

## ESD5471S

1-Line, Bi-directional, Transient Voltage Suppressor

<http://www.sh-willsemi.com>

### Descriptions

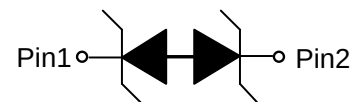
The ESD5471S is a bi-directional TVS (Transient Voltage Suppressor). It is specifically designed to protect sensitive electronic components which are connected to low speed data lines and control lines from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and Lightning.

The ESD5471S may be used to provide ESD protection up to  $\pm 30\text{kV}$  (contact and air discharge) according to IEC61000-4-2, and withstand peak pulse current up to 6A (8/20 $\mu\text{s}$ ) according to IEC61000-4-5.

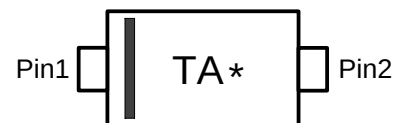
The ESD5471S is available in SOD-523 package. Standard products are Pb-free and Halogen-free.



**SOD-523 (Top View)**



**Circuit diagram**



TA = Device code

\* = Month code (A~Z)

**Marking (Top View)**

### Features

- Reverse stand-off voltage:  $\pm 5\text{V}$  Max
- Transient protection for each line according to  
IEC61000-4-2 (ESD):  $\pm 30\text{kV}$  (contact and air discharge)  
IEC61000-4-4 (EFT): 40A (5/50ns)  
IEC61000-4-5 (surge): 6A (8/20 $\mu\text{s}$ )
- Capacitance:  $C_J = 9\text{pF}$  typ.
- Low leakage current
- Low clamping voltage:  $V_{CL} = 12\text{V}$  typ. @  $I_{PP} = 16\text{A}$  (TLP)
- Solid-state silicon technology

### Applications

- Cellular handsets
- Tablets
- Laptops
- Other portable devices
- Network communication devices

