

## Features

- ❑ Transient protection for high-speed data lines  
     IEC 61000-4-2 (ESD)  $\pm 27\text{kV}$  (Air)  
      $\pm 17\text{kV}$  (Contact)  
     IEC 61000-4-4 (EFT) 40A (5/50 ns)  
     Cable Discharge Event (CDE)
- ❑ Small package (2.9mm × 2.8mm × 1.4mm)
- ❑ Protects four data lines
- ❑ Low capacitance: 0.3pF Typical (I/O-I/O)
- ❑ Low leakage current: 0.1 $\mu\text{A}$  @  $V_{\text{RWM}}$  (Typical)
- ❑ Low clamping voltage
- ❑ Each I/O pin can withstand over 1000 ESD strikes for  $\pm 8\text{kV}$  contact discharge
- ❑ Green Part

## Description

SRV05-4 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 0.3pF only, SRV05-4 is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC 61000-4-2 (ESD), Level 4 ( $\pm 15\text{kV}$  air,  $\pm 8\text{kV}$  contact discharge), IEC 61000-4-4 (electrical fast transient - EFT) (40A, 5/50 ns), very fast charged device model (CDM) ESD and cable discharge event (CDE), etc.

SRV05-4 uses small SOT23-6L package. Each SRV05-4 device can protect four high-speed data lines. The combined features of low capacitance, small size and high ESD robustness make S R V 0 5 - 4 ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the S R V 0 5 - 4 guarantees a minimum stress on the protected IC.

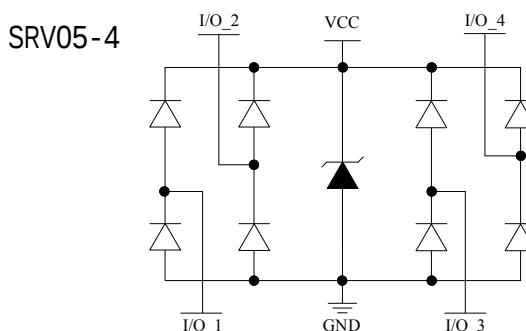
## Applications

- ❑ Serial ATA
- ❑ PCI Express
- ❑ Desktops, Servers and Notebooks
- ❑ MDDI Ports
- ❑ USB 2.0/3.0 Power and Data Line Protection
- ❑ Display Ports
- ❑ High Definition Multi-Media Interface (HDMI)
- ❑ Digital Visual Interfaces (DVI)

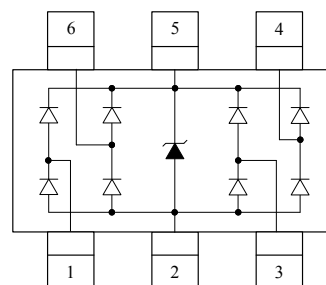
## Mechanical Characteristics

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

## Circuit Diagram



## Pin Configuration



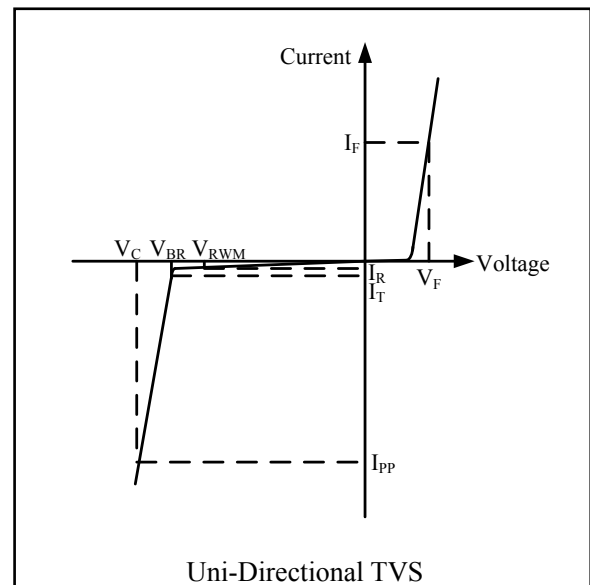
SOT23-6L  
(Top View)

