

### Features

- Operation Voltage Range: 1.65~5.5V
- Inputs Accept Voltages to 5.5V
- Max tPD of 0.8 ns at 3.3V
- High Degree of Linearity
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

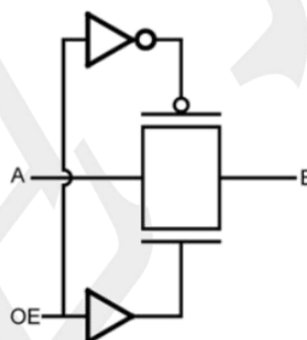
### General Description

The NC7SZ66 is a ultra high-speed (UHS) CMOS compatible single-pole/single-throw (SPST) bus switch. The LOW on resistance of the switch allows inputs to be connected to outputs with minimal propagation delay and without generating additional ground bounce noise. The device is organized as a 1-bit switch with a switch enable (OE) signal. When OE is HIGH, the switch is on and port A is connected to port B. When OE is LOW, the switch is open and a high-impedance state exists between the two ports..

### Applications

- Wireless Devices
- Audio and Video Signal Routing
- Portable Computing
- Wearable Devices
- Signal Gating, Chopping, Modulation or Demodulation (Modem)
- Signal Multiplexing for Analog-to-Digital and Digital-to-Analog Conversion Systems

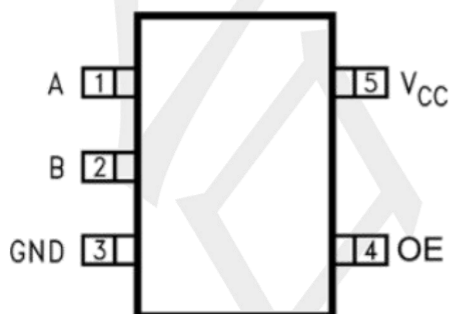
### Logic Diagram



### Ordering Information

| ORDER NUMBER  | PACKAGE DESCRIPTION | PACKAGE OPTION     | Marking |
|---------------|---------------------|--------------------|---------|
| NC7SZ66M5X-TP | SOT23-5             | Tape and Reel,3000 | 7Z66D   |
| NC7SZ66P5X-TP | SOT353              | Tape and Reel,3000 | Z66C    |

### Pin Configuratio



**SOT23-5**  
**SOT353**

### Function Table(each gate)

| QE | B0           | Function     |
|----|--------------|--------------|
| L  | High Z-State | Disconnected |
| H  | A0           | Connect      |

### Absolute Maximum Ratings

( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                                                  | SYMBOL    | RATINGS             | UNIT               |
|------------------------------------------------------------|-----------|---------------------|--------------------|
| Supply Voltage(Note2)                                      | $V_{CC}$  | -0.5 ~ 6.5          | V                  |
| Input Voltage                                              | $V_{IN}$  | -0.5 ~ 6.5          | V                  |
| Switch I/O Voltage Range                                   | $V_{I/O}$ | -0.5 ~ $V_{CC}+0.5$ | V                  |
| Control Input Clamp Current( $V_{IN}<0$ )                  | $I_{IK}$  | -50                 | mA                 |
| I/O Port Diode Current ( $V_{I/O}<0$ or $V_{I/O}>V_{CC}$ ) | $I_{IOK}$ | $\pm 50$            | mA                 |
| On-state Switch Current ( $V_{I/O} : 0$ to $V_{CC}$ )      | $I_T$     | $\pm 50$            | mA                 |
| $V_{CC}$ or GND Current                                    | $I_{CC}$  | $\pm 100$           | mA                 |
| Storage Temperature                                        | $T_{STG}$ | -65 ~ +150          | $^{\circ}\text{C}$ |

Notes: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. 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

