

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 \times 2.8mm \times 1.4mm)
- ❑ Protects four data lines
- ❑ Low capacitance: 0.3pF Typical (I/O-I/O)
- ❑ Low leakage current: 0.1 μA @ V_{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 SRV05-4 ideal for high-speed data ports and high-frequency lines (e.g., HDMI & DVI) applications. The low clamping voltage of the SRV05-4 guarantees a minimum stress on the protected IC.

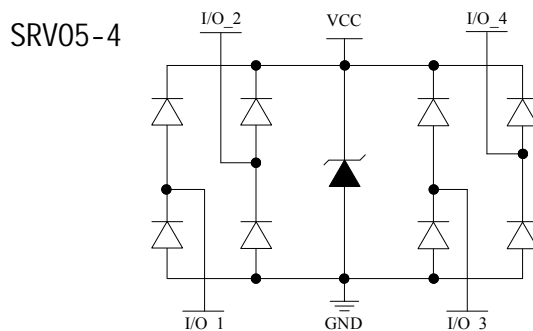
Applications

- ❑ 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)

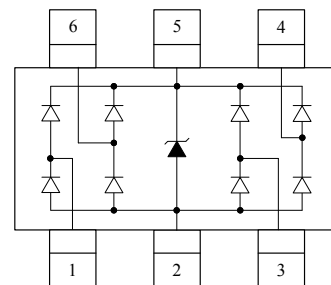
Mechanical Characteristics

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

Circuit Diagram



Pin Configuration



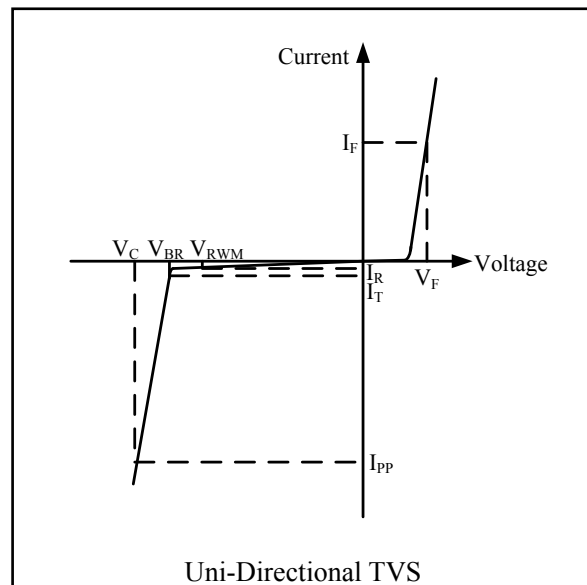
SOT23-6L
(Top View)

Absolute Maximum Rating

| Symbol | Parameter | Value | Units |
|-----------|---|----------------------|-------------|
| P_{PP} | Peak Pulse Power (8/20 μ 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) ESD per IEC 61000-4-2 (Contact) | ± 25 ± 17 | kV |
| T_{OPT} | Operating Temperature | -55/+125 | $^{\circ}C$ |
| T_{STG} | Storage Temperature | -55/+150 | $^{\circ}C$ |

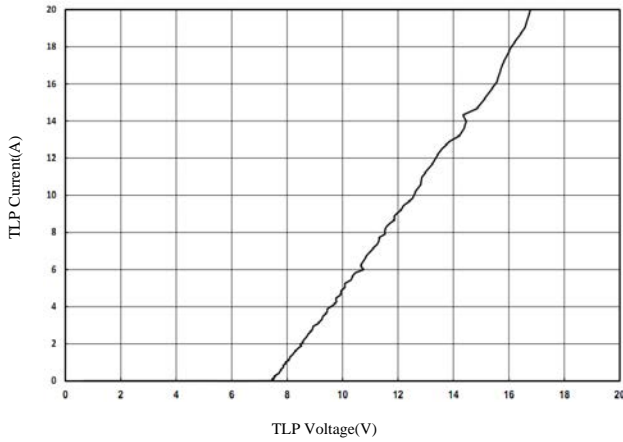
Electrical Characteristics (T = 25 $^{\circ}C$)

