

General Description

SY205205 is a low-capacitance transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for data interfaces. With typical capacitance of 25pF, SY205205 is designed to protect against over-voltage and over-current transient events. It complies with IEC61000-4-2 (ESD) ($\pm 30\text{kV}$ air, $\pm 30\text{kV}$ contact discharge), IEC61000-4-5 (surge) (16A, 8/20 μs).

Each SY205205 device can protect one data line.

Features

- Transient Protection for data Lines
 - IEC61000-4-2 (ESD) $\pm 30\text{kV}$ (air) $\pm 30\text{kV}$ (contact)
 - IEC61000-4-5 (surge) 16A (8/20 μs)
- For Operating Voltage of 3.3V and Below
- Package Optimized for data Lines
- Small Package:
DFN1.0x0.6-2/SOD523/DFN0.6x0.3-2
- Protects One Data Line
- Capacitance: 25pF
- Low Leakage Current 0.01 μA @ V_{RWM} (typical)
- Low Clamping Voltage
- Each I/O pin withstands over 1000 ESD strikes for $\pm 8\text{kV}$ contact discharge.

Applications

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

Mechanical Characteristics

- Package: DFN1.0x0.6-2/SOD523/DFN0.6x0.3-2
- Marking: Device Code, Date code
- Packaging: Tape and Reel

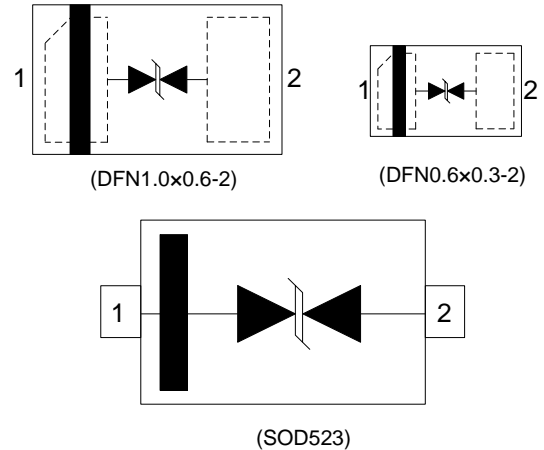
Circuit Diagram



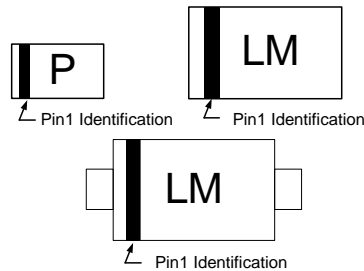
Ordering Information

| Part Number | Package Type | Top Mark |
|-------------|---|----------|
| SY205205DXC | DFN0.6x0.3-2 RoHS Compliant and Halogen Free | P |
| SY205205DWC | DFN1.0x0.6-2 RoHS Compliant and Halogen Free | LM |
| SY205205ANC | SOD523 RoHS Compliant and Halogen Free | LM |

Pinout (Top View)



Marking Codes



Note 1: “P”, “L” is device code, fixed.

Note 2: “M” is date code, from 1 to 0, A to Z

| Absolute Maximum Rating | | | | |
|-------------------------------------|-----------|-----|------|------|
| Parameter | Symbol | Min | Max | Unit |
| Maximum Peak Pulse Current (8/20μs) | I_{PP} | | 16 | A |
| Maximum Peak Pulse Power (8/20μs) | P_{PK} | | 155 | W |
| ESD per IEC 61000-4-2 (Air) | V_{ESD} | -30 | 30 | kV |
| ESD per IEC 61000-4-2 (Contact) | | | | |
| Operating Temperature | T_{OPT} | -40 | +85 | °C |
| Storage Temperature | T_{STG} | -55 | +150 | °C |

