

### Features

- Transient protection for high-speed data lines  
IEC 61000-4-2 (ESD)  $\pm 30\text{kV}$  (Air)  
 $\pm 30\text{kV}$  (Contact)  
IEC 61000-4-5 (Surge) 8A (8/20 $\mu\text{s}$ )
- Small package (2.9mm  $\times$  2.8mm  $\times$  1.4mm)
- Protects four data lines
- Low capacitance: 1.2pF Typical (I/O-GND)
- Low leakage current: 0.01 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Typical)
- Low clamping voltage
- Back-drive protection for power-down mode
- Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge

### Description

SYT05S05ABC 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 1.2pF only, SYT05S05ABC is designed to protect parasitic-sensitive systems 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 61000-4-5 (Surge) (8A, 8/20 $\mu\text{s}$ ), etc.

SYT05S05ABC uses small SOT23-6L package. Each SYT05S05ABC device can protect four high-speed data lines. The combined features of low capacitance, small size and high ESD robustness make SYT05S05ABC ideal for high-speed data ports and high-frequency lines (e.g., VGA & DVI) applications. The low clamping voltage of the SYT05S05ABC guarantees a minimum stress on the protected IC.

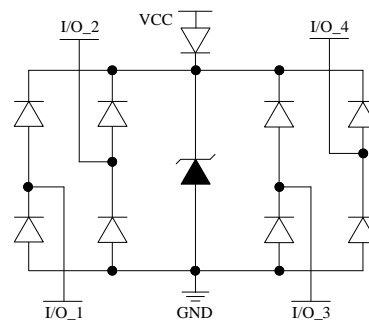
### Applications

- Desktops, Servers and Notebooks
- USB2.0 Power and Data Line Protection
- Display Ports
- Video Graphics Cards
- Digital Visual Interfaces (DVI)

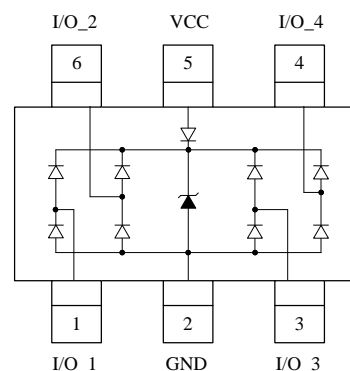
### Mechanical Characteristics

- SOT23-6L package
- Flammability Rating: UL 94V-0
- Marking: Part number, Date
- Packaging: Tape and Reel

### Circuit Diagram



### Pin Configuration



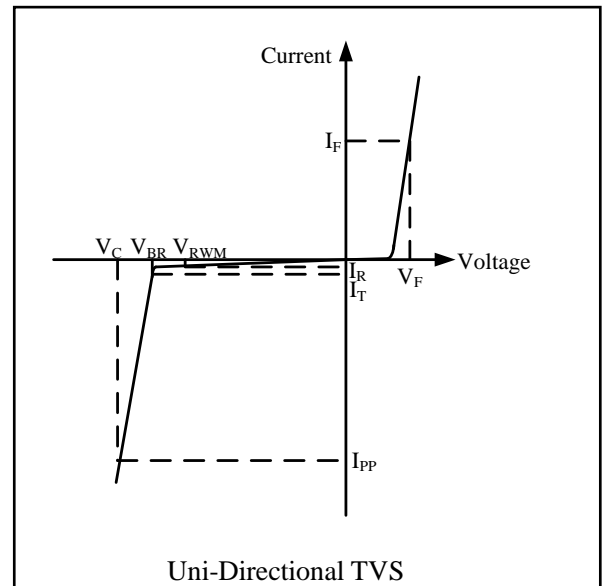
SOT23-6  
(Top View)

