

## Dual Inverter Gate

### General Description

The ET74AUP2G04 is a high performance dual inverter operating from a 0.8V to 3.6V supply. This device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive.

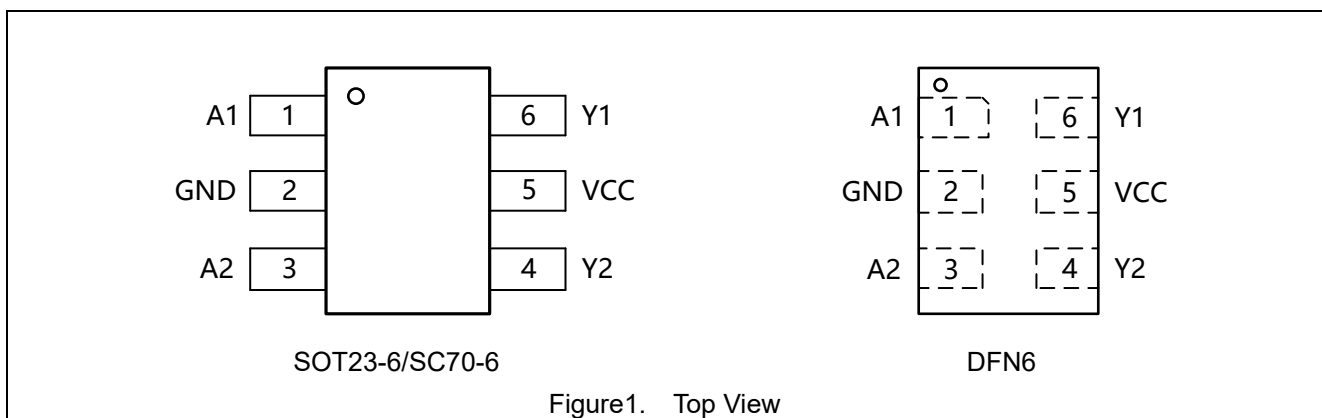
### Features

- Designed for 0.8V to 3.6V V<sub>CC</sub> Operation
- Low static power consumption; I<sub>CC</sub> = 0.7μA (maximum)
- 4mA 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
- Packages are SC70-6, SOT23-6 or small DFN6
- MSL1 (DFN6) , MSL3(SC70-6, SOT23-6)

### Device Information

| Part No.     | Package | Size        |
|--------------|---------|-------------|
| ET74AUP2G04  | SC70-6  | 1.3mm×2.1mm |
| ET74AUP2G04T | SOT23-6 | 1.6mm×2.9mm |
| ET74AUP2G04Y | DFN6    | 1.0mm×1.5mm |

### Pin Configuration



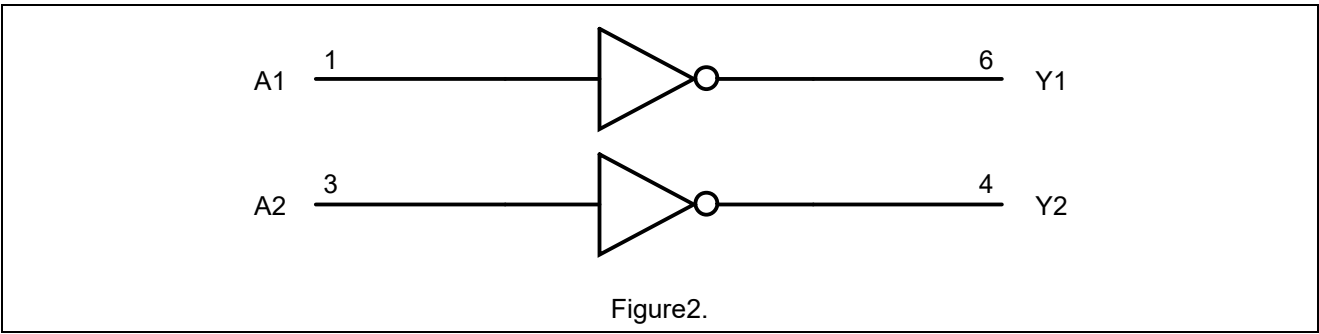
# ET74AUP2G04

## Pin Function

SC70-6/ SOT23-6/DFN6

| Pin No. | Pin Name | Function       |
|---------|----------|----------------|
| 1       | A1       | Input CH1      |
| 2       | GND      | Ground         |
| 3       | A2       | Input CH2      |
| 4       | Y2       | Output CH2     |
| 5       | VCC      | Supply Voltage |
| 6       | Y1       | Output CH1     |

