# 74HC4024

## 7-stage binary ripple counter

Rev. 9 — 28 April 2016 Product data sheet

## 1. General description

The 74HC4024 is a 7-stage binary ripple counter with a clock input ($\overline{CP}$), an overriding asynchronous master reset input (MR) and seven fully buffered parallel outputs (Q0 to Q6). The counter advances on the HIGH-to-LOW transition of $\overline{CP}$. A HIGH on MR clears all counter stages and forces all outputs LOW, independent of the state of $\overline{CP}$. Each counter stage is a static toggle flip-flop. Schmitt-trigger action in the clock input makes the circuit highly tolerant to slower clock rise and fall times. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of $V_{CC}$.

## 2. Features and benefits

- Low-power dissipation
- Complies with JEDEC standard no. 7A
- CMOS input levels
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V.
- Multiple package options
- Specified from –40 °C to +80 °C and from –40 °C to +125 °C.

## 3. Applications

- Frequency dividing circuits
- Time delay circuits.

## 4. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC4024D | –40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74HC4024PW | –40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |

## 5. Functional diagram

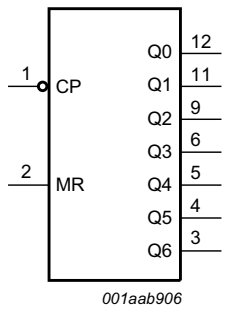



**Fig 1. Logic symbol**

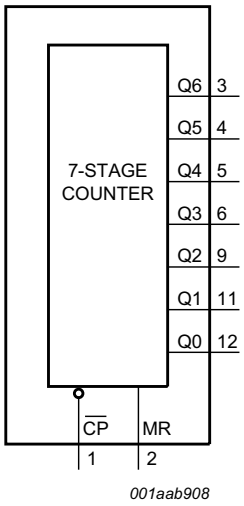



**Fig 2. Functional diagram**

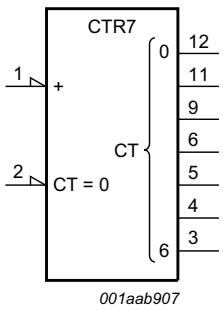



**Fig 3. IEC logic symbol**

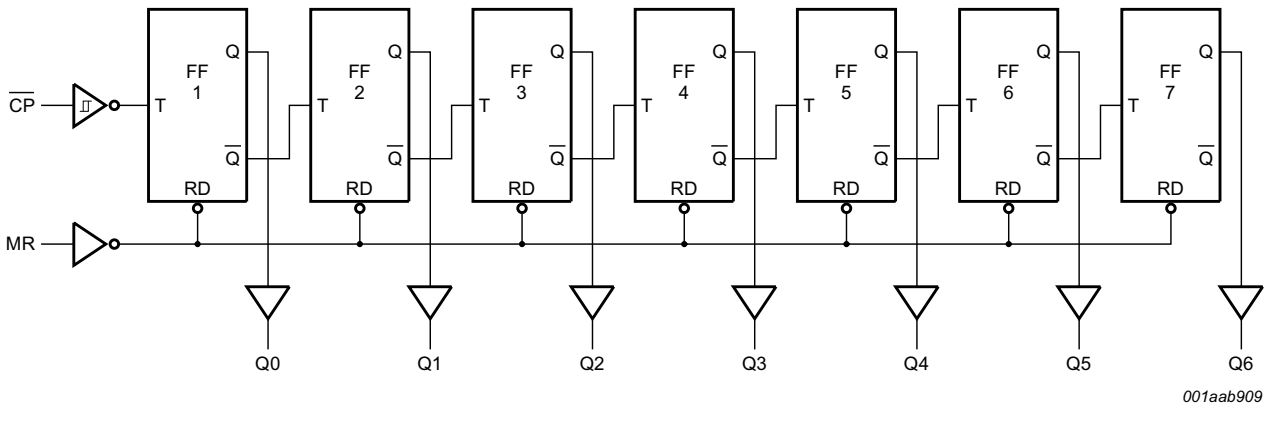



**Fig 4. Logic diagram**

# 6. Pinning information

## 6.1 Pinning

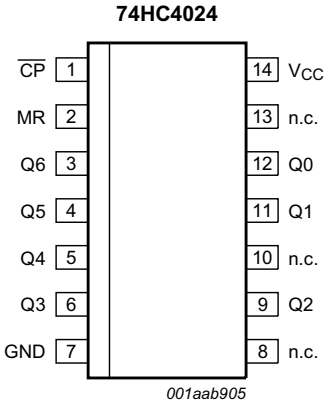



**Fig 5. Pin configuration**

## 6.2 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| $\overline{CP}$ | 1 | clock input (HIGH-to-LOW, edge-triggered) |
| MR | 2 | master reset input (active HIGH) |
| Q6, Q5, Q4, Q3, Q2, Q2, Q1, Q0 | 3, 4, 5, 6, 9, 11, 12 | parallel output |
| GND | 7 | ground (0 V) |
| n.c. | 8, 10, 13 | not connected |
| $V_{CC}$ | 14 | positive supply voltage |

# 7. Functional description

**Table 3. Function table[1]**

| Input | | Output |
|---|---|---|
| **MR** | **$\overline{CP}$** | **Qn** |
| H | X | L |
| L | ↑ | no change |
| | ↓ | count |

[1] H = HIGH voltage level;
L = LOW voltage level;
X = don't care;
↑ = LOW-to-HIGH clock transition;
↓ = HIGH-to-LOW clock transition.

# 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 | $V_I < –0.5$ V or $V_I > V_{CC} + 0.5$ V | - | ±20 | mA |
| $I_{OK}$ | output clamping current | $V_O < –0.5$ V or $V_O > V_{CC} + 0.5$ V | - | ±20 | mA |
