

### Features

- Operate from 1.65V to 5.5V
- Inputs accept voltages to 5.5V
- IOFF supports partial-power-down mode
- Low power dissipation
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 1000-V Charged-Device Model (C101)

### General Description

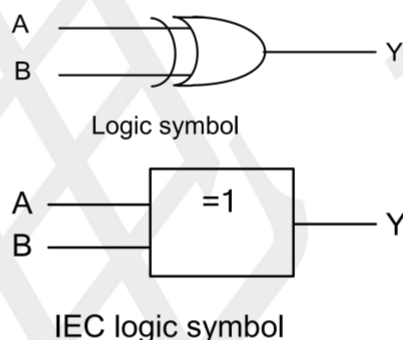
The is a single 2-input EXCLUSIVE-OR gate which provides the Function  $Y = A \oplus B$  or  $Y = \bar{A}B + A\bar{B}$  in positive logic. Inputs can be driven from either 3.3V or 5V devices. These features allow the use of these devices in a mixed 3.3V and 5V environment.

This device is fully specified for partial Power-down applications using IOFF. The IOFF circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

### 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

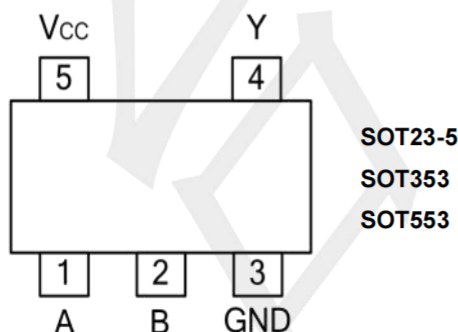
### Logic Diagram



| ORDER NUMBER  | PACKAGE DESCRIPTION | PACKAGE OPTION     | Marking |
|---------------|---------------------|--------------------|---------|
| TP74LVC1G86S5 | SOT23-5             | Tape and Reel,3000 | S186    |
| TP74LVC1G86C5 | SOT353              | Tape and Reel,3000 | C186    |
| TP74LVC1G86X5 | SOT553              | Tape and Reel,4000 | CH7     |

### Ordering Information

### Pin Configuratio



### Function Table

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

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

### Absolute Maximum Ratings

| PARAMETER                 | SYMBOL        | CONDITIONS                      | RATINGS        | UNIT |
|---------------------------|---------------|---------------------------------|----------------|------|
| Supply Voltage            | VCC           |                                 | -0.5 ~ +6.5    | V    |
| Input Voltage             | VIN           |                                 | -0.5 ~ +6.5    | V    |
| Output Voltage            | VOUT          | Output in the Power-off state   | -0.5 ~ +6.5    | V    |
|                           |               | Output in the High or Low state | -0.5 ~ VCC+0.5 | V    |
| VCC or GND Current        | ICC           | Output in the Power-off state   | ±100           | mA   |
| Continuous Output Current | IOUT          | VOUT=0~VCC                      | ±50            | mA   |
| Input Clamp Current       | IIK           | VIN<0                           | -50            | mA   |
| Output Clamp Current      | IOK           | VOUT<0                          | -50            | mA   |
| Storage Temperature Range | TSTG          |                                 | -65 ~ +150     | °C   |
| Junction to Ambient       | $\theta_{JA}$ | SOT-23-5                        | 230            | °C/W |
|                           |               | SOT353                          | 280            | °C/W |
|                           |               | SOT553                          | 250            | °C/W |
|                           |               | DFN1510-6                       | 440            | °C/W |
|                           |               | DFN0808-4                       | 340            | °C/W |

