



SN74HC/HCT194 (LX) 4-bit Bidirectional Universal Shift Register

Product Specification

Specification Revision History:

| Version | Date | Description |
|------------|---------|-------------|
| 2023-05-A1 | 2023-05 | New |
| | | |
| | | |
| | | |



Contents

| | |
|---|-----------|
| 1、 General Description..... | 3 |
| 2、 Block Diagram And Pin Description | 5 |
| 2.1、 Block Diagram | 5 |
| 2.2、 Pin Configurations..... | 5 |
| 2.3、 Pin Description | 6 |
| 3、 Electrical Parameter | 7 |
| 3.1、 Absolute Maximum Ratings..... | 7 |
| 3.2、 Recommended Operating Conditions | 7 |
| 3.3、 Electrical Characteristics | 7 |
| 3.3.1、 DC Characteristics 1 | 7 |
| 3.3.2、 DC Characteristics 2 | 8 |
| 3.3.3、 AC Characteristics 1 | 9 |
| 3.3.4、 AC Characteristics 2 | 11 |
| 4、 Testing Circuit | 13 |
| 4.1、 AC Testing Circuit | 13 |
| 4.2、 Test Data | 13 |
| 4.3、 AC Testing Waveforms..... | 14 |
| 4.4、 Measurement Points | 15 |
| 5、 Package Information | 16 |
| 5.1、 DIP16 | 16 |
| 5.2、 SOP16 | 17 |
| 5.3、 TSSOP16..... | 18 |
| 6、 Statements And Notes | 19 |
| 6.1、 The name and content of Hazardous substances or Elements in the product..... | 19 |
| 6.2、 Notes | 19 |



1、General Description

The SN74HC/HCT194 is a 4-bit bidirectional universal shift register.

Features:

- Supply voltage range:
SN74HC194: 2V to 6V
SN74HCT194: 4.5V to 5.5V
- Input levels:
SN74HC194: CMOS level
SN74HCT194: TTL level
- Temperature range: -40°C to +125°C
- Packaging information: DIP16/SOP16/TSSOP16

Ordering Information:

Tube packing specifications:

| Part number | Packaging form | Marking code | Tube quantity | Boxed tube quantity | Boxed quantity | Notes |
|------------------|----------------|--------------|----------------|---------------------|------------------|--|
| SN74HC194N (LX) | DIP16 | SN74HC194N | 25 PCS/tube | 40 tube/box | 1000 PCS/box | Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm |
| SN74HCT194N (LX) | DIP16 | 74HCT194 | 25 PCS/tube | 40 tube/box | 1000 PCS/box | Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm |
| SN74HC194D (LX) | SOP16 | SN74HC194 | 50 PCS/tube | 200 tube/box | 10000 PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm |
| SN74HCT194D (LX) | SOP16 | HCT194 | 50 PCS/tube | 200 tube/box | 10000 PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm |
| SN74HC194P (LX) | TSSOP16 | 74HC194 | 96 PCS/tube | 200 tube/box | 19200 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |
| SN74HCT194P (LX) | TSSOP16 | 74HCT194 | 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 |
|-------------------|----------------|--------------|------------------|---------------------|--|
| SN74HC194DR (LX) | SOP16 | SN74HC194 | 4000 PCS/reel | 8000 PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm |
| SN74HCT194DR (LX) | SOP16 | 74HCT194 | 4000 PCS/reel | 8000 PCS/box | Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm |
| SN74HC194PW (LX) | TSSOP16 | 74HC194 | 5000 PCS/reel | 10000 PCS/box | Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm |
| SN74HCT194PW (LX) | TSSOP16 | 74HCT194 | 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.



2.3、Pin Description

| Pin No. | Pin Name | Description |
|---------|------------------------|---|
| 1 | $\overline{\text{MR}}$ | Asynchronous master reset input(active low) |
| 2 | DSR | serious data input(shift right) |
| 3 | D0 | parallel data input |
| 4 | D1 | parallel data input |
| 5 | D2 | parallel data input |
| 6 | D3 | parallel data input |
| 7 | DSL | Serial data input(shift left) |
| 8 | GND | ground (0V) |
| 9 | S0 | mode control input |
| 10 | S1 | mode control input |
| 11 | CP | Clock input(LOW-to-HIGH edge-triggered) |
| 12 | Q3 | Parallel output |
| 13 | Q2 | Parallel output |
| 14 | Q1 | Parallel output |
| 15 | Q0 | Parallel output |
| 16 | V _{CC} | supply voltage |