| $I_O$ | output current | $V_O = –0.5$ V to $V_{CC} + 0.5$ 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 | SO14 package [1] | - | 500 | mW |
| | | TSSOP14 package [2] | - | 500 | mW |

[1] For SO16 package: $P_{tot}$ derates linearly with 8 mW/K above 70 °C.

[2] For TSSOP16 package: $P_{tot}$ derates linearly with 5.5 mW/K above 60 °C.

# 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

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

## 10. Static characteristics

**Table 6. Static characteristics**

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | 1.2 | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | 2.4 | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | 3.2 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | 0.8 | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | 2.1 | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | 2.8 | 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 | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 4.5 V | 4.4 | 4.5 | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 6.0 V | 5.9 | 6.0 | - | V |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.98 | 4.32 | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 5.48 | 5.81 | - | 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 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 4.5 V | - | 0 | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 6.0 V | - | 0 | 0.1 | V |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | 0.15 | 0.26 | V |
| | | $I_O$ = 5.2 mA; $V_{CC}$ = 6.0 V | - | 0.16 | 0.26 | V |
| $I_I$ | input leakage current | $V_I$ = $V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±0.1 | μA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 8.0 | μA |
| $C_I$ | input capacitance | | - | 3.5 | - | pF |
| **$T_{amb}$ = –40 °C to +85 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | - | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | - | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | - | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | - | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | - | 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 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 4.5 V | 4.4 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 6.0 V | 5.9 | - | - | V |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.84 | - | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 5.34 | - | - | V |

