

General Description

The SYT21M05 is a low-capacitance, bi-directional transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With a typical capacitance of 15pF, the SYT21M05 is designed to protect parasitic-sensitive systems against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD), ($\pm 30\text{kV}$ air, $\pm 30\text{kV}$ contact discharge), and IEC 61000-4-5 (Surge) (7A, 8/20 μs) standards.

Each SYT21M05 device can protect one line. It is available in a compact DFN0.6x0.3-2 or DFN1.0x0.6-2 or SOD-523 package.

Features

- Operating Voltage: 5V and Below
- Transient Protection for High-Speed Data Lines
 - IEC61000-4-2 (ESD) $\pm 30\text{kV}$ (Air) $\pm 30\text{kV}$ (Contact)
 - IEC61000-4-5 (Surge) 7A (8/20 μs)
- Low Capacitance: 15pF(Typical)
- Low Leakage Current: 0.1 μA at V_{RWM} (Max)
- Low Clamping Voltage

Applications

- Portable Electronics
- Desktops, Servers and Notebooks
- Smart Phones
- MP3 Ports
- Digital Camera Ports

Mechanical Characteristics

- DFN0.6x0.3-2/DFN1.0x0.6-2/SOD-523 Package
- Marking: Device Code, Date Code
- Packaging: Tape and Reel

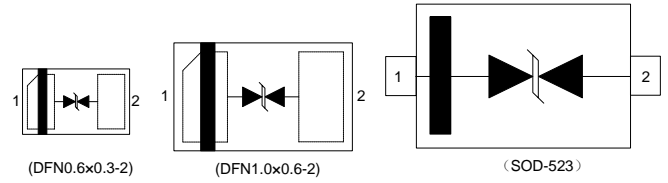
Circuit Diagram



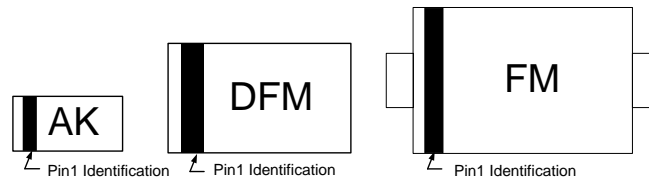
Ordering Information

Part Number	Package Type	Top Mark
SYT21M05DXD	DFN0.6x0.3-2	AK
SYT21M05DWD	DFN1.0x0.6-2	DFM
SYT21M05ANO	SOD-523	FM

Pinout (Top View)



Marking Codes



Notes: "AK", "DF" and "F" are the device code, fixed.
"M" is the date code.

Pin Descriptions

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

Absolute Maximum Ratings(Note 1)				
Parameter	Symbol	Min	Max	Unit
Maximum Peak Pulse Current (8/20μs)	I_{PP}		7	A
Maximum Peak Pulse Power (8/20μs)	P_{PK}		65	W
ESD per IEC 61000-4-2 (Air)	V_{ESD}	-30	30	kV
ESD per IEC 61000-4-2 (Contact)		-30	30	
Junction Temperature	T_J	-40	+125	°C
Storage Temperature	T_{STG}	-55	+150	°C

Electrical Characteristics (IO Referenced to IO, $T_A = 25^\circ\text{C}$, Note 4)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Nominal Reverse Working Voltage	V_{RWM}		-5.0		5.0	V
Reverse Leakage Current at V_{RWM}	I_R	$V_{RWM} = 5\text{V}$, $T_A = 25^\circ\text{C}$		0.01	0.1	μA
Reverse Breakdown Voltage at I_T	V_{BR}	$I_T = 1\text{mA}$	5.4		8	V
Clamping Voltage at I_{PP} (Note 5)	V_C	$I_{PP} = 7\text{A}$, $t_p = 8/20\mu\text{s}$		9	15	V
Clamping Voltage at I_{PP} (Note 5)	V_C	$I_{PP} = 16\text{A}$, $t_p = 10/100\text{ns}$		7.5		V
Dynamic Resistance (Note 2, 5)	R_{DYN}	$t_p = 10/100\text{ns}$		0.09		Ω
Parasitic Capacitance (Note 5)	C_{ESD}	$V_R = 0\text{V}$, $f = 1\text{MHz}$		15	20	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 $T_A \cong T_J = 25^\circ C$. 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.

