

## Single 2-input NAND Gate

### General Description

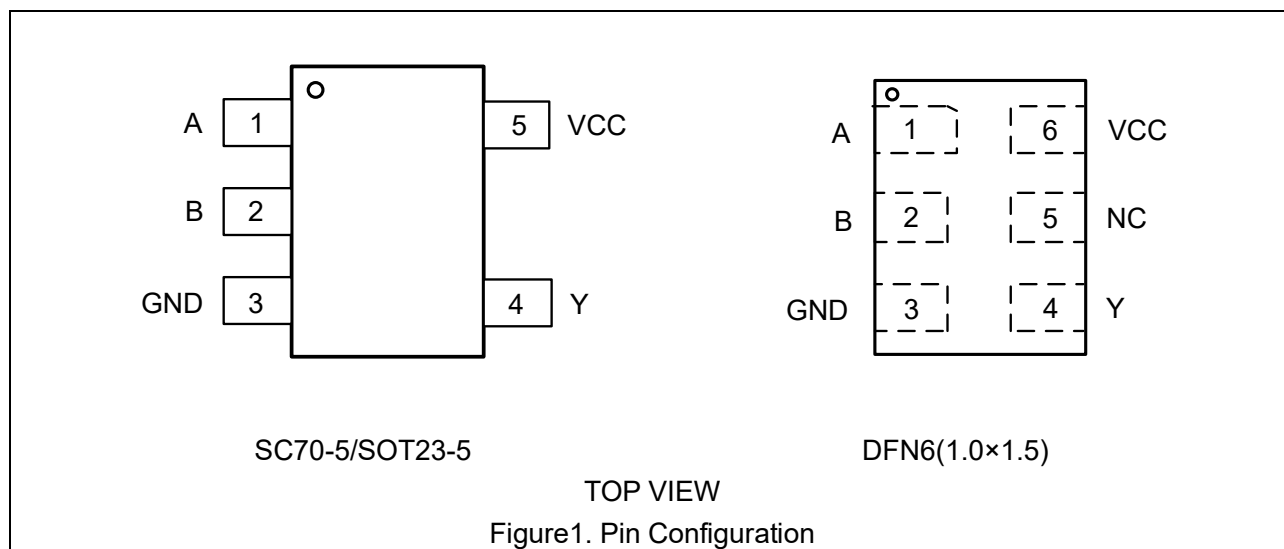
The ETQ74LVC1G00 is a single 2-input NAND Gate operating from a 1.65V to 5.5V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

### Features

- Designed for 1.65V to 5.5V  $V_{CC}$  Operation
- Over-voltage Tolerant Inputs
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- These Devices are Pb-Free and are RoHS Compliant
- Multiple Package Options Automotive AEC-Q100 Grade 1 Qualified
  - Ambient Temperature Range of  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
  - ESD HBM  $\pm 4\text{KV}$  PASS
  - ESD CDM  $\pm 1\text{KV}$  PASS
  - Latch Up Current to  $\pm 100\text{mA}$  PASS
- Part No. and Package Information

| Part No.      | Package                | Packing Option         | MSL |
|---------------|------------------------|------------------------|-----|
| ETQ74LVC1G00  | SC70-5(1.3mm × 2.1mm)  | Tape and Reel, 3K/Reel | 1   |
| ETQ74LVC1G00T | SOT23-5(1.6mm × 2.9mm) | Tape and Reel, 3K/Reel | 3   |
| ETQ74LVC1G00Y | DFN6(1.0mm × 1.5mm)    | Tape and Reel, 3K/Reel | 1   |