2.4、Function Table

| Operation mode | inputs | | | | | | | Outputs | | | |
|------------------|--------|------------------------|----|----|-----|-----|----|---------|----|----|----|
| | CP | $\overline{\text{MR}}$ | S1 | S0 | DSR | DSL | Dn | Q0 | Q1 | Q2 | Q3 |
| reset(clear) | X | L | X | X | X | X | X | L | L | L | L |
| Hold(do nothing) | X | H | l | l | X | X | X | Q0 | Q1 | Q2 | Q3 |
| Shift left | ↑ | H | h | l | X | l | X | Q1 | Q2 | Q3 | L |
| | ↑ | H | h | l | X | h | X | Q1 | Q2 | Q3 | H |
| Shift right | ↑ | H | l | h | l | X | X | L | Q0 | Q1 | Q2 |
| | ↑ | H | l | h | h | X | X | H | Q0 | Q1 | Q2 |
| Parallel load | ↑ | H | h | h | X | X | Dn | D0 | D1 | D2 | D3 |

Note:

H=HIGH voltage level; L=LOW voltage level.

h=HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition.

l=LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition.

X=don't care.

↑=LOW to HIGH CP 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 | $^{\circ}C$ |
| soldering temperature | T_L | 10s | DIP | 245 | $^{\circ}C$ |
| | | | SOP/TSSOP | 260 | |

3.2、Recommended Operating Conditions

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------|------------|------|------|----------|-------------|
| SN74HC194 | | | | | | |
| 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 | $^{\circ}C$ |
| SN74HCT194 | | | | | | |
| supply voltage | V_{CC} | - | 4.5 | 5.0 | 5.5 | V |
| input voltage | V_I | - | 0 | - | V_{CC} | V |
| output voltage | V_O | - | 0 | - | V_{CC} | V |
| ambient temperature | T_{amb} | - | -40 | - | +125 | $^{\circ}C$ |

3.3、Electrical Characteristics

3.3.1、DC Characteristics 1

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

| Parameter | Symbol | V_{CC} | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------|----------|------------------|------|------|------|------|
| SN74HC194 | | | | | | | |
| 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 | $I_O = -20\mu A$ | 1.9 | 2.0 | - | V |
| | | 4.5V | $I_O = -20\mu A$ | 4.4 | 4.5 | - | V |
| | | 6.0V | $I_O = -20\mu A$ | 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 | V_{OL} | 2.0V | $I_O = 20\mu A$ | - | 0 | 0.1 | V |



| | | | | | | | |
|---------------------------|-----------------|--------------|--|------|------|---------|---------|
| output voltage | | 4.5V | $I_O=20\mu A$ | - | 0 | 0.1 | V |
| | | 6.0V | $I_O=20\mu A$ | - | 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 | μA |
| supply current | I_{CC} | 6.0V | $V_I=V_{CC}$ or GND; $I_O=0A$ | - | - | 80 | μA |
| SN74HC194 | | | | | | | |
| HIGH-level input voltage | V_{IH} | 4.5V to 5.5V | - | 2.0 | 1.6 | - | V |
| LOW-level input voltage | V_{IL} | 4.5V to 5.5V | - | - | 1.2 | 0.8 | V |
| HIGH-level output voltage | V_{OH} | 4.5V | $I_O=-20\mu A$ | 4.4 | 4.5 | - | V |
| | | | $I_O=-4.0mA$ | 3.84 | 4.32 | - | V |
| LOW-level output voltage | V_{OL} | 4.5V | $I_O=20\mu A$ | - | 0 | 0.1 | V |
| | | | $I_O=4.0mA$ | - | 0.15 | 0.33 | V |
| input leakage current | I_I | 5.5V | $V_I=V_{CC}$ or GND | - | - | ± 1 | μA |
| supply current | I_{CC} | 6.0V | $V_I=V_{CC}$ or GND; $I_O=0A$ | - | - | 80 | μA |
| additional supply current | ΔI_{CC} | 4.5V to 5.5V | One input at $V_I=V_{CC}-2.1V$; Other inputs at V_{CC} or GND; $I_O=0A$ | - | - | 135 | μA |

