



SN74LS107 (LX) Dual JK Flip-Flop with Reset; Negative-Edge Trigger

Product Specification

Specification Revision History:

| Version | Date | Description |
|------------|---------|-----------------------|
| 2023-12-A0 | 2023-12 | New |
| 2024-03-A1 | 2024-03 | Modify the parameters |
| | | |
| | | |



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1、General Description

The SN74LS107 is dual negative-edge triggered JK-type flip-flops featuring individual J, K, clock (\overline{nCP}) and reset (\overline{nR}) inputs; also complementary Q and \overline{Q} outputs.

Features:

- Supply voltage range: 2V to 6V
- Temperature range: -40°C to +125°C
- Packaging information: DIP14/SOP14/TSSOP14

Ordering Information:

Tube packing specifications:

| Part number | Packaging form | Marking code | Tube quantity | Boxed tube quantity | Boxed quantity | Notes |
|-----------------|----------------|--------------|----------------|---------------------|------------------|--|
| SN74LS107N (LX) | DIP14 | SN74LS107N | 25 PCS/tube | 40 tube/box | 1000 PCS/box | Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm |
| SN74LS107D (LX) | SOP14 | LS107 | 50 PCS/tube | 200 tube/box | 10000 PCS/box | Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm |
| SN74LS107P (LX) | TSSOP14 | LS107 | 96 PCS/tube | 200 tube/box | 19200 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |



Reel packing specifications:

| Part number | Packaging form | Marking code | Reel quantity | Boxed reel quantity | Notes |
|-----------------|----------------|--------------|------------------|---------------------|---|
| SN74LS107DR(LX) | SOP14 | LS107 | 2500 PCS/reel | 5000 PCS/box | Dimensions of plastic enclosure: 8.7mm×3.9mm Pin spacing: 1.27mm |
| SN74LS107PW(LX) | TSSOP14 | LS107 | 5000 PCS/reel | 10000 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