### Pin Configuration



# ETQ74LVC1G00

## Pin Function

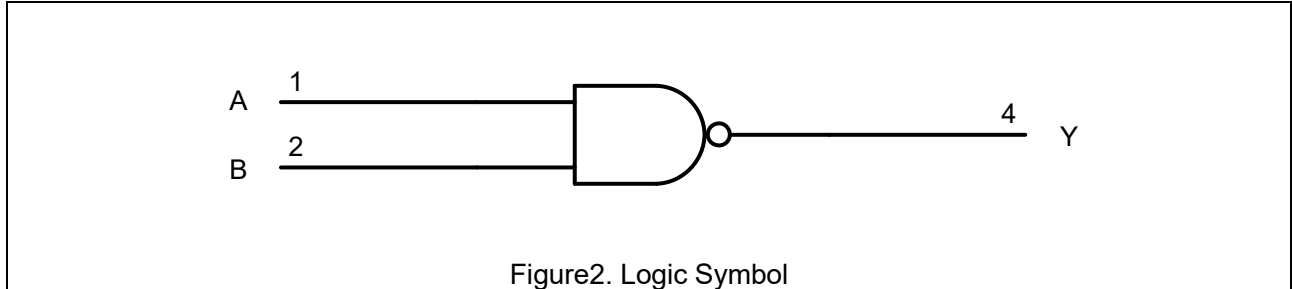
SC70-5 / SOT23-5

| Pin No. | Pin Name | Function       |
|---------|----------|----------------|
| 1       | A        | Input A        |
| 2       | B        | Input B        |
| 3       | GND      | Ground         |
| 4       | Y        | Output Y       |
| 5       | VCC      | Supply Voltage |

DFN6

| Pin No. | Pin Name | Function       |
|---------|----------|----------------|
| 1       | A        | Input A        |
| 2       | B        | Input B        |
| 3       | GND      | Ground         |
| 4       | Y        | Output Y       |
| 5       | NC       | No Connect     |
| 6       | VCC      | Supply Voltage |

## Block Diagram



## Functional Description

Function Table

| Input |   | Output |
|-------|---|--------|
| A     | B | Y      |
| L     | L | H      |
| L     | H | H      |
| H     | L | H      |
| H     | H | L      |

# ETQ74LVC1G00

## Absolute Maximum Ratings

| Symbol           | Parameter                                                                      |                                     | Value                         | Unit |
|------------------|--------------------------------------------------------------------------------|-------------------------------------|-------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage(VCC Pin)                                                     |                                     | -0.5 to 6.5                   | V    |
| V <sub>I</sub>   | DC Input Voltage <sup>(1)</sup>                                                |                                     | -0.5 ≤ V <sub>I</sub> ≤ 6.5   | V    |
| V <sub>O</sub>   | DC Output Voltage Output in Higher or Low State                                |                                     | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>  | DC Input Diode Current V <sub>I</sub> < GND                                    |                                     | -50                           | mA   |
| I <sub>OK</sub>  | DC Output Diode Current V <sub>O</sub> < GND, V <sub>O</sub> > V <sub>CC</sub> |                                     | ±50                           | mA   |
| I <sub>O</sub>   | DC Output Sink Current                                                         |                                     | ±50                           | mA   |
| I <sub>CC</sub>  | DC Supply Current per Supply Pin                                               |                                     | +100                          | mA   |
| I <sub>GND</sub> | DC Ground Current per Supply Pin                                               |                                     | -100                          | mA   |
| T <sub>STG</sub> | Storage Temperature Range                                                      |                                     | -65 to 150                    | °C   |
| T <sub>L</sub>   | Lead Temperature, Soldering 10 Seconds                                         |                                     | 260                           | °C   |
| T <sub>J</sub>   | Max Junction Temperature                                                       |                                     | 150                           | °C   |
| V <sub>ESD</sub> | ESD Classification                                                             | Human Body Model <sup>(2)</sup>     | ±4000                         | V    |
|                  |                                                                                | Charged Device Model <sup>(3)</sup> | ±1000                         |      |
| I <sub>LU</sub>  | Max Latch Up Current Above V <sub>CC</sub> and GND at 125°C <sup>(4)</sup>     |                                     | ±100                          | mA   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Note1:** I<sub>O</sub> absolute maximum rating must be observed.