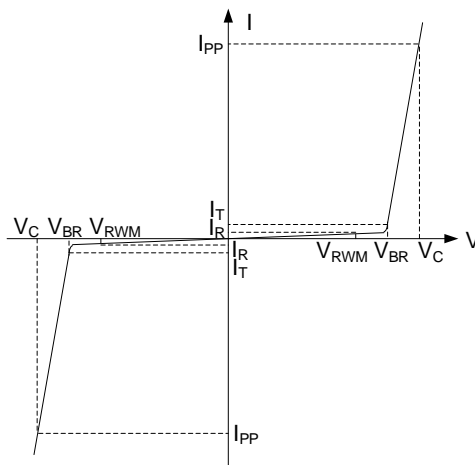
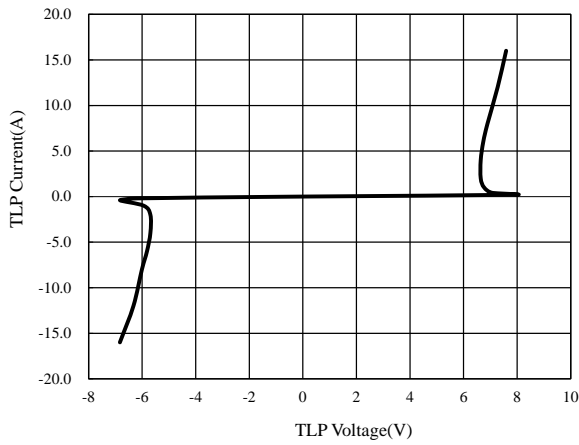


