SYT05S05ABC

Low Capacitance TVS Protection

Features

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

Applications

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

Mechanical Characteristics

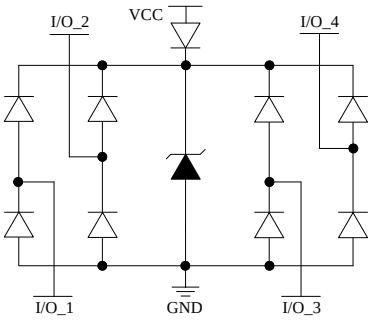
- SOT23-6L package
- Flammability Rating: UL 94V-0
- Marking: Part number, Date
- Packaging: Tape and Reel

Description

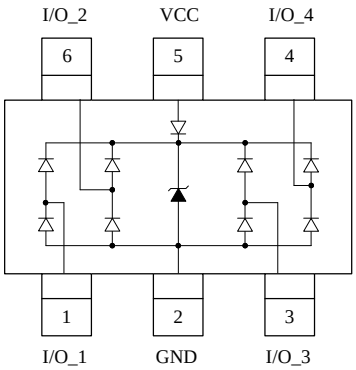
SYT05S05ABC is an ultra-low capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 1.2pF only, SYT05S05ABC is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD) (±30kV air, ±30kV contact discharge), IEC 61000-4-5 (Surge) (8A, 8/20μs), 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.

Circuit Diagram



Pin Configuration



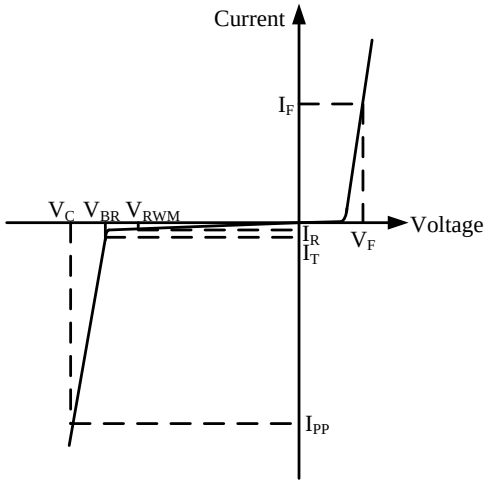
SOT23-6
(Top View)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Maximum Peak Pulse Current (8/20μs)	8	A
P_{PK}	Maximum Peak Pulse Power (8/20μs)	100	Watts
V_{ESD}	ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	±30 ±30	kV
T_{OPT}	Operating Temperature	-40/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°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



Uni-Directional TVS

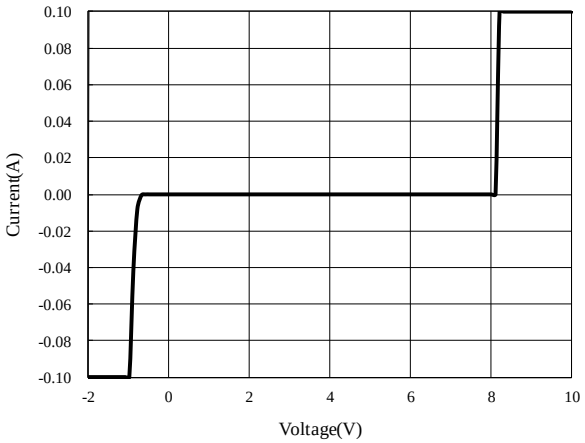
Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				5.0	V
I_R	V_{RWM} = 5V, T = 25°C Between I/O and GND		0.01	0.1	μA
V_{BR}	I_T = 1mA Between I/O and GND	6.0	8.0	10.0	V
V_F	I_F = 1mA Between GND and I/O	0.4	0.7	1.2	V
V_C[1]	I_{PP} = 8A, t_p = 8/20μs Between I/O and GND		11	13	V
V_C[1]	I_{PP} = 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		Ω
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

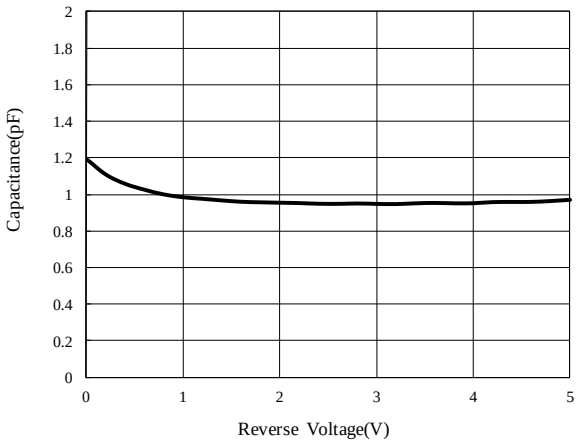
[1]Guaranteed by design and no subject to production test.