**Table 6. Static characteristics** *…continued*

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 20 μA; $V_{CC}$ = 2.0 V | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 4.5 V | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 6.0 V | - | - | 0.1 | V |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | - | 0.33 | V |
| | | $I_O$ = 5.2 mA; $V_{CC}$ = 6.0 V | - | - | 0.33 | V |
| $I_I$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±1.0 | μA |
| $I_{CC}$ | supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 80 | μA |
| **$T_{amb}$ = –40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | 1.5 | - | - | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | - | - | V |
| | | $V_{CC}$ = 6.0 V | 4.2 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | - | - | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | - | - | 1.35 | V |
| | | $V_{CC}$ = 6.0 V | - | - | 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 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 4.5 V | 4.4 | - | - | V |
| | | $I_O$ = –20 μA; $V_{CC}$ = 6.0 V | 5.9 | - | - | V |
| | | $I_O$ = –4 mA; $V_{CC}$ = 4.5 V | 3.7 | - | - | V |
| | | $I_O$ = –5.2 mA; $V_{CC}$ = 6.0 V | 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 | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 4.5 V | - | - | 0.1 | V |
| | | $I_O$ = 20 μA; $V_{CC}$ = 6.0 V | - | - | 0.1 | V |
| | | $I_O$ = 4 mA; $V_{CC}$ = 4.5 V | - | - | 0.4 | V |
| | | $I_O$ = 5.2 mA; $V_{CC}$ = 6.0 V | - | - | 0.4 | V |
| $I_I$ | input leakage current | $V_I = V_{CC}$ or GND; $V_{CC}$ = 6.0 V | - | - | ±1.0 | μA |
| $I_{CC}$ | supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 160 | μA |

## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; for test circuit see Figure 7.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | 47 | 175 | ns |
| | | $V_{CC}$ = 4.5 V | - | 17 | 35 | ns |
| | | $V_{CC}$ = 6.0 V | - | 14 | 30 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 14 | - | ns |
| | | Qn to Qn+1; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | 25 | 80 | ns |
| | | $V_{CC}$ = 4.5 V | - | 9 | 16 | ns |
| | | $V_{CC}$ = 6.0 V | - | 7 | 14 | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Q0; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | 63 | 200 | ns |
| | | $V_{CC}$ = 4.5 V | - | 23 | 40 | ns |
| | | $V_{CC}$ = 6.0 V | - | 18 | 34 | ns |
| $t_t$ | transition time | see Figure 6 [2] | | | | |
| | | $V_{CC}$ = 2.0 V | - | 19 | 75 | ns |
| | | $V_{CC}$ = 4.5 V | - | 7 | 15 | ns |
| | | $V_{CC}$ = 6.0 V | - | 6 | 13 | ns |
| $t_W$ | pulse width | $\overline{CP}$ HIGH or LOW; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 17 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 6 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 5 | - | ns |
| | | MR HIGH; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 22 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 8 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 6 | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 50 | 6 | - | ns |
| | | $V_{CC}$ = 4.5 V | 10 | 2 | - | ns |
| | | $V_{CC}$ = 6.0 V | 9 | 2 | - | ns |
| $f_{max}$ | maximum frequency | CP; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 6.0 | 27 | - | MHz |
| | | $V_{CC}$ = 4.5 V | 30 | 82 | - | MHz |
| | | $V_{CC}$ = 6.0 V | 35 | 98 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 90 | - | MHz |
| $C_{PD}$ | power dissipation capacitance | $V_I$ = GND to $V_{CC}$ [3] | - | 25 | - | pF |

**Table 7. Dynamic characteristics** *...continued*

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; for test circuit see Figure 7.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = –40 °C to +85 °C** | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 220 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 44 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 37 | ns |
| | | Qn to Qn+1; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 100 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 20 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 17 | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Q0; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 250 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 50 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 43 | ns |
| $t_t$ | transition time | see Figure 6 [2] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 95 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 19 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 16 | ns |
| $t_W$ | pulse width | $\overline{CP}$ HIGH or LOW; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 100 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 20 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 17 | - | - | ns |
| | | MR HIGH; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 100 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 20 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 17 | - | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 65 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 13 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 11 | - | - | ns |
| $f_{max}$ | maximum frequency | CP; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 4.8 | - | - | MHz |
| | | $V_{CC}$ = 4.5 V | 24 | - | - | MHz |
| | | $V_{CC}$ = 6.0 V | 28 | - | - | MHz |