**Note2:** HBM tested per AEC-Q100-002(JEDEC JS-001);

**Note3:** CDM tested per AEC-Q100-011(JEDEC JS-002);

**Note4:** Latch up Current Maximum Rating tested per AEC-Q100-004(JEDEC JESD78F).

## Thermal Characteristics

| Symbol           | Package | Ratings                                                      | Value | Unit |
|------------------|---------|--------------------------------------------------------------|-------|------|
| R <sub>θJA</sub> | SC70-5  | Thermal Characteristics, Thermal Resistance, Junction-to-Air | 300   | °C/W |
|                  | SOT23-5 |                                                              | 250   |      |
|                  | DFN6    |                                                              | 440   |      |

## Recommended Operating Conditions

| Symbol                          | Parameter                             |                                 | Min  | Max | Unit |
|---------------------------------|---------------------------------------|---------------------------------|------|-----|------|
| V <sub>CC</sub>                 | DC Supply Voltage Operating           |                                 | 1.65 | 5.5 | V    |
|                                 | Data Retention                        |                                 | 1.5  | 5.5 |      |
| V <sub>IN</sub>                 | DC Input Voltage                      |                                 | 0    | 5.5 | V    |
| V <sub>OUT</sub>                | DC Output Voltage (High or Low State) |                                 | 0    | 5.5 | V    |
| T <sub>A</sub>                  | Operating Temperature Range           |                                 | -40  | 125 | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time              | V <sub>CC</sub> = 2.5 V ± 0.2 V | 0    | 20  | ns/V |
|                                 |                                       | V <sub>CC</sub> = 3.0 V ± 0.3 V | 0    | 10  |      |
|                                 |                                       | V <sub>CC</sub> = 5.0 V ± 0.5 V | 0    | 5   |      |