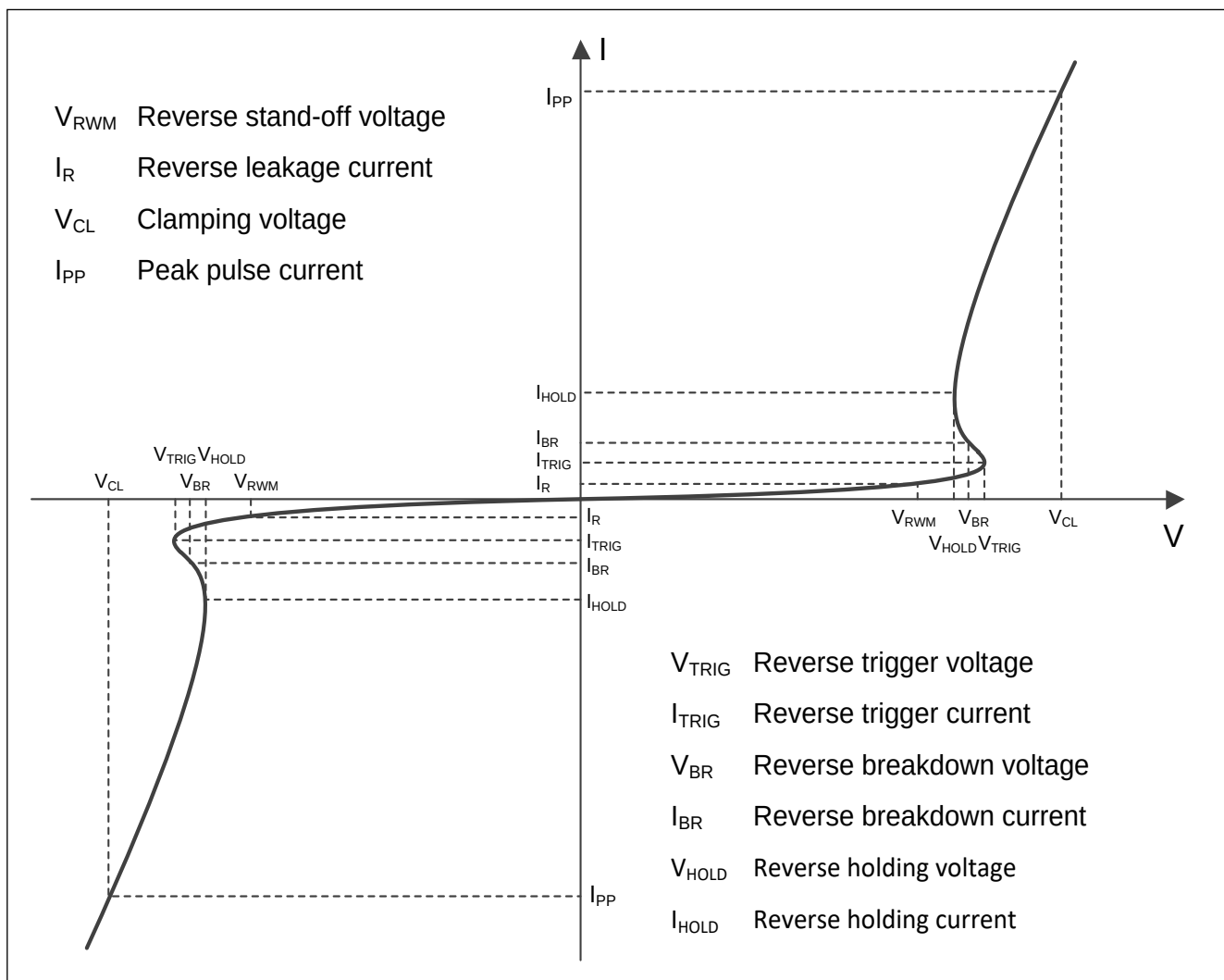
### Order information

| Device        | Package | Shipping       |
|---------------|---------|----------------|
| ESD5471S-2/TR | SOD-523 | 3000/Tape&Reel |

### Absolute maximum ratings

| Parameter                                       | Symbol    | Rating   | Unit        |
|-------------------------------------------------|-----------|----------|-------------|
| Peak pulse power ( $t_p = 8/20\mu s$ )          | $P_{pk}$  | 72       | W           |
| Peak pulse current ( $t_p = 8/20\mu s$ )        | $I_{pp}$  | 6        | A           |
| ESD according to IEC61000-4-2 air discharge     | $V_{ESD}$ | $\pm 30$ | kV          |
| ESD according to IEC61000-4-2 contact discharge |           | $\pm 30$ |             |
| Junction temperature                            | $T_J$     | 125      | $^{\circ}C$ |
| Operating temperature                           | $T_{OP}$  | -40~85   | $^{\circ}C$ |
| Lead temperature                                | $T_L$     | 260      | $^{\circ}C$ |
| Storage temperature                             | $T_{STG}$ | -55~150  | $^{\circ}C$ |

