

### Features

- Wide supply voltage range from 0.8V to 3.6V
- Inputs accept voltages up to 3.6V
- I<sub>OFF</sub> supports partial-power-down mode
- Low static power consumption; I<sub>CC</sub>=0.5μA (Max.)
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

### General Description

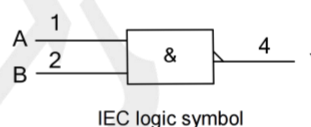
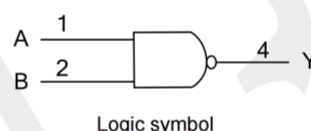
The TP74AUP1G00 is a 2-input NAND gate which provides the Function  $Y = \overline{A \cdot B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

This device ensures a very low static and dynamic power consumption across the entire VCC range from 0.8V to 3.6V.

### Applications

- AV Receiver
- Audio Dock: Portable
- Blu-ray Player and Home Theater
- Embedded PC
- Personal Digital Assistant(PDA)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drive(SSD): Client and Enterprise
- Wireless Headset, Keyboard, and Mouse

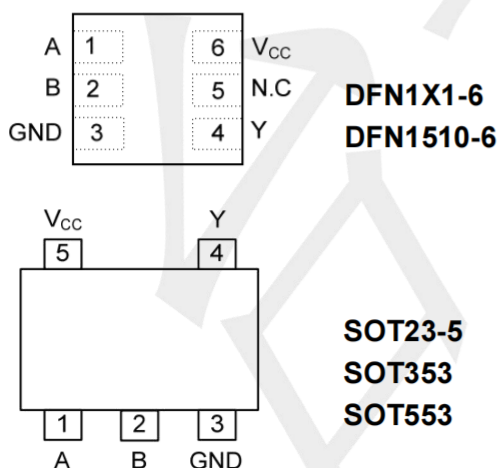
### Logic Diagram



### Ordering Information

| ORDER NUMBER  | PACKAGE DESCRIPTION | PACKAGE OPTION      |
|---------------|---------------------|---------------------|
| TP74AUP1G00S5 | SOT23-5             | Tape and Reel, 3000 |
| TP74AUP1G00C5 | SOT353              | Tape and Reel, 3000 |
| TP74AUP1G00X5 | SOT553              | Tape and Reel, 4000 |
| TP74AUP1G00D6 | DFN1X1-6            | Tape and Reel, 5000 |
| TP74AUP1G00N6 | DFN1510-6           | Tape and Reel, 5000 |

### Pin Configuratio (TOP VIEW)



### Function Table (each gate)

| INPUT(A) | INPUT(B) | OUTPUT(Y) |
|----------|----------|-----------|
| L        | L        | H         |
| L        | H        | H         |
| H        | L        | H         |
| H        | H        | L         |

Note: H: HIGH voltage level; L: LOW voltage level.

### Absolute Maximum Ratings

| PARAMETER                 | SYMBOL           | CONDITIONS                          | RATINGS                       | UNIT |
|---------------------------|------------------|-------------------------------------|-------------------------------|------|
| Supply Voltage            | V <sub>CC</sub>  |                                     | -0.5 ~ +4.6                   | V    |
| Input Voltage             | V <sub>IN</sub>  |                                     | -0.5 ~ +4.6                   | V    |
| Output Voltage            | V <sub>OUT</sub> | Output in the high or low state     | -0.5 ~ +V <sub>CC</sub> +0.5V | V    |
|                           |                  | Output in the power-off state       | -0.5 ~ +4.6                   | V    |
| VCC or GND Current        | I <sub>CC</sub>  |                                     | ±50                           | mA   |
| Continuous Output Current | I <sub>OUT</sub> | V <sub>OUT</sub> =0~V <sub>CC</sub> | ±20                           | mA   |
| Input Clamp Current       | I <sub>IK</sub>  | V <sub>IN</sub> <0                  | -50                           | mA   |
| Output Clamp Current      | I <sub>OK</sub>  | V <sub>OUT</sub> <0                 | -50                           | mA   |
| Storage Temperature Range | T <sub>STG</sub> |                                     | -65 ~ +150                    | °C   |
| Junction to Ambient       | θ <sub>JA</sub>  | SOT-23-5                            | 230                           | °C/W |
|                           |                  | SOT353                              | 280                           | °C/W |
|                           |                  | SOT553                              | 250                           | °C/W |
|                           |                  | DFN1X1-6                            | 460                           | °C/W |
|                           |                  | DFN1510-6                           | 440                           | °C/W |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### Recommended Operating Conditions

| PARAMETER                          | SYMBOL           | TEST CONDITIONS              | MIN | TYP | MAX             | UNIT |
|------------------------------------|------------------|------------------------------|-----|-----|-----------------|------|
| Supply Voltage                     | V <sub>CC</sub>  | Operating                    | 0.8 | --  | 3.6             | V    |
| Input Voltage                      | V <sub>IN</sub>  |                              | 0   | --  | 3.6             | V    |
| Output Voltage                     | V <sub>OUT</sub> | High or low state            | 0   | --  | V <sub>CC</sub> | V    |
| Input Transition Rise or Fall Rate | Δt/Δv            | V <sub>CC</sub> =0.8V ~ 3.6V | --  | --  | 200             | ns/V |
| Operating Temperature              | T <sub>A</sub>   |                              | -40 | --  | +125            | °C   |