# ETQ74LVC1G00

## Electrical Characteristics

### DC Electrical Characteristics

| Symbol           | Parameter                 | Condition                                               | V <sub>CC</sub> (V)        | T <sub>A</sub> = 25 °C                    |                 |                                           | -40°C ≤ T <sub>A</sub> ≤ 125°C            |                                           | Unit |
|------------------|---------------------------|---------------------------------------------------------|----------------------------|-------------------------------------------|-----------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|------|
|                  |                           |                                                         |                            | Min                                       | Typ             | Max                                       | Min                                       | Max                                       |      |
| V <sub>IH</sub>  | High-Level Input Voltage  |                                                         | 1.65 to 1.95<br>2.3 to 5.5 | 0.75V <sub>CC</sub><br>0.7V <sub>CC</sub> |                 |                                           | 0.75V <sub>CC</sub><br>0.7V <sub>CC</sub> |                                           | V    |
| V <sub>IL</sub>  | Low-Level Input Voltage   |                                                         | 1.65 to 1.95<br>2.3 to 5.5 |                                           |                 | 0.25V <sub>CC</sub><br>0.3V <sub>CC</sub> |                                           | 0.25V <sub>CC</sub><br>0.3V <sub>CC</sub> | V    |
| V <sub>OH</sub>  | High-Level Output Voltage | I <sub>OH</sub> = -100µA                                | 1.65 to 5.5                | V <sub>CC</sub> -0.1                      | V <sub>CC</sub> |                                           | V <sub>CC</sub> -0.1                      |                                           | V    |
|                  |                           | I <sub>OH</sub> = -3mA                                  | 1.65                       | 1.29                                      | 1.4             |                                           | 1.29                                      |                                           |      |
|                  |                           | I <sub>OH</sub> = -8mA                                  | 2.3                        | 1.9                                       | 2.1             |                                           | 1.9                                       |                                           |      |
|                  |                           | I <sub>OH</sub> = -12mA                                 | 2.7                        | 2.2                                       | 2.4             |                                           | 2.2                                       |                                           |      |
|                  |                           | I <sub>OH</sub> = -16mA                                 | 3.0                        | 2.4                                       | 2.7             |                                           | 2.4                                       |                                           |      |
|                  |                           | I <sub>OH</sub> = -24mA                                 | 3.0                        | 2.3                                       | 2.5             |                                           | 2.3                                       |                                           |      |
|                  |                           | I <sub>OH</sub> = -32mA                                 | 4.5                        | 3.8                                       | 4.0             |                                           | 3.8                                       |                                           |      |
| V <sub>OL</sub>  | Low-Level Output Voltage  | I <sub>OH</sub> = 100µA                                 | 1.65 to 5.5                |                                           | 0.0             | 0.1                                       |                                           | 0.1                                       | V    |
|                  |                           | I <sub>OL</sub> = 3mA                                   | 1.65                       |                                           | 0.08            | 0.24                                      |                                           | 0.24                                      |      |
|                  |                           | I <sub>OL</sub> = 8mA                                   | 2.3                        |                                           | 0.20            | 0.3                                       |                                           | 0.3                                       |      |
|                  |                           | I <sub>OL</sub> = 12mA                                  | 2.7                        |                                           | 0.22            | 0.4                                       |                                           | 0.4                                       |      |
|                  |                           | I <sub>OL</sub> = 16mA                                  | 3.0                        |                                           | 0.28            | 0.4                                       |                                           | 0.4                                       |      |
|                  |                           | I <sub>OL</sub> = 24mA                                  | 3.0                        |                                           | 0.38            | 0.55                                      |                                           | 0.55                                      |      |
|                  |                           | I <sub>OL</sub> = 32mA                                  | 4.5                        |                                           | 0.42            | 0.55                                      |                                           | 0.55                                      |      |
| I <sub>IN</sub>  | Input Leakage Current     | V <sub>IN</sub> = 5.5V<br>or GND                        | 0 to 5.5                   |                                           |                 | ±0.1                                      |                                           | ±1.0                                      | µA   |
| I <sub>OFF</sub> | Power Off Leakage Current | V <sub>IN</sub> = 5.5V<br>or<br>V <sub>OUT</sub> = 5.5V | 0                          |                                           |                 | 1                                         |                                           | 10                                        | µA   |
| I <sub>CC</sub>  | Quiescent Supply Current  | V <sub>IN</sub> = 5.5V<br>or GND                        | 5.5                        |                                           |                 | 1                                         |                                           | 10                                        | µA   |

# ETQ74LVC1G00

## AC Electrical Characteristics

$t_r = t_f = 5\text{ns}$

| Symbol                 | Parameter                          | Condition                                   | $V_{CC}(V)$ | $T_A = 25^\circ\text{C}$ |      |      | $-40^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ |      | Unit |
|------------------------|------------------------------------|---------------------------------------------|-------------|--------------------------|------|------|-----------------------------------------------------|------|------|
|                        |                                    |                                             |             | Min                      | Typ  | Max  | Min                                                 | Max  |      |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>(Figure3and4) | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | 1.65        | 2.0                      | 12.3 | 14.9 | 2.0                                                 | 15.9 | ns   |
|                        |                                    |                                             | 1.8         | 2.0                      | 10   | 11.6 | 2.0                                                 | 14.4 |      |
|                        |                                    | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | 2.5         | 0.2                      | 6.0  | 8.7  | 0.8                                                 | 9.2  |      |
|                        |                                    | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | 3.3         | 0.8                      | 5.0  | 6.5  | 0.5                                                 | 7.0  |      |
|                        |                                    | $R_L = 500\Omega$ $C_L = 50\text{pF}$       |             | 1.2                      | 5.6  | 7.1  | 1.5                                                 | 7.6  |      |
|                        |                                    | $R_L = 1\text{M}\Omega$ $C_L = 15\text{pF}$ | 5.0         | 0.5                      | 4.4  | 5.6  | 0.5                                                 | 6.1  |      |
|                        |                                    | $R_L = 500\Omega$ $C_L = 50\text{pF}$       |             | 0.8                      | 4.8  | 6.1  | 0.8                                                 | 6.6  |      |

