SY205238

Low Capacitance TVS Protection

General Description

The SY205238 is a low-capacitance transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for general-speed data interfaces. With a typical capacitance of 23pF, the SY205238 is designed to protect against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD, ±30kV air, ±30kV contact discharge), and IEC 61000-4-5 (Surge, 10A, 8/20 μs).

Each SY205238 device can protect one data line. The SY205238 is available in a small DFN1.0mm×0.6mm package or a DFN0.6mm×0.3mm package.

Features

- Protects One Data, Control, or Power Line
- Low Capacitance: 23pF (Typical)
- Low Leakage Current: 0.1μA @ V_{RWM} (Max)
- Low Clamping Voltage
- 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)
- Ultra Small Packages: DFN0.6×0.3-2/DFN1.0×0.6-2

Applications

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

Mechanical Characteristics

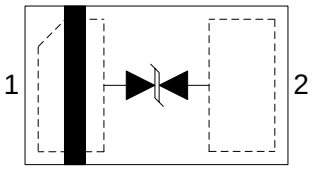
- Package: DFN0.6×0.3-2/DFN1.0×0.6-2
- Marking: Device Code, Date Code
- Packaging: Tape and Reel

Circuit Diagram

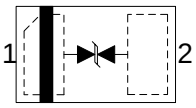
Ordering Information

Part Number	Package Type	Top Mark
SY205238DXD	DFN0.6×0.3-2 RoHS Compliant and Halogen Free	n
SY205238DWD	DFN1.0×0.6-2 RoHS Compliant and Halogen Free	BM

Pinout (Top View)

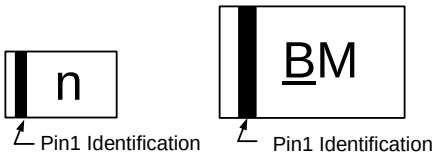


(DFN1.0×0.6-2)



(DFN0.6×0.3-2)

Marking Codes



Note 1: "n", "B" 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}		90	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}		-5		5	V
Reverse Leakage Current @ V_{RWM}	I_R	V_{RWM} = 5V, T_A = 25°C Between I/O_1 and I/O_2		0.01	0.1	μA
Reverse Breakdown Voltage @ I_T	V_{BR}	I_T = 1mA Between I/O_1 and I/O_2	5.5		8	V
Clamping Voltage @ I_{PP} (5)	V_C	I_{PP} = 10A, t_p = 8/20μs Between I/O_1 and I/O_2		8.5		V
Clamping Voltage @ I_{PP} (5)	V_C	I_{PP} = 16A, t_p = 10/100ns Between I/O_1 and I/O_2		7.5		V
Dynamic Resistance(2,5)	R_{DYN}	t_p = 10/100ns Between I/O_1 and I/O_2		0.1		Ω
Parasitic Capacitance (5)	C_{ESD}	V_R = 0V, f = 1MHz Between I/O_1 and I/O_2		23		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 2: The device is not guaranteed to function outside its operating conditions.

Note 3: 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 4: Guaranteed by design or statistical correlation and not production tested.

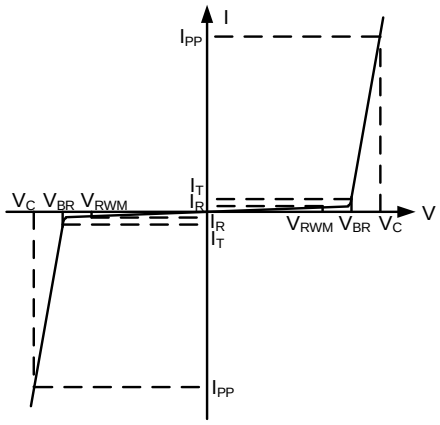
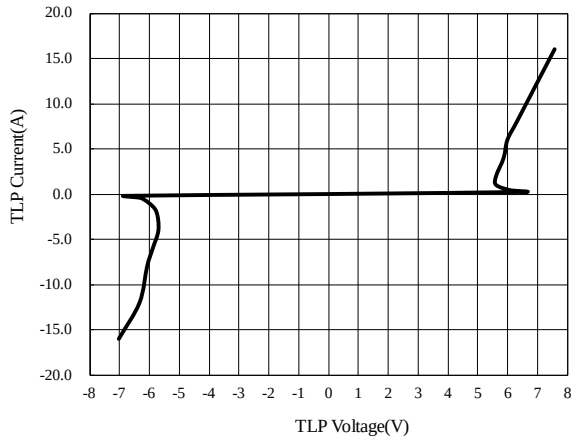


