

### Features

- Transient protection for high-speed data lines  
IEC 61000-4-2 (ESD)  $\pm 15\text{kV}$  (Air)  
 $\pm 15\text{kV}$  (Contact)  
IEC 61000-4-5 (Surge) 3A (8/20 $\mu\text{s}$ )
- For 3.3V and below operating voltage
- Ultra-small package (2.5mm\*1.0mm\*0.55mm)
- Protects four data lines
- Ultra Low capacitance: 0.25pF for each channel
- Low leakage current: 0.1 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Max.)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge
- Pb free & RoHS Compliant

### Description

SYT16S03DVC 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 0.25pF only, SYT16S03DVC is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD) ( $\pm 15\text{kV}$  air,  $\pm 15\text{kV}$  contact discharge), IEC 61000-4-5 (Surge) (3A, 8/20 $\mu\text{s}$ ), etc.

SYT16S03DVC uses small DFN2.5\*1.0-10 package. Each SYT16S03DVC device can protect four high-speed data lines. The combined features of ultra-low capacitance, ultra-small size and high ESD robustness make SYT16S03DVC ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the SYT16S03DVC guarantees a minimum stress on the protected IC.

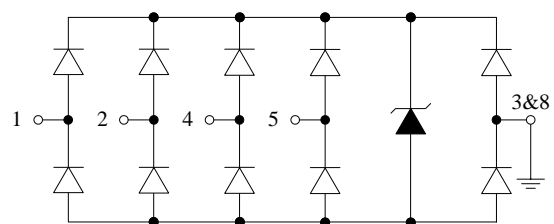
### Applications

- Serial ATA
- PCI Express
- Desktops, Servers and Notebooks
- MDDI Ports
- USB2.0, 3.0 and 3.1
- Display Ports
- HDMI 1.3, 1.4, 2.0 and 2.1.
- Digital Visual Interfaces (DVI)

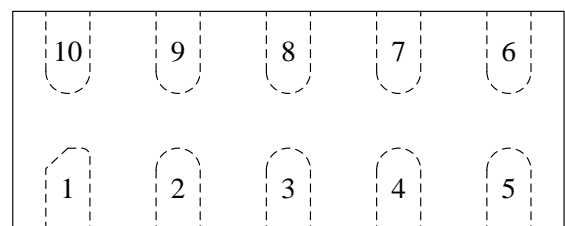
### Mechanical Characteristics

- DFN2.5\*1.0-10 package
- Flammability Rating: UL 94V-0
- Marking: Part number, Date
- Packaging: Tape and Reel

### Circuit Diagram



### Pin Configuration



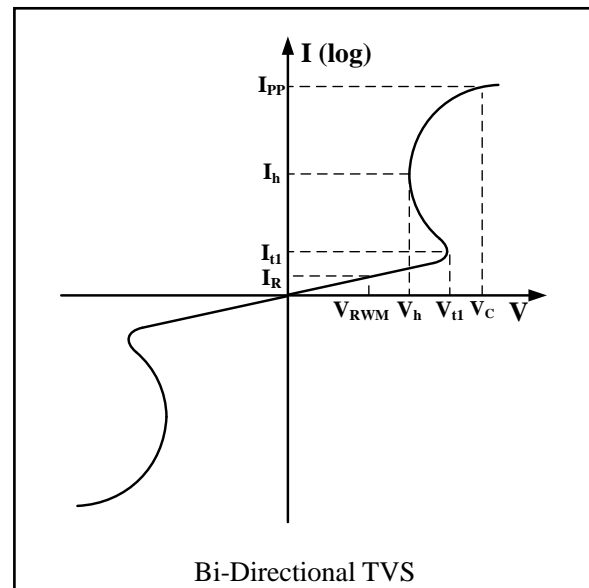
DFN2.5\*1.0-10  
(Top View)

## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Pulse Current (8/20 $\mu$ s)	3	A
$P_{PK}$	Peak Pulse Power (8/20 $\mu$ s)	50	Watts
$V_{ESD}$	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$\pm 15$ $\pm 15$	kV
$T_{OPT}$	Operating Temperature	-40/+125	$^{\circ}$ C
$T_{STG}$	Storage Temperature	-55/+150	$^{\circ}$ C

## Electrical Characteristics (T = 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 @ $I_h$
$I_h$	Test Current for Holding Voltage
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$V_R$	Reverse Voltage
f	Small Signal Frequency