### Electrical Characteristics (T<sub>A</sub>=25°C ,unless otherwise specified)

| PARAMETER                                         | SYMBOL               | TEST CONDITIONS                                                                          | MIN                     | TYP  | MAX                  | UNIT |
|---------------------------------------------------|----------------------|------------------------------------------------------------------------------------------|-------------------------|------|----------------------|------|
| High-level Input Voltage                          | V <sub>IH</sub>      | V <sub>CC</sub> =0.8V                                                                    | 0.7×V <sub>CC</sub>     | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =1.1V ~ 1.95V                                                            | 0.65×V <sub>CC</sub>    | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V ~ 2.7V                                                             | 1.6                     | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =3V ~ 3.6V                                                               | 2                       | --   | --                   | V    |
| Low-level Input Voltage                           | V <sub>IL</sub>      | V <sub>CC</sub> =0.8V                                                                    | --                      | --   | 0.3×V <sub>CC</sub>  | V    |
|                                                   |                      | V <sub>CC</sub> =1.1V ~ 1.95V                                                            | --                      | --   | 0.35×V <sub>CC</sub> | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V ~ 2.7V                                                             | --                      | --   | 0.7                  | V    |
|                                                   |                      | V <sub>CC</sub> =3V ~ 3.6V                                                               | --                      | --   | 0.9                  | V    |
| High-Level Output Voltage                         | V <sub>OH</sub>      | V <sub>CC</sub> =0.8 ~ 3.6V, I <sub>OH</sub> =-20μA                                      | V <sub>CC</sub> -0.1    | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =1.1V, I <sub>OH</sub> =-1.1mA                                           | 0.75×V <sub>CC</sub>    | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =1.4V, I <sub>OH</sub> =-1.7mA                                           | 1.11                    | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =1.65V, I <sub>OH</sub> =-1.9mA                                          | 1.32                    | --   | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V                                                                    | I <sub>OH</sub> =-2.3mA | 2.05 | --                   | V    |
|                                                   |                      |                                                                                          | I <sub>OH</sub> =-3.1mA | 1.9  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =3V                                                                      | I <sub>OH</sub> =-2.7mA | 2.72 | --                   | V    |
|                                                   |                      |                                                                                          | I <sub>OH</sub> =-4mA   | 2.6  | --                   | V    |
| Low-Level Output Voltage                          | V <sub>OL</sub>      | V <sub>CC</sub> =0.8 ~ 3.6V, I <sub>OL</sub> =20μA                                       | --                      | --   | 0.1                  | V    |
|                                                   |                      | V <sub>CC</sub> =1.1V, I <sub>OL</sub> =1.1mA                                            | --                      | --   | 0.3×V <sub>CC</sub>  | V    |
|                                                   |                      | V <sub>CC</sub> =1.4V, I <sub>OL</sub> =1.7mA                                            | --                      | --   | 0.31                 | V    |
|                                                   |                      | V <sub>CC</sub> =1.65V, I <sub>OL</sub> =1.9mA                                           | --                      | --   | 0.31                 | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V                                                                    | I <sub>OL</sub> =2.3mA  | --   | 0.31                 | V    |
|                                                   |                      |                                                                                          | I <sub>OL</sub> =3.1mA  | --   | 0.44                 | V    |
|                                                   |                      | V <sub>CC</sub> =3V                                                                      | I <sub>OL</sub> =2.7mA  | --   | 0.31                 | V    |
|                                                   |                      |                                                                                          | I <sub>OL</sub> =4mA    | --   | 0.44                 | V    |
| Input Leakage Current                             | I <sub>I(LEAK)</sub> | V <sub>CC</sub> =0 ~ 3.6V, V <sub>IN</sub> =GND ~ 3.6V                                   | --                      | --   | ±0.1                 | μA   |
| Power OFF Leakage Current                         | I <sub>off</sub>     | V <sub>CC</sub> =0 V, V <sub>IN</sub> or V <sub>OUT</sub> =0 ~ 3.6V                      | --                      | --   | ±0.2                 | μA   |
| Additional Power OFF Leakage Current              | ΔI <sub>off</sub>    | V <sub>CC</sub> =0 V~0.2V, V <sub>IN</sub> or V <sub>OUT</sub> =0 ~ 3.6V                 | --                      | --   | ±0.2                 | μA   |
| Quiescent Supply Current                          | I <sub>CC</sub>      | V <sub>CC</sub> =0.8 ~3.6V, V <sub>IN</sub> =V <sub>CC</sub> or GND, I <sub>OUT</sub> =0 | --                      | --   | 0.5                  | μA   |
| Additional Quiescent Supply Current Per Input Pin | ΔI <sub>CC</sub>     | V <sub>CC</sub> =3.3 V, V <sub>IN</sub> =V <sub>CC</sub> -0.6V, I <sub>OUT</sub> =0      | --                      | --   | 40                   | μA   |
| Input Capacitance                                 | C <sub>I</sub>       | V <sub>CC</sub> =0V-3.6V, V <sub>IN</sub> =V <sub>CC</sub> or GND                        | --                      | 1.5  | --                   | pF   |
| Output Capacitance                                | C <sub>OUT</sub>     | V <sub>CC</sub> =0V, V <sub>OUT</sub> =GND                                               | --                      | 3    | --                   | pF   |