2、Block Diagram And Pin Description

2.1、Block Diagram

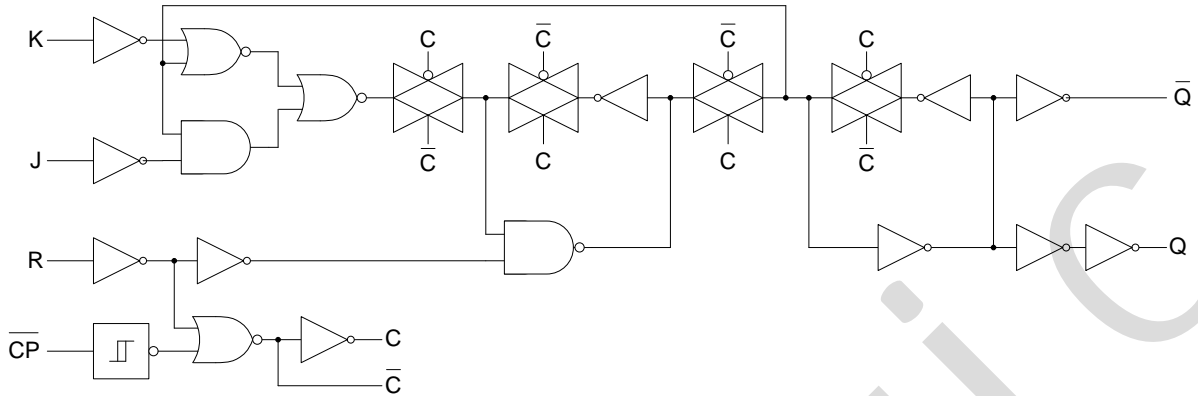


Figure 1. Logic diagram

2.2、Pin Configurations

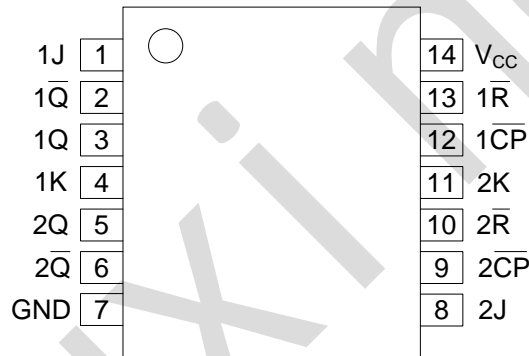


Figure 2. Pin Configurations

2.3、Pin Description

| Pin No. | Pin Name | Description |
|---------|-----------------|--|
| 1 | 1J | synchronous J input |
| 2 | 1Q \bar{Q} | complement output |
| 3 | 1Q | true output |
| 4 | 1K | synchronous K input |
| 5 | 2Q | true output |
| 6 | 2Q \bar{Q} | complement output |
| 7 | GND | ground (0V) |
| 8 | 2J | synchronous J input |
| 9 | 2CP | clock input (HIGH-to-LOW edge-triggered) |
| 10 | 2R \bar{R} | asynchronous reset input (active LOW) |
| 11 | 2K | synchronous K input |
| 12 | 1CP | clock input (HIGH-to-LOW edge-triggered) |
| 13 | 1R \bar{R} | asynchronous reset input (active LOW) |
| 14 | V _{CC} | supply voltage |



2.4、Function Table

| Input | | | | Output | | Operating mode |
|------------|-------------|------|------|-----------|------------|--------------------|
| \bar{nR} | \bar{nCP} | nJ | nK | nQ | \bar{nQ} | |
| L | X | X | X | L | H | asynchronous reset |
| H | ↓ | h | h | \bar{q} | q | toggle |
| H | ↓ | l | h | L | H | load 0 (reset) |
| H | ↓ | h | l | H | L | load 1 (set) |
| H | ↓ | l | l | q | \bar{q} | hold (no change) |

Notes:

H = HIGH voltage level;

h = HIGH voltage level one set-up time prior to the HIGH-to-LOW clock transition;

L = LOW voltage level;

l = LOW voltage level one set-up time prior to the HIGH-to-LOW clock transition;

q = state of referenced output one set-up time prior to the HIGH-to-LOW clock transition;

X = don't care;

↓ = HIGH-to-LOW clock transition.

3、Electrical Parameter

3.1、Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | Conditions | Min. | Max. | Unit |
|-------------------------|-----------|--------------------------------------|-----------|------|------|
| supply voltage | V_{CC} | - | -0.5 | +7 | V |
| supply current | I_{CC} | - | - | 50 | mA |
| ground current | I_{GND} | - | -50 | - | mA |
| input clamping current | I_{IK} | $V_I < -0.5V$ or $V_I > V_{CC}+0.5V$ | - | ±20 | mA |
| output clamping current | I_{OK} | $V_O < -0.5V$ or $V_O > V_{CC}+0.5V$ | - | ±20 | mA |
| output current | I_O | $-0.5V < V_O < V_{CC}+0.5V$ | - | ±25 | mA |
| storage temperature | T_{stg} | - | -65 | +150 | °C |
| soldering temperature | T_L | 10s | DIP | | °C |
| | | | SOP/TSSOP | | |

3.2、Recommended Operating Conditions

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------|------------|------|------|----------|------|
| supply voltage | V_{CC} | - | 2.0 | 5.0 | 6.0 | V |
| input voltage | V_I | - | 0 | - | V_{CC} | V |
| output voltage | V_O | - | 0 | - | V_{CC} | V |
| ambient temperature | T_{amb} | - | -40 | - | +125 | °C |



3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

($T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | V _{CC} | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|-----------------|-----------------|--|------|------|------|------|
| HIGH-level input voltage | V _{IH} | 2.0V | - | 1.5 | 1.2 | - | V |
| | | 4.5V | - | 3.15 | 2.4 | - | V |
| | | 6.0V | - | 4.2 | 3.2 | - | V |
| LOW-level input voltage | V _{IL} | 2.0V | - | - | 0.8 | 0.5 | V |
| | | 4.5V | - | - | 2.1 | 1.35 | V |
| | | 6.0V | - | - | 2.8 | 1.8 | V |
| HIGH-level output voltage | V _{OH} | 2.0V | I _O =-20uA | 1.9 | 2.0 | - | V |
| | | 4.5V | I _O =-20uA | 4.4 | 4.5 | - | V |
| | | 6.0V | I _O =-20uA | 5.9 | 6.0 | - | V |
| | | 4.5V | I _O =-4.0mA | 3.84 | 4.32 | - | V |
| | | 6.0V | I _O =-5.2mA | 5.34 | 5.81 | - | V |
| LOW-level output voltage | V _{OL} | 2.0V | I _O =20uA | - | 0 | 0.1 | V |
| | | 4.5V | I _O =20uA | - | 0 | 0.1 | V |
| | | 6.0V | I _O =20uA | - | 0 | 0.1 | V |
| | | 4.5V | I _O =4.0mA | - | 0.15 | 0.33 | V |
| | | 6.0V | I _O =5.2mA | - | 0.16 | 0.33 | V |
| input leakage current | I _I | 6.0V | V _I =V _{CC} or GND | - | - | ±1 | uA |
| supply current | I _{CC} | 6.0V | V _I =V _{CC} or GND; I _O =0A | - | - | 80 | uA |



