

## Features

- Transient protection for high-speed data lines  
IEC61000-4-2(ESD)  $\pm 20\text{kV}$  (Air)  
 $\pm 20\text{kV}$ (Contact)  
IEC61000-4-5(Surge) 9A (8/20 $\mu\text{s}$ )
- For 5V and below operating voltage
- Package optimized for high-speed lines
- Ultra-small package (0.6mm\*0.3mm\*0.3mm)
- Protects one data line
- Ultra Low capacitance: 0.2pF
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge

## Description

SYT21A05DXC is an ultra-low capacitance transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.2pF only, SYT21A05DXC is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC61000-4-2 (ESD) ( $\pm 20\text{kV}$  air,  $\pm 20\text{kV}$  contact discharge), IEC61000-4-5 (Surge) (9A, 8/20 $\mu\text{s}$ ), etc.

SYT21A05DXC uses ultra-small DFN0.6\*0.3-2 package. Each SYT21A05DXC device can protect one high-speed data line. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make SYT21A05DXC ideal for high-speed data ports and high-frequency lines (e.g., USB3.x& DVI) applications. The low clamping voltage of the SYT21A05DXC guarantees a minimum stress on the protected IC.

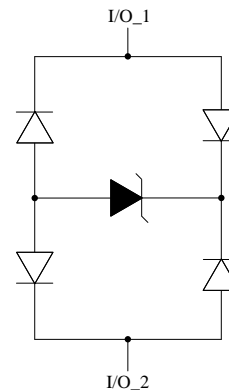
## Applications

- USB Type-C
- USB2.0&3.x
- HDMI 1.3, 1.4, 2.0 and 2.1.
- Serial ATA
- PCI Express
- Desktops, Servers and Notebooks
- Display Ports
- Digital Visual Interfaces (DVI)

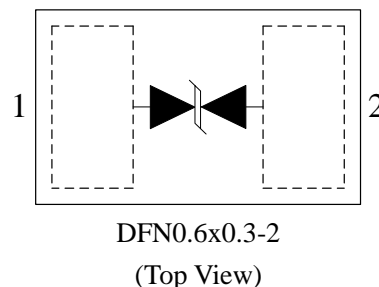
## Mechanical Characteristics

- DFN0.6\*0.3-2 package
- Marking: Device code
- Packaging: Tape and Reel

## Circuit Diagram



## Pin Configuration

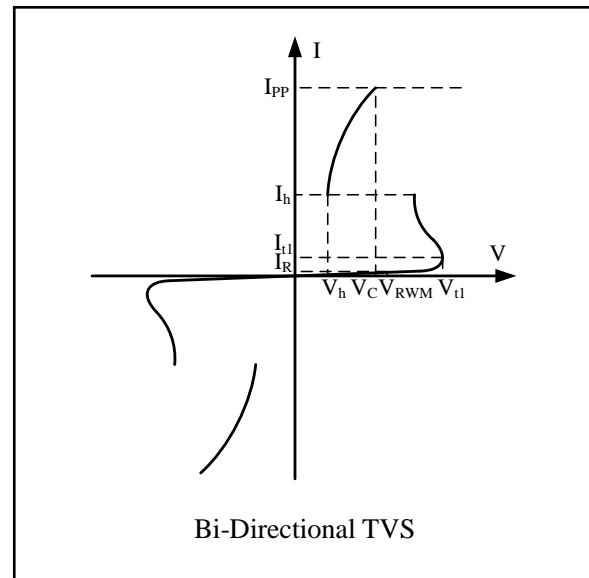


## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Maximum Peak Pulse Current (8/20 $\mu$ s)	9	A
$P_{PK}$	Maximum Peak Pulse Power (8/20 $\mu$ s)	55	W
$V_{ESD}$	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$\pm 20$ $\pm 20$	kV
$T_{OPT}$	Operating Temperature	-40/+85	$^{\circ}$ C
$T_{STG}$	Storage Temperature	-55/+150	$^{\circ}$ C

