SYT22U05DXD

Ultra-Low Capacitance TVS Protection

General Description

The SYT22U05DXD is an ultra-low capacitance transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With a typical capacitance of 0.5pF, the SYT22U05DXD is designed to protect parasitic-sensitive systems against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD) (±15kV air, ±15kV contact discharge), and IEC 61000-4-5 (surge) (6A, 8/20μs) standards.

The SYT22U05DXD is available in a small DFN0.6×0.3-2 package. Each SYT22U05DXD device can protect one high-speed data line. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make the SYT22U05DXD ideal for high-speed data ports and high-frequency line applications. The low clamping voltage of the SYT22U05DXD guarantees a minimum stress on the protected device.

Features

- Operating Voltage: 5V and Below
- Transient Protection for High-Speed Data Lines
  - IEC 61000-4-2 (ESD) ±15kV (Air) ±15kV (Contact)
  - IEC 61000-4-5 (Surge) 6A (8/20μs)
- Protects One Data Line
- Low Capacitance: 0.5pF (Typical)
- Low Leakage Current: 0.01μA at V_{RWM} (Max)
- Low Clamping Voltage

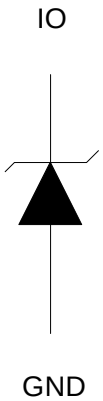
Applications

- Serial ATA
- PCI Express
- Desktops, Servers and Notebooks
- MDDI Ports
- USB2.0, 3.0 and 3.1
- Display Ports
- HDMI 1.3, 1.4 and 2.0
- Digital Visual Interfaces (DVI)

Mechanical Characteristics

- DFN0.6×0.3-2 Package
- Marking: Device Code
- Packaging: Tape and Reel

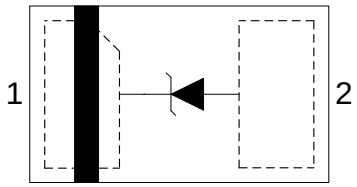
Circuit Diagram



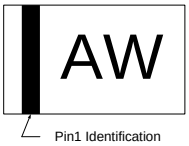
Ordering Information

Part Number	Package Type	Top Mark
SYT22U05DXD	DFN0.6×0.3-2	AW

Pinout (Top View)



Marking Codes



Notes: "AW" is the device code, fixed.

Pin Descriptions

Device Pins	Name	Description
1	Input/Output	IO
2	Ground	GND

Absolute Maximum Ratings (Note 1)				
Parameter	**Symbol**	**Min**	**Max**	**Unit**
Maximum Peak Pulse Current (8/20μs)	I_{PP}		6	A
Peak Pulse Power (8/20μs)	P_{PK}		42	W
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	-15 -15	15 15	kV
Junction Temperature	T_J	-40	+125	°C
Storage Temperature	T_{STG}	-55	+150	°C

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}				5.0	V
Reverse Leakage Current at V_{RWM}	I_R	V_{RWM} =5V, T_A = 25°C		0.01	0.1	μA
Reverse Breakdown Voltage at I_{t1} (Note 5)	V_{BR}	I_t=1mA	5.1		9	V
Clamping Voltage at I_{PP}(Note 5)	V_C	I_{PP} = 6A, t_p = 8/20us		7	10	V
Clamping Voltage at I_{PP}(Note 5)	V_C	I_{PP} = 16A, t_p = 10/100ns		8.5		V
Dynamic Resistance (Note 2, 5)	R_{DYN}	t_p = 10/100ns		0.18		Ω
Parasitic Capacitance(Note 5)	C_{ESD}	V_R = 2.5V, f = 1MHz		0.5	0.8	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.

