



# 74LVC1G11Q

## Automotive Single 3-Input Positive AND Gate

### GENERAL DESCRIPTION

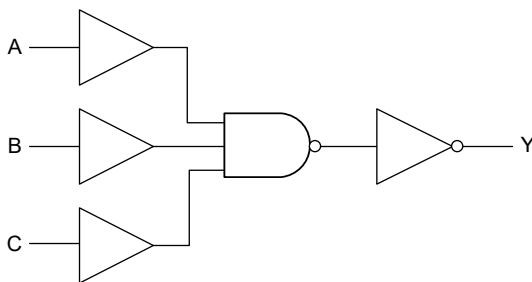
The 74LVC1G11Q is a single 3-input positive AND gate which can accept the supply voltage range from 1.65V to 5.5V. It implements the Boolean function  $Y = A \cdot B \cdot C$  or  $Y = \overline{\overline{A} + \overline{B} + \overline{C}}$  in positive logic.

This device is highly suitable for partial power-down applications by using power-off leakage current ( $I_{OFF}$ ) circuit. When the device is powered down, the outputs are disabled, and the current backflow can be prevented from passing through the device.

The device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The 74LVC1G11Q is available in Green SC70-6 and SOT-23-6 packages. It operates over an ambient temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

### LOGIC DIAGRAM



### FEATURES

- **AEC-Q100 Qualified for Automotive Applications**  
Device Temperature Grade 1  
 $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- **Wide Supply Voltage Range: 1.65V to 5.5V**
- **Inputs Accept Voltages up to 5.5V**
- **+24mA/-24mA Output Current at  $V_{CC} = 3.0\text{V}$**
- **Low Quiescent Current:  $I_{CC} = 0.1\mu\text{A}$  (TYP)**
- **Propagation Delay: 5.25ns (TYP) at  $V_{CC} = 3.3\text{V}$**
- **Support Partial Power-Down Mode**
- **$-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  Operating Temperature Range**
- **Available in Green SC70-6 and SOT-23-6 Packages**

### APPLICATIONS

Automotive Applications  
Battery Powered Equipment  
Medical Equipment  
Industrial Equipment  
Telecom Equipment  
Wireless Equipment

### FUNCTION TABLE

| INPUTS |   |   | OUTPUT |
|--------|---|---|--------|
| A      | B | C | Y      |
| H      | H | H | H      |
| L      | X | X | L      |
| X      | L | X | L      |
| X      | X | L | L      |

$$Y = A \cdot B \cdot C \text{ or } Y = \overline{\overline{A} + \overline{B} + \overline{C}}$$

H = High Voltage Level

L = Low Voltage Level

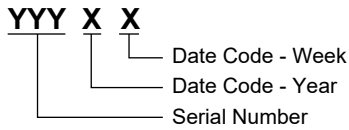
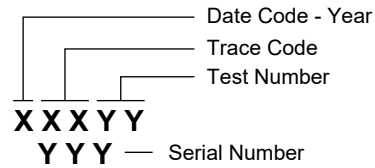
X = Don't Care

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****PACKAGE/ORDERING INFORMATION**

| MODEL      | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER  | PACKAGE MARKING | PACKING OPTION      |
|------------|---------------------|-----------------------------|------------------|-----------------|---------------------|
| 74LVC1G11Q | SC70-6              | -40°C to +125°C             | 74LVC1G11QC6G/TR | 1L7XX           | Tape and Reel, 3000 |
|            | SOT-23-6            | -40°C to +125°C             | 74LVC1G11QN6G/TR | XXXXY<br>1IU    | Tape and Reel, 3000 |

**MARKING INFORMATION**

NOTE: X = Date Code. XXX = Date Code and Trace Code.