### Electrical characteristics ( $T_A=25^{\circ}C$ , unless otherwise noted)



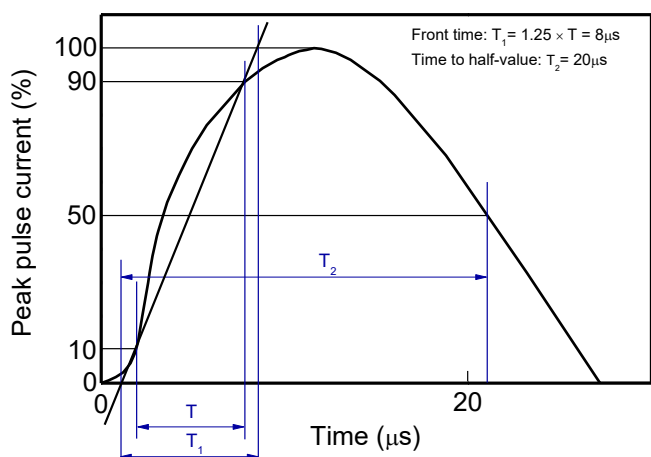
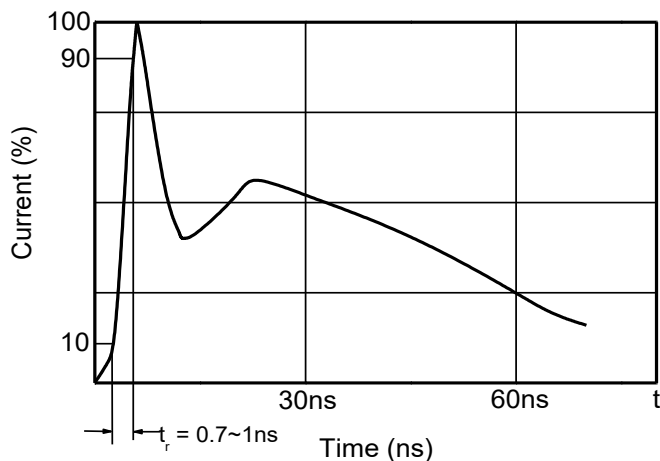
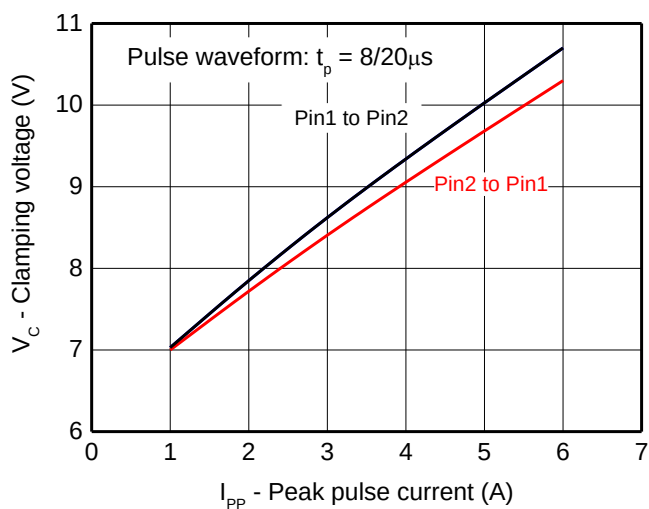
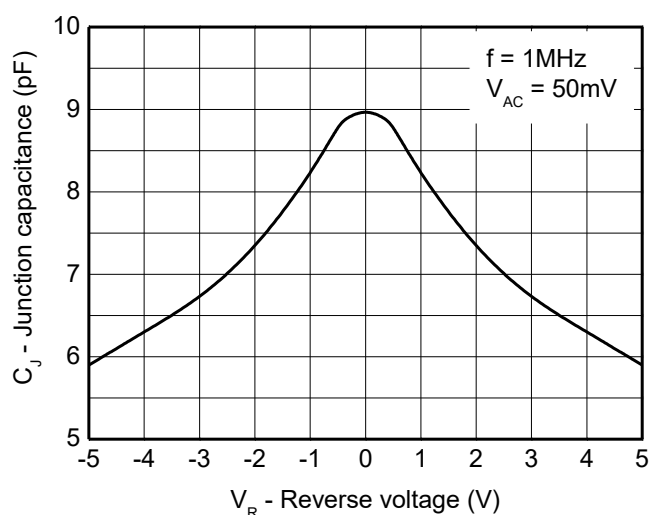
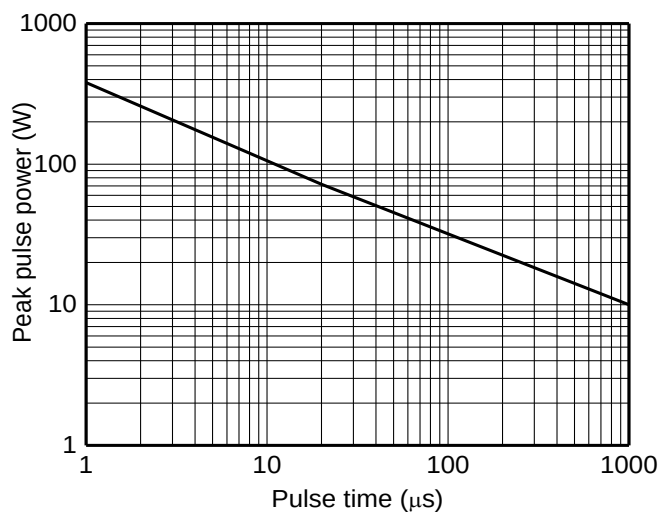
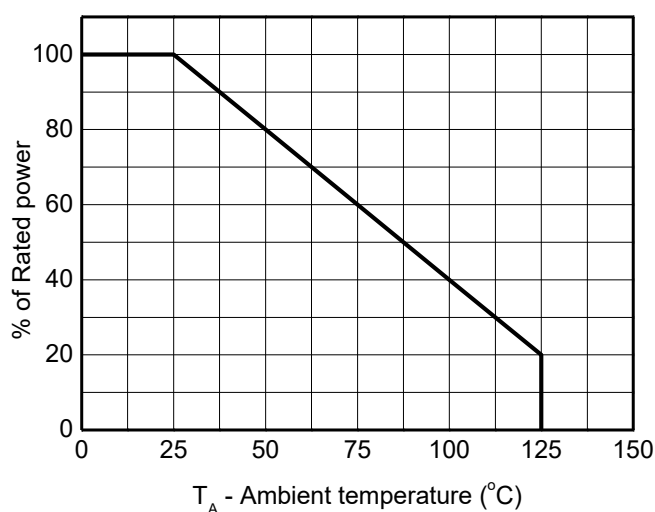
Definitions of electrical characteristics

