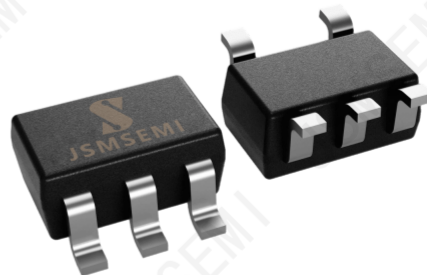


### Description

The 74AHCT1G08 device is a single 2-input positive-AND gate. The device performs the Boolean function  $Y = A \cdot B$  or  $Y = A + B$  in positive logic. Low  $I_{CC}$  current allows this device to be used in power-sensitive or battery-powered applications.

The 74AHCT1G08 is available in Green SOT23-5 and SOT-353 packages. It operates over an ambient temperature range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .



### Features

- Operating Range: 2.0 V to 5.5 V
- Typ  $t_{pd}$  of 4.1 ns at 5 V
- Low Power Consumption: Maximum  $I_{CC}$  of  $1\mu\text{A}$
- $\pm 32\text{mA}$  Output Drive at 5 V
- Inputs Are TTL-Voltage Compatible
- Operating Temperature Range:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Packages: SOT23-5, SOT-353(SC70-5)
- RoSH compatible

### Applications

- TV, Set-Top Box, and Audio
- Wireless Infrastructure
- Factory Automation and Control
- PC and Notebooks
- Building Automation
- Grid Infrastructure
- Medical, Healthcare, and Fitness
- Printers
- Test and Measurement
- EPOS (Electronic Point of Sale)
- Telecom Infrastructure
- Projectors

Logic Diagram



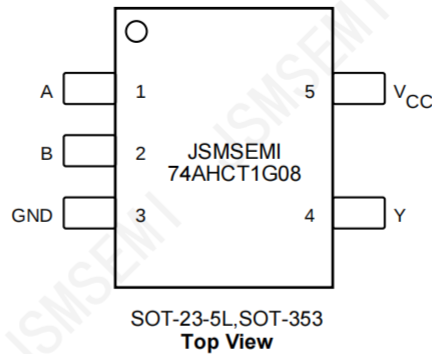
Function Table

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

### Ordering Information

| Order number         | Package   | Marking | Operation Temperature Range    | MSL Grade | Ship,Quantity | Green |
|----------------------|-----------|---------|--------------------------------|-----------|---------------|-------|
| 74AHCT1G08GV,125-JSM | SOT-23-5L | B08S    | $-40$ to $125^{\circ}\text{C}$ | 3         | TR&3000       | Rohs  |
| 74AHCT1G08GW,125-JSM | SOT-353   | BEG     | $-40$ to $125^{\circ}\text{C}$ | 3         | TR&3000       | Rohs  |

## Pin Configuration and Functions



### Pin Functions

| PIN             |     | I/O | DESCRIPTION |
|-----------------|-----|-----|-------------|
| NAME            | NO. |     |             |
| A               | 1   | I   | Input A     |
| B               | 2   | I   | Input B     |
| GND             | 3   | —   | Ground Pin  |
| V <sub>CC</sub> | 5   | —   | Supply Pin  |
| Y               | 4   | O   | Output      |

## Specifications

### Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted).<sup>(1)(2)</sup>

|                  |                                                                                             | MIN     | MAX                  | UNIT |
|------------------|---------------------------------------------------------------------------------------------|---------|----------------------|------|
| V <sub>CC</sub>  | Supply voltage range                                                                        | -0.5    | 6.5                  | V    |
| V <sub>I</sub>   | Input voltage range <sup>(2)</sup>                                                          | -0.5    | 6.5                  | V    |
| V <sub>O</sub>   | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | -0.5    | 6.5                  | V    |
| V <sub>O</sub>   | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | -0.5    | V <sub>CC</sub> +0.5 | V    |
| I <sub>IK</sub>  | Input clamp current                                                                         |         | -50                  | mA   |
| I <sub>OK</sub>  | Output clamp current                                                                        |         | -50                  | mA   |
| I <sub>O</sub>   | Continuous output current                                                                   |         | ±50                  | mA   |
|                  | Continuous current through V <sub>CC</sub> or GND                                           |         | ±100                 | mA   |
| θ <sub>JA</sub>  | Package thermal impedance <sup>(4)</sup>                                                    | SOT23-5 | 230                  | °C/W |
|                  |                                                                                             | SC70-5  | 376                  |      |
| T <sub>J</sub>   | Junction temperature <sup>(5)</sup>                                                         | -65     | 150                  | °C   |
| T <sub>stg</sub> | Storage temperature                                                                         | -65     | 150                  | °C   |