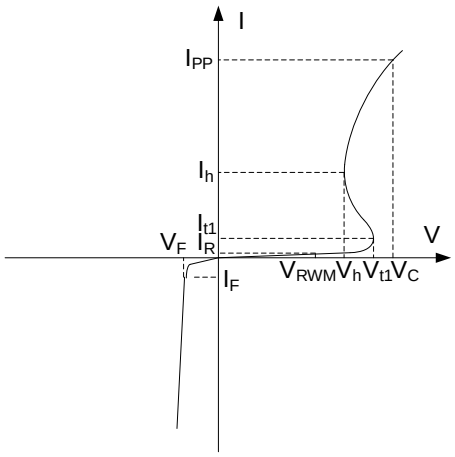
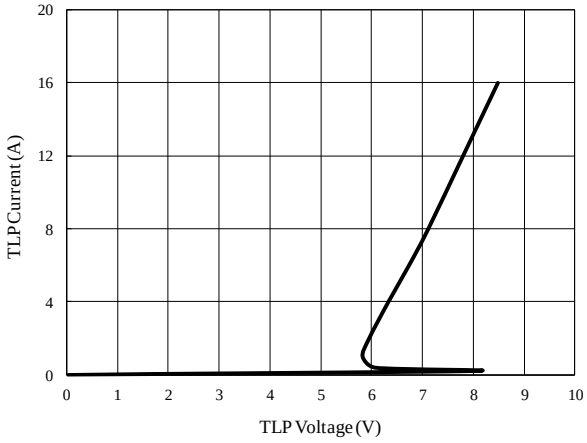