### Recommended Operating Conditions

| PARAMETER                          | SYMBOL              | TEST CONDITIONS           | MIN  | TYP | MAX | UNIT |
|------------------------------------|---------------------|---------------------------|------|-----|-----|------|
| Supply Voltage                     | VCC                 | Operating                 | 1.65 | --  | 5.5 | V    |
|                                    |                     | Data retention only       | 1.5  | --  | --  | V    |
| Input Voltage                      | VIN                 |                           | 0    | --  | 5.5 | V    |
| Output Voltage                     | VOUT                | High or low state         | 0    | --  | VCC | V    |
| Input Transition Rise or Fall rate | $\Delta t/\Delta v$ | VCC=1.8V±0.15V, 2.5V±0.2V | --   | --  | 20  | ns/V |
|                                    |                     | VCC=3.3V±0.3V             | --   | --  | 10  | ns/V |
|                                    |                     | VCC=5V±0.5V               | --   | --  | 5   | ns/V |
| High-level Output Current          | IOH                 | VCC=1.65V                 | --   | --  | -4  | mA   |
|                                    |                     | VCC=2.3V                  | --   | --  | -8  | mA   |
|                                    |                     | VCC=2.7V                  | --   | --  | -16 | mA   |
|                                    |                     | VCC=3V                    | --   | --  | -24 | mA   |
|                                    |                     | VCC=4.5V                  | --   | --  | -32 | mA   |
| Low-level Output Current           | IOL                 | VCC=1.65V                 | --   | --  | 4   | mA   |
|                                    |                     | VCC=2.3V                  | --   | --  | 8   | mA   |
|                                    |                     | VCC=2.7V                  | --   | --  | 16  | mA   |
|                                    |                     | VCC=3V                    | --   | --  | 24  | mA   |
|                                    |                     | VCC=4.5V                  | --   | --  | 32  | mA   |
| Operating Temperature              | TA                  |                           | -40  | --  | 125 | °C   |

# TP74LVC1G86 Series

## SINGLE 2-INPUT EXCLUSIVE-OR GATE

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### Electrical Characteristics (TA =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> =1.65V ~ 1.95V                                                                        | 0.65×V <sub>CC</sub> | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V ~ 2.7V                                                                          | 1.7                  | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =3V ~ 3.6V                                                                            | 2                    | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =4.5V ~ 5.5V                                                                          | 0.7×V <sub>CC</sub>  | --  | --                   | V    |
| Low-Level Input Voltage                           | V <sub>IL</sub>      | V <sub>CC</sub> =1.65V ~ 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                                                                            | --                   | --  | 0.8                  | V    |
|                                                   |                      | V <sub>CC</sub> =4.5V ~ 5.5V                                                                          | --                   | --  | 0.3×V <sub>CC</sub>  | V    |
| High-Level Output Voltage                         | V <sub>OH</sub>      | V <sub>CC</sub> =1.65 ~ 5.5V, I <sub>OH</sub> =-100μA                                                 | V <sub>CC</sub> -0.1 | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =1.65V, I <sub>OH</sub> =-4mA                                                         | 1.2                  | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V, I <sub>OH</sub> =-8mA                                                          | 1.9                  | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =3.0V, I <sub>OH</sub> =-16mA                                                         | 2.4                  | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =3.0V, I <sub>OH</sub> =-24mA                                                         | 2.3                  | --  | --                   | V    |
|                                                   |                      | V <sub>CC</sub> =4.5V, I <sub>OH</sub> =-32mA                                                         | 3.8                  | --  | --                   | V    |
| Low-Level Output Voltage                          | V <sub>OL</sub>      | V <sub>CC</sub> =1.65 ~ 5.5V, I <sub>OL</sub> =100μA                                                  | --                   | --  | 0.1                  | V    |
|                                                   |                      | V <sub>CC</sub> =1.65V, I <sub>OL</sub> =4mA                                                          | --                   | --  | 0.45                 | V    |
|                                                   |                      | V <sub>CC</sub> =2.3V, I <sub>OL</sub> =8mA                                                           | --                   | --  | 0.3                  | V    |
|                                                   |                      | V <sub>CC</sub> =3.0V, I <sub>OL</sub> =16mA                                                          | --                   | --  | 0.4                  | V    |
|                                                   |                      | V <sub>CC</sub> =3.0V, I <sub>OL</sub> =24mA                                                          | --                   | --  | 0.55                 | V    |
|                                                   |                      | V <sub>CC</sub> =4.5V, I <sub>OL</sub> =32mA                                                          | --                   | --  | 0.55                 | V    |
| Input Leakage Current                             | I <sub>I(LEAK)</sub> | V <sub>CC</sub> =0 ~ 5.5V, V <sub>IN</sub> =5.5V or GND                                               | --                   | --  | ±5                   | uA   |
| Power OFF Leakage Current                         | I <sub>OFF</sub>     | V <sub>CC</sub> =0V, V <sub>IN</sub> or V <sub>OUT</sub> =5.5V                                        | --                   | --  | ±10                  | uA   |
| Quiescent Supply Current                          | I <sub>Q</sub>       | V <sub>CC</sub> =1.65 ~ 5.5V, V <sub>IN</sub> =V <sub>CC</sub> or GND, I <sub>OUT</sub> =0A           | --                   | --  | 10                   | uA   |
| Additional Quiescent Supply Current Per Input Pin | ΔI <sub>Q</sub>      | V <sub>CC</sub> =3 ~ 5.5V, One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND | --                   | --  | 500                  | uA   |
| Input Capacitance                                 | C <sub>I</sub>       | V <sub>CC</sub> =3.3V, V <sub>IN</sub> =V <sub>CC</sub> or GND                                        | --                   | 6   | --                   | pF   |