## Capacitance Characteristics

| Symbol   | Parameter                         | Condition                                                     | Typ | Unit |
|----------|-----------------------------------|---------------------------------------------------------------|-----|------|
| $C_{IN}$ | Input Capacitance                 | $V_{CC} = 5.5\text{V}$ , $V_I = 0\text{V}$ or $V_{CC}$        | >4  | pF   |
| $C_{PD}$ | Power Dissipation Capacitance (5) | 10MHz, $V_{CC} = 3.3\text{V}$ , $V_I = 0\text{V}$ or $V_{CC}$ | 21  | pF   |
|          |                                   | 10MHz, $V_{CC} = 5.5\text{V}$ , $V_I = 0\text{V}$ or $V_{CC}$ | 21  |      |

**Note5.**  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

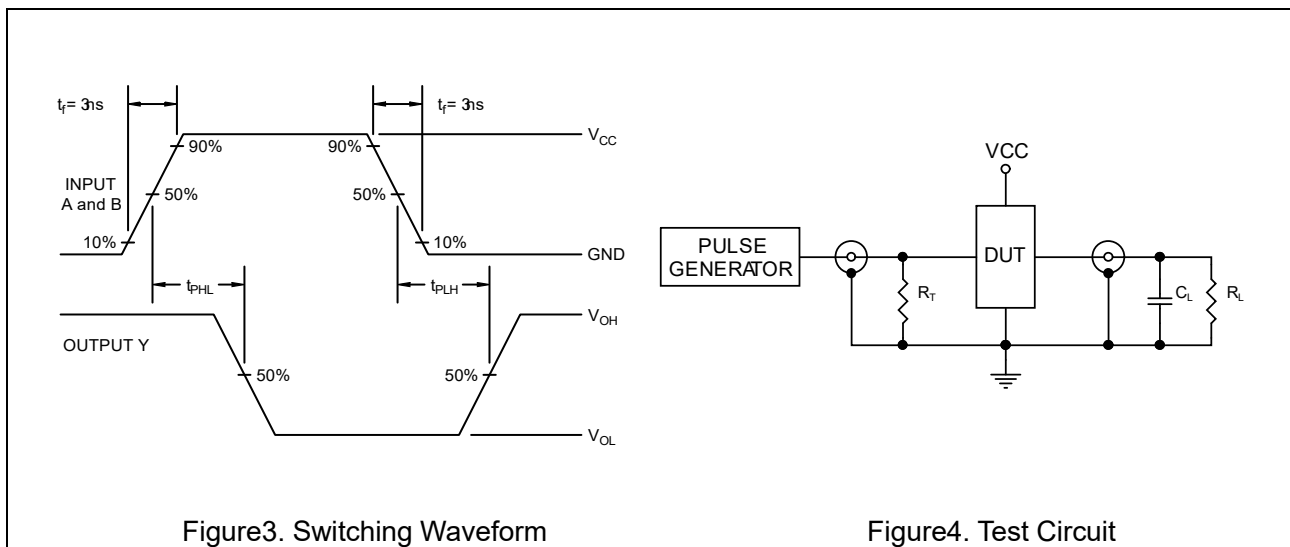
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