( $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                       | SYMBOL      | TEST CONDITIONS                        | MIN  | TYP | MAX      | UNIT               |
|---------------------------------|-------------|----------------------------------------|------|-----|----------|--------------------|
| Supply Voltage                  | $V_{CC}$    |                                        | 1.65 | --  | 5.5      | V                  |
| Input Voltage                   | $V_{IN}$    |                                        | 0    | --  | 5.5      | V                  |
| I/O Port Voltage                | $V_{I/O}$   |                                        | 0    | --  | $V_{CC}$ | V                  |
| Input Transition Rise/Fall Time | $t_R / t_F$ | $V_{CC}=1.65\text{V}\sim 1.95\text{V}$ | --   | --  | 20       | ns                 |
|                                 |             | $V_{CC}=2.3\text{V}\sim 2.7\text{V}$   | --   | --  | 20       | ns                 |
|                                 |             | $V_{CC}=3\text{V}\sim 3.6\text{V}$     | --   | --  | 10       | ns                 |
|                                 |             | $V_{CC}=4.5\text{V}\sim 5.5\text{V}$   | --   | --  | 10       | ns                 |
| Operating Temperature           | $T_A$       |                                        | -40  | --  | +125     | $^{\circ}\text{C}$ |

### STATIC CHARACTERISTICS (Unless otherwise specified)

| PARAMETER                           | SYMBOL                | TEST CONDITIONS                                                                                                                                                                      | T <sub>A</sub> =25°C                           |     |                          | T <sub>A</sub> =-40°C~+125°C |     |                          | UNIT     |
|-------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----|--------------------------|------------------------------|-----|--------------------------|----------|
|                                     |                       |                                                                                                                                                                                      | MIN                                            | TYP | MAX                      | MIN                          | TYP | MAX                      |          |
| High-level Input Voltage            | V <sub>IH</sub>       | V <sub>CC</sub> =1.65V~1.95V                                                                                                                                                         | 0.65×<br>V <sub>CC</sub>                       | --  | --                       | 0.65×<br>V <sub>CC</sub>     | --  | --                       | V        |
|                                     |                       | V <sub>CC</sub> =2.3V~2.7V                                                                                                                                                           | 1.7                                            | --  | --                       | 1.7                          | --  | --                       | V        |
|                                     |                       | V <sub>CC</sub> =3V~3.6V                                                                                                                                                             | 2                                              | --  | --                       | 2                            | --  | --                       | V        |
|                                     |                       | V <sub>CC</sub> =4.5V~5.5V                                                                                                                                                           | 0.7×<br>V <sub>CC</sub>                        | --  | --                       | 0.7×<br>V <sub>CC</sub>      | --  | --                       | V        |
| Low-level Input Voltage             | V <sub>IL</sub>       | V <sub>CC</sub> =1.65V~1.95V                                                                                                                                                         | --                                             | --  | 0.35×<br>V <sub>CC</sub> | --                           | --  | 0.35×<br>V <sub>CC</sub> | V        |
|                                     |                       | V <sub>CC</sub> =2.3V~2.7V                                                                                                                                                           | --                                             | --  | 0.7                      | --                           | --  | 0.7                      | V        |
|                                     |                       | V <sub>CC</sub> =3V~3.6V                                                                                                                                                             | --                                             | --  | 0.8                      | --                           | --  | 0.8                      | V        |
|                                     |                       | V <sub>CC</sub> =4.5V~5.5V                                                                                                                                                           | --                                             | --  | 0.3×<br>V <sub>CC</sub>  | --                           | --  | 0.3×<br>V <sub>CC</sub>  | V        |
| ON-Resistance (Rail)                | R <sub>ON(rail)</sub> | V <sub>I</sub> =GND or<br>V <sub>CC</sub>                                                                                                                                            | V <sub>CC</sub> =1.65V,<br>I <sub>S</sub> =4mA | --  | 12                       | 30                           | --  | --                       | 45<br>Ω  |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =2.3V,<br>I <sub>S</sub> =8mA  | --  | 9                        | 25                           | --  | --                       | 30<br>Ω  |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =3V,<br>I <sub>S</sub> =24mA   | --  | 7.5                      | 20                           | --  | --                       | 23<br>Ω  |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =4.5V,<br>I <sub>S</sub> =32mA | --  | 5.5                      | 15                           | --  | --                       | 15<br>Ω  |
| ON-Resistance (Peak)                | R <sub>ON(peak)</sub> | V <sub>I</sub> =GND to<br>V <sub>CC</sub>                                                                                                                                            | V <sub>CC</sub> =1.65V,<br>I <sub>S</sub> =4mA | --  | 105                      | 140                          | --  | --                       | 185<br>Ω |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =2.3V,<br>I <sub>S</sub> =8mA  | --  | 30                       | 40                           | --  | --                       | 50<br>Ω  |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =3V,<br>I <sub>S</sub> =24mA   | --  | 11.5                     | 20                           | --  | --                       | 30<br>Ω  |
|                                     |                       |                                                                                                                                                                                      | V <sub>CC</sub> =4.5V,<br>I <sub>S</sub> =32mA | --  | 7.5                      | 15                           | --  | --                       | 23<br>Ω  |
| On-state Switch Leakage Current     | I <sub>S(ON)</sub>    | V <sub>I</sub> = V <sub>CC</sub> or GND, V <sub>C</sub> = V <sub>IH</sub> ,<br>V <sub>O</sub> = Open, V <sub>CC</sub> =5.5V                                                          | --                                             | --  | ±0.1                     | --                           | --  | 2                        | μA       |
| Off-state Switch Leakage Current    | I <sub>S(off)</sub>   | V <sub>I</sub> = V <sub>CC</sub> and V <sub>O</sub> = GND or<br>V <sub>I</sub> = GND and V <sub>O</sub> = V <sub>CC</sub> , V <sub>C</sub> = V <sub>IL</sub> , V <sub>CC</sub> =5.5V | --                                             | --  | ±0.1                     | --                           | --  | 1                        | μA       |
| Control Input Current               | I <sub>I(CTL)</sub>   | V <sub>C</sub> = V <sub>CC</sub> or GND,<br>V <sub>CC</sub> =5.5V                                                                                                                    | --                                             | --  | ±0.1                     | --                           | --  | 1                        | μA       |
| Quiescent Supply Current            | I <sub>CC</sub>       | V <sub>C</sub> = V <sub>CC</sub> or GND,<br>V <sub>CC</sub> =5.5V                                                                                                                    | --                                             | --  | 1                        | --                           | --  | 10                       | μA       |
| Additional Quiescent Supply Current | ΔI <sub>CC</sub>      | V <sub>C</sub> = V <sub>CC</sub> - 0.6V, V <sub>CC</sub> =5.5V                                                                                                                       | --                                             | --  | 500                      | --                           | --  | 500                      | μA       |