**SC70-6****SOT-23-6**

Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>**

|                                               |                                      |
|-----------------------------------------------|--------------------------------------|
| Supply Voltage, $V_{CC}$                      | -0.5V to 6.5V                        |
| Input Voltage, $V_I$ <sup>(2)</sup>           | -0.5V to 6.5V                        |
| Output Voltage, $V_O$ <sup>(2)</sup>          |                                      |
| Active Mode                                   | -0.5V to MIN(6.5V, $V_{CC} + 0.5V$ ) |
| Power-Down Mode                               | -0.5V to 6.5V                        |
| Input Clamp Current, $I_{IK}$ ( $V_I < 0V$ )  | -50mA                                |
| Output Clamp Current, $I_{OK}$ ( $V_O < 0V$ ) | -50mA                                |
| Continuous Output Current, $I_O$              | ±50mA                                |
| Continuous Current through $V_{CC}$ or GND    | ±100mA                               |
| Junction Temperature <sup>(3)</sup>           | +150°C                               |
| Storage Temperature Range                     | -65°C to +150°C                      |
| Lead Temperature (Soldering, 10s)             | +260°C                               |
| ESD Susceptibility                            |                                      |
| HBM                                           | TBD                                  |
| CDM                                           | TBD                                  |

**RECOMMENDED OPERATING CONDITIONS**

|                                                         |                 |
|---------------------------------------------------------|-----------------|
| Supply Voltage, $V_{CC}$                                | 1.65V to 5.5V   |
| Input Voltage, $V_I$                                    | 0V to 5.5V      |
| Output Voltage, $V_O$                                   |                 |
| Active Mode                                             | 0V to $V_{CC}$  |
| Power-Down Mode, $V_{CC} = 0V$                          | 0V to 5.5V      |
| Input Transition Rise or Fall Rate, $\Delta t/\Delta V$ |                 |
| $V_{CC} = 1.8V \pm 0.15V$ , $2.5V \pm 0.2V$             | 20ns/V (MAX)    |
| $V_{CC} = 3.3V \pm 0.3V$ , $5.0V \pm 0.5V$              | 10ns/V (MAX)    |
| Operating Temperature Range                             | -40°C to +125°C |

**OVERSTRESS CAUTION**

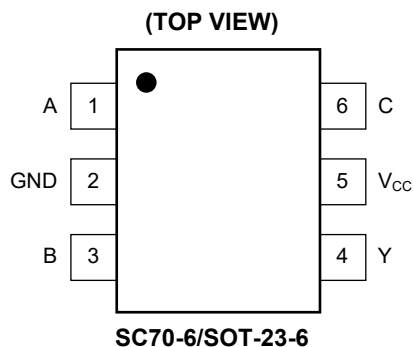
- Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.
- The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
- The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****PIN CONFIGURATIONS****PIN DESCRIPTION**

| PIN     | NAME            | FUNCTION        |
|---------|-----------------|-----------------|
| 1, 3, 6 | A, B, C         | Data Inputs.    |
| 2       | GND             | Ground.         |
| 4       | Y               | Data Output.    |
| 5       | V <sub>CC</sub> | Supply Voltage. |

