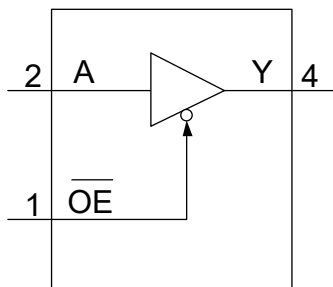## GENERAL DESCRIPTION

The 74LVC1G125 is a single buffer/line driver with a non-inverting 3-state output and it is designed for 1.65V to 5.5V $V_{CC}$ operation. The 3-state output is controlled by the output enable input ($\overline{OE}$). When $\overline{OE}$ is low, the device passes data from the A input to the Y output. When $\overline{OE}$ is high, the output is in the high-impedance state. The input from 3.3V or 5V device makes this device to operate in a mixed 3.3V and 5V system environment.

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

## FEATURES

- **Wide Operating Voltage Range: 1.65V to 5.5V**
- **Inputs Accept Voltages up to 5V**
- **+24mA/-24mA Output Current at $V_{CC}$ = 3.0V**
- **CMOS Low Power Dissipation**
- **Direct Interface with TTL Levels**
- **High Noise Immunity**
- **Latch-up Performance Exceeds 250mA**
- **-40℃ to +125℃ Operating Temperature Range**
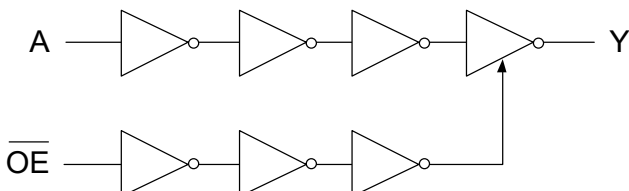- **Available in Green SC70-5 and SOT-23-5 Packages**

## LOGIC SYMBOL



## FUNCTION TABLE

| INPUT | | OUTPUT |
|---|---|---|
| $\overline{OE}$ | **A** | **Y** |
| L | L | L |
| L | H | H |
| H | *X* | Z |

H = High Voltage Level
L = Low Voltage Level
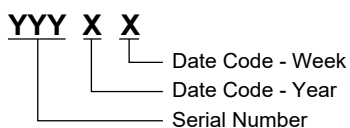Z = High-Impedance State
*X* = Don't Care

## LOGIC DIAGRAM

# PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-------|--------------------|-----------------------------|-----------------|-----------------|----------------|
| 74LVC1G125 | SC70-5 | -40℃ to +125℃ | 74LVC1G125XC5G/TR | R56XX | Tape and Reel, 3000 |
| | SOT-23-5 | -40℃ to +125℃ | 74LVC1G125XN5G/TR | MEZXX | Tape and Reel, 3000 |

## MARKING INFORMATION

NOTE: XX = Date Code.

**YYY X X**

- Date Code - Week
- Date Code - Year
- Serial Number

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 [1]

Supply Voltage, $V_{CC}$...................................... -0.5V to 6.5V
Input Voltage, $V_I$ [2]...................................... -0.5V to 6.5V
Output Voltage, $V_O$ [2] [3]
  Active Mode ..........................................-0.5V to $V_{CC}$ + 0.5V
  Power-Down Mode ............................................-0.5 to 6.5V
Input Clamping Current, $I_{IK}$ ($V_I$ < 0V)............................-50mA
Output Clamping Current, $I_{OK}$ ($V_O$ > $V_{CC}$ or $V_O$ < 0V)
.......................................................................... ±50mA
Output Current, $I_O$ ($V_O$ = 0V to $V_{CC}$)
  High-State or Low-State ........................................±50mA
Supply Current, $I_{CC}$ ....................................................50mA
Ground Current, $I_{GND}$...............................................-50mA
Package Thermal Resistance
  SC70-5, $\theta_{JA}$........................................... 346℃/W
  SOT-23-5, $\theta_{JA}$........................................ 323℃/W
Junction Temperature [4] ...........................................+150℃
Storage Temperature Range .......................-65℃ to +150℃
Lead Temperature (Soldering, 10s)............................+260℃
ESD Susceptibility
HBM..............................................................................6000V
CDM .............................................................................1000V

