# 74HC4520; 74HCT4520

## Dual 4-bit synchronous binary counter

Rev. 4 — 10 May 2016 Product data sheet

## 1. General description

The 74HC4520; 74HCT4520 are dual 4-bit internally synchronous binary counters with two clock inputs (nCP0 and $n\overline{CP}1$). They have buffered outputs from all 4 bit positions (nQ0 to nQ3) and an asynchronous master reset input (nMR). The counter advances on the LOW-to-HIGH transition of nCP0 when $n\overline{CP}1$ is HIGH. It also advances on the HIGH-to-LOW transition of $n\overline{CP}1$ when nCP0 is LOW. Either nCP0 or $n\overline{CP}1$ may be used as the clock input to the counter. The other clock input may be used as a clock enable input. A HIGH on nMR, resets the counter (nQ0 to nQ3 = LOW) independent of nCP0 and $n\overline{CP}1$. Inputs include clamp diodes. It enables the use of current limiting resistors to interface inputs to voltages in excess of $V_{CC}$.

## 2. Features and benefits

- Complies with JEDEC standard no. 7A
- Input levels:
  - For 74HC4520: CMOS level
  - For 74HCT4520: TTL level
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from −40 °C to +85 °C and −40 °C to +125 °C

## 3. Applications

- Multistage synchronous counting
- Multistage asynchronous counting
- Frequency dividers

## 4. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC4520D | –40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT4520D | | | | |
| 74HC4520DB | –40 °C to +125 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| 74HCT4520DB | | | | |
| 74HC4520PW | –40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

