

### General Description

The SY205237DVD 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 0.35pF, the SY205237DVD is designed to protect parasitic-sensitive systems against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD), ( $\pm 15\text{kV}$  air,  $\pm 15\text{kV}$  contact discharge), and IEC 61000-4-5 (Surge) (7A, 8/20 $\mu\text{s}$ ) standards.

Each SY205237DVD device can protect four high-speed data lines. Its ultra-low capacitance, ultra-small size, and high ESD robustness make the SY205237DVD ideal for high-speed data ports and high-frequency line applications. The low clamping voltage of the SY205237DVD guarantees minimum stress on the protected device.

The SY205237DVD is available in a compact DFN2.5x1.0-10 package.

### Features

- Operating Voltage: 3.3V and Below
- Transient Protection for High-Speed Data Lines
  - IEC61000-4-2 (ESD)  $\pm 15\text{kV}$  (Air)  $\pm 15\text{kV}$  (Contact)
  - IEC61000-4-5 (Surge) 7A (8/20 $\mu\text{s}$ )
- Protects Four High-Speed Data Lines
- Ultra Low Capacitance: 0.35pF (Typical)
- Low Clamping Voltage

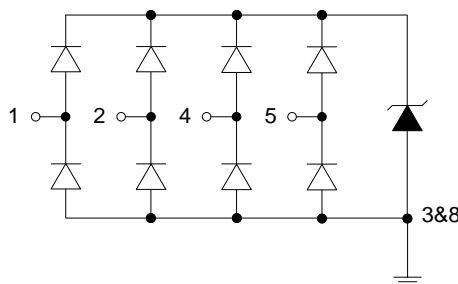
### Applications

- 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 Boxes
- PCI Express and SATA Ports

### Mechanical Characteristics

- DFN2.5x1.0-10 Package
- Marking: Device Code, Date Code
- Packaging: Tape and Reel

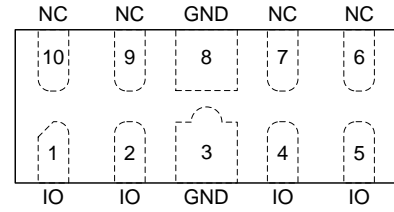
### Circuit Diagram



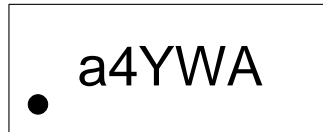
## Ordering Information

## Pinout (Top View)

Part Number	Package Type	Top Mark
SY205237DVD	DFN2.5x1.0-10	a4YWA



## Marking Codes



Notes: “a4” is the device code, fixed.

“YWA” is the 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 Ratings(Note 1)				
Parameter	Symbol	Min	Max	Unit
Peak Pulse Current (8/20μs)	$I_{PP}$		7	A
ESD per IEC 61000-4-2 (Air)	$V_{ESD}$	-15	15	kV
ESD per IEC 61000-4-2 (Contact)		-15	15	
Junction Temperature	$T_J$	-40	+125	°C
Storage Temperature	$T_{STG}$	-55	+150	°C

Electrical Characteristics (IO Referenced to GND, $T_A = 25^\circ\text{C}$ , Note 4)						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Nominal Reverse Working Voltage	$V_{RWM}$				3.3	V
Reverse Leakage Current at $V_{RWM}$	$I_R$	$V_{RWM} = 3.3\text{V}, T_A = 25^\circ\text{C}$		0.01	0.1	μA
Reverse Triggering Voltage at $I_{R1}$	$V_{th}$	$I_{th} = 1\text{mA}$	5.0		9	V
Clamping Voltage at $I_{PP}$ (Note 5)	$V_C$	$I_{PP} = 16\text{A}, t_p = 10/100\text{ns}$		9.5		V
Clamping Voltage at $I_{PP}$ (Note 5)	$V_C$	$I_{PP} = 7\text{A}, t_p = 8/20\mu\text{s}$		9.5	11	V
Dynamic Resistance (Notes 2, 5)	$R_{DYN}$	$t_p = 10/100\text{ns}$		0.24		Ω
Parasitic Capacitance (Note 5)	$C_{ESD}$	$V_R = 1.65\text{V}, f = 1\text{MHz}, \text{IO-GND}$		0.35	0.5	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.