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

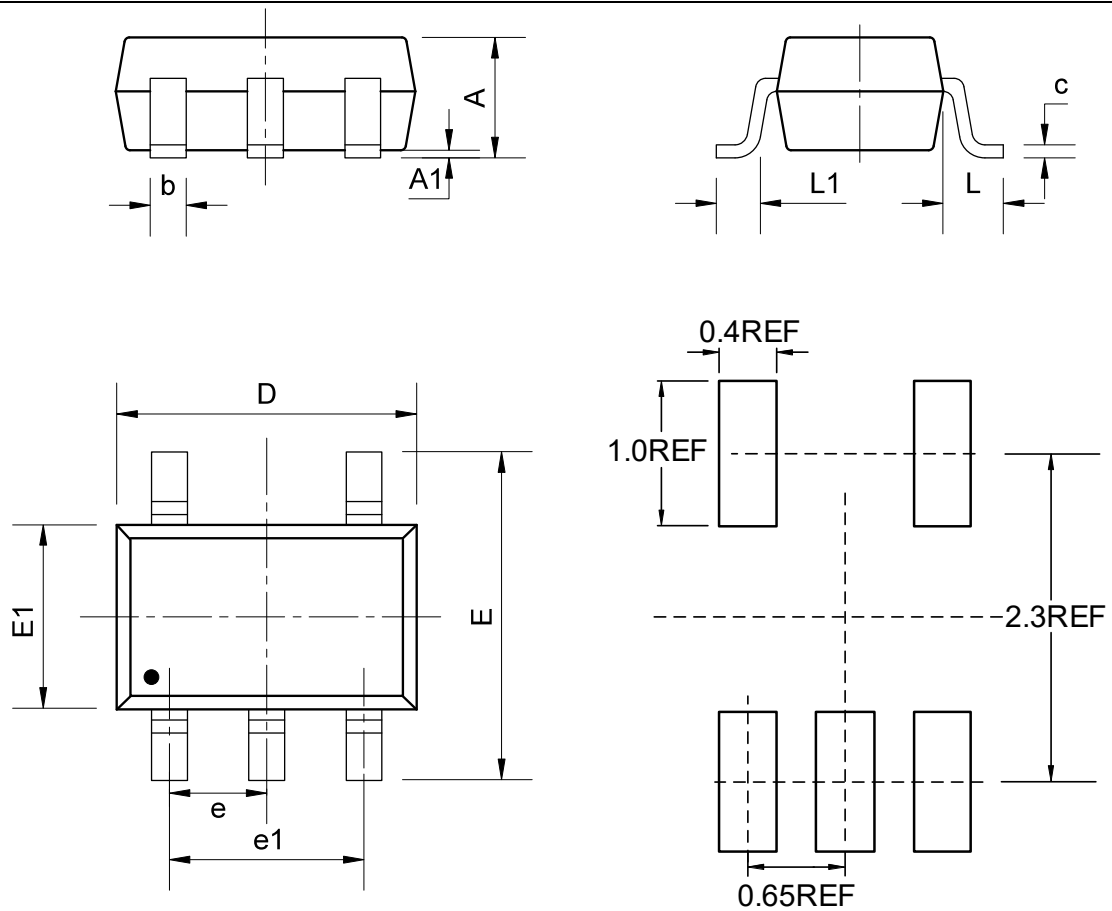
## AC Test Circuit



# ETQ74LVC1G00

## Package Dimension

SC70-5(1.3mm × 2.1mm)