## Absolute Maximum Rating

| Symbol    | Parameter                                                     | Value                | Units |
|-----------|---------------------------------------------------------------|----------------------|-------|
| $P_{PP}$  | Peak Pulse Power (8/20 $\mu$ s) (I/O pins)                    | 60                   | W     |
| $I_{PP}$  | Peak Pulse Current( $t_p=8/20\mu s$ ) (I/O pins)              | 6                    | A     |
| $V_{ESD}$ | ESD per IEC 61000-4-2(Air)<br>ESD per IEC 61000-4-2 (Contact) | $\pm 25$<br>$\pm 17$ | kV    |
| $T_{OPT}$ | Operating Temperature                                         | -55/+125             | °C    |
| $T_{STG}$ | Storage Temperature                                           | -55/+150             | °C    |

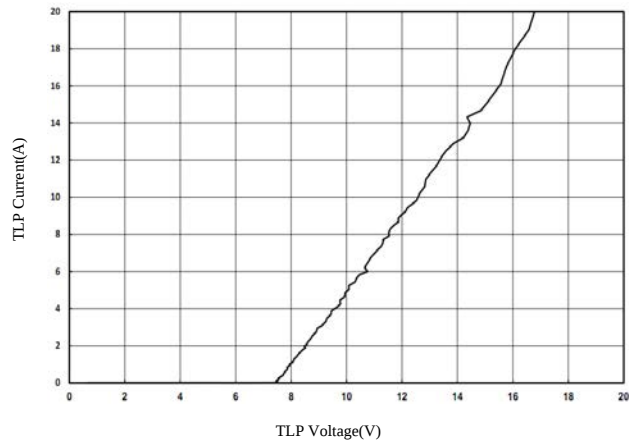
## Electrical Characteristics (T = 25°C)

| 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 @ $I_F$             |

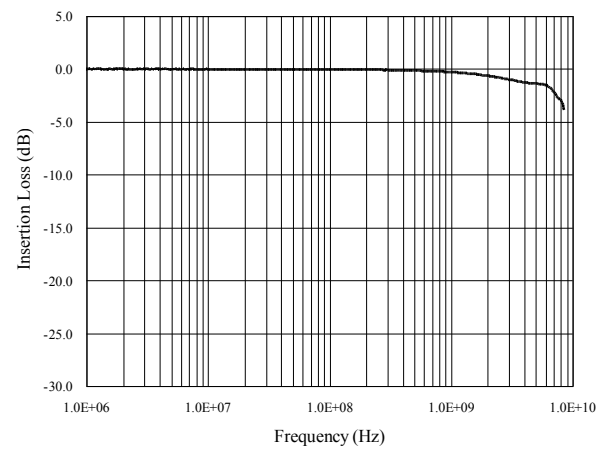


| Symbol    | Test Condition                                                                 | Minimum | Typical | Maximum | Units   |
|-----------|--------------------------------------------------------------------------------|---------|---------|---------|---------|
| $V_{RWM}$ |                                                                                |         |         | 5.0     | V       |
| $I_R$     | $V_{RWM} = 5V$ , $T = 25^\circ C$<br>Between I/O and GND , Between VCC and GND |         | 0.1     | 1.0     | $\mu A$ |
| $V_{BR}$  | $I_T = 1mA$<br>Between I/O and GND , Between VCC and GND                       | 6.0     |         | 9.0     | V       |
| $V_C$     | $I_{PP} = 6A$ , $t_p = 8/20\mu s$<br>Between I/O and GND                       |         |         | 11.0    | V       |
| $C_{ESD}$ | $V_R = 0V$ , $f = 1MHz$<br>Between I/O and GND                                 |         | 0.6     | 0.8     | pF      |
| $C_{ESD}$ | $V_R = 0V$ , $f = 1MHz$<br>Between I/O and I/O                                 |         | 0.3     | 0.4     | pF      |

