

### General Description

SY205210DHC is a low-capacitance transient voltage suppressor (TVS) array designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 3.0pF, the SY205210DHC is designed to protect against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD) ( $\pm 30\text{kV}$  air,  $\pm 30\text{kV}$  contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 $\mu\text{s}$ ), IEC 61000-4-5 (surge) (40A, 8/20 $\mu\text{s}$ ).

The combined features of low capacitance and high ESD robustness makes SY205210DHC ideal for high-speed data port and high-frequency line (e.g., Gigabit Ethernet ports) applications. The low clamping voltage of the SY205210DHC guarantees a minimum stress on the protected IC. The “flow-through” design minimizes trace inductance and reduces voltage overshoot associated with ESD events.

Each SY205210DHC device can protect two high-speed line pairs. The SY205210DHC is available in a compact DFN3.0x2.0-10 package.

### Features

- 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) 40A (8/20 $\mu\text{s}$ )
- Package Optimized for High-Speed Lines
- Provides Protection for Two Line Pairs
- Low Capacitance: 3.0pF @ 0V (typical)
- Low Leakage Current: 0.1 $\mu\text{A}$  @  $V_{RWM}$  (typical)
- Low Operating and Clamping Voltage

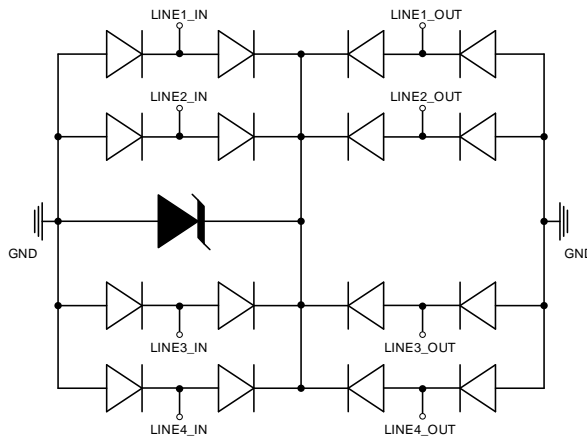
### Applications

- 10/100/1000M Ethernet Ports
- WAN/LAN Equipment
- Desktops, Servers, and Notebooks
- Mobile Phones
- Switching Systems
- Audio/Video Inputs

### Mechanical Characteristics

- DFN3.0x2.0-10 Package
- Marking: Device code, Date code
- Packaging: Tape and Reel

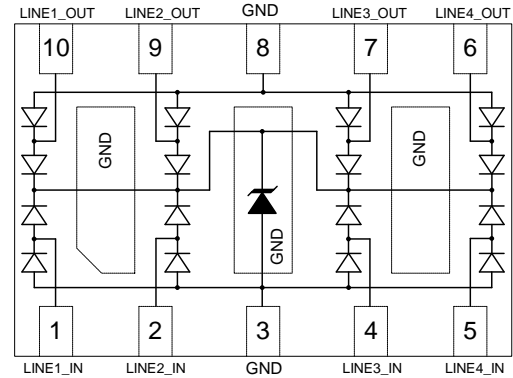
### Circuit Diagram



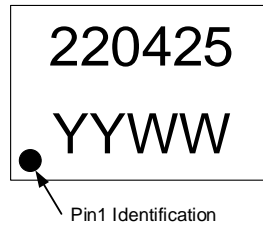
## Ordering Information

Part Number	Package Type	Top Mark
SY205210DHC	DFN3.0x2.0-10 RoHS Compliant and Halogen Free	220425YYWW

## Pinout (Top View)



## Marking Codes



**Note 1:** “220425” is device code, fixed.

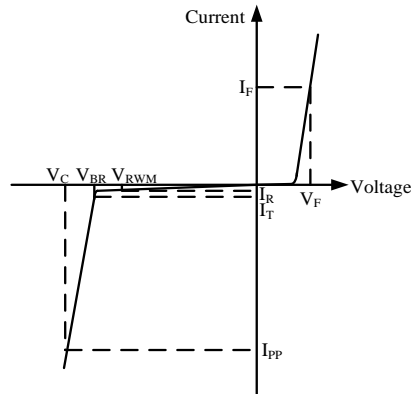
**Note 2:** “YYWW” is date code.