| Electrical Characteristics $T_A = 25^\circ\text{C}$ | | | | | | |
|---|-----------------|---|------|------|-----|------|
| 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 | $V_R = 3.3\text{V}$ | | 0.01 | 0.1 | μA |
| Reverse Breakdown Voltage @ I_T | V_{t1} | $I_T = 10\text{mA}$ | 3.7 | | | V |
| Clamping Voltage @ I_{PP} | $V_C (1)$ | $I_{PP} = 16\text{A}$, $t_p = 10/100\text{ns}$ | | 6 | | V |
| Clamping Voltage @ I_{PP} | $V_C (1)$ | $I_{PP} = 16\text{A}$, $t_p = 8/20\mu\text{s}$ | | | 10 | V |
| Dynamic Resistance | $R_{DYN} (1,2)$ | $t_p = 10/100\text{ns}$ | | 0.17 | | Ω |
| Parasitic Capacitance | $C_{ESD} (1)$ | $V_R = 0\text{V}$, $f = 1\text{MHz}$ | | 25 | 30 | pF |

Note 1: The device is not guaranteed to function outside its operating conditions.

Note 2: R_{DYN} calculated based on $I_{PP}=8\text{A}$ to $I_{PP}=16\text{A}$, $t_p = 10/100\text{ns}$.

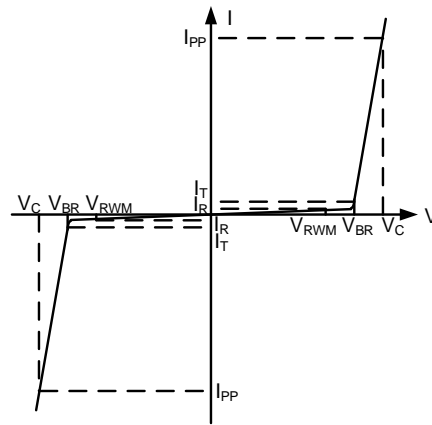
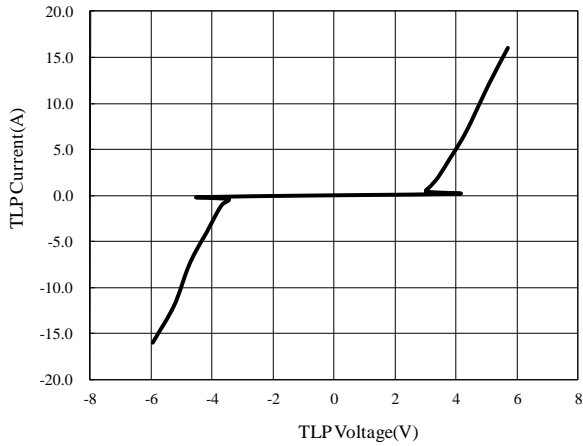