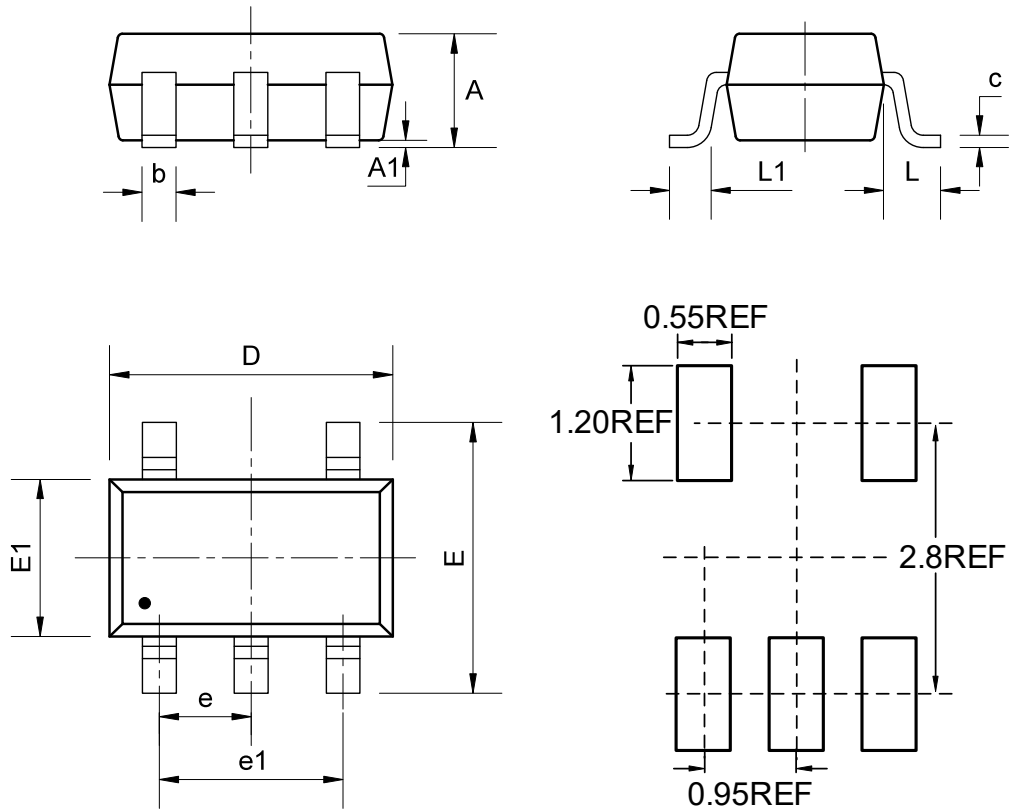
## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | -       | -    | 1.05 |
| A1     | 0       | -    | 0.15 |
| b      | 0.17    | -    | 0.33 |
| c      | 0.12    | -    | 0.20 |
| D      | 2.00    | 2.10 | 2.20 |
| e      | 0.65BSC |      |      |
| e1     | 1.30BSC |      |      |
| E      | 2.20    | 2.30 | 2.40 |
| E1     | 1.21    | 1.30 | 1.35 |
| L      | 0.50REF |      |      |
| L1     | 0.33REF |      |      |

# ETQ74LVC1G00

SOT23-5(1.6mm × 2.9mm)