**Table 7. Dynamic characteristics** *...continued*

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; for test circuit see Figure 7.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = –40 °C to +125 °C** | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 265 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 53 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 45 | ns |
| | | Qn to Qn+1; see Figure 6 [1] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 120 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 24 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 20 | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Q0; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 300 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 60 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 51 | ns |
| $t_t$ | transition time | see Figure 6 [2] | | | | |
| | | $V_{CC}$ = 2.0 V | - | - | 110 | ns |
| | | $V_{CC}$ = 4.5 V | - | - | 22 | ns |
| | | $V_{CC}$ = 6.0 V | - | - | 19 | ns |
| $t_W$ | pulse width | $\overline{CP}$ HIGH or LOW; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 120 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 24 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 20 | - | - | ns |
| | | MR HIGH; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 120 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 24 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 20 | - | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 75 | - | - | ns |
| | | $V_{CC}$ = 4.5 V | 15 | - | - | ns |
| | | $V_{CC}$ = 6.0 V | 13 | - | - | ns |

**Table 7. Dynamic characteristics** *...continued*

*GND = 0 V; $t_r = t_f$ = 6 ns; $C_L$ = 50 pF; for test circuit see Figure 7.*

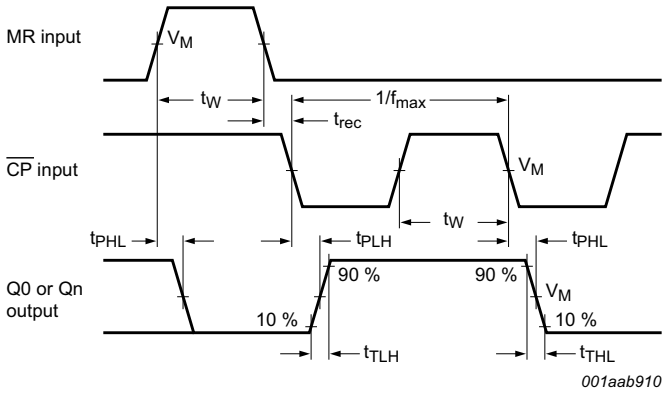
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $f_{max}$ | maximum frequency | CP; see Figure 6 | | | | |
| | | $V_{CC}$ = 2.0 V | 4.0 | - | - | MHz |
| | | $V_{CC}$ = 4.5 V | 20 | - | - | MHz |
| | | $V_{CC}$ = 6.0 V | 24 | - | - | MHz |

[1] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

[2] $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in μW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

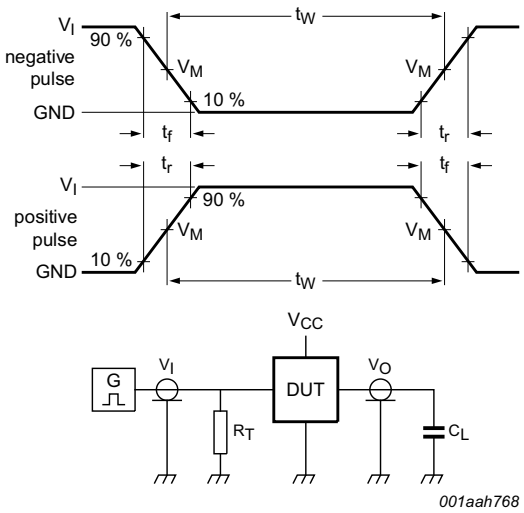
## 12. Waveforms




Also showing the master reset (MR) pulse width, the master reset to output (Qn) propagation delays and the master reset to clock ($\overline{CP}$) recovery time.

$V_M = 0.5 \times V_I$.

**Fig 6. Waveforms showing the clock ($\overline{CP}$) to output (Qn) propagation delays, the clock pulse width, the output transition times and the maximum clock frequency**




Test data is given in Table 8.

Definitions for test circuit:

$R_T$ = Termination resistance should be equal to output impedance $Z_o$ of the pulse generator.

$C_L$ = Load capacitance including jig and probe capacitance.

