SYT56S03DVD

Ultra-Low Capacitance TVS Protection

General Description

SYT56S03DVD 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 0.4pF only, SYT56S03DVD is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), (±30kV air, ±30kV contact discharge), IEC 61000-4-5 (Surge) (6A, 8/20μs), etc.

SYT56S03DVD uses ultra-small DFN2.5*1.0-10 package. Each SYT56S03DVD device can protect four high-speed data lines. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make SYT56S03DVD ideal for high-speed data ports and high-frequency lines (e.g., USB3.x & DVI) applications. The low clamping voltage of the SYT56S03DVD guarantees a minimum stress on the protected IC.

Features

- Operating Voltage: 3.3V and Below
- Transient Protection for High-speed Data Lines
  - IEC61000-4-2(ESD) ±30kV (Air) ±30kV (Contact)
  - IEC61000-4-5(Surge) 6A (8/20μs)
- Ultra-Small Package(2.5mm*1.0mm*0.55mm)
- Ultra Low Capacitance: 0.4pF(Typical)
- Protects Four High-speed Data Lines
- Low clamping voltage

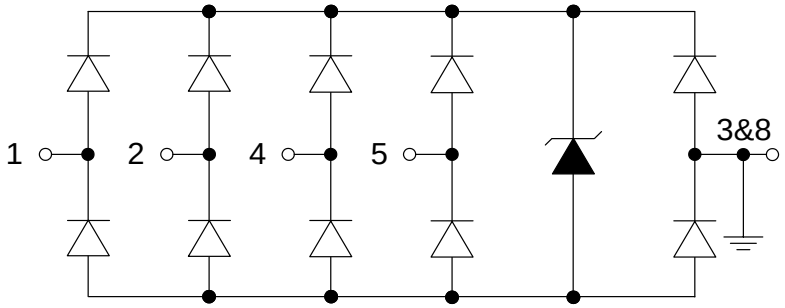
Applications

- USB2.0&3.x,USB Type-C
- HDMI 1.3, 1.4,2.0 and 2.1
- V-By-One
- Display Ports
- 10G Ethernet Ports
- TV and Set-Top Box
- PCI Express and SATA Ports

Mechanical Characteristics

- DFN2.5*1.0-10 package
- Marking: Device Code, Date code.
- Packaging: Tape and Reel
- MSL Rating:MSL1

Circuit Diagram



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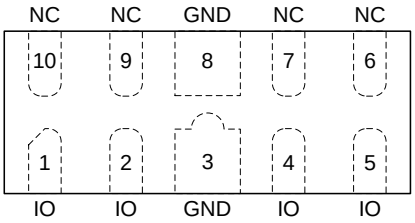
Ordering Information

Part Number	Package type	Top Mark
SYT56S03DVD	DFN2.5*1.0-10	9tYWA

Pinout (Top View)



Marking Codes

Note 1: "9t" is device code, fixed.

Note 2: "YWA" is date code.

Pin Descriptions

Device Pins	Name	Description
1	Input/Output	IO1
2	Input/Output	IO2
3	Ground	GND
4	Input/Output	IO3
5	Input/Output	IO4

Absolute Maximum Rating(Note 1)				
Parameter	**Symbol**	**Min**	**Max**	**Unit**
Maximum Peak Pulse Current (8/20μs)	I_{PP}		6	A
Maximum Peak Pulse Power (8/20μs)	P_{PK}		50	W
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	-30 -30	30 30	kV
Junction Temperature	T_J	-40	+125	°C
Storage Temperature	T_{STG}	-55	+150	°C