## Electrical Characteristics ( $T_A = 25^{\circ}$ C)

Symbol	Parameter
$V_{RWM}$	Nominal Reverse Working Voltage
$I_R$	Reverse Leakage Current @ $V_{RWM}$
$V_{t1}$	Reverse Triggering Voltage @ $I_{t1}$
$I_{t1}$	Test Current for Reverse Triggering
$V_h$	Holding Voltage
$I_h$	Holding Current
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$V_R$	Reverse Voltage
f	Small Signal Frequency

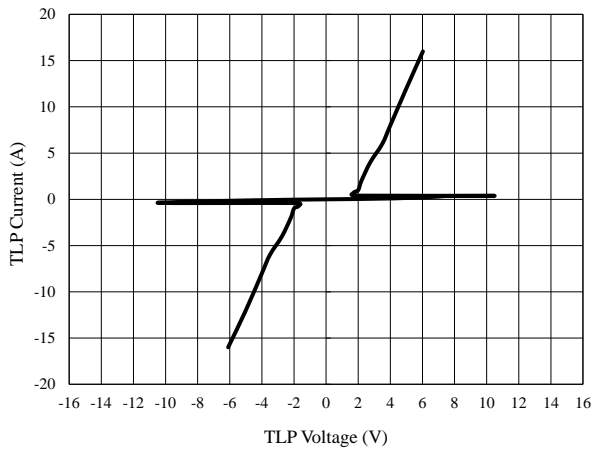


Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$		-5		5	V
$I_R$	$V_R = 5V, T_A = 25^{\circ}$ C		0.1		$\mu$ A
$V_{t1}$	$I_{t1} = 1mA$	5.5	10		V
$V_h$	$I_h = 100mA$	1.2		3	V
$V_C^1$	$I_{PP} = 16A, t_p = 10/100ns$		6		V
$V_C^1$	$I_{PP} = 9A, t_p = 8/20\mu s$		6		V
$R_{DYN}^{1,2}$	$t_p = 10/100ns$		0.23		$\Omega$
$C_{ESD}^1$	$V_R = 1V, f = 1MHz$		0.2	0.25	pF

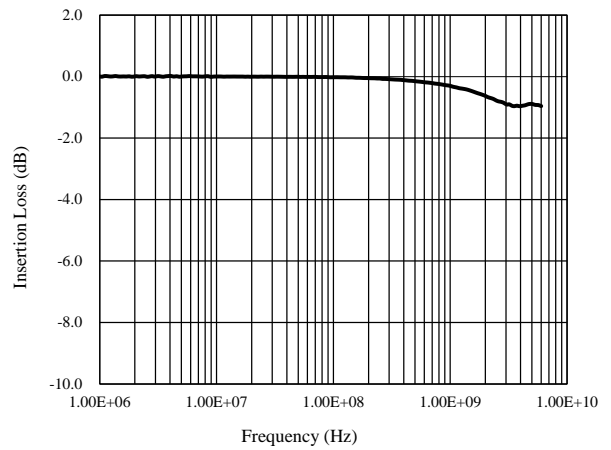
**NOTES** <sup>1</sup>Guaranteed by design and not subject to production test.

<sup>2</sup> $R_{DYN}$  calculated based on  $I_{PP}=8A$  to  $I_{PP}=16A, t_p = 10/100ns$ .