- 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.
- The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- The value of V<sub>CC</sub> is provided in the Recommended Operating Conditions table.
- The package thermal impedance is calculated in accordance with JEDEC-51.
- The maximum power dissipation is a function of T<sub>J(MAX)</sub>, R<sub>θJA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any ambient temperature is P<sub>D</sub> = (T<sub>J(MAX)</sub> - T<sub>A</sub>) / R<sub>θJA</sub>. All numbers apply for packages soldered directly onto a PCB.

### ESD Ratings

|                    |                         | VALUE                      | UNIT  |
|--------------------|-------------------------|----------------------------|-------|
| V <sub>(ESD)</sub> | Electrostatic discharge | Human-body model (HBM)     | ±2500 |
|                    |                         | Charged-device model (CDM) | ±1000 |

### Recommended Operating Conditions

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

| PARAMETER                     | SYMBOL          | TEST CONDITIONS               | MIN | MAX             | UNIT |
|-------------------------------|-----------------|-------------------------------|-----|-----------------|------|
| Supply voltage                | V <sub>CC</sub> | Operating                     | 2.0 | 5.5             | V    |
| High-level input voltage      | V <sub>IH</sub> | V <sub>CC</sub> =2.0V         | 1.0 |                 | V    |
|                               |                 | V <sub>CC</sub> =3.3V         | 1.5 |                 |      |
|                               |                 | V <sub>CC</sub> =4.5V to 5.5V | 2.0 |                 |      |
| Low-level input voltage       | V <sub>IL</sub> | V <sub>CC</sub> =2.0V         |     | 0.3             | V    |
|                               |                 | V <sub>CC</sub> =3.3V         |     | 0.55            |      |
|                               |                 | V <sub>CC</sub> =4.5V to 5.5V |     | 0.8             |      |
| Input voltage                 | V <sub>I</sub>  |                               | 0   | 5.5             | V    |
| Output voltage                | V <sub>O</sub>  |                               | 0   | V <sub>CC</sub> | V    |
| Input transition rise or fall | Δt/Δv           | V <sub>CC</sub> =2.0V to 5.5V |     | 5               | ns/V |
| Operating temperature         | T <sub>A</sub>  |                               | -40 | +125            | °C   |

(1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation.

### Electrical Characteristics

over recommended operating free-air temperature range (TYP values are at T<sub>A</sub> = +25°C, Full=-40°C to 125°C, unless otherwise noted.)

| PARAMETER                          |               | TEST CONDITIONS                                           | V <sub>CC</sub> | TEMP  | MIN <sup>(2)</sup>   | TYP <sup>(3)</sup> | MAX <sup>(2)</sup> | UNIT |
|------------------------------------|---------------|-----------------------------------------------------------|-----------------|-------|----------------------|--------------------|--------------------|------|
| V <sub>OH</sub>                    |               | I <sub>OH</sub> = -100μA                                  | 2.0V to 5.5V    | Full  | V <sub>CC</sub> -0.1 |                    |                    | V    |
|                                    |               | I <sub>OH</sub> = -8mA                                    | 2.0             |       | 1.6                  |                    |                    |      |
|                                    |               | I <sub>OH</sub> = -24mA                                   | 3.3             |       | 2.5                  |                    |                    |      |
|                                    |               | I <sub>OH</sub> = -32mA                                   | 4.5V            |       | 3.8                  |                    |                    |      |
|                                    |               |                                                           | 5V              |       | 4.2                  |                    |                    |      |
|                                    |               |                                                           | 5.5V            |       | 4.8                  |                    |                    |      |
| V <sub>OL</sub>                    |               | I <sub>OL</sub> = 100μA                                   | 2.0V to 5.5V    | Full  |                      |                    | 0.1                | V    |
|                                    |               | I <sub>OH</sub> = 8mA                                     | 2.0             |       |                      |                    | 0.45               |      |
|                                    |               | I <sub>OH</sub> = 24mA                                    | 3.3             |       |                      |                    | 0.55               |      |
|                                    |               | I <sub>OL</sub> = 32mA                                    | 4.5V            |       |                      |                    | 0.55               |      |
|                                    |               |                                                           | 5V              |       |                      |                    | 0.5                |      |
|                                    |               |                                                           | 5.5V            |       |                      |                    | 0.45               |      |
| I <sub>I</sub>                     | A or B inputs | 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                    | 0V              | +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            | 2.0V to 5.5V    | +25°C |                      | 0.1                | 1                  | μA   |
|                                    |               |                                                           |                 | Full  |                      |                    | 10                 |      |
| ICCT                               |               | One input at 3.4V, Other inputs at V <sub>CC</sub> or GND | 5.5V            | Full  |                      |                    | 500                | μA   |
| C <sub>i</sub> (Input Capacitance) |               | V <sub>CC</sub> =0V, f=10MHz                              | 0V              | +25°C |                      | 6                  |                    | pF   |