## Absolute Maximum Rating

Symbol	Parameter	Value	Units
$I_{PP}$	Maximum Peak Pulse Current (8/20 $\mu$ s)	8	A
$P_{PK}$	Maximum Peak Pulse Power (8/20 $\mu$ s)	100	Watts
$V_{ESD}$	ESD per IEC 61000-4-2 (Air)	$\pm 30$	kV
	ESD per IEC 61000-4-2 (Contact)	$\pm 30$	
$T_{OPT}$	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 @ $V_{RWM}$
$V_{BR}$	Reverse Breakdown Voltage @ $I_T$
$I_T$	Test Current for Reverse Breakdown
$V_C$	Clamping Voltage @ $I_{PP}$
$I_{PP}$	Maximum Peak Pulse Current
$C_{ESD}$	Parasitic Capacitance
$V_R$	Reverse Voltage
f	Small Signal Frequency
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



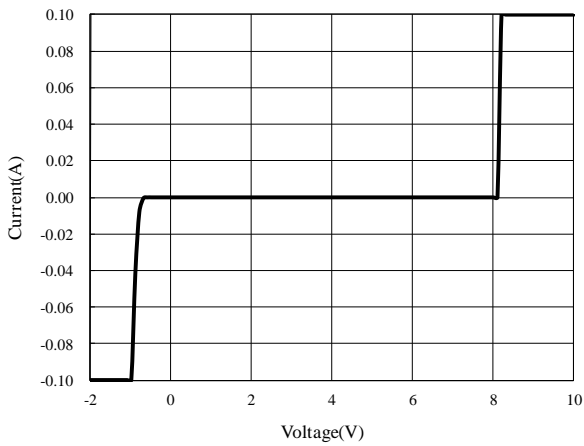
Symbol	Test Condition	Minimum	Typical	Maximum	Units
$V_{RWM}$				5.0	V
$I_R$	$V_{RWM} = 5V, T = 25^{\circ}C$ Between I/O and GND		0.01	0.1	$\mu$ A
$V_{BR}$	$I_T = 1mA$ Between I/O and GND	6.0	8.0	10.0	V
$V_F$	$I_F = 1mA$ Between GND and I/O	0.4	0.7	1.2	V
$V_C^1$	$I_{PP} = 8A, t_p = 8/20\mu s$ Between I/O and GND		11	13	V
$V_C^1$	$I_{PP} = 16A, t_p = 10/100ns$ Between I/O and GND		10.5		V
$R_{DYN}^{1,2}$	$t_p = 10/100ns$ Between I/O and GND		0.25		$\Omega$
$C_{ESD}^1$	$V_R = 0V, f = 1MHz$ Between I/O and GND		1.20	1.50	pF
$C_{ESD}^1$	$V_R = 0V, f = 1MHz$ Between I/O and I/O		0.60	0.75	pF

### NOTES

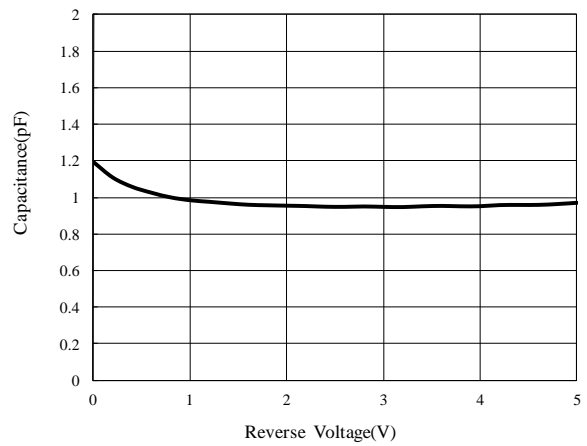
<sup>1</sup>Guaranteed by design and no subject to production test.