### ANALOG SWITCH CHARACTERISTICS

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

| PARAMETER                                                                            | SYMBOL           | TEST CONDITIONS                                                                  |                        | MIN | TYP   | MAX | UNIT |
|--------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------|------------------------|-----|-------|-----|------|
| Frequency Response From Input (A or B) to Output (B or A) (Note 1) (Switch ON)       | f <sub>MAX</sub> | C <sub>L</sub> =50pF, R <sub>L</sub> =600Ω, F <sub>IN</sub> =Wine Wave           | V <sub>CC</sub> =1.65V | --  | 35    | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3   | --  | 120   | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | 175   | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | 195   | --  | MHz  |
|                                                                                      |                  | C <sub>L</sub> =5pF, R <sub>L</sub> =50Ω, F <sub>IN</sub> =Sine Wave             | V <sub>CC</sub> =1.65V | --  | >300  | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | >300  | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | >300  | --  | MHz  |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | >300  | --  | MHz  |
| Crosstalk Voltage From Input (C) to Output (A or B) (Control Input to Signal Output) | V <sub>CT</sub>  | C <sub>L</sub> =50pF, R <sub>L</sub> =600Ω, F <sub>IN</sub> =1MHZ (Square Wave)  | V <sub>CC</sub> =1.65V | --  | 35    | --  | mV   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | 50    | --  | mV   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | 70    | --  | mV   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | 100   | --  | mV   |
| Feedthrough Attenuation From Input (A or B) to Output (B or A) (Note 2) (Switch OFF) | α <sub>iso</sub> | C <sub>L</sub> =50pF, R <sub>L</sub> =600Ω, F <sub>IN</sub> =1MHZ (Square Wave)  | V <sub>CC</sub> =1.65V | --  | -58   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | -58   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | -58   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | -58   | --  | dB   |
|                                                                                      |                  | C <sub>L</sub> =5pF, R <sub>L</sub> =50Ω, F <sub>IN</sub> =1MHZ (Square Wave)    | V <sub>CC</sub> =1.65V | --  | -42   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | -42   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | -42   | --  | dB   |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | -42   | --  | dB   |
| Sine-Wave Distortion From Input (A or B) to Output (B or A)                          | THD              | C <sub>L</sub> =50pF, R <sub>L</sub> =10KΩ, F <sub>IN</sub> =1KHZ (Square Wave)  | V <sub>CC</sub> =1.65V | --  | 0.1   | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | 0.025 | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | 0.015 | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | 0.01  | --  | %    |
|                                                                                      |                  | C <sub>L</sub> =50pF, R <sub>L</sub> =10kΩ, F <sub>IN</sub> =10KHZ (Square Wave) | V <sub>CC</sub> =1.65V | --  | 0.15  | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =2.3V  | --  | 0.025 | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =3V    | --  | 0.015 | --  | %    |
|                                                                                      |                  |                                                                                  | V <sub>CC</sub> =4.5V  | --  | 0.01  | --  | %    |