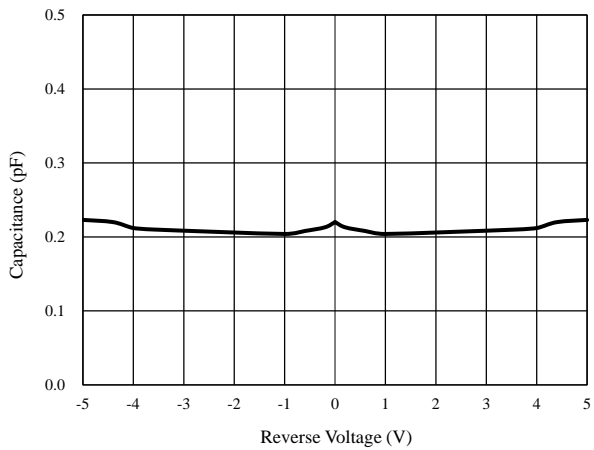
**TLP Testing of I/O to I/O**



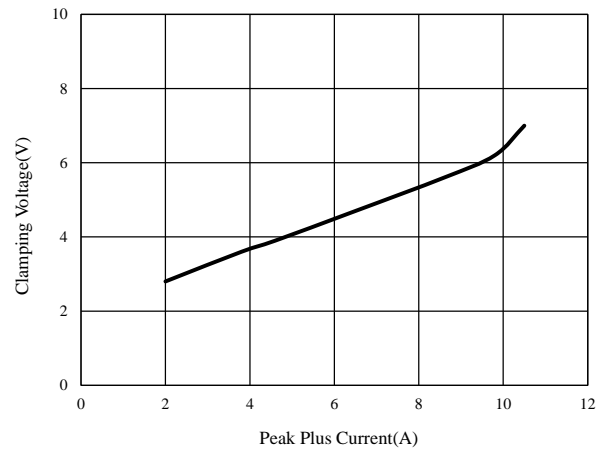
**Insertion Loss S21 of I/O to I/O**



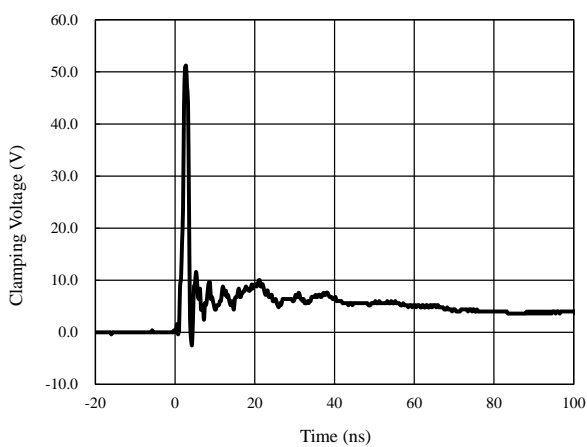
**Capacitance vs. Voltage of I/O to I/O**



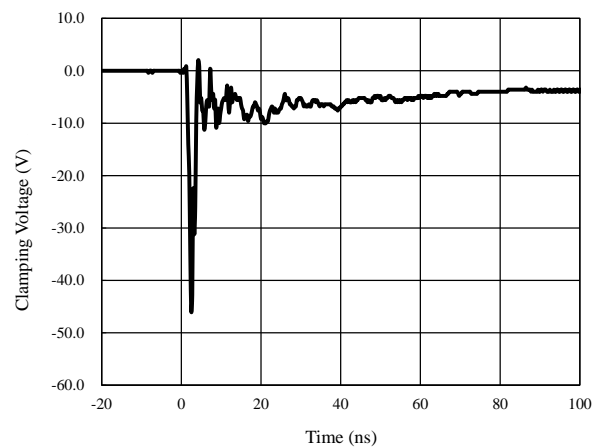
**Clamping Voltage vs. Peak Pulse Current (8/20μs)**