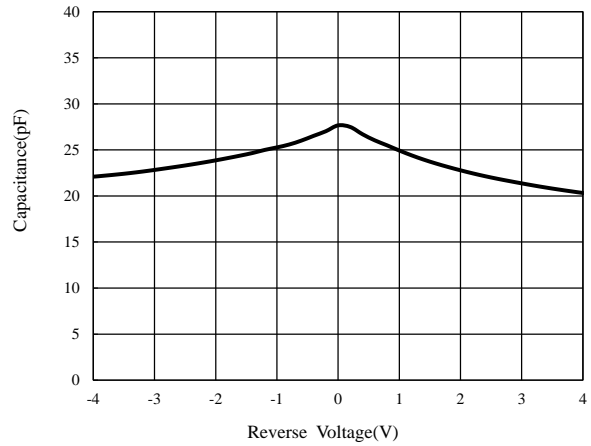
Figure 1. Bi-Directional TVS

Typical Characteristics

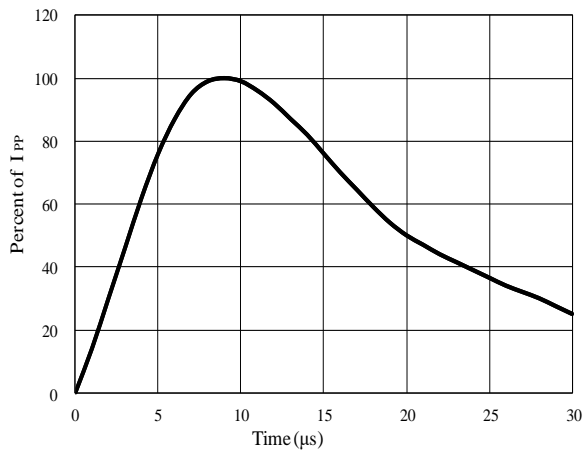
TLP Testing of I/O to I/O



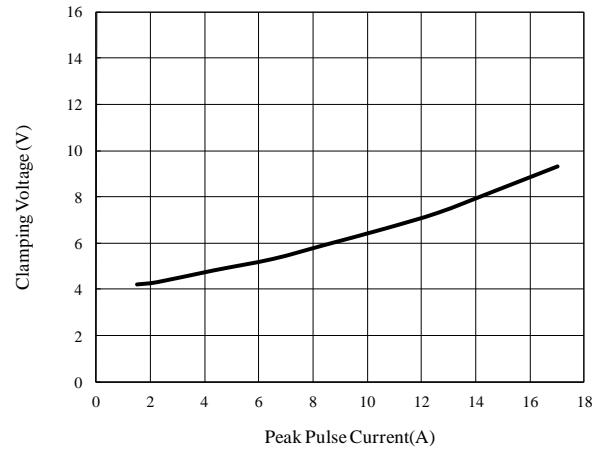
Capacitance vs. Voltage of I/O to I/O



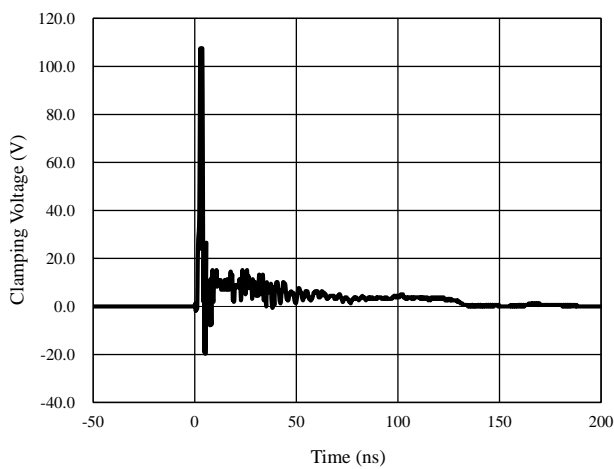
Pulse Waveform



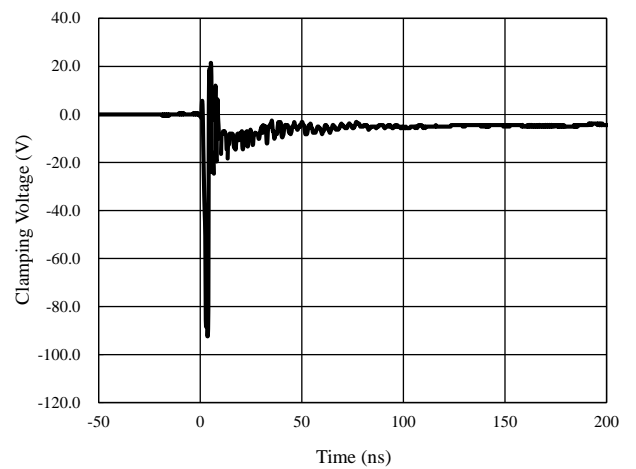
Clamping Voltage vs. Peak Pulse Current (8/20µs)



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



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



Application Information

The SY205205 protects one bidirectional data line against over-voltage and over-current transient events by clamping it to an acceptable reference.

The SY205205 pin connections are shown in Figure 2. The protected line is connected at Pin1 while Pin2 is connected to GND, which should connect to a ground plane on the board. All path lengths connected to pins of SY205205 should be as short as possible to minimize the parasitic inductance.