[2]R_{DYN} calculated based on I_{PP}=8A to I_{PP}=16A, t_p = 10/100ns.

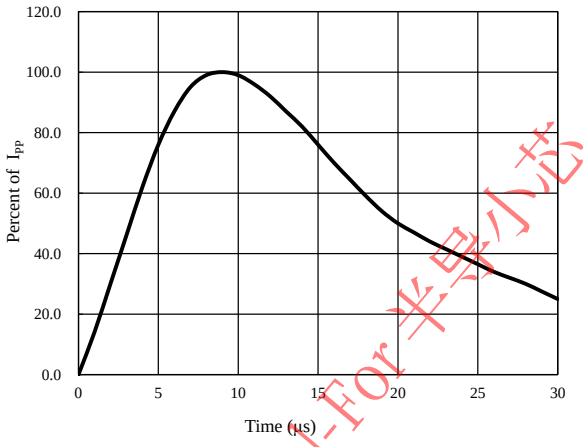
Voltage Sweeping of I/O to GND



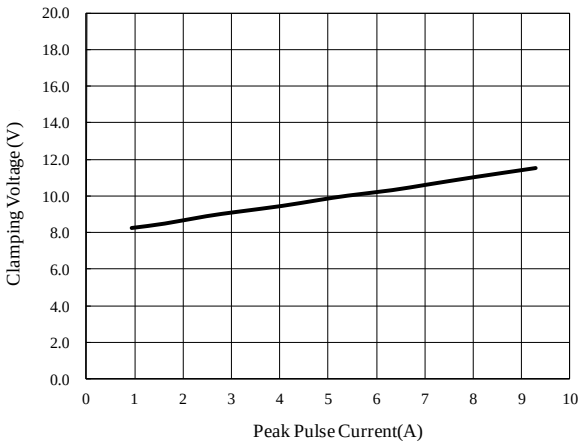
Capacitance vs. Voltage



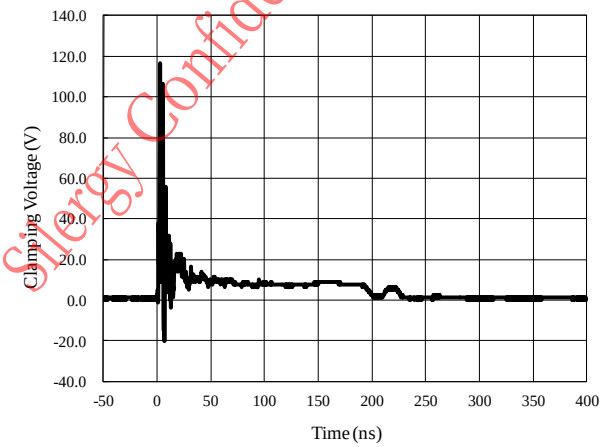
Pulse Waveform



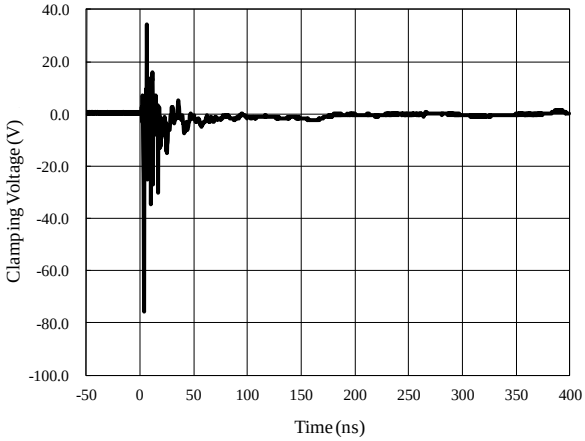
Clamping Voltage vs. Peak Pulse Current



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.

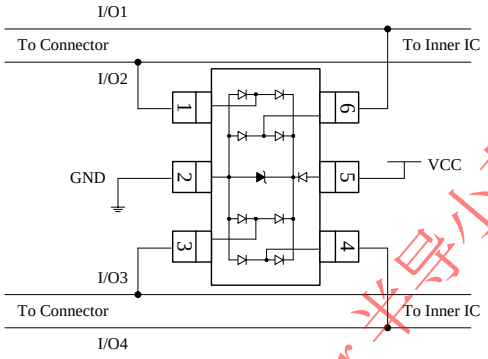


Figure 1 SYT05S05ABC pin connection in PCB

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.