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Electrical Characteristics (IO Referenced to GND, T_A = 25°C, Note 4)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Nominal Reverse Working Voltage	V_{RWM}		-3.3		3.3	V
Reverse Leakage Current @ V_{RWM}	I_R	V_{RWM} = 3.3V, T_A = 25°C		0.01	0.1	μA
Reverse Triggering Voltage @ I_{t1}	V_{tl}	I_{tl} = 10mA	3.3		6.3	V
Clamping Voltage at I_{PP} (Note 5)	V_C	I_{PP} = 16A, t_p = 10/100ns		7.5		V
Clamping Voltage at I_{PP} (Note 5)	V_C	I_{PP} = 6A, t_p = 8/20us		8.0		V
Dynamic Resistance (Notes 2, 5)	R_{DYN}	t_p = 10/100ns		0.20		Ω
Parasitic Capacitance (Note 5)	C_{ESD}	V_R =0V, f = 1MHz,IO-GND		0.40	0.65	pF

Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: R_{DYN} calculated based on I_{PP}=8A to I_{PP}=16A, t_p = 10/100ns.

Note 3: The device is not guaranteed to function outside its operating conditions.

Note 4: °Unless otherwise stated, limits are 100% production tested under pulsed load conditions such that $T_A \cong T_J$ = 25 °C. Limits over the operating temperature range (see recommended operating conditions) and relevant voltage range(s) are guaranteed by design, test, or statistical correlation.

Note 5: Guaranteed by design or statistical correlation and not production tested.

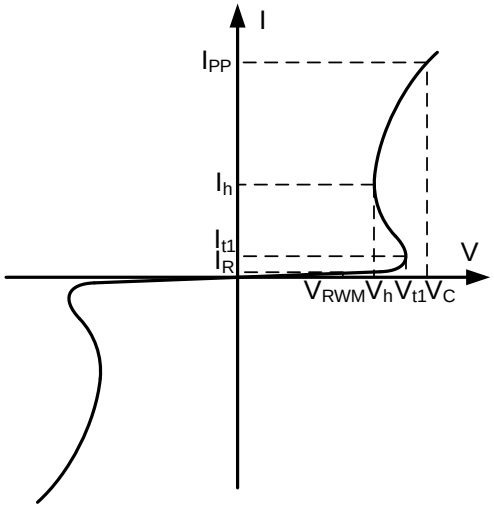

Figure 1. Bi-Directional TVS

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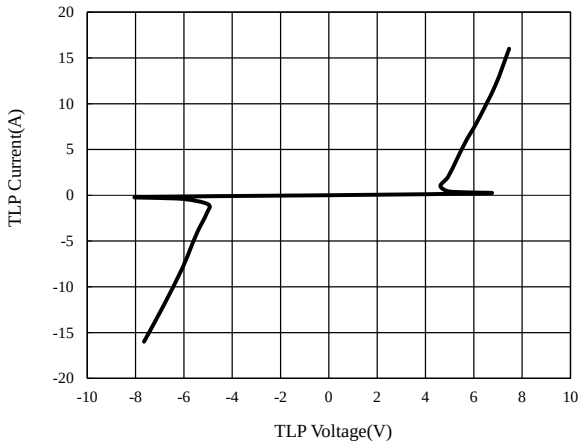
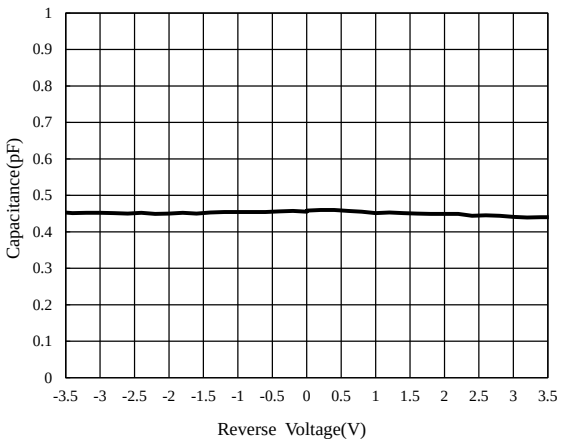
Typical Characteristics, IO Referenced to GND