## Block Diagram



## Functional Description

Function Table

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

# ET74AUP2G04

## Absolute Maximum Ratings

| Symbol           | Parameter                                                                  |                                                        | Value                        | Unit |
|------------------|----------------------------------------------------------------------------|--------------------------------------------------------|------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage                                                          |                                                        | −0.5 to 4.6                  | V    |
| V <sub>I</sub>   | DC Input Voltage                                                           |                                                        | −0.5 ≤ V <sub>I</sub> ≤ +4.6 | V    |
| V <sub>O</sub>   | DC Output Voltage Output in Higher or Low State <sup>(1)</sup>             |                                                        | −0.5 to 4.6                  | 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                                                     |                                                        | ±20                          | mA   |
| I <sub>CC</sub>  | DC Supply Current per Supply Pin                                           |                                                        | ±50                          | mA   |
| I <sub>GND</sub> | DC Ground Current per Supply Pin                                           |                                                        | ±50                          | 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                        | mW   |
|                  |                                                                            | Charged Device Model <sup>(3)</sup>                    | ±1000                        | V    |
| I <sub>LU</sub>  | Max Latch up Current Above V <sub>CC</sub> and GND at 125°C <sup>(4)</sup> |                                                        | ±100                         |      |

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.

**Notes:** 1. IO absolute maximum rating must be observed.

2. Tested to EIA/JESD22-A114-A

3. Tested to JESD22-C101-A.

4. Tested to EIA/JESD78.

## Thermal Characteristics

| Symbol           | Package       | Ratings                                                      | Value | Unit |
|------------------|---------------|--------------------------------------------------------------|-------|------|
| R <sub>θJA</sub> | SC70-6        | Thermal Characteristics, Thermal Resistance, Junction-to-Air | 280   | °C/W |
|                  | SOT23-6       |                                                              | 180   |      |
|                  | DFN6(1.0×1.5) |                                                              | 440   |      |
| P <sub>D</sub>   | SC70-6        | Power Dissipation in Still Air at 85°C                       | 230   | mW   |
|                  | SOT23-6       |                                                              | 360   |      |
|                  | DFN6(1.0×1.5) |                                                              | 150   |      |

## Recommended Operating Conditions

| Symbol                          | Parameter                             |                                | Min | Max | Unit |
|---------------------------------|---------------------------------------|--------------------------------|-----|-----|------|
| V <sub>CC</sub>                 | DC Supply Voltage Operating           |                                | 0.8 | 3.6 | V    |
| V <sub>IN</sub>                 | DC Input Voltage                      |                                | 0   | 3.6 | V    |
| V <sub>OUT</sub>                | DC Output Voltage (High or Low State) |                                | 0   | 3.6 | V    |
| T <sub>A</sub>                  | Operating Temperature Range           |                                | −40 | 85  | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time              | V <sub>CC</sub> = 0.8V to 3.6V | 0   | 20  | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied.