Notes: 1. Adjust f<sub>IN</sub> voltage to obtain 0 dBm at output. Increase f<sub>IN</sub> frequency until dB meter reads -3dB.

2. Adjust f<sub>IN</sub> voltage to obtain 0 dBm at input.

### DYNAMIC CHARACTERISTICS

(Unless otherwise specified)

| PARAMETER                                                      | SYMBOL                    | TEST CONDITIONS             | T <sub>A</sub> =25°C |     |     | T <sub>A</sub> =-40°C~+125°C |     |      | UNIT |
|----------------------------------------------------------------|---------------------------|-----------------------------|----------------------|-----|-----|------------------------------|-----|------|------|
|                                                                |                           |                             | MIN                  | TYP | MAX | MIN                          | TYP | MAX  |      |
| Propagation Delay<br>From Input (A or B)<br>to Output (B or A) | t <sub>PD</sub> (Note 1)  | V <sub>CC</sub> =1.8V±0.15V | --                   | --  | 3   | --                           | --  | 4    | ns   |
|                                                                |                           | V <sub>CC</sub> =2.5V±0.2V  | --                   | --  | 2.4 | --                           | --  | 3.4  | ns   |
|                                                                |                           | V <sub>CC</sub> =3.3V±0.3V  | --                   | --  | 2.2 | --                           | --  | 3.2  | ns   |
|                                                                |                           | V <sub>CC</sub> =5V±0.5V    | --                   | --  | 2   | --                           | --  | 3    | ns   |
| Enable Time From<br>Input<br>(C) to Output (A or B)            | t <sub>EN</sub> (Note 2)  | V <sub>CC</sub> =1.8V±0.15V | 1.0                  | --  | 12  | --                           | --  | 15.5 | ns   |
|                                                                |                           | V <sub>CC</sub> =2.5V±0.2V  | 1.0                  | --  | 7.5 | --                           | --  | 9.5  | ns   |
|                                                                |                           | V <sub>CC</sub> =3.3V±0.3V  | 1.0                  | --  | 6.5 | --                           | --  | 8    | ns   |
|                                                                |                           | V <sub>CC</sub> =5V±0.5V    | 1.0                  | --  | 5.5 | --                           | --  | 6.5  | ns   |
| Disable Time From<br>Input<br>(C) to Output (A or B)           | t <sub>DIS</sub> (Note 3) | V <sub>CC</sub> =1.8V±0.15V | 1.0                  | --  | 10  | --                           | --  | 13   | ns   |
|                                                                |                           | V <sub>CC</sub> =2.5V±0.2V  | 1.0                  | --  | 6.9 | --                           | --  | 9    | ns   |
|                                                                |                           | V <sub>CC</sub> =3.3V±0.3V  | 1.0                  | --  | 6.5 | --                           | --  | 8.5  | ns   |
|                                                                |                           | V <sub>CC</sub> =5V±0.5V    | 1.0                  | --  | 5   | --                           | --  | 6.5  | ns   |

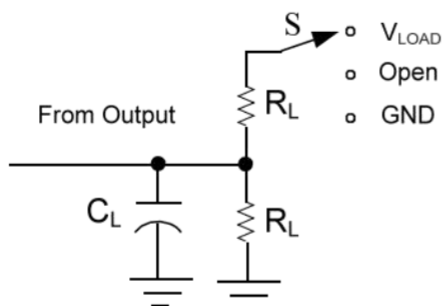
- Notes: 1. t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>PD</sub>.  
 2. t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>EN</sub>.  
 3. t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>DIS</sub>.