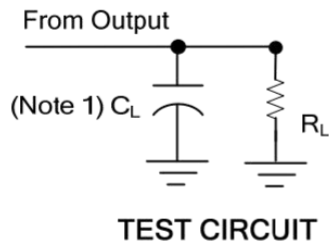
### OPERATING CHARACTERISTICS (f=10MHz, TA =25°C , unless otherwise specified)

| PARAMETER                     | SYMBOL          | TEST CONDITIONS            | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|----------------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | C <sub>PD</sub> | V <sub>CC</sub> =0.8V      | --  | 4.0 | --  | pF   |
|                               |                 | V <sub>CC</sub> =1.2±0.1V  | --  | 4.0 | --  | pF   |
|                               |                 | V <sub>CC</sub> =1.5±0.1V  | --  | 4.0 | --  | pF   |
|                               |                 | V <sub>CC</sub> =1.8±0.15V | --  | 4.0 | --  | pF   |
|                               |                 | V <sub>CC</sub> =2.5±0.2V  | --  | 4.0 | --  | pF   |
|                               |                 | V <sub>CC</sub> =3.3±0.3V  | --  | 4.0 | --  | pF   |

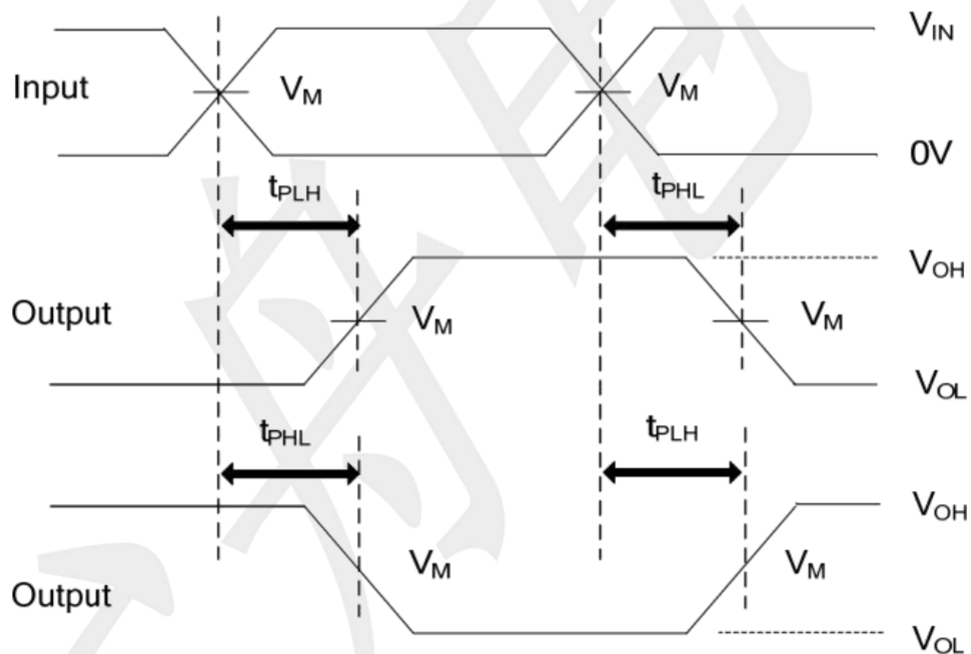
### SWITCHING CHARACTERISTICS (TA =25°C, unless otherwise specified)

