SY205257

Low Capacitance TVS Protection

General Description

The SY205257 is a low-capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With a typical capacitance of 16pF, the SY205257 is designed to protect parasitic-sensitive systems against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD, ±30kV air, ±30kV contact discharge), IEC 61000-4-5 (Surge, 10A, 8/20 μs), etc.

Each SY205257 device can protect one data line. It offers system designers flexibility to protect single data line where space is a premium concern.

Features

- Transient protection for high-speed data lines
  - IEC 61000-4-2 (ESD) ±30kV (Air) ±30kV (Contact)
  - IEC 61000-4-5 (Surge) 10A (8/20 μs)
- Package optimized for high-speed lines
- Ultra-small package:DFN0.6×0.3-2/DFN1.0×0.6-2
- Protects one data, control or power line
- Low capacitance:16pF (Typical)
- Low leakage current: 0.1μA @ V_{RWM} (Max)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±8kV contact discharge

Applications

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

Mechanical Characteristics

- Package: DFN0.6×0.3-2/DFN1.0×0.6-2
- Marking: Device code, date code
- Packaging: Tape and Reel

Circuit Diagram

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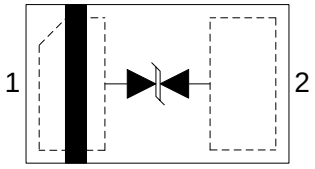
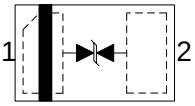
Ordering Information

Part Number	Package Type	Top Mark
SY205257DXD	DFN0.6×0.3-2 RoHS Compliant and Halogen Free	AB
SY205257DWD	DFN1.0×0.6-2 RoHS Compliant and Halogen Free	AYM

Pinout (Top View)

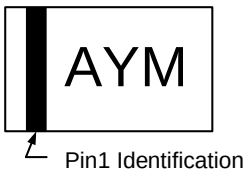


(DFN1.0×0.6-2)



(DFN0.6×0.3-2)

Marking Codes



Note 1: “AB”, “AY” is device code, fixed.

Note 2: “M” is date code

Absolute Maximum Rating (1)				
Parameter	**Symbol**	**Min**	**Max**	**Unit**
Peak Pulse Current (8/20μs)	I_{PP}		10	A
Peak Pulse Power (8/20μs)	P_{PK}		70	W
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	-30	30	kV
Operating Temperature	T_{OPT}	-40	+125	°C
Storage Temperature	T_{STG}	-55	+150	°C

Electrical Characteristics T_A = 25°C (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 Between I/O_1 and I/O_2		0.01	0.1	μA
Triggering Voltage @ I_{t1}	V_{t1}	I_{t1} = 1mA Between I/O_1 and I/O_2	6		8	V
Holding Voltage @ I_h	V_h	I_h = 100mA Between I/O_1 and I/O_2	3.65			V
Clamping Voltage @ I_{PP}(5)	V_C	I_{PP} = 10A, t_p = 8/20μs Between I/O_1 and I/O_2		7	8	V
Clamping Voltage @ I_{PP}(5)	V_C	I_{PP} = 16A, t_p = 10/100ns Between I/O_1 and I/O_2		6.5		V
Dynamic Resistance (2,5)	R_{DYN}	t_p = 10/100ns Between I/O_1 and I/O_2		0.1	0.13	Ω
Parasitic Capacitance(5)	C_{ESD}	V_R = 0V, f = 1MHz Between I/O_1 and I/O_2		16	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.

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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 at $T_A \approx T_J$ = -40 to 125°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.