### OPERATING CHARACTERISTICS

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

| PARAMETER                                            | SYMBOL           | TEST CONDITIONS                | MIN | TYP | MAX | UNIT |
|------------------------------------------------------|------------------|--------------------------------|-----|-----|-----|------|
| Cic Control input Capacitance                        | C <sub>IC</sub>  | V <sub>CC</sub> =5V            | --  | 2   | --  | pF   |
| C <sub>IO(OFF)</sub> Switch Input/Output Capacitance | C <sub>OFF</sub> | V <sub>CC</sub> =5V            | --  | 6   | --  | pF   |
| C <sub>IO(ON)</sub> Switch Input/Output Capacitance  | C <sub>ON</sub>  | V <sub>CC</sub> =5V            | --  | 13  | --  | pF   |
| Power Dissipation Capacitance                        | C <sub>PD</sub>  | V <sub>CC</sub> =3.3V, f=10MHz | --  | 9   | --  | pF   |

### TEST CIRCUIT AND WAVEFORMS



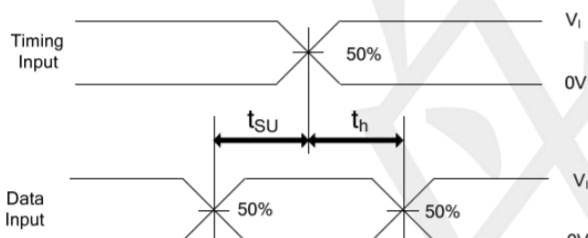
| TEST              | S          |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PHZ}/t_{PZH}$ | GND        |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |

$t_{PD}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .  
 $t_{en}$  is the same as  $t_{PZL}$  and  $t_{PZH}$ .  
 $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

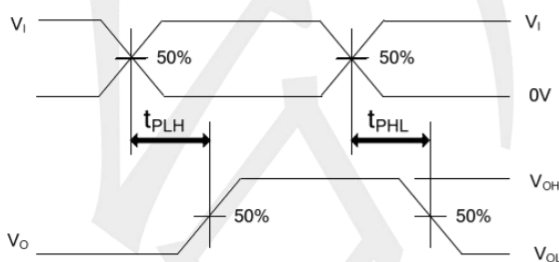
#### TEST CIRCUIT

Note:  $C_L$  includes probe and jig capacitance.

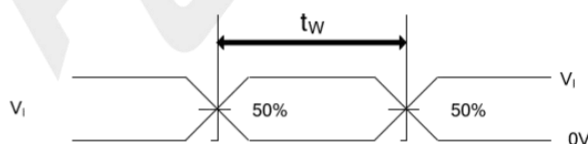
| $V_{CC}$    | $V_I$    | $t_R, t_F$   | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|-------------|----------|--------------|------------|-------------------|-------|--------------|--------------|
| 1.65V~1.95V | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF  | 1k $\Omega$  | 0.15V        |
| 2.3V~2.7V   | $V_{CC}$ | $\leq 2ns$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF  | 500 $\Omega$ | 0.15V        |
| 3.0V~3.6V   | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 50pF  | 500 $\Omega$ | 0.3V         |
| 4.5V~5.5V   | $V_{CC}$ | $\leq 2.5ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 50pF  | 500 $\Omega$ | 0.3V         |