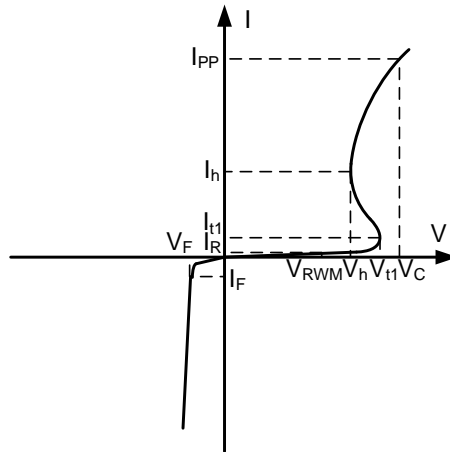
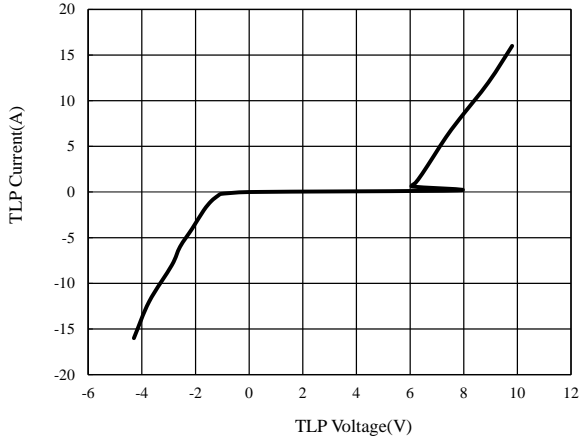


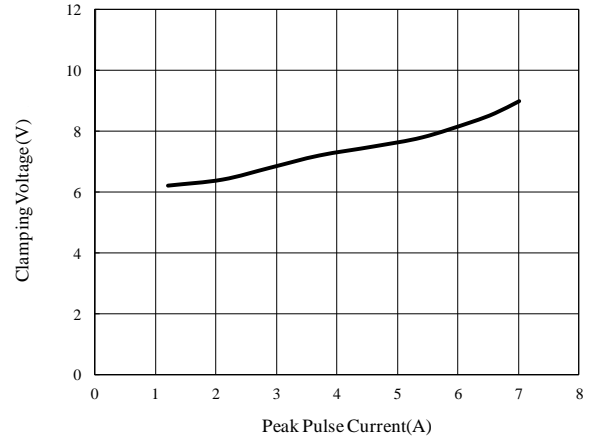
Figure 1. Uni-Directional TVS

## Typical Performance Characteristics, IO Referenced to GND

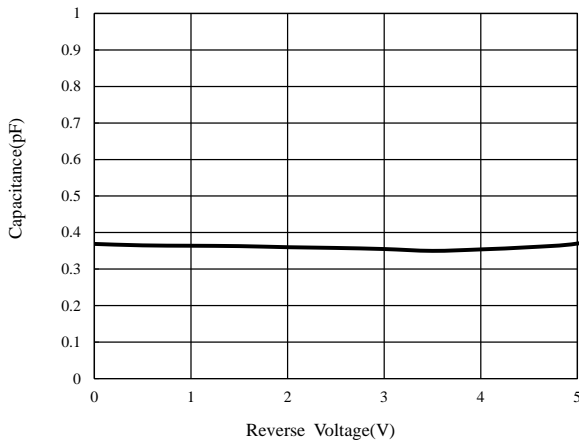
### TLP Testing



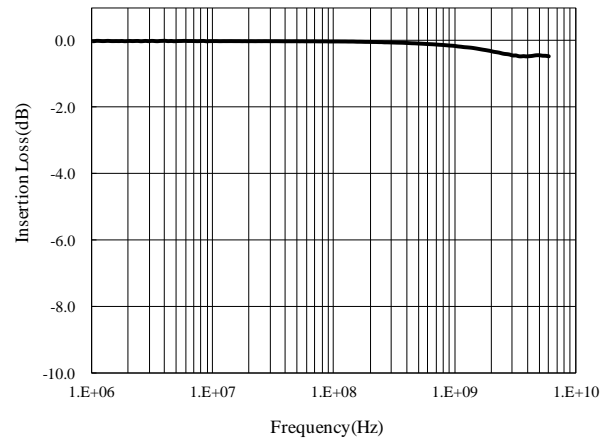
### Clamping Voltage vs. Peak Pulse Current (8/20μs)