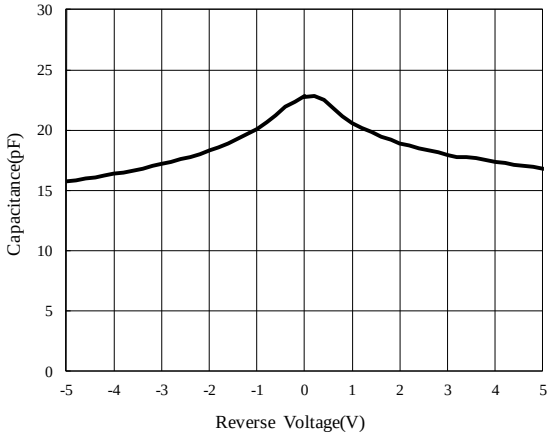
Figure 1. Bi-directional TVS

Typical Characteristics

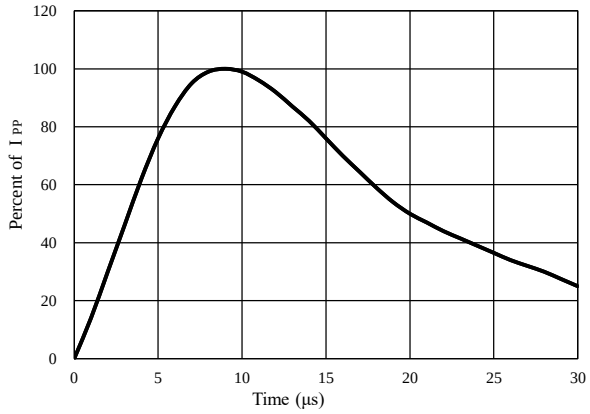
TLP Testing of I/O_1 to I/O_2



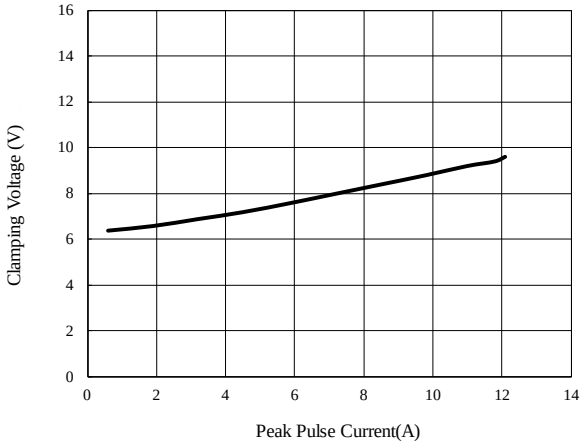
Capacitance vs. Voltage



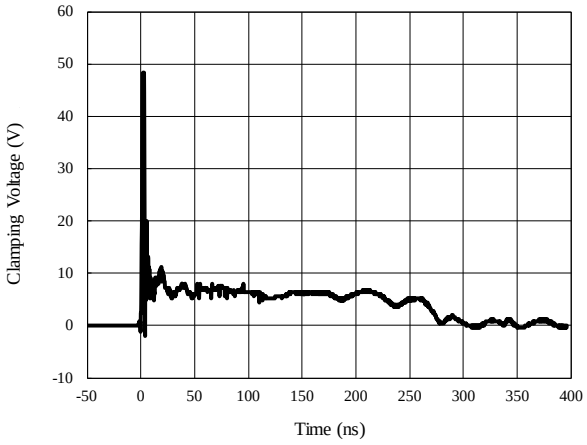
Pulse Waveform



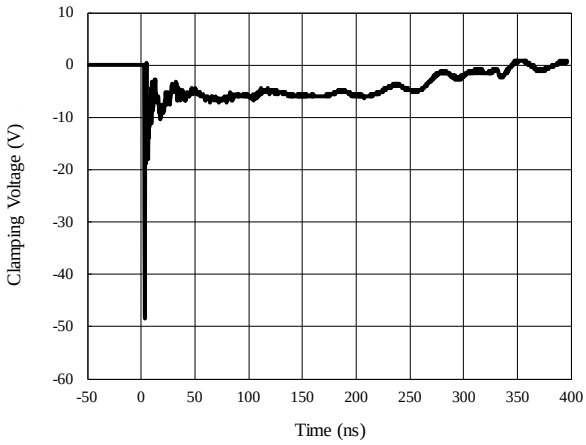
Clamping Voltage vs. Peak Pulse Current



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)



Application Information

Each SY205238 protects one line against overvoltage and overcurrent transient events by clamping it to an acceptable reference.

The SY205238 pin connections are shown in Figure 2. The protected line is connected at Pin 1 while Pin 2 is connected to GND, which should connect to a ground plane on the PCB board. All traces connected to the pins of the SY205238 should be as short as possible to minimize the parasitic inductance.