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****ELECTRICAL CHARACTERISTICS**(Full = -40°C to +125°C, all typical values are measured at T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER                 | SYMBOL           | CONDITIONS                                                                                            | TEMP                                                      | MIN                    | TYP                    | MAX                    | UNITS |
|---------------------------|------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------|------------------------|------------------------|-------|
| High-Level Input Voltage  | V <sub>IH</sub>  | V <sub>CC</sub> = 1.65V to 1.95V                                                                      | Full                                                      | 0.67 × V <sub>CC</sub> |                        |                        | V     |
|                           |                  | V <sub>CC</sub> = 2.3V to 2.7V                                                                        | Full                                                      | 1.7                    |                        |                        |       |
|                           |                  | V <sub>CC</sub> = 2.7V to 3.6V                                                                        | Full                                                      | 2.0                    |                        |                        |       |
|                           |                  | V <sub>CC</sub> = 4.5V to 5.5V                                                                        | Full                                                      | 0.7 × V <sub>CC</sub>  |                        |                        |       |
| Low-Level Input Voltage   | V <sub>IL</sub>  | V <sub>CC</sub> = 1.65V to 1.95V                                                                      | Full                                                      |                        |                        | 0.35 × V <sub>CC</sub> | V     |
|                           |                  | V <sub>CC</sub> = 2.3V to 2.7V                                                                        | Full                                                      |                        |                        | 0.7                    |       |
|                           |                  | V <sub>CC</sub> = 2.7V to 3.6V                                                                        | Full                                                      |                        |                        | 0.8                    |       |
|                           |                  | V <sub>CC</sub> = 4.5V to 5.5V                                                                        | Full                                                      |                        |                        | 0.3 × V <sub>CC</sub>  |       |
| High-Level Output Voltage | V <sub>OH</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                   | V <sub>CC</sub> = 1.65V to 5.5V, I <sub>OH</sub> = -100μA | Full                   | V <sub>CC</sub> - 0.01 |                        | V     |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 1.65V, I <sub>OH</sub> = -4mA           | Full                   | 1.55                   |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 2.3V, I <sub>OH</sub> = -8mA            | Full                   | 2.15                   |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 2.7V, I <sub>OH</sub> = -12mA           | Full                   | 2.5                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 3.0V, I <sub>OH</sub> = -16mA           | Full                   | 2.7                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 3.0V, I <sub>OH</sub> = -24mA           | Full                   | 2.7                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = -32mA           | Full                   | 4.5                    |                        |       |
| Low-Level Output Voltage  | V <sub>OL</sub>  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                                   | V <sub>CC</sub> = 1.65V to 5.5V, I <sub>OL</sub> = 100μA  | Full                   | 0.01                   |                        | V     |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 1.65V, I <sub>OL</sub> = 4mA            | Full                   | 0.1                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 2.3V, I <sub>OL</sub> = 8mA             | Full                   | 0.15                   |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 2.7V, I <sub>OL</sub> = 12mA            | Full                   | 0.2                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 3.0V, I <sub>OL</sub> = 16mA            | Full                   | 0.2                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 3.0V, I <sub>OL</sub> = 24mA            | Full                   | 0.3                    |                        |       |
|                           |                  |                                                                                                       | V <sub>CC</sub> = 4.5V, I <sub>OL</sub> = 32mA            | Full                   | 0.35                   |                        |       |
| Input Leakage Current     | I <sub>I</sub>   | V <sub>CC</sub> = 0V to 5.5V, V <sub>I</sub> = 5.5V or GND                                            | Full                                                      |                        | ±0.1                   |                        | μA    |
| Power-Off Leakage Current | I <sub>OFF</sub> | V <sub>CC</sub> = 0V, V <sub>I</sub> or V <sub>O</sub> = 5.5V                                         | Full                                                      |                        | ±0.1                   |                        | μA    |
| Supply Current            | I <sub>CC</sub>  | V <sub>CC</sub> = 1.65V to 5.5V, V <sub>I</sub> = 5.5V or GND, I <sub>O</sub> = 0A                    | Full                                                      |                        | 0.1                    |                        | μA    |
| Additional Supply Current | ΔI <sub>CC</sub> | Per pin, V <sub>CC</sub> = 3.0V to 5.5V, V <sub>I</sub> = V <sub>CC</sub> - 0.6V, I <sub>O</sub> = 0A | Full                                                      |                        | 0.1                    |                        | μA    |
| Input Capacitance         | C <sub>I</sub>   | V <sub>CC</sub> = 3.3V, V <sub>I</sub> = GND to V <sub>CC</sub>                                       | +25°C                                                     |                        | 5                      |                        | pF    |