### TLP Measurement of I/O to GND

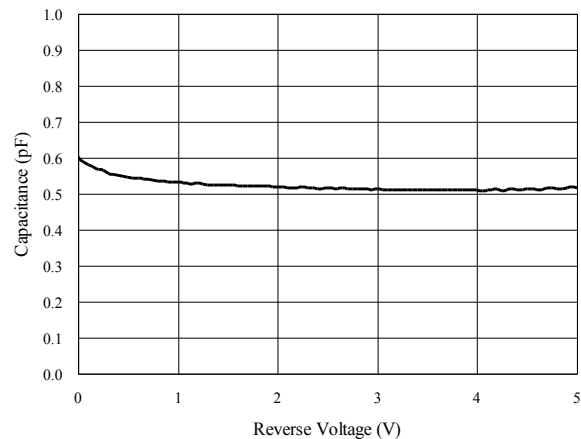


### Insertion Loss S21 of I/O to GND

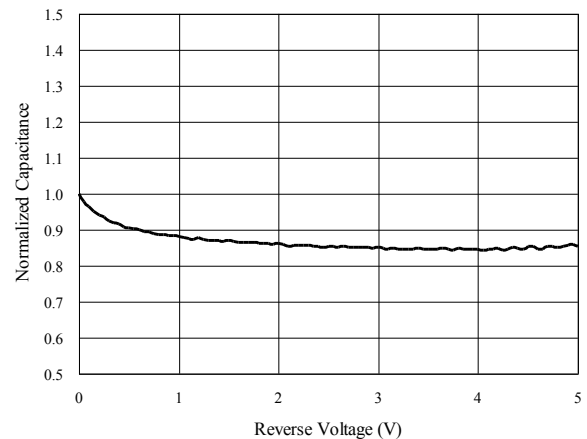


### Capacitance vs. Voltage of I/O to GND (f = 1MHz)

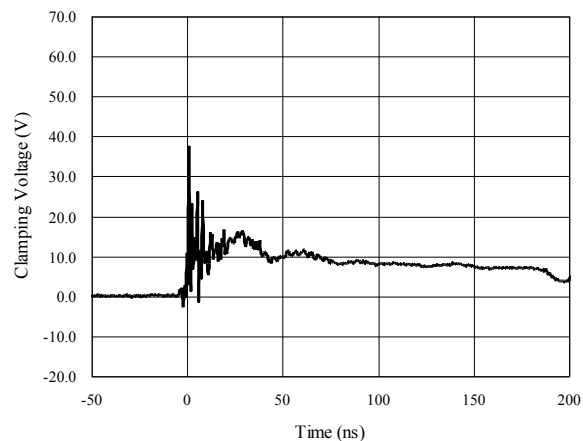
Capacitance vs. Reverse Voltage



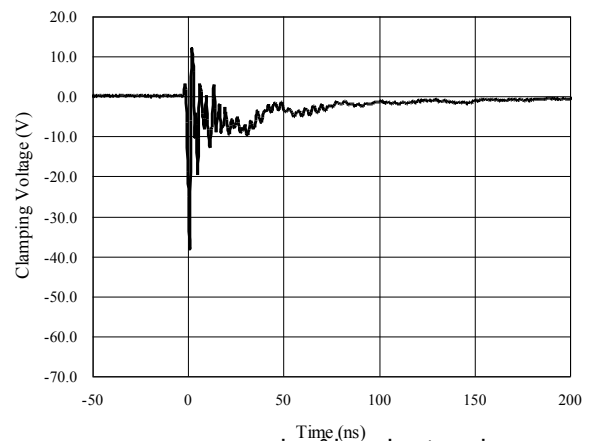
Normalized Capacitance vs. Reverse Voltage



### 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

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

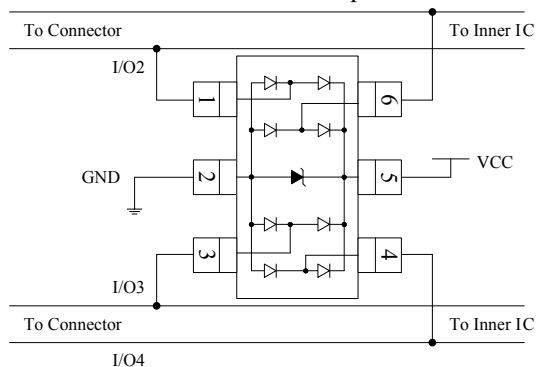


Figure 1 SRV05-4 pin connection in PCB

### PCB Layout Guidelines

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

- ❑ SRV05-4 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 SRV05-4 VCC & GND pins to the PCB VCC & GND should be wide.
- ❑ Place SRV05-4 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.