## 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 and Fall Rate, $\Delta t/\Delta V$
  $V_{CC}$ = 1.65V to 2.7V ......................................20ns/V (MAX)
  $V_{CC}$ = 2.7V to 5.5V ........................................ 10ns/V (MAX)
Operating Temperature Range ...................-40℃ to +125℃

## OVERSTRESS CAUTION

1. 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.

2. The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.

3. The $V_O$ can reach 5.5V in normal operation when $V_{CC}$ = 0V.

4. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.
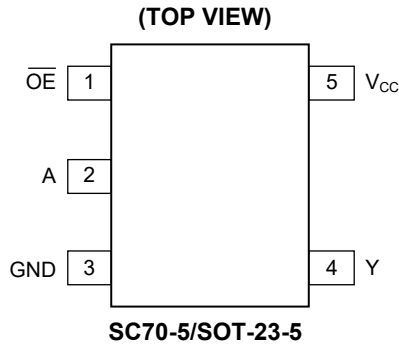
## ESD SENSITIVITY CAUTION

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.

# PIN CONFIGURATIONS

**(TOP VIEW)**

```
          ┌─────────┐
  OE ──│ 1       5 │── Vcc
          │           │
   A ──│ 2         │
          │           │
 GND ──│ 3       4 │── Y
          └─────────┘
```

**SC70-5/SOT-23-5**

# PIN DESCRIPTION

| PIN | NAME | FUNCTION |
|-----|------|----------|
| 1 | $\overline{OE}$ | Output Enable Input. |
| 2 | A | Data Input. |
| 3 | GND | Ground. |
| 4 | Y | Data Output. |
| 5 | Vcc | Supply Voltage. |