Absolute Maximum Rating				
Parameter	Symbol	Min	Max	Unit
Maximum Peak Pulse Current (8/20 $\mu$ s)	$I_{PP}$		40	A
Maximum Peak Pulse Power (8/20 $\mu$ s)	$P_{PK}$		1000	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	$^{\circ}$ C
Storage Temperature	$T_{STG}$	-55	+150	$^{\circ}$ C

Electrical Characteristics $T_A = 25^{\circ}$ C						
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Nominal Reverse Working Voltage	$V_{RWM}$				2.5	V
Reverse Leakage Current @ $V_{RWM}$	$I_R$	$V_{RWM} = 2.5V, T = 25^{\circ}$ C		0.1	1.0	$\mu$ A
Reverse Breakdown Voltage @ $I_T$	$V_{t1}$	$I_{t1} = 1\mu$ A	3.0	3.7	4.5	V
Forward Voltage @ $I_F$	$V_h$	$I_h = 1mA$	3.0		4.0	V
Clamping Voltage @ $I_{PP}$	$V_C (1)$	Any I/O to Ground $I_{PP} = 1A, t_p = 8/20\mu$ s			4.5	V
Clamping Voltage @ $I_{PP}$	$V_C (1)$	Any I/O to Ground $I_{PP} = 10A, t_p = 8/20\mu$ s			7.5	V
Clamping Voltage @ $I_{PP}$	$V_C (1)$	Any I/O to Ground $I_{PP} = 25A, t_p = 8/20\mu$ s			12.0	V
Clamping Voltage @ $I_{PP}$	$V_C (1)$	Line-to-Line/Line-to-GND, two I/O pins connected together on each line. $I_{PP} = 40A, t_p = 8/20\mu$ s			20.0	V
Dynamic Resistance	$R_{DYN} (1,2)$	$t_p = 10/100ns$ From I/O to GND		0.19		$\Omega$
Parasitic Capacitance	$C_{ESD} (1)$	Between I/O Pins and Ground $V_R = 0V, f = 1MHz$		3.0	4.0	pF
Parasitic Capacitance	$C_{ESD} (1)$	Between I/O Pins $V_R = 0V, f = 1MHz$		1.5	2.0	V

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

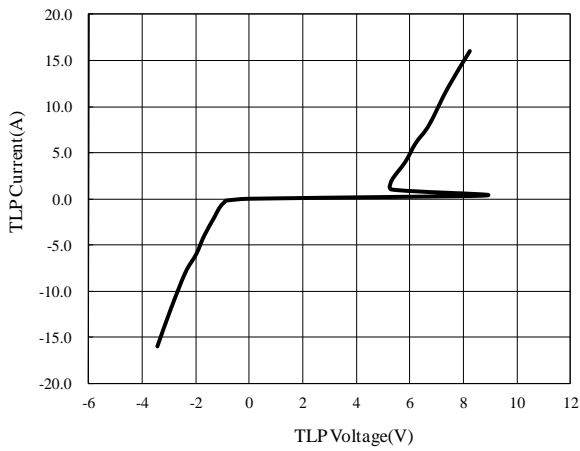
**Note 2:**  $R_{DYN}$  calculated based on  $I_{PP}=8A$  to  $I_{PP}=16A$ ,  $t_p = 10/100ns$ .