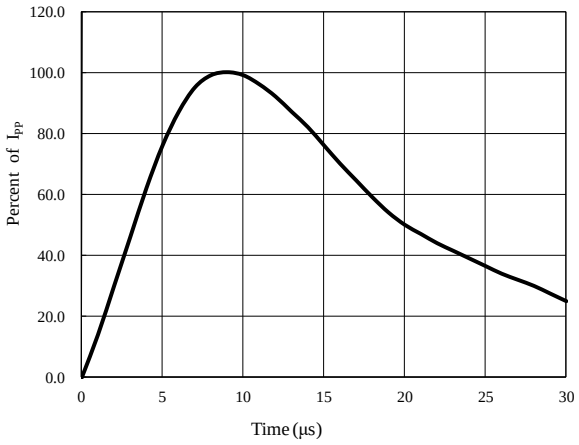
TLP Testing



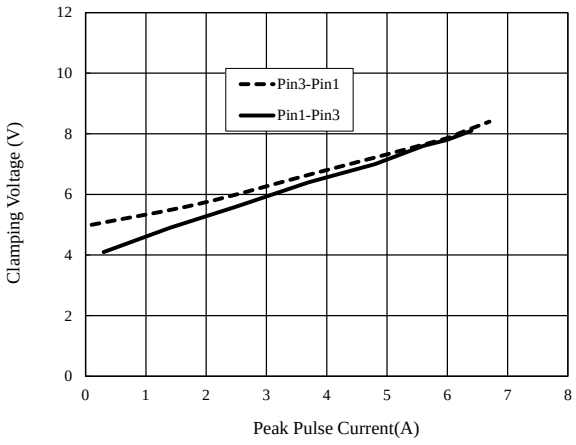
Capacitance vs. Reverse Voltage



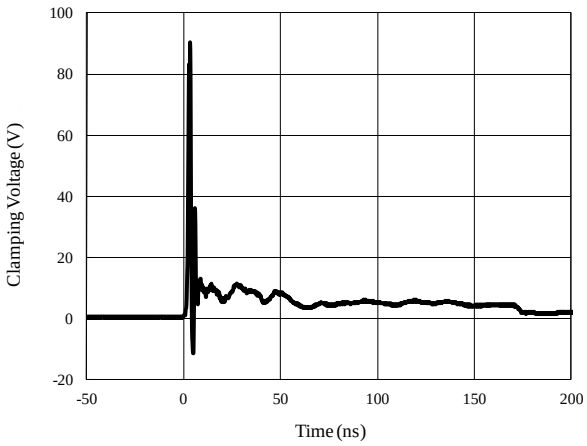
8/20μs Pulse Waveform



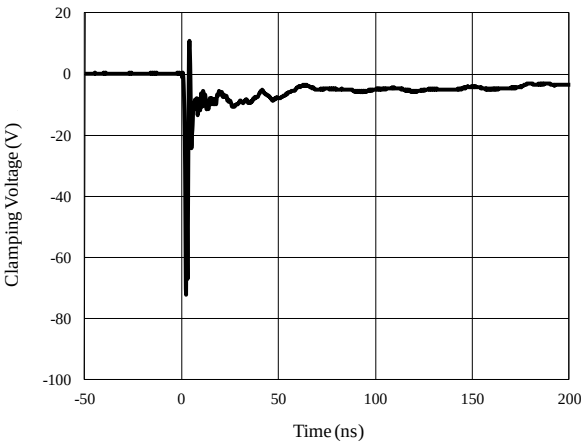
Clamping Voltage vs. Peak Pulse Current



ESD Clamping
(+8kV Contact per IEC 61000-4-2)



ESD Clamping
(-8kV Contact per IEC 61000-4-2)



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Application Information

Pin Connections

SYT56S03DVD provides ESD protection for four data lines simultaneously. The pin connection is shown in the *Figure 2* below.

Four parallel data lines, from inner IC to IO port connector, could connect to SYT56S03DVD four IO pins directly. Pin 3&8 of SYT56S03DVD is the GND pin, which should connect to the GND of PCB. The wire should be as short as possible in order to minimize the parasitic inductance.