**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)**

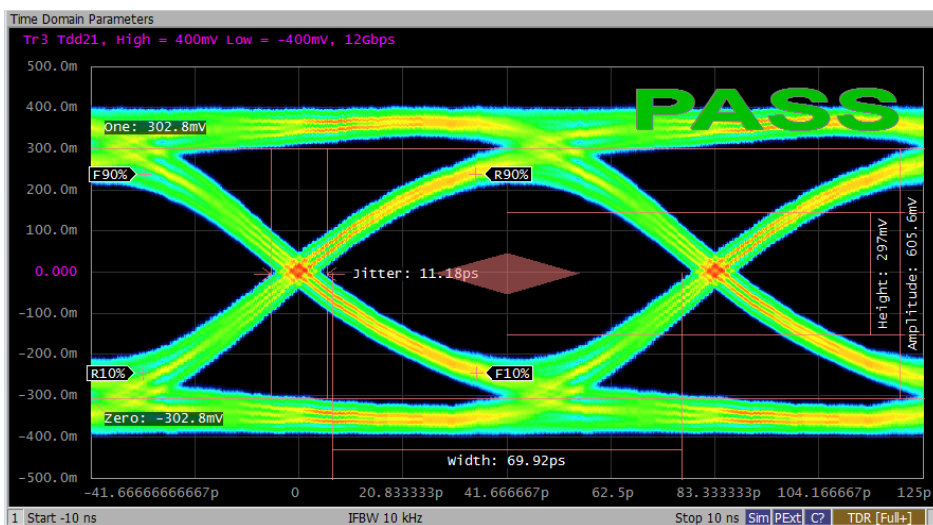




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# SYT21A05DXC

## Eye Diagram Measurement For HDMI2.1



Data rate 12Gb/s

HDMI2.1 Eye Diagram without SYT21A05DXC

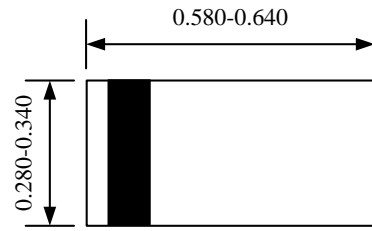


Data rate 12Gb/s

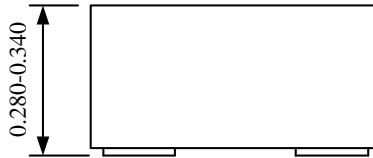
HDMI2.1 Eye Diagram with SYT21A05DXC

## Package Outline

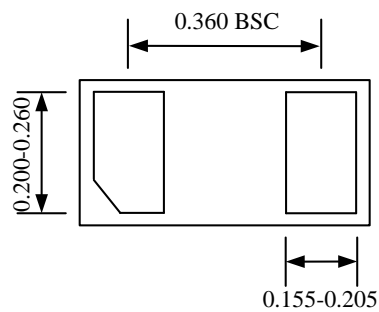
- DFN0.6\*0.3-2 package



Top View



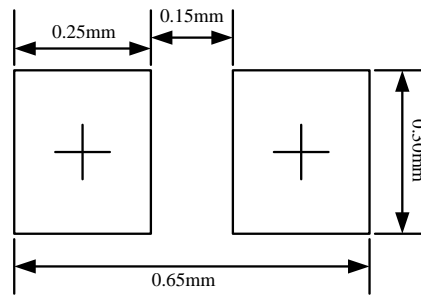
Side View



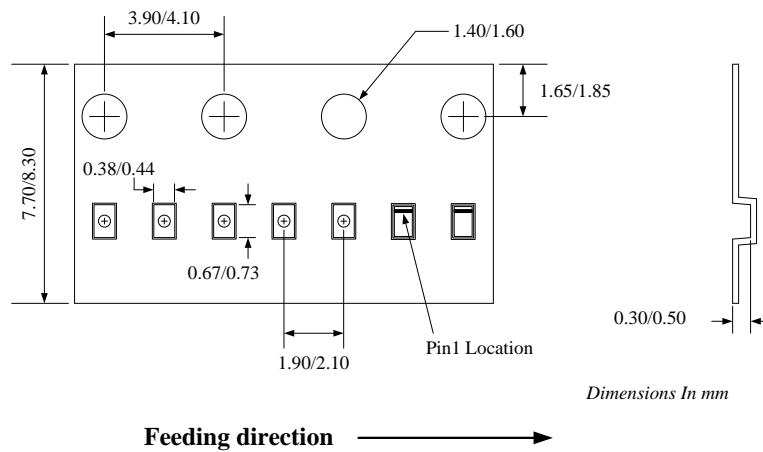
Bottom View

Notes: All dimension in millimeter and exclude mold flash & metal burr.

## PCB Layout Pattern

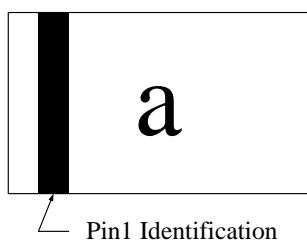


## Tape and Reel Specification



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Qty per reel (pcs)
DFN0.6*0.3-2	8	2	7"	10000

## Marking Codes



## Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
SYT21A05DXC	5V	10,000	7 Inch

### Note:

- (1) "a" is device code, fixed.

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