## ELECTRICAL CHARACTERISTICS

(Full = -40°C  to +125°C, all typical values are measured at $V_{CC}$ = 3.3V and $T_A$ = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | TEMP | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|---|---|
| High-Level Input Voltage | $V_{IH}$ | $V_{CC}$ = 1.65V to 1.95V | | Full | 0.68 × $V_{CC}$ | | | V |
| | | $V_{CC}$ = 2.3V to 2.7V | | Full | 1.7 | | | |
| | | $V_{CC}$ = 2.7V to 3.6V | | Full | 2.0 | | | |
| | | $V_{CC}$ = 4.5V to 5.5V | | Full | 0.7 × $V_{CC}$ | | | |
| Low-Level Input Voltage | $V_{IL}$ | $V_{CC}$ = 1.65V to 1.95V | | Full | | | 0.35 × $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3V to 2.7V | | Full | | | 0.7 | |
| | | $V_{CC}$ = 2.7V to 3.6V | | Full | | | 0.8 | |
| | | $V_{CC}$ = 4.5V to 5.5V | | Full | | | 0.3 × $V_{CC}$ | |
| High-Level Output Voltage | $V_{OH}$ | $V_I = V_{IH}$ | $V_{CC}$ = 1.65V to 5.5V, $I_O$ = -100μA | Full | $V_{CC}$ - 0.05 | $V_{CC}$ - 0.01 | | V |
| | | | $V_{CC}$ = 1.65V, $I_O$ = -4mA | Full | 1.43 | 1.55 | | |
| | | | $V_{CC}$ = 2.3V, $I_O$ = -8mA | Full | 2.02 | 2.18 | | |
| | | | $V_{CC}$ = 2.7V, $I_O$ = -12mA | Full | 2.38 | 2.56 | | |
| | | | $V_{CC}$ = 3.0V, $I_O$ = -24mA | Full | 2.52 | 2.74 | | |
| | | | $V_{CC}$ = 4.5V, $I_O$ = -32mA | Full | 4.00 | 4.22 | | |
| Low-Level Output Voltage | $V_{OL}$ | $V_I = V_{IL}$ | $V_{CC}$ = 1.65V to 5.5V, $I_O$ = 100μA | Full | | 0.01 | 0.05 | V |
| | | | $V_{CC}$ = 1.65V, $I_O$ = 4mA | Full | | 0.10 | 0.22 | |
| | | | $V_{CC}$ = 2.3V, $I_O$ = 8mA | Full | | 0.12 | 0.28 | |
| | | | $V_{CC}$ = 2.7V, $I_O$ = 12mA | Full | | 0.16 | 0.34 | |
| | | | $V_{CC}$ = 3.0V, $I_O$ = 24mA | Full | | 0.30 | 0.56 | |
| | | | $V_{CC}$ = 4.5V, $I_O$ = 32mA | Full | | 0.32 | 0.60 | |
| Input Leakage Current | $I_I$ | $V_{CC}$ = 0V to 5.5V, $V_I$ = 5.5V or GND | | Full | | ±0.01 | ±1 | μA |
| Off-State Output Current | $I_{OZ}$ | $V_{CC}$ = 3.6V, $V_I = V_{IH}$ or $V_{IL}$, $V_O$ = 5.5V or GND | | Full | | ±0.01 | ±1 | μA |
| Power-Off Leakage Current | $I_{OFF}$ | $V_{CC}$ = 0V, $V_I$ or $V_O$ = 5.5V | | Full | | ±0.01 | ±1 | μA |
| Supply Current | $I_{CC}$ | $V_{CC}$ = 1.65V to 5.5V, $V_I$ = 5.5V or GND, $I_O$ = 0A | | Full | | 0.01 | 1 | μA |
| Additional Supply Current | $\Delta I_{CC}$ | Per pin, $V_{CC}$ = 2.3V to 5.5V, $V_I = V_{CC}$ - 0.6V, $I_O$ = 0A | | Full | | 0.05 | 10 | μA |
| Input Capacitance | $C_I$ | $V_{CC}$ = 3.3V, $V_I$ = GND to $V_{CC}$ | | +25°C | | 3.5 | | pF |

## DYNAMIC CHARACTERISTICS

(For test circuit, see Figure 1. Full = -40℃ to +125℃, all typical values are measured at $T_A$ = +25℃ and $V_{CC}$ = 1.8V, 2.5V, 2.7V, 3.3V and 5.0V respectively, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | TEMP | MIN [1] | TYP | MAX [1] | UNITS |
|---|---|---|---|---|---|---|---|---|
| Propagation Delay [2] | $t_{PD}$ | A to Y, see Figure 2 | $V_{CC}$ = 1.65V to 1.95V | Full | 0.5 | 6.4 | 15.0 | ns |
| | | | $V_{CC}$ = 2.3V to 2.7V | Full | 0.5 | 3.6 | 7.5 | |
| | | | $V_{CC}$ = 2.7V | Full | 0.5 | 3.3 | 7.5 | |
| | | | $V_{CC}$ = 3.0V to 3.6V | Full | 0.5 | 3.1 | 6.5 | |
| | | | $V_{CC}$ = 4.5V to 5.5V | Full | 0.5 | 2.7 | 5.0 | |
| Enable Time [3] | $t_{EN}$ | $\overline{OE}$ to Y, see Figure 3 | $V_{CC}$ = 1.65V to 1.95V | Full | 0.5 | 6.9 | 16.5 | ns |
| | | | $V_{CC}$ = 2.3V to 2.7V | Full | 0.5 | 3.7 | 8.0 | |
| | | | $V_{CC}$ = 2.7V | Full | 0.1 | 3.6 | 8.0 | |
| | | | $V_{CC}$ = 3.0V to 3.6V | Full | 0.1 | 3.0 | 6.5 | |
| | | | $V_{CC}$ = 4.5V to 5.5V | Full | 0.1 | 2.6 | 4.5 | |
| Disable Time [4] | $t_{DIS}$ | $\overline{OE}$ to Y, see Figure 3 | $V_{CC}$ = 1.65V to 1.95V | Full | 0.5 | 6.4 | 12.5 | ns |
| | | | $V_{CC}$ = 2.3V to 2.7V | Full | 0.5 | 3.6 | 6.5 | |
| | | | $V_{CC}$ = 2.7V | Full | 0.5 | 4.2 | 6.5 | |
| | | | $V_{CC}$ = 3.0V to 3.6V | Full | 0.5 | 4.2 | 6.5 | |
| | | | $V_{CC}$ = 4.5V to 5.5V | Full | 0.5 | 3.5 | 5.0 | |
| Power Dissipation Capacitance [5] | $C_{PD}$ | $V_I$ = GND to $V_{CC}$ | Output enabled | +25℃ | | 32.0 | | pF |
| | | | Output disabled | +25℃ | | 0.5 | | |