3.3.2、DC Characteristics 2

($T_{amb}=-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | V _{CC} | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|-----------------|-----------------|--|------|------|------|------|
| HIGH-level input voltage | V _{IH} | 2.0V | - | 1.5 | - | - | V |
| | | 4.5V | - | 3.15 | - | - | V |
| | | 6.0V | - | 4.2 | - | - | V |
| LOW-level input voltage | V _{IL} | 2.0V | - | - | - | 0.5 | V |
| | | 4.5V | - | - | - | 1.35 | V |
| | | 6.0V | - | - | - | 1.8 | V |
| HIGH-level output voltage | V _{OH} | 2.0V | I _O =-20uA | 1.9 | - | - | V |
| | | 4.5V | I _O =-20uA | 4.4 | - | - | V |
| | | 6.0V | I _O =-20uA | 5.9 | - | - | V |
| | | 4.5V | I _O =-4.0mA | 3.7 | - | - | V |
| | | 6.0V | I _O =-5.2mA | 5.2 | - | - | V |
| LOW-level output voltage | V _{OL} | 2.0V | I _O =20uA | - | - | 0.1 | V |
| | | 4.5V | I _O =20uA | - | - | 0.1 | V |
| | | 6.0V | I _O =20uA | - | - | 0.1 | V |
| | | 4.5V | I _O =4.0mA | - | - | 0.4 | V |
| | | 6.0V | I _O =5.2mA | - | - | 0.4 | V |
| input leakage current | I _I | 6.0V | V _I =V _{CC} or GND | - | - | ±1 | uA |
| supply current | I _{CC} | 6.0V | V _I =V _{CC} or GND; I _O =0A | - | - | 160 | uA |



3.3.3、AC Characteristics 1

($T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | V _{CC} | Conditions | Min. | Typ. | Max. | Unit | | | | |
|-----------------------------------|-------------------------------------|-------------------------------------|----------------------|----------------------|----------------------|----------------------|--------------|-----|-----|----|-----|
| SN74LS107 | | | | | | | | | | | |
| nCP to nQ propagation delay | t _{PLH} , t _{PHL} | 2.0V | C _L =50pF | see Figure 4 | - | 52 | 160 | ns | | | |
| | | 4.5V | C _L =50pF | | - | 19 | 32 | ns | | | |
| | | 5.0V | C _L =15pF | | - | 16 | - | ns | | | |
| | | 6.0V | C _L =50pF | | | 15 | 27 | ns | | | |
| nCP to nQ propagation delay | | 2.0V | C _L =50pF | see Figure 4 | - | 52 | 200 | ns | | | |
| | | 4.5V | C _L =50pF | | - | 19 | 40 | ns | | | |
| | | 5.0V | C _L =15pF | | - | 16 | - | ns | | | |
| | | 6.0V | C _L =50pF | | | 15 | 34 | ns | | | |
| nR to nQ/nQ propagation delay | | t _{THL} , t _{TLH} | 2.0V | C _L =50pF | see Figure 5 | - | 52 | 195 | ns | | |
| | | | 4.5V | C _L =50pF | | - | 19 | 39 | ns | | |
| | | | 5.0V | C _L =15pF | | - | 16 | - | ns | | |
| | | | 6.0V | C _L =50pF | | | 15 | 26 | ns | | |
| nQ/nQ transition time | tw | | 2.0V | C _L =50pF | see Figure 4 | - | 19 | 95 | ns | | |
| | | | 4.5V | C _L =50pF | | - | 7 | 19 | ns | | |
| | | | 6.0V | C _L =50pF | | - | 6 | 16 | ns | | |
| nCP input HIGH or LOW pulse width | | | trec | 2.0V | C _L =50pF | see Figure 4 | 100 | 22 | - | ns | |
| | | | | 4.5V | C _L =50pF | | 20 | 8 | - | ns | |
| | | | | 6.0V | C _L =50pF | | 17 | 6 | - | ns | |
| nR input, HIGH pulse width | | | | tsu | 2.0V | C _L =50pF | see Figure 5 | 100 | 22 | - | ns |
| | | | | | 4.5V | C _L =50pF | | 20 | 8 | - | ns |
| | | 6.0V | | | C _L =50pF | 17 | | 6 | - | ns | |
| nR to nCP recovery time | | th | | | 2.0V | C _L =50pF | see Figure 5 | 75 | 19 | - | ns |
| | | | | | 4.5V | C _L =50pF | | 15 | 7 | - | ns |
| | | | | | 6.0V | C _L =50pF | | 13 | 6 | - | ns |
| nJ,nK to nCP set-up time | fmax | | | | 2.0V | C _L =50pF | see Figure 4 | 125 | 22 | - | ns |
| | | | | | 4.5V | C _L =50pF | | 25 | 8 | - | ns |
| | | | | | 6.0V | C _L =50pF | | 21 | 6 | - | ns |
| nJ,nK to nCP hold time | | | fmax | | 2.0V | C _L =50pF | see Figure 4 | 3 | -6 | - | ns |
| | | | | | 4.5V | C _L =50pF | | 3 | -2 | - | ns |
| | | | | | 6.0V | C _L =50pF | | 3 | -2 | - | ns |
| maximum clock frequency | | | | fmax | 2.0V | C _L =50pF | see Figure 4 | 4.8 | 30 | - | MHz |
| | | | | | 4.5V | C _L =50pF | | 24 | 91 | - | MHz |
| | | | | | 6.0V | C _L =50pF | | 28 | 108 | - | MHz |



