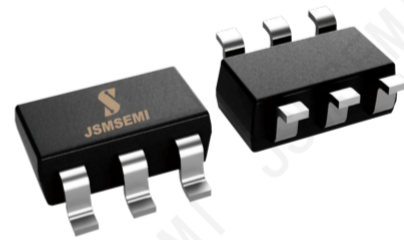
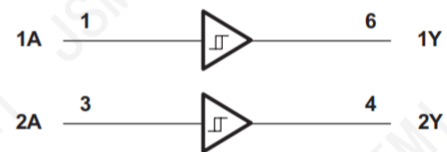


## Description

This dual Schmitt-Trigger buffer is designed for 1.65V to 5.5V V<sub>CC</sub> operation.

The SN74LVC2G17 device contains two buffers and performs the Boolean function  $Y=A$ . The device functions as two independent buffers, but because of Schmitt action, it may have different input threshold levels for positive-going (V<sub>T+</sub>) and negative-going (V<sub>T-</sub>) signals. This device is fully specified for partial-power-down applications using I<sub>off</sub>. The I<sub>off</sub> circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down. The SN74LVC2G17 is available in Green SOT23-6 and SOT-363 packages. It operates over an ambient temperature range of -40°C to +125°C.



Simplified Schematic

## Features

- Schmitt-Trigger inputs provide hysteresis
- Supports 5V V<sub>CC</sub> Operation
- Inputs Accept Voltages to 5.5 V
- Typ t<sub>pd</sub> of 4.2ns at 3.3 V
- Low Power Consumption, 1μA Max I<sub>CC</sub>
- ±24mA Output Drive at 3V
- I<sub>off</sub> Supports Live Insertion, Partial-Power-Down Mode Operation and Back-Drive Protection
- Packages: SOT23-6, SOT-363(SC70-6)
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model
  - 1000-V Charged-Device Model
- Operating Temperature Range: -40°C to +125°C
- RoSH compatible

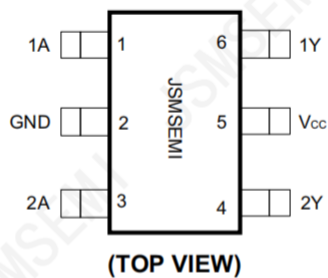
## Applications

- AV Receivers
- Audio Docks: Portable
- Blu-ray Players and Home Theater
- MP3 Players/Recorders
- Personal Digital Assistants (PDAs)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drives (SSDs): Client and Enterprise
- TVs: LCD/Digital and High-Definition (HDTVs)
- Tablets: Enterprise
- Video Analytics: Server
- Wireless Headsets, Keyboards, and Mice

## Ordering Information

| Order number        | Package   | Marking | Operation Temperature Range | MSL Grade | Ship,Quantity | Green |
|---------------------|-----------|---------|-----------------------------|-----------|---------------|-------|
| SN74LVC2G17DBVR-JSM | SOT-23-6L | C175    | -40 to 125°C                | 3         | TR&3000       | Rohs  |
| SN74LVC2G17DCKR-JSM | SOT-363   | C7R     | -40 to 125°C                | 3         | TR&3000       | Rohs  |

## Pin Configuration and Functions



### Pin Functions

| PIN             |     | TYPE | DESCRIPTION |
|-----------------|-----|------|-------------|
| NAME            | NO. |      |             |
| 1A              | 1   | I    | Input 1     |
| 1Y              | 6   | O    | Output 1    |
| 2A              | 3   | I    | Input 2     |
| 2Y              | 4   | O    | Output 2    |
| GND             | 2   | —    | Ground      |
| V <sub>cc</sub> | 5   | —    | Power Pin   |

## Specifications

### Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|           |                                                                                             | MIN       | MAX            | UNIT |
|-----------|---------------------------------------------------------------------------------------------|-----------|----------------|------|
| $V_{CC}$  | Supply voltage range                                                                        | -0.5      | 6.5            | V    |
| $V_I$     | Input voltage range <sup>(2)</sup>                                                          | -0.5      | 6.5            | V    |
| $V_O$     | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | -0.5      | 6.5            | V    |
| $V_O$     | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | -0.5      | $V_{CC} + 0.5$ | V    |
| $I_{IK}$  | Input clamp current                                                                         | $V_I < 0$ | -50            | mA   |
| $I_{OK}$  | Output clamp current                                                                        | $V_O < 0$ | -50            | mA   |
| $I_O$     | Continuous output current                                                                   |           | ±50            | mA   |
|           | Continuous current through $V_{CC}$ or GND                                                  |           | ±100           | mA   |
| $T_J$     | Junction temperature under bias                                                             |           | 150            | °C   |
| $T_{stg}$ | Storage temperature range                                                                   | -65       | 150            | °C   |

- (1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of  $V_{CC}$  is provided in the Recommended Operating Conditions table.