NOTES:

1. Specified by design and characterization; not production tested.

2. $t_{PD}$ is the same as $t_{PLH}$ and $t_{PHL.}$

3. $t_{EN}$ is the same as $t_{PZH}$ and $t_{PZL.}$

4. $t_{DIS}$ is the same as $t_{PLZ}$ and $t_{PHZ.}$

5. $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ 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:

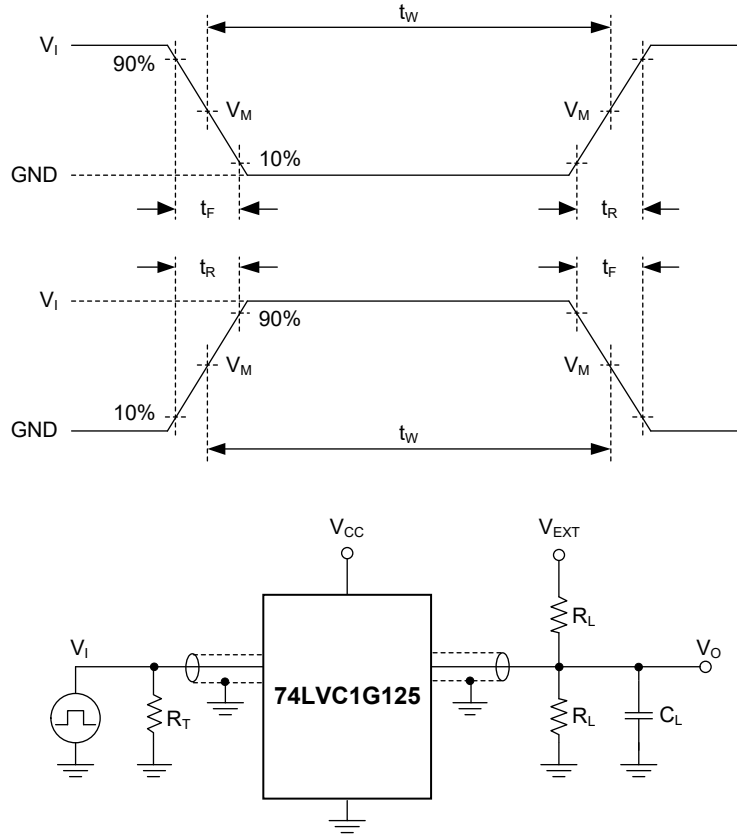$f_i$ = Input frequency in MHz.

$f_o$ = Output frequency in MHz.

$C_L$ = Output load capacitance in pF.

$V_{CC}$ = Supply voltage in Volts.

N = Number of inputs switching.

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = Sum of outputs.