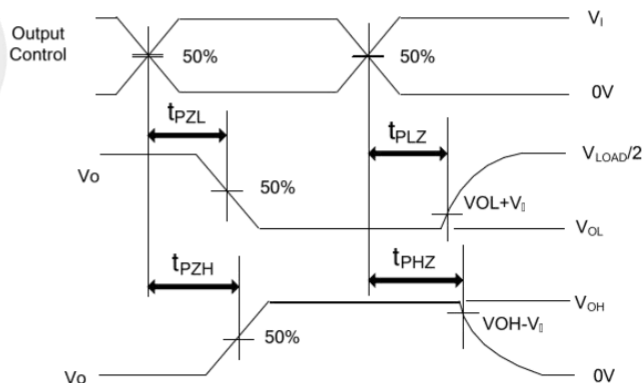
#### SETUP TIME AND HOLD TIME



#### PROPAGATION DELAY TIMES



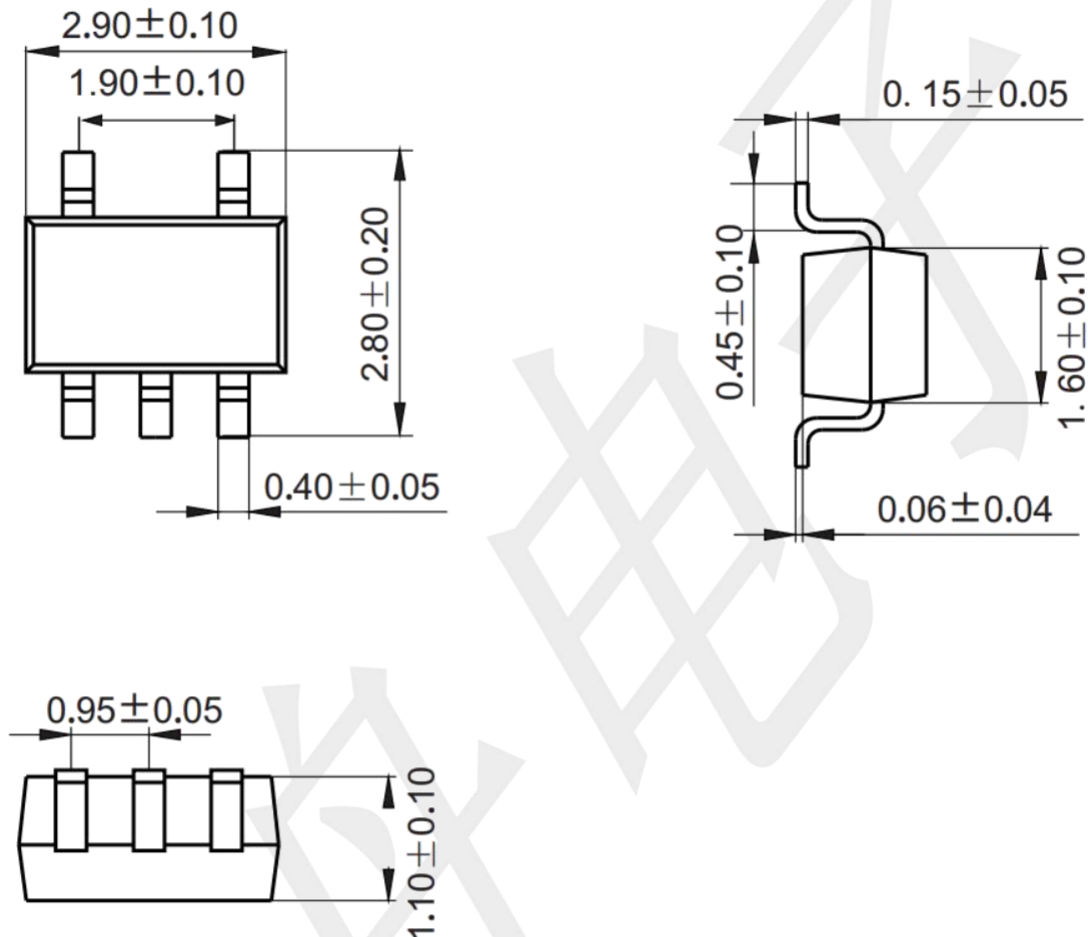
#### PULSE WIDTH



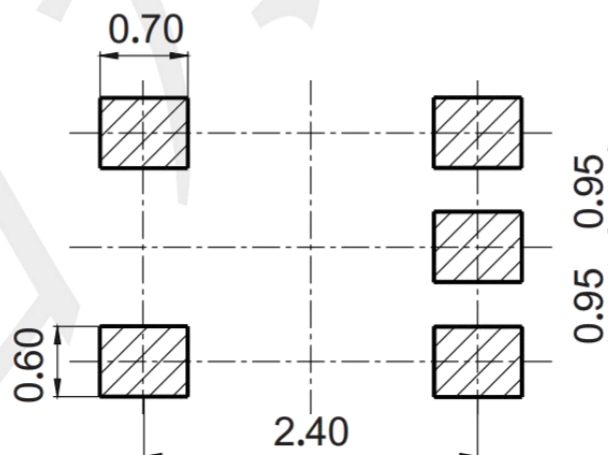