### ESD Ratings

|           |                            | VALUE | UNIT |
|-----------|----------------------------|-------|------|
| $V_{ESD}$ | Human-Body Model (HBM)     | 2000  | V    |
|           | Charged-Device Model (CDM) | 1000  | V    |

### Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|          |                                |                          | MIN  | MAX      | UNIT |
|----------|--------------------------------|--------------------------|------|----------|------|
| $V_{CC}$ | Supply voltage                 | Operating                | 1.65 | 5.5      | V    |
| $V_I$    | Input voltage                  |                          | 0    | 5.5      | V    |
| $V_O$    | Output voltage                 |                          | 0    | $V_{CC}$ | V    |
| $I_{OH}$ | High-level output current      | $V_{CC} = 1.65\text{ V}$ |      | -4       | mA   |
|          |                                | $V_{CC} = 2.3\text{ V}$  |      | -8       |      |
|          |                                | $V_{CC} = 3\text{ V}$    |      | -16      |      |
|          |                                | $V_{CC} = 4.5\text{ V}$  |      | -24      |      |
| $I_{OL}$ | Low-level output current       | $V_{CC} = 1.65\text{ V}$ |      | 4        | mA   |
|          |                                | $V_{CC} = 2.3\text{ V}$  |      | 8        |      |
|          |                                | $V_{CC} = 3\text{ V}$    |      | 16       |      |
|          |                                | $V_{CC} = 4.5\text{ V}$  |      | 24       |      |
| $T_A$    | Operating free-air temperature |                          | -40  | 125      | °C   |

- (1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

**Thermal Information**

| THERMAL METRIC        |                                          | SN74LVC2G17 |                | UNIT |
|-----------------------|------------------------------------------|-------------|----------------|------|
|                       |                                          | 6PINS       |                |      |
|                       |                                          | SOT23-6     | SOT363(SC70-6) |      |
| R <sub>ΘJA</sub>      | Junction-to-ambient thermal resistance   | 273.8       | 214.7          | °C/W |
| R <sub>ΘJC(top)</sub> | Junction-to-case(top) thermal resistance | 126.8       | 127.1          | °C/W |
| R <sub>ΘJB</sub>      | Junction-to-board thermal resistance     | 85.9        | 60.0           | °C/W |

**Electrical Characteristics**

over recommended operating free-air temperature range (Full <sup>(4)</sup> = -40°C to +125°C, typical values are at  $T_A = +25^\circ\text{C}$ , unless otherwise noted.) <sup>(1)</sup>