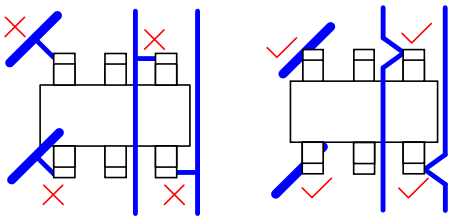
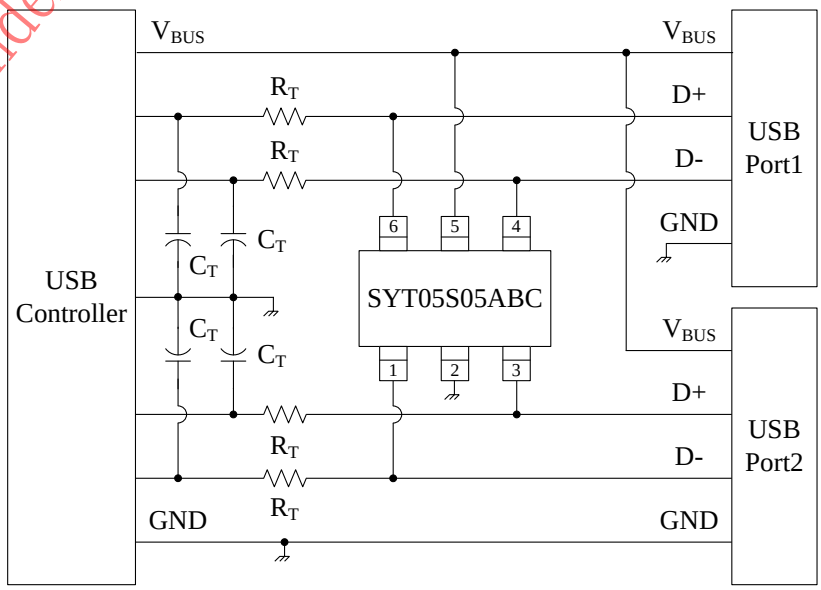


Figure 2 SYT05S05ABC Layout Guideline

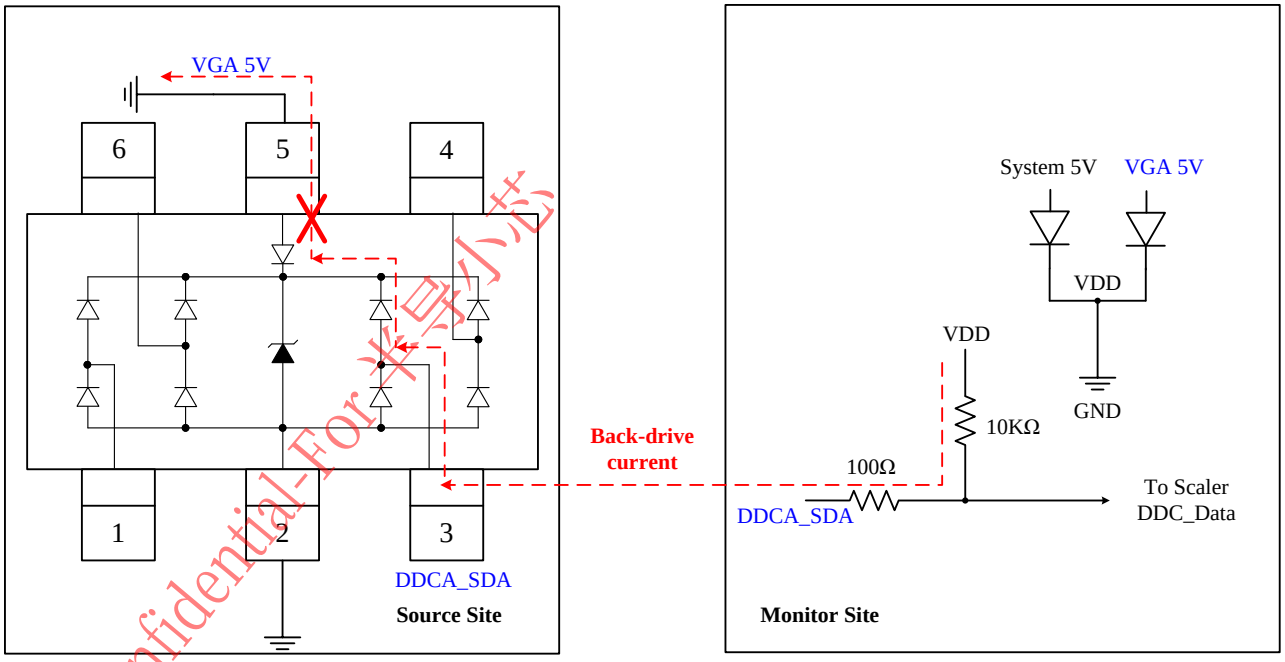
Universal Serial Bus ESD Protection



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.