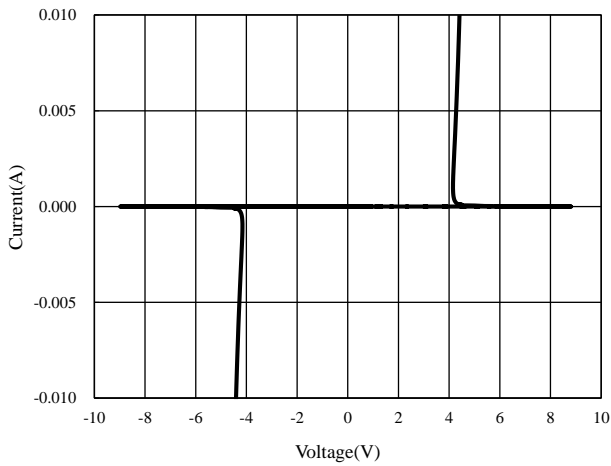
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				3.3	V
$I_R$	$V_{RWM} = 3.3V, T = 25^{\circ}C$ Between I/O and GND		0.01	0.1	$\mu$ A
$V_h$	$I_h = 1mA$ Between I/O and GND	3.7			V
$V_C^1$	$I_{PP} = 3A, t_p = 8/20\mu s$ Between I/O and GND			11	V
$V_C^1$	$I_{PP} = 16A, t_p = 10/100ns$ Between I/O and GND		10		V
$R_{DYN}^{1,2}$	$t_p = 10/100ns$ Between I/O and GND		0.3		$\Omega$
$C_{ESD}^1$	$V_R = 3.3V, f = 1MHz$ Between Any Pins		0.25	0.30	pF

### NOTES

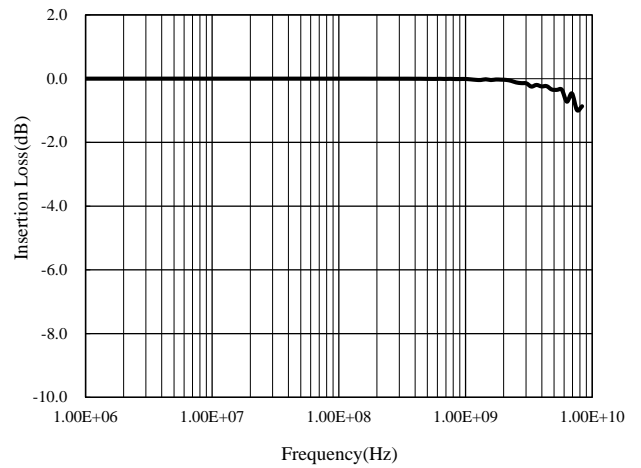
<sup>1</sup>Guaranteed by design and not subject to production test.