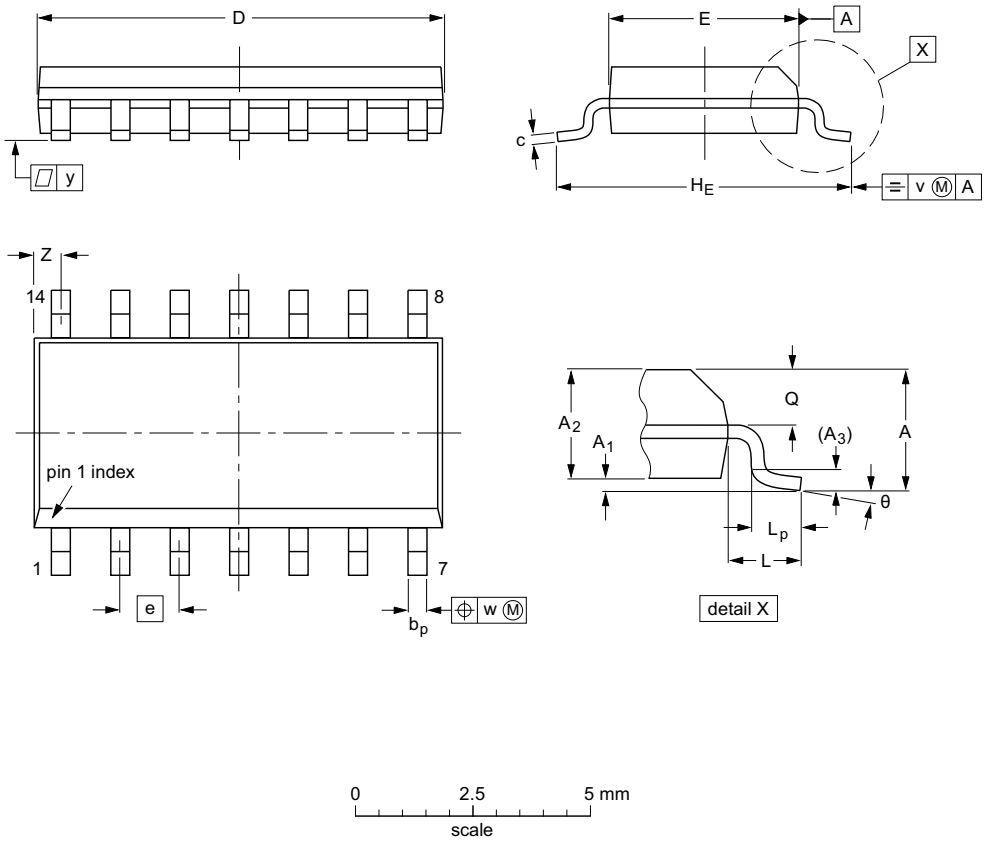
**Fig 7. Test circuit for measuring switching times**

**Table 8. Test data**

| Supply | Input | | Load |
|---|---|---|---|
| $V_{CC}$ | $V_I$ | $t_r$, $t_f$ | $C_L$ |
| 2.0 V | $V_{CC}$ | 6 ns | 50 pF |
| 4.5 V | $V_{CC}$ | 6 ns | 50 pF |
| 6.0 V | $V_{CC}$ | 6 ns | 50 pF |
| 5.0 V | $V_{CC}$ | 6 ns | 15 pF |

## 13. Package outline

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




**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<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | $8^o$<br>$0^o$ |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

