

74HC4094-Q100; 74HCT4094-Q100

8-stage shift-and-store bus register

Rev. 3 — 22 October 2021

Product data sheet

1. General description

The 74HC4094-Q100; 74HCT4094-Q100 is an 8-bit serial-in/serial or parallel-out shift register with a storage register and 3-state outputs. Both the shift and storage register have separate clocks. The device features a serial input (D) and two serial outputs (QS1 and QS2) to enable cascading. Data is shifted on the LOW-to-HIGH transitions of the CP input. Data is available at QS1 on the LOW-to-HIGH transitions of the CP input to allow cascading when clock edges are fast. The same data is available at QS2 on the next HIGH-to-LOW transition of the CP input to allow cascading when clock edges are slow. The data in the shift register is transferred to the storage register when the STR input is HIGH. Data in the storage register appears at the outputs whenever the output enable input (OE) is HIGH. A LOW on OE causes the outputs to assume a high-impedance OFF-state. Operation of the OE input does not affect the state of the registers. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Complies with JEDEC standard JESD7A
- Input levels:
 - For 74HC4094-Q100: CMOS level
 - For 74HCT4094-Q100: TTL level
- Low-power dissipation
- ESD protection:
 - MIL-STD-883, method 3015 exceeds 2000 V
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V (C = 200 pF; R = 0 Ω)

3. Applications

- Serial-to-parallel data conversion
- Remote control holding register

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-----------------|-------------------|---------|--|----------|
| | Temperature range | Name | Description | Version |
| 74HC4094D-Q100 | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT4094D-Q100 | | | | |
| 74HC4094PW-Q100 | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