**Electrical characteristics ( $T_A=25\text{ }^{\circ}\text{C}$ , unless otherwise noted)**

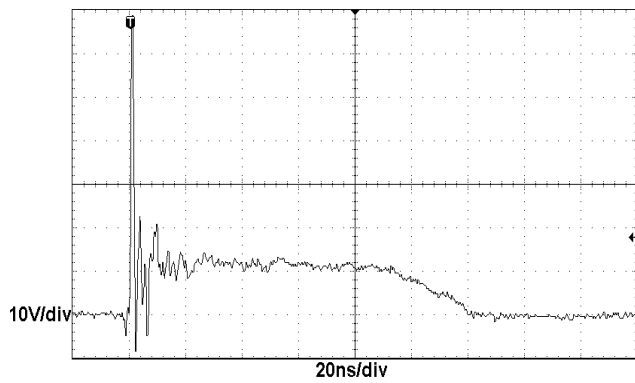
| Parameter                        | Symbol     | Condition                                      | Min. | Typ. | Max.    | Unit          |
|----------------------------------|------------|------------------------------------------------|------|------|---------|---------------|
| Reverse stand-off voltage        | $V_{RWM}$  |                                                |      |      | $\pm 5$ | V             |
| Reverse leakage current          | $I_R$      | $V_{RWM} = 5\text{V}$                          |      |      | 1       | $\mu\text{A}$ |
| Reverse breakdown voltage        | $V_{BR}$   | $I_{BR} = 1\text{mA}$                          | 5.1  |      |         | V             |
| Reverse holding voltage          | $V_{HOLD}$ | $I_{HOLD} = 50\text{mA}$                       | 5.1  |      |         | V             |
| Clamping voltage <sup>1)</sup>   | $V_{CL}$   | $I_{PP} = 16\text{A}$ , $t_p = 100\text{ns}$   |      | 12   |         | V             |
| Clamping voltage <sup>2)</sup>   | $V_{CL}$   | $V_{ESD} = 8\text{kV}$                         |      | 12   |         | V             |
| Clamping voltage <sup>3)</sup>   | $V_{CL}$   | $I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$ |      |      | 8       | V             |
|                                  |            | $I_{PP} = 6\text{A}$ , $t_p = 8/20\mu\text{s}$ |      |      | 12      | V             |
| Dynamic resistance <sup>1)</sup> | $R_{DYN}$  |                                                |      | 0.28 |         | $\Omega$      |
| Junction capacitance             | $C_J$      | $V_R = 0\text{V}$ , $f = 1\text{MHz}$          |      | 9    | 12      | pF            |
|                                  |            | $V_R = 5\text{V}$ , $f = 1\text{MHz}$          |      | 6    | 8       | pF            |

Notes:

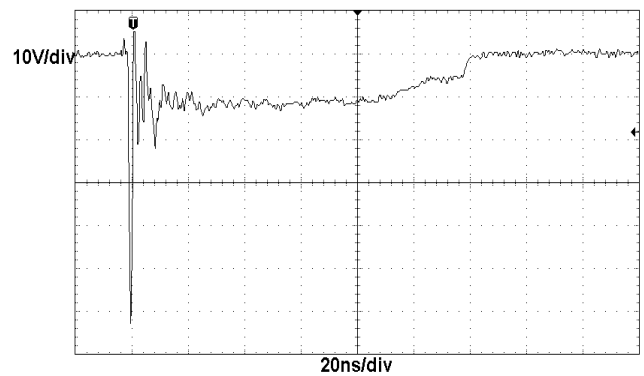
- 1) TLP parameter:  $Z_0 = 50\Omega$ ,  $t_p = 100\text{ns}$ ,  $t_r = 2\text{ns}$ , averaging window from 60ns to 80ns.  $R_{DYN}$  is calculated from 4A to 16A.
- 2) Contact discharge mode, according to IEC61000-4-2.
- 3) Non-repetitive current pulse, according to IEC61000-4-5.