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

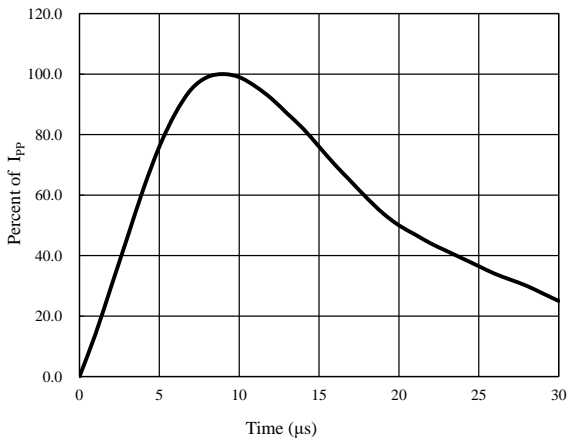
### Voltage Sweeping of I/O to GND



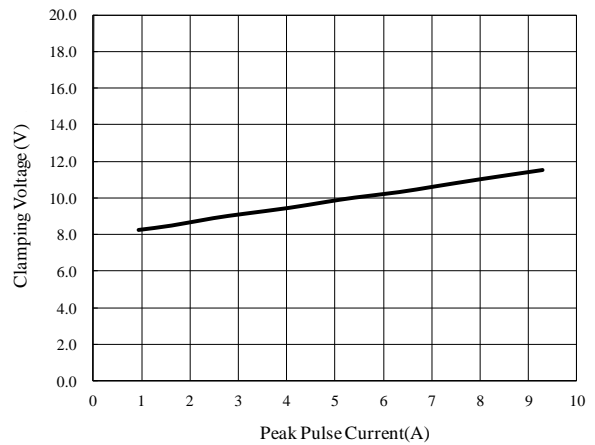
### Capacitance vs. Voltage



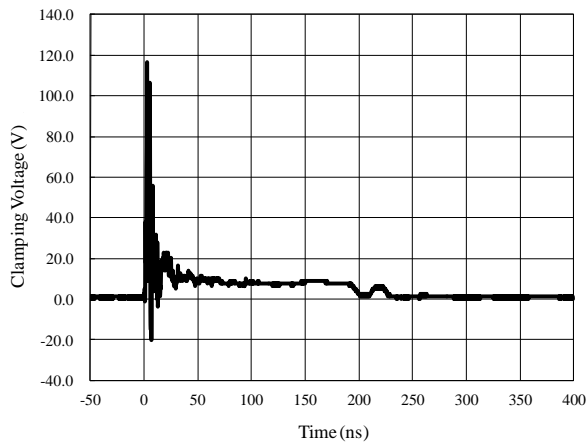
### Pulse Waveform



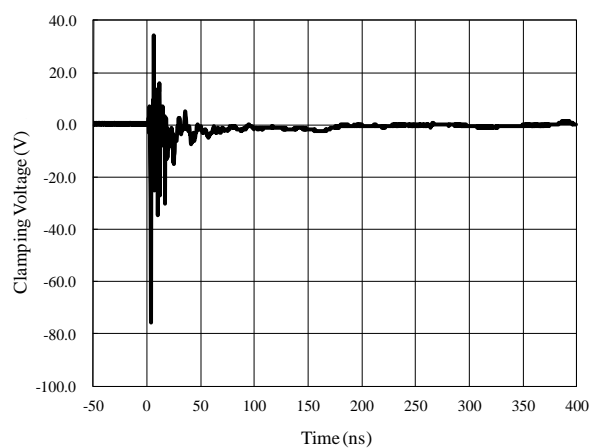
### Clamping Voltage vs. Peak Pulse Current



### 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

### Pin Connection in PCB

SYT05S05ABC is capable to provide ESD protection for four data lines simultaneously. The pin connection is shown in Figure 1.

Four parallel data lines, from inner IC to I/O port connector, could connect to SYT05S05ABC four I/O pins directly. Pin 2 of SYT05S05ABC is the negative reference pin, which should connect to the GND of PCB. The connection wires should be as short as possible in order to minimize the parasitic inductance.

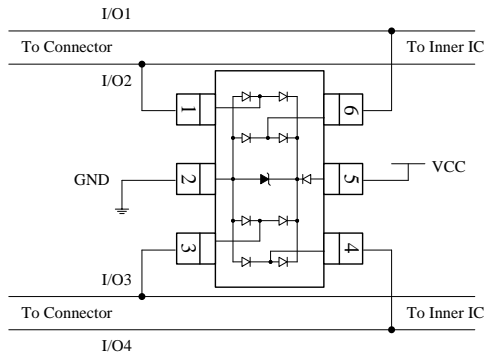


Figure 1 SYT05S05ABC pin connection in PCB

### PCB Layout Guidelines

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

- SYT05S05ABC 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 SYT05S05ABC VCC & GND pins to the PCB VCC & GND should be wide.
- Place SYT05S05ABC 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.