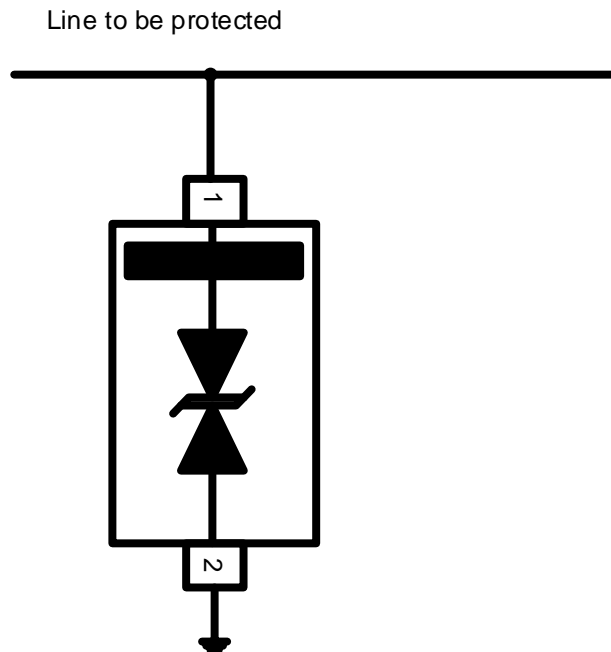


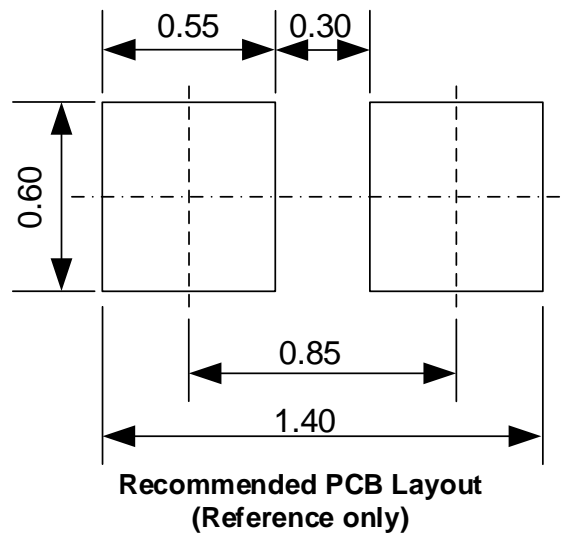
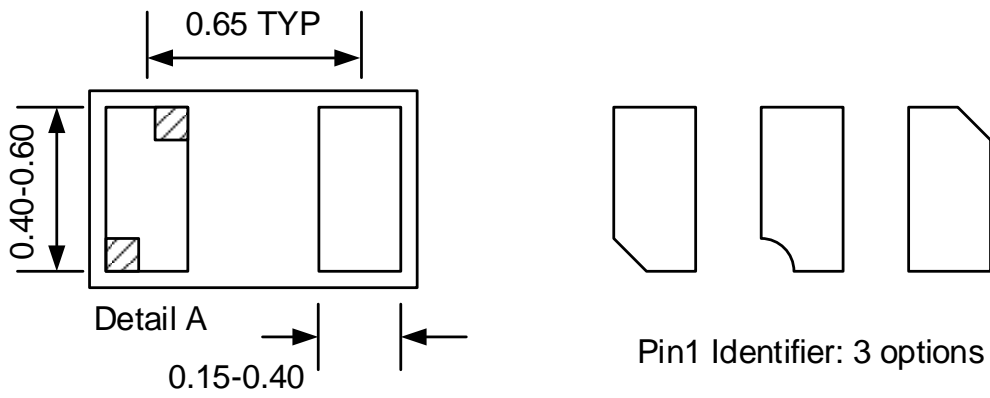
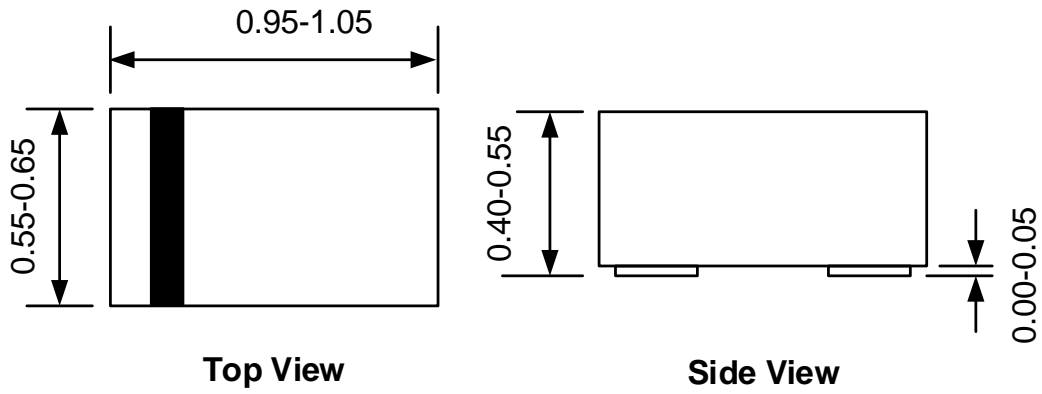
Figure 2. ESD/ Surge Protection Circuit