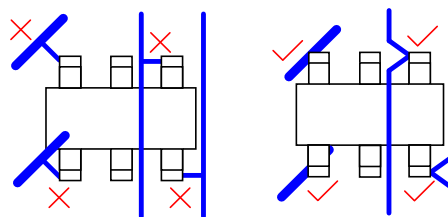
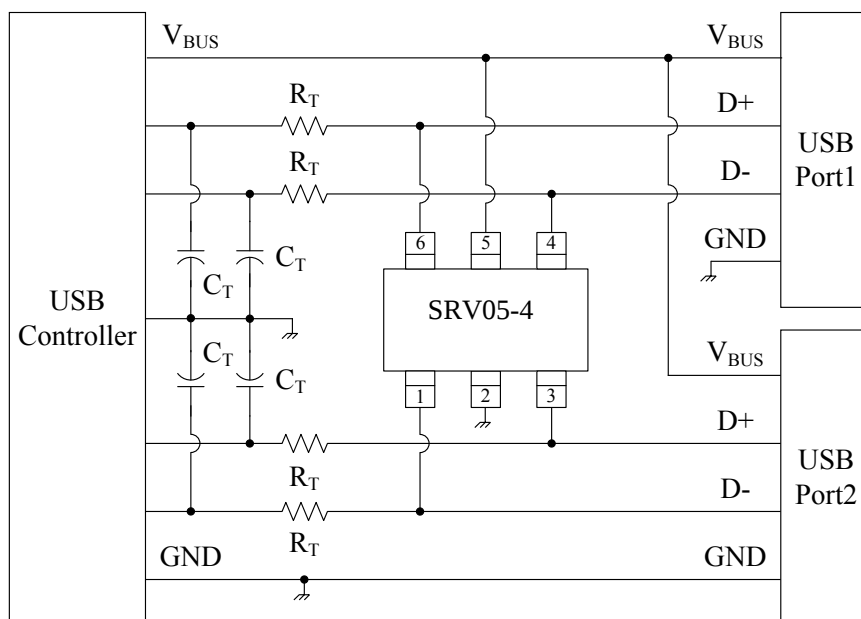