## 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).

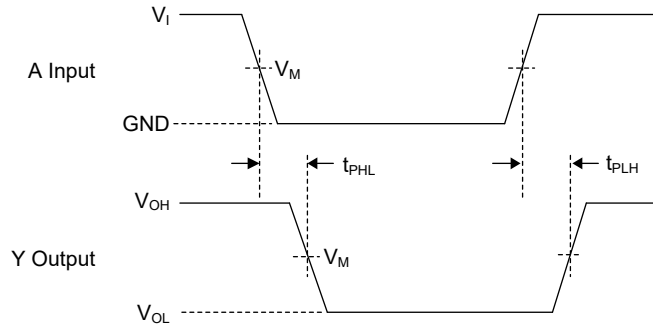$R_T$: Termination resistance (equals to output impedance $Z_O$ of the pulse generator).

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

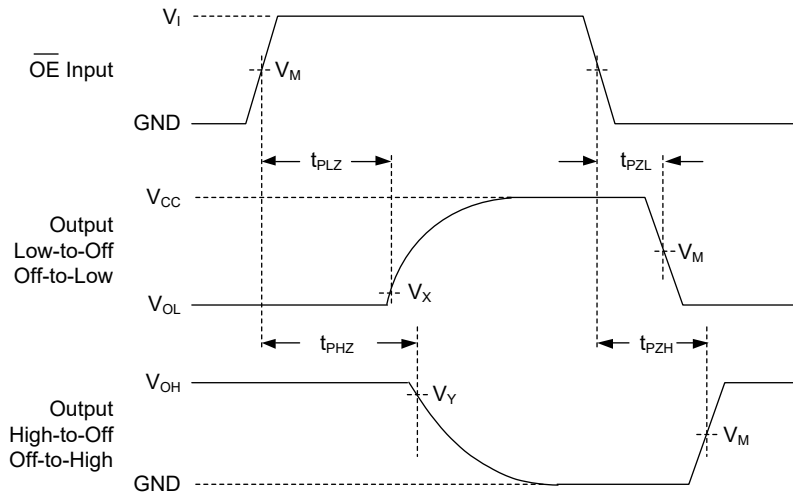**Figure 1. Test Circuit for Measuring Switching Times**

**Table 1. Test Conditions**

| SUPPLY VOLTAGE | INPUT | | LOAD | | $V_{EXT}$ | | |
|---|---|---|---|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r, t_f$ | $C_L$ | $R_L$ | $t_{PLH}, t_{PHL}$ | $t_{PLZ}, t_{PZL}$ | $t_{PHZ}, t_{PZH}$ |
| 1.65V to 1.95V | $V_{CC}$ | ≤ 2.0ns | 30pF | 1kΩ | Open | $2V_{CC}$ | GND |
| 2.3V to 2.7V | $V_{CC}$ | ≤ 2.0ns | 30pF | 500Ω | Open | $2V_{CC}$ | GND |
| 2.7V | 2.7V | ≤ 2.5ns | 50pF | 500Ω | Open | 6V | GND |
| 3.0V to 3.6V | 2.7V | ≤ 2.5ns | 50pF | 500Ω | Open | 6V | GND |
| 4.5V to 5.5V | $V_{CC}$ | ≤ 2.5ns | 50pF | 500Ω | Open | $2V_{CC}$ | GND |

## 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 to Output Y Propagation Delays**



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 3. 3-State Enable and Disable Times**

**Table 2. Measurement Points**

| SUPPLY VOLTAGE | INPUT | OUTPUT | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ [1] | $V_M$ | $V_X$ | $V_Y$ |
| 1.65V to 1.95V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.15V | $V_{OH}$ - 0.15V |
| 2.3V to 2.7V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.15V | $V_{OH}$ - 0.15V |
| 2.7V | 1.5V | 1.5V | $V_{OL}$ + 0.3V | $V_{OH}$ - 0.3V |
| 3.0V to 3.6V | 1.5V | 1.5V | $V_{OL}$ + 0.3V | $V_{OH}$ - 0.3V |
| 4.5V to 5.5V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL}$ + 0.3V | $V_{OH}$ - 0.3V |