**Typical characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)**

**8/20 $\mu\text{s}$  waveform per IEC61000-4-5**

**Contact discharge current waveform per IEC61000-4-2**

**Clamping voltage vs. Peak pulse current**

**Capacitance vs. Reverse voltage**

**Non-repetitive peak pulse power vs. Pulse time**

**Power derating vs. Ambient temperature**

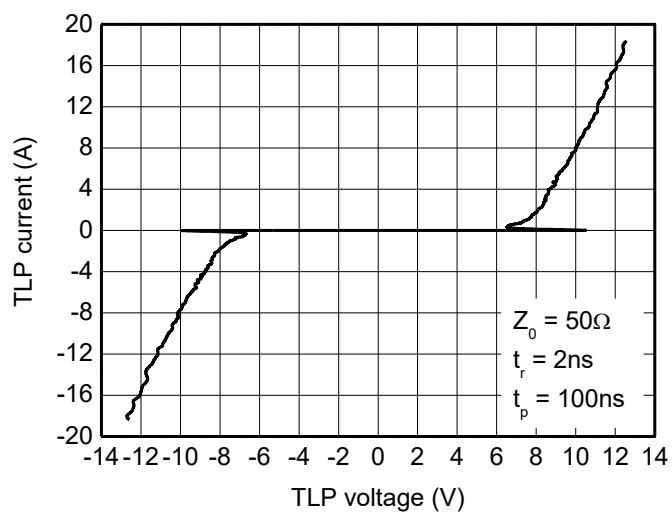
Typical characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)



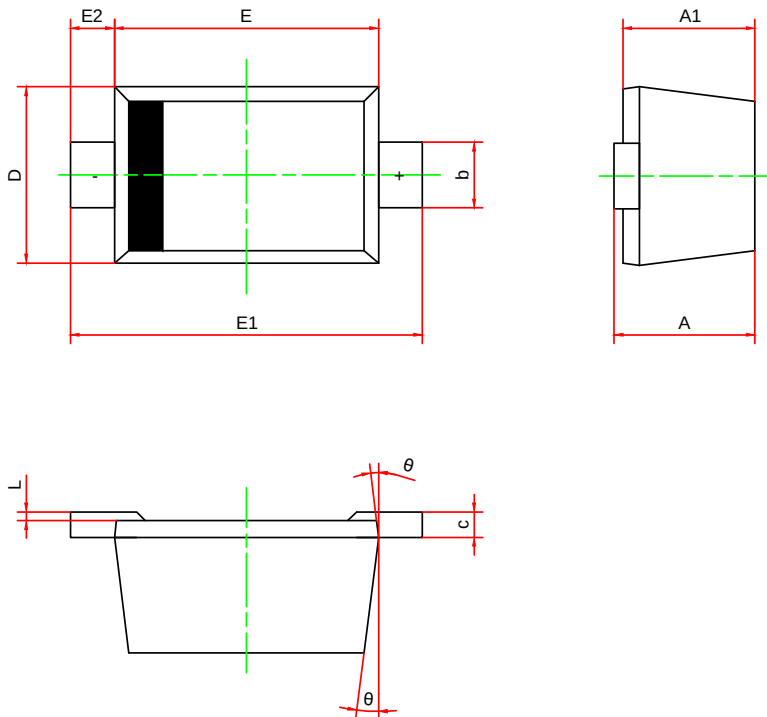
**ESD clamping**  
(+8kV contact discharge per IEC61000-4-2)