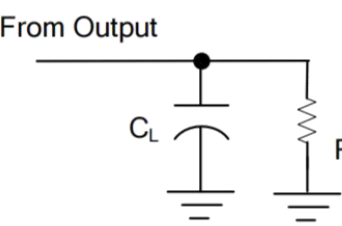
### OPERATING CHARACTERISTICS (f=10MHz, TA =25°C , unless otherwise specified)

| PARAMETER                     | SYMBOL          | TEST Conditions       | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------------|-----------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | C <sub>PD</sub> | V <sub>CC</sub> =1.8V | --  | 22  | --  | pF   |
|                               |                 | V <sub>CC</sub> =2.5V | --  | 22  | --  | pF   |
|                               |                 | V <sub>CC</sub> =3.3V | --  | 22  | --  | pF   |
|                               |                 | V <sub>CC</sub> =5.0V | --  | 24  | --  | pF   |

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

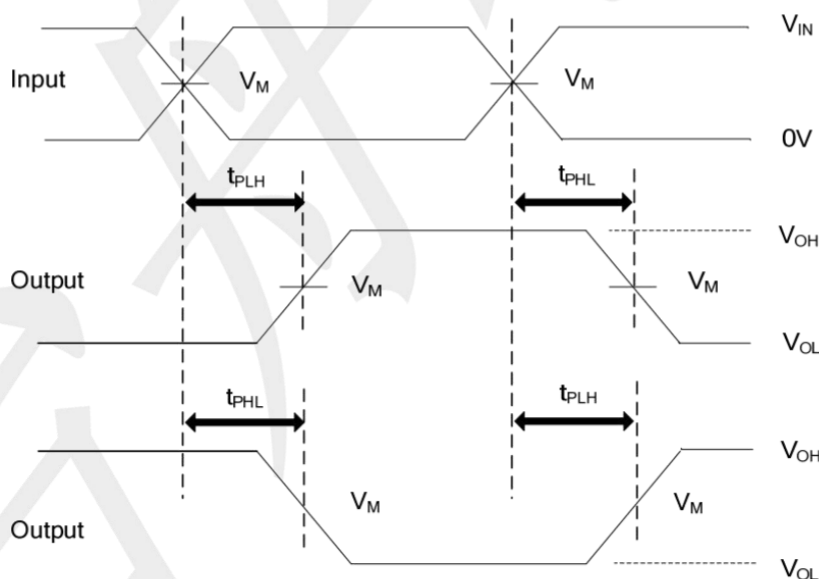
| PARAMETER                                          | SYMBOL                              | TEST Conditions    |                                    | MIN | TYP | MAX | UNIT |
|----------------------------------------------------|-------------------------------------|--------------------|------------------------------------|-----|-----|-----|------|
| Propagation delay from input (A or B) to output(Y) | t <sub>PLH</sub> / t <sub>PHL</sub> | CL=15pF<br>RL=1MΩ  | V <sub>CC</sub> =1.8±0.15V         | 2.1 | --  | 9.1 | nS   |
|                                                    |                                     |                    | V <sub>CC</sub> =2.5±0.2V          | 1   | --  | 4.5 | nS   |
|                                                    |                                     |                    | V <sub>CC</sub> =3.3±0.3V          | 0.6 | --  | 4   | nS   |
|                                                    |                                     |                    | V <sub>CC</sub> =5±0.5V            | 0.8 | --  | 3.3 | nS   |
|                                                    | t <sub>PLH</sub> / t <sub>PHL</sub> | CL=30pF            | V <sub>CC</sub> =1.8±0.15V, RL=1KΩ | 3.5 | --  | 9.9 | nS   |
|                                                    |                                     |                    | V <sub>CC</sub> =2.5±0.2V, RL=500Ω | 1.8 | --  | 5.5 | nS   |
|                                                    |                                     | CL=50pF<br>RL=500Ω | V <sub>CC</sub> =3.3±0.3V          | 1.3 | --  | 5   | nS   |
|                                                    |                                     |                    | V <sub>CC</sub> =5±0.5V            | 1   | --  | 4   | nS   |

### TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT

| V <sub>CC</sub> | Inputs          |                                 | V <sub>M</sub>     | C <sub>L</sub> | R <sub>L</sub> |
|-----------------|-----------------|---------------------------------|--------------------|----------------|----------------|
|                 | V <sub>IN</sub> | t <sub>R</sub> , t <sub>F</sub> |                    |                |                |
| 1.8V±0.15V      | V <sub>CC</sub> | ≤2ns                            | V <sub>CC</sub> /2 | 15pF           | 1MΩ            |
| 2.5V±0.2V       | V <sub>CC</sub> | ≤2ns                            | V <sub>CC</sub> /2 | 30pF           | 1KΩ            |
| 3.3V±0.3V       | 3V              | ≤2.5ns                          | 1.5V               | 15pF           | 1MΩ            |
|                 |                 |                                 |                    | 30pF           | 500Ω           |
|                 |                 |                                 |                    | 50pF           | 500Ω           |
| 5V±0.5V         | V <sub>CC</sub> | ≤2.5ns                          | V <sub>CC</sub> /2 | 15pF           | 1MΩ            |
|                 |                 |                                 |                    | 50pF           | 500Ω           |



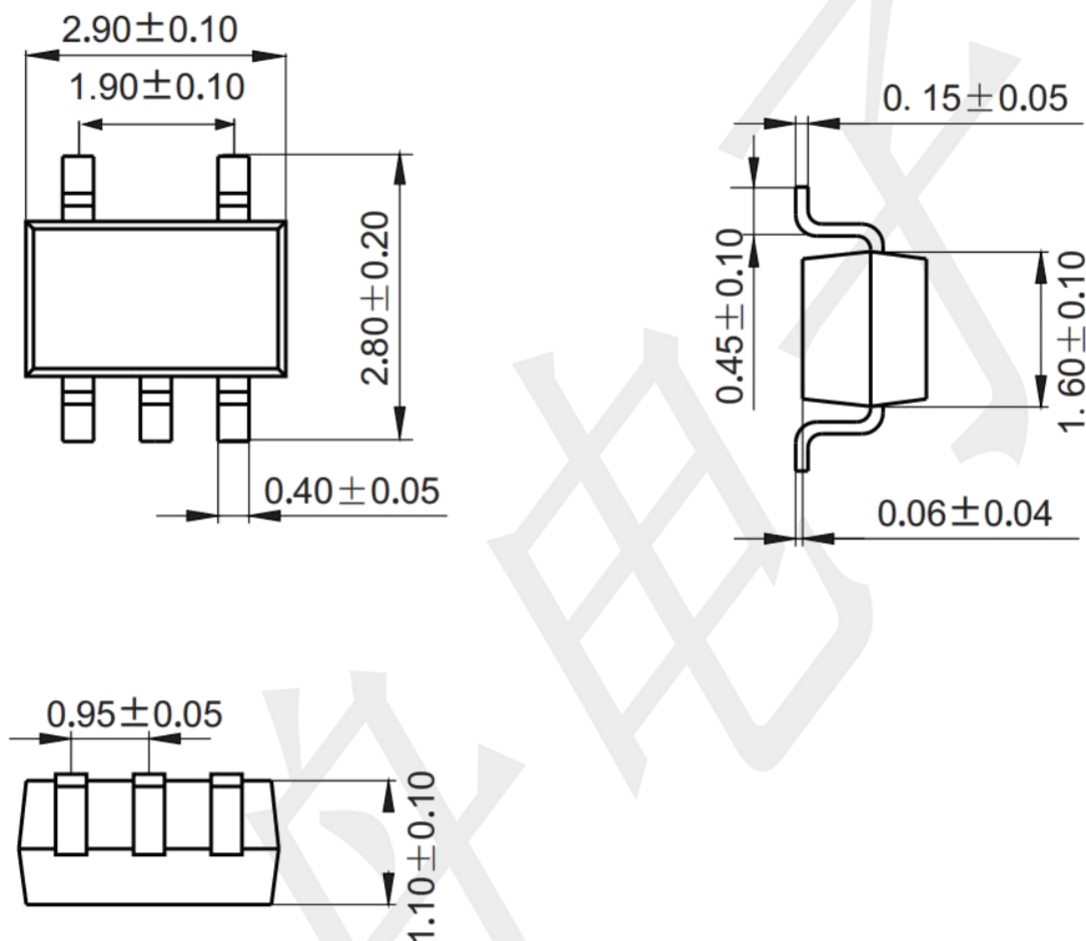
PROPAGATION DELAY TIMES

Note: CL includes probe and jig capacitance.