5. Functional diagram

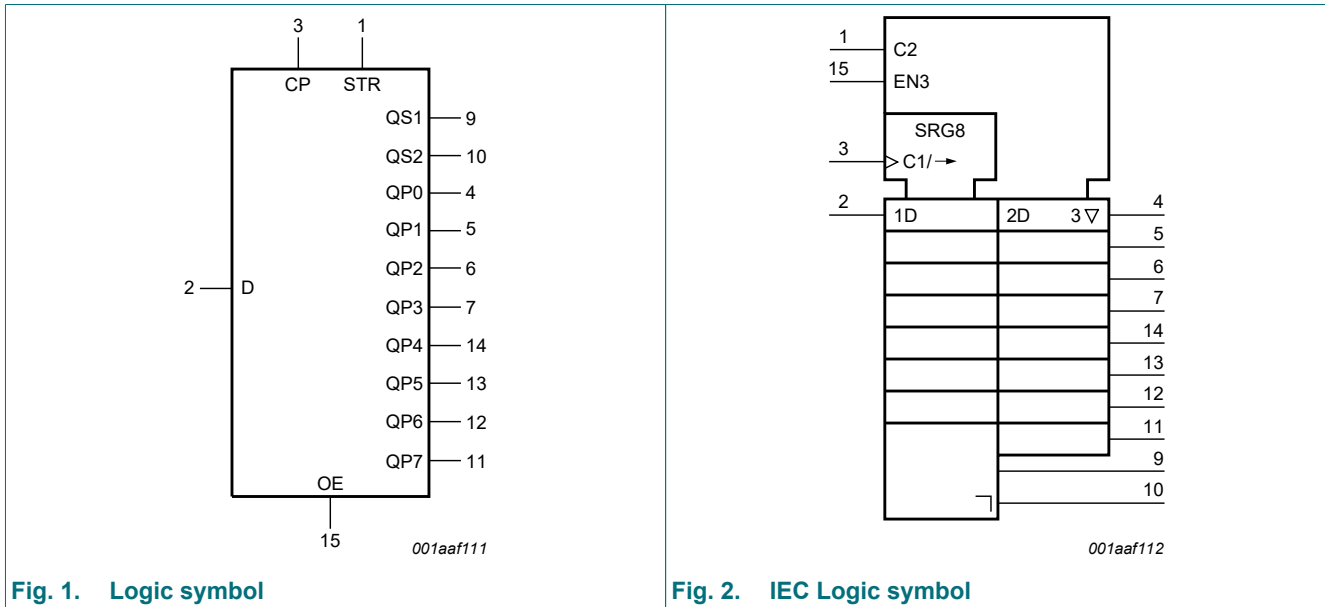


Fig. 1. Logic symbol

Fig. 2. IEC Logic symbol

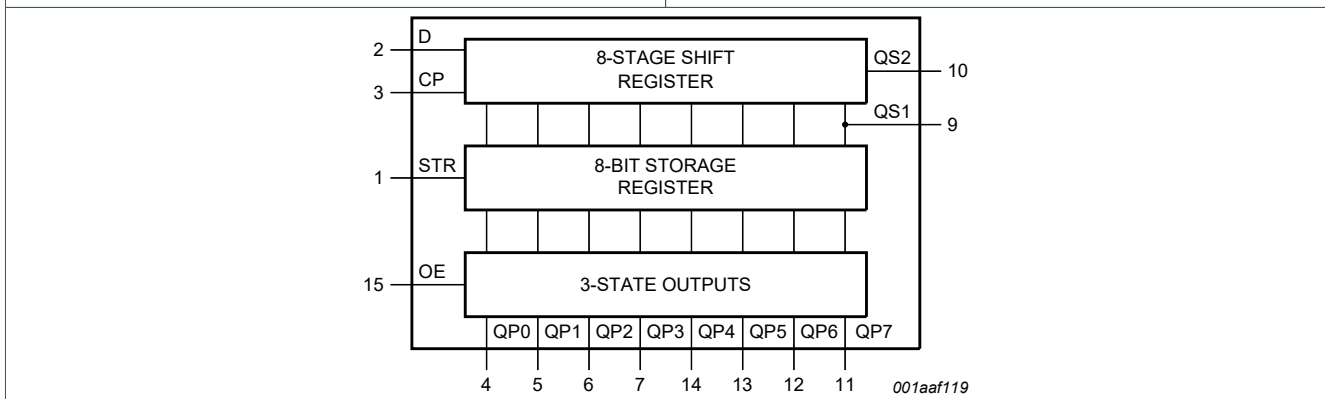


Fig. 3. Functional diagram

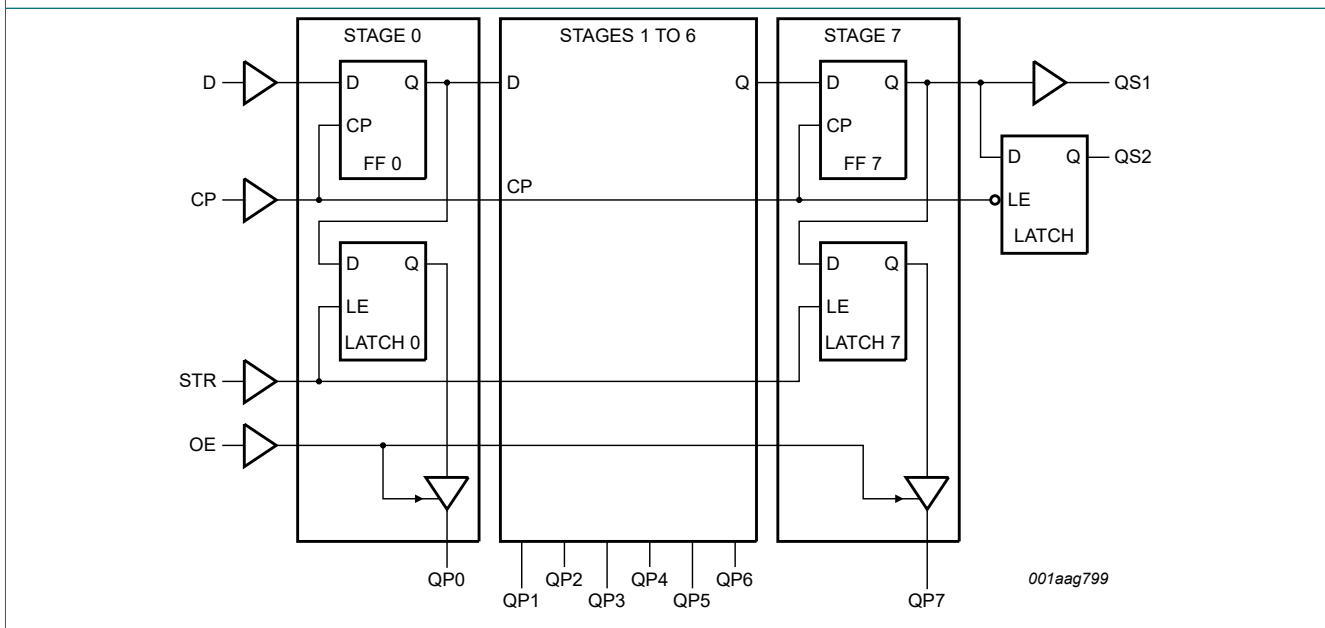


Fig. 4. Logic diagram

6. Pinning information

6.1. Pinning

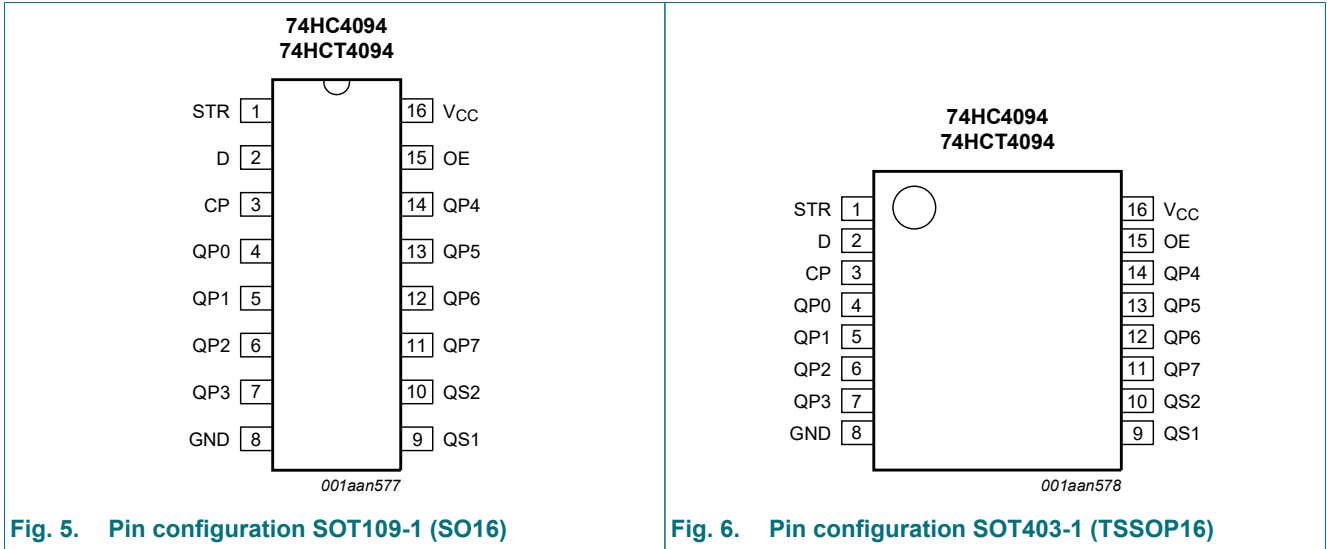


Fig. 5. Pin configuration SOT109-1 (SO16)

Fig. 6. Pin configuration SOT403-1 (TSSOP16)

6.2. Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|----------------------------|-----------------------|
| STR | 1 | strobe input |
| D | 2 | data input |
| CP | 3 | clock input |
| QP0 to QP7 | 4, 5, 6, 7, 14, 13, 12, 11 | parallel output |
| GND | 8 | ground supply voltage |
| QS1, QS2 | 9, 10 | serial output |
| OE | 15 | output enable input |
| V _{CC} | 16 | supply voltage |