(1) All unused inputs of the device must be held at V<sub>CC</sub> 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.

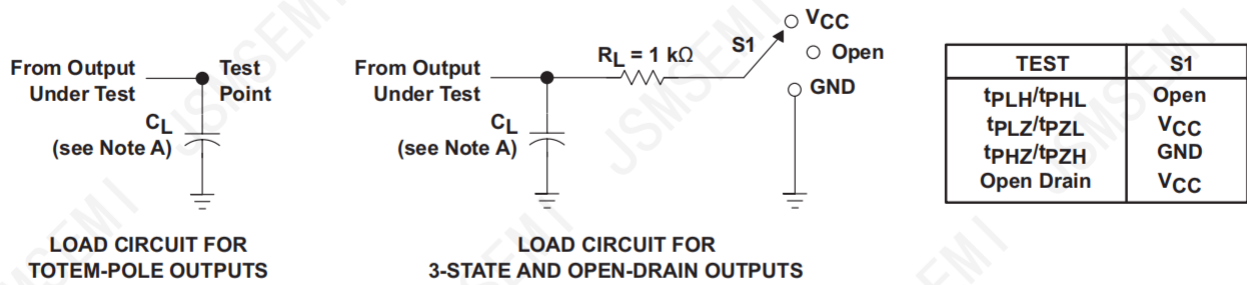
(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

| PARAMETER                     | SYMBOL   | TEST CONDITIONS      |                           | MIN <sup>(2)</sup> | TYP <sup>(3)</sup> | MAX <sup>(2)</sup> | UNIT |
|-------------------------------|----------|----------------------|---------------------------|--------------------|--------------------|--------------------|------|
| Propagation Delay             | $t_{pd}$ | $V_{CC}=2.0V\pm0.2V$ | $C_L=30pF, R_L=500\Omega$ |                    | 15.5               |                    | ns   |
|                               |          | $V_{CC}=3.3V\pm0.3V$ | $C_L=50pF, R_L=500\Omega$ |                    | 13.5               |                    |      |
|                               |          | $V_{CC}=5V\pm0.5V$   | $C_L=50pF, R_L=500\Omega$ |                    | 4.1                |                    |      |
| Power dissipation capacitance | $C_{pd}$ | $V_{CC}=5V$          | $f=10MHz$                 |                    | 22                 |                    | pF   |

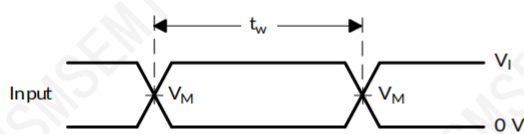
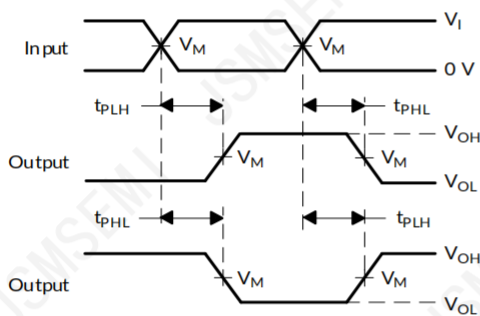
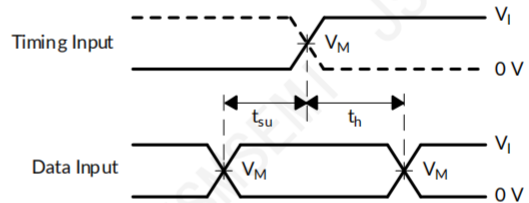
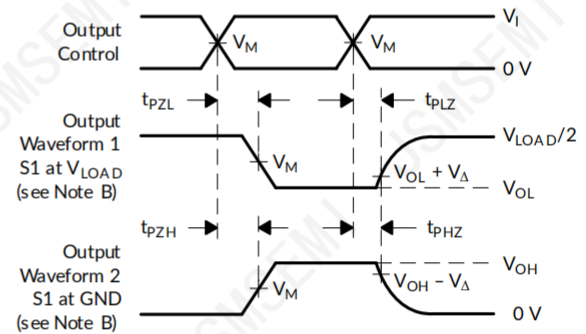
(1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