3.3.2、DC Characteristics 2

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

| Parameter | Symbol | V_{CC} | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------|----------|-------------------------------|------|------|---------|---------|
| SN74HC194 | | | | | | | |
| 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 | $I_O=-20\mu A$ | 1.9 | - | - | V |
| | | 4.5V | $I_O=-20\mu A$ | 4.4 | - | - | V |
| | | 6.0V | $I_O=-20\mu A$ | 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 | $I_O=20\mu A$ | - | - | 0.1 | V |
| | | 4.5V | $I_O=20\mu A$ | - | - | 0.1 | V |
| | | 6.0V | $I_O=20\mu A$ | - | - | 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 | μA |
| supply current | I_{CC} | 6.0V | $V_I=V_{CC}$ or GND; $I_O=0A$ | - | - | 160 | μA |
| SN74HCT194 | | | | | | | |



| | | | | | | | |
|---------------------------|-----------------|--------------|--|-----|---|---------|---------|
| HIGH-level input voltage | V_{IH} | 4.5V to 5.5V | - | 2.0 | - | - | V |
| LOW-level input voltage | V_{IL} | 4.5V to 5.5V | - | - | - | 0.8 | V |
| HIGH-level output voltage | V_{OH} | 4.5V | $I_O=-20\mu A$ | 4.4 | - | - | V |
| | | | $I_O=-4.0mA$ | 3.7 | - | - | V |
| LOW-level output voltage | V_{OL} | 4.5V | $I_O=20\mu A$ | - | - | 0.1 | V |
| | | | $I_O=4.0mA$ | - | - | 0.4 | V |
| input leakage current | I_I | 5.5V | $V_I=V_{CC}$ or GND | - | - | ± 1 | μA |
| supply current | I_{CC} | 6.0V | $V_I=V_{CC}$ or GND; $I_O=0A$ | - | - | 160 | μA |
| additional supply current | ΔI_{CC} | 4.5V to 5.5V | One input at $V_I=V_{CC}-2.1V$; Other inputs at V_{CC} or GND; $I_O=0A$ | - | - | 147 | μA |

3.3.3、AC Characteristics 1

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

| Parameter | Symbol | V_{CC} | Conditions | Min. | Typ. | Max. | Unit | |
|---|--------------------|----------|------------|--------------|------|------|------|----|
| SN74HC194 | | | | | | | | |
| CP to Qn propagation delay | t_{PLH}, t_{PHL} | 2.0V | $C_L=50pF$ | see Figure 4 | - | 47 | 155 | ns |
| | | 4.5V | $C_L=50pF$ | | - | 17 | 36 | ns |
| | | 6.0V | $C_L=50pF$ | | - | 14 | 31 | ns |
| \overline{MR} to Qn propagation delay | t_{PHL} | 2.0V | $C_L=50pF$ | see Figure 5 | - | 39 | 175 | ns |
| | | 4.5V | $C_L=50pF$ | | - | 14 | 35 | ns |
| | | 6.0V | $C_L=50pF$ | | - | 11 | 30 | ns |
| transition time | t_{THL}, t_{TLH} | 2.0V | $C_L=50pF$ | see Figure 5 | 100 | 17 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 20 | 6 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 17 | 5 | - | ns |
| clock pulse width | t_w | 2.0V | $C_L=50pF$ | see Figure 4 | 100 | 17 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 20 | 6 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 17 | 5 | - | ns |
| master reset pulse | t_w | 2.0V | $C_L=50pF$ | see Figure 5 | 100 | 17 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 20 | 6 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 17 | 5 | - | ns |
| \overline{MR} to CP removal time | trem | 2.0V | $C_L=50pF$ | see Figure 5 | 60 | 17 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 12 | 6 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 10 | 5 | - | ns |
| Dn to CP set-up time | t_{su} | 2.0V | $C_L=50pF$ | see Figure 6 | 90 | 17 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 18 | 6 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 15 | 5 | - | ns |
| S0, S1 to CP set-up time | t_{su} | 2.0V | $C_L=50pF$ | see Figure 7 | 100 | 22 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 20 | 8 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 17 | 6 | - | ns |
| DSR, DSL to CP set-up time | t_{su} | 2.0V | $C_L=50pF$ | see Figure 6 | 90 | 19 | - | ns |
| | | 4.5V | $C_L=50pF$ | | 18 | 7 | - | ns |
| | | 6.0V | $C_L=50pF$ | | 15 | 6 | - | ns |