7. Functional description

Table 3. Function table

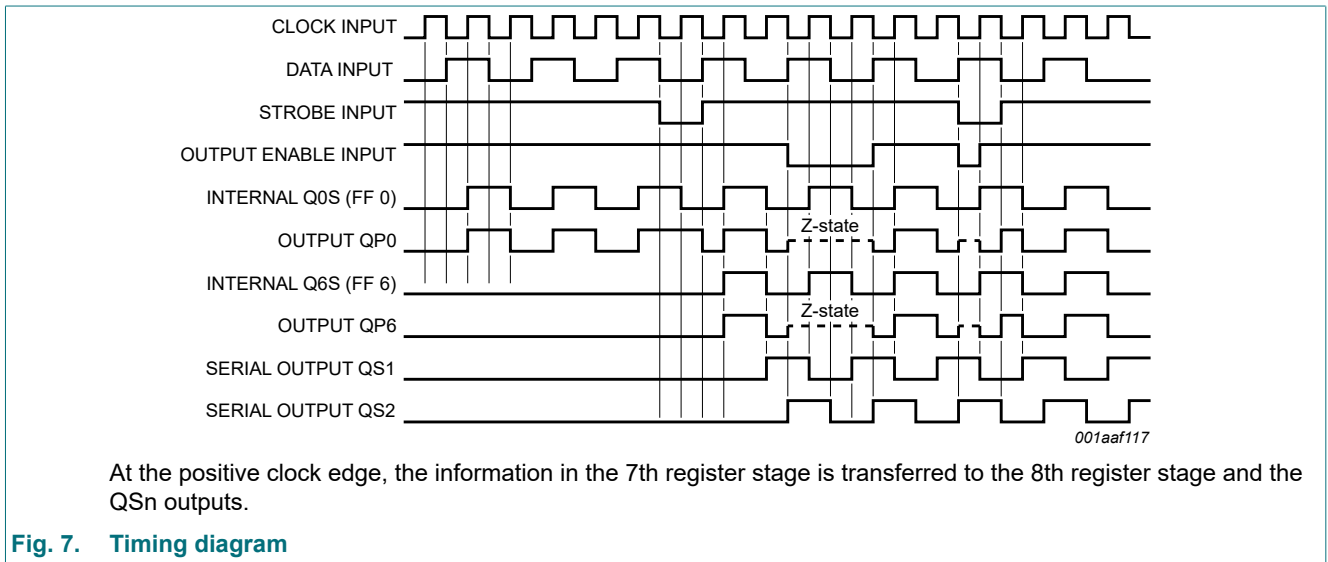
H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = HIGH-impedance OFF-state; NC = no change;

↑ = positive-going transition; ↓ = negative-going transition;

Q6S = the data in register stage 6 before the LOW to HIGH clock transition;

Q7S = the data in register stage 7 before the HIGH to LOW clock transition.

| Inputs | | | | Parallel outputs | | Serial outputs | |
|--------|----|-----|---|------------------|---------|----------------|-----|
| CP | OE | STR | D | QP0 | QPn | QS1 | QS2 |
| ↑ | L | X | X | Z | Z | Q6S | NC |
| ↓ | L | X | X | Z | Z | NC | Q7S |
| ↑ | H | L | X | NC | NC | Q6S | NC |
| ↑ | H | H | L | L | QPn - 1 | Q6S | NC |
| ↑ | H | H | H | H | QPn - 1 | Q6S | NC |
| ↓ | H | H | H | NC | NC | NC | Q7S |



8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|--|------|----------|------|
| V_{CC} | supply voltage | | -0.5 | +7 | V |
| I_{IK} | input clamping current | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ | - | ± 20 | mA |
| I_{OK} | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ | - | ± 20 | mA |
| I_O | output current | $V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$ | - | ± 25 | mA |
| I_{CC} | supply current | | - | +50 | mA |
| I_{GND} | ground current | | - | -50 | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | [1] | - | 500 | mW |

- [1] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.
 For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol | Parameter | Conditions | 74HC4094-Q100 | | | 74HCT4094-Q100 | | | Unit |
|---------------------|-------------------------------------|-------------------------|---------------|------|----------|----------------|------|----------|------|
| | | | Min | Typ | Max | Min | Typ | Max | |
| V_{CC} | supply voltage | | 2.0 | 5.0 | 6.0 | 4.5 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | V_{CC} | 0 | - | V_{CC} | V |
| V_O | output voltage | | 0 | - | V_{CC} | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | +25 | +125 | -40 | +25 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | - | - | 625 | - | - | - | ns/V |
| | | $V_{CC} = 4.5\text{ V}$ | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | $V_{CC} = 6.0\text{ V}$ | - | - | 83 | - | - | - | ns/V |

10. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---------------------------|--|-------|------|------|------------------|------|-------------------|-------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC4094-Q100 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 2.0 V | 1.5 | 1.2 | - | 1.5 | - | 1.5 | - | V |
| | | V _{CC} = 4.5 V | 3.15 | 2.4 | - | 3.15 | - | 3.15 | - | V |
| | | V _{CC} = 6.0 V | 4.2 | 3.2 | - | 4.2 | - | 4.2 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 2.0 V | - | 0.8 | 0.5 | - | 0.5 | - | 0.5 | V |
| | | V _{CC} = 4.5 V | - | 2.1 | 1.35 | - | 1.35 | - | 1.35 | V |
| | | V _{CC} = 6.0 V | - | 2.8 | 1.8 | - | 1.8 | - | 1.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = -20 μA; V _{CC} = 2.0 V | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | I _O = -20 μA; V _{CC} = 4.5 V | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -20 μA; V _{CC} = 6.0 V | 5.9 | 6.0 | - | 5.9 | - | 5.9 | - | V |
| | | I _O = -4.0 mA; V _{CC} = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| I _O = -5.2 mA; V _{CC} = 6.0 V | 5.48 | 5.81 | - | 5.34 | - | 5.2 | - | V | | |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 20 μA; V _{CC} = 2.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 4.5 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 20 μA; V _{CC} = 6.0 V | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _O = 5.2 mA; V _{CC} = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V | | |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.5 | - | ±5.0 | - | ±10.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V | - | - | 8.0 | - | 80 | - | 160 | μA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-----------------------|---------------------------|--|-------|------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HCT4094-Q100 | | | | | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 4.5 V to 5.5 V | 2.0 | 1.6 | - | 2.0 | - | 2.0 | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 4.5 V to 5.5 V | - | 1.2 | 0.8 | - | 0.8 | - | 0.8 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = -20 µA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | I _O = -4.0 mA | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V | | | | | | | | |
| | | I _O = 20 µA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | I _O = 4.0 mA | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | µA |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V | - | - | ±0.5 | - | ±5.0 | - | ±10 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 8.0 | - | 80 | - | 160 | µA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A | | | | | | | | |
| | | per input pin; STR input | - | 100 | 360 | - | 450 | - | 490 | µA |
| | | per input pin; OE input | - | 150 | 540 | - | 675 | - | 735 | µA |
| | | per input pin; CP input | - | 150 | 540 | - | 675 | - | 735 | µA |
| | | per input pin; D input | - | 40 | 144 | - | 180 | - | 196 | µA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

11. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see Fig. 12.

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-------------------------------|-------------------|-------------------------------|-------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC4094-Q100 | | | | | | | | | | |
| t_{pd} | propagation delay | CP to QS1; see Fig. 8 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 50 | 150 | - | 190 | - | 225 | ns |
| | | $V_{CC} = 4.5$ V | - | 18 | 30 | - | 38 | - | 45 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 15 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 14 | 26 | - | 33 | - | 38 | ns |
| | | CP to QS2; see Fig. 8 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 44 | 135 | - | 170 | - | 205 | ns |
| | | $V_{CC} = 4.5$ V | - | 16 | 27 | - | 34 | - | 41 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 13 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 13 | 23 | - | 29 | - | 35 | ns |
| | | CP to QPn; see Fig. 8 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 63 | 195 | - | 245 | - | 295 | ns |
| | | $V_{CC} = 4.5$ V | - | 23 | 39 | - | 49 | - | 59 | ns |
| | | $V_{CC} = 5$ V; $C_L = 15$ pF | - | 20 | - | - | - | - | - | ns |
| | | $V_{CC} = 6.0$ V | - | 18 | 33 | - | 42 | - | 50 | ns |
| | | STR to QPn; see Fig. 9 [1] | | | | | | | | |
| $V_{CC} = 2.0$ V | - | 58 | 180 | - | 225 | - | 270 | ns | | |
| $V_{CC} = 4.5$ V | - | 21 | 36 | - | 45 | - | 54 | ns | | |
| $V_{CC} = 5$ V; $C_L = 15$ pF | - | 18 | - | - | - | - | - | ns | | |
| $V_{CC} = 6.0$ V | - | 17 | 31 | - | 38 | - | 46 | ns | | |
| t_{en} | enable time | OE to QPn; see Fig. 10 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 55 | 175 | - | 220 | - | 265 | ns |
| | | $V_{CC} = 4.5$ V | - | 20 | 35 | - | 44 | - | 53 | ns |
| | | $V_{CC} = 6.0$ V | - | 16 | 30 | - | 37 | - | 45 | ns |
| t_{dis} | disable time | OE to QPn; see Fig. 10 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 41 | 125 | - | 155 | - | 190 | ns |
| | | $V_{CC} = 4.5$ V | - | 15 | 25 | - | 31 | - | 38 | ns |
| | | $V_{CC} = 6.0$ V | - | 12 | 21 | - | 26 | - | 32 | ns |
| t_t | transition time | QPn and QSn; see Fig. 8 [1] | | | | | | | | |
| | | $V_{CC} = 2.0$ V | - | 19 | 75 | - | 95 | - | 110 | ns |
| | | $V_{CC} = 4.5$ V | - | 7 | 15 | - | 19 | - | 22 | ns |
| | | $V_{CC} = 6.0$ V | - | 6 | 13 | - | 16 | - | 19 | ns |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-------------------------|-------------------------------|--|-------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _w | pulse width | CP HIGH or LOW; see Fig. 8 | | | | | | | | |
| | | V _{CC} = 2.0 V | 80 | 14 | - | 100 | - | 120 | - | ns |
| | | V _{CC} = 4.5 V | 16 | 5 | - | 20 | - | 24 | - | ns |
| | | V _{CC} = 6.0 V | 14 | 4 | - | 17 | - | 20 | - | ns |
| | | STR HIGH; see Fig. 9 | | | | | | | | |
| | | V _{CC} = 2.0 V | 80 | 14 | - | 100 | - | 120 | - | ns |
| | | V _{CC} = 4.5 V | 16 | 5 | - | 20 | - | 24 | - | ns |
| V _{CC} = 6.0 V | 14 | 4 | - | 17 | - | 20 | - | ns | | |
| t _{su} | set-up time | D to CP; see Fig. 11 | | | | | | | | |
| | | V _{CC} = 2.0 V | 50 | 14 | - | 65 | - | 75 | - | ns |
| | | V _{CC} = 4.5 V | 10 | 5 | - | 13 | - | 15 | - | ns |
| | | V _{CC} = 6.0 V | 9 | 4 | - | 11 | - | 13 | - | ns |
| | | CP to STR; see Fig. 9 | | | | | | | | |
| | | V _{CC} = 2.0 V | 100 | 28 | - | 125 | - | 150 | - | ns |
| | | V _{CC} = 4.5 V | 20 | 10 | - | 25 | - | 30 | - | ns |
| V _{CC} = 6.0 V | 17 | 8 | - | 21 | - | 26 | - | ns | | |
| t _h | hold time | D to CP; see Fig. 11 | | | | | | | | |
| | | V _{CC} = 2.0 V | 3 | -6 | - | 3 | - | 3 | - | ns |
| | | V _{CC} = 4.5 V | 3 | -2 | - | 3 | - | 3 | - | ns |
| | | V _{CC} = 6.0 V | 3 | -2 | - | 3 | - | 3 | - | ns |
| | | CP to STR; see Fig. 9 | | | | | | | | |
| | | V _{CC} = 2.0 V | 0 | -14 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 4.5 V | 0 | -5 | - | 0 | - | 0 | - | ns |
| V _{CC} = 6.0 V | 0 | -4 | - | 0 | - | 0 | - | ns | | |
| f _{max} | maximum frequency | CP; see Fig. 8 | | | | | | | | |
| | | V _{CC} = 2.0 V | 6.0 | 28 | - | 4.8 | - | 4.0 | - | MHz |
| | | V _{CC} = 4.5 V | 30 | 87 | - | 24 | - | 20 | - | MHz |
| | | V _{CC} = 5 V; C _L = 15 pF | - | 95 | - | - | - | - | - | MHz |
| | | V _{CC} = 6.0 V | 35 | 103 | - | 28 | - | 24 | - | MHz |
| C _{PD} | power dissipation capacitance | C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} [2] | - | 83 | - | - | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|-------------------------------|--|-------|-----|-----|------------------|-----|-------------------|-----|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HCT4094-Q100 | | | | | | | | | | |
| t _{pd} | propagation delay | CP to QS1; see Fig. 8 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 23 | 39 | - | 49 | - | 59 | ns |
| | | V _{CC} = 5 V; C _L = 15 pF | - | 19 | - | - | - | - | - | ns |
| | | CP to QS2; see Fig. 8 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 21 | 36 | - | 45 | - | 54 | ns |
| | | V _{CC} = 5 V; C _L = 15 pF | - | 18 | - | - | - | - | - | ns |
| | | CP to QPn; see Fig. 8 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 25 | 43 | - | 54 | - | 65 | ns |
| | | V _{CC} = 5 V; C _L = 15 pF | - | 21 | - | - | - | - | - | ns |
| | | STR to QPn; see Fig. 9 [1] | | | | | | | | |
| V _{CC} = 4.5 V | - | 22 | 39 | - | 49 | - | 59 | ns | | |
| V _{CC} = 5 V; C _L = 15 pF | - | 19 | - | - | - | - | - | ns | | |
| t _{en} | enable time | OE to QPn; see Fig. 10 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 20 | 35 | - | 44 | - | 53 | ns |
| t _{dis} | disable time | OE to QPn; see Fig. 10 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 21 | 35 | - | 44 | - | 53 | ns |
| t _t | transition time | QPn and QSn; see Fig. 8 [1] | | | | | | | | |
| | | V _{CC} = 4.5 V | - | 7 | 15 | - | 19 | - | 22 | ns |
| t _w | pulse width | CP HIGH or LOW; see Fig. 8 | | | | | | | | |
| | | V _{CC} = 4.5 V | 16 | 7 | - | 20 | - | 24 | - | ns |
| | | STR HIGH; see Fig. 9 | | | | | | | | |
| V _{CC} = 4.5 V | 16 | 5 | - | 20 | - | 24 | - | ns | | |
| t _{su} | set-up time | Dn to CP; see Fig. 11 | | | | | | | | |
| | | V _{CC} = 4.5 V | 10 | 4 | - | 13 | - | 15 | - | ns |
| | | CP to STR; see Fig. 9 | | | | | | | | |
| V _{CC} = 4.5 V | 20 | 9 | - | 25 | - | 30 | - | ns | | |
| t _h | hold time | Dn to CP; see Fig. 11 | | | | | | | | |
| | | V _{CC} = 4.5 V | 4 | 0 | - | 4 | - | 4 | - | ns |
| | | CP to STR; see Fig. 9 | | | | | | | | |
| V _{CC} = 4.5 V | 0 | -4 | - | 0 | - | 0 | - | ns | | |
| f _{max} | maximum frequency | CP; see Fig. 8 | | | | | | | | |
| | | V _{CC} = 4.5 V | 30 | 80 | - | 24 | - | 20 | - | MHz |
| | | V _{CC} = 5 V; C _L = 15 pF | - | 86 | - | - | - | - | - | MHz |
| C _{PD} | power dissipation capacitance | C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC} - 1.5 V [2] | - | 92 | - | - | - | - | - | pF |