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****DYNAMIC CHARACTERISTICS**(See Figure 1 for test circuit. Full = -40°C to +125°C, all typical values are measured at T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER                                    | SYMBOL          | CONDITIONS                                                       | TEMP                           | MIN   | TYP  | MAX | UNITS |
|----------------------------------------------|-----------------|------------------------------------------------------------------|--------------------------------|-------|------|-----|-------|
| Propagation Delay <sup>(1)</sup>             | t <sub>PD</sub> | A, B or C to Y,<br>C <sub>L</sub> = 30pF or 50pF,<br>see Table 1 | V <sub>CC</sub> = 1.8V ± 0.15V | Full  | 9.50 |     | ns    |
|                                              |                 |                                                                  | V <sub>CC</sub> = 2.5V ± 0.2V  | Full  | 6.25 |     |       |
|                                              |                 |                                                                  | V <sub>CC</sub> = 3.3V ± 0.3V  | Full  | 5.25 |     |       |
|                                              |                 |                                                                  | V <sub>CC</sub> = 5.0V ± 0.5V  | Full  | 4.75 |     |       |
| Power Dissipation Capacitance <sup>(2)</sup> | C <sub>PD</sub> | f = 10MHz                                                        | V <sub>CC</sub> = 1.8V         | +25°C | 39   |     | pF    |
|                                              |                 |                                                                  | V <sub>CC</sub> = 2.5V         | +25°C | 34   |     |       |
|                                              |                 |                                                                  | V <sub>CC</sub> = 3.3V         | +25°C | 35   |     |       |
|                                              |                 |                                                                  | V <sub>CC</sub> = 5.0V         | +25°C | 43   |     |       |

**NOTES:**

- t<sub>PD</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

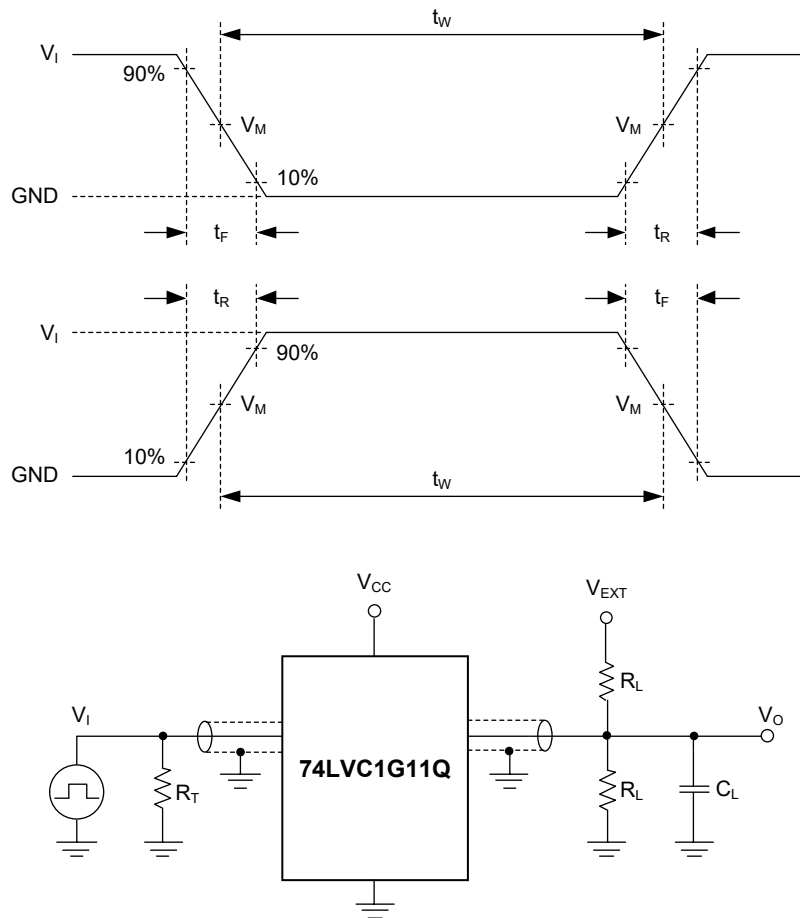
$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$

where:

f<sub>i</sub> = Input frequency in MHz.f<sub>o</sub> = Output frequency in MHz.C<sub>L</sub> = Output load capacitance in pF.V<sub>CC</sub> = Supply voltage in Volts.

N = Number of inputs switching.

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = Sum of outputs.

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****TEST CIRCUIT**

Test conditions are given in Table 1.

Definitions for test circuit:

$R_L$ : Load resistance.

$C_L$ : Load capacitance (includes jig and probe).