# ET74AUP2G04

## 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> ≤ 85°C |                     | Unit |
|------------------|---------------------------|-----------------------------------------------------|---------------------|-----------------------|------|---------------------|-------------------------------|---------------------|------|
|                  |                           |                                                     |                     | Min                   | Typ  | Max                 | Min                           | Max                 |      |
| V <sub>IH</sub>  | High-Level Input Voltage  |                                                     | 0.8                 | 0.75V <sub>CC</sub>   |      |                     | 0.75V <sub>CC</sub>           |                     | V    |
|                  |                           |                                                     | 0.9 to 1.95         | 0.7V <sub>CC</sub>    |      |                     | 0.7V <sub>CC</sub>            |                     |      |
|                  |                           |                                                     | 2.3 to 2.7          | 1.6                   |      |                     | 1.6                           |                     |      |
|                  |                           |                                                     | 3.0 to 3.6          | 2.0                   |      |                     | 2.0                           |                     |      |
| V <sub>IL</sub>  | Low-Level Input Voltage   |                                                     | 0.8                 |                       |      | 0.25V <sub>CC</sub> |                               | 0.25V <sub>CC</sub> | V    |
|                  |                           |                                                     | 0.9 to 1.95         |                       |      | 0.3V <sub>CC</sub>  |                               | 0.3V <sub>CC</sub>  |      |
|                  |                           |                                                     | 2.3 to 2.7          |                       |      | 0.7                 |                               | 0.7                 |      |
|                  |                           |                                                     | 3.0 to 3.6          |                       |      | 0.9                 |                               | 0.9                 |      |
| V <sub>OH</sub>  | High-Level Output Voltage | I <sub>OH</sub> =-20uA                              | 0.8 to 3.6          | V <sub>CC</sub> -0.1  |      |                     | V <sub>CC</sub> -0.1          |                     | V    |
|                  |                           | I <sub>OH</sub> =-1.1mA                             | 1.1                 | 0.82                  | 1.02 |                     | 0.77                          |                     |      |
|                  |                           | I <sub>OH</sub> =-1.7mA                             | 1.4                 | 1.11                  | 1.32 |                     | 1.03                          |                     |      |
|                  |                           | I <sub>OH</sub> =-1.9mA                             | 1.65                | 1.32                  | 1.58 |                     | 1.30                          |                     |      |
|                  |                           | I <sub>OH</sub> =-2.3mA                             | 2.3                 | 2.05                  | 2.24 |                     | 1.97                          |                     |      |
|                  |                           | I <sub>OH</sub> =-3.1mA                             |                     | 1.9                   | 2.22 |                     | 1.85                          |                     |      |
|                  |                           | I <sub>OH</sub> =-2.7mA                             | 3.0                 | 2.72                  | 2.95 |                     | 2.67                          |                     |      |
|                  |                           | I <sub>OH</sub> =-4.0mA                             |                     | 2.6                   | 2.92 |                     | 2.55                          |                     |      |
| V <sub>OL</sub>  | Low-Level Output Voltage  | I <sub>OL</sub> =20uA                               | 0.8 to 3.6          |                       |      | 0.1                 |                               | 0.1                 | V    |
|                  |                           | I <sub>OL</sub> =1.1mA                              | 1.1                 |                       | 0.11 | 0.33                |                               | 0.33                |      |
|                  |                           | I <sub>OL</sub> =1.7mA                              | 1.4                 |                       | 0.12 | 0.31                |                               | 0.37                |      |
|                  |                           | I <sub>OL</sub> =1.9mA                              | 1.65                |                       | 0.11 | 0.31                |                               | 0.35                |      |
|                  |                           | I <sub>OL</sub> =2.3mA                              | 2.3                 |                       | 0.14 | 0.31                |                               | 0.33                |      |
|                  |                           | I <sub>OL</sub> =3.1mA                              |                     |                       | 0.19 | 0.44                |                               | 0.45                |      |
|                  |                           | I <sub>OL</sub> =2.7mA                              | 3.0                 |                       | 0.11 | 0.31                |                               | 0.33                |      |
|                  |                           | I <sub>OL</sub> =4.0mA                              |                     |                       | 0.16 | 0.44                |                               | 0.45                |      |
| I <sub>IN</sub>  | Input Leakage Current     | V <sub>IN</sub> = V <sub>CC</sub> or GND            | 0 to 3.6            |                       |      | ±0.1                |                               | ±0.2                | uA   |
| I <sub>OFF</sub> | Power Off Leakage Current | V <sub>IN</sub> = 3.6 V or V <sub>OUT</sub> = 3.6 V | 0                   |                       |      | ±0.2                |                               | ±0.5                | uA   |
| I <sub>CC</sub>  | Quiescent Supply Current  | V <sub>IN</sub> = 3.6V or GND                       | 3.6                 |                       |      | ±0.2                |                               | ±0.7                | uA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# ET74AUP2G04

