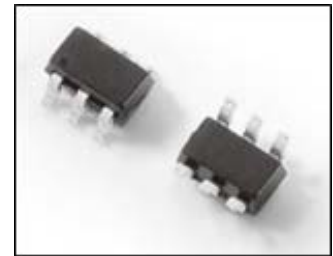




### FEATURES:

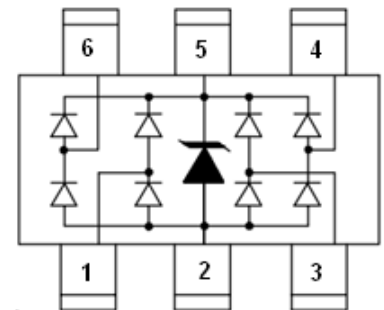
- ✧ 100 watts peak pulse power per line ( $t_P=8/20\mu s$ )
- ✧ Low capacitance:0.7pF(typ.)( I/O pin to Ground)
- ✧ Low leakage current:0.1 $\mu A@V_{RWM}$ (typ.)
- ✧ Protects four I/O lines
- ✧ Low clamping voltage and operating voltage
- ✧ RoHS compliant
- ✧ Meets MSL level 3
- ✧ Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8kV$  contact discharge



SOT23-6L

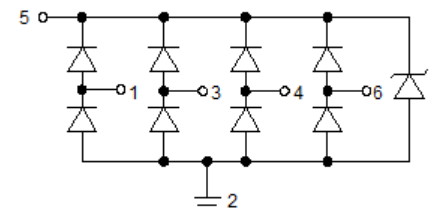
### GENERAL DESCRIPTION:

SRV05-4C is a low capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge(ESD) protection for high-speed data interfaces. With typical capacitance of 0.7pF only,SRV05-4C is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events.



Pin Configuration

SRV05-4C uses small SOT23-6L package. Each SRV05-4C device can protect four high-speed data lines. The combined features of low capacitance, small size and high ESD robustness make SRV05-4C ideal for high-speed data ports and high frequency lines(e.g. HDMI & DVI) applications. The low clamping voltage of the SRV05-4C guarantees a minimum stress on the protected IC.



Circuit Diagram

### MAIN APPLICATIONS

- ✧ USB 2.0&3.0 power and data line protection
- ✧ Digital video interface (DVI)
- ✧ Notebook computers
- ✧ Video graphics cards
- ✧ Monitors and flat panel displays
- ✧ 10/100/1000 ethernet
- ✧ SIM ports
- ✧ ATM interfaces

## PROTECTION SOLUTION TO MEET

- ✧ IEC61000-4-2 (ESD)  $\pm 15\text{kV}$  (air),  $\pm 15\text{kV}$  (contact)
- ✧ IEC61000-4-4 (EFT) 40A (5/50ns)
- ✧ IEC61000-4-5 (Lightning) 4A (8/20 $\mu\text{s}$ ) (I/O pin to Ground)
- ✧ IEC61000-4-5 (Lightning) 17A (8/20 $\mu\text{s}$ ) ( $V_{CC}$  pin to Ground)

## MECHANICAL CHARACTERISTICS

- ✧ JEDEC SOT23-6L package
- ✧ Molding compound flammability rating: UL 94V-0
- ✧ Quantity per reel: 3, 000pcs
- ✧ Lead finish: lead free
- ✧ Marking code: 0544

## ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ , RH=45%-75%, unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak pulse power dissipation on 8/20 $\mu\text{s}$ waveform	$P_{PP}$	100	W
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	$V_{ESD}$	+/- 15 +/- 15	kV
Lead soldering temperature	$T_L$	260 (10 sec.)	$^\circ\text{C}$
Operating junction temperature range	$T_J$	-55 to +125	$^\circ\text{C}$
Storage temperature range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ )

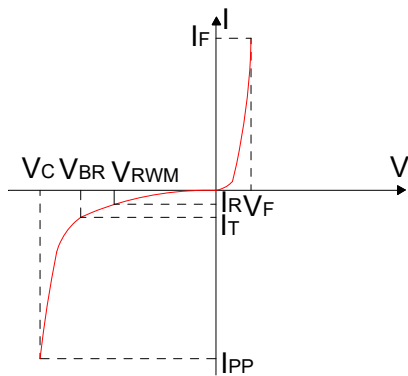
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse working voltage	$V_{RWM}$				5.0	V
Reverse breakdown voltage	$V_{BR}$	$I_T=1\text{mA}$	6.0			V
Reverse leakage current	$I_R$	$V_{RWM}=5\text{V}$		0.1	1	$\mu\text{A}$
Forward voltage	$V_F$	$I_T=10\text{mA}$		0.8	1.0	V
Clamping voltage (I/O pin to Ground)	$V_C$	$I_{PP}=1\text{A}$ , $t_P=8/20\mu\text{s}$		9.5	12	V
		$I_{PP}=4\text{A}$ , $t_P=8/20\mu\text{s}$		13.5	16	
Clamping voltage ( $V_{CC}$ pin to Ground)	$V_C$	$I_{PP}=8\text{A}$ , $t_P=8/20\mu\text{s}$		12	15	V
		$I_{PP}=17\text{A}$ , $t_P=8/20\mu\text{s}$		16.5	20	

**ELECTRICAL CHARACTERISTICS** ( $T_A=25^{\circ}\text{C}$ , continued)

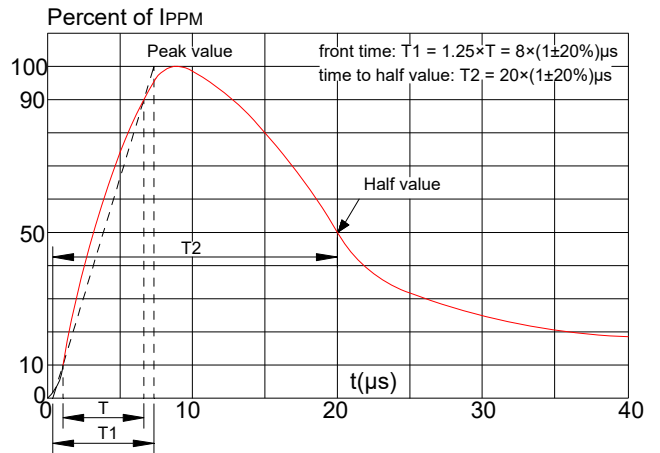
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Junction capacitance	$C_J$	$V_{RWM}=0\text{V}$ , $f=1\text{MHz}$ Any I/O pin to Ground		0.7	0.8	pF
		$V_{RWM}=0\text{V}$ , $f=1\text{MHz}$ Between I/O pins		0.35		

**RATINGS AND V-I CHARACTERISTICS CURVES** ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

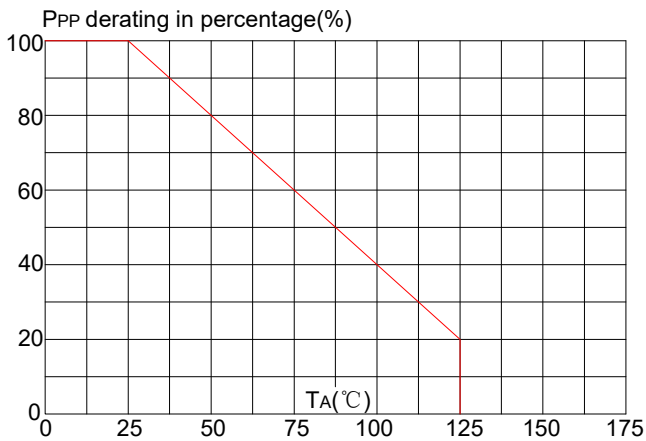
**FIG.1: V- I curve characteristics (Uni-directional)**