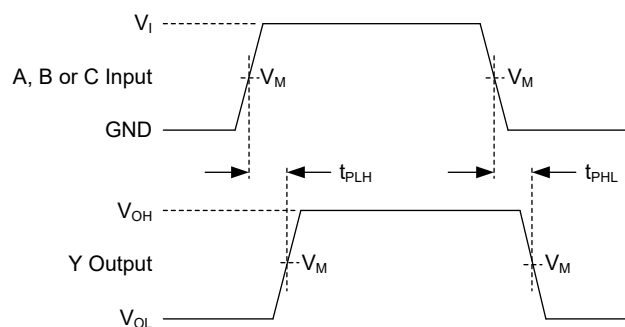
$R_T$ : Termination resistance (equals to output impedance  $Z_o$  of the pulse generator).

$V_{EXT}$ : External voltage is used to measure switching times.

**Figure 1. Test Circuit for Measuring Switching Times**

**Table 1. Test Conditions**

| SUPPLY VOLTAGE   | INPUT    |              | LOAD  |              | $V_{EXT}$          |
|------------------|----------|--------------|-------|--------------|--------------------|
| $V_{CC}$         | $V_I$    | $t_R, t_F$   | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ |
| $1.8V \pm 0.15V$ | $V_{CC}$ | $\leq 2.0ns$ | 30pF  | 1k $\Omega$  | Open               |
| $2.5V \pm 0.2V$  | $V_{CC}$ | $\leq 2.0ns$ | 30pF  | 500 $\Omega$ | Open               |
| $3.3V \pm 0.3V$  | 3.0V     | $\leq 2.5ns$ | 50pF  | 500 $\Omega$ | Open               |
| $5.0V \pm 0.5V$  | $V_{CC}$ | $\leq 2.5ns$ | 50pF  | 500 $\Omega$ | Open               |

**74LVC1G11Q****Automotive Single 3-Input Positive AND Gate****WAVEFORMS**

Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Figure 2. Input (A, B or C) to Output (Y) Propagation Delays**

**Table 2. Measurement Points**

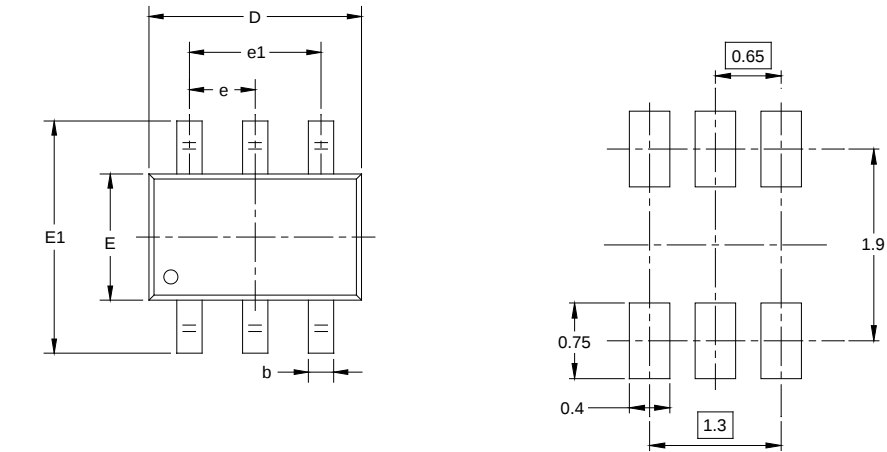
| SUPPLY VOLTAGE   | INPUT    |                     | OUTPUT              |
|------------------|----------|---------------------|---------------------|
| $V_{CC}$         | $V_I$    | $V_M^{(1)}$         | $V_M$               |
| $1.8V \pm 0.15V$ | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| $2.5V \pm 0.2V$  | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| $3.3V \pm 0.3V$  | 3.0V     | 1.5V                | 1.5V                |
| $5.0V \pm 0.5V$  | $V_{CC}$ | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |

NOTE:

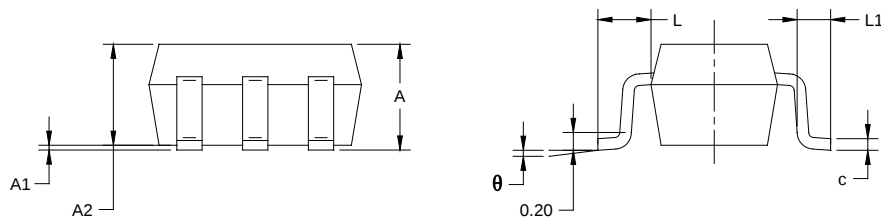
1. The measurement points should be  $V_{IH}$  or  $V_{IL}$  when the input rising or falling time exceeds 2.5ns.