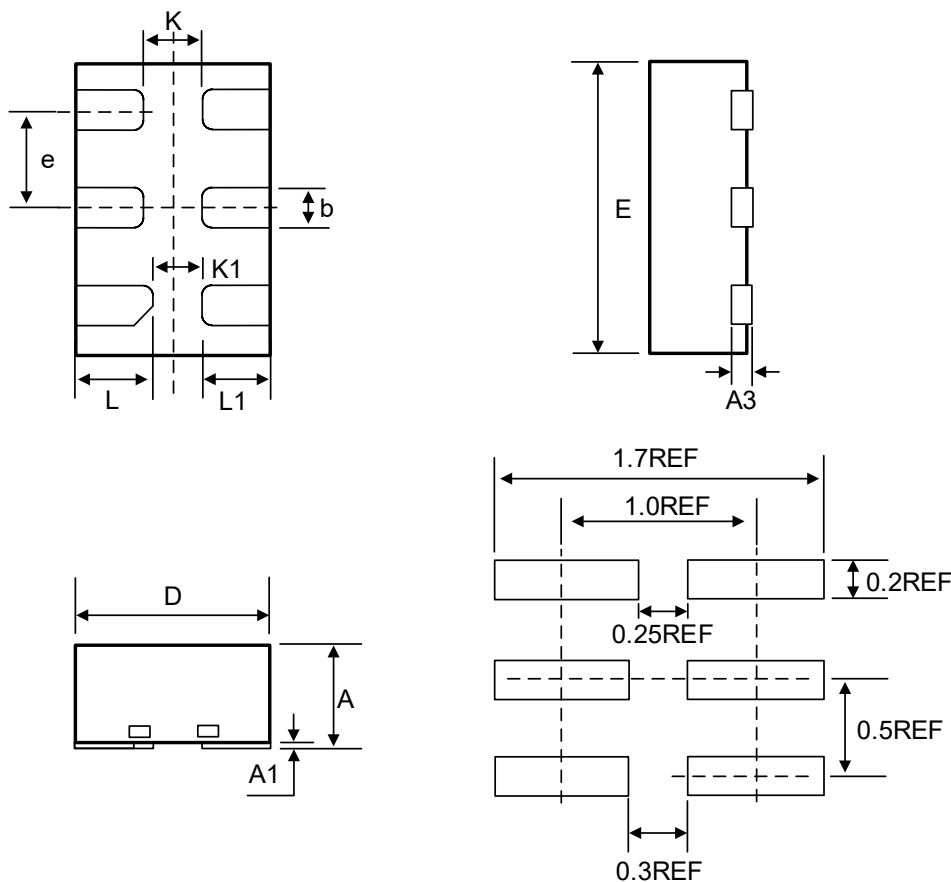
## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN     | NOM  | MAX  |
|--------|---------|------|------|
| A      | -       | -    | 1.25 |
| A1     | 0       | -    | 0.15 |
| b      | 0.36    | -    | 0.50 |
| c      | 0.12    | -    | 0.20 |
| D      | 2.75    | 2.9  | 3.05 |
| e      | 0.90    | 0.95 | 1.00 |
| e1     | 1.80    | 1.90 | 2.00 |
| E      | 2.60    | 2.80 | 3.00 |
| E1     | 1.45    | 1.6  | 1.75 |
| L      | 0.60REF |      |      |
| L1     | 0.30    | 0.45 | 0.60 |

# ETQ74LVC1G00

DFN6 (1.0mm × 1.5mm)



## COMMON DIMENSIONS

(Unit: mm)

| SYMBOL | MIN      | NOM  | MAX  |
|--------|----------|------|------|
| A      | 0.34     | 0.37 | 0.40 |
| A1     | 0        | 0.02 | 0.05 |
| A3     | 0.10REF  |      |      |
| b      | 0.10     | 0.15 | 0.20 |
| D      | 0.95     | 1.00 | 1.05 |
| E      | 0.95     | 1.00 | 1.05 |
| e      | 0.30     | 0.35 | 0.40 |
| H      | 0.10REF  |      |      |
| K      | 0.15     | --   | --   |
| L      | 0.35     | 0.40 | 0.45 |
| L1     | 0.075REF |      |      |



# ETQ74LVC1G00

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## Revision History and Checking Table

| Version | Date       | Revision Item                             | Modifier     | Function & Spec Checking | Package & Tape Checking |
|---------|------------|-------------------------------------------|--------------|--------------------------|-------------------------|
| 1.0     | 2017-07-17 | Original Version                          | Ma Yong jian | Ma Yong jian             | Liu Jia Ying            |
| 1.1     | 2019-07-18 | Update AC Table and Device Information    | Ma Yong jian | Ma Yong jian             | Liu Jia Ying            |
| 1.2     | 2021-10-26 | Update AC Table                           | Ma Yong jian | Ma Yong jian             | Liu Jia Ying            |
| 1.3     | 2022-06-10 | ESD Update                                | Shi bo       | Shi bo                   | Zhu junli               |
| 1.4     | 2022-10-14 | Update format and Thermal Characteristics | Wu han       | Shi bo                   | Zhu junli               |
| 1.5     | 2023-11-29 | Update Typeset /ESD                       | Shi bo       | Shi bo                   | Zhu junli               |
| 1.6     | 2025-06-07 | Add Packing Option                        | Yang xiaoxu  | Yang xiaoxu              | Liu jiaying             |
| 1.7     | 2025-10-15 | Update Format                             | Wang anran   | Yang xiaoxu              | Liu jiaying             |