## AC Electrical Characteristics

$t_r = t_f = 2.5\text{ns}$

| Symbol                               | Parameter                            | Condition                             | V <sub>CC</sub> (V) | T <sub>A</sub> = 25°C |      |      | -40°C ≤ T <sub>A</sub> ≤ 85°C |      | Unit |
|--------------------------------------|--------------------------------------|---------------------------------------|---------------------|-----------------------|------|------|-------------------------------|------|------|
|                                      |                                      |                                       |                     | Min                   | Typ  | Max  | Min                           | Max  |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>(Figure3 And 4) | C <sub>L</sub> = 5 pF <sup>(5)</sup>  | 0.8                 | 13.2                  | 29   | 90.1 | 11.9                          | 220  | ns   |
|                                      |                                      |                                       | 1.2                 | 5.0                   | 7.6  | 14.3 | 4.6                           | 14.4 |      |
|                                      |                                      |                                       | 1.5                 | 3.4                   | 4.8  | 8.9  | 3                             | 9.6  |      |
|                                      |                                      |                                       | 1.8                 | 2.7                   | 3.6  | 6.9  | 2.3                           | 7.6  |      |
|                                      |                                      |                                       | 2.5                 | 1.9                   | 2.4  | 5.1  | 1.6                           | 5.6  |      |
|                                      |                                      |                                       | 3.3                 | 1.5                   | 1.9  | 4.4  | 1.3                           | 4.8  |      |
|                                      |                                      | C <sub>L</sub> = 10 pF <sup>(5)</sup> | 0.8                 | 14.3                  | 31.3 | 97.9 | 12.8                          | 239  | ns   |
|                                      |                                      |                                       | 1.2                 | 5.4                   | 8.3  | 15.3 | 5.0                           | 15.3 |      |
|                                      |                                      |                                       | 1.5                 | 3.7                   | 5.2  | 9.5  | 3.2                           | 10.2 |      |
|                                      |                                      |                                       | 1.8                 | 2.9                   | 3.9  | 7.4  | 2.5                           | 8.1  |      |
|                                      |                                      |                                       | 2.5                 | 2.0                   | 2.6  | 5.4  | 1.7                           | 6.0  |      |
|                                      |                                      |                                       | 3.3                 | 1.6                   | 2.0  | 4.6  | 1.3                           | 5.1  |      |
|                                      |                                      | C <sub>L</sub> = 15 pF <sup>(5)</sup> | 0.8                 | 15.3                  | 32.5 | 106  | 13.8                          | 259  | ns   |
|                                      |                                      |                                       | 1.2                 | 5.8                   | 8.9  | 16.3 | 5.3                           | 16.3 |      |
|                                      |                                      |                                       | 1.5                 | 4.0                   | 5.6  | 10.1 | 3.5                           | 10.9 |      |
|                                      |                                      |                                       | 1.8                 | 3.1                   | 4.2  | 7.8  | 2.6                           | 8.6  |      |
|                                      |                                      |                                       | 2.5                 | 2.1                   | 2.8  | 5.8  | 1.8                           | 6.4  |      |
|                                      |                                      |                                       | 3.3                 | 1.7                   | 2.2  | 4.9  | 1.4                           | 5.4  |      |
|                                      |                                      | C <sub>L</sub> = 30 pF <sup>(5)</sup> | 0.8                 | 18.3                  | 37.5 | 130  | 16.6                          | 323  | ns   |
|                                      |                                      |                                       | 1.2                 | 7.0                   | 10.7 | 19.3 | 6.4                           | 19.3 |      |
|                                      |                                      |                                       | 1.5                 | 4.8                   | 6.9  | 12.0 | 4.2                           | 12.9 |      |
|                                      |                                      |                                       | 1.8                 | 3.7                   | 5.1  | 9.2  | 3.2                           | 10.2 |      |
|                                      |                                      |                                       | 2.5                 | 2.6                   | 3.5  | 6.7  | 2.2                           | 7.5  |      |
|                                      |                                      |                                       | 3.3                 | 2.0                   | 2.2  | 5.6  | 1.7                           | 6.3  |      |