## PACKAGE OUTLINE DIMENSIONS

### SC70-6



RECOMMENDED LAND PATTERN (Unit: mm)



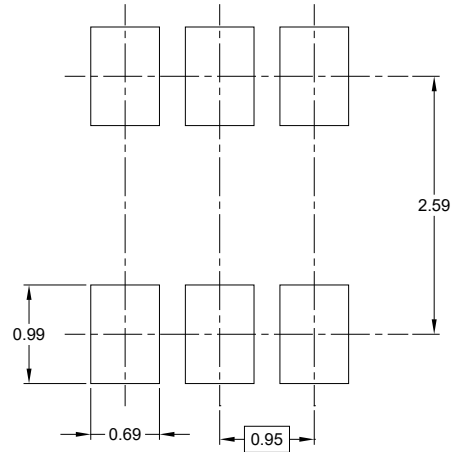
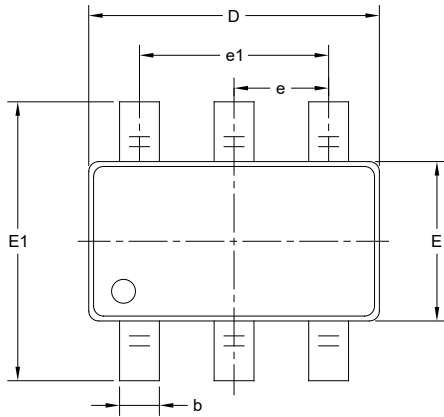
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        | 0.800                        | 1.100 | 0.031                   | 0.043 |
| A1       | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2       | 0.800                        | 1.000 | 0.031                   | 0.039 |
| b        | 0.150                        | 0.350 | 0.006                   | 0.014 |
| c        | 0.080                        | 0.220 | 0.003                   | 0.009 |
| D        | 2.000                        | 2.200 | 0.079                   | 0.087 |
| E        | 1.150                        | 1.350 | 0.045                   | 0.053 |
| E1       | 2.150                        | 2.450 | 0.085                   | 0.096 |
| e        | 0.65 TYP                     |       | 0.026 TYP               |       |
| e1       | 1.300 BSC                    |       | 0.051 BSC               |       |
| L        | 0.525 REF                    |       | 0.021 REF               |       |
| L1       | 0.260                        | 0.460 | 0.010                   | 0.018 |
| $\theta$ | 0°                           | 8°    | 0°                      | 8°    |

#### NOTES:

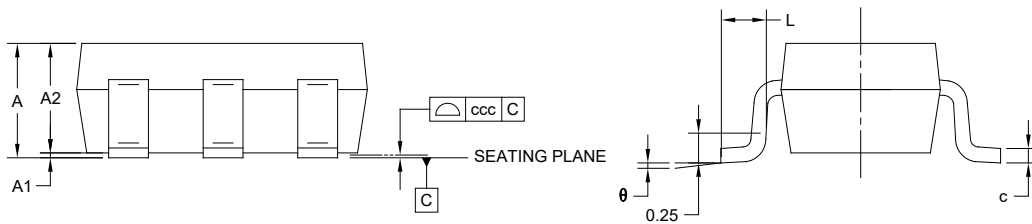
1. Body dimensions do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### SOT-23-6



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol   | Dimensions In Millimeters |     |       |
|----------|---------------------------|-----|-------|
|          | MIN                       | MOD | MAX   |
| A        | -                         | -   | 1.450 |
| A1       | 0.000                     | -   | 0.150 |
| A2       | 0.900                     | -   | 1.300 |
| b        | 0.300                     | -   | 0.500 |
| c        | 0.080                     | -   | 0.220 |
| D        | 2.750                     | -   | 3.050 |
| E        | 1.450                     | -   | 1.750 |
| E1       | 2.600                     | -   | 3.000 |
| e        | 0.950 BSC                 |     |       |
| e1       | 1.900 BSC                 |     |       |
| L        | 0.300                     | -   | 0.600 |
| $\theta$ | 0°                        | -   | 8°    |
| ccc      | 0.100                     |     |       |