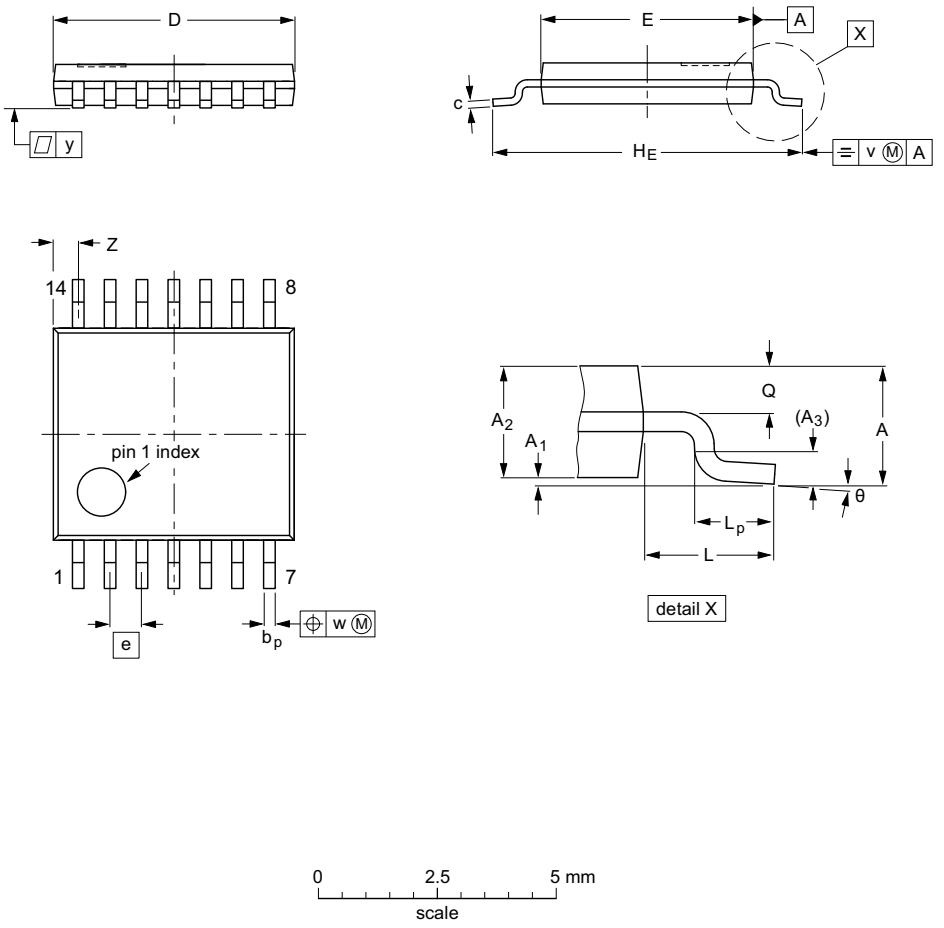
**Note**

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 | | | |
| SOT108-1 | 076E06 | MS-012 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 8. Package outline SOT108-1 (SO14)**

**TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm** **SOT402-1**




**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<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 5.1<br>4.9 | 4.5<br>4.3 | 0.65 | 6.6<br>6.2 | 1 | 0.75<br>0.50 | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.72<br>0.38 | 8°<br>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 | | | |
| SOT402-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig 9. Package outline SOT402-1 (TSSOP14)**

## 14. Abbreviations

**Table 9. Abbreviations**

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

## 15. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC4024 v.9 | 20160428 | Product data sheet | - | 74HC4024 v.8 |
| Modifications: | • Type number 74HC4024DB (SOT337-1) removed. | | | |
| 74HC4024 v.8 | 20151202 | Product data sheet | - | 74HC4024 v.7 |
| Modifications: | • Type number 74HC4024N (SOT27-1) removed. | | | |
| 74HC4024 v.7 | 20131031 | Product data sheet | - | 74HC4024 v.6 |
| Modifications: | • General description updated. | | | |
| 74HC4024 v.6 | 20120823 | Product data sheet | - | 74HC4024 v.5 |
| 74HC4024 v.4 | 20100929 | Product data sheet | - | 74HC4024 v.3 |
| 74HC4024 v.3 | 20041112 | Product data sheet | - | 74HC_HCT4024_CNV v.2 |
| 74HC_HCT4024_CNV v.2 | 19970901 | Product specification | - | 74HC_HCT4024 v.1 |
| 74HC_HCT4024 v.1 | 19901201 | Product specification | - | - |

# 16. Legal information

## 16.1 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 URL http://www.nexperia.com.

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## 18. Contents





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**Date of release: 28 April 2016**