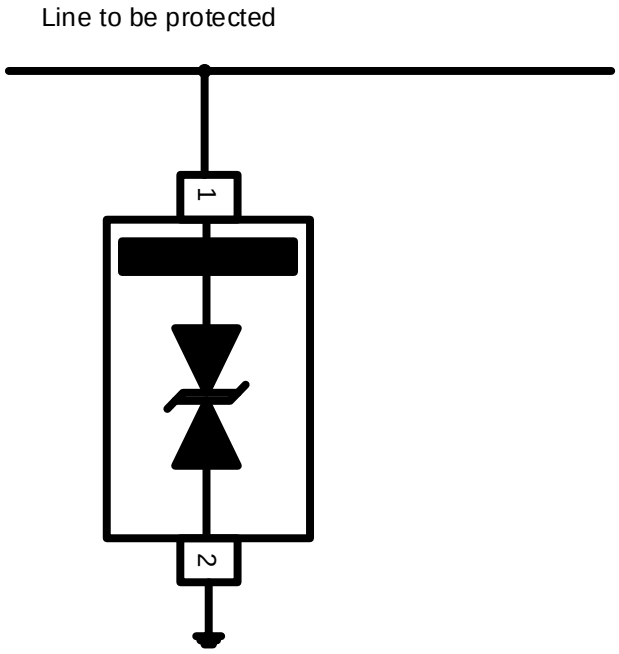


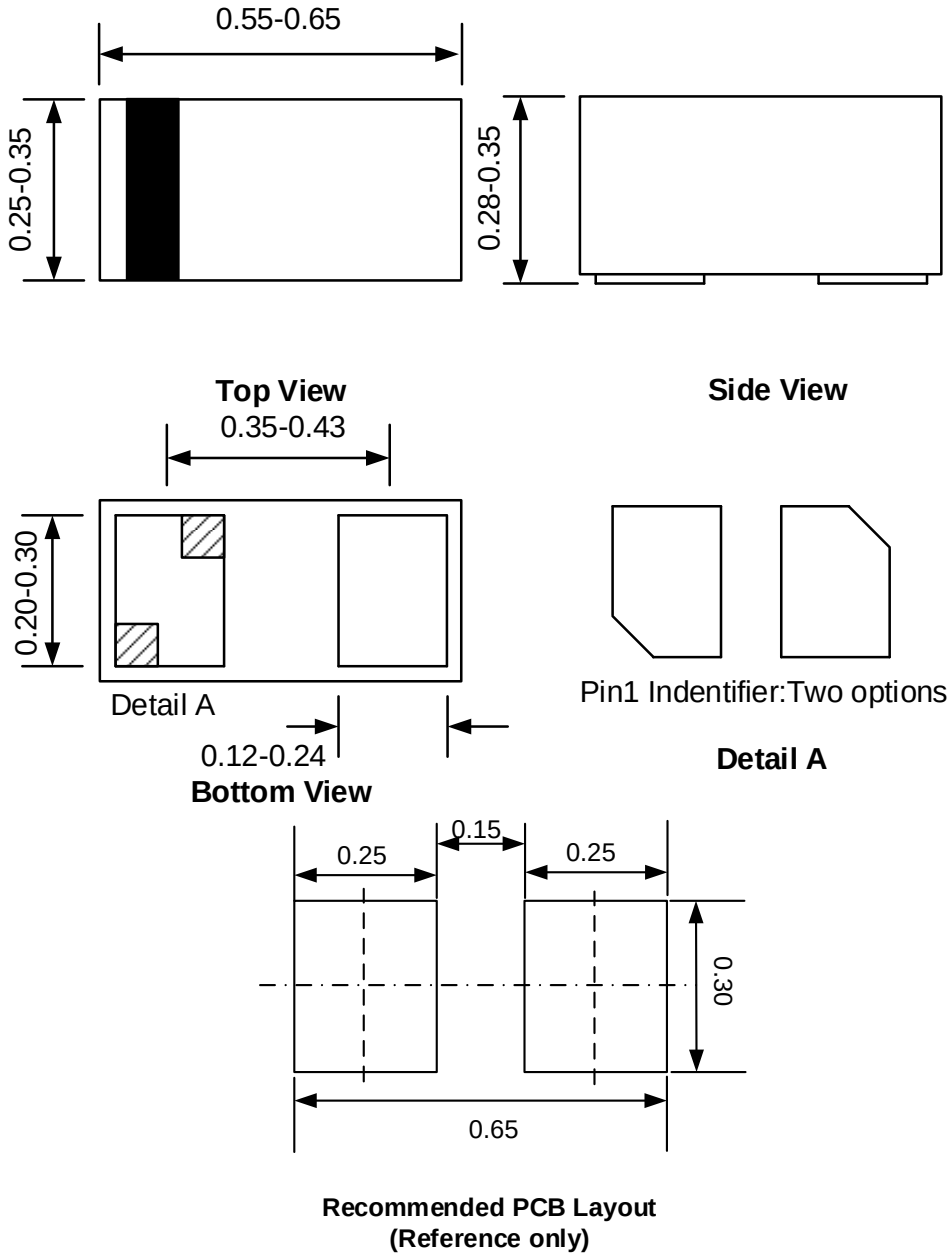
Figure 2. ESD/Surge Protection Circuit

PCB Layout Guidelines

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

- Place the SY205238 as close to the connector or terminal ports as possible.
- Use a large via to connect the SY205238 ground pin to the board ground layer.
- Avoid running signals near board edges.
- The SY205238 should be placed close to the protected line.
- The distance between the SY205238 ground pin and the board GND reference path should be as short as possible to minimize the ESD transient return path.

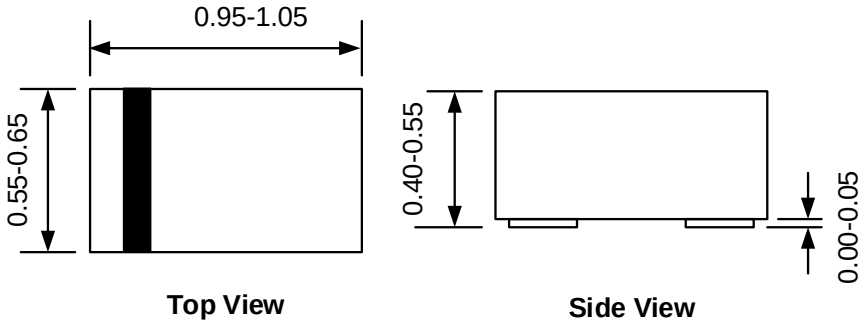
DFN0.6×0.3-2 Package Outline Drawing



Recommended PCB Layout
(Reference only)