[1] t_{pd} is the same as t_{PLH} and t_{PHL}; t_{en} is the same as t_{PZH} and t_{PZL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}; t_t is the same as t_{THL} and t_{TLH}.

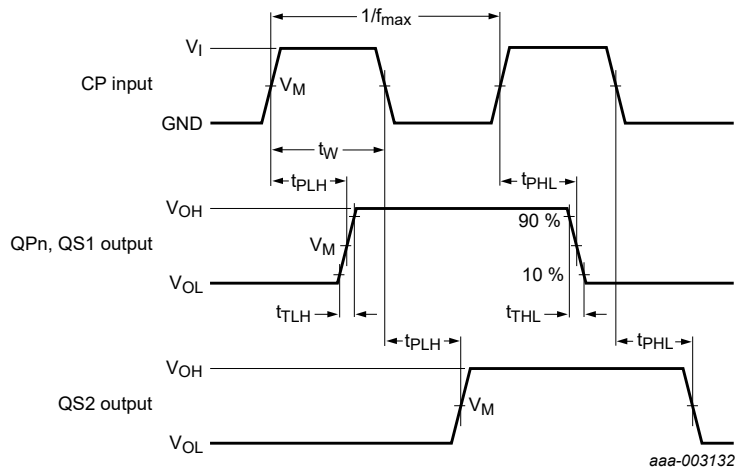
[2] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f_i = input frequency in MHz; f_o = output frequency in MHz; C_L = output load capacitance in pF;

V_{CC} = supply voltage in V; N = number of inputs switching; $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