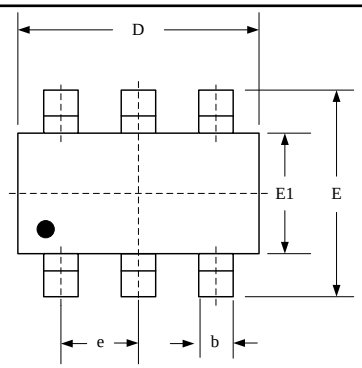
For example, consider a VGA source connected to a VGA monitor via a VGA interface. If the VGA source is switched off and the VGA monitor is left on, there is a possibility of reverse current flow back into the main power supply rail of the VGA source. Typically, the power supply of the VGA source has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



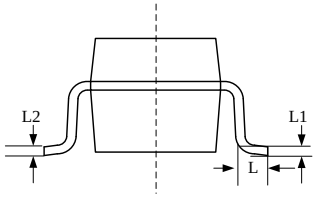
TVS Array with Back-drive Protection

Package Outline

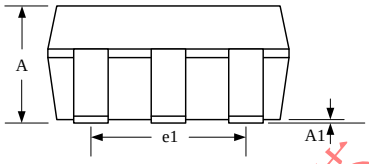
- SOT23-6L package



TOP VIEW



SIDE VIEW



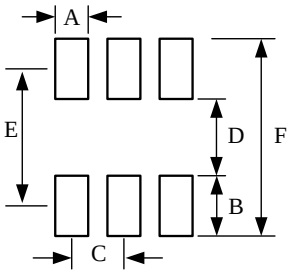
SIDE VIEW

Package Dimensions

Symbol	Dimensions In Millimeters	
	Minimum	Maximum
A	1.00	1.30
A1	0.01	0.10
D	2.80	3.10
E	2.70	3.00
E1	1.50	1.70
b	0.30	0.50
e	0.95 TYP	
e1	1.90 TYP	
L	0.30	0.60
L1	0.25 TYP	
L2	0.10	0.15

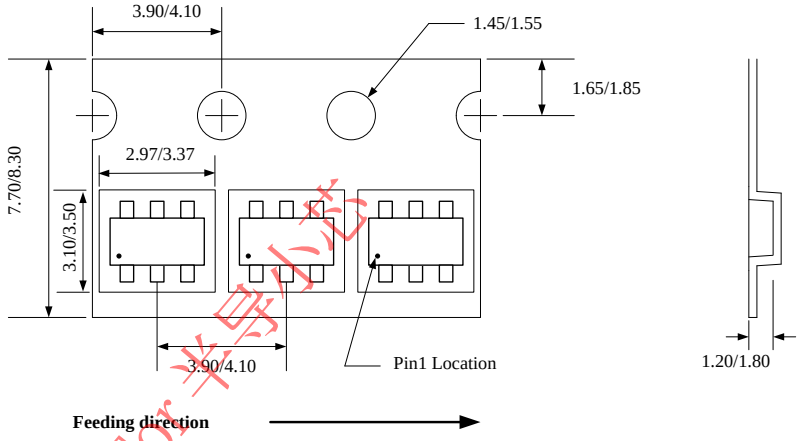
Notes: All dimension in millimeter and exclude mold flash & metal burr.

PCB Layout Pattern



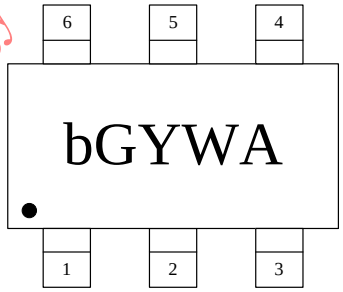
Symbol	Dimensions	
	Millimeters	Inches
A	0.60	0.024
B	1.10	0.043
C	0.95	0.037
D	1.40	0.055
E	2.50	0.098
F	3.60	0.141

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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