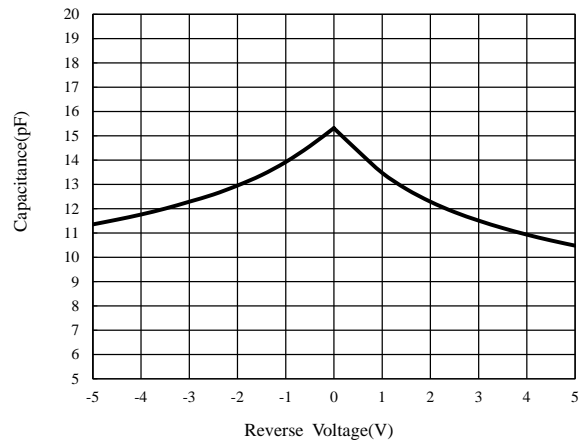
Figure 1. Bi-Directional TVS

Typical Performance Characteristics, Between IO1 and IO2

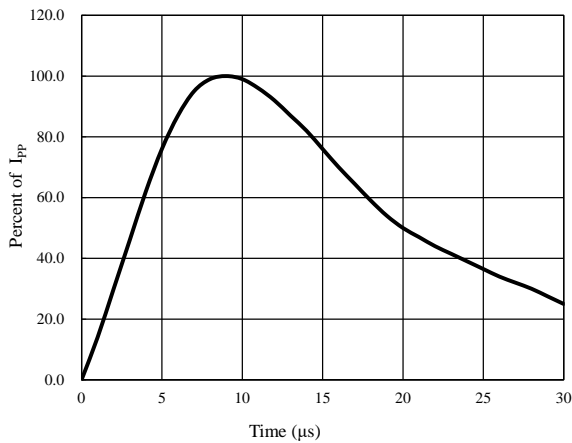
TLP Testing



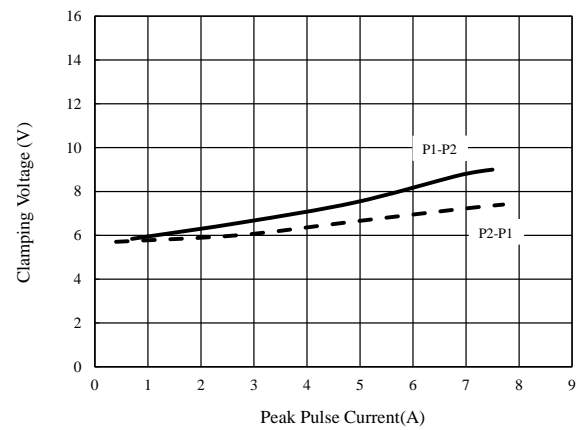
Capacitance vs. Voltage



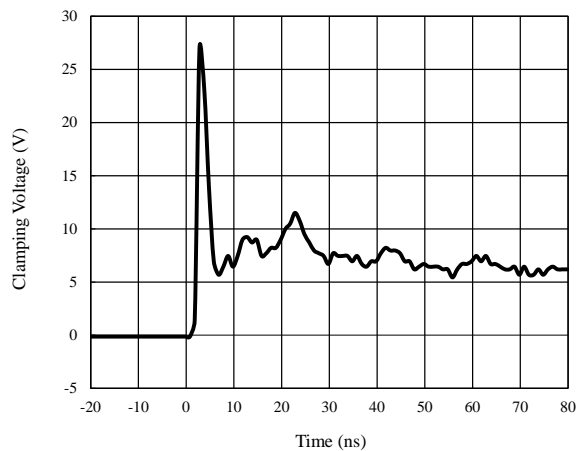
Pulse Waveform



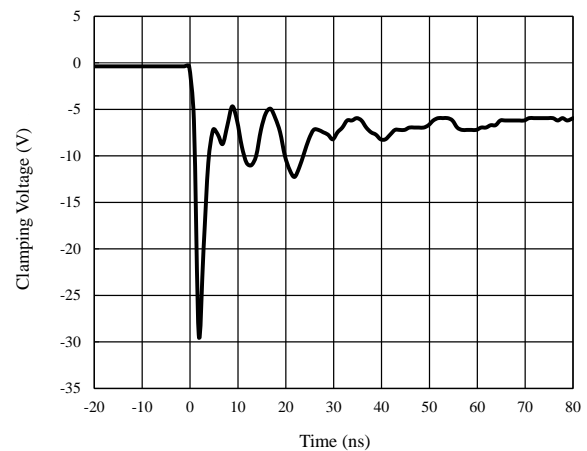
Clamping Voltage vs. Peak Pulse Current



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



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



Application Information

PCB Pin Connections

The SYT21M05 is designed to protect one bi-directional data or power line against overvoltage and overcurrent transient events by clamping it to an acceptable reference.

The SYT21M05 pin connections are shown in Figure 2. The protected line connects to one of the pins, while the other is connected to GND, which should connect to a ground plane on the board. All path lengths connected to the pins of SYT21M05 should be as short as possible to minimize parasitic inductance.