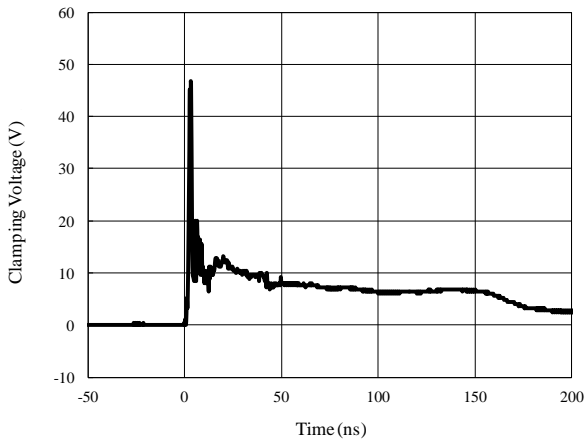
### Capacitance vs. Voltage



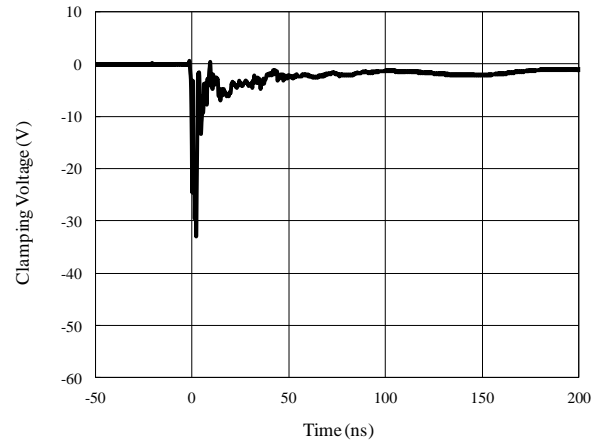
### Insertion Loss S21



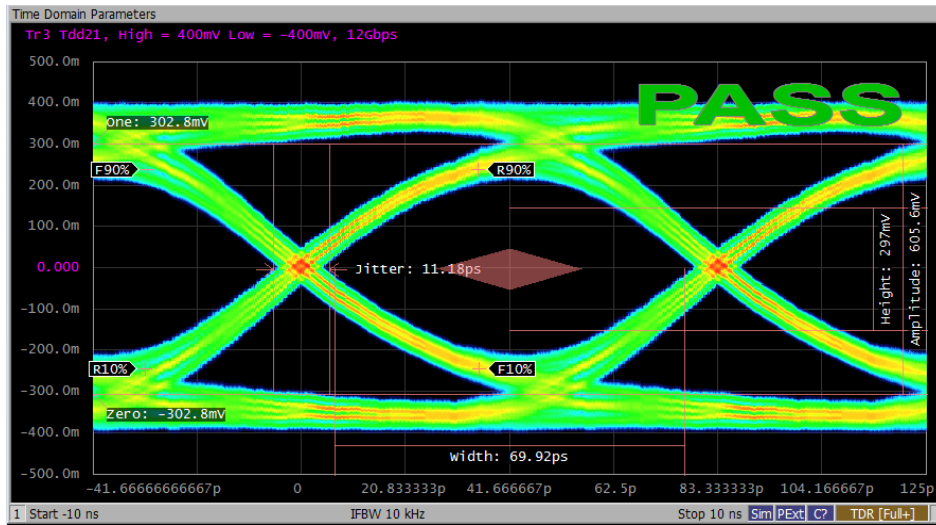
### ESD Clamping (+8kV Contact per IEC 61000-4-2)