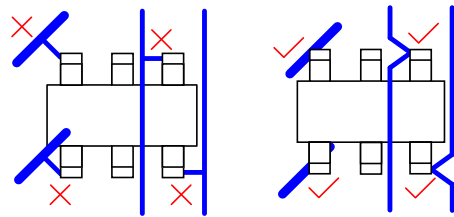
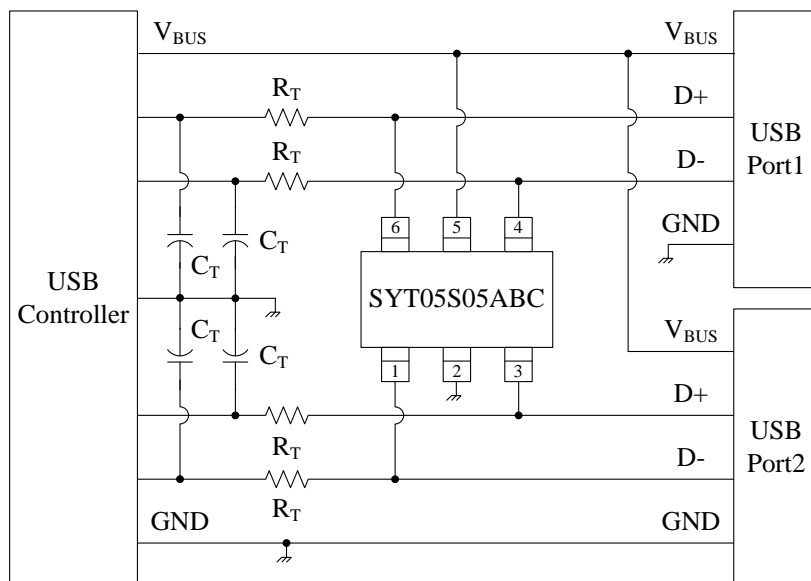