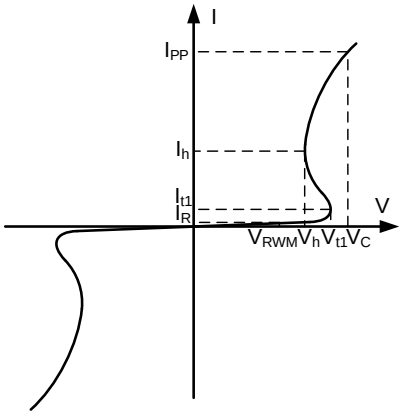

Figure 1. Bi-directional TVS

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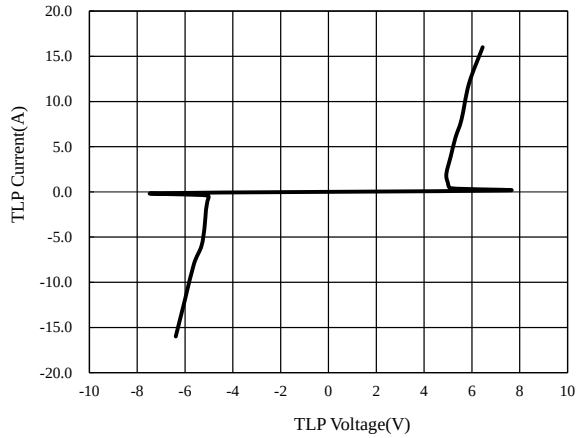
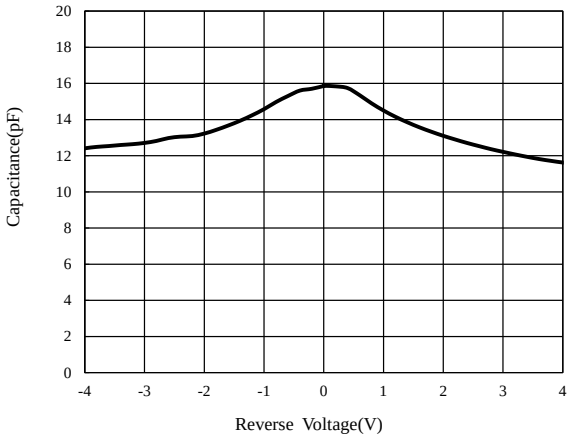
Typical Characteristics