3.3.4、AC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

| Parameter | Symbol | V _{CC} | Conditions | Min. | Typ. | Max. | Unit | | |
|-----------------------------------|-------------------------------------|-------------------------------------|----------------------|----------------------|--------------|------|------|-----|----|
| nCP to nQ propagation delay | t _{PLH} , t _{PHL} | 2.0V | C _L =50pF | see Figure 4 | - | - | 240 | ns | |
| | | 4.5V | C _L =50pF | | - | - | 48 | ns | |
| | | 6.0V | C _L =50pF | | | | 41 | ns | |
| nCP to nQ propagation delay | | t _{PLH} , t _{PHL} | 2.0V | C _L =50pF | see Figure 4 | - | - | 240 | ns |
| | | | 4.5V | C _L =50pF | | - | - | 48 | ns |
| | | | 6.0V | C _L =50pF | | - | - | 41 | ns |
| nR to nQ/nQ propagation delay | | t _{PLH} , t _{PHL} | 2.0V | C _L =50pF | see Figure 5 | - | - | 235 | ns |
| | | | 4.5V | C _L =50pF | | - | - | 47 | ns |
| | | | 6.0V | C _L =50pF | | | | 40 | ns |
| nQ/nQ transition time | t _{THL} , t _{TLH} | 2.0V | C _L =50pF | see Figure 4 | - | - | 110 | ns | |
| | | 4.5V | C _L =50pF | | - | - | 22 | ns | |
| | | 6.0V | C _L =50pF | | - | - | 19 | ns | |
| nCP input HIGH or LOW pulse width | t _w | 2.0V | C _L =50pF | see Figure 4 | 120 | - | - | ns | |
| | | 4.5V | C _L =50pF | | 24 | - | - | ns | |
| | | 6.0V | C _L =50pF | | 20 | - | - | ns | |
| nR input, HIGH pulse width | | t _w | 2.0V | C _L =50pF | see Figure 5 | 120 | - | - | ns |
| | | | 4.5V | C _L =50pF | | 24 | - | - | ns |
| | | | 6.0V | C _L =50pF | | 20 | - | - | ns |
| nR to nCP recovery time | t _{rec} | 2.0V | C _L =50pF | see Figure 5 | 90 | - | - | ns | |
| | | 4.5V | C _L =50pF | | 18 | - | - | ns | |
| | | 6.0V | C _L =50pF | | 15 | - | - | ns | |
| nJ,nK to nCP set-up time | t _{su} | 2.0V | C _L =50pF | see Figure 4 | 150 | - | - | ns | |
| | | 4.5V | C _L =50pF | | 30 | - | - | ns | |
| | | 6.0V | C _L =50pF | | 26 | - | - | ns | |
| nJ,nK to nCP hold time | t _h | 2.0V | C _L =50pF | see Figure 4 | 3 | - | - | ns | |
| | | 4.5V | C _L =50pF | | 3 | - | - | ns | |
| | | 6.0V | C _L =50pF | | 3 | - | - | ns | |
| maximum clock frequency | f _{max} | 2.0V | C _L =50pF | see Figure 4 | 4.0 | - | - | MHz | |
| | | 4.5V | C _L =50pF | | 20 | - | - | MHz | |
| | | 6.0V | C _L =50pF | | 24 | - | - | MHz | |