| | | | | | | | | |
|--|--------------------|------|-------------------|--------------|-----|-----|----|-----|
| Dn to CP hold time | | 2.0V | $C_L=50\text{pF}$ | see Figure 6 | 0 | -14 | - | ns |
| | | 4.5V | $C_L=50\text{pF}$ | | 0 | -5 | - | ns |
| | | 6.0V | $C_L=50\text{pF}$ | | 0 | -4 | - | ns |
| S0, S1 to CP hold time | th | 2.0V | $C_L=50\text{pF}$ | see Figure 7 | 0 | -11 | - | ns |
| | | 4.5V | $C_L=50\text{pF}$ | | 0 | -4 | - | ns |
| | | 6.0V | $C_L=50\text{pF}$ | | 0 | -3 | - | ns |
| DSR, DSL to CP hold time | | 2.0V | $C_L=50\text{pF}$ | see Figure 6 | 0 | -17 | - | ns |
| | | 4.5V | $C_L=50\text{pF}$ | | 0 | -6 | - | ns |
| | | 6.0V | $C_L=50\text{pF}$ | | 0 | -5 | - | ns |
| maximum clock pulse frequency | fmax | 2.0V | $C_L=50\text{pF}$ | see Figure 4 | 4.8 | 31 | - | MHz |
| | | 4.5V | $C_L=50\text{pF}$ | | 24 | 93 | - | MHz |
| | | 6.0V | $C_L=50\text{pF}$ | | 28 | 111 | - | MHz |
| SN74HCT194 | | | | | | | | |
| CP to Qn propagation delay | t_{PLH}, t_{PHL} | 4.5V | $C_L=50\text{pF}$ | see Figure 4 | - | 18 | 40 | ns |
| $\overline{\text{MR}}$ to Qn propagation delay | t_{PHL} | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | - | 18 | 40 | ns |
| transition time | t_{THL}, t_{TLH} | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | - | 7 | 19 | ns |
| clock pulse width | t_w | 4.5V | $C_L=50\text{pF}$ | see Figure 4 | 20 | 7 | - | ns |
| master reset pulse | t_w | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | 20 | 7 | - | ns |
| $\overline{\text{MR}}$ to CP removal time | trem | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | 15 | 6 | - | ns |
| Dn to CP set-up time | tsu | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 18 | 7 | - | ns |
| S0, S1 to CP set-up time | | 4.5V | $C_L=50\text{pF}$ | see Figure 7 | 25 | 10 | - | ns |
| DSR, DSL to CP set-up time | | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 18 | - | - | ns |
| Dn to CP hold time | th | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 0 | -7 | - | ns |
| S0, S1 to CP hold time | | 4.5V | $C_L=50\text{pF}$ | see Figure 7 | 0 | -5 | - | ns |
| DSR, DSL to CP hold time | | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 0 | -7 | - | ns |
| maximum clock pulse frequency | fmax | 4.5V | $C_L=50\text{pF}$ | see Figure 4 | 24 | 70 | - | 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 | |
|--|-------------------------------------|-----------------|----------------------|--------------|------|------|------|-----|
| SN74HC194 | | | | | | | | |
| CP to Qn propagation delay | t _{PLH} , t _{PHL} | 2.0V | C _L =50pF | see Figure 4 | - | - | 220 | ns |
| | | 4.5V | C _L =50pF | | - | - | 44 | ns |
| | | 6.0V | C _L =50pF | | - | - | 38 | ns |
| $\overline{\text{MR}}$ to Qn propagation delay | t _{PHL} | 2.0V | C _L =50pF | see Figure 5 | - | - | 210 | ns |
| | | 4.5V | C _L =50pF | | - | - | 42 | ns |
| | | 6.0V | C _L =50pF | | - | - | 36 | ns |
| transition time | t _{THL} , t _{TLH} | 2.0V | C _L =50pF | see Figure 5 | - | - | 110 | ns |
| | | 4.5V | C _L =50pF | | - | - | 22 | ns |
| | | 6.0V | C _L =50pF | | - | - | 19 | ns |
| clock 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 |
| master reset pulse | 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 |
| $\overline{\text{MR}}$ to CP removal time | t _{rem} | 2.0V | C _L =50pF | see Figure 5 | 90 | - | - | ns |
| | | 4.5V | C _L =50pF | | 18 | - | - | ns |
| | | 6.0V | C _L =50pF | | 15 | - | - | ns |
| Dn to CP set-up time | | 2.0V | C _L =50pF | see Figure 6 | 105 | - | - | ns |
| | | 4.5V | C _L =50pF | | 21 | - | - | ns |
| | | 6.0V | C _L =50pF | | 18 | - | - | ns |
| S0, S1 to CP set-up time | t _{su} | 2.0V | C _L =50pF | see Figure 7 | 120 | - | - | ns |
| | | 4.5V | C _L =50pF | | 24 | - | - | ns |
| | | 6.0V | C _L =50pF | | 20 | - | - | ns |
| DSR, DSL to CP set-up time | | 2.0V | C _L =50pF | see Figure 6 | 105 | - | - | ns |
| | | 4.5V | C _L =50pF | | 21 | - | - | ns |
| | | 6.0V | C _L =50pF | | 18 | - | - | ns |
| Dn to CP hold time | | 2.0V | C _L =50pF | see Figure 6 | 0 | - | - | ns |
| | | 4.5V | C _L =50pF | | 0 | - | - | ns |
| | | 6.0V | C _L =50pF | | 0 | - | - | ns |
| S0, S1 to CP hold time | t _h | 2.0V | C _L =50pF | see Figure 7 | 0 | - | - | ns |
| | | 4.5V | C _L =50pF | | 0 | - | - | ns |
| | | 6.0V | C _L =50pF | | 0 | - | - | ns |
| DSR, DSL to CP hold time | | 2.0V | C _L =50pF | see Figure 6 | 0 | - | - | ns |
| | | 4.5V | C _L =50pF | | 0 | - | - | ns |
| | | 6.0V | C _L =50pF | | 0 | - | - | ns |
| maximum clock pulse 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 |
| SN74HCT194 | | | | | | | | |
| CP to Qn | t _{PLH} , t _{PHL} | 4.5V | C _L =50pF | see Figure 4 | - | - | 48 | ns |