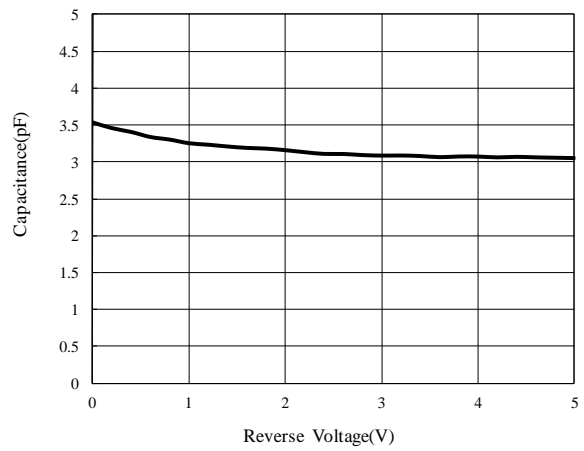
**Figure 1. Uni-Directional TVS**

## Typical Characteristics

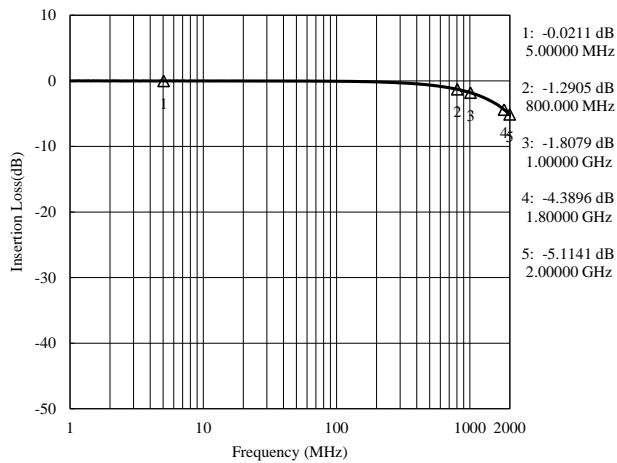
### TLP Testing of I/O to GND



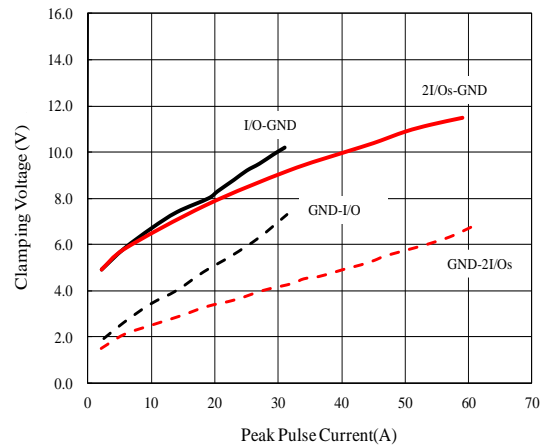
### Capacitance vs. Voltage of I/O to GND



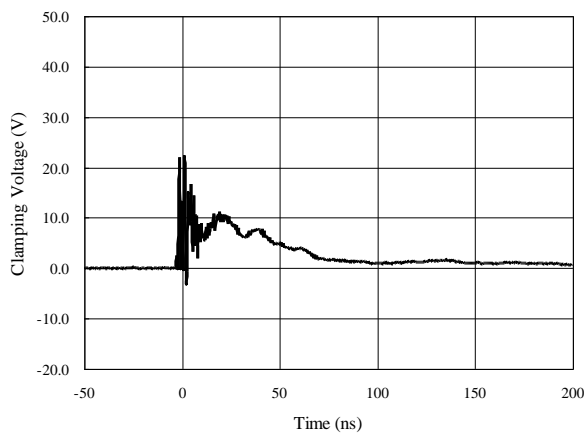
### Insertion Loss S21



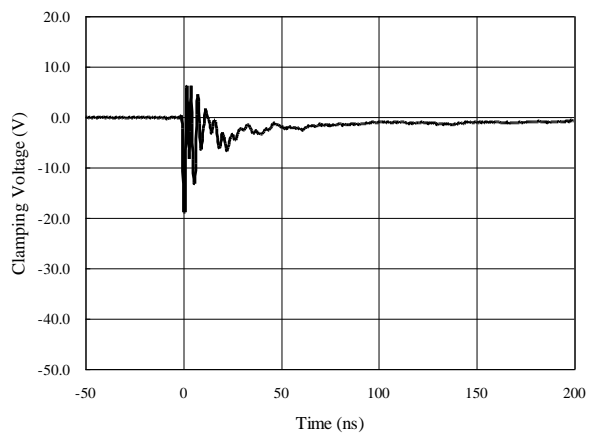
### Clamping Voltage vs. Peak Pulse Current (8/20µs)



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



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



## Application Information

The SY205210DHC is designed to protect equipment from damage caused by transient events including ESD, EFT, and lightning strikes. This device can be connected as shown below to meet the requirements for common-mode and differential-mode protection:

