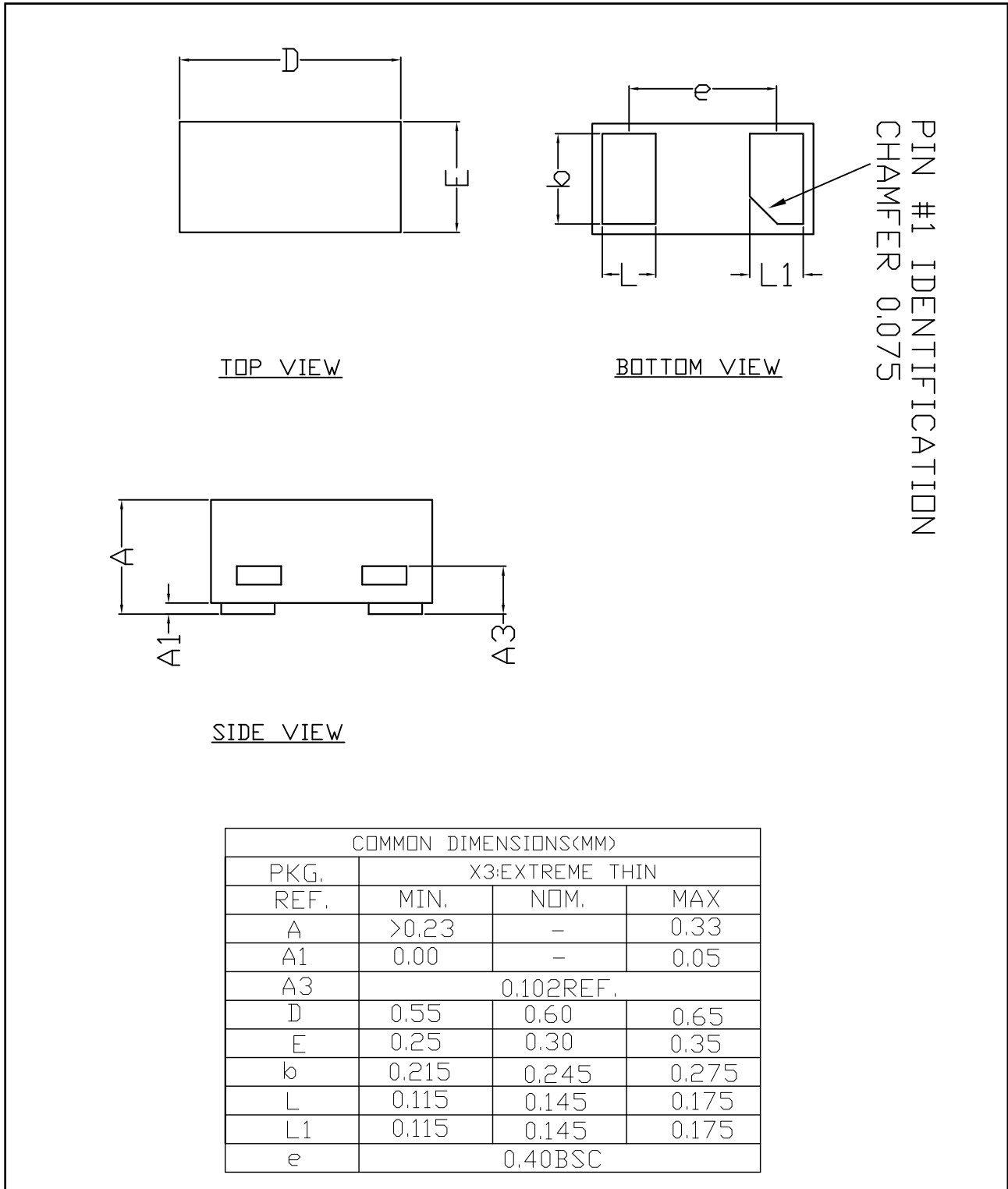
Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
DFN0603	8	4 ± 0.1	0.157 ± 0.004	178	7	10,000



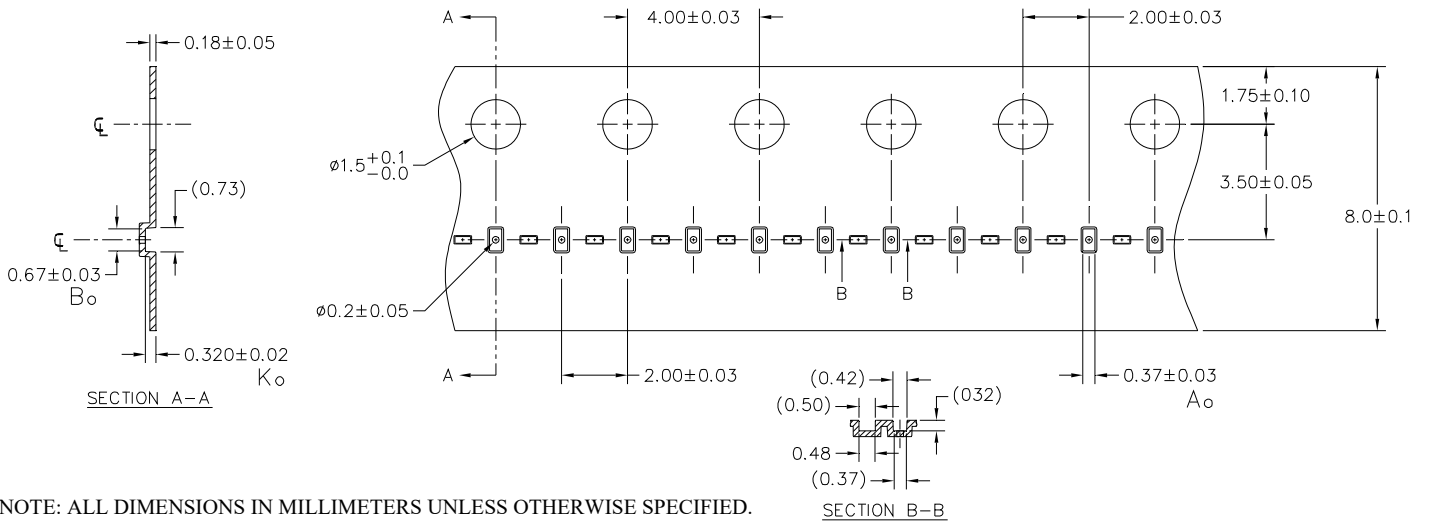
Package Outline

- DFN0603 package
- 2 leads
- MSL-1





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

Marking Codes



Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TT2401MA	24V	10,000	7 Inch

Note:

(1) "EM" is part number.