| | | | | | | | | |
|--|----------------------------------|------|-------------------|--------------|----|---|----|-----|
| propagation delay | | | | | | | | |
| $\overline{\text{MR}}$ to Qn propagation delay | t_{PHL} | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | - | - | 48 | ns |
| transition time | $t_{\text{THL}}, t_{\text{TLH}}$ | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | - | - | 22 | ns |
| clock pulse width | t_w | 4.5V | $C_L=50\text{pF}$ | see Figure 4 | 24 | - | - | ns |
| master reset pulse | t_w | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | 24 | - | - | ns |
| $\overline{\text{MR}}$ to CP removal time | trem | 4.5V | $C_L=50\text{pF}$ | see Figure 5 | 18 | - | - | ns |
| Dn to CP set-up time | tsu | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 21 | - | - | ns |
| S0, S1 to CP set-up time | | 4.5V | $C_L=50\text{pF}$ | see Figure 7 | 30 | - | - | ns |
| DSR, DSL to CP set-up time | | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 21 | - | - | ns |
| Dn to CP hold time | th | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 0 | - | - | ns |
| S0, S1 to CP hold time | | 4.5V | $C_L=50\text{pF}$ | see Figure 7 | 0 | - | - | ns |
| DSR, DSL to CP hold time | | 4.5V | $C_L=50\text{pF}$ | see Figure 6 | 0 | - | - | ns |
| maximum clock pulse frequency | fmax | 4.5V | $C_L=50\text{pF}$ | see Figure 4 | 20 | - | - | MHz |



4、Testing Circuit

4.1、AC Testing Circuit

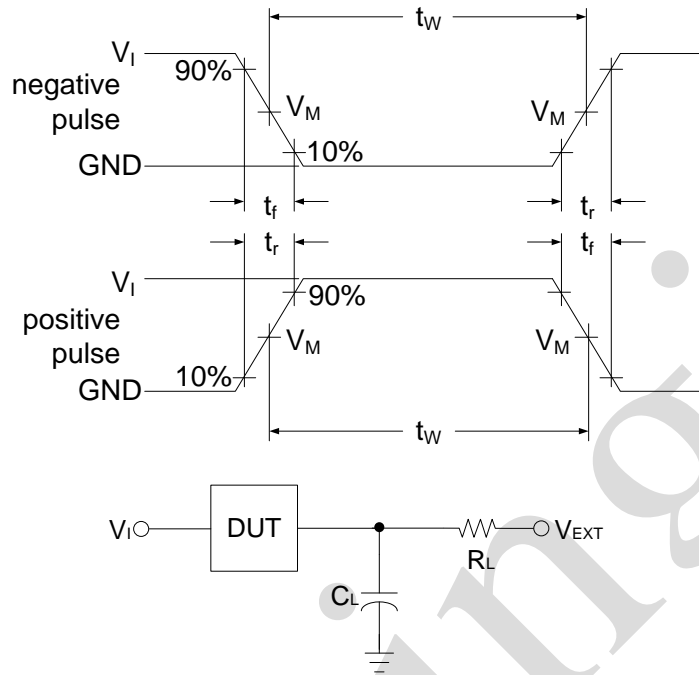


Figure 3. Test circuit for measuring switching times

C_L includes probe and jig capacitance.