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

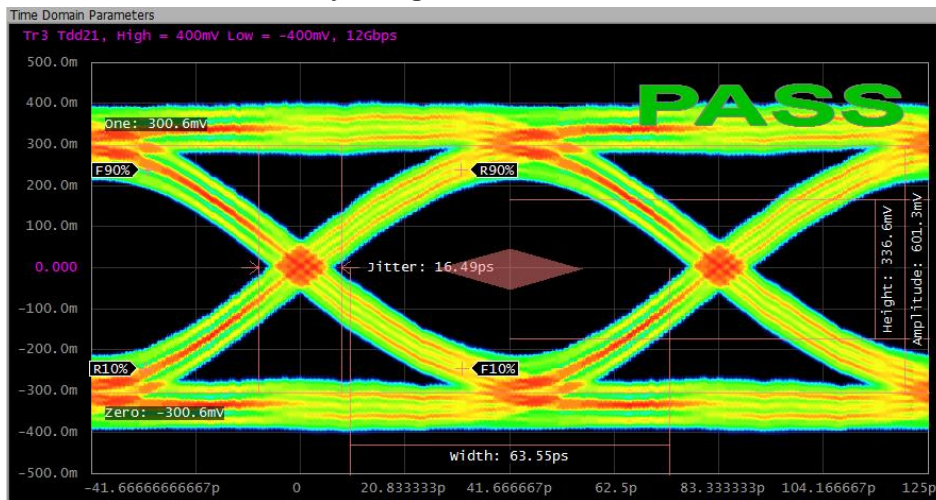


### Eye Diagram Measurement for HDMI2.1



Data rate 12Gb/s

HDMI2.1 Eye Diagram without SY205237DVD



Data rate 12Gb/s

HDMI2.1 Eye Diagram with SY205237DVD

## Application Information

### Pin Connection in PCB

The SY205237DVD provides ESD protection for four data lines simultaneously. The pin connections are shown in Figure 2 below.

The four parallel data lines from the inner device to the IO port connector can connect directly to the four IO pins of the SY205237DVD. Pins 3 and 8 of the SY205237DVD are GND pins and should connect to the PCB ground. To minimize parasitic inductance, ensure the grounding trace is as short as possible.

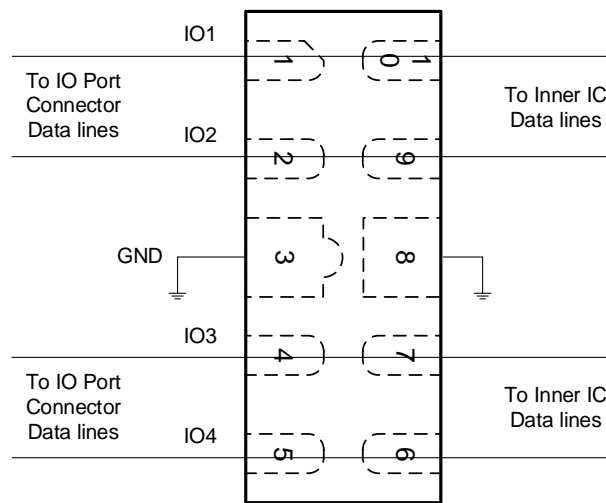


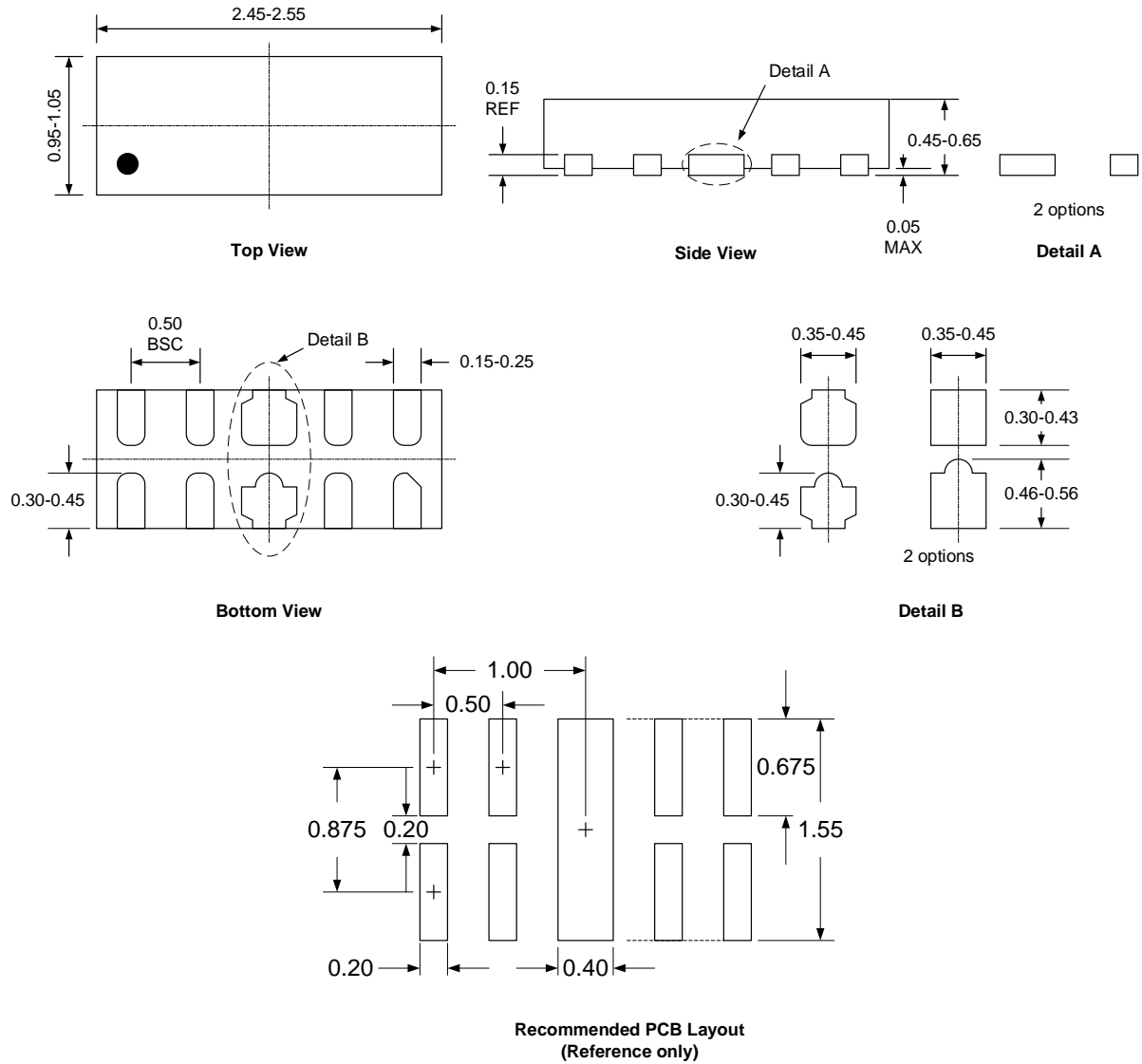
Figure 2 SY205237DVD Pin Connection in PCB