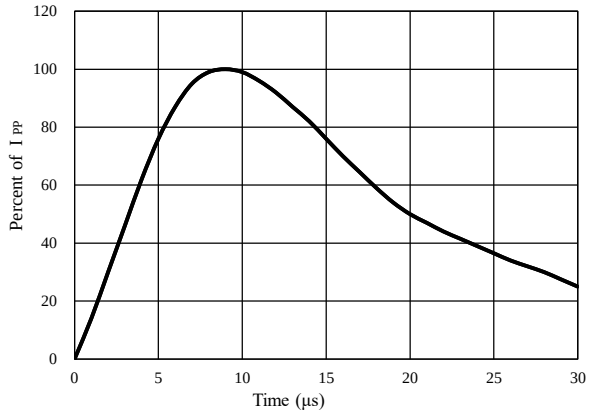
TLP Testing of I/O_1 to I/O_2



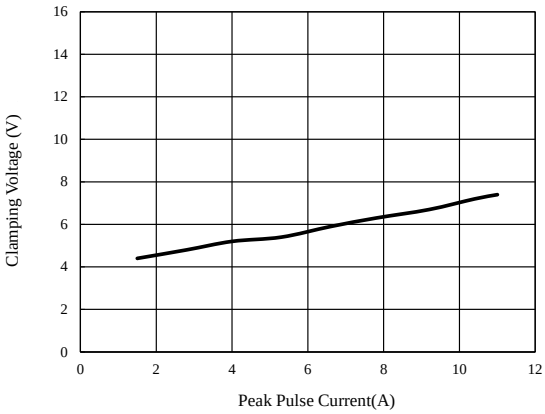
Capacitance vs. Voltage



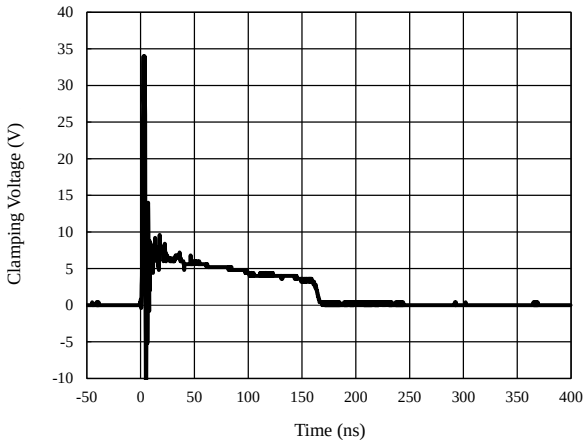
Pulse Waveform



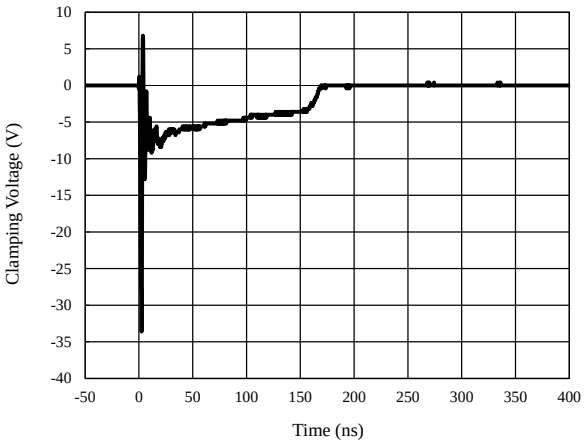
Clamping Voltage vs. Peak Pulse Current



ESD Clamping of I/O_1 to I/O_2 (+8kV Contact per IEC 61000-4-2)



ESD Clamping of I/O_1 to I/O_2 (-8kV Contact per IEC 61000-4-2)



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Application Information

Pin Connection in PCB

The SY205257 is designed to protect one bidirectional data line against overvoltage and overcurrent transient events by clamping it to an acceptable reference.

The connection of the SY205257 pins is shown in Figure 2 below. The protected line is connected at Pin 1. Pin 2 is the GND, which should connect to a ground plane on the PCB board. All traces connected to the SY205257 pins should be as short as possible to minimize the parasitic inductance.

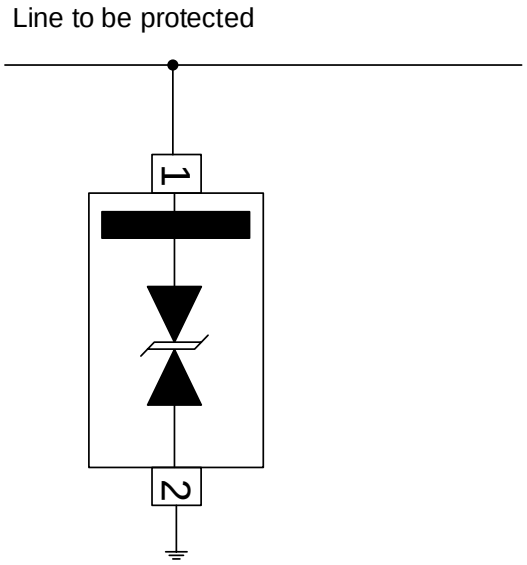

Figure 2 ESD/Surge Protection Circuit.

PCB Layout Guidelines

For optimal ESD protection and circuit performance, the following circuit board guidelines are recommended.

- Place the SY205257 as close to the connectors or terminal port as possible.
- Use a large via to connect the SY205257 ground pin to the board ground layer.
- Avoid running signals near board edges.
- The SY205257 should be placed close to the protected lines.
- The distance between the SY205257 ground pin and the board GND reference path should be as short as possible to minimize the ESD transient return path.

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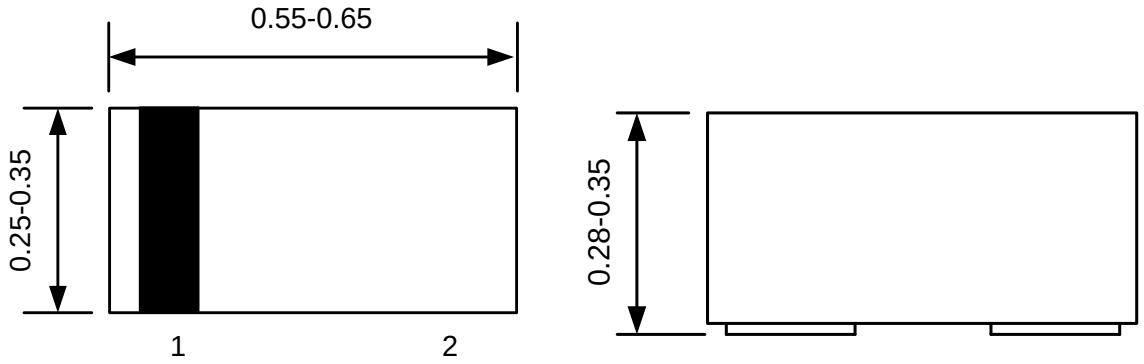
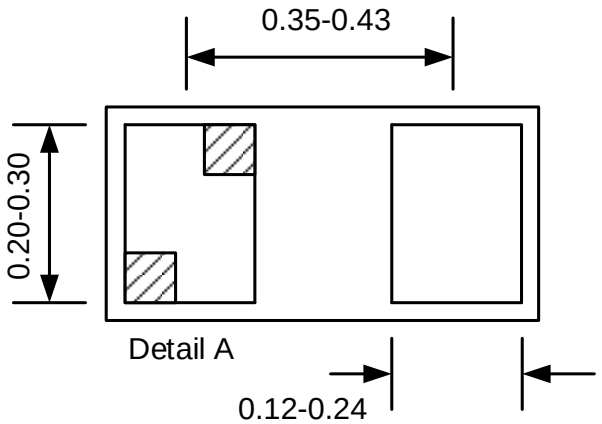
DFN0.6×0.3-2 Package Outline Drawing