Figure 2 SYT05S05ABC Layout Guideline

### Universal Serial Bus ESD Protection

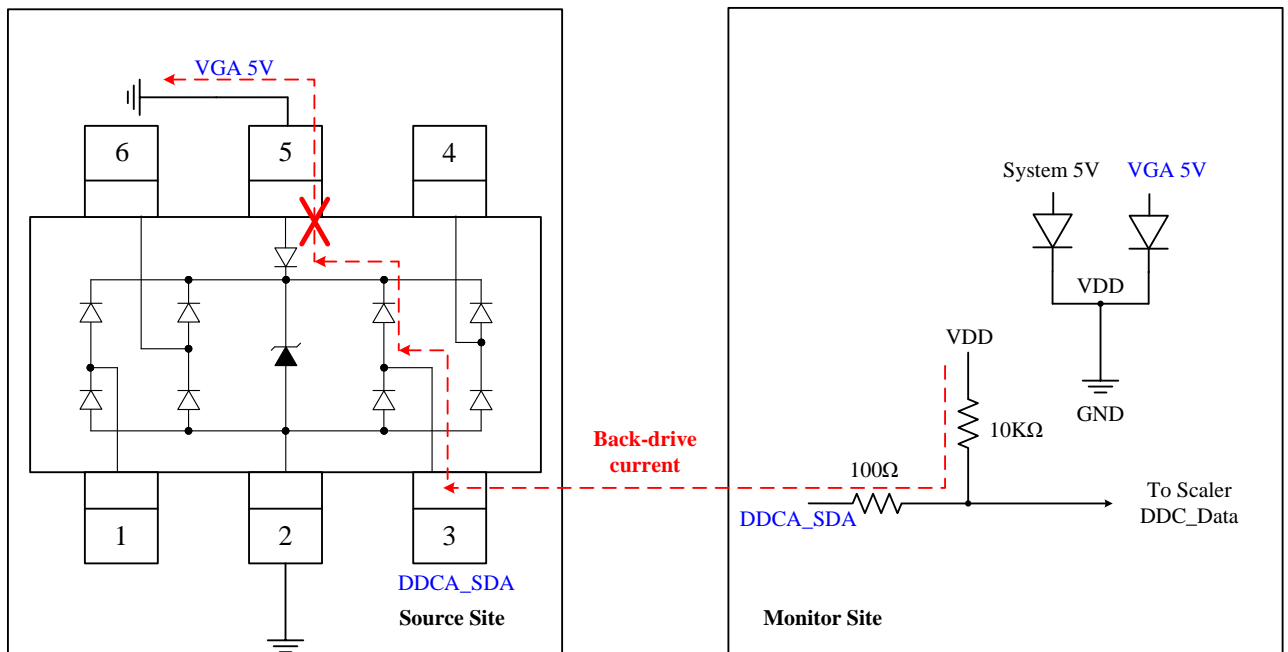


## Back-Drive Protection

Back-drive protection is needed to block against back-drive current flowing from a high potential voltage node toward a lower potential voltage node through the interface cable.

For example, consider a VGA source connected to a VGA monitor via a VGA interface. If the VGA source is switched off and the VGA monitor is left on, there is a possibility of reverse current flow back into the main power supply rail of the VGA source. Typically, the power supply of the VGA source has some form of

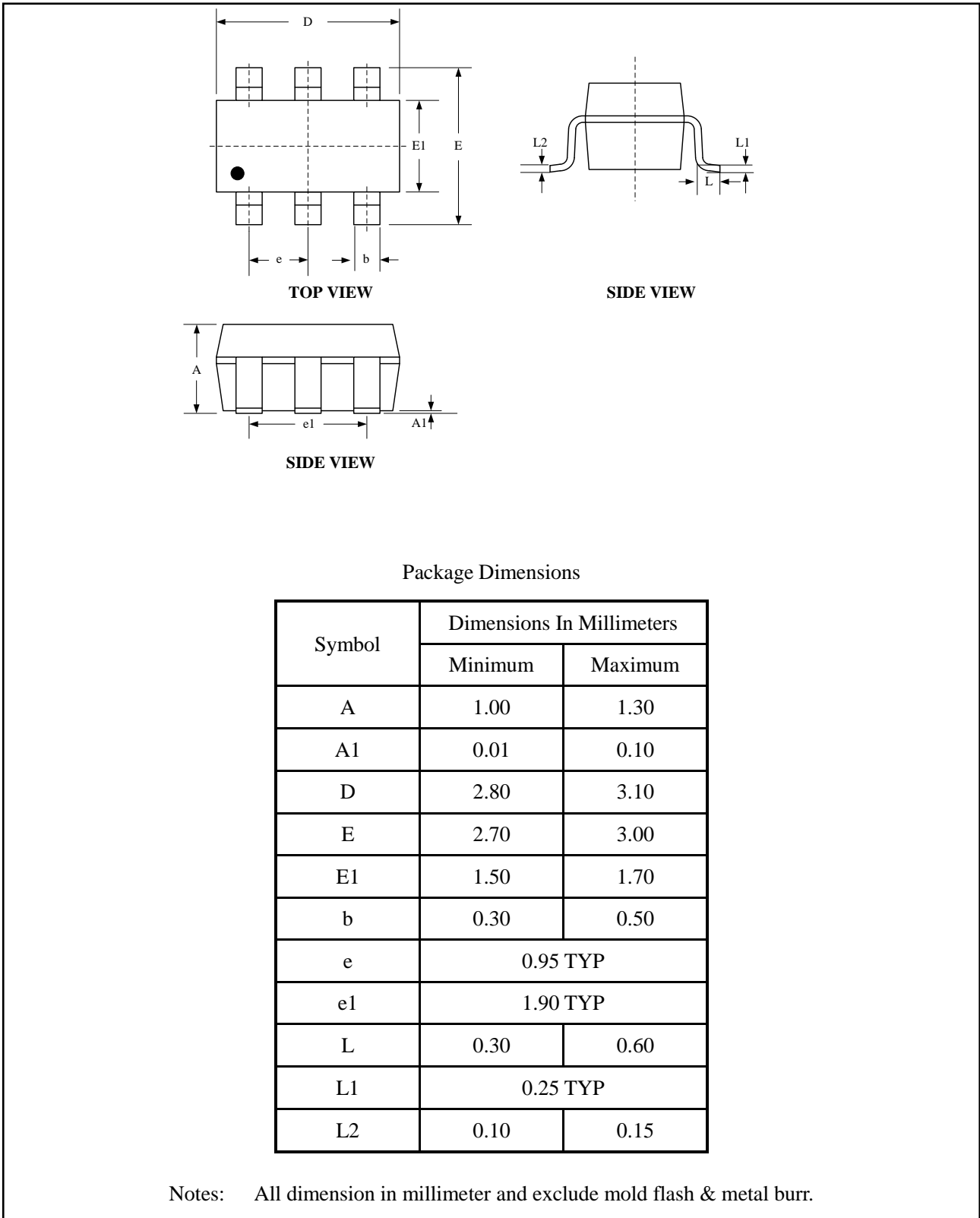
associated bulk supply capacitance, and it is possible over time to charge that bulk supply capacitance to some intermediate level. If that level rises above the voltage level of some of the integrated circuits, the VGA source may not reset properly when the VGA source is turned back on. To avoid this situation, the SYT05S05ABC with integrated back-drive protection diode was designed to block back-drive current for power-down mode.