| PARAMETER        |                                                | TEST CONDITIONS                                                            | V <sub>CC</sub> | TEMP  | MIN <sup>(2)</sup>   | TYP <sup>(3)</sup> | MAX <sup>(2)</sup> | UNIT |
|------------------|------------------------------------------------|----------------------------------------------------------------------------|-----------------|-------|----------------------|--------------------|--------------------|------|
| V <sub>T+</sub>  | Positive going input threshold voltage         |                                                                            | 1.65V           | Full  | 0.75                 |                    | 1.05               | V    |
|                  |                                                |                                                                            | 2.3V            |       | 1.25                 |                    | 1.55               |      |
|                  |                                                |                                                                            | 3V              |       | 1.5                  |                    | 2.1                |      |
|                  |                                                |                                                                            | 4.5V            |       | 2.3                  |                    | 3.0                |      |
|                  |                                                |                                                                            | 5.5V            |       | 2.8                  |                    | 3.4                |      |
| V <sub>T-</sub>  | Negative going input threshold voltage         |                                                                            | 1.65V           | Full  | 0.3                  |                    | 0.6                | V    |
|                  |                                                |                                                                            | 2.3V            |       | 0.35                 |                    | 0.65               |      |
|                  |                                                |                                                                            | 3V              |       | 0.45                 |                    | 0.75               |      |
|                  |                                                |                                                                            | 4.5V            |       | 0.7                  |                    | 1.0                |      |
|                  |                                                |                                                                            | 5.5V            |       | 0.85                 |                    | 1.15               |      |
| ΔV <sub>T</sub>  | Hysteresis (V <sub>T+</sub> -V <sub>T-</sub> ) |                                                                            | 1.65V           | Full  | 0.35                 |                    | 0.6                | V    |
|                  |                                                |                                                                            | 2.3V            |       | 0.6                  |                    | 1.2                |      |
|                  |                                                |                                                                            | 3V              |       | 1.05                 |                    | 1.65               |      |
|                  |                                                |                                                                            | 4.5V            |       | 1.6                  |                    | 2.0                |      |
|                  |                                                |                                                                            | 5.5V            |       | 1.95                 |                    | 2.25               |      |
| V <sub>OH</sub>  |                                                | I <sub>OH</sub> = -100μA                                                   | 1.65V to 5.5V   | Full  | V <sub>CC</sub> -0.1 |                    |                    | V    |
|                  |                                                | I <sub>OH</sub> = -4mA                                                     | 1.65V           |       | 1.2                  |                    |                    |      |
|                  |                                                | I <sub>OH</sub> = -8mA                                                     | 2.3V            |       | 1.9                  |                    |                    |      |
|                  |                                                | I <sub>OH</sub> = -16mA                                                    | 3V              |       | 2.4                  |                    |                    |      |
|                  |                                                | I <sub>OH</sub> = -24mA                                                    |                 |       | 2.3                  |                    |                    |      |
|                  |                                                | I <sub>OH</sub> = -32mA                                                    | 4.5V            |       | 3.8                  |                    |                    |      |
| V <sub>OL</sub>  |                                                | I <sub>OL</sub> = 100μA                                                    | 1.65V to 5.5V   | Full  |                      |                    | 0.1                | V    |
|                  |                                                | I <sub>OL</sub> = 4mA                                                      | 1.65V           |       |                      |                    | 0.45               |      |
|                  |                                                | I <sub>OL</sub> = 8mA                                                      | 2.3V            |       |                      |                    | 0.3                |      |
|                  |                                                | I <sub>OL</sub> = 16mA                                                     | 3V              |       |                      |                    | 0.4                |      |
|                  |                                                | I <sub>OL</sub> = 24mA                                                     |                 |       |                      |                    | 0.55               |      |
|                  |                                                | I <sub>OL</sub> = 32mA                                                     | 4.5V            |       |                      |                    | 0.55               |      |
| I <sub>I</sub>   | A input                                        | V <sub>I</sub> =5.5V or GND                                                | 0V to 5.5V      | +25°C |                      | ±0.1               | ±1                 | μA   |
|                  |                                                |                                                                            |                 | Full  |                      |                    | ±5                 |      |
| I <sub>off</sub> |                                                | V <sub>I</sub> or V <sub>O</sub> =5.5V                                     | 0               | +25°C |                      | ±0.1               | ±1                 | μA   |
|                  |                                                |                                                                            |                 | Full  |                      |                    | ±10                |      |
| I <sub>CC</sub>  |                                                | V <sub>I</sub> =5.5V or GND, I <sub>O</sub> =0                             | 1.65V to 5.5V   | +25°C |                      | 0.1                | 1                  | μA   |
|                  |                                                |                                                                            |                 | Full  |                      |                    | 10                 |      |
| ΔI <sub>CC</sub> |                                                | One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND | 3V to 5.5V      | Full  |                      |                    | 500                | μA   |