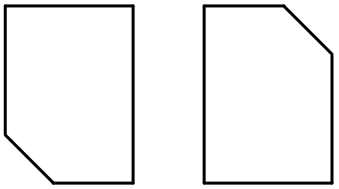


Top View

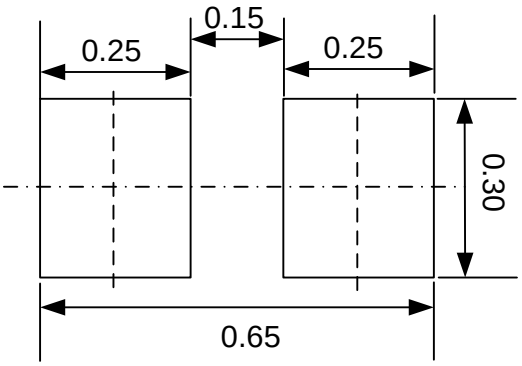
Side View



Bottom View



Detail A



Recommended PCB Layout
(Reference only)

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

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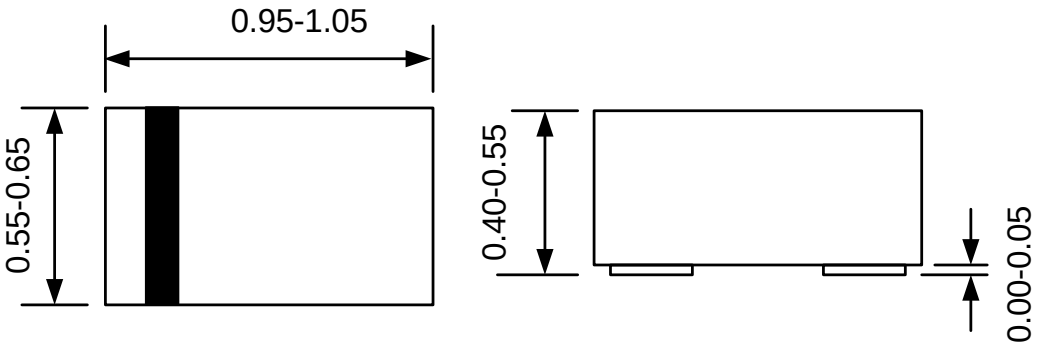
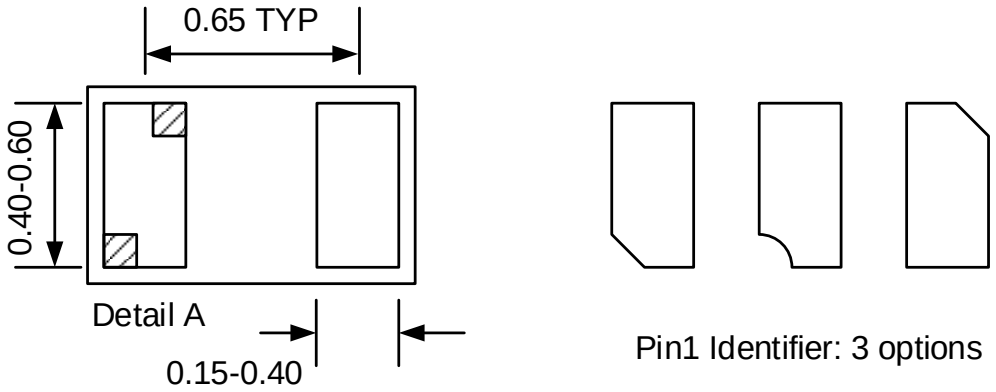
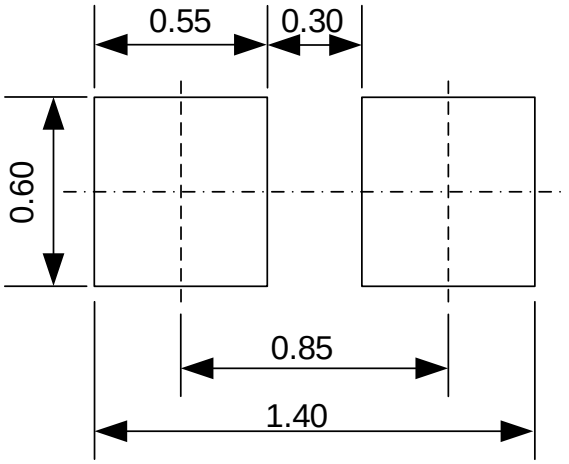
DFN1.0×0.6-2 Package Outline Drawing