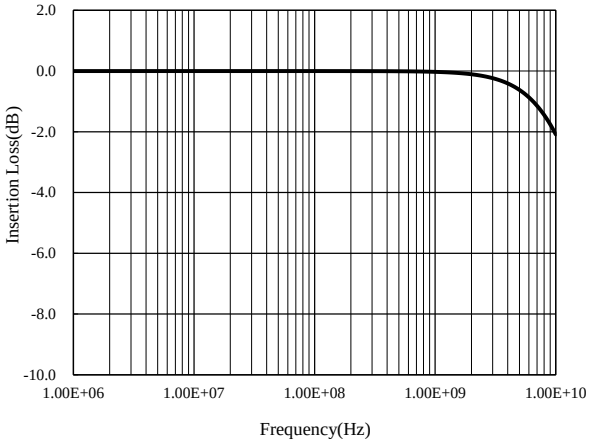
Figure 1. Uni-Directional TVS

Typical Performance Characteristics, IO Referenced to GND

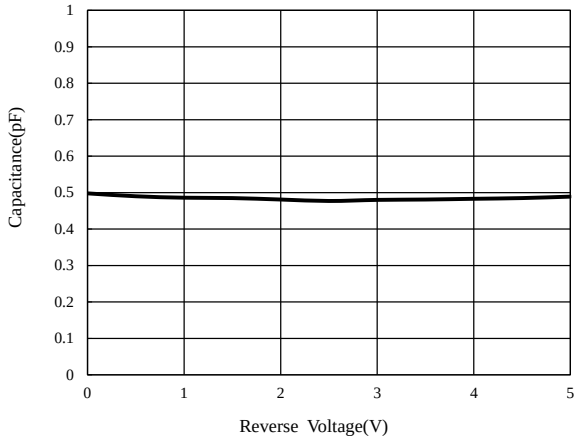
TLP Testing



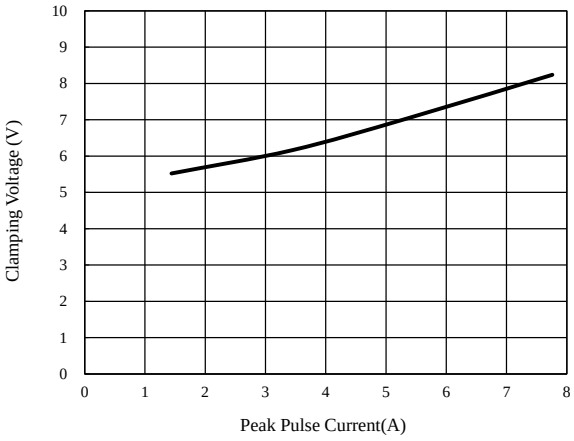
Insertion Loss



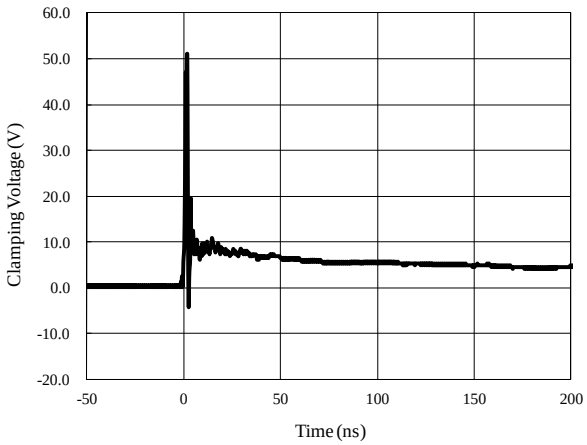
Capacitance vs. Voltage



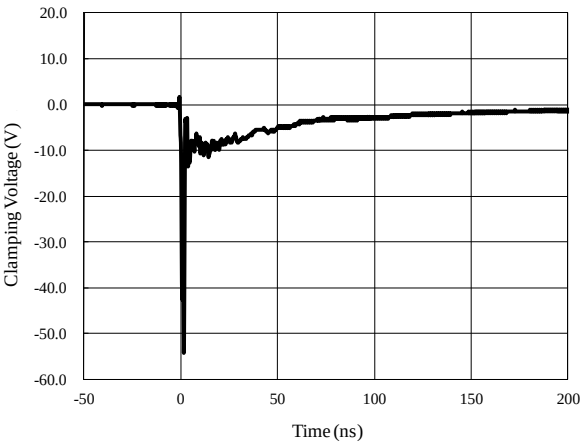
Clamping Voltage vs. Peak Pulse Current



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



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



Application Information

PCB Pin Connections

The SYT22U05DXD is designed to protect one unidirectional data line against overvoltage and overcurrent transient events by clamping it to an acceptable reference.

The connection of the SYT22U05DXD pins is shown in the figure below. The protected line is connected at Pin 1. Pin 2 is the GND, which should connect to a ground plane on the board. All path lengths connected to pins of the SYT22U05DXD should be as short as possible in order to minimize parasitic inductance.

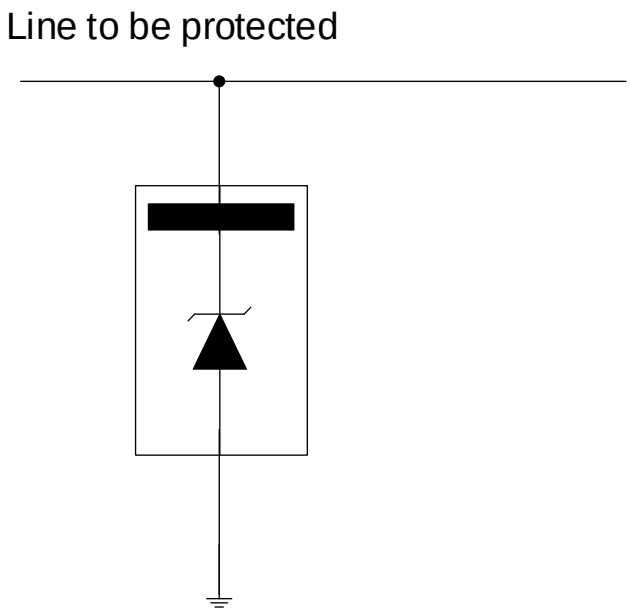


Figure 2. ESD/Surge Protection Circuit

PCB Layout Guidelines

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

- Place the SYT22U05DXD as close to the connectors or terminal ports as possible.
- Use a large via to connect the SYT22U05DXD to the ground.
- Avoid running signals near board edges.
- The SYT22U05DXD should be placed near the protected lines.
- The distance between the SYT22U05DXD ground pin and the GND reference path should be as short as possible to reduce the ESD transient return path to ground.

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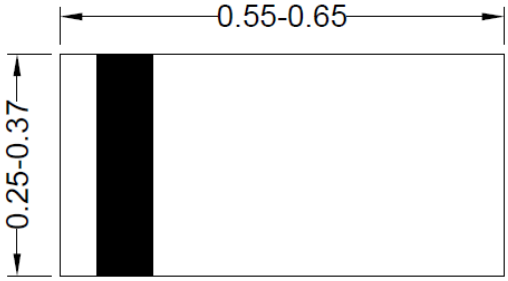
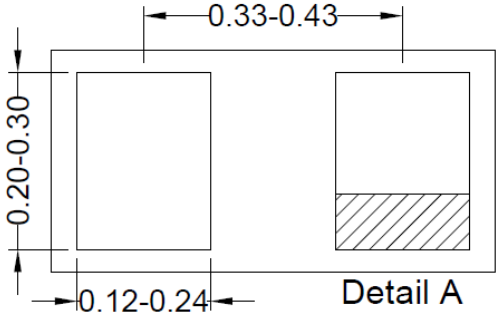
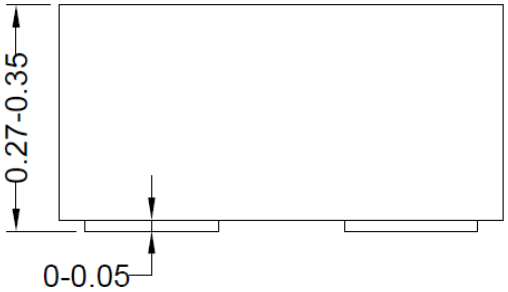
DFN0.6×0.3-2 Package Outline