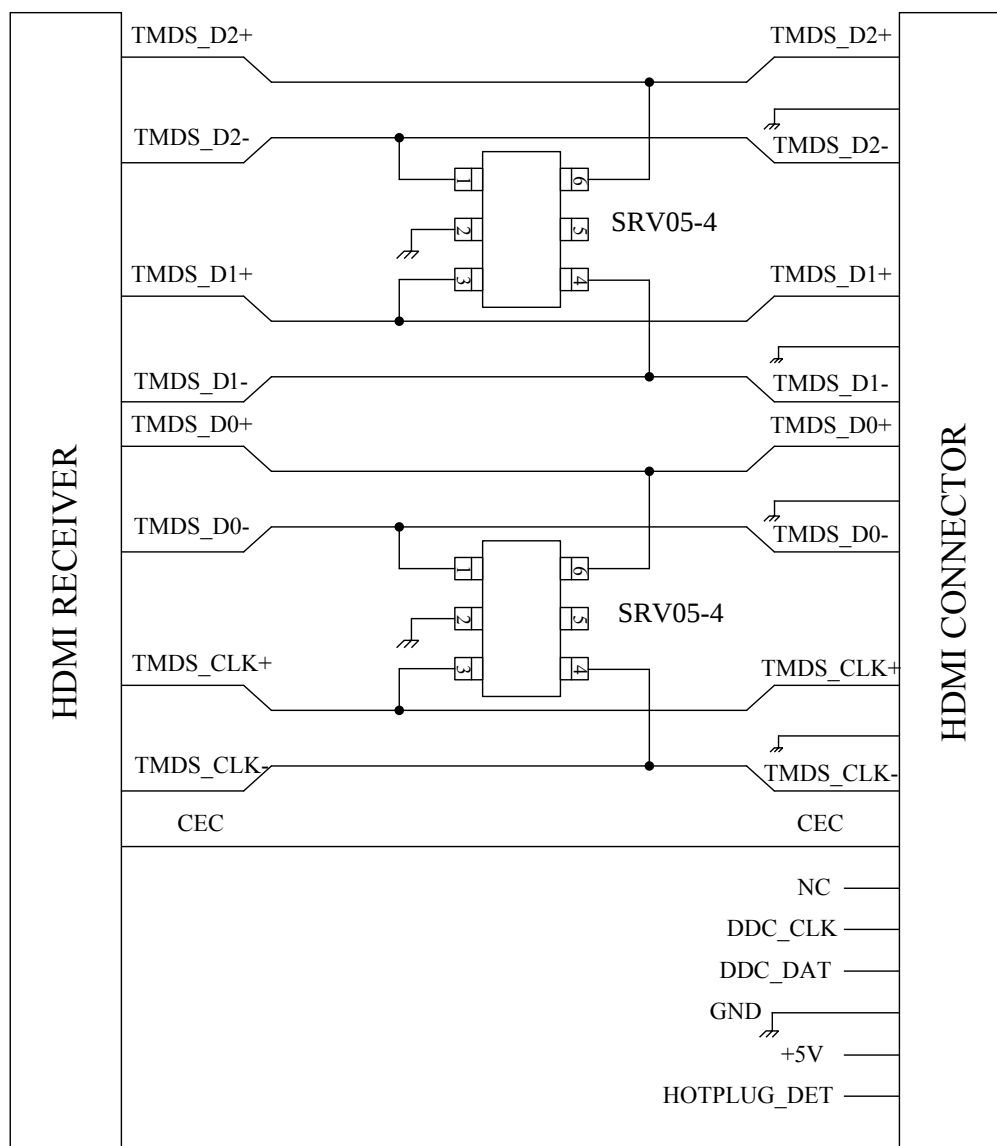
Figure 2 SRV05-4 Layout Guideline

### Universal Serial Bus ESD Protection



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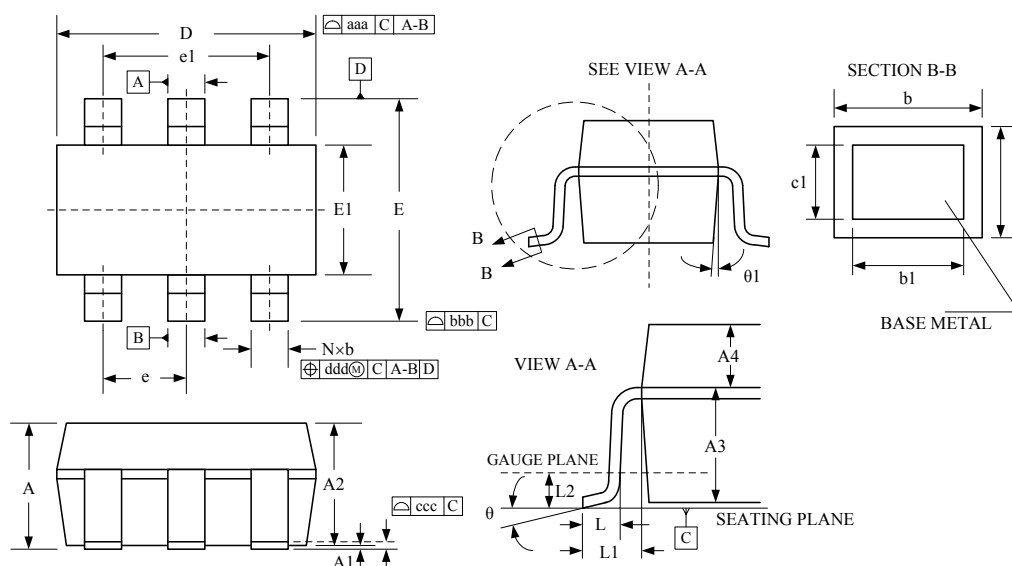
## Application Information (continued)