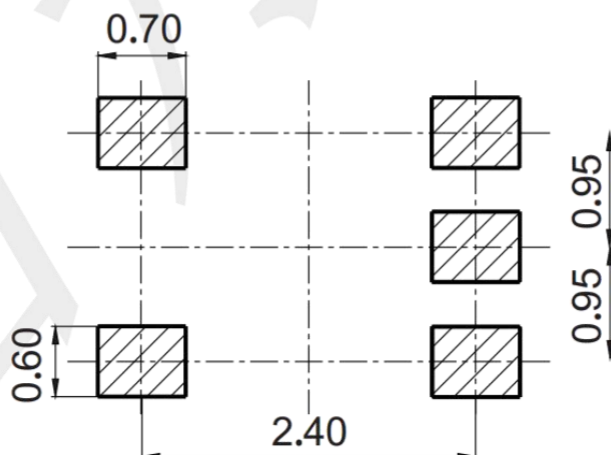
All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Z<sub>O</sub> = 50Ω.

## Package informantion

SOT23-5 (Unit: mm)

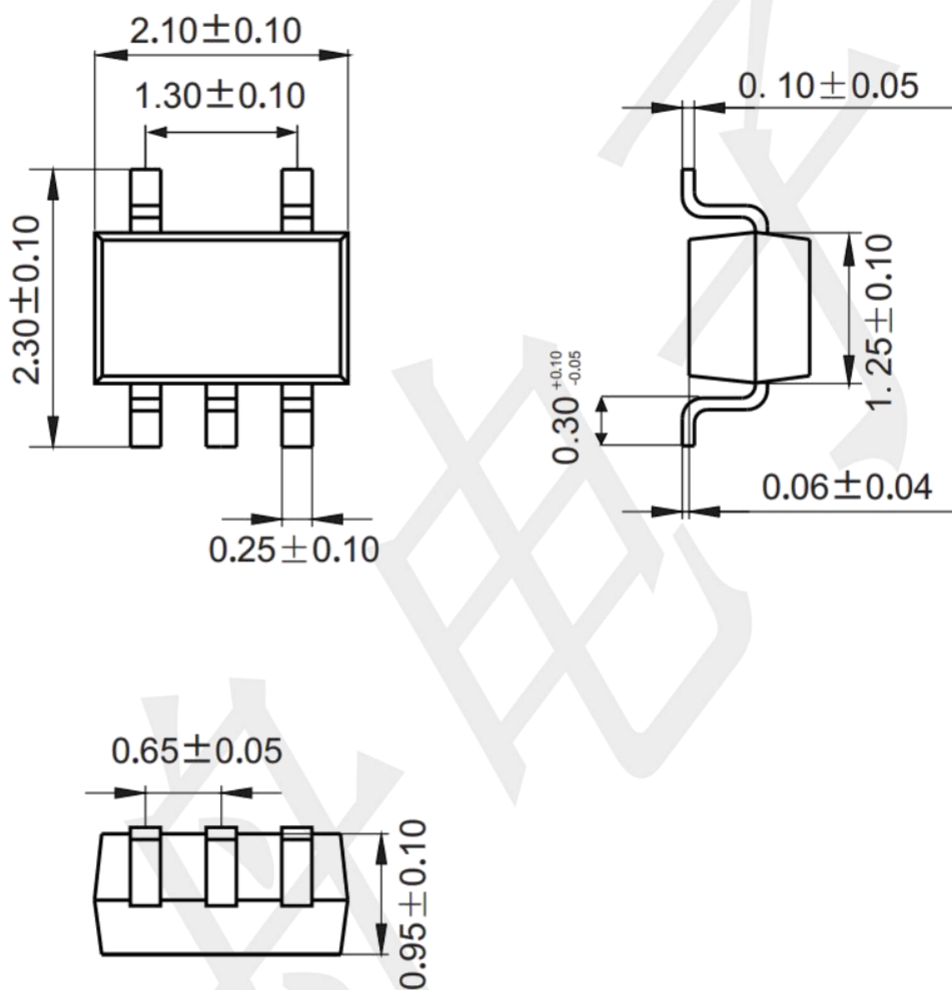


## Mounting Pad Layout (Unit: mm)