## 5. Functional diagram

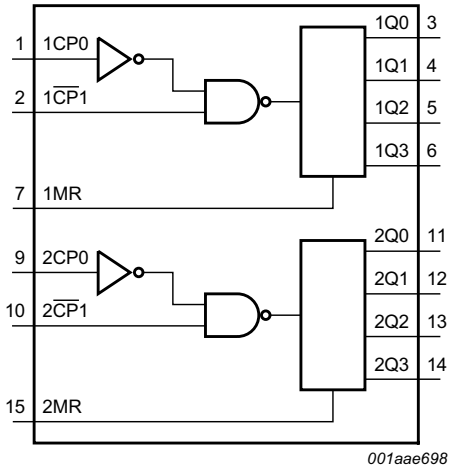



**Fig 1. Functional diagram**

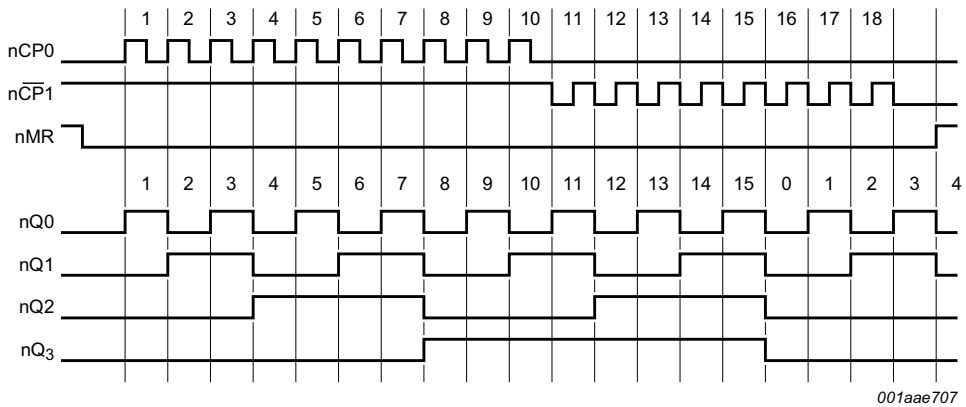



**Fig 2. Timing diagram**

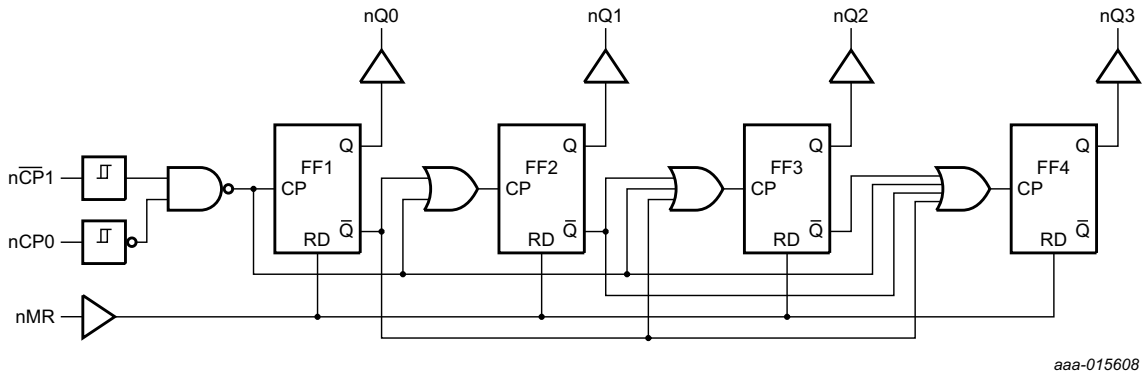



**Fig 3. Logic diagram for one counter**

# 6. Pinning information

## 6.1 Pinning

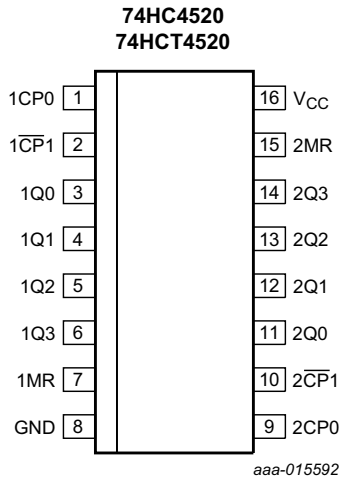



**Fig 4. Pin configuration SO16**

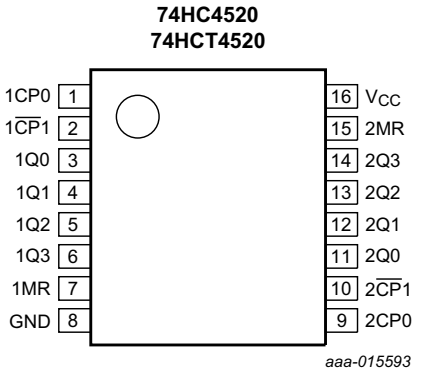



**Fig 5. Pin configuration TSSOP16 and SSOP16**

## 6.2 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1CP0, 2CP0 | 1, 9 | clock input (LOW-to-HIGH edge-triggered) |
| 1$\overline{CP}$1, 2$\overline{CP}$1 | 2, 10 | clock input (HIGH-to-LOW edge-triggered) |
| 1Q0 to 1Q3 | 3, 4, 5, 6 | output |
| 1MR, 2MR | 7, 15 | asynchronous master reset input (active HIGH) |
| GND | 8 | ground (0 V) |
| 2Q0 to 2Q3 | 11, 12, 13, 14 | output |
| $V_{CC}$ | 16 | supply voltage |

# 7. Functional description

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

| nCP0 | $\overline{nCP1}$ | nMR | Mode |
|---|---|---|---|
| ↑ | H | L | counter advances |
| L | ↓ | L | counter advances |
| ↓ | X | L | no change |
| X | ↑ | L | no change |
| ↑ | L | L | no change |
| H | ↓ | L | no change |
| X | X | H | nQ0 to nQ3 = LOW |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; ↑ = positive-going transition; ↓ = negative-going 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 | +7.0 | 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 | SO16 and (T)SSOP16 package [1] | - | 500 | mW |

[1] For SO16 package: above 70 °C the value of $P_{tot}$ derates linearly at 8 mW/K.
For (T)SSOP16 packages: above 60 °C the value of $P_{tot}$ derates linearly at 5.5 mW/K.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

*Voltages are referenced to GND (ground = 0 V)*

| Symbol | Parameter | Conditions | 74HC4520 | | | 74HCT4520 | | | 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 V | - | - | 625 | - | - | - | ns/V |
| | | $V_{CC}$ = 4.5 V | - | 1.67 | 139 | - | 1.67 | 139 | ns/V |
| | | $V_{CC}$ = 6.0 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 | |
| **74HC4520** | | | | | | | | | | |
| $V_{IH}$ | 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; $V_{CC}$ = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | V |
| | | $I_O$ = –5.2; $V_{CC}$ = 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 |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 6.0 V | - | - | 8.0 | - | 80.0 | - | 160.0 | μA |

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

*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 | |
| $C_I$ | input capacitance | | - | 3.5 | - | - | - | - | - | pF |
| **74HCT4520** | | | | | | | | | | |
| $V_{IH}$ | 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 |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 8.0 | - | 80.0 | - | 160.0 | μA |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_I$ = $V_{CC}$ – 2.1 V; other inputs at $V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V; $I_O$ = 0 A | | | | | | | | |
| | | pin nCP0, $n\overline{CP1}$ | - | 80 | 288 | - | 360 | - | 392 | μA |
| | | pin nMR | - | 150 | 540 | - | 675 | - | 735 | 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 Figure 7.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4520** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP0 to nQn; see Figure 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 77 | 240 | - | 300 | - | 360 | ns |
| | | $V_{CC}$ = 4.5 V | - | 28 | 48 | - | 60 | - | 72 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 24 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 22 | 41 | - | 51 | - | 61 | ns |
| | | $n\overline{CP1}$ to nQn; see Figure 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 77 | 240 | - | 300 | - | 360 | ns |
| | | $V_{CC}$ = 4.5 V | - | 28 | 48 | - | 60 | - | 72 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 24 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 22 | 41 | - | 51 | - | 61 | ns |