**Note5.** C<sub>L</sub> includes probe and jig capacitance.

# ET74AUP2G04

## Capacitance Characteristics

| Symbol          | Parameter                                    | Condition                                                       |                         | Typical | Unit |
|-----------------|----------------------------------------------|-----------------------------------------------------------------|-------------------------|---------|------|
| C <sub>IN</sub> | Input Capacitance                            | V <sub>CC</sub> = 3.6V, V <sub>I</sub> = 0 V or V <sub>CC</sub> |                         | 2       | pF   |
| C <sub>O</sub>  | output capacitance                           | V <sub>CC</sub> = 0V, V <sub>OUT</sub> = GND                    |                         | 3       | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance <sup>(6)</sup> | 1 MHz,<br>V <sub>I</sub> = 0 V to V <sub>CC</sub>               | V <sub>CC</sub> = 0.8V  | 7.6     | pF   |
|                 |                                              |                                                                 | V <sub>CC</sub> = 1.2V  | 8.1     |      |
|                 |                                              |                                                                 | V <sub>CC</sub> = 1.5V  | 8.5     |      |
|                 |                                              |                                                                 | V <sub>CC</sub> = 1.8V  | 8.6     |      |
|                 |                                              |                                                                 | V <sub>CC</sub> = 2.5V  | 9.0     |      |
|                 |                                              |                                                                 | V <sub>CC</sub> = 3.3 V | 9.6     |      |

**Note6.**  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:  $I_{CC(OPR)} = C_{PD} \times V_{CC} \times f_{in} + I_{CC} \times C_{PD}$  is used to determine the no-load dynamic power consumption;  $P_D = C_{PD} \times V_{CC}^2 \times f_{in} + I_{CC} \times V_{CC} \times Fig.$

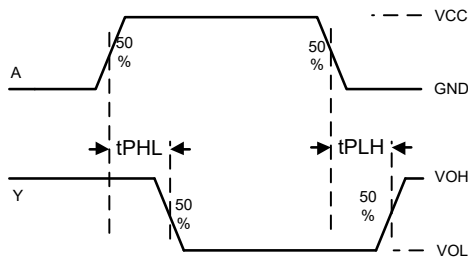


Figure 3. Switching Waveform

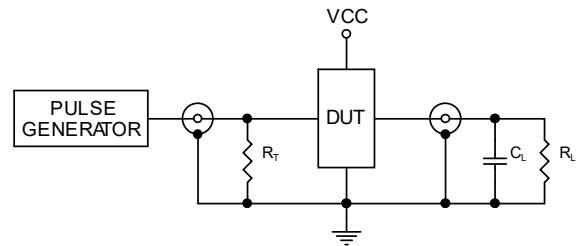
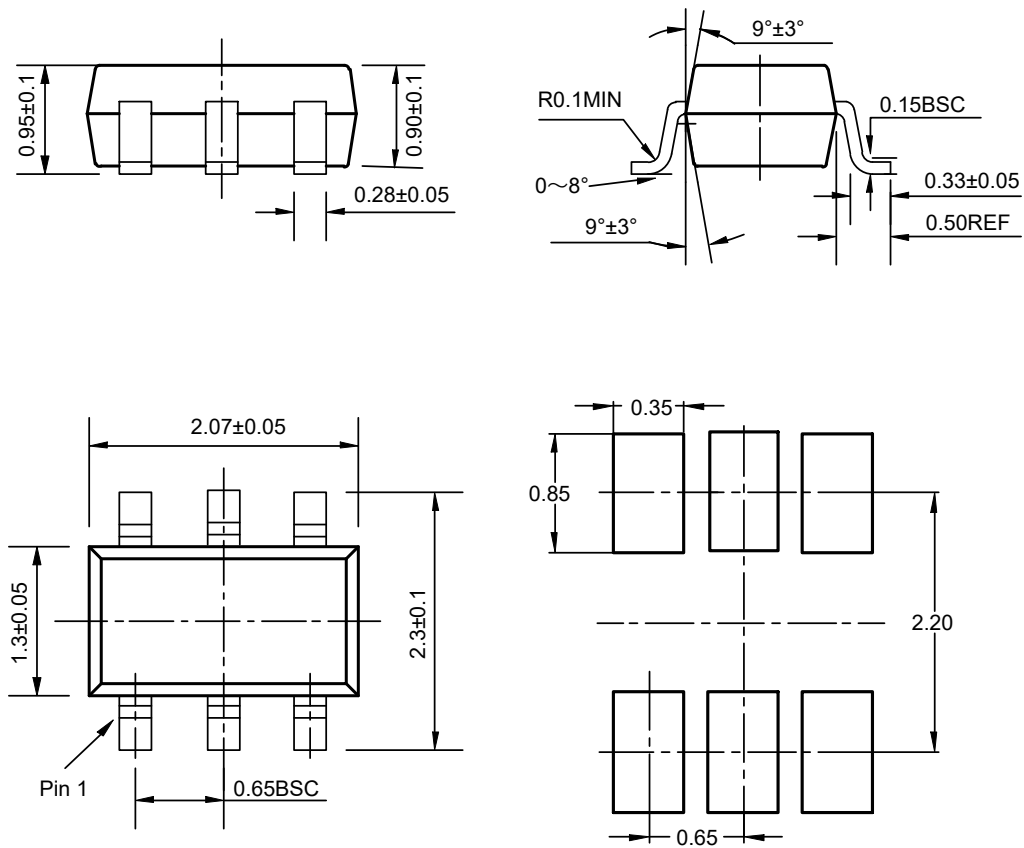