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

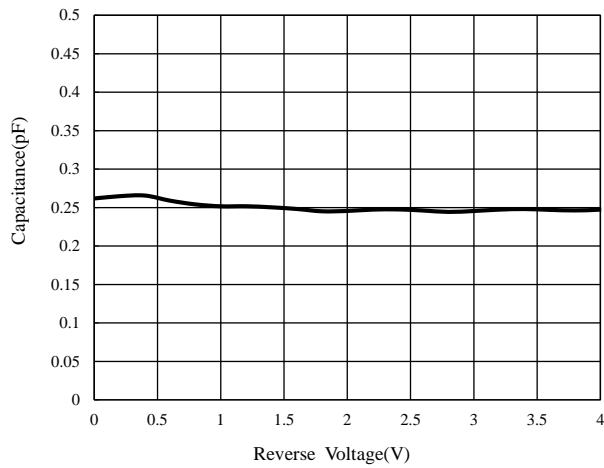
### Current Sweeping of I/O to GND



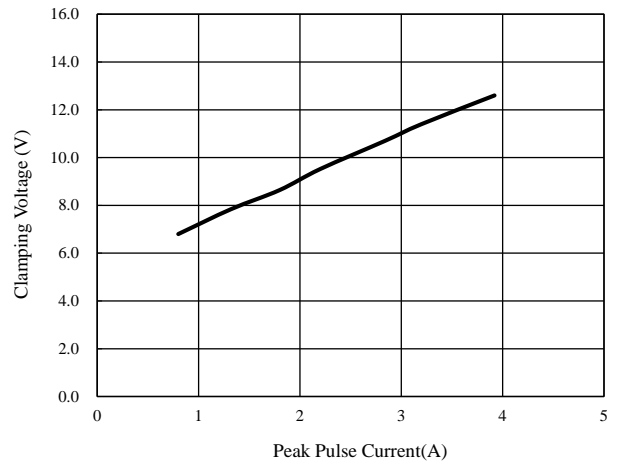
### Insertion Loss S21 of I/O to GND



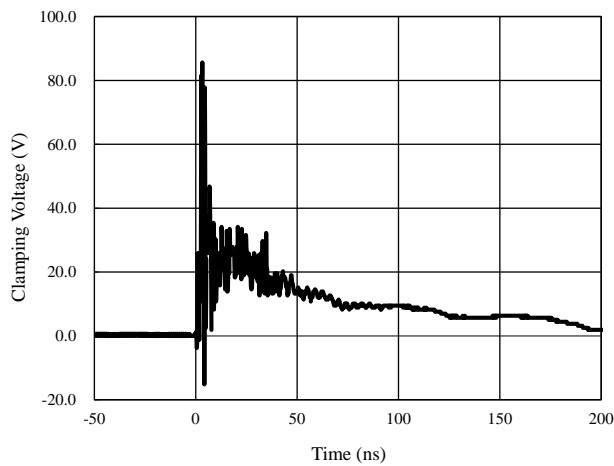
### Capacitance vs. Voltage of I/O to GND



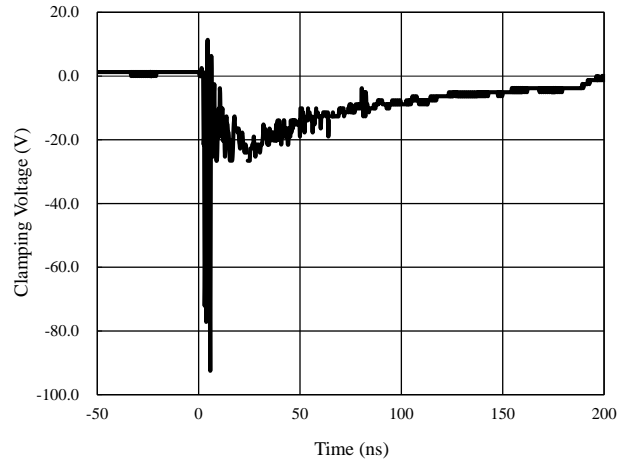
### Clamping Voltage vs. Peak Pulse Current (8/20μs)



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



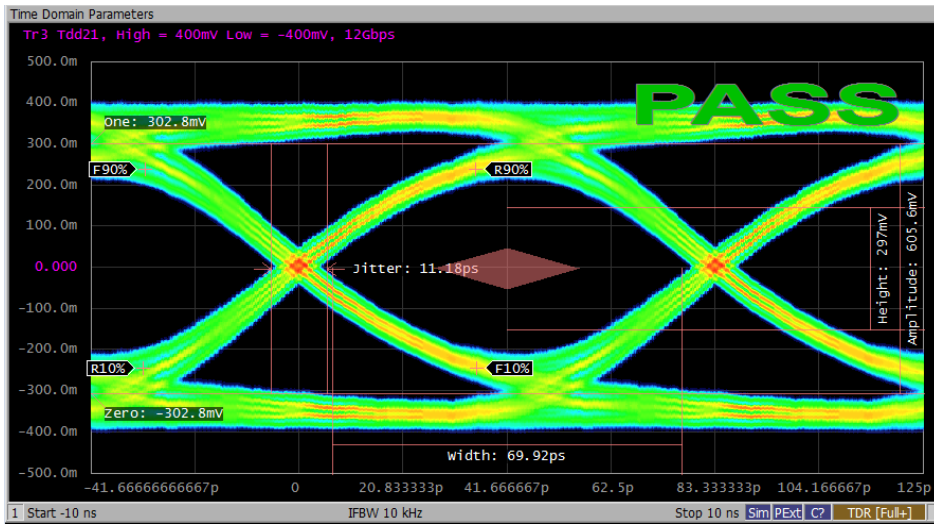
### ESD Clamping of I/O to GND (-8kV Contact per IEC 61000-4-2)