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

*Voltages are referenced to GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit, see Figure 7.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $t_{PHL}$ | HIGH to LOW propagation delay | nMR to nQn; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 44 | 150 | - | 190 | - | 225 | ns |
| | | $V_{CC}$ = 4.5 V | - | 16 | 30 | - | 38 | - | 45 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 13 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 13 | 26 | - | 33 | - | 38 | ns |
| $t_t$ | transition time | nQn; see Figure 6 [2] | | | | | | | | |
| | | $V_{CC}$ = 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 |
| $t_W$ | pulse width | nCP0, $n\overline{CP}1$ HIGH or LOW; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 22 | - | 100 | - | 120 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 8 | - | 20 | - | 24 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 6 | - | 17 | - | 20 | - | ns |
| | | nMR HIGH; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 120 | 39 | - | 150 | - | 180 | - | ns |
| | | $V_{CC}$ = 4.5 V | 24 | 14 | - | 30 | - | 36 | - | ns |
| | | $V_{CC}$ = 6.0 V | 20 | 11 | - | 26 | - | 31 | - | ns |
| $t_{rec}$ | recovery time | nMR to nCP0, $n\overline{CP}1$; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 0 | –28 | - | 0 | - | 0 | - | ns |
| | | $V_{CC}$ = 4.5 V | 0 | –10 | - | 0 | - | 0 | - | ns |
| | | $V_{CC}$ = 6.0 V | 0 | –8 | - | 0 | - | 0 | - | ns |
| $t_{su}$ | set-up time | nCP0 to $n\overline{CP}1$; $n\overline{CP}1$ to nCP0; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 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 |
| $f_{max}$ | maximum frequency | nCP0, $n\overline{CP}1$; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 6 | 19 | - | 4.8 | - | 4 | - | MHz |
| | | $V_{CC}$ = 4.5 V | 30 | 58 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 68 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 6.0 V | 35 | 69 | - | 28 | - | 24 | - | MHz |
| $C_{PD}$ | power dissipation capacitance | $V_I$ = GND to $V_{CC}$; $V_{CC}$ = 5 V; $f_i$ = 1 MHz [3] | - | 29 | - | - | - | - | - | pF |

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

*Voltages are referenced to GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit, see Figure 7.*

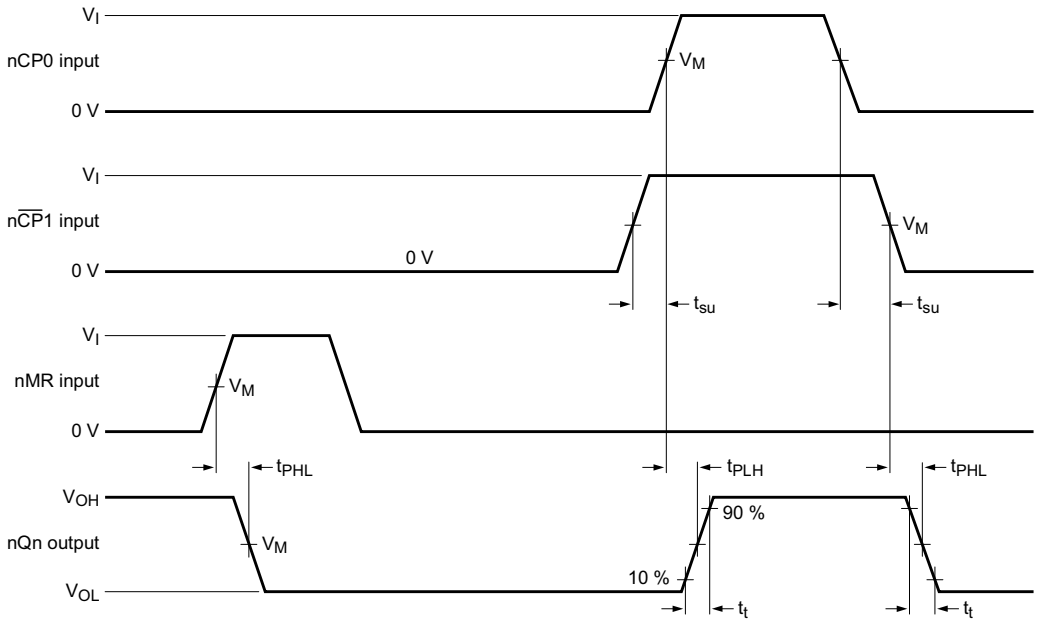
| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HCT4520** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP0 to nQn; see Figure 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 28 | 53 | - | 66 | - | 80 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 24 | - | - | - | - | - | ns |
| | | $n\overline{CP}1$ to nQn; see Figure 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 25 | 53 | - | 66 | - | 80 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 24 | - | - | - | - | - | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | nMR to nQn; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 16 | 35 | - | 44 | - | 53 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 13 | - | - | - | - | - | ns |
| $t_t$ | transition time | nQn; see Figure 6 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 7 | 15 | - | 19 | - | 22 | ns |
| $t_W$ | pulse width | nCP0, $n\overline{CP}1$ HIGH or LOW; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 20 | 10 | - | 25 | - | 30 | - | ns |
| | | nMR HIGH; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 20 | 12 | - | 25 | - | 30 | - | ns |
| $t_{rec}$ | recovery time | nMR to nCP0, $n\overline{CP}1$; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 0 | –8 | - | 0 | - | 0 | - | ns |
| $t_{su}$ | set-up time | nCP0 to $n\overline{CP}1$; $n\overline{CP}1$ to nCP0; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 16 | 6 | - | 20 | - | 24 | - | ns |
| $f_{max}$ | maximum frequency | nCP0, $n\overline{CP}1$; see Figure 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 30 | 58 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 64 | - | - | - | - | - | MHz |
| $C_{PD}$ | power dissipation capacitance | $V_I$ = GND to $V_{CC}$ – 1.5 V; $V_{CC}$ = 5 V; $f_i$ = 1 MHz [3] | - | 24 | - | - | - | - | - | pF |