**Electrical Characteristics(continued)**

| PARAMETER                     | SYMBOL   | TEST CONDITIONS       |                           | TEMP  | MIN <sup>(2)</sup> | TYP <sup>(3)</sup> | MAX <sup>(2)</sup> | UNIT |
|-------------------------------|----------|-----------------------|---------------------------|-------|--------------------|--------------------|--------------------|------|
| Propagation Delay             | $t_{pd}$ | $V_{CC}=1.8V\pm0.15V$ | $C_L=30pF, R_L=500\Omega$ | Full  |                    | 21                 |                    | ns   |
|                               |          | $V_{CC}=2.5V\pm0.2V$  | $C_L=30pF, R_L=500\Omega$ | Full  |                    | 7.8                |                    |      |
|                               |          | $V_{CC}=3.3V\pm0.3V$  | $C_L=50pF, R_L=500\Omega$ | Full  |                    | 5.7                |                    |      |
|                               |          | $V_{CC}=5V\pm0.5V$    | $C_L=50pF, R_L=500\Omega$ | Full  |                    | 4.2                |                    |      |
| Input Capacitance             | $C_i$    | $V_{CC}=3.3V$         | $V_i=V_{CC}$ or GND       | +25°C |                    | 4                  |                    | pF   |
| Power dissipation capacitance | $C_{pd}$ | $V_{CC}=1.8V$         | $f=10MHz$                 | +25°C |                    | 21                 |                    | pF   |
|                               |          | $V_{CC}=2.5V$         |                           |       |                    | 22                 |                    |      |
|                               |          | $V_{CC}=3.3V$         |                           |       |                    | 22                 |                    |      |
|                               |          | $V_{CC}=5V$           |                           |       |                    | 25                 |                    |      |

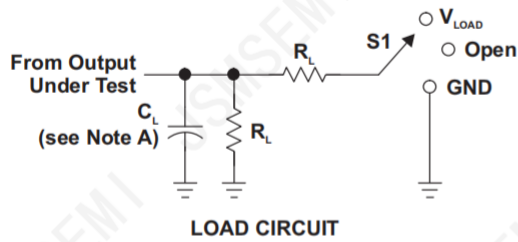
(1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

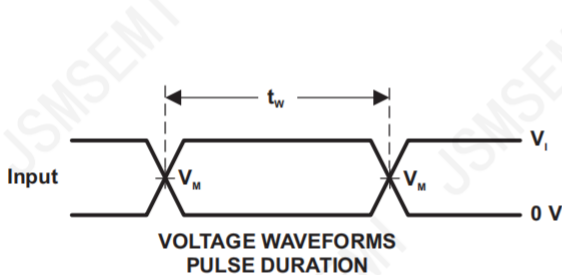
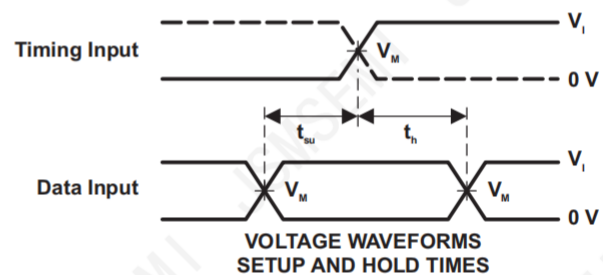
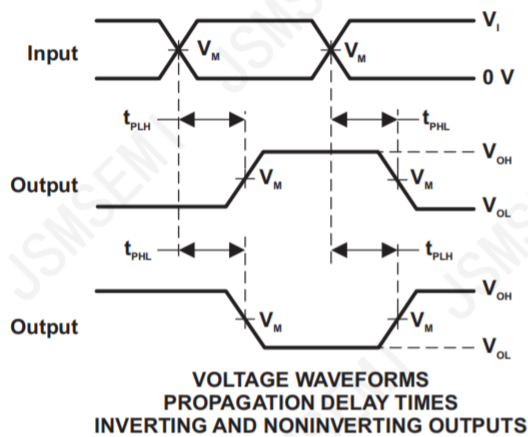
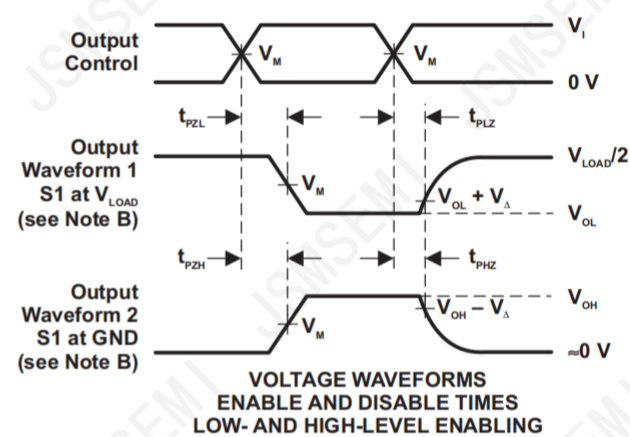
(4) Specified by characterization only.