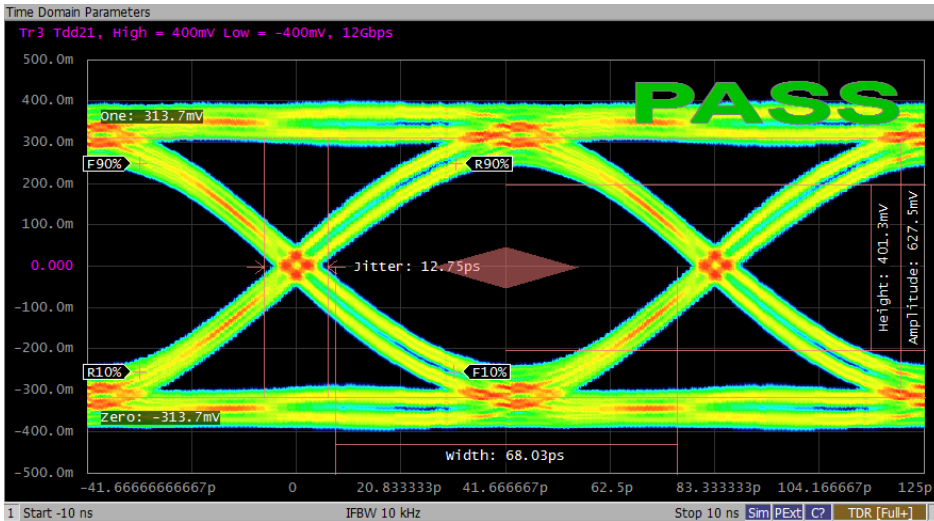
SILERGY

## Eye Diagram Measurement For HDMI2.1



Data rate 12Gb/s

### HDMI2.1 Eye Diagram without SYT16S03DVC



Data rate 12Gb/s

### HDMI2.1 Eye Diagram with SYT16S03DVC

## Application Information

### Pin Connection in PCB

SYT16S03DVC provides ESD protection for four data lines simultaneously. The pin connection is shown in the figure below.

Four parallel data lines, from inner IC to I/O port connector, could connect to SYT16S03DVC four I/O pins directly. Pin 3&8 of SYT16S03DVC is the GND pin, which should connect to the GND of PCB. The wire should be as short as possible in order to minimize the parasitic inductance.

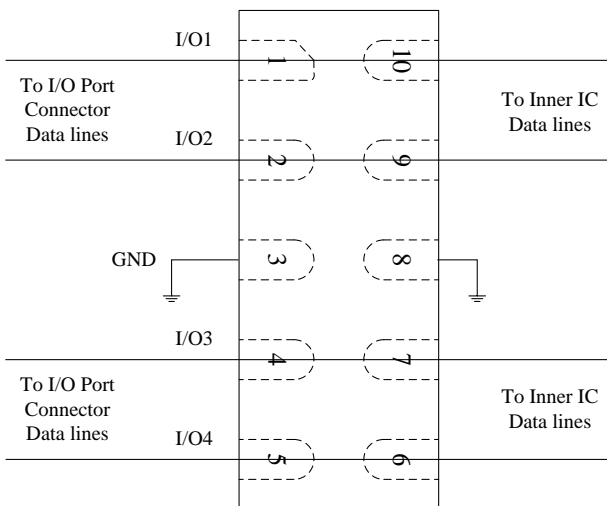


Figure 1 SYT16S03DVC pin connection in PCB

### PCB Layout Guidelines

For optimum ESD protection and the whole circuit performance, the following PCB layout guidelines are recommended:

- SYT16S03DVC GND pin to the PCB GND rail path should be as short as possible. It could reduce the ESD transient return path to GND.
- The vias connecting SYT16S03DVC GND pins to the PCB GND should be wide.
- Place SYT16S03DVC as close to the connector port as possible. It could reduce the parasitic inductance and restrict ESD coupling into adjacent traces.
- Avoid running critical signals near board edges.