4、Testing Circuit

4.1、AC Testing Circuit

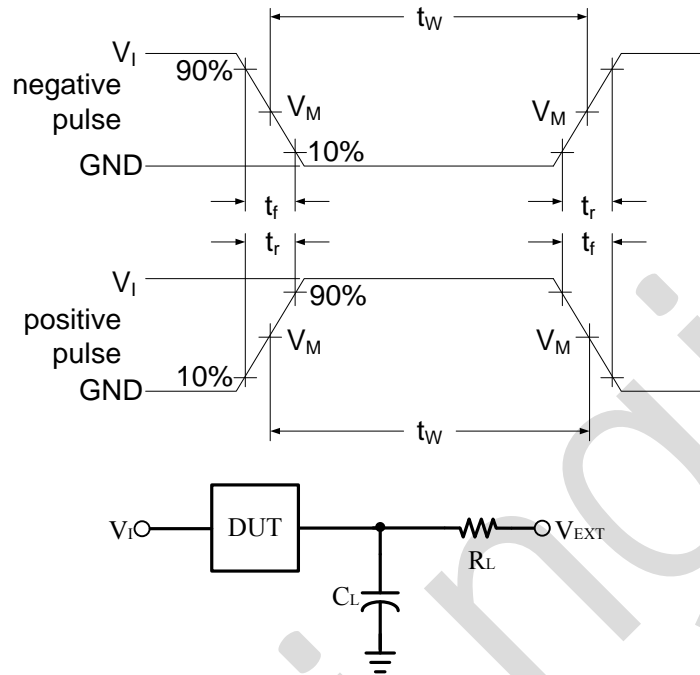


Figure 3. Test circuit for measuring switching times

C_L includes probe and jig capacitance.

4.2、Test Data

| Input | | Load | | V_{EXT} | | |
|----------|-------------|------------|-------------|-------------------|-------------------|-------------------|
| V_I | $t_r = t_f$ | C_L | R_L | t_{PLH}/t_{PHL} | t_{PLZ}/t_{PZL} | t_{PHZ}/t_{PZH} |
| V_{CC} | 3.0ns | 15pF, 50pF | 1K Ω | Open | V_{CC} | GND |



4.3、AC Testing Waveforms

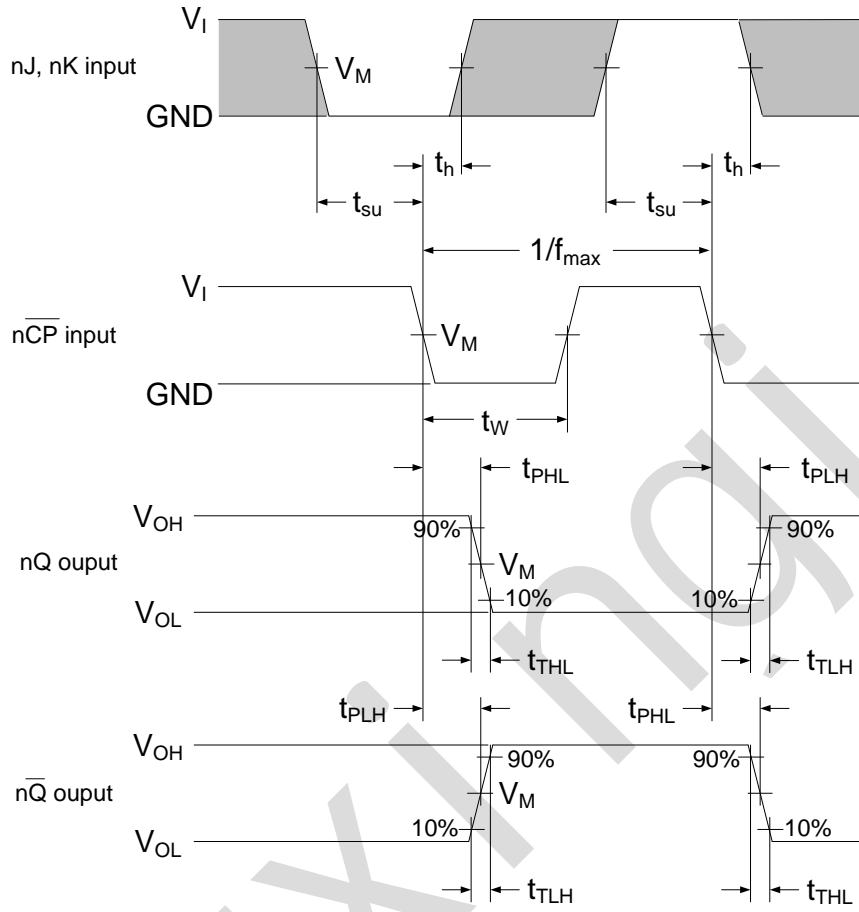


Figure 4. Clock propagation delays, pulse width, set-up and hold times, output transition times and the maximum frequency