| PARAMETER                                                 | SYMBOL          | TEST CONDITIONS    |                            | MIN | TYP  | MAX | UNIT |
|-----------------------------------------------------------|-----------------|--------------------|----------------------------|-----|------|-----|------|
| Propagation delay<br>from inputs (A or B)<br>to output(Y) | t <sub>PD</sub> | CL=5pF,<br>RL=1MΩ  | V <sub>CC</sub> =0.8V      | --  | 16.6 | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.2±0.1V  | 2.6 | 7.0  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.5±0.1V  | 2.9 | 5.0  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.8±0.15V | 2.0 | 4.0  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =2.5±0.2V  | 1.3 | 2.9  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =3.3±0.3V  | 1.0 | 2.4  | --  | ns   |
|                                                           |                 | CL=10pF,<br>RL=1MΩ | V <sub>CC</sub> =0.8V      | --  | 18.9 | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.2±0.1V  | 1.5 | 8.0  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.5±0.1V  | 2.9 | 5.8  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.8±0.15V | 2.0 | 4.7  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =2.5±0.2V  | 1.3 | 3.4  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =3.3±0.3V  | 1.0 | 2.9  | --  | ns   |
|                                                           |                 | CL=15pF,<br>RL=1MΩ | V <sub>CC</sub> =0.8V      | --  | 21.3 | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.2±0.1V  | 3.6 | 9.0  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.5±0.1V  | 2.9 | 6.5  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.8±0.15V | 2.0 | 5.3  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =2.5±0.2V  | 1.3 | 3.9  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =3.3±0.3V  | 1.0 | 3.3  | --  | ns   |
|                                                           |                 | CL=30pF,<br>RL=1MΩ | V <sub>CC</sub> =0.8V      | --  | 28.4 | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.2±0.1V  | 4.9 | 11.9 | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.5±0.1V  | 2.9 | 8.6  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =1.8±0.15V | 2.0 | 7.1  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =2.5±0.2V  | 1.3 | 5.3  | --  | ns   |
|                                                           |                 |                    | V <sub>CC</sub> =3.3±0.3V  | 1.0 | 4.5  | --  | ns   |

## TEST CIRCUIT AND WAVEFORMS



| $V_{CC}$         | $V_{IN}$ | $t_R / t_F$       | $V_M$      | $C_L$           | $R_L$       |
|------------------|----------|-------------------|------------|-----------------|-------------|
| 0.8V             | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.2V $\pm$ 0.1V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.5V $\pm$ 0.1V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 1.8V $\pm$ 0.15V | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 2.5V $\pm$ 0.2V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |
| 3.3V $\pm$ 0.3V  | $V_{CC}$ | $\leq 3\text{ns}$ | $V_{CC}/2$ | 5, 10, 15, 30pF | 1M $\Omega$ |