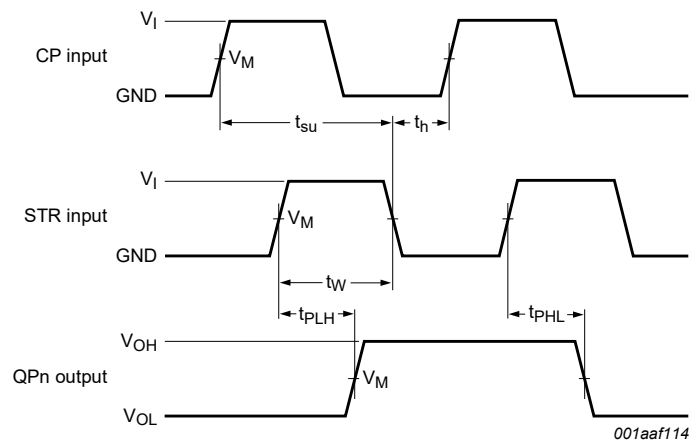
11.1. Waveforms and test circuits



Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

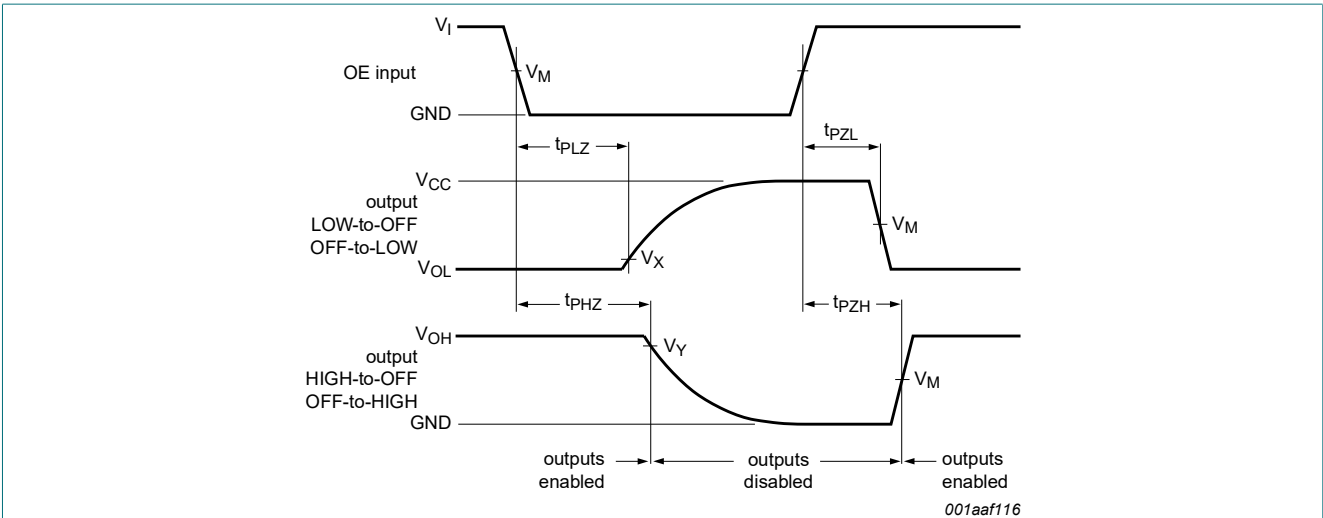
Fig. 8. Propagation delay input (CP) to output (QPn, QS1, QS2), output transition time, clock input (CP) pulse width and the maximum frequency (CP)



Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

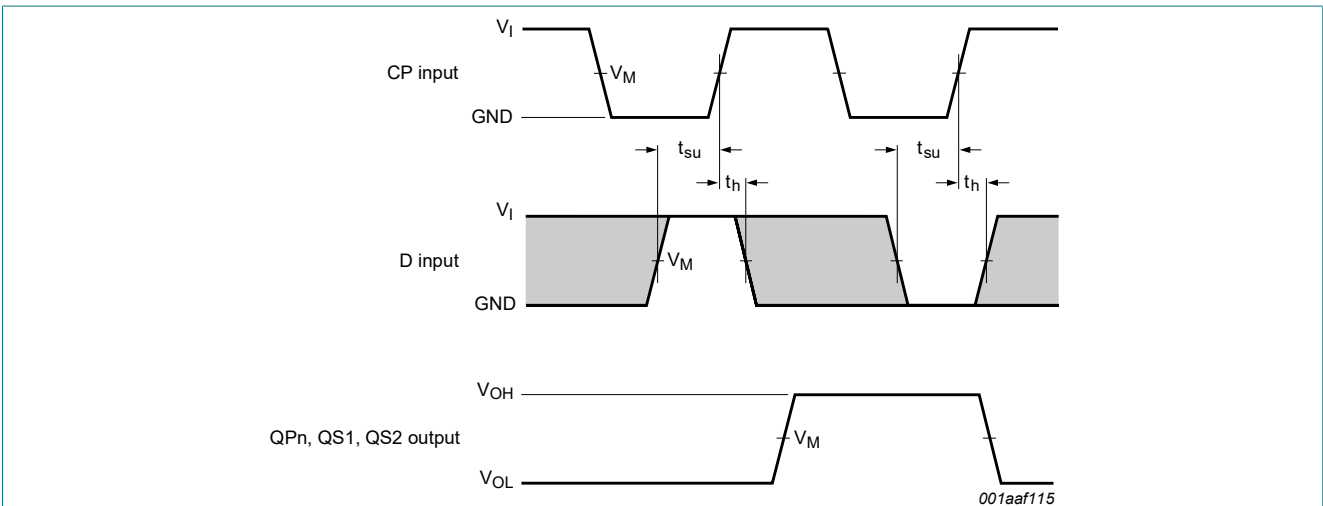
Fig. 9. Propagation delay strobe input (STR) to output (QPn), strobe input (STR) pulse width and the clock set-up and hold times for strobe input



Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 10. Enable and disable times



Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig. 11. The data input (D) to clock input (CP) set-up times and clock input (CP) to data input (D) hold times