4.2、Test Data

| Type | 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} |
| SN74HC194 | V_{CC} | 6.0ns | 50pF | 1K Ω | Open | V_{CC} | GND |
| SN74HCT194 | 3.0V | 6.0ns | 50pF | 1K Ω | Open | V_{CC} | GND |



4.3. AC Testing Waveforms

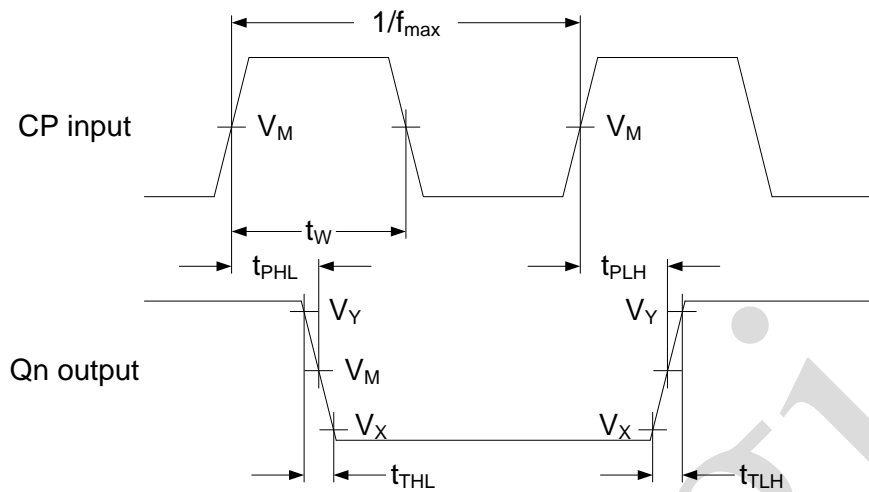


Figure 4. Waveforms showing the clock (CP) to output (Qn) propagation delays, the clock pulse width, the output transition times and the maximum clock frequency

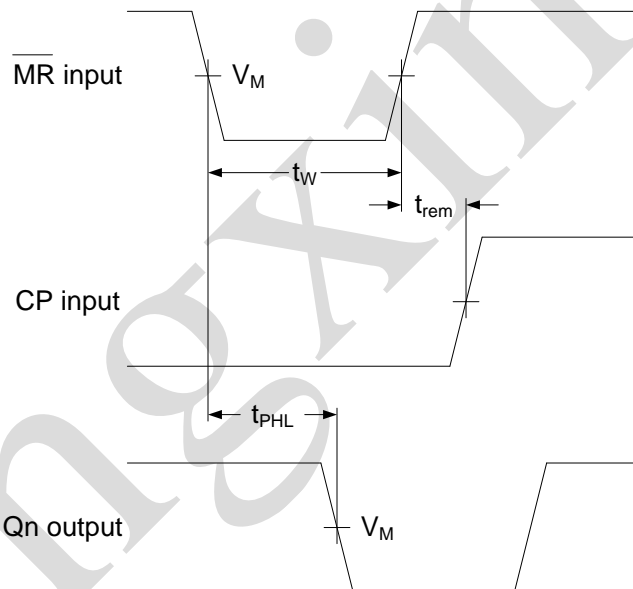


Figure 5. Waveforms showing the master reset (\overline{MR}) pulse width, the master reset to output (Qn) propagation delays and the master reset to clock (CP) removal time

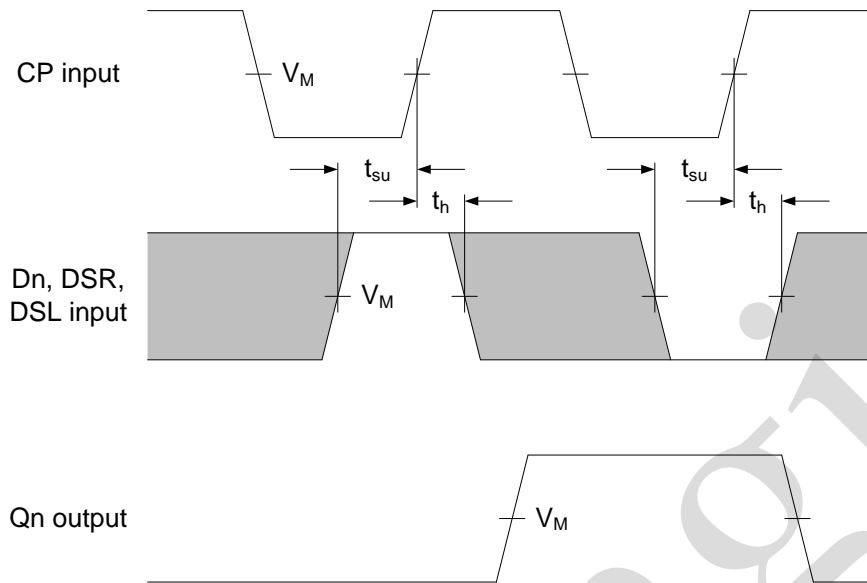


Figure 6. Waveforms showing the set-up and hold times from the data inputs (Dn, DSR and DSL) to the clock (CP).