Top View **Side View**



Bottom View **Detail A**



Recommended PCB Layout
(Reference only)

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

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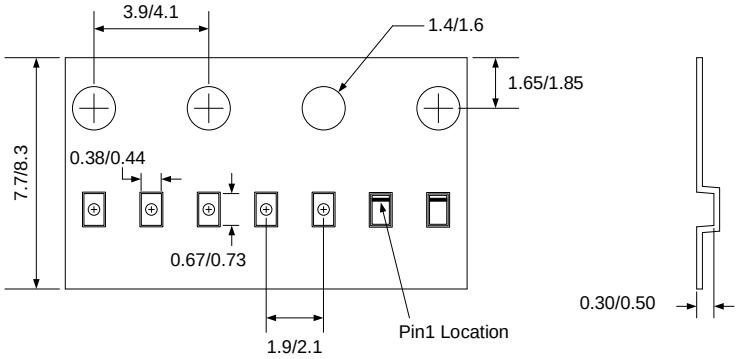
Tape and Reel Specification

Tape Dimensions and Pin 1 Orientation

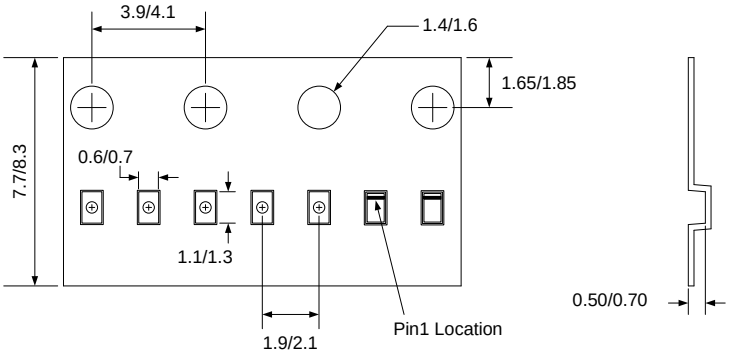
DFN0.6×0.3-2



Dimensions In mm

Feeding direction

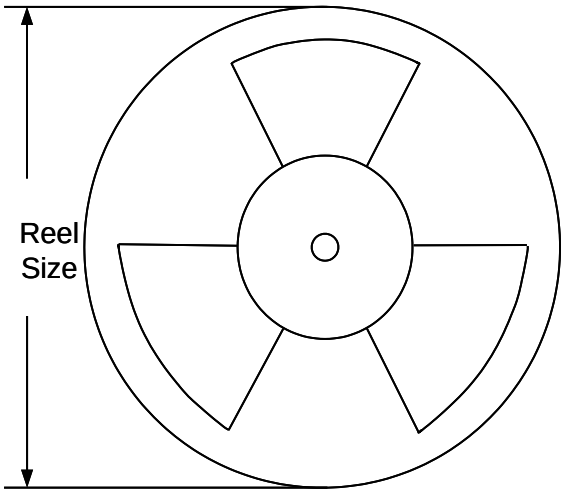
DFN1.0×0.6-2



Dimensions In mm

Feeding direction

Reel Dimensions



Package Types	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel(pcs)
DFN1.0×0.6-2	8	2	7"	10000
DFN0.6×0.3-2	8	2	7"	10000

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Revision History

The revision history provided is for informational purpose 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
0.9	September 15, 2023	Initial Release	
1.0	February 6, 2025	Production Release. Language Improvement for clarity.	

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