### PCB Layout Guidelines

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

- The SY205237DVD GND pin to the PCB GND rail path should be as short as possible to reduce the ESD transient return path to GND.
- The vias connecting the SY205237DVD GND pins to the PCB GND should be wide.
- Place SY205237DVD as close to the connector port as possible to reduce parasitic inductance and restrict ESD coupling into adjacent traces.
- Avoid running critical signals near board edges.

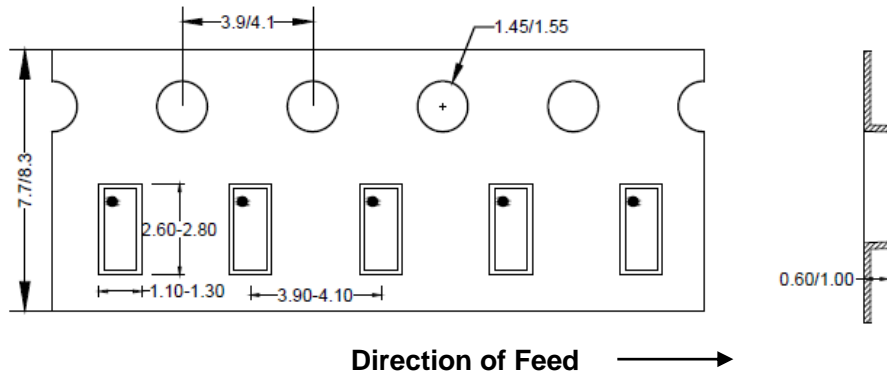
## DFN2.5x1.0-10 Package Outline



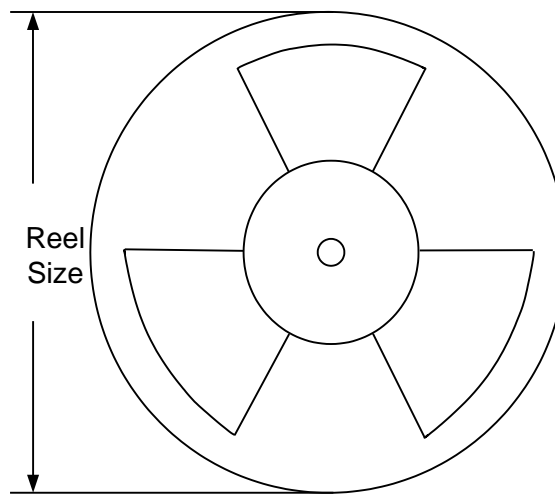
Note: All dimensions are in millimeters and exclude mold flash and metal burr.

## Tape and Reel Information

### Tape Dimensions and Pin 1 Orientation



### Reel Dimensions



Package Type	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN2.5x1.0-10	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 warranted. Please make sure that you have the latest revision.

Revision Number	Revision Date	Description	Pages changed
1.0	Sep. 13, 2024	Initial Release	

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