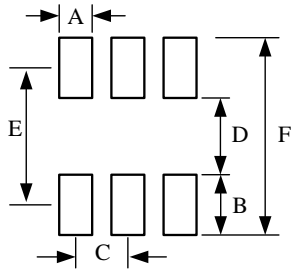
TVS Array with Back-drive Protection

**Package Outline**

- SOT23-6L package

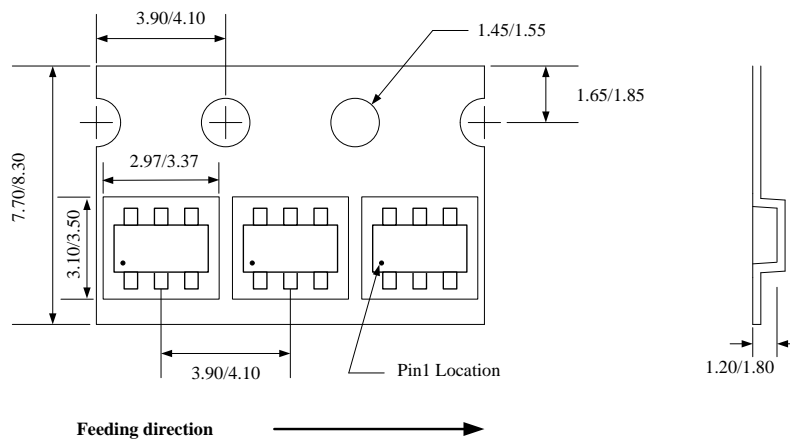


## PCB Layout Pattern



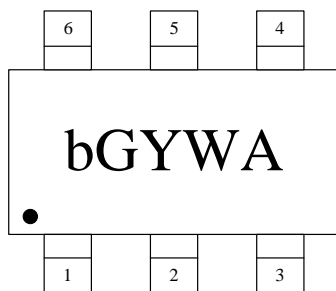
Symbol	Dimensions	
	Millimeters	Inches
A	0.60	0.024
B	1.10	0.043
C	0.95	0.037
D	1.40	0.055
E	2.50	0.098
F	3.60	0.141

## Tape and Reel Specification



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer * length(mm)	Leader * length (mm)	Qty per reel (pcs)
SOT23-6L	8	4	7"	400	400	3000

## Marking Codes



### Note:

- (1) "bG" is part number, fixed.
- (2) "YWA" is date code.

## Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
SYT05S05ABC	5V	3,000	7 Inch

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