Figure4. Test Circuit

# ET74AUP2G04

## Package Dimension

SC70-6

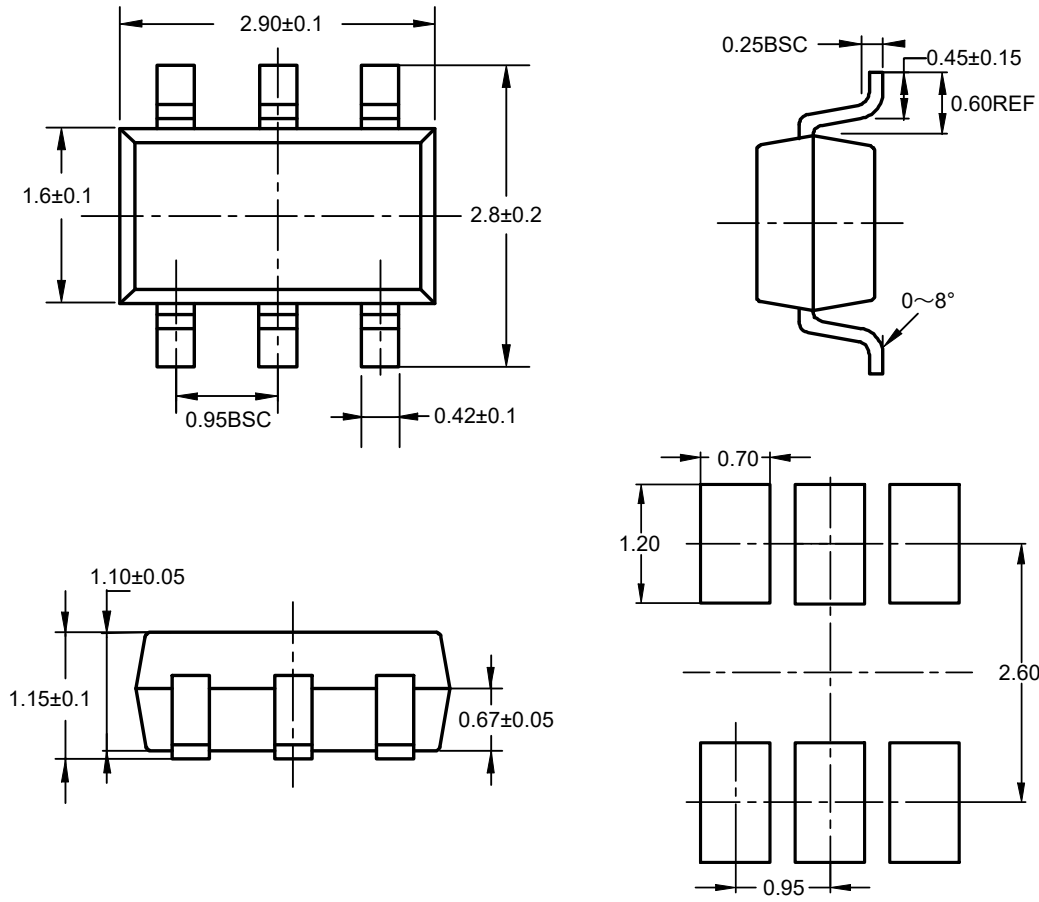


Recommended Land Pattern

Unit: mm

# ET74AUP2G04

SOT23-6



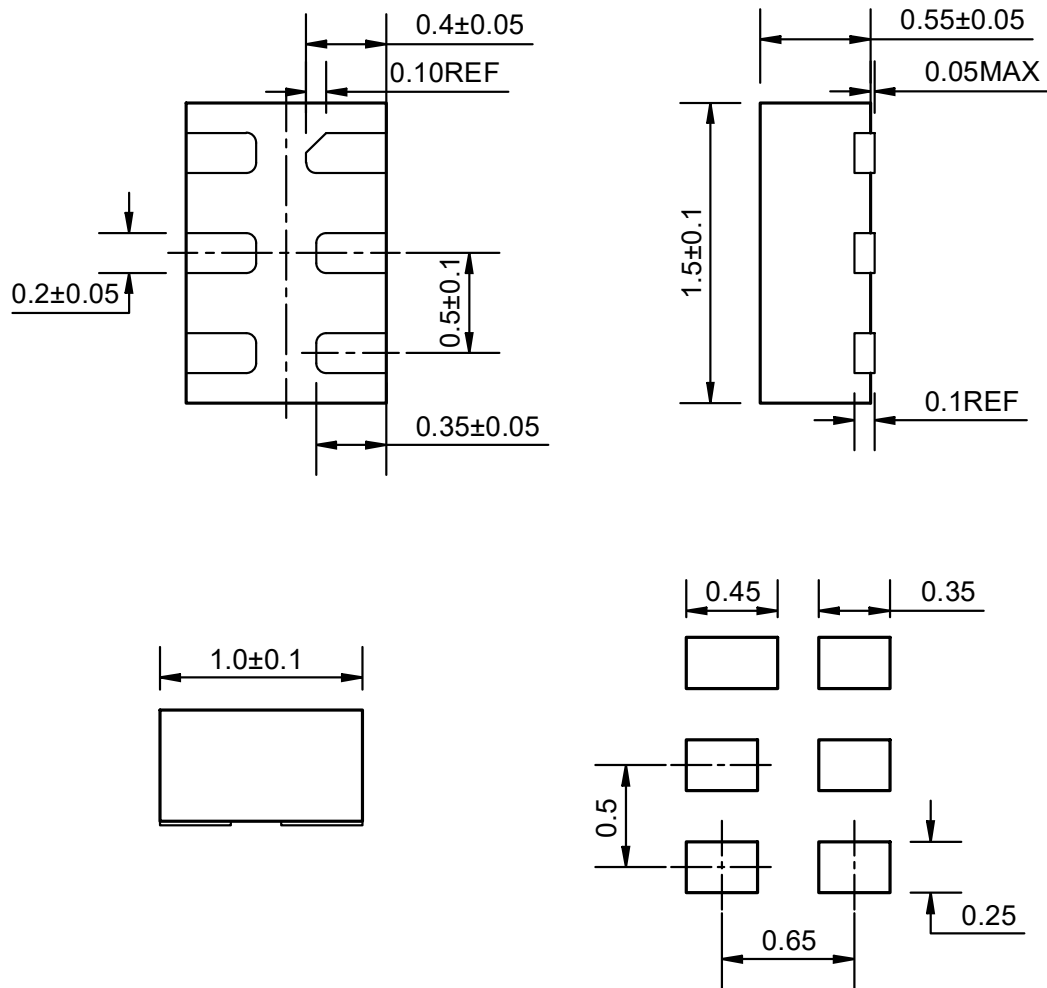
Recommended Land Pattern

Unit: mm



# ET74AUP2G04

DFN6



Recommended Land Pattern

Unit: mm

## Revision History and Checking Table

| Version | Date       | Revision Item               | Modifier | Function & Spec Checking | Package & Tape Checking |
|---------|------------|-----------------------------|----------|--------------------------|-------------------------|
| 1.0     | 2023-11-28 | Initial Version             | Shibo    | Luh                      | Liuji                   |
| 1.1     | 2023-12-09 | Update Package picture /ESD | Shibo    | Shibo                    | Shibo                   |