PCB Layout Guidelines

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

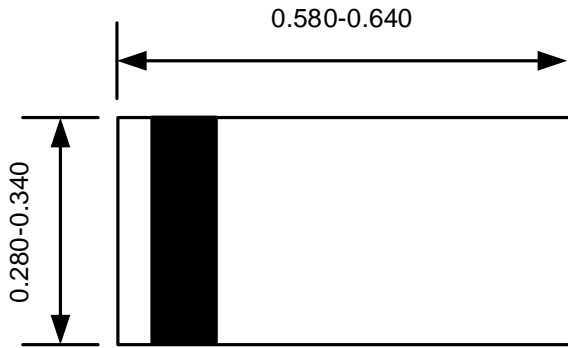
- Place SY205205 as close to the connector or terminal ports as possible.
- Use a large via to connect the SY205205 pin to the ground.
- Avoid running signals near board edges.
- The SY205205 should be placed near the protected line.
- The distance between the SY205205 ground pin and the GND reference path should be as short as possible.

DFN1.0x0.6-2 Package Outline



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

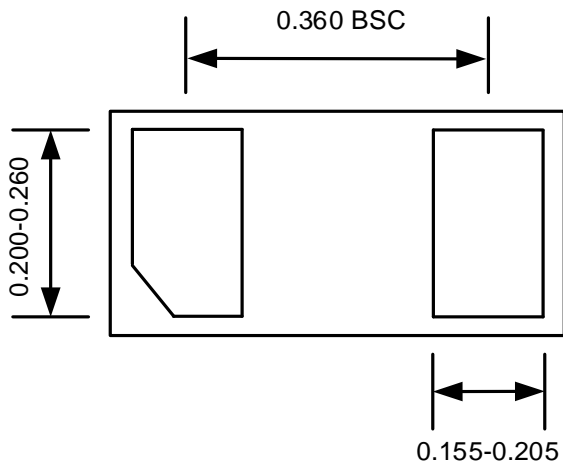
DFN0.6x0.3-2 Package Outline



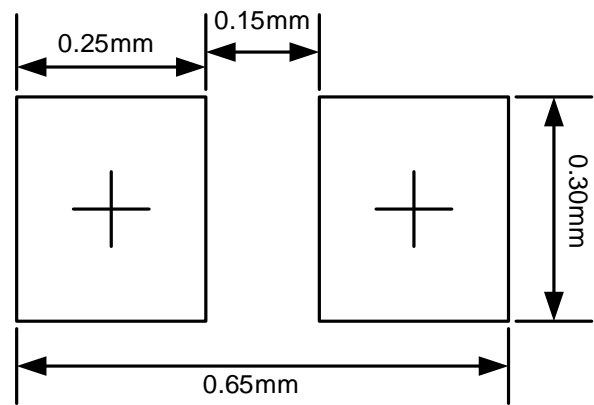
Top View



Side View



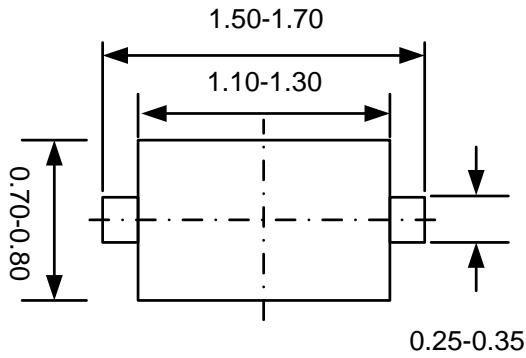
Bottom View



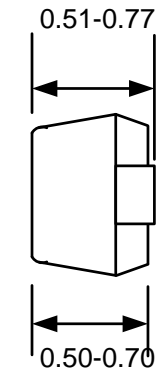
**Recommended PCB Layout
(Reference only)**

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