| 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 |

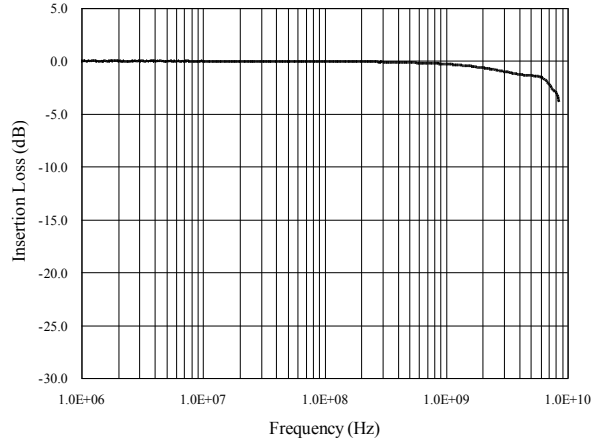


| Symbol | Test Condition | Minimum | Typical | Maximum | Units |
|-----------|--|---------|---------|---------|---------|
| V_{RWM} | | | | 5.0 | V |
| I_R | $V_{RWM} = 5V, T = 25^{\circ}C$ Between I/O and GND , Between VCC and GND | | 0.1 | 1.0 | μA |
| V_{BR} | $I_T = 1mA$ Between I/O and GND , Between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

TLP Measurement of I/O to GND

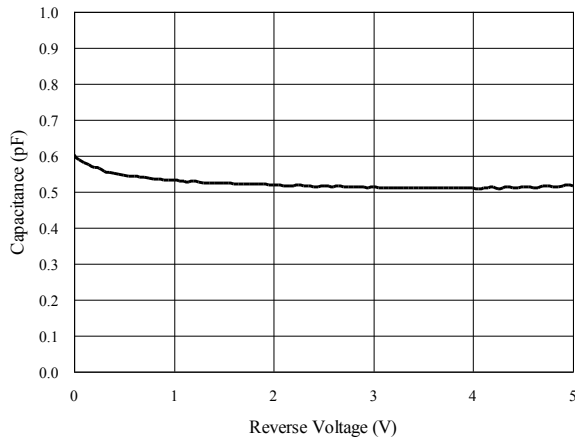


Insertion Loss S21 of I/O to GND

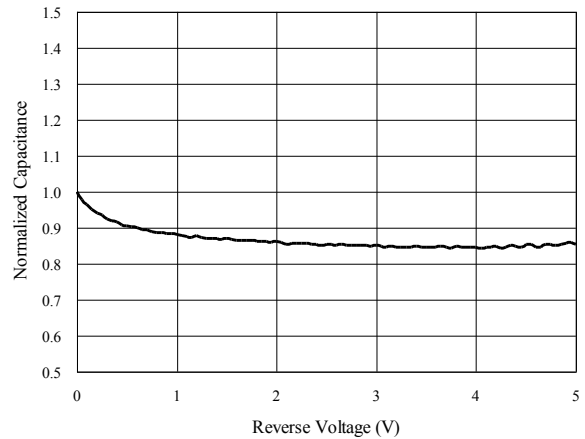


Capacitance vs. Voltage of I/O to GND (f = 1MHz)