Layout Top View for HDMI Interface with SRV05-4

## Package Outline

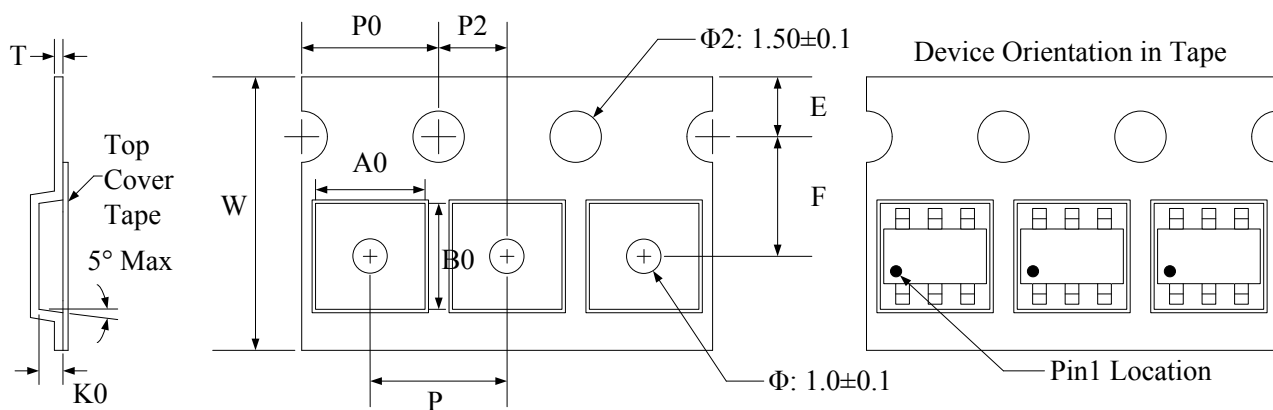
□ SOT23-6L package



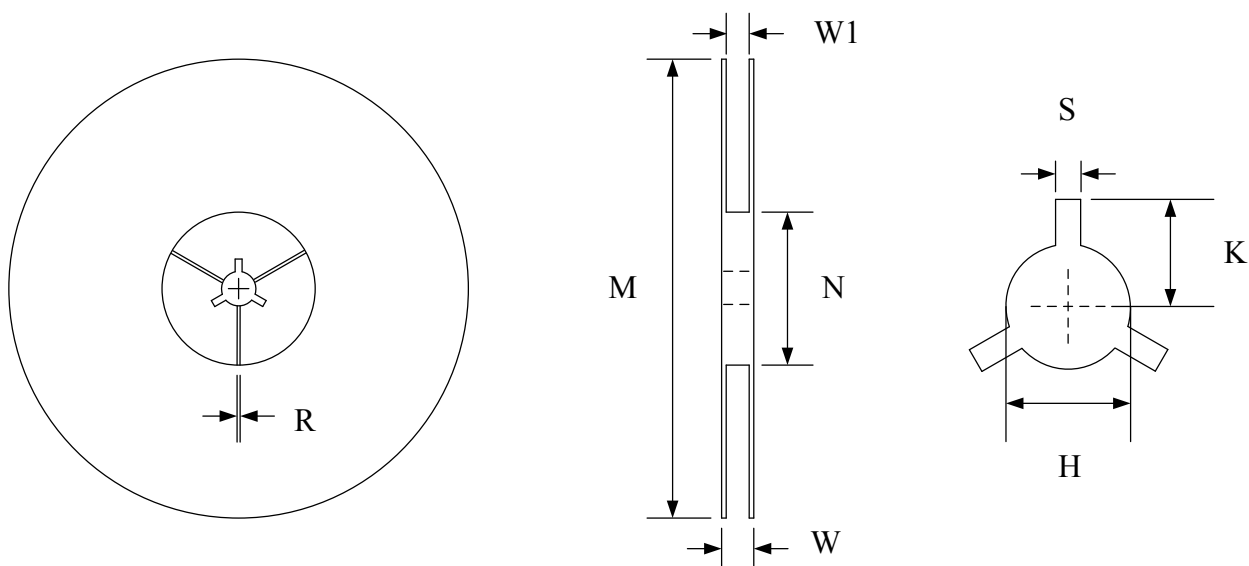
Package Dimensions (Controlling dimensions are in millimeters)