#### ENABLE AND DISABLE TIMES

## Package informantion

SOT23-5 (Unit: mm)

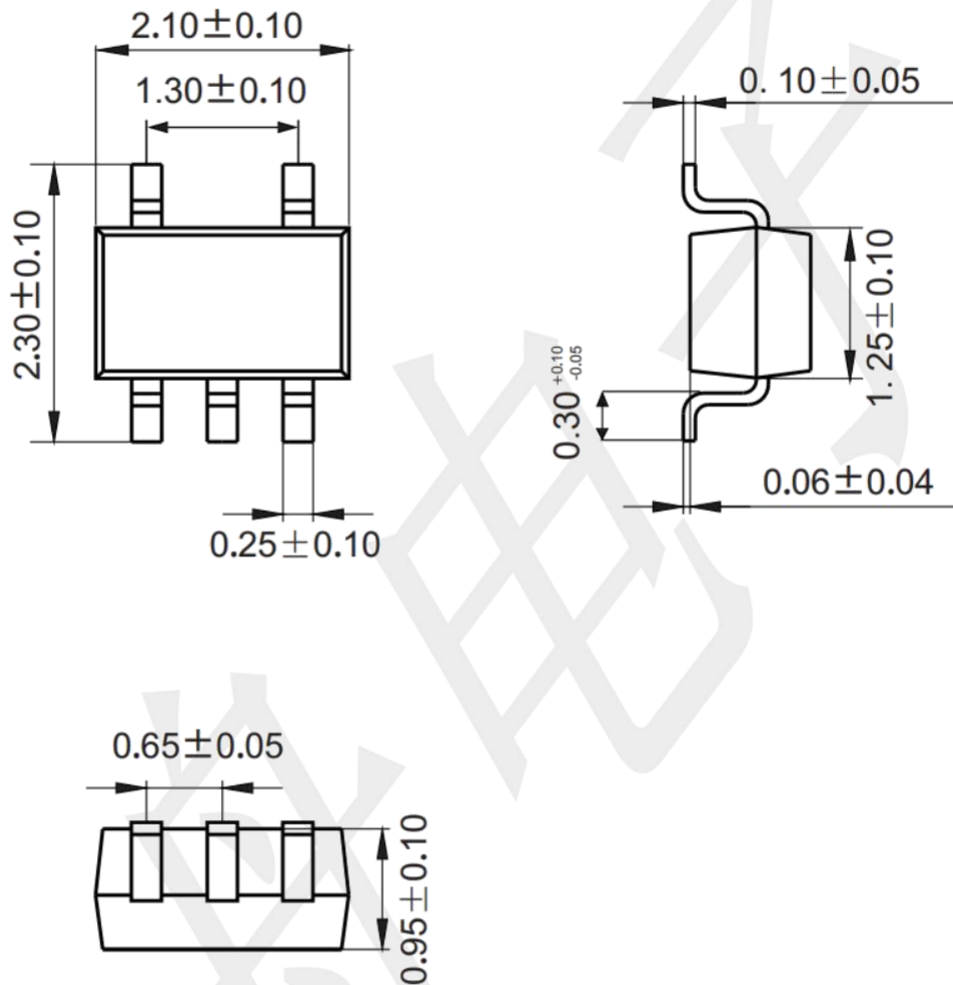


## Mounting Pad Layout (Unit: mm)



## Package informantion

SOT353 (Unit: mm)



## Mounting Pad Layout (Unit: mm)