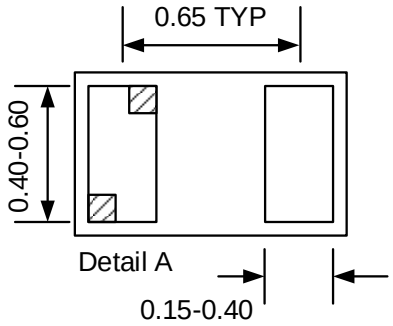
Note: *All dimensions are in millimeters and exclude mold flash and metal burr.*

DFN1.0×0.6-2 Package Outline Drawing

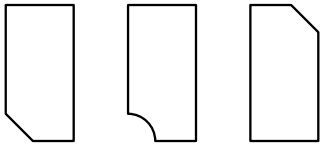


Top View

Side View

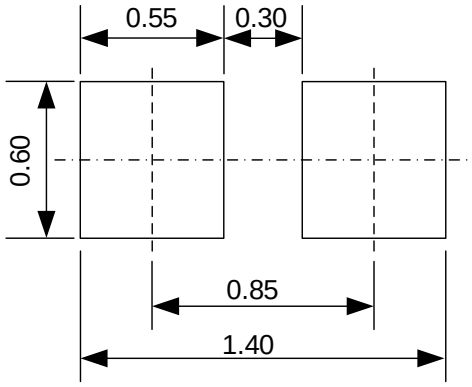


Bottom View



Pin1 Identifier: 3 options

Detail A



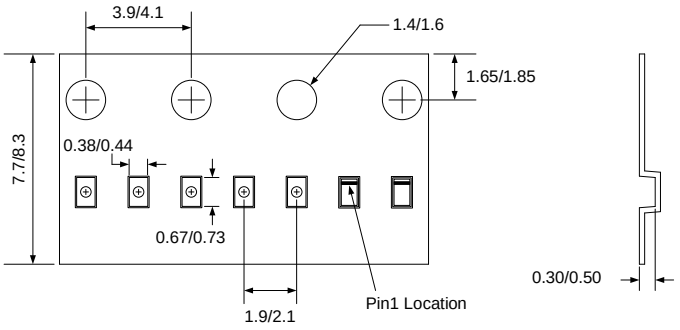
Recommended PCB Layout
(Reference only)

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

Tape and Reel Specification

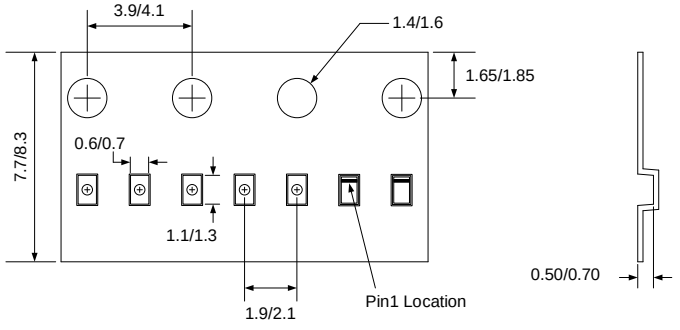
Tape Dimensions and Pin 1 Orientation

DFN0.6×0.3-2



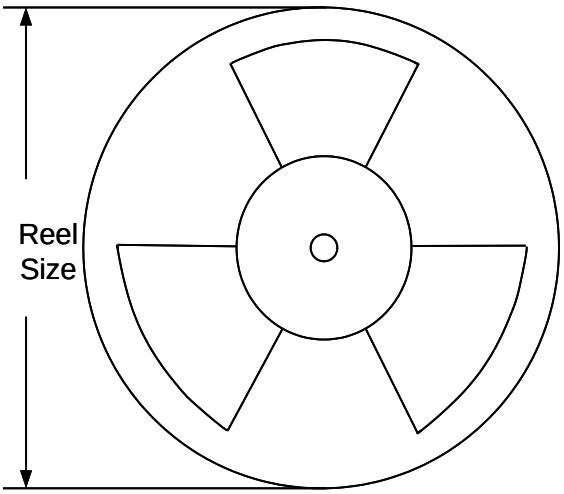
Feeding direction ⟶

DFN1.0×0.6-2



Feeding direction ⟶

Reel Dimensions



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

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	08/01/2023	Initial Release	
1.0	06/02/2025	Production Release. Language Improvement for clarity	

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