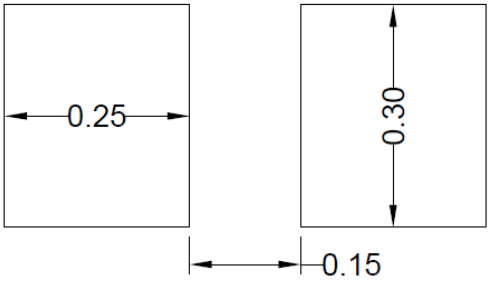
Top View



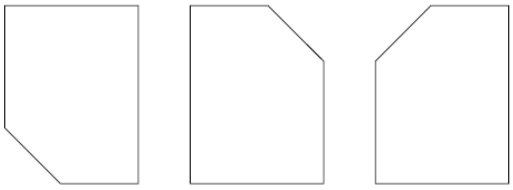
Bottom View



Front View



Recommended PCB Layout
(Reference Only)

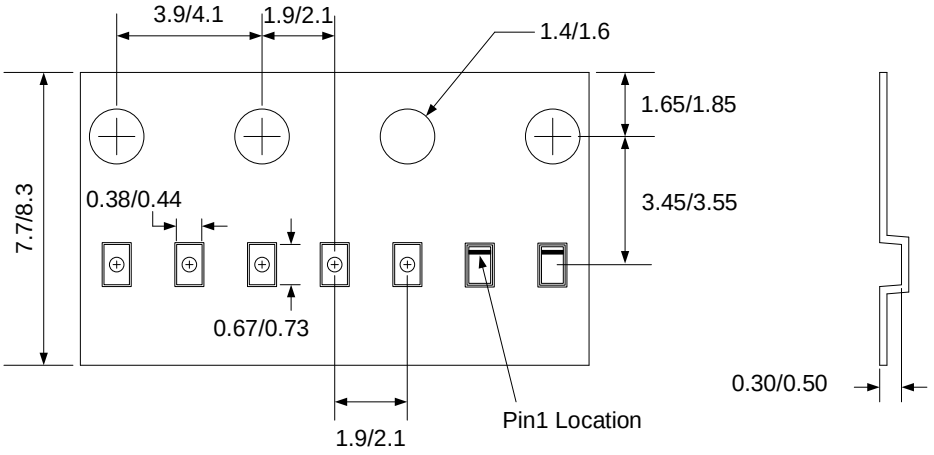


Detail A
Pin1 Identifier: Three Options

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

Tape and Reel Information

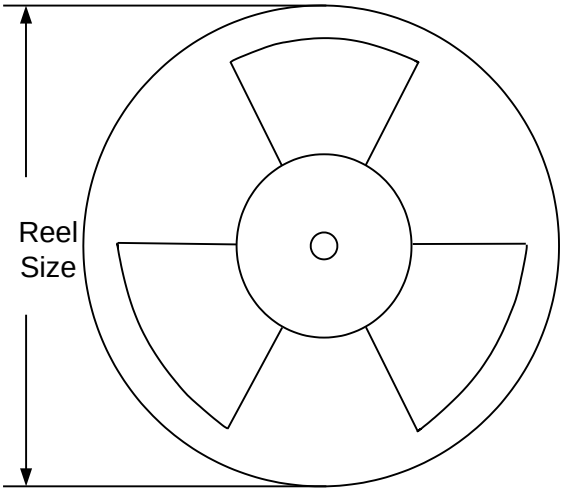
Tape Dimensions and Pin 1 Orientation



Dimensions In mm

Feeding direction ⟶

Reel Dimensions



Package Type	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN0.6×0.3-2	8	2	7"	10000

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	Feb.28, 2025	Initial Release	

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