### Gigabit Ethernet Protection

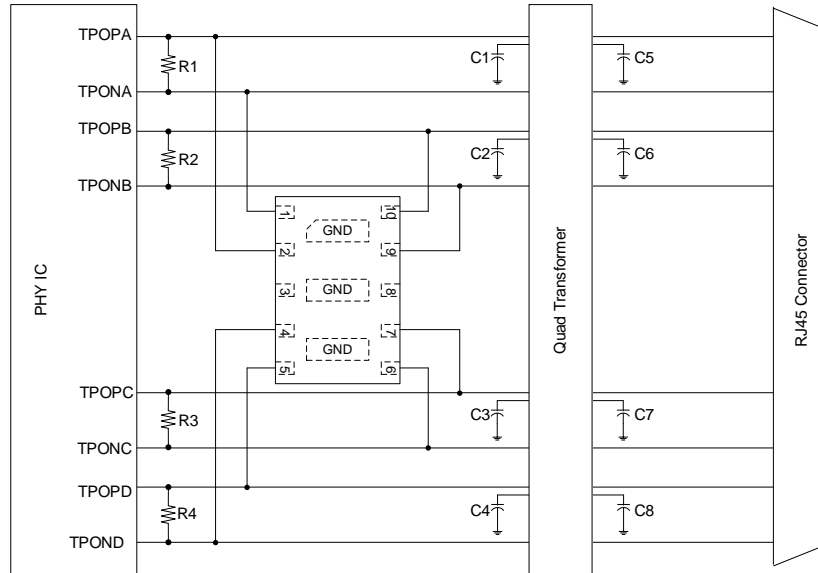


Figure 2. Schematic Diagram for Gigabit Ethernet ESD/Surge Protection using SY205210DHC

**Note:** Connect Pin3, Pin8 and all GND pins of SY205210DHC to the ground plane.

### Gigabit Ethernet Protection (Continued)

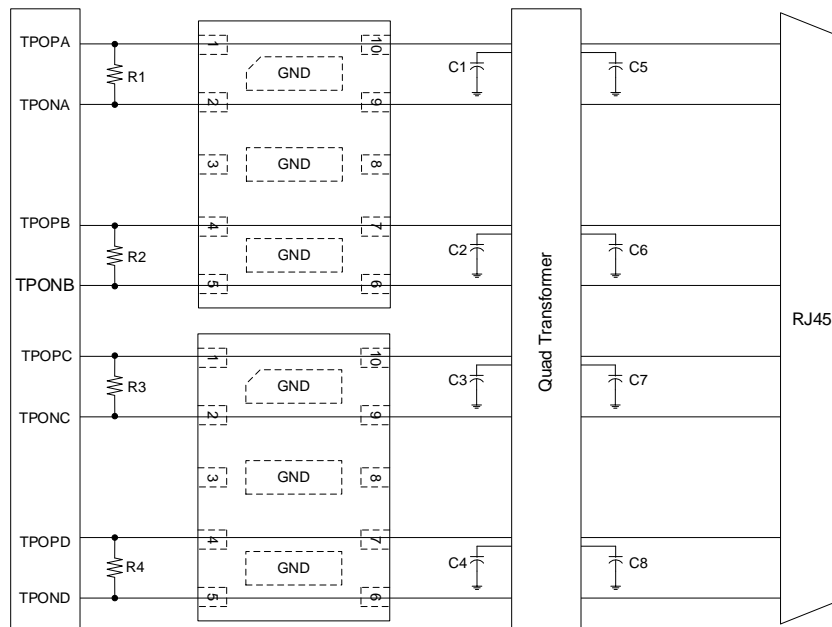
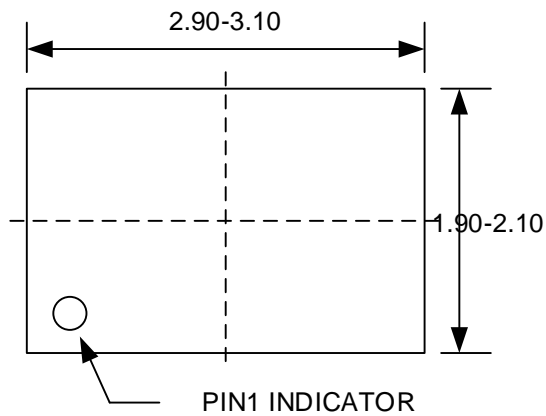


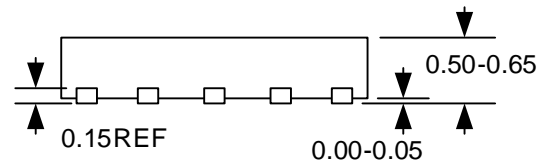
Figure 3. Schematic Diagram for Gigabit Ethernet ESD/Surge Protection using SY205210DHC