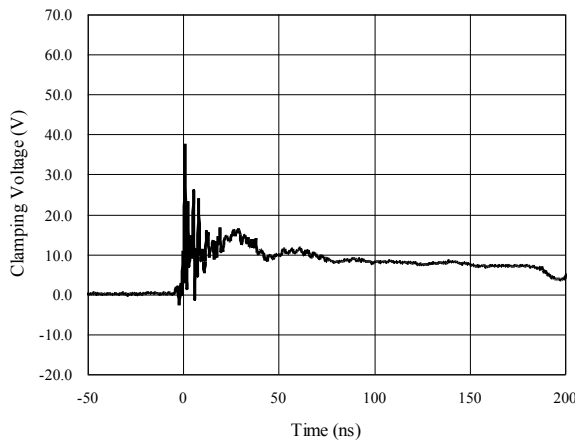
Capacitance vs. Reverse Voltage



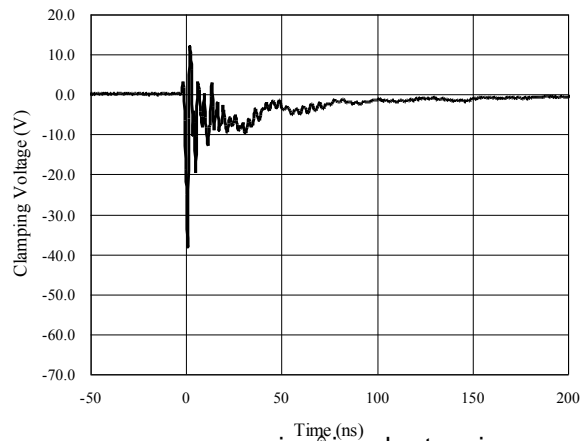
Normalized Capacitance vs. Reverse Voltage



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.

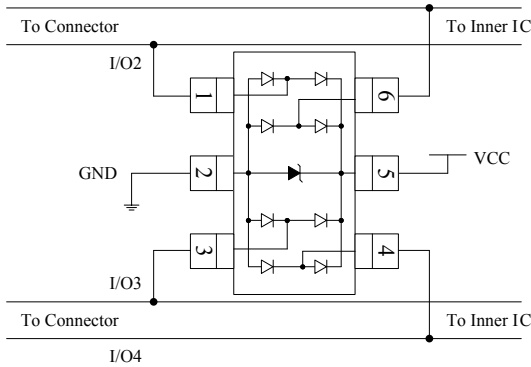


Figure 1 SRV05-4 pin connection in PCB

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.

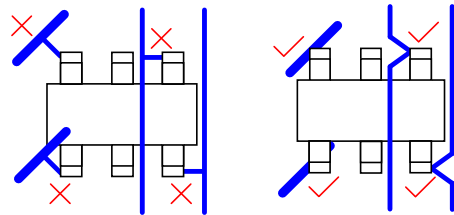
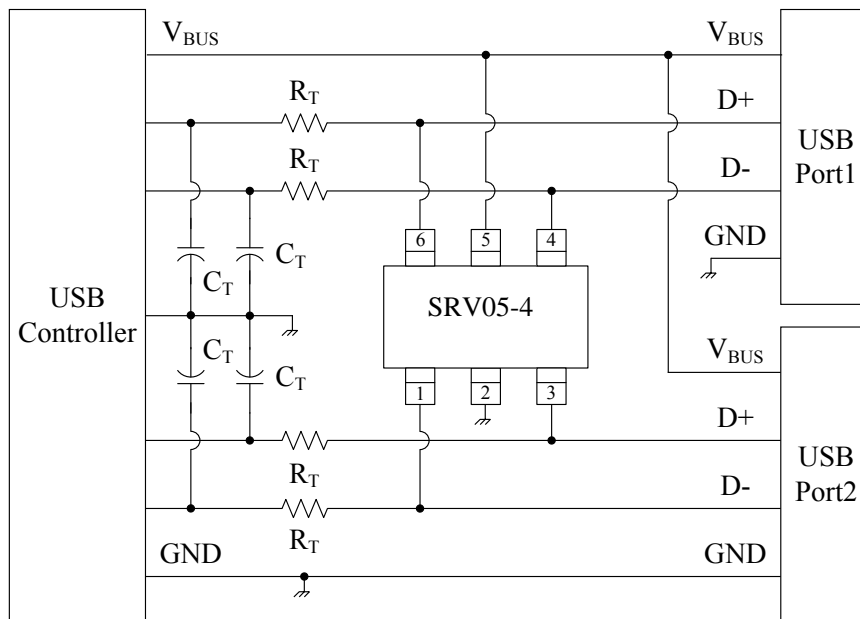