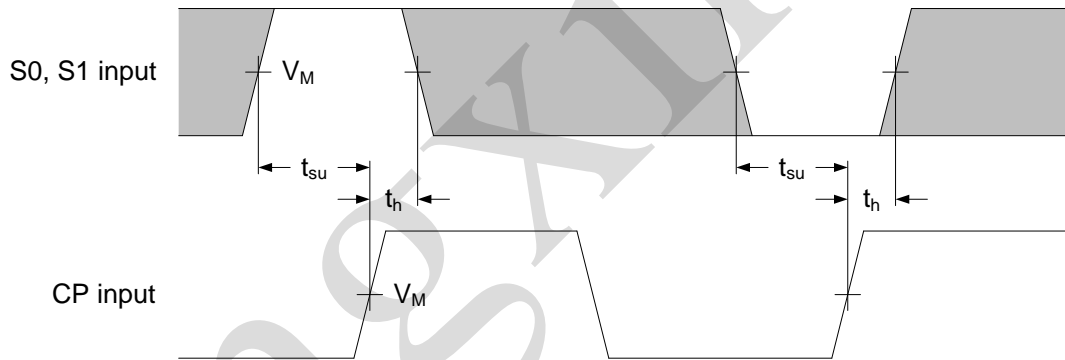


Figure 7. Waveforms showing the set-up and hold times from the mode control inputs (Sn) to the clock input (CP).

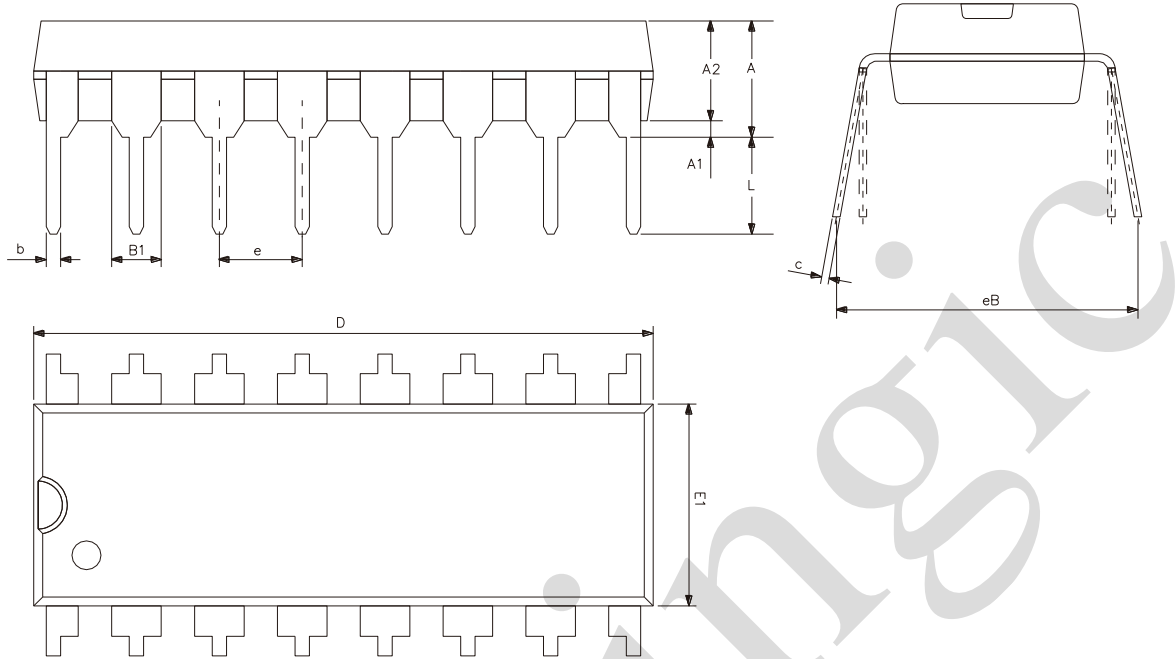
4.4. Measurement Points

| Type | Input | | Output | |
|------------|---------------------|---------------------|---------------------|---------------------|
| | V_M | V_M | V_X | V_Y |
| SN74HC194 | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |
| SN74HCT194 | 1.3V | 1.3V | $0.1 \times V_{CC}$ | $0.9 \times V_{CC}$ |