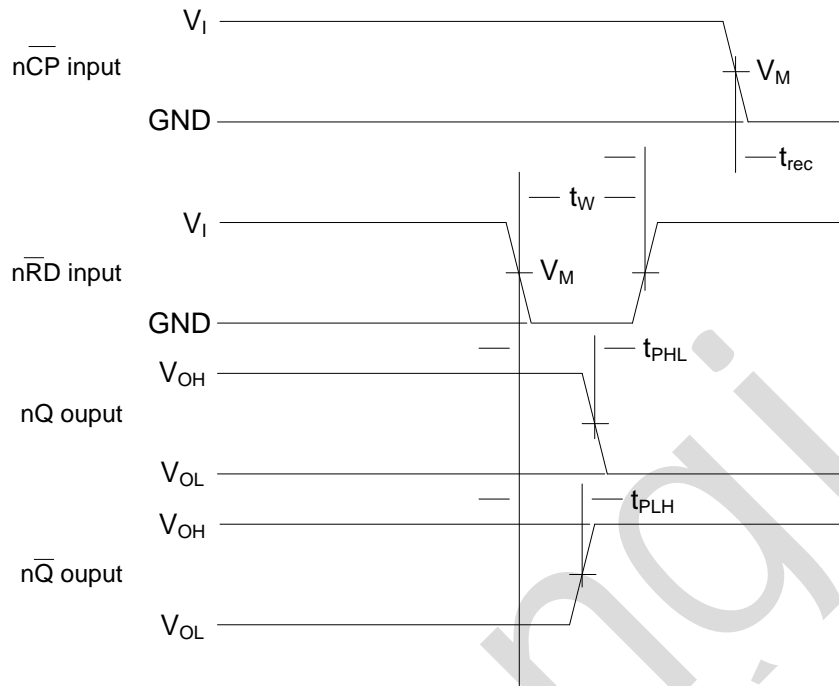


Figure 5. Reset propagation delays, pulse width and recovery time

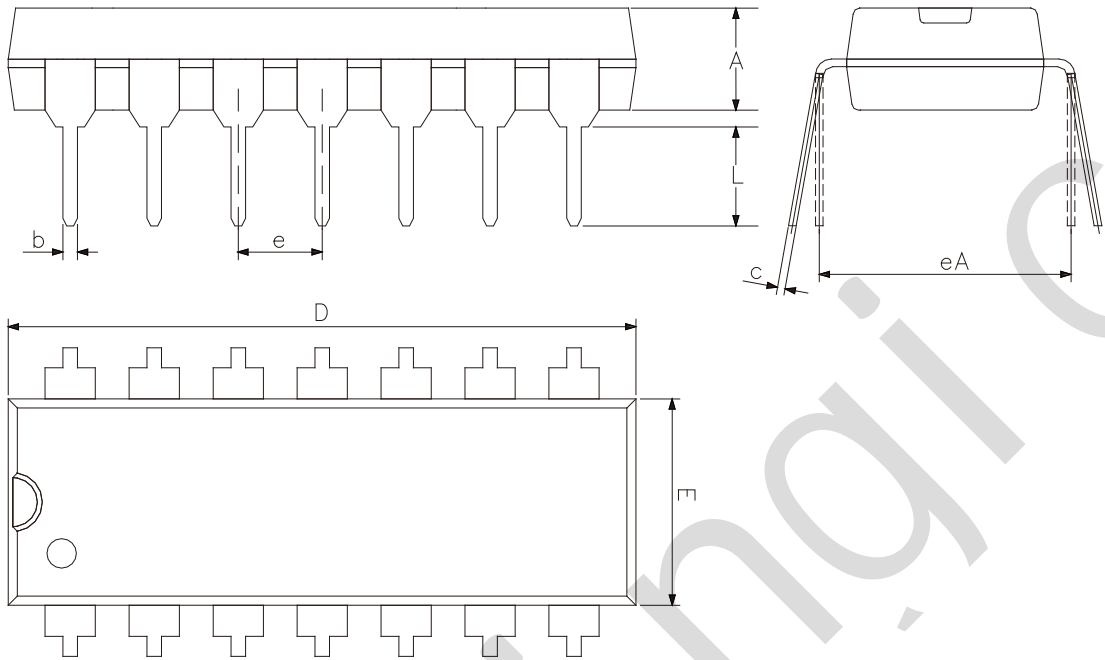
4.4. Measurement Points

| Input | Output |
|---------------------|---------------------|
| V_M | V_M |
| $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |