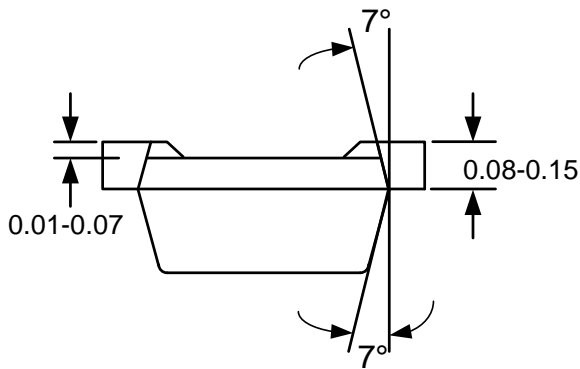
SOD 523 Package Outline



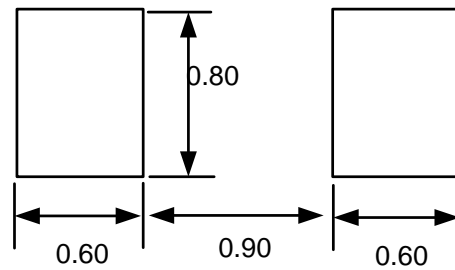
Top View



Side View



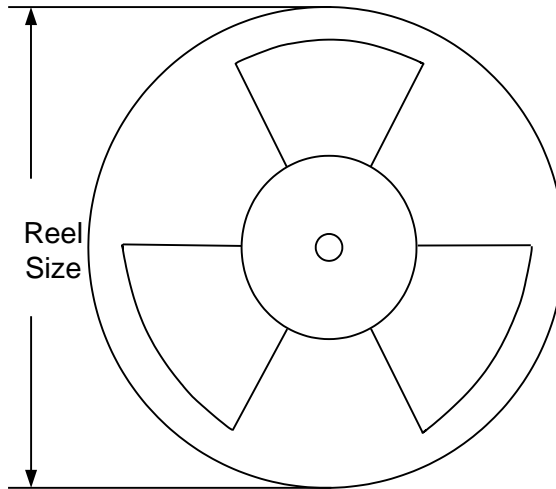
Side View



**Recommended PCB Layout
(Reference only)**

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

Carrier Tape & Reel Specification for Packages



| Package Types | Tape Width (mm) | Pocket Pitch(mm) | Reel Size (Inch) | Qty per Reel (pcs) |
|---------------|-----------------|------------------|------------------|--------------------|
| DFN1.0x0.6-2 | 8 | 2 | 7" | 10000 |
| DFN0.6x0.3-2 | 8 | 2 | 7" | 10000 |
| SOD523 | 8 | 2 | 7" | 8000 |

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 | 08/29/2019 | Initial Release | |
| 1.0 | 08/29/2020 | Production Release | |
| 1.0A | 11/8/2023 | V _{t1} min changed from 3.4V to 3.7V | 2 |

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