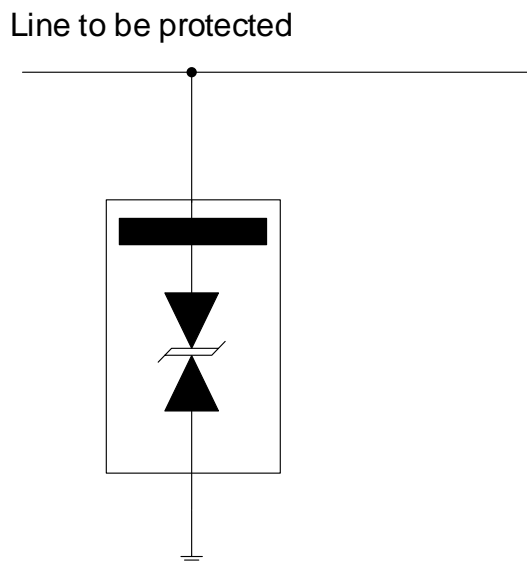


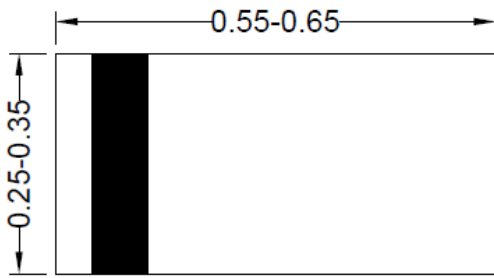
Figure 2 ESD/Surge Protection Circuit

PCB Layout Guidelines

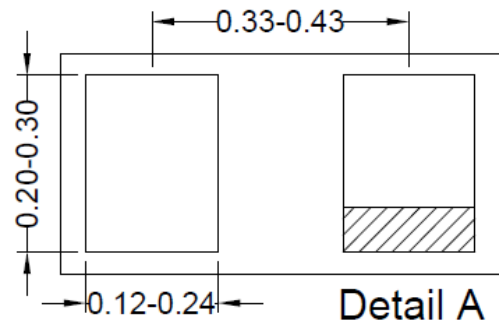
For optimum ESD protection and circuit performance, the following PCB layout guidelines are recommended:

- Place the SYT21M05 as close to the connectors or terminal ports as possible.
- Use a large via to connect the SYT21M05 pin to the ground.
- Avoid running signals near board edges.
- The SYT21M05 should be placed near the protected line.
- The distance between the SYT21M05 ground pin to the board ground rail should be as short as possible to reduce the ESD transient return path to ground.