## Application Information

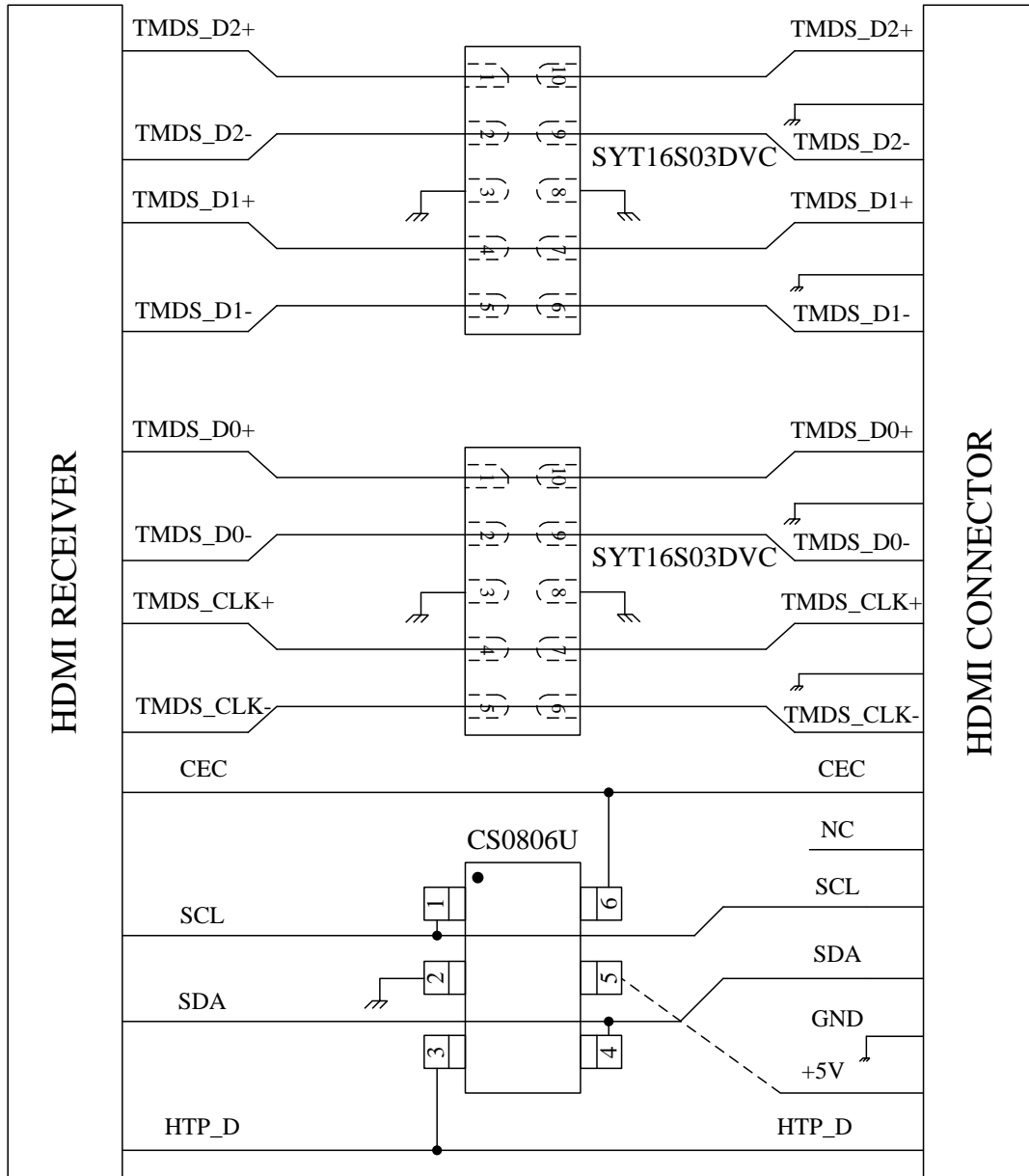
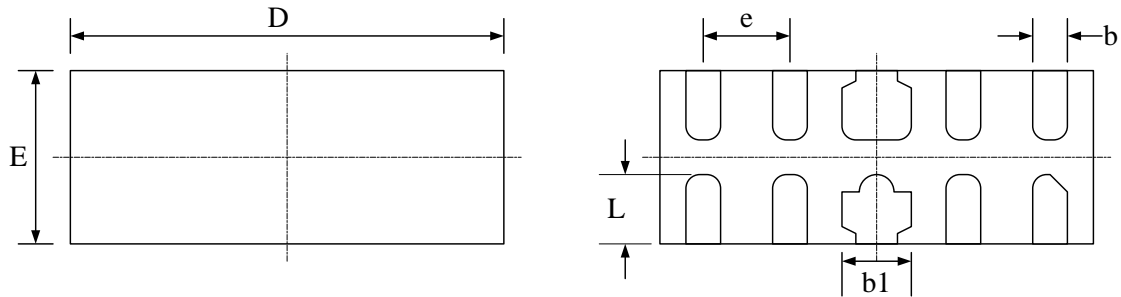