**FIG.2: Pulse waveform (8/20 $\mu\text{s}$ )**



**FIG.3: Pulse derating curve**



**FIG.4: ESD clamping (15kV contact)**

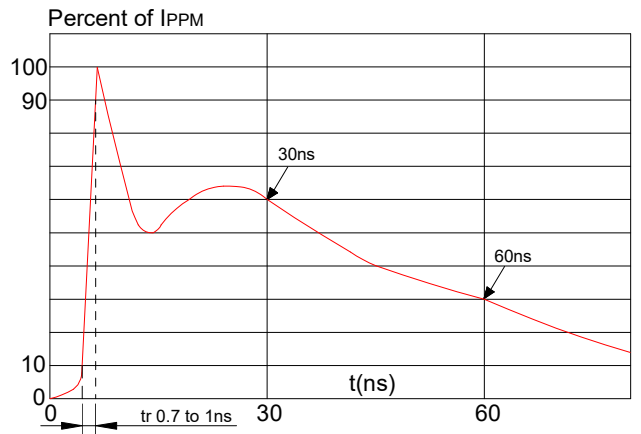


FIG.5: Voltage sweeping of I/O to GND

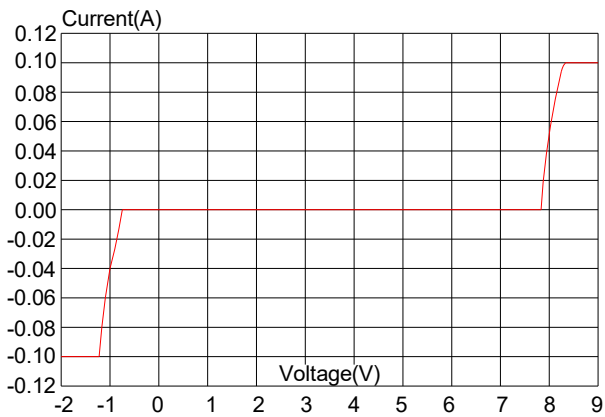


FIG.6: Insertion loss S21 of I/O to GND

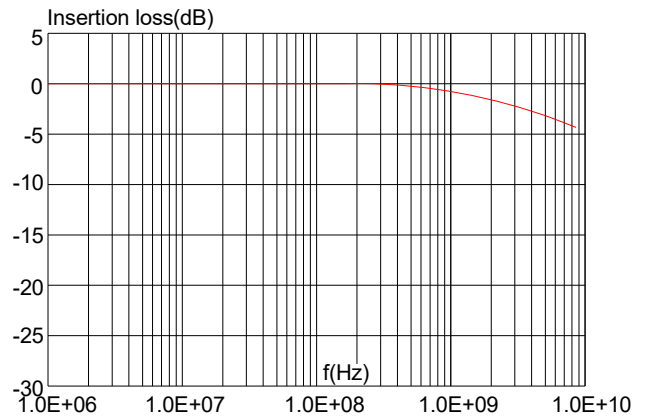


FIG.7: Capacitance vs. voltage of I/O to GND (f=1MHz)

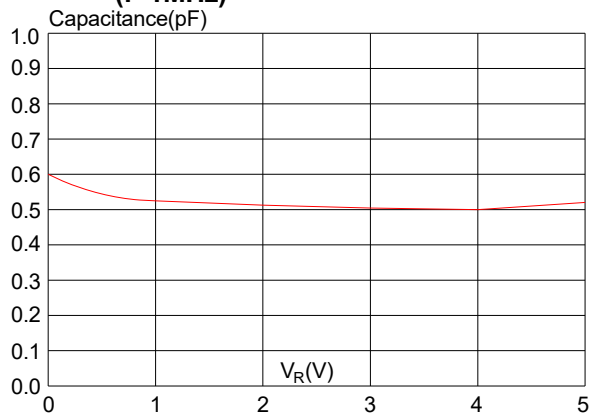


FIG.8: Clamping voltage vs. peak pulse current (8/20μs)