## Parameter Measurement Information



| TEST              | S1         |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |

| $V_{CC}$         | INPUTS   |              | $V_M$      | $V_{LOAD}$        | $C_L$ |      | $R_L$       |              | $V_{\Delta}$ |
|------------------|----------|--------------|------------|-------------------|-------|------|-------------|--------------|--------------|
|                  | $V_I$    | $t_r/t_f$    |            |                   |       |      |             |              |              |
| $1.8V \pm 0.15V$ | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 30pF | 1M $\Omega$ | 1k $\Omega$  | 0.15V        |
| $2.5V \pm 0.2V$  | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 30pF | 1M $\Omega$ | 500 $\Omega$ | 0.15V        |
| $3.3V \pm 0.3V$  | 3V       | $\leq 2.5ns$ | 1.5V       | 6V                | 15pF  | 50pF | 1M $\Omega$ | 500 $\Omega$ | 0.3V         |
| $5V \pm 0.5V$    | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 15pF  | 50pF | 1M $\Omega$ | 500 $\Omega$ | 0.3V         |



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_o = 50 \Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{PLH}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{PHL}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

## Detailed Description

### Overview

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

### Functional Block Diagram



### Feature Description

- 1.65 V to 5.5 V operating voltage range
- Allows down voltage translation
  - 5 V to 3.3 V
  - 5 V or 3.3 V to 1.8 V
- Inputs accept voltages to 5.5 V
  - 5-V tolerance on input pin
- $I_{off}$  feature
  - Allows voltage on the inputs and outputs when  $V_{CC}$  is 0 V
  - Able to reduce leakage when  $V_{CC}$  is 0 V
- Schmitt-Trigger Input can improve the noise immunity capability

### Device Functional Modes

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | H           |
| L          | L           |

### Application Information

The SN74LVC2G17 device contains two buffers and performs the Boolean function  $Y = A$ . The device functions as two independent buffers, but because of Schmitt action, it may have different input threshold levels for positive-going ( $V_{T+}$ ) and negative-going ( $V_{T-}$ ) signals.

### Typical Power Button Circuit

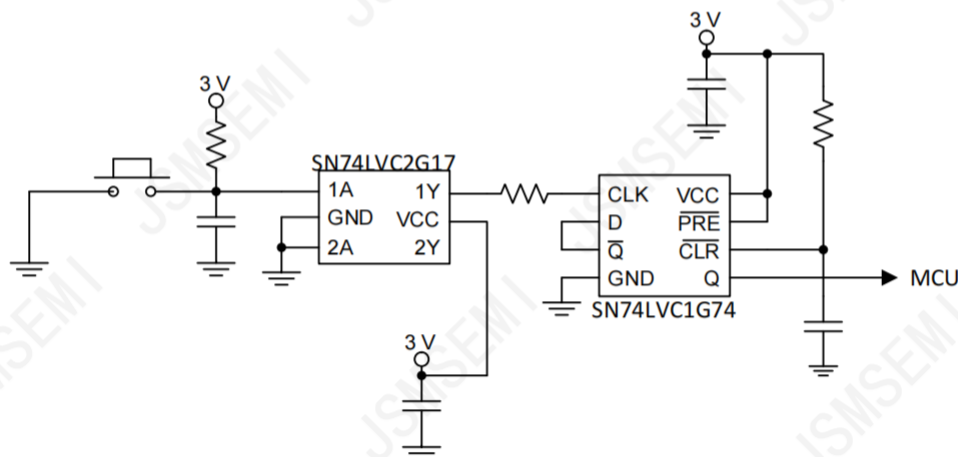


Figure 2 . Device Power Button Circuit

## Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. Outputs can be combined to produce higher drive but the high drive will also create faster edges into light loads so routing and load conditions should be considered to prevent ringing.

## Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the *Recommended Operating Conditions* table.

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1  $\mu\text{F}$  capacitor is recommended. If there are multiple  $V_{CC}$  terminals then 0.01  $\mu\text{F}$  or 0.022  $\mu\text{F}$  capacitors are recommended for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. Multiple bypass capacitors may be paralleled to reject different frequencies of noise. The bypass capacitor should be installed as close to the power terminal as possible for the best results.