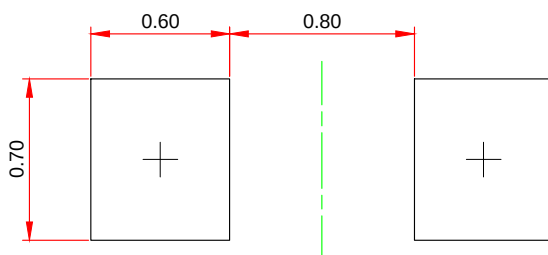
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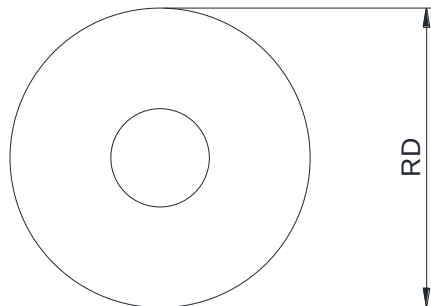
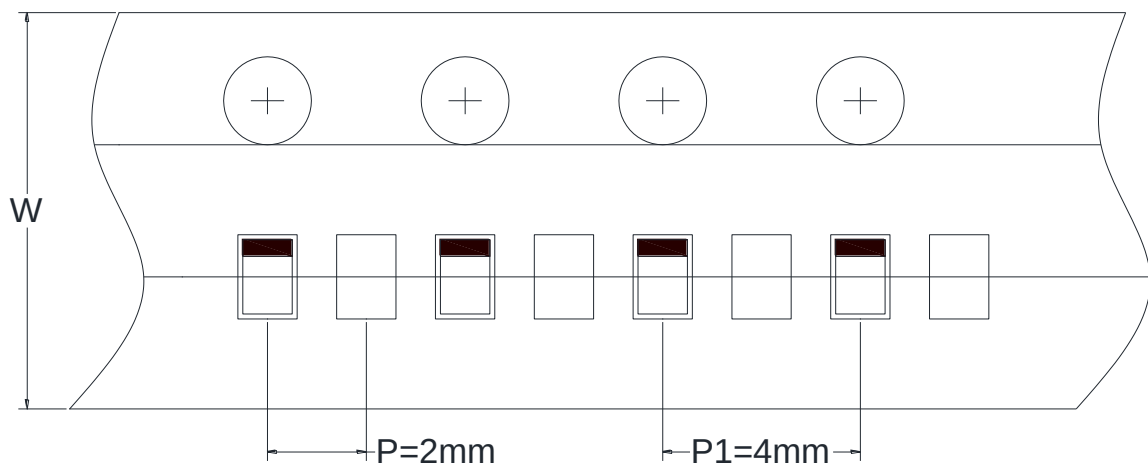
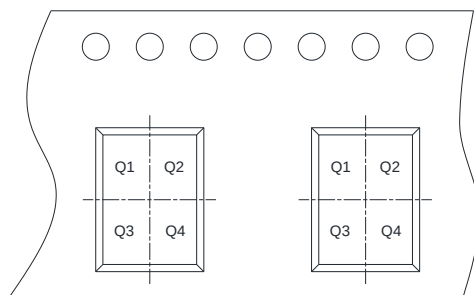
**TLP Measurement**

**Package outline dimensions**
**SOD-523**


| Symbol   | Dimensions in millimeter |       |       |
|----------|--------------------------|-------|-------|
|          | Min.                     | Typ.  | Max.  |
| A        | 0.510                    | 0.640 | 0.770 |
| A1       | 0.500                    | 0.600 | 0.700 |
| b        | 0.250                    | 0.300 | 0.350 |
| c        | 0.080                    | 0.115 | 0.150 |
| D        | 0.750                    | 0.800 | 0.850 |
| E        | 1.100                    | 1.200 | 1.300 |
| E1       | 1.500                    | 1.600 | 1.700 |
| E2       | 0.200 Ref                |       |       |
| L        | 0.010                    | 0.040 | 0.070 |
| $\theta$ | 7° Ref                   |       |       |

**Recommend land pattern (Unit: mm)**

**Notes:**

This recommended land pattern is for reference purposes only. Please consult your manufacturing group to ensure your PCB design guidelines are met.

**TAPE AND REEL INFORMATION**
**Reel Dimensions**

**Tape Dimensions**

**Quadrant Assignments For PIN1 Orientation In Tape**


  
 User Direction of Feed

|      |                                         |                                           |                                                                                                |
|------|-----------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------|
| RD   | Reel Dimension                          | <input checked="" type="checkbox"/> 7inch | <input type="checkbox"/> 13inch                                                                |
| W    | Overall width of the carrier tape       | <input checked="" type="checkbox"/> 8mm   | <input type="checkbox"/> 12mm <input type="checkbox"/> 16mm                                    |
| P1   | Pitch between successive cavity centers | <input type="checkbox"/> 2mm              | <input checked="" type="checkbox"/> 4mm <input type="checkbox"/> 8mm                           |
| Pin1 | Pin1 Quadrant                           | <input checked="" type="checkbox"/> Q1    | <input checked="" type="checkbox"/> Q2 <input type="checkbox"/> Q3 <input type="checkbox"/> Q4 |