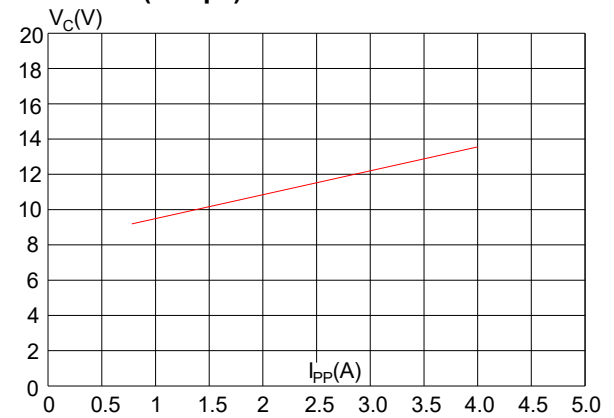


FIG.9: ESD clamping of I/O to GND (+8kV contact per IEC 61000-4-2)

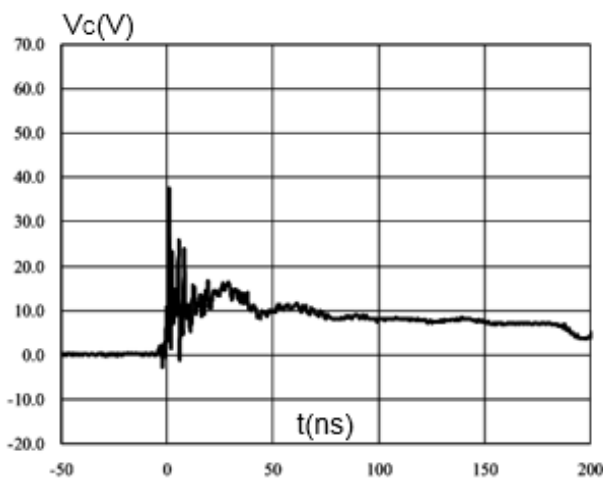
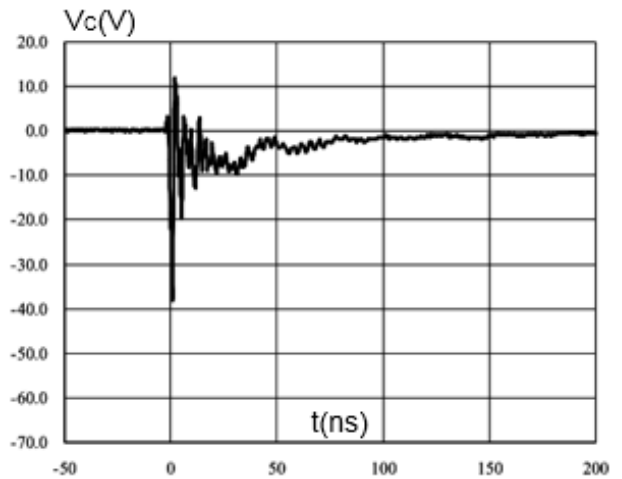


FIG.10: ESD clamping of I/O to GND (-8kV contact per IEC 61000-4-2)



## APPLICATION INFORMATION

### Pin connection in PCB

SRV05-4C 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 SRV05-4C four I/O pins directly. Pin 2 of SRV05-4C 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.