DFN0.6x0.3-2 Package Outline

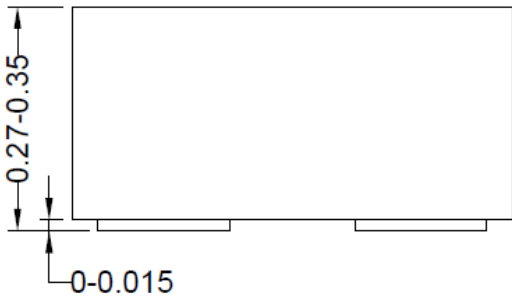


Top View

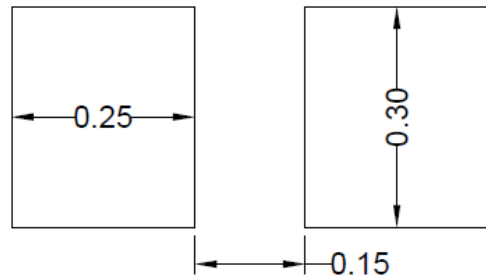


Detail A

Bottom View



Front View



**Recommended PCB Layout
(Reference only)**

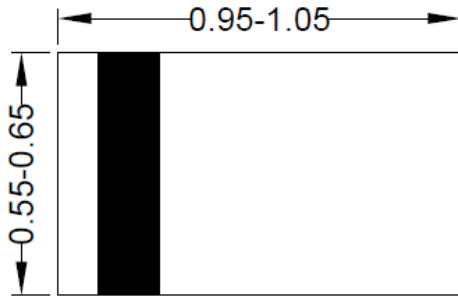


Detail A

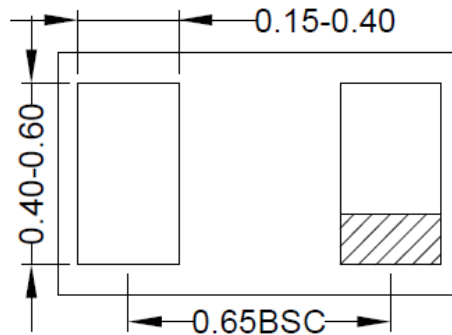
Pin1 Identifier: Two Options

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

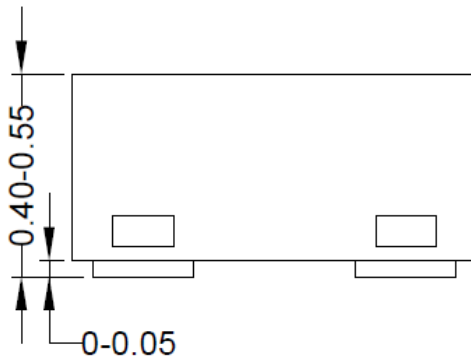
DFN1.0x0.6-2 Package Outline



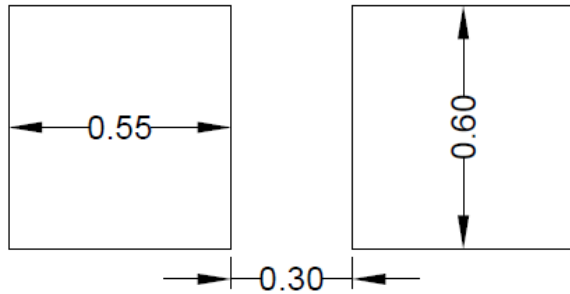
Top View



Bottom View



Front View



**Recommended PCB Layout
(Reference only)**

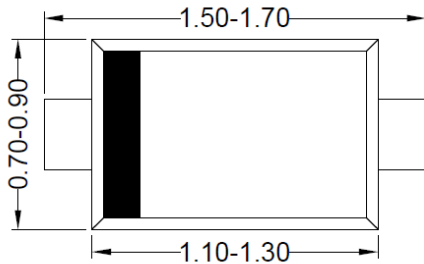


Detail A

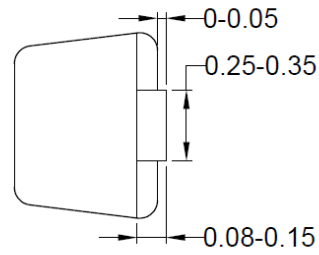
Pin1 Identifier: Three Options

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

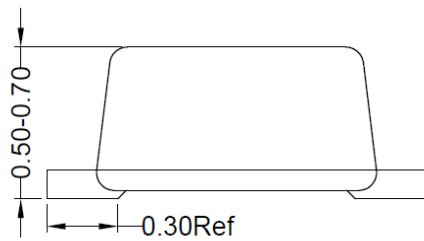
SOD-523 Package Outline



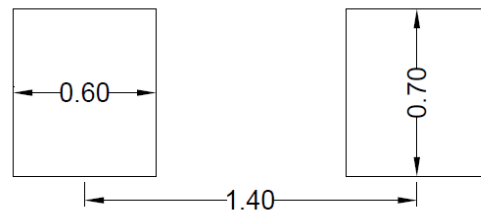
Top View



Side View A



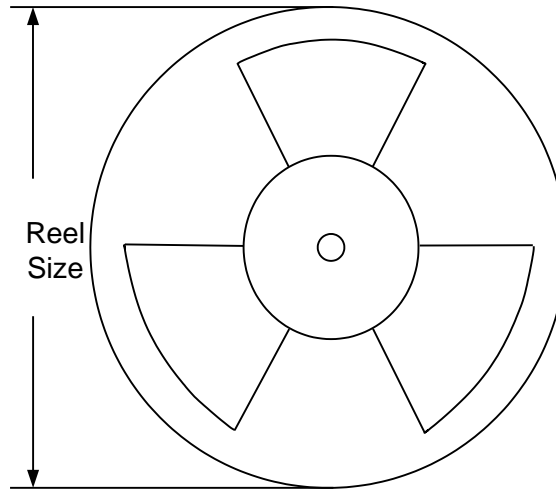
Side View B



**Recommended PCB Layout
(Reference only)**

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

Reel Dimensions



Package Type	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN0.6x0.3-2	8	2	7"	10000
DFN1.0x0.6-2	8	2	7"	10000
SOD-523	8	2	7"	8000



Revision History

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

Revision Number	Revision Date	Description	Pages changed
1.0	Nov.14,2024	Initial Release	
1.0	Mar.17,2025	SYT21M05ANO related information added	

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