**Note:** Connect Pin3, Pin8 and all GND pins of SY205210DHC to the ground plane.

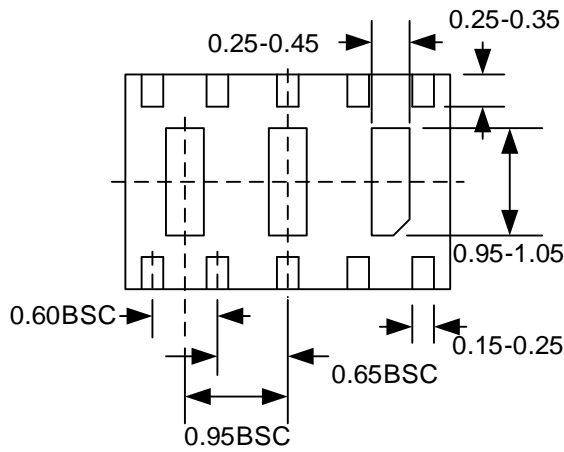
## DFN3.0x2.0-10 Package Outline



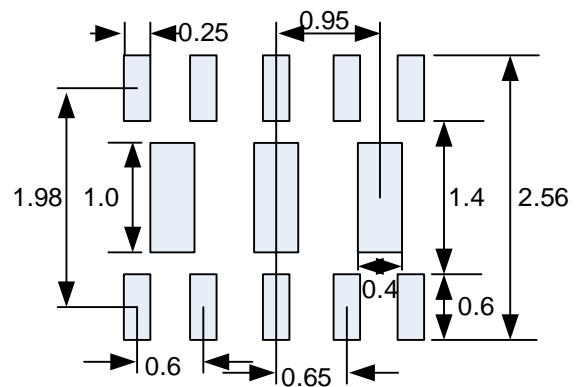
**Top View**



**Side View**



**Bottom View**

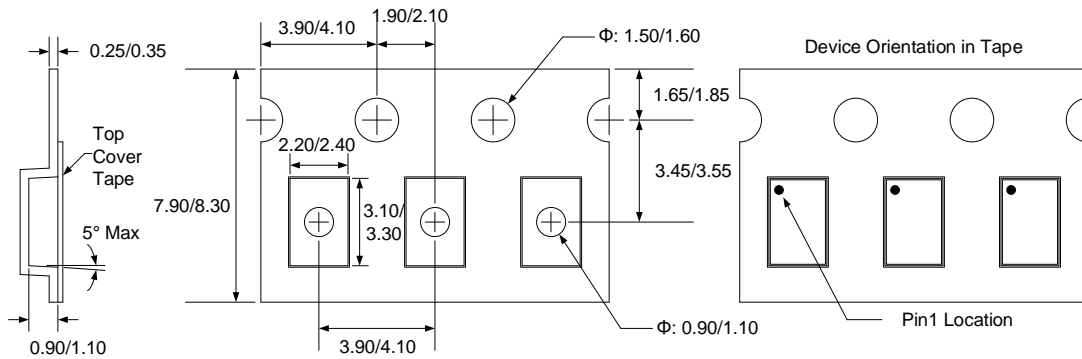


**Recommended PCB Layout  
(Reference only)**

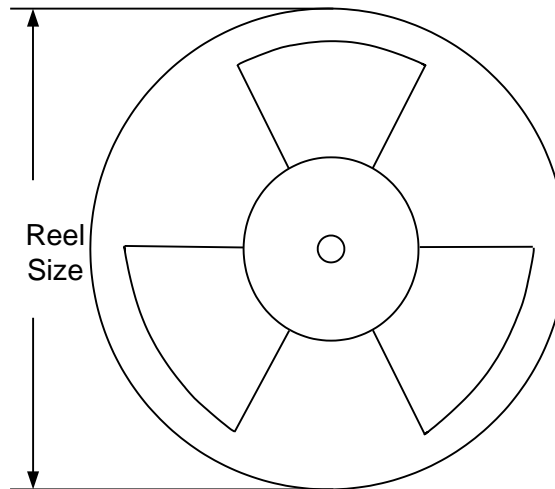
**Note:** All dimensions are in millimeters and exclude mold flash and metal burr.

## Tape and Reel Specification

### DFN3.0x2.0-10 Taping Orientation



### Carrier Tape & Reel Specification for Packages



Package Types	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
DFN3.0x2.0-10	8	4	7"	3000



## 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	05/06/2014	Initial Release	
1.0	05/06/2015	Production Release	



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