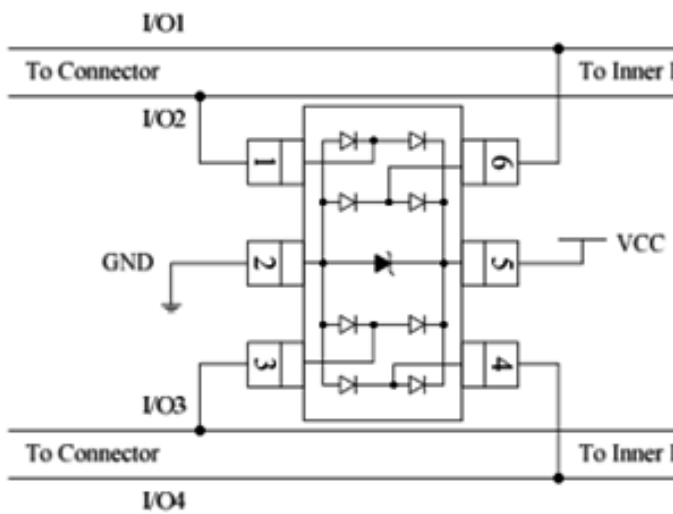


Figure1. SRV05-4C pin connection in PCB

### PCB layout guidelines

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

- ◆ SRV05-4C 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 SRV05-4C V<sub>CC</sub> & GND pins to the PCB V<sub>CC</sub>&GND should be wide.
- ◆ Place SRV05-4C 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.

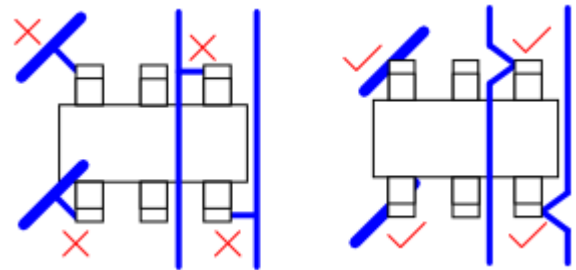
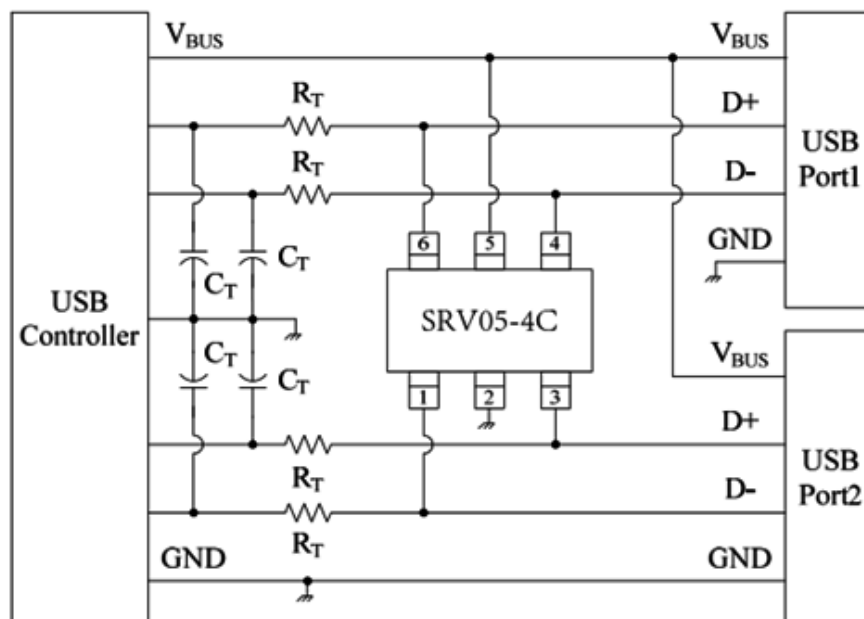
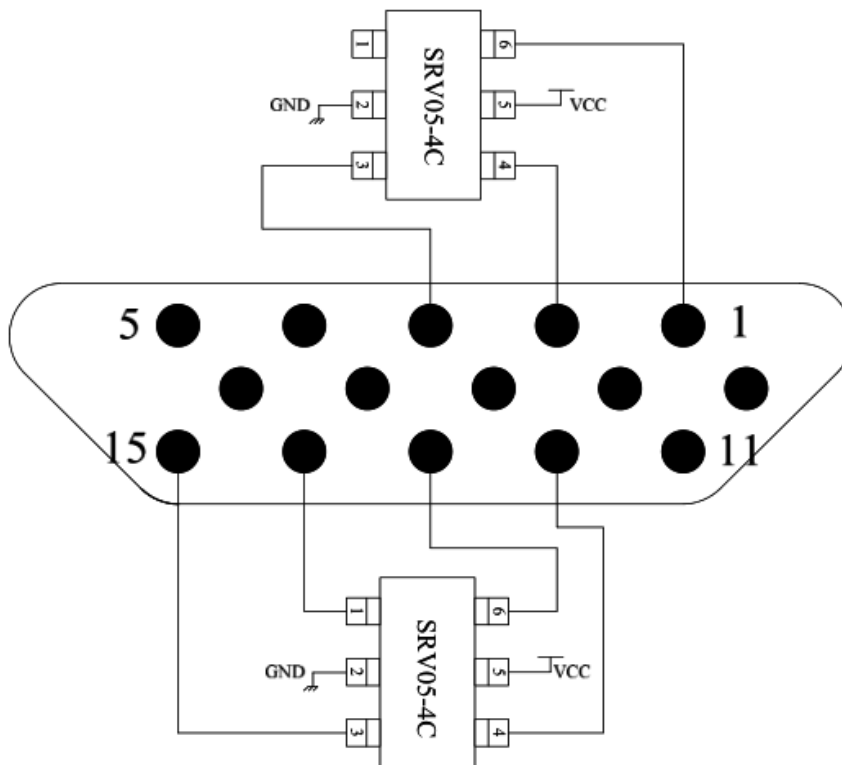