## Layout

### Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when only 3 of the 4-buffer gates are used. Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states.

Specified in Figure 3 are rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or  $V_{CC}$ , whichever makes more sense or is more convenient.

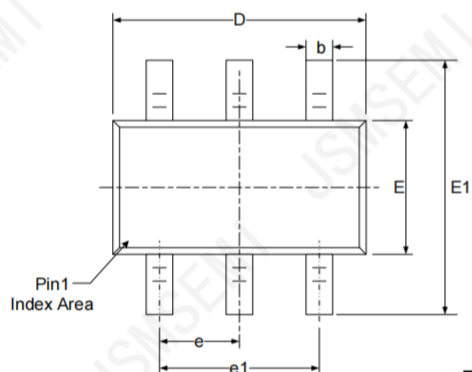
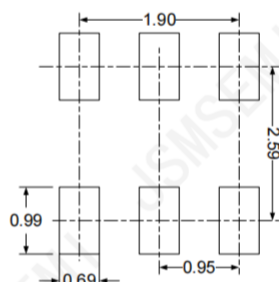
### Layout Example



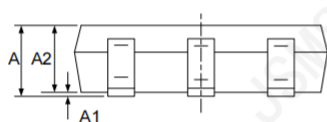
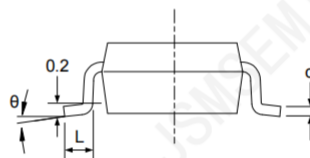
**Figure 3 . Layout Diagram**

## Package Information

### SOT-23-6L



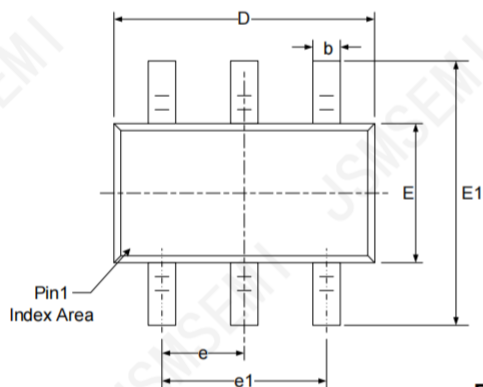
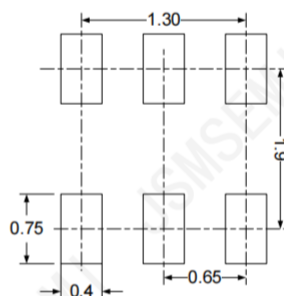
RECOMMENDED LAND PATTERN (Unit: mm)



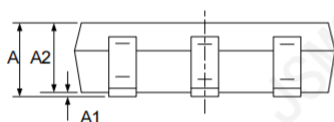
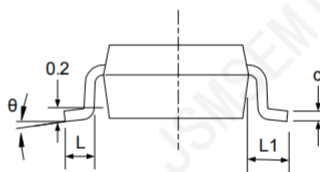
| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1       | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2       | 1.050                     | 1.150 | 0.041                | 0.045 |
| b        | 0.300                     | 0.500 | 0.012                | 0.020 |
| c        | 0.100                     | 0.200 | 0.004                | 0.008 |
| D        | 2.820                     | 3.020 | 0.111                | 0.119 |
| E        | 1.500                     | 1.700 | 0.059                | 0.067 |
| E1       | 2.650                     | 2.950 | 0.104                | 0.116 |
| e        | 0.950(BSC)                |       | 0.037(BSC)           |       |
| e1       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.300                     | 0.600 | 0.012                | 0.024 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |

## Package Information

### SOT-363(SC70-6)



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.100 | 0.035                | 0.043 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.000 | 0.035                | 0.039 |
| b      | 0.150                     | 0.350 | 0.006                | 0.014 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| 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      | 0.650(BSC)                |       | 0.026(BSC)           |       |
| e1     | 1.300(BSC)                |       | 0.051(BSC)           |       |
| L      | 0.260                     | 0.460 | 0.010                | 0.018 |
| L1     | 0.525                     |       | 0.021                |       |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

## Revision History

| Rev. | Change          | Date      |
|------|-----------------|-----------|
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