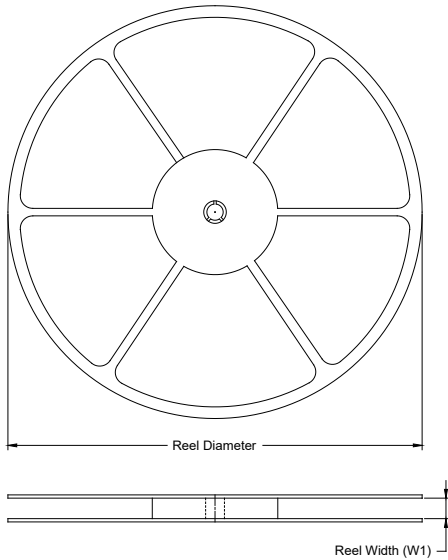
#### NOTES:

1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

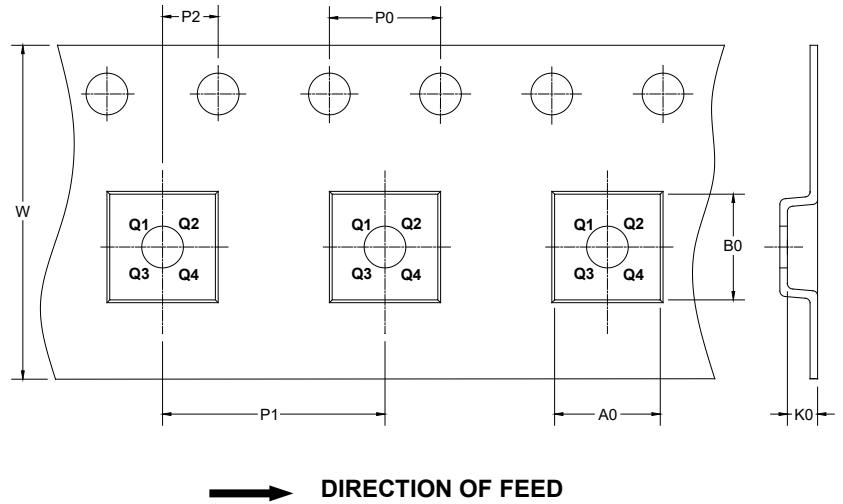
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

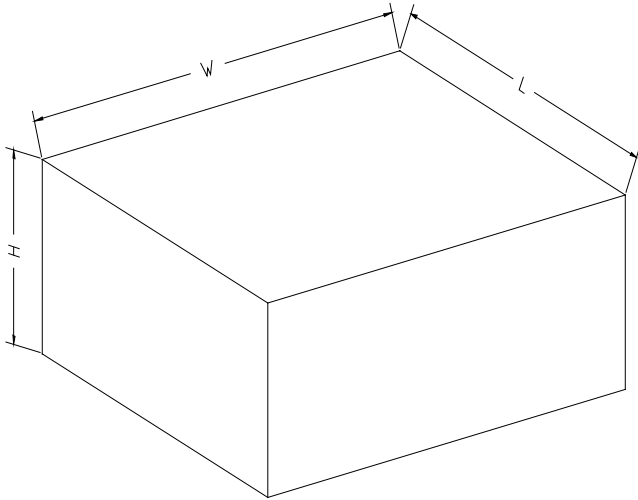
### KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SC70-6       | 7"            | 9.5                | 2.40    | 2.50    | 1.20    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |
| SOT-23-6     | 7"            | 9.5                | 3.23    | 3.17    | 1.37    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |

DD0001

## PACKAGE INFORMATION

### CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

### KEY PARAMETER LIST OF CARTON BOX

| Reel Type   | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368         | 227        | 224         | 8            |
| 7"          | 442         | 410        | 224         | 18           |

DD0002