Figure2. SRV05-4C layout guideline

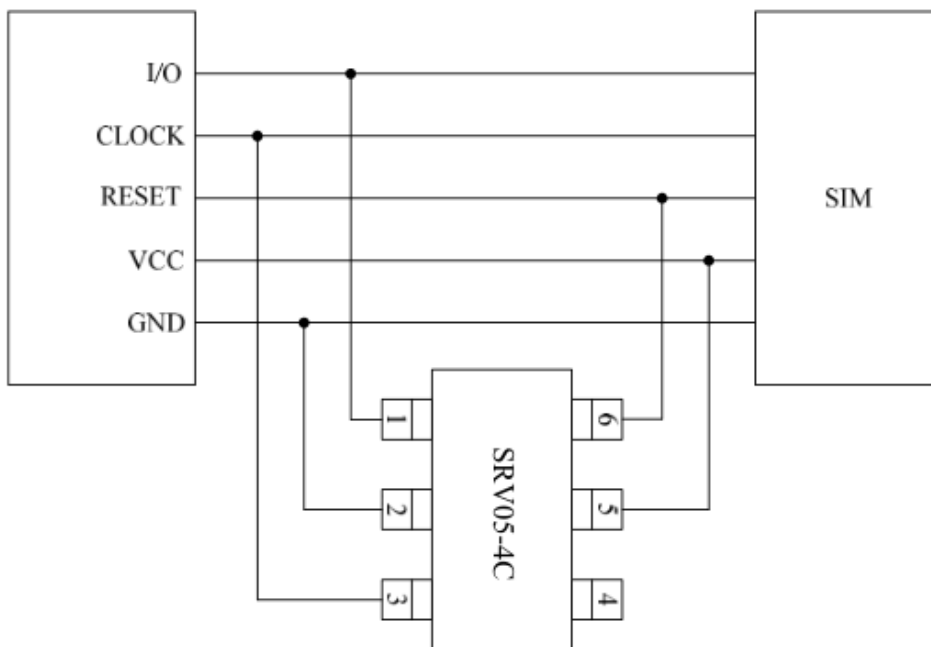
### Universal serial bus ESD protection



APPLICATION INFORMATION(continued)