Table 8. Measurement points

| Type | Input | Output | | |
|----------------|-------------|-------------|-------------|-------------|
| | V_M | V_M | V_X | V_Y |
| 74HC4094-Q100 | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{OH}$ | $0.9V_{OH}$ |
| 74HCT4094-Q100 | 1.3 V | 1.3 V | $0.1V_{OH}$ | $0.9V_{OH}$ |

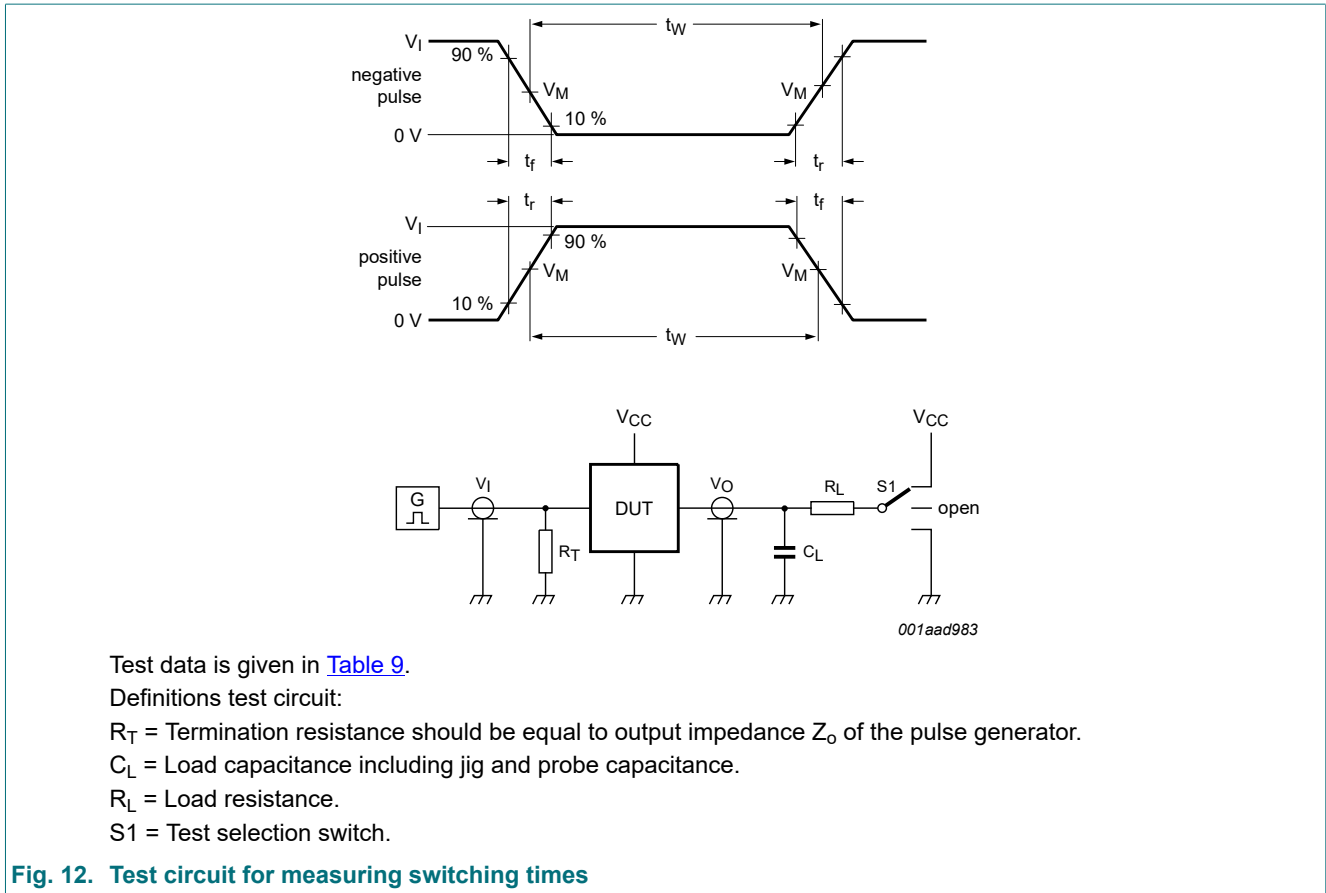


Fig. 12. Test circuit for measuring switching times

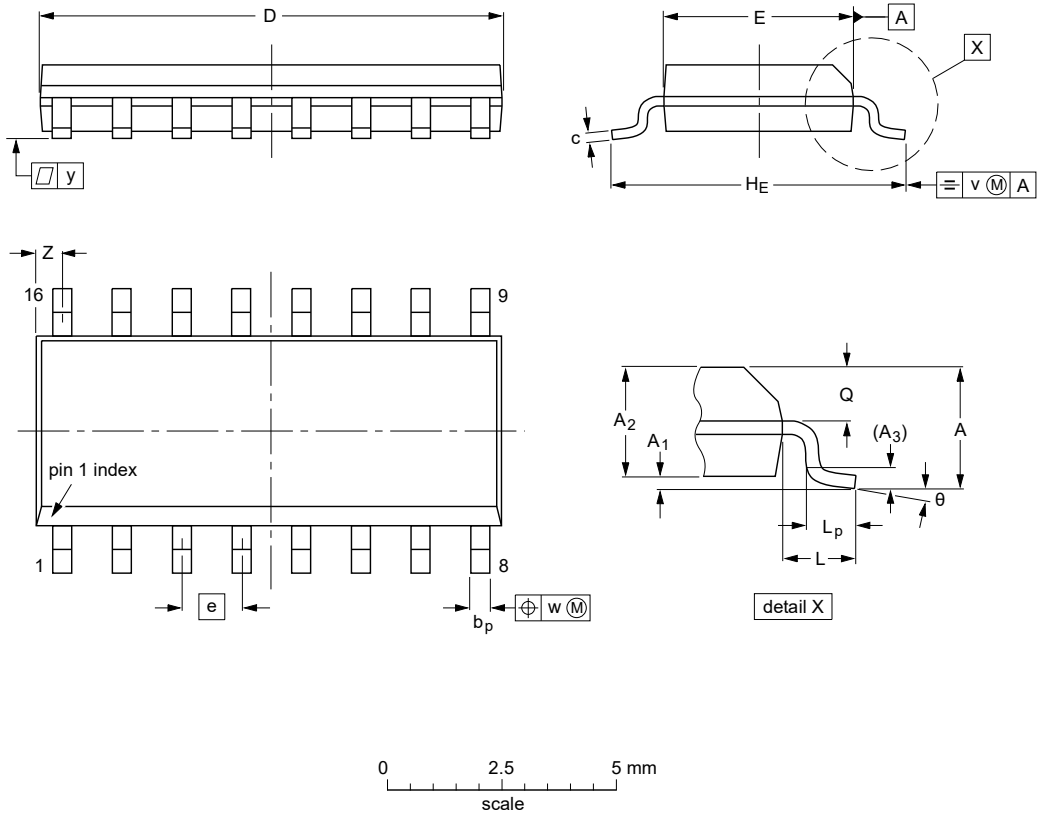
Table 9. Test data

| Type | Input | | Load | | S1 position | | |
|----------------|----------|------------|--------------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PHL}, t_{PLH} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| 74HC4094-Q100 | V_{CC} | 6 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT4094-Q100 | 3 V | 6 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|------------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 1.75 | 0.25 0.10 | 1.45 1.25 | 0.25 | 0.49 0.36 | 0.25 0.19 | 10.0 9.8 | 4.0 3.8 | 1.27 | 6.2 5.8 | 1.05 | 1.0 0.4 | 0.7 0.6 | 0.25 | 0.25 | 0.1 | 0.7 0.3 | 8° 0° |
| inches | 0.069 | 0.010 0.004 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0100 0.0075 | 0.39 0.38 | 0.16 0.15 | 0.05 | 0.244 0.228 | 0.041 | 0.039 0.016 | 0.028 0.020 | 0.01 | 0.01 | 0.004 | 0.028 0.012 | |

Note

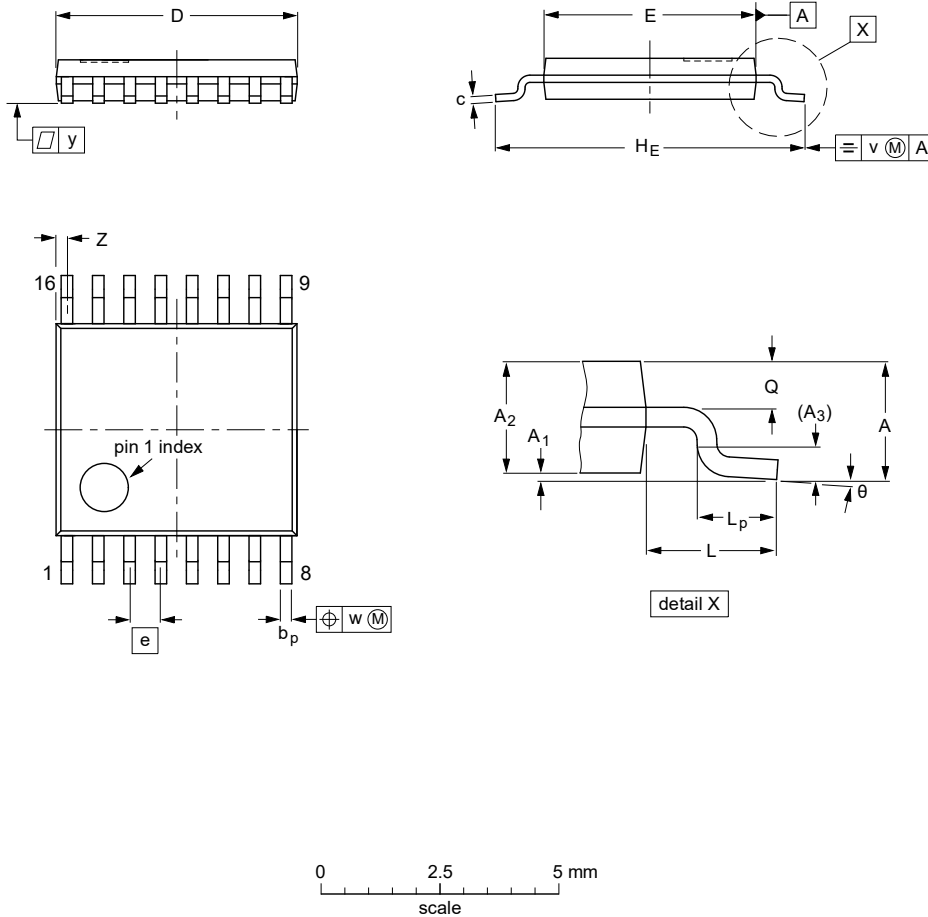
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT109-1 | 076E07 | MS-012 | | | | 99-12-27 03-02-19 |

Fig. 13. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.1 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 5.1 4.9 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.40 0.06 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT403-1 | | MO-153 | | | | -99-12-27 03-02-18 |

Fig. 14. Package outline SOT403-1 (TSSOP16)

13. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MIL | Military |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------------|---|--------------------|---------------|-----------------------|
| 74HC_HCT4094_Q100 v.3 | 20211022 | Product data sheet | - | 74HC_HCT4094_Q100 v.2 |
| Modifications: | <ul style="list-style-type: none"> Type numbers 74HC4094DB-Q100 and 74HCT4094DB-Q100 (SOT338-1/SSOP16) removed. Section 8: Derating values for P_{tot} total power dissipation updated. | | | |
| 74HC_HCT4094_Q100 v.2 | 20181114 | Product data sheet | - | 74HC_HCT4094_Q100 v.1 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Fig. 4 and Fig. 7 corrected. | | | |
| 74HC_HCT4094_Q100 v.1 | 20130130 | Product data sheet | - | - |

15. Legal information

Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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