Figure 2 SRV05-4 Layout Guideline

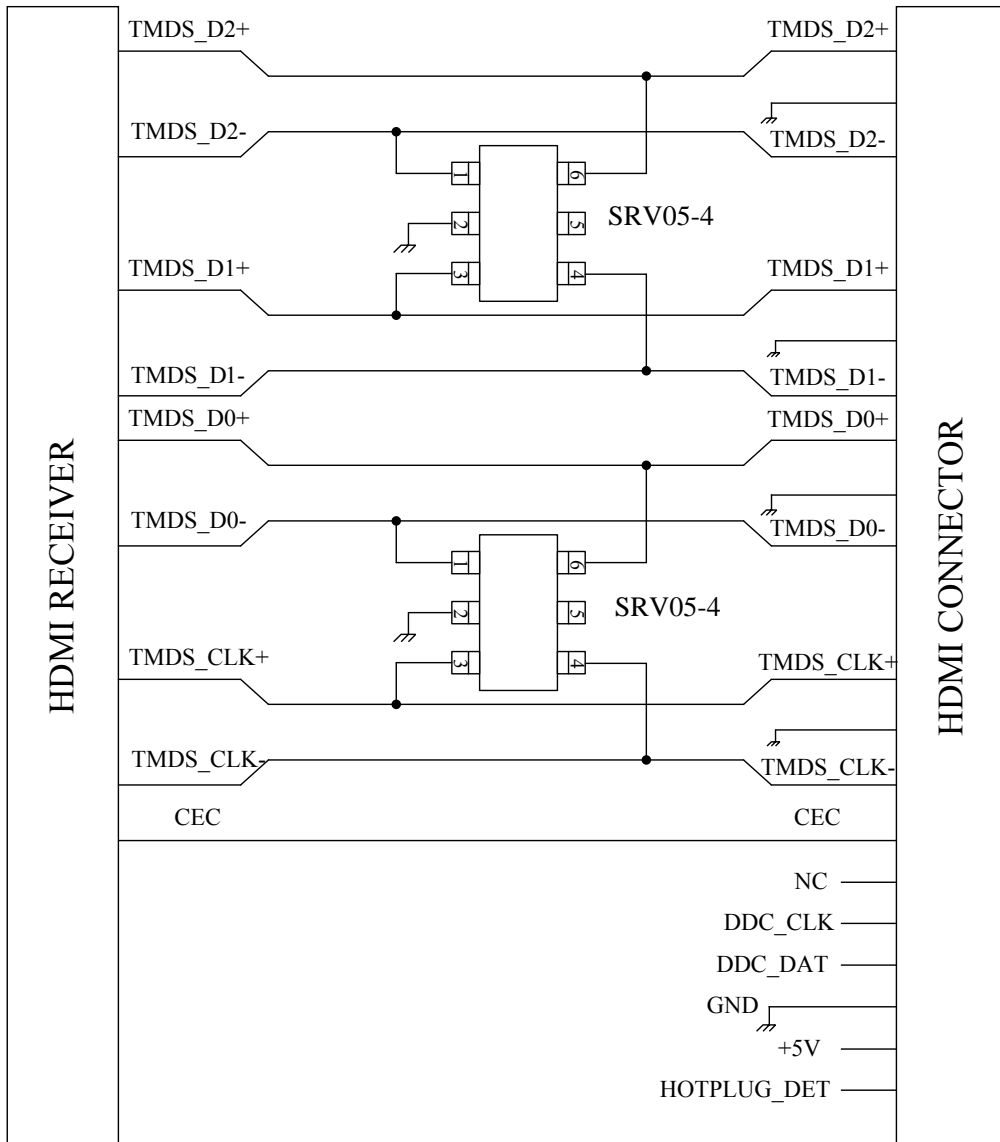
Universal Serial Bus ESD Protection



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Application Information (continued)