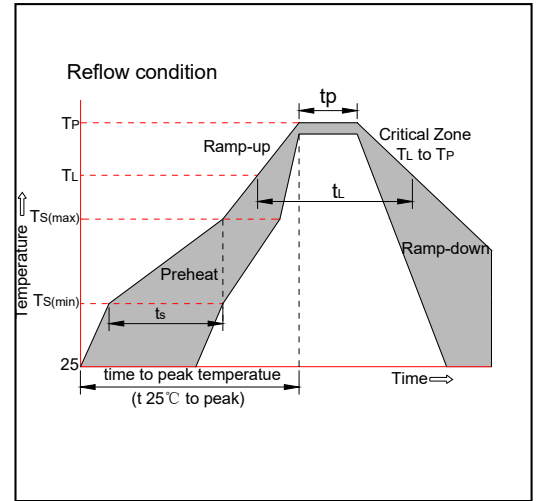
Layout top view for video(VGA) interface with SRV05-4C



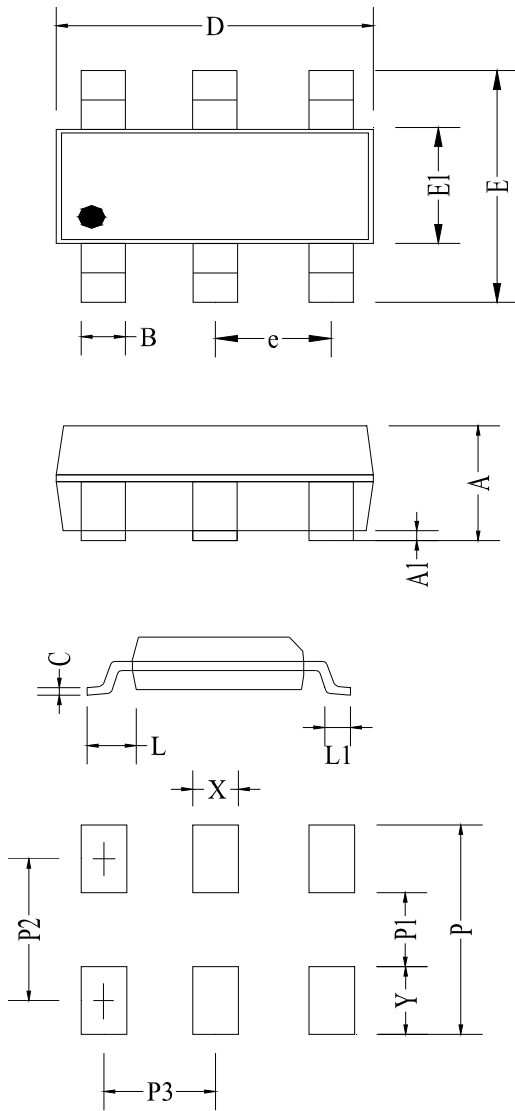
Layout top view for SIM port with SRV05-4C

**SOLDERING PARAMETERS**

Reflow Condition		Pb-Free assembly (see figure at right)
Pre Heat	-Temperature Min ( $T_{s(min)}$ )	+150°C
	-Temperature Max( $T_{s(max)}$ )	+200°C
	-Time (Min to Max) ( $t_s$ )	60-180 secs.
Average ramp up rate (Liquidus Temp ( $T_L$ )to peak)		3°C/sec. Max
$T_{s(max)}$ to $T_L$ - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature( $T_L$ )(Liquidus)	+217°C
	-Temperature( $t_L$ )	60-150 secs.
Peak Temp ( $T_P$ )		+260(+0/-5)°C
Time within 5°C of actual Peak Temp ( $t_p$ )		20-40secs.
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp ( $T_P$ )		8 min. Max
Do not exceed		+260°C