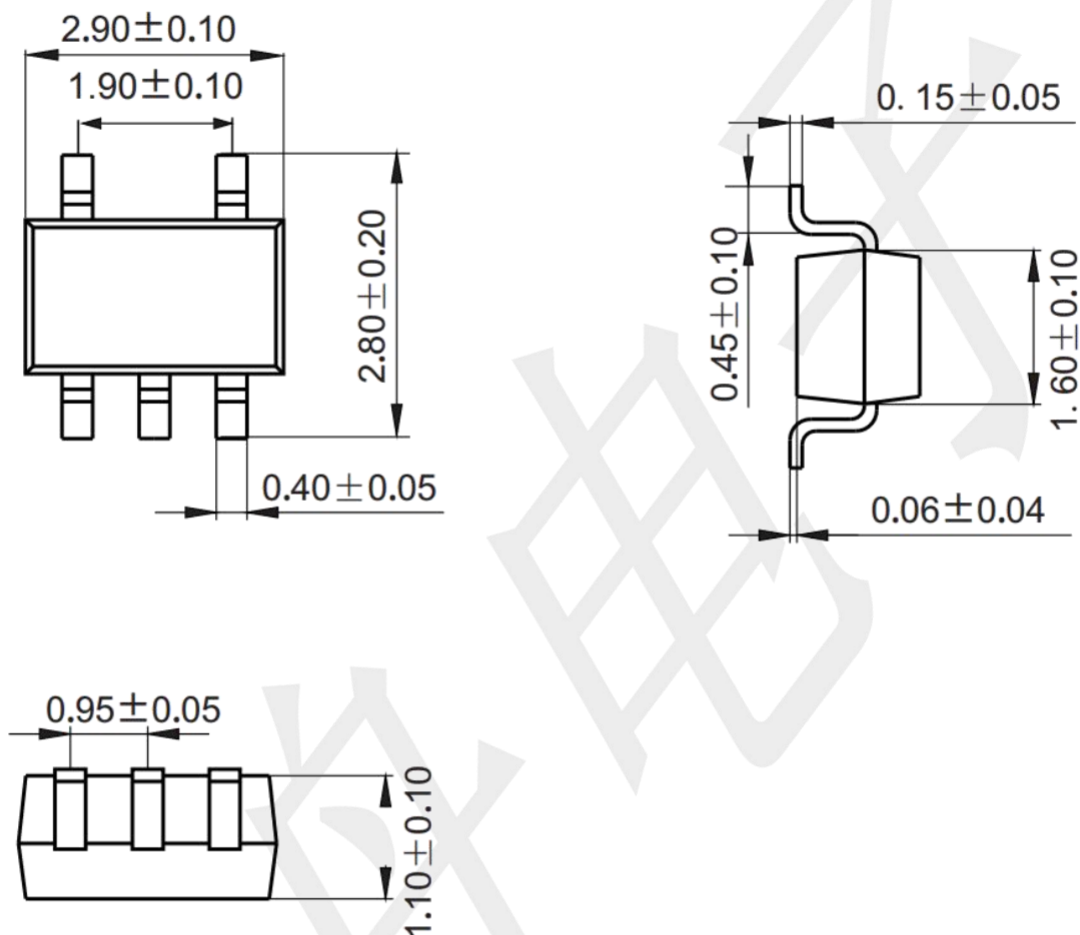
## PROPAGATION DELAY TIMES

Notes:

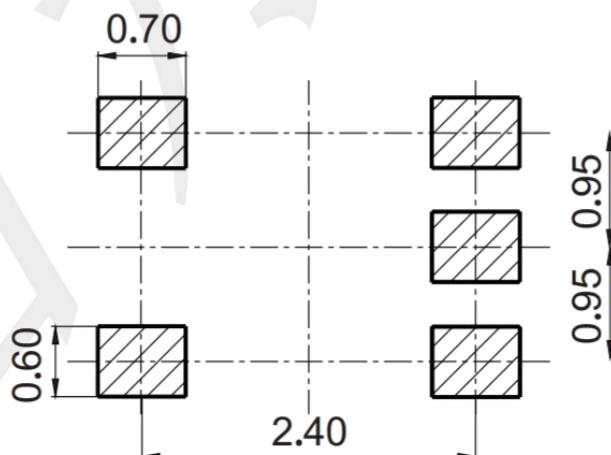
1.  $C_L$  includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10\text{MHz}$ ,  $Z_O = 50\Omega$ .