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

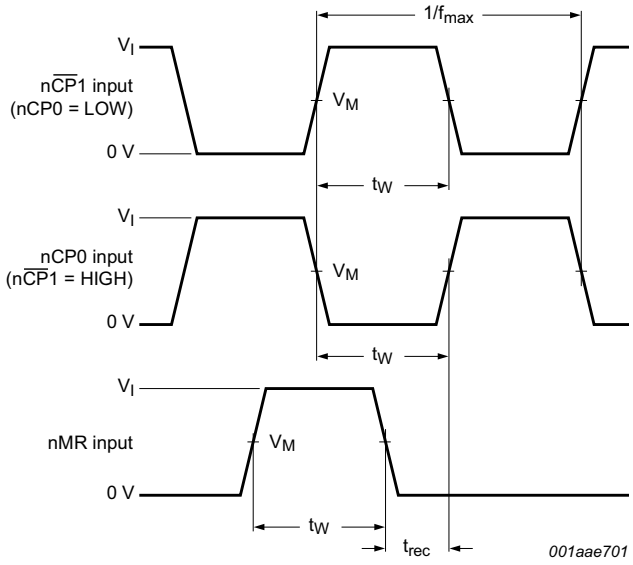
[2] $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.

[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




a. nCP0 and nCP1 set-up times, propagation delays and output transition times




b. nMR recovery time, minimum nCP0, nCP1, nMR pulse widths and maximum frequency

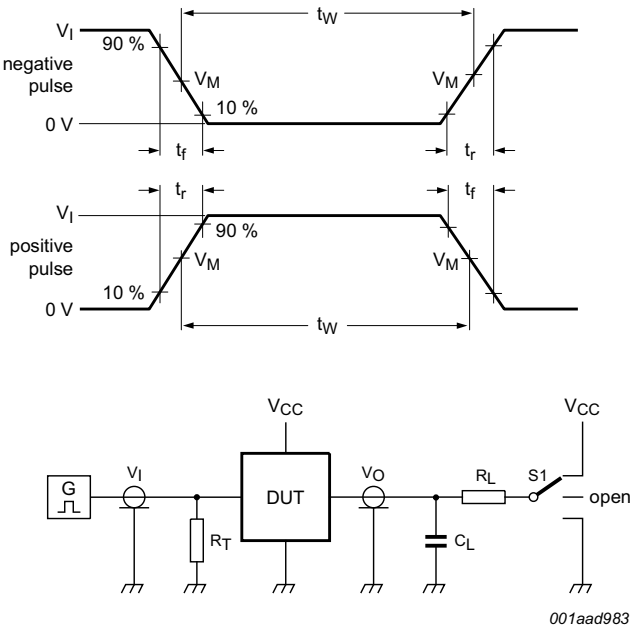
Measurement points are given in Table 8.

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

**Fig 6. Waveforms showing measurements for switching times**

**Table 8. Measurement points**

| Type | Input | | Output |
|---|---|---|---|
| | $V_M$ | $V_I$ | $V_M$ |
| 74HC4520 | 0.5 × $V_{CC}$ | GND to $V_{CC}$ | 0.5 × $V_{CC}$ |
| 74HCT4520 | 1.3 V | GND to 3 V | 1.3 V |




Test data is given in Table 9.

Test circuit definitions:

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

$C_L$ = Load capacitance including jig and probe capacitance

$R_L$ = Load resistance.

S1 = Test selection switch