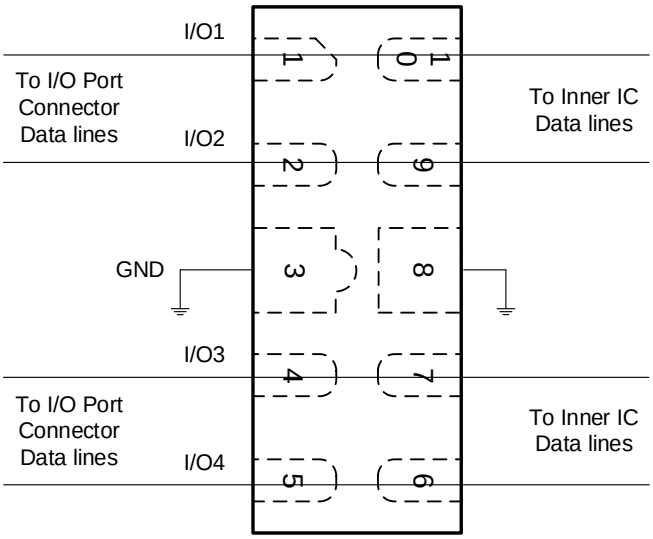

Figure 2 SYT56S03DVD pin connection in PCB

PCB Layout Guidelines

For optimum ESD protection and the whole circuit performance, the following PCB layout guidelines are recommended:

- SYT56S03DVD GND pin to the PCB GND rail path should be as short as possible. It could reduce the ESD transient return path to GND.
- The vias connecting SYT56S03DVD GND pins to the PCB GND should be wide.
- Place SYT56S03DVD as close to the connector port as possible. It could reduce the parasitic inductance and restrict ESD coupling into adjacent traces.
- Avoid running critical signals near board edges.

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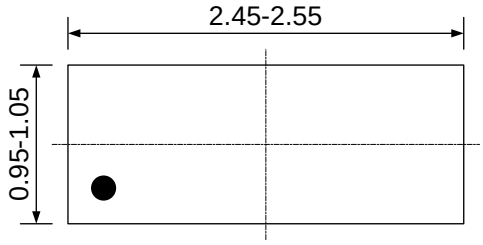
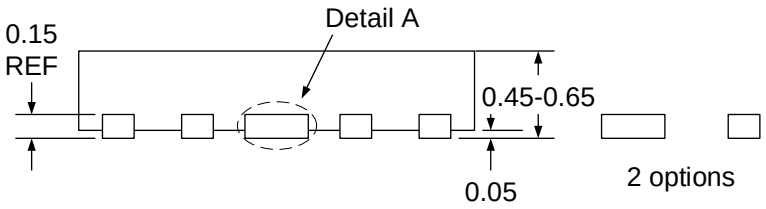
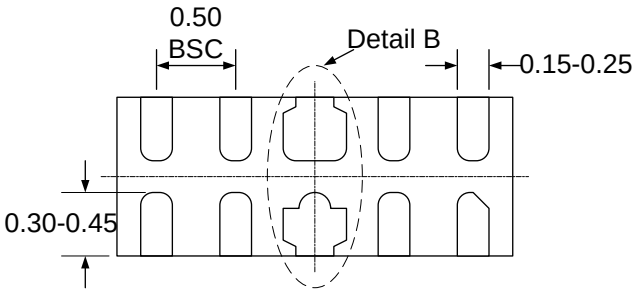
DFN2.5*1.0-10 Package Outline