**Package information (Unit: mm)**

**SOT23-5**

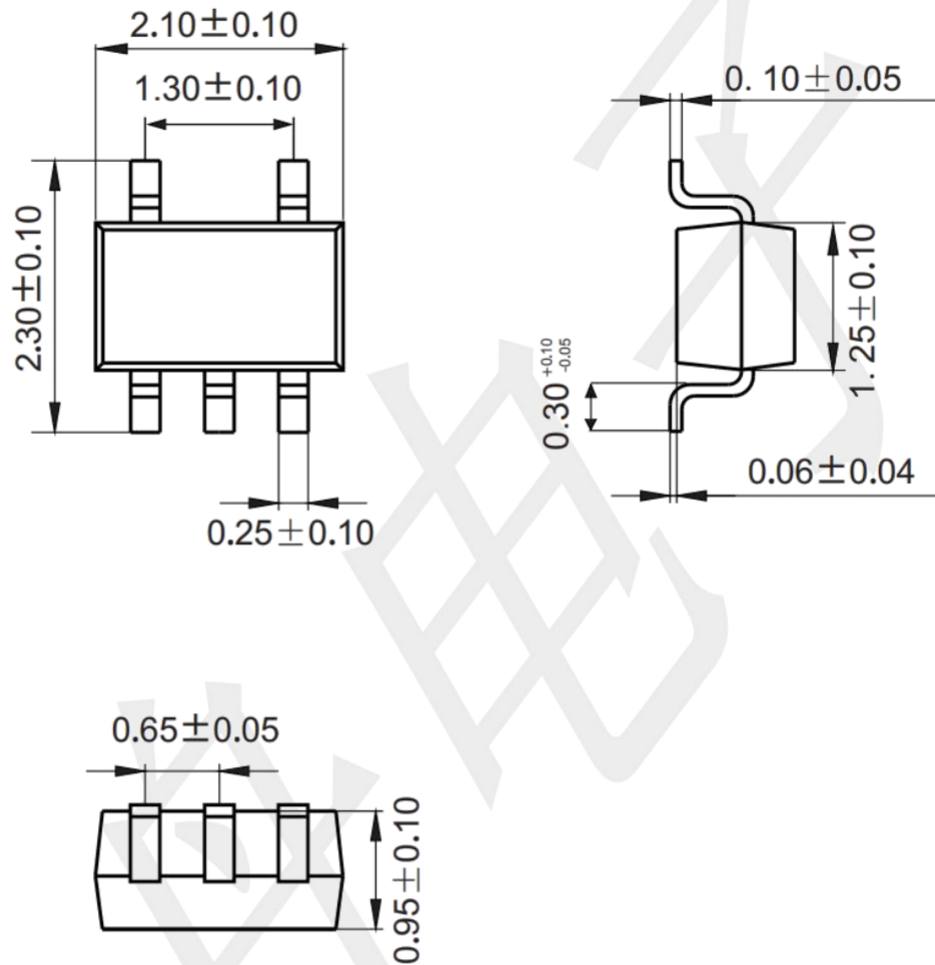


**Mounting Pad Layout (unit: mm)**

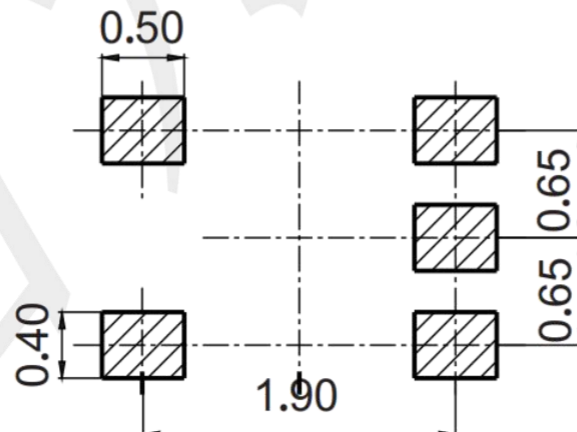


**Package information (Unit: mm)**

**SOT353**

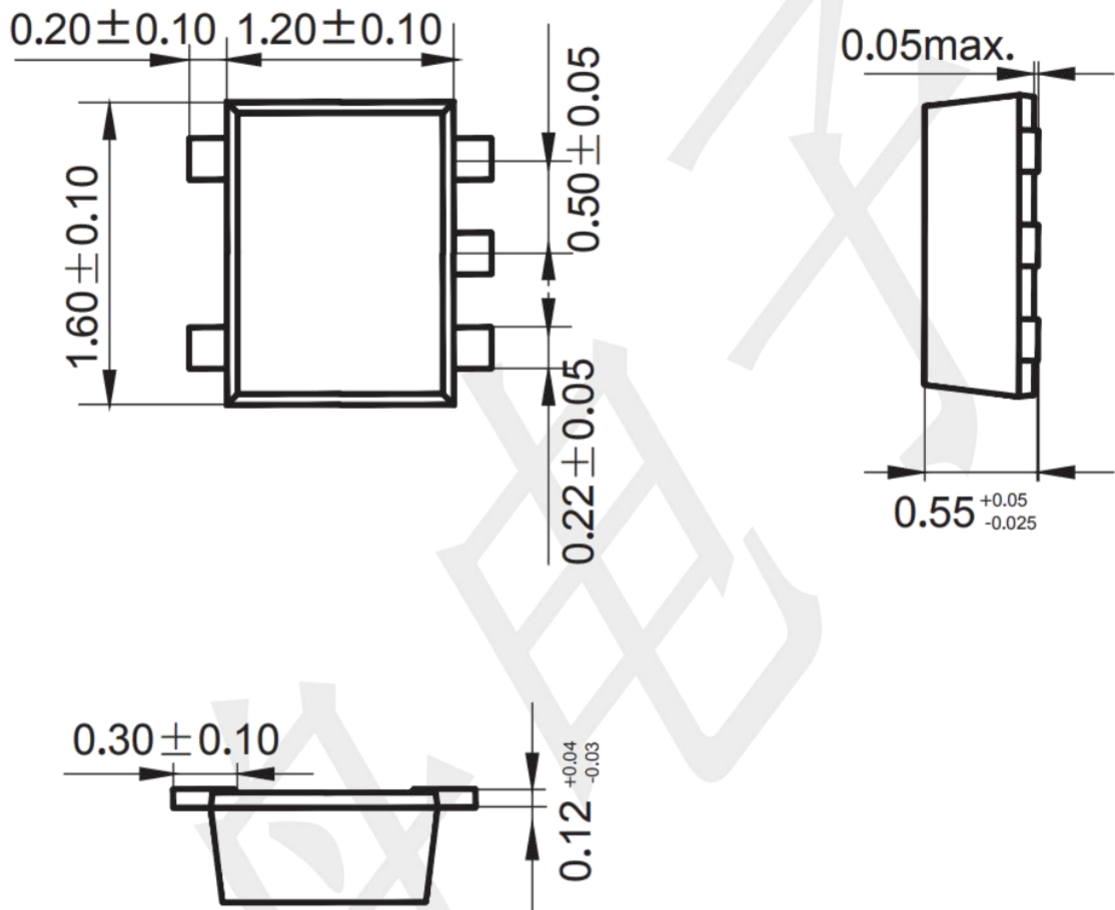


**Mounting Pad Layout (unit: mm)**

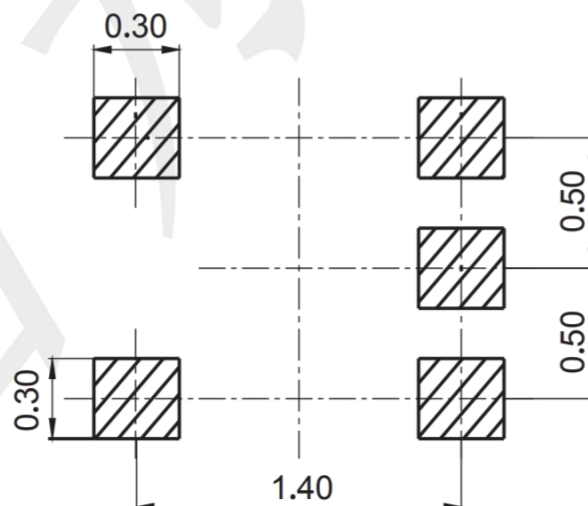


**Package information (unit: mm)**

SOT553

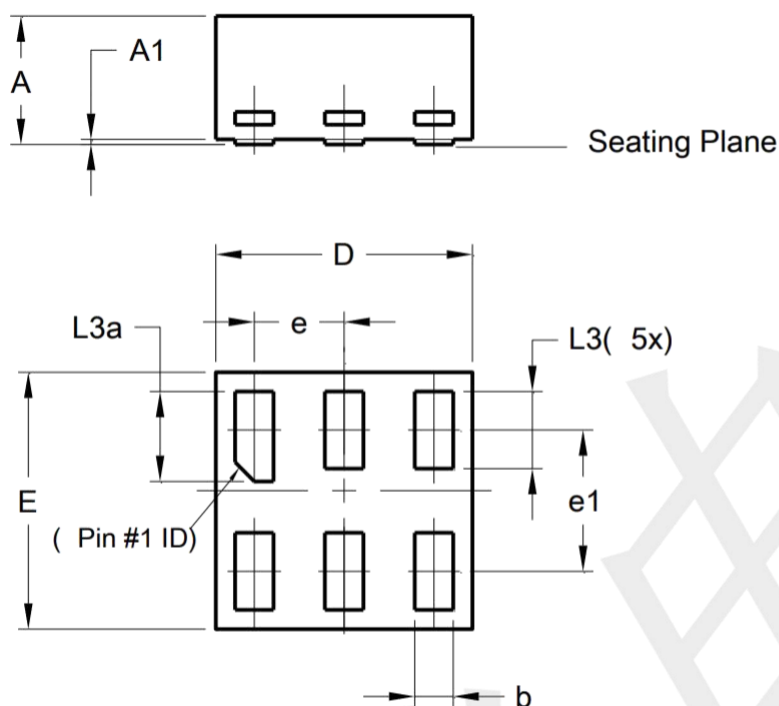


**Mounting Pad Layout (unit: mm)**



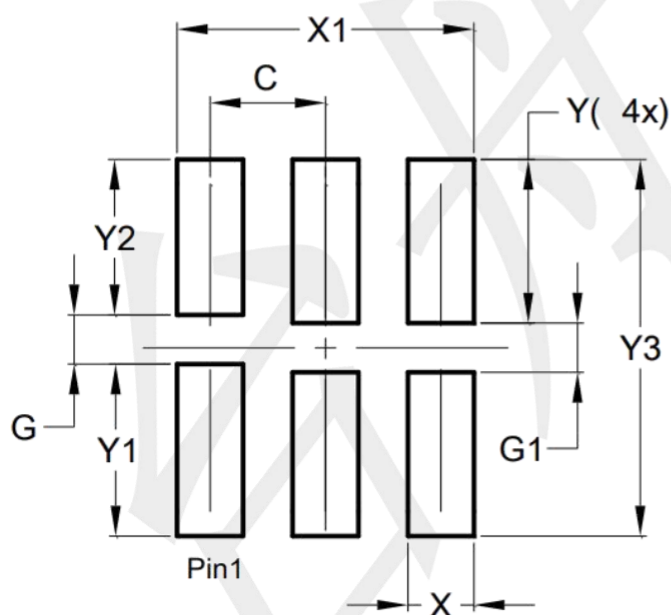
**Package information (unit: mm)**

**DFN1X1-6**



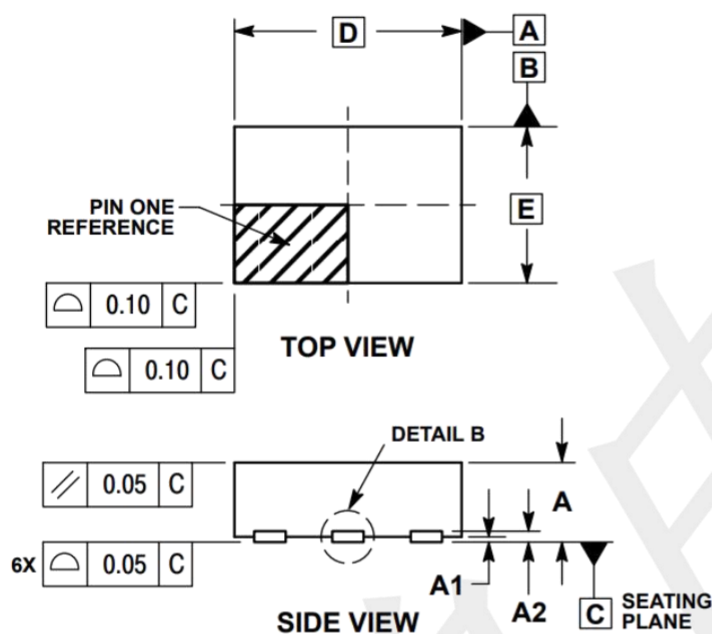
| <b>DFN1010-6<br/>(Type B)</b> |            |            |            |
|-------------------------------|------------|------------|------------|
| <b>Dim</b>                    | <b>Min</b> | <b>Max</b> | <b>Typ</b> |
| <b>A</b>                      | -          | 0.50       | 0.39       |