**PACKAGE MECHANICAL DATA**

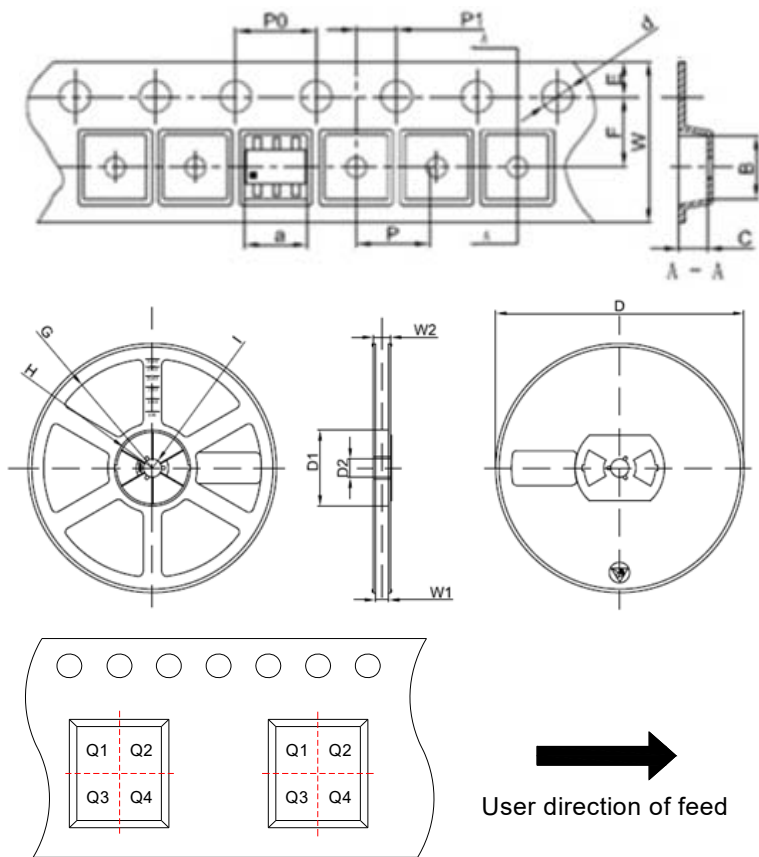


**Land Pattern**

Symbol	Millimeter			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.90	1.18	1.45	0.035	0.046	0.057
A1	0.02	0.08	0.14	0.001	0.003	0.006
B	0.35	0.40	0.50	0.014	0.016	0.020
C	0.08	0.15	0.20	0.003	0.006	0.008
D	2.92	3.00	3.02	0.115	0.118	0.119
e	0.69	0.95	1.02	0.027	0.037	0.040
E1	1.50	1.60	1.75	0.059	0.063	0.069
E	2.80BSC			0.110BSC		
L1	0.35	0.45	0.55	0.014	0.018	0.022
L	0.6			0.024		
X	0.6			0.024		
Y	1.1			0.043		
P	3.6			0.142		
P1	1.4			0.055		
P2	2.5			0.098		
P3	0.95			0.037		



TAPE AND REEL SPECIFICATION-SOT23-6L



Pin 1 quadrant:Q3

Symbol	Millimeters	Inches
	Typ.	Typ.
a	3.17	0.125
B	3.23	0.127
C	1.37	0.054
d	Φ1.55	Φ0.061
E	1.75	0.069
F	3.50	0.138
P0	4.00	0.157
P	4.00	0.157
P1	2.00	0.079
W	8.00	0.315
D	Φ180	Φ7.087
D1	60.00	2.632
D2	13.00	0.512
G	R78.00	R3.071
H	R25.60	R1.008
I	R6.50	R0.256
W1	9.50	0.374
W2	13.10	0.516

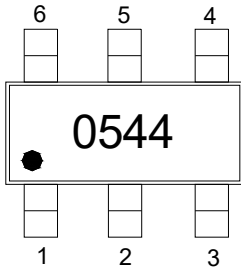
Packaging Description:

SOT23-6L parts are shipped in tape. The carrier tape is made from a dissipative(carbon filled) polycarbonate resin. The cover tape is a multilayer film(heat activated adhesive in nature)primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000units per 7" or 17.8cm diameter reel. The reels are clear in color and made of polystyrene plastic(anti-static coated).

ORDERING INFORMATION

PART No.	PACKAGE TYPE	QUANTITY(PCS) REEL	DESCRIPTION
SRV05-4C	SOT23-6L	3,000	7 inch reel pack

**MARKING CODE**

Part Number	Marking Code
SRV05-4C	

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