(2) This parameter is ensured by design and/or characterization and is not tested in production.

(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.

**Parameter Measurement Information**


| $V_{CC}$        | INPUTS   |              | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$ | $V_{\Delta}$ |
|-----------------|----------|--------------|------------|-------------------|-------|-------|--------------|
|                 | $V_I$    | $t_r/t_f$    |            |                   |       |       |              |
| $2.0V \pm 0.2V$ | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF  | 500Ω  | 0.15V        |
| $3.3V \pm 0.3V$ | 3V       | $\leq 2.5ns$ | 1.5V       | 6V                | 50pF  | 500Ω  | 0.3V         |
| $5V \pm 0.5V$   | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 50pF  | 500Ω  | 0.3V         |


**VOLTAGE WAVEFORMS**  
**PULSE DURATION**

**VOLTAGE WAVEFORMS**  
**PROPAGATION DELAY TIMES**  
**INVERTING AND NONINVERTING OUTPUTS**

**VOLTAGE WAVEFORMS**  
**SETUP AND HOLD TIMES**

**VOLTAGE WAVEFORMS**  
**ENABLE AND DISABLE TIMES**  
**LOW- AND HIGH-LEVEL ENABLING**
**NOTES:**

- CL 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  $\leq 10$  MHz, ZO = 50Ω.
- The outputs are measured one at a time, with one transition per measurement.
- tPLZ and tPHZ are the same as tdis.
- tPZL and tPZH are the same as ten.
- tPLH and tPHL are the same as tpd.
- All parameters and waveforms are not applicable to all devices.

**Figure1. Load Circuit and Voltage Waveforms**

## Detailed Description

### Overview

The 74AHCT1G08 device is a single 2-input positive-AND gate. The device performs the Boolean AND function ( $Y = A \cdot B$  or  $Y = A + B$ ) in positive logic. Low  $I_{CC}$  current allows this device to be used in power-sensitive or battery-powered applications. Robust inputs allow the device to up-translate with a propagation delay of 20 ns.

### Functional Block Diagram



Figure2. Logic Diagram(Positive Logic)

### Feature Description

The  $V_{CC}$  for the device is optimized at 5 V.

The inputs accept  $V_{IH}$  levels of 2 V.

Output ringing is minimized by slow edge rates.

Inputs are TTL-Voltage compatible.

### Device Functional Modes

Table 1 lists the functional modes of the 74AHCT1G08.

Table 1. Function Table

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

### Application Information

The 74AHCT1G08 device is a single AND gate, which is often used for many common functions like power sequencing or an on LED indicator. Because the device is configured to output LOW unless all inputs are HIGH, an LED tied to the output of the device will only turn HIGH when all systems connected are sending a HIGH, or ready signal.