5、Package Information

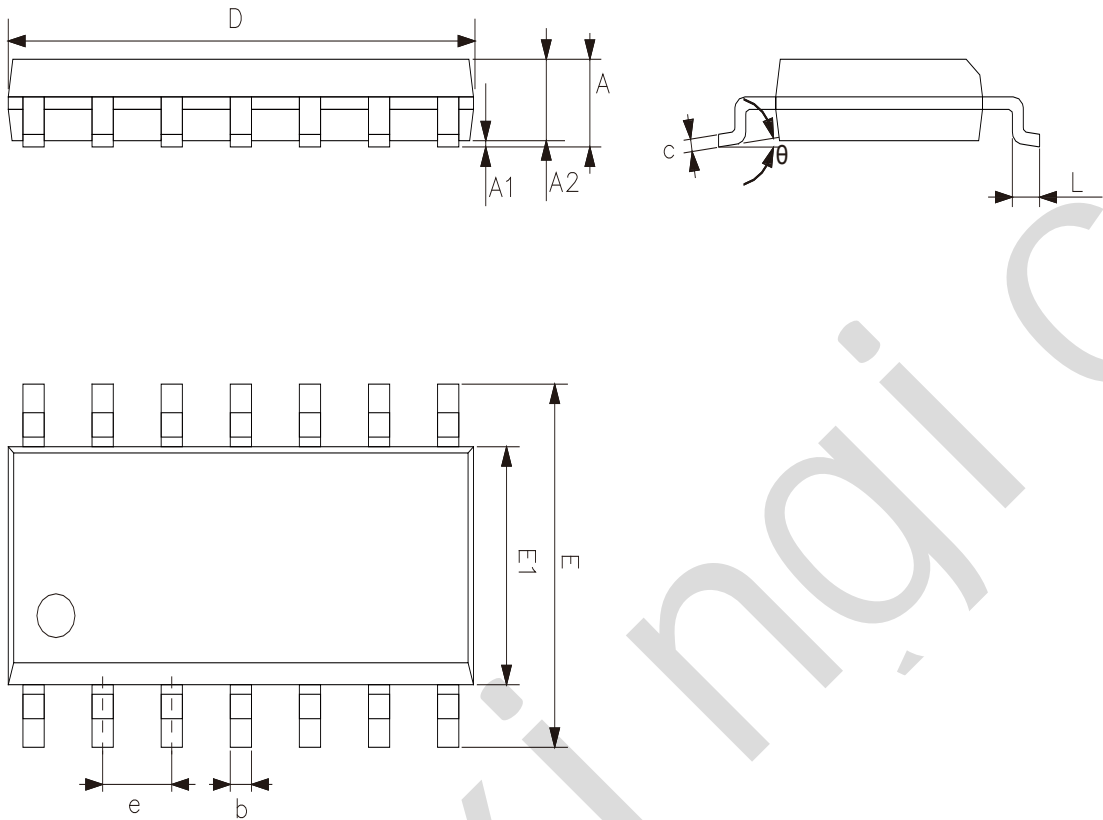
5.1、DIP14



| 2023/12/A | Dimensions In Millimeters | |
|-----------|---------------------------|-------|
| Symbol | Min | Max |
| A | 3.05 | 3.60 |
| b | 0.33 | 0.56 |
| c | 0.20 | 0.36 |
| D | 18.80 | 19.40 |
| E | 6.20 | 6.60 |
| e | 2.54 | |
| eA | 7.62 | 10.90 |
| L | 2.92 | — |