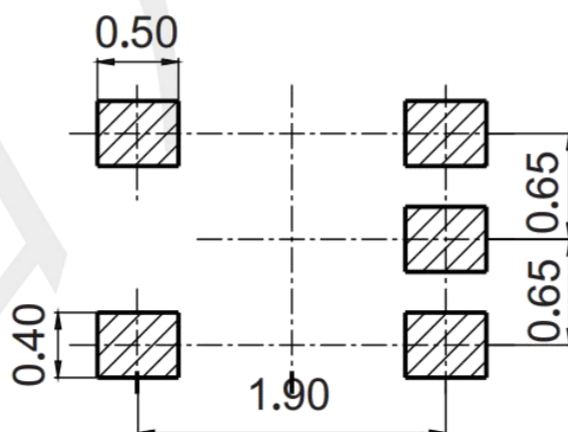


## Package information

SOT353 (Unit: mm)

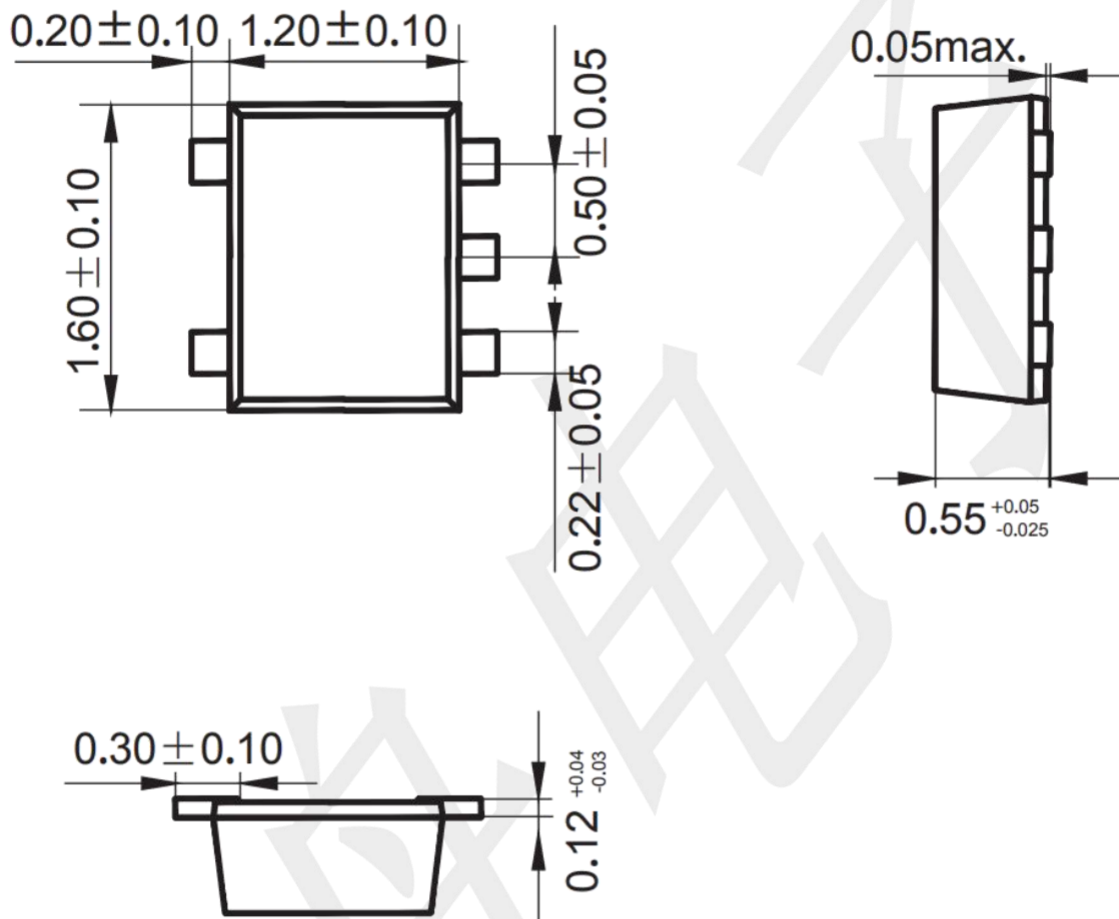


## Mounting Pad Layout (Unit: mm)



## Package informantion

SOT553 (Unit: mm)



## Mounting Pad Layout (Unit: mm)