NOTE:

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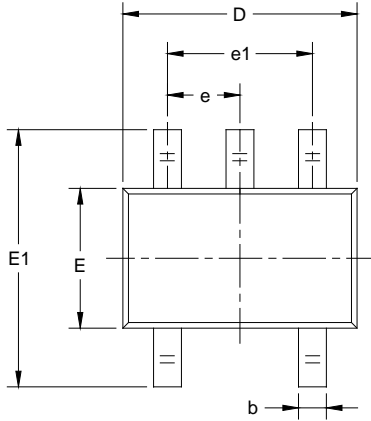
# REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

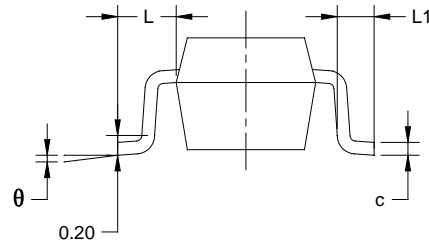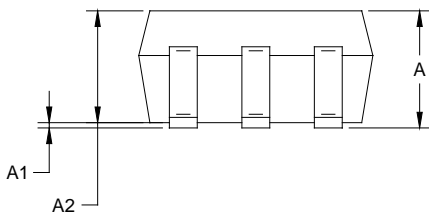## PACKAGE OUTLINE DIMENSIONS

### SC70-5



**RECOMMENDED LAND PATTERN** (Unit: mm)

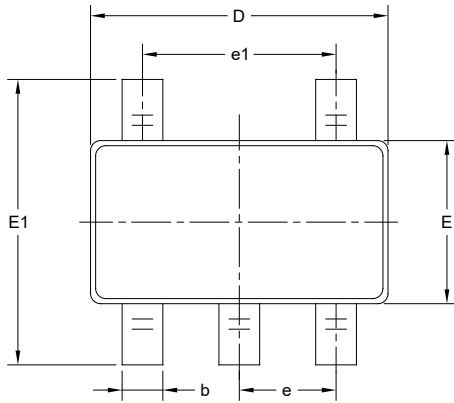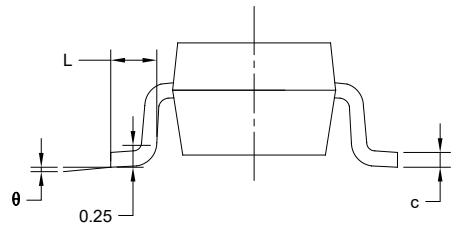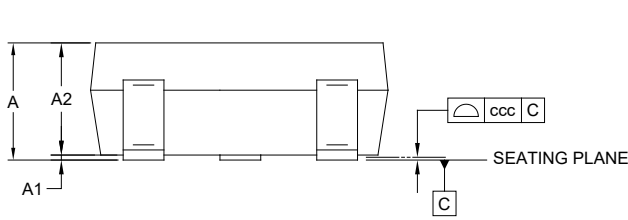| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------|------|------|------|
| | **MIN** | **MAX** | **MIN** | **MAX** |
| A | 0.800 | 1.100 | 0.031 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.800 | 1.000 | 0.031 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| 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 |
| θ | 0° | 8° | 0° | 8° |

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

TX00043.001

# PACKAGE OUTLINE DIMENSIONS

## SOT-23-5

**RECOMMENDED LAND PATTERN** (Unit: mm)

SEATING PLANE

| 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 |
| θ | 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.

# TAPE AND REEL INFORMATION

## REEL DIMENSIONS

## TAPE DIMENSIONS



DIRECTION OF FEED

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 |
|---|---|---|---|---|---|---|---|---|---|---|
| SC70-5 | 7" | 9.5 | 2.40 | 2.50 | 1.20 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |
| SOT-23-5 | 7" | 9.5 | 3.20 | 3.20 | 1.40 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |

DD0001

## 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