| <b>A1</b>                     | -          | 0.04       | -          |
| <b>b</b>                      | 0.12       | 0.20       | 0.15       |
| <b>D</b>                      | 0.95       | 1.050      | 1.00       |
| <b>E</b>                      | 0.95       | 1.050      | 1.00       |
| <b>e</b>                      | 0.35 BSC   |            |            |
| <b>e1</b>                     | 0.55 BSC   |            |            |
| <b>L3</b>                     | 0.27       | 0.30       | 0.30       |
| <b>L3a</b>                    | 0.32       | 0.40       | 0.35       |
| <b>All Dimensions in mm</b>   |            |            |            |

**Mounting Pad Layout (unit: mm)**



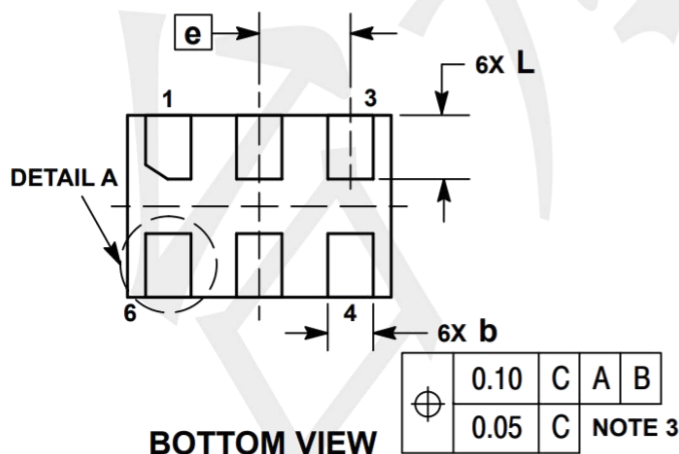
| <b>Dimensions</b> | <b>Value<br/>(in mm)</b> |
|-------------------|--------------------------|
| <b>C</b>          | 0.350                    |
| <b>G</b>          | 0.150                    |
| <b>G1</b>         | 0.150                    |
| <b>X</b>          | 0.200                    |
| <b>X1</b>         | 0.900                    |
| <b>Y</b>          | 0.500                    |
| <b>Y1</b>         | 0.525                    |
| <b>Y2</b>         | 0.475                    |
| <b>Y3</b>         | 1.150                    |

### Package information (unit: mm)

**DFN1510-6**

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.45        | 0.55 |
| A1  | 0.00        | 0.05 |
| A2  | 0.07 REF    |      |
| b   | 0.20        | 0.30 |
| D   | 1.45 BSC    |      |
| E   | 1.00 BSC    |      |
| e   | 0.50 BSC    |      |
| L   | 0.30        | 0.40 |
| L1  | ---         | 0.15 |

### Mounting Pad Layout (unit: mm)



## MOUNTING FOOTPRINT