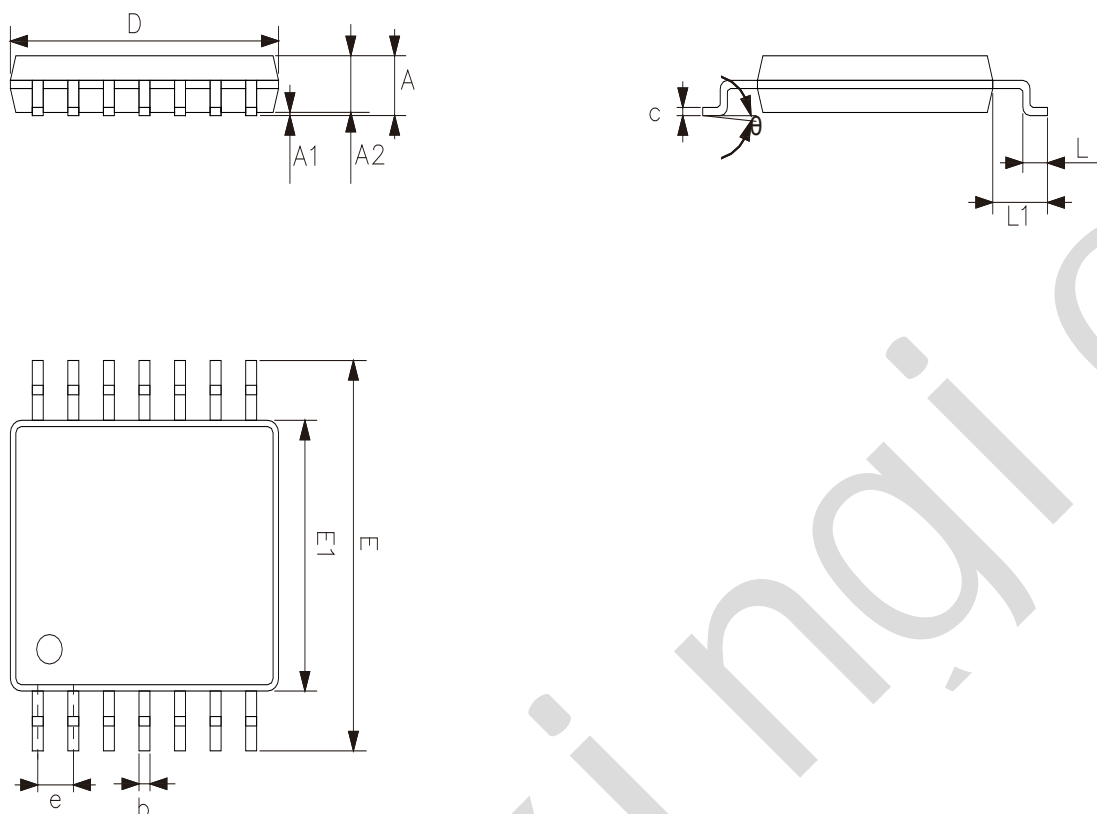
5.2、SOP14



| 2023/12/A | Dimensions In Millimeters | |
|-----------|---------------------------|------|
| Symbol | Min. | Max. |
| A | 1.50 | 1.75 |
| A1 | 0.05 | 0.25 |
| A2 | 1.30 | — |
| b | 0.33 | 0.50 |
| c | 0.19 | 0.25 |
| D | 8.43 | 8.76 |
| E | 5.80 | 6.25 |
| E1 | 3.75 | 4.00 |
| e | 1.27 | |
| L | 0.40 | 0.89 |
| θ | 0° | 8° |



5.3、TSSOP14



| 2023/12/A | Dimensions In Millimeters | | |
|-----------|---------------------------|------|------|
| | Symbol | Min | Max |
| | A | — | 1.20 |
| | A1 | 0.05 | 0.15 |
| | A2 | 0.80 | 1.05 |
| | b | 0.19 | 0.30 |
| | c | 0.09 | 0.20 |
| | D | 4.90 | 5.10 |
| | E1 | 4.30 | 4.50 |
| | E | 6.20 | 6.60 |
| | e | 0.65 | |
| | L | 0.45 | 0.75 |
| | L1 | 1.00 | |
| | θ | 0° | 8° |



6、 Statements And Notes

6.1、 The name and content of Hazardous substances or Elements in the product

| Part name | Hazardous substances or Elements | | | | | | | | | |
|-------------------------|---|-------------------------------|-------------------------------|-------------------------------|--------------------------|--------------------------------|-------------------|-----------------------|---------------------------|----------------------|
| | Lead and lead compounds | Mercury and mercury compounds | Cadmium and cadmium compounds | Hexavalent chromium compounds | Polybrominated biphenyls | Polybrominated biphenyl ethers | Dibutyl phthalate | Butylbenzyl phthalate | Di-2-ethylhexyl phthalate | Diisobutyl phthalate |
| Lead frame | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic resin | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Chip | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The lead | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic sheet installed | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| explanation | ○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements. | | | | | | | | | |

6.2、 Notes

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