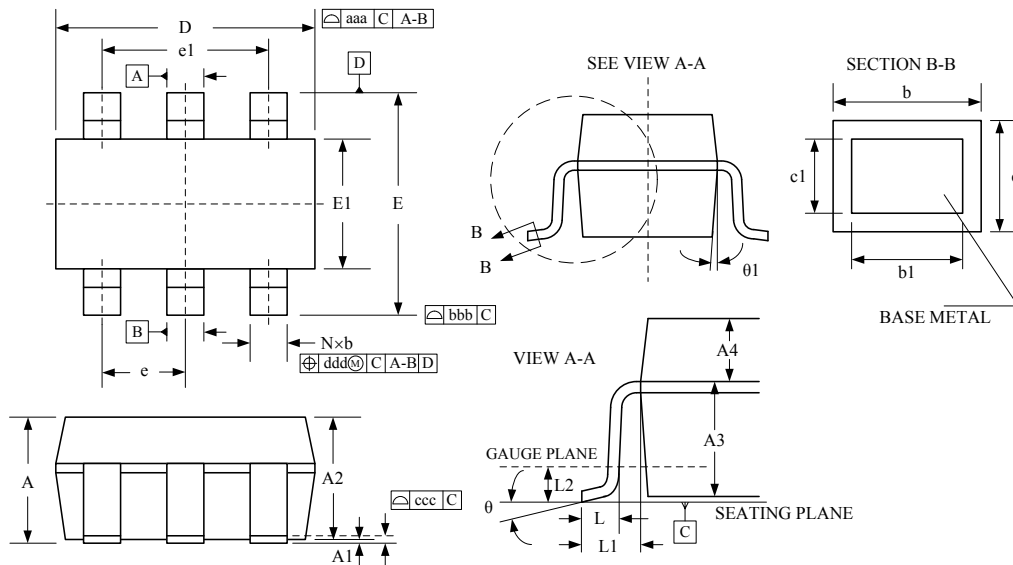


Layout Top View for HDMI Interface with SRV05-4



Package Outline

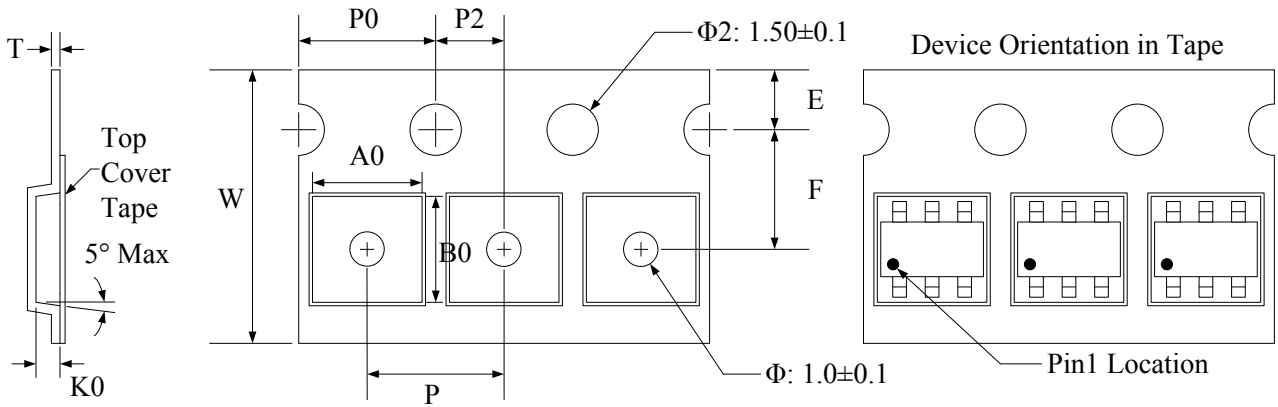
□ SOT23-6L package



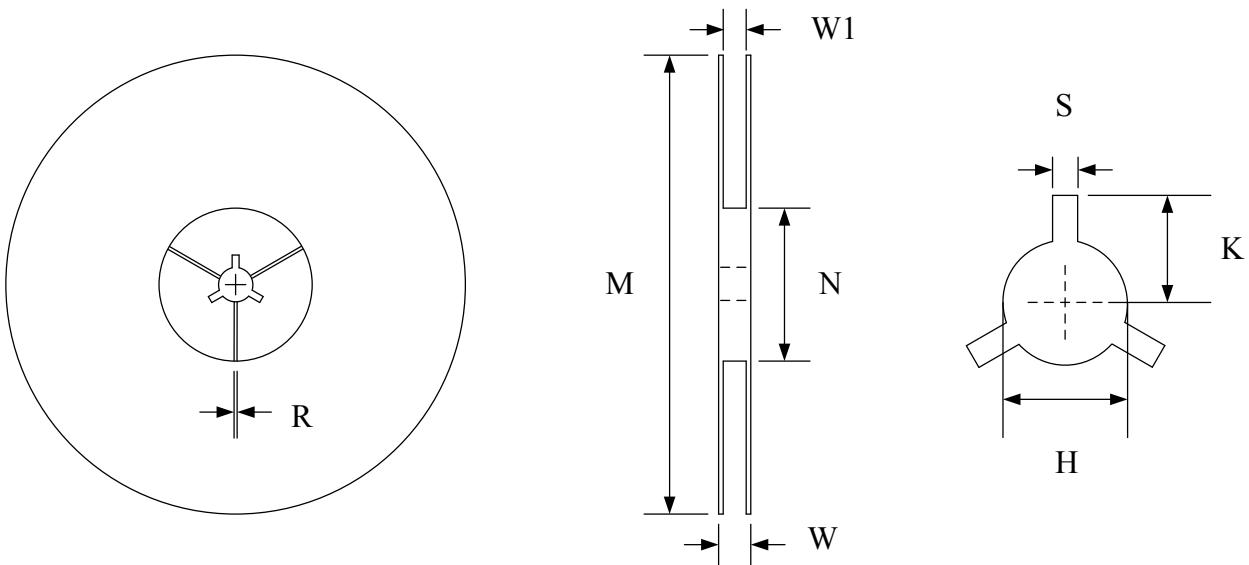
Package Dimensions (Controlling dimensions are in millimeters)

| 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

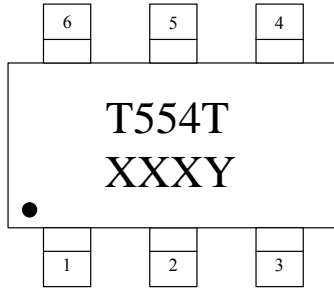


| Symbol | W | A0 | B0 | K0 | E | F | P | P0 | P2 | T |
|-----------------|------------------|-----------|-----------|-----------|----------|----------|---------|---------|----------|-----------|
| Dimensions (mm) | 8.00+0.3 -0.1 | 3.23±0.05 | 3.17±0.05 | 1.37±0.05 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 4.0±0.1 | 2.0±0.05 | 0.25±0.02 |



| Symbol | Reel Size | M | N | W | W1 | H | S | K | R |
|-----------------|-----------|-----------|----------|----------|---------|----------|---------|----------|----------|
| Dimensions (mm) | Φ178 | 178.0±1.0 | 60.0±1.0 | 11.5±0.5 | 9.0±0.5 | 13.0±0.5 | 2.0±0.1 | 11.0±0.2 | 1.0±0.05 |

Marking Codes



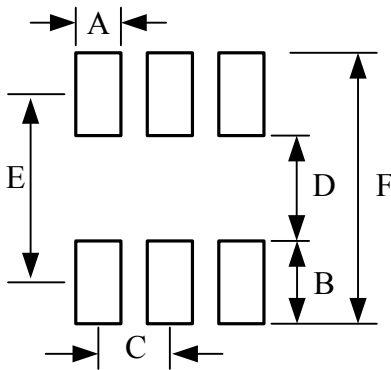
Note:

- (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 |

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