### Typical Application

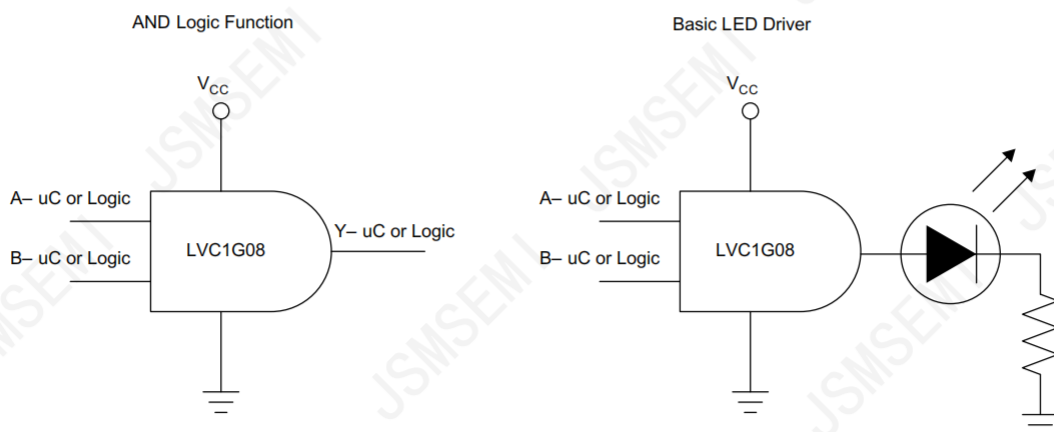


Figure3. Typical Application Diagram

### Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in Recommended Operating Conditions.

Each  $V_{CC}$  pin must have a good bypass capacitor to prevent power disturbance. Recommends a  $0.1\mu\text{F}$  capacitor for devices with a single supply; and a  $0.01\mu\text{F}$  or  $0.022\mu\text{F}$  capacitor for each power pin if there are multiple  $V_{CC}$  pins. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise.  $0.1\mu\text{F}$  and  $1\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor must be installed as close to the power pin as possible for best results.

### Layout

#### Layout Guidelines

When using multiple bit logic devices inputs must not ever float. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Observe the following rules 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 must 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 make more sense or is more convenient.

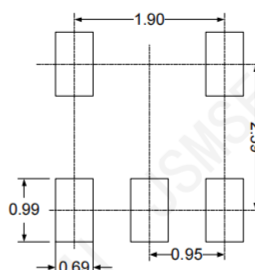
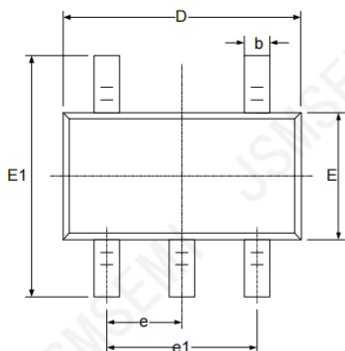
#### Layout Example



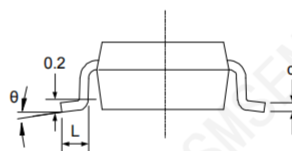
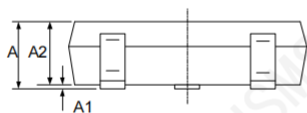
Figure 4. Layout Diagram

Package Information

SOT-23-5L



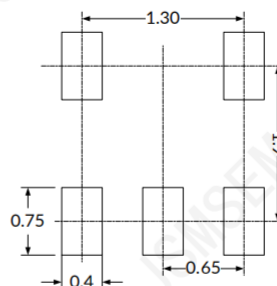
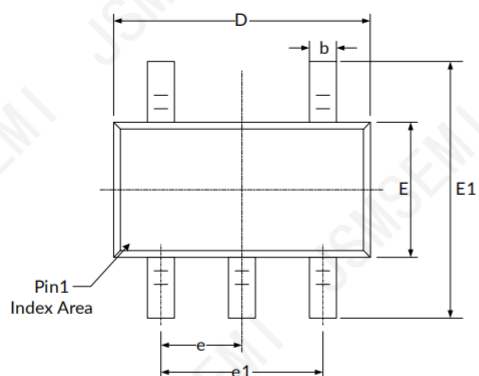
RECOMMENDED LAND PATTERN (Unit: mm)



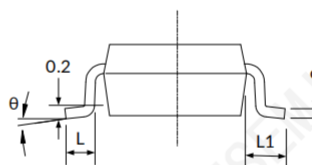
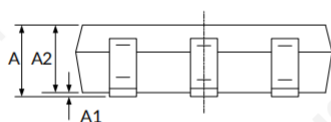
| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 1.050                     | 1.250 | 0.041                | 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-353(SC70-5)



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 <sup>(1)</sup> | 2.000                     | 2.200 | 0.079                | 0.087 |
| E <sup>(1)</sup> | 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                |       |
| $\theta$         | 0°                        | 8°    | 0°                   | 8°    |

## Revision History

| Rev. | Change          | Date      |
|------|-----------------|-----------|
| V1.0 | Initial version | 3/17/2023 |
|      |                 |           |

## Important Notice

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