Figure 2 Layout Top View for HDMI Interface with SYT16S03DVC & CS0806U

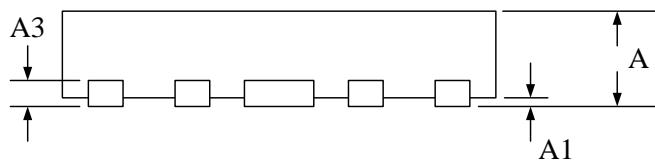
## Package Outline

- DFN2.5\*1.0-10 package



**TOP VIEW**

**BOTTOM VIEW**



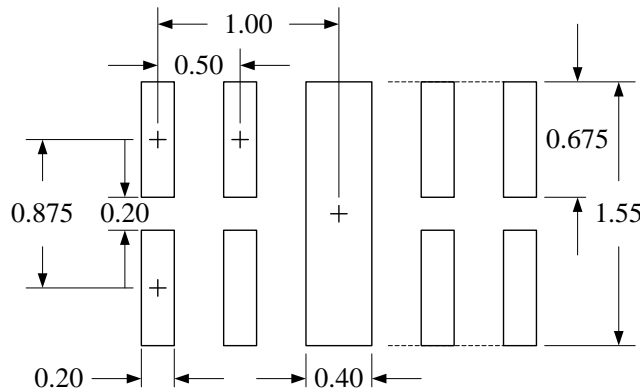
**SIDE VIEW**

Package Dimensions

Symbol	Dimensions (mm)	
	Minimum	Maximum
A	0.450	0.650
A1	0.000	0.050
A3	0.15REF.	
b	0.150	0.250
b1	0.350	0.450
D	2.450	2.550
E	0.950	1.050
e	0.500 BSC	
L	0.300	0.400

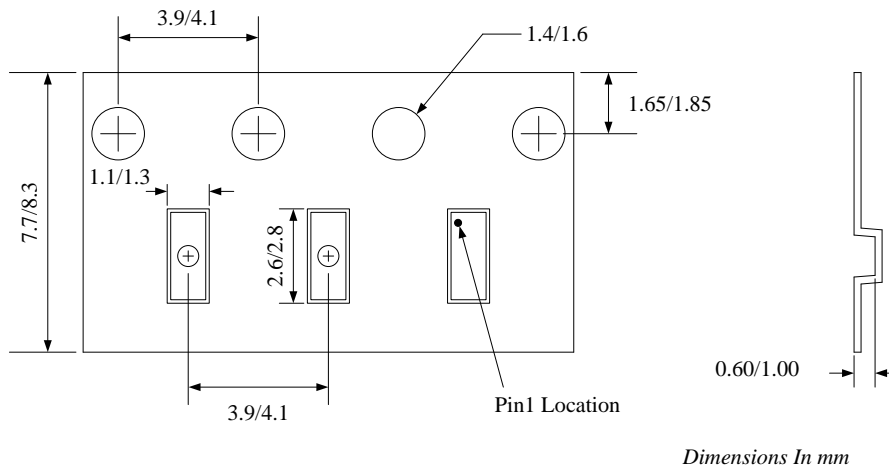
Notes: All dimension in millimeter and exclude mold flash & metal burr.

## PCB Layout Pattern



Notes: All dimension in millimeter

## Tape and Reel Specification



Feeding direction →

Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer * length(mm)	Leader * length (mm)	Qty per reel (pcs)
DFN2.5*1.0-10	8	4	7"	400	400	3000

## Marking Codes



### Note:

- "Ym" is the part number of SYT16S03DVC, fixed.
- "Y" is year code, from 0 to 9, for 2015 "Y" is 5.
- "W" is date code. "W" is the assembly week in a

year, from 1 to 0, A to Z.

- "A" is the production lot number, from A to Z.

## Ordering Information

Part Number	Quantity Per Reel	Reel Size
SYT16S03DVC	3,000	7 Inch