5、Package Information

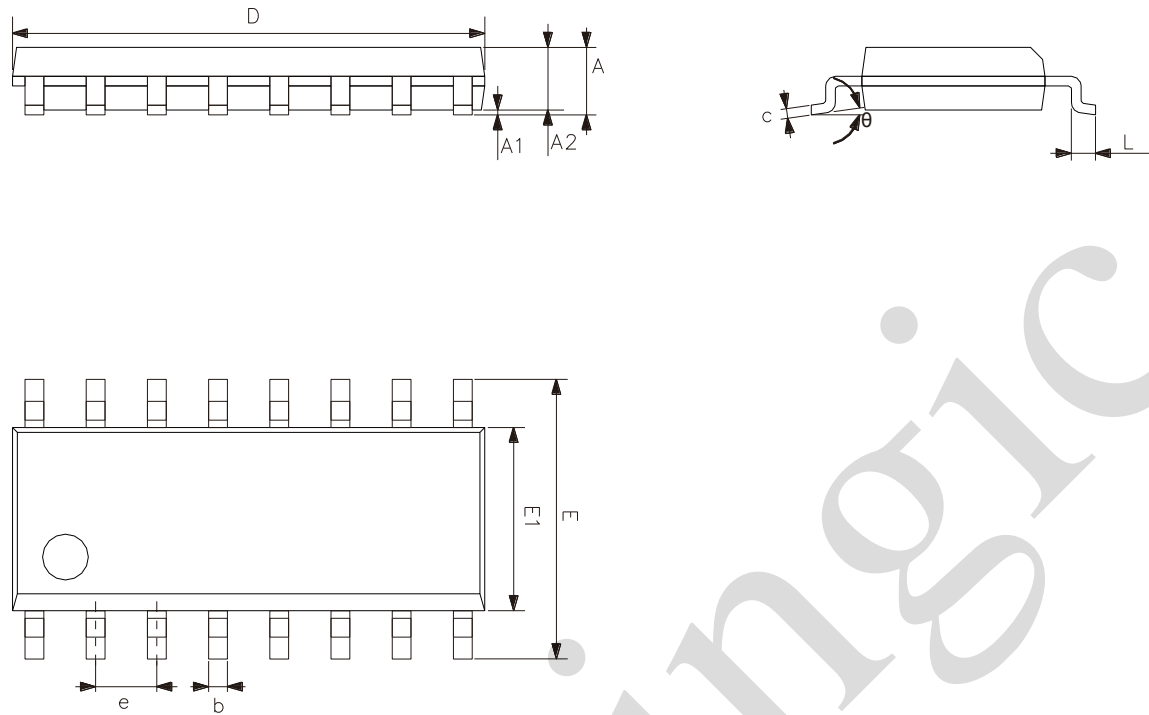
5.1、DIP16



| Symbol | Dimensions (mm) | |
|--------|-----------------|-------|
| | Min. | Max. |
| A2 | 3.20 | 3.60 |
| A1 | 0.51 | - |
| A | 3.60 | 5.33 |
| L | 3.00 | 3.60 |
| b | 0.36 | 0.56 |
| B1 | 1.52 | |
| D | 18.80 | 19.94 |
| E1 | 6.20 | 6.60 |
| e | 2.54 | |
| c | 0.20 | 0.36 |
| eB | 7.62 | 9.30 |



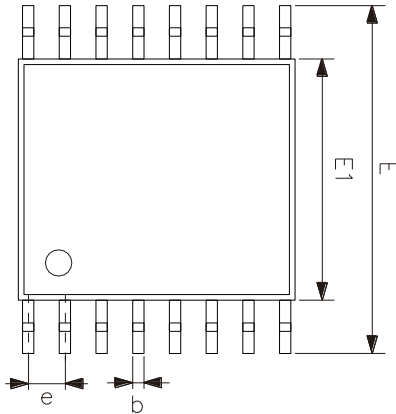
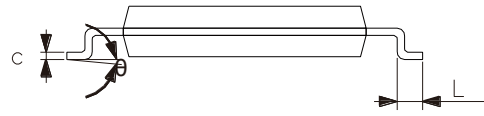
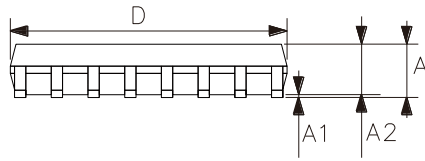
5.2、SOP16



| Symbol | Dimensions (mm) | |
|----------|-----------------|-------|
| | Min. | Max. |
| A | 1.35 | 1.80 |
| A1 | 0.10 | 0.25 |
| A2 | 1.25 | 1.55 |
| b | 0.33 | 0.51 |
| c | 0.19 | 0.25 |
| D | 9.50 | 10.10 |
| E | 5.80 | 6.30 |
| E1 | 3.70 | 4.10 |
| e | 1.27 | |
| L | 0.35 | 0.89 |
| θ | 0° | 8° |



5.3、TSSOP16



| Symbol | Dimensions (mm) | |
|----------|-----------------|------|
| | 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 |
| 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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