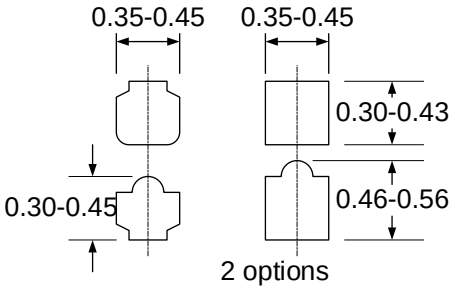
TOP VIEW



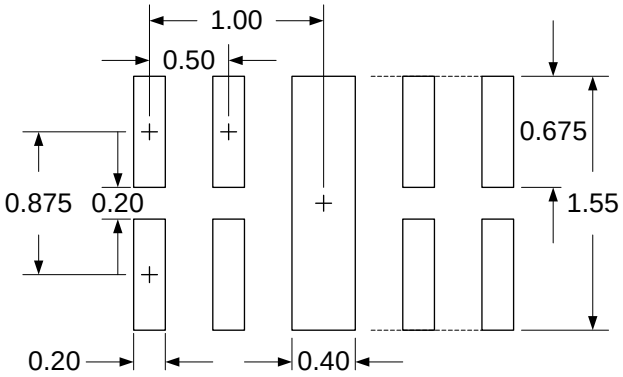
SIDE VIEW **Detail A**



BOTTOM VIEW



Detail B



Recommended PCB Layout
(Reference only)

Notes: All dimensions are in millimeters and exclude mold flash and metal burr.

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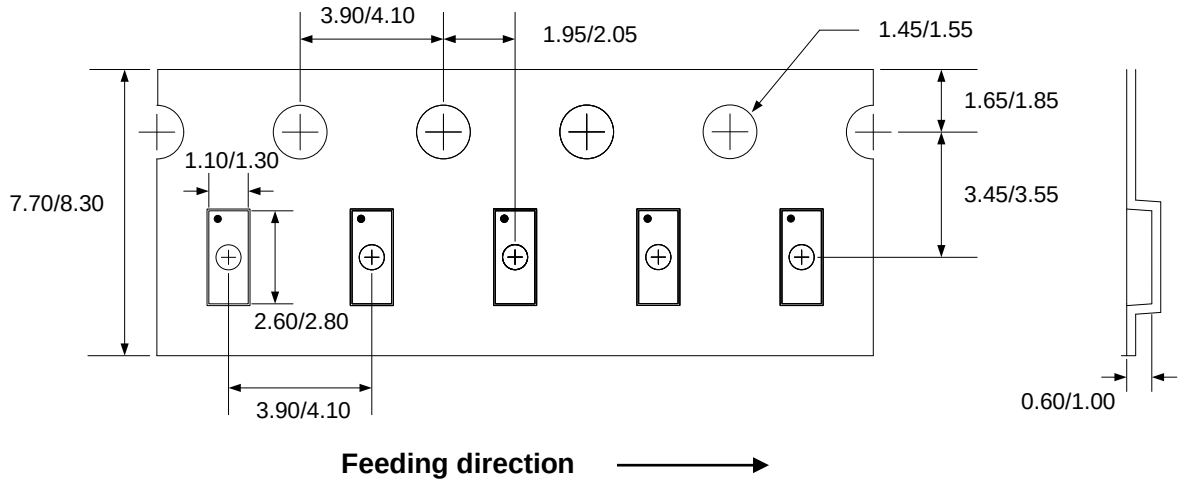
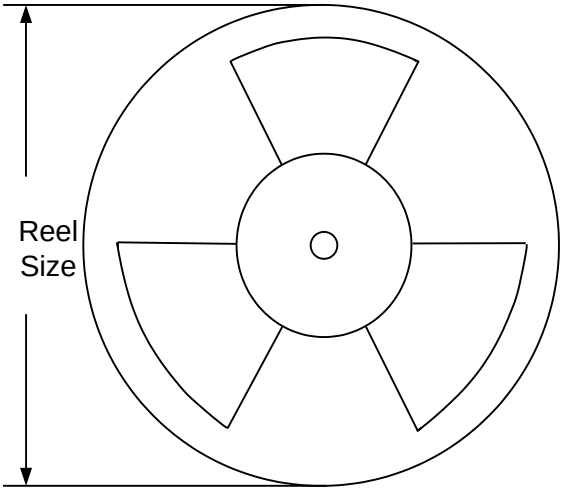
Tape and Reel Information

Tape Dimensions and Pin 1 Orientation



Reel Dimensions



Package Types	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN2.5*1.0-10	8	4	7"	3000

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Revision History

The revision history provided is for informational purposes only and is believed to be accurate; however, not warrantied. Please make sure that you have the latest revision.

Revision Number	Revision Date	Description	Pages changed
1.0	Dec.9, 2025	Initial Release	

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