| Symbol | Dimensions (mm) |         |         | Dimensions (Inches) |         |         |
|--------|-----------------|---------|---------|---------------------|---------|---------|
|        | Minimum         | Typical | Maximum | Minimum             | Typical | Maximum |
| A      | —               | —       | 1.450   | —                   | —       | 0.057   |
| A1     | 0.000           | —       | 0.150   | 0.000               | —       | 0.006   |
| A2     | 0.900           | 1.200   | 1.300   | 0.035               | 0.047   | 0.012   |
| A3     | 0.637           | 0.787   | 0.837   | 0.025               | 0.031   | 0.033   |
| A4     | 0.263           | 0.413   | 0.463   | 0.010               | 0.016   | 0.018   |
| b      | 0.300           | —       | 0.500   | 0.012               | —       | 0.020   |
| b1     | 0.300           | 0.400   | 0.450   | 0.012               | 0.016   | 0.018   |
| c      | 0.080           | —       | 0.220   | 0.003               | —       | 0.009   |
| c1     | 0.080           | 0.130   | 0.200   | 0.003               | 0.005   | 0.008   |
| D      | 2.90 BSC        |         |         | 0.114 BSC           |         |         |
| e      | 0.95 BSC        |         |         | 0.037 BSC           |         |         |
| e1     | 1.90 BSC        |         |         | 0.075 BSC           |         |         |
| E      | 2.80 BSC        |         |         | 0.110 BSC           |         |         |
| E1     | 1.60 BSC        |         |         | 0.063 BSC           |         |         |
| L      | 0.300           | 0.450   | 0.600   | 0.012               | 0.018   | 0.024   |
| L1     | 0.600 REF       |         |         | 0.024 REF           |         |         |
| L2     | 0.250 BSC       |         |         | 0.010 BSC           |         |         |
| θ      | 0°              | 4°      | 8°      | 0°                  | 4°      | 8°      |
| θ1     | 5°              | 10°     | 15°     | 5°                  | 10°     | 15°     |
| aaa    | 0.150           |         |         | 0.006               |         |         |
| bbb    | 0.200           |         |         | 0.008               |         |         |
| ccc    | 0.100           |         |         | 0.004               |         |         |
| ddd    | 0.100           |         |         | 0.004               |         |         |

## Tape and Reel Specification

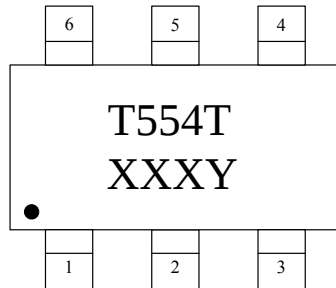


| Symbol          | W                        | A0              | B0              | K0              | E              | F              | P             | P0            | P2             | T               |
|-----------------|--------------------------|-----------------|-----------------|-----------------|----------------|----------------|---------------|---------------|----------------|-----------------|
| Dimensions (mm) | $8.00 \pm 0.3$<br>$-0.1$ | $3.23 \pm 0.05$ | $3.17 \pm 0.05$ | $1.37 \pm 0.05$ | $1.75 \pm 0.1$ | $3.5 \pm 0.05$ | $4.0 \pm 0.1$ | $4.0 \pm 0.1$ | $2.0 \pm 0.05$ | $0.25 \pm 0.02$ |



| Symbol          | Reel Size  | M               | N              | W              | W1            | H              | S             | K              | R              |
|-----------------|------------|-----------------|----------------|----------------|---------------|----------------|---------------|----------------|----------------|
| Dimensions (mm) | $\Phi 178$ | $178.0 \pm 1.0$ | $60.0 \pm 1.0$ | $11.5 \pm 0.5$ | $9.0 \pm 0.5$ | $13.0 \pm 0.5$ | $2.0 \pm 0.1$ | $11.0 \pm 0.2$ | $1.0 \pm 0.05$ |

## Marking Codes



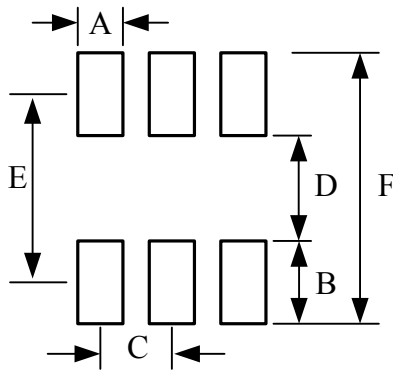
### Note:

- (1) "T554T" is the part number, fixed.
- (2) "XXX" is the last 3 characters of the wafer's Lot No.,  
 "Y" is the internal code.

## Ordering Information

| Part Number | Working Voltage | Quantity Per Reel | Reel Size |
|-------------|-----------------|-------------------|-----------|
| SRV05-4     | 5V              | 3,000             | 7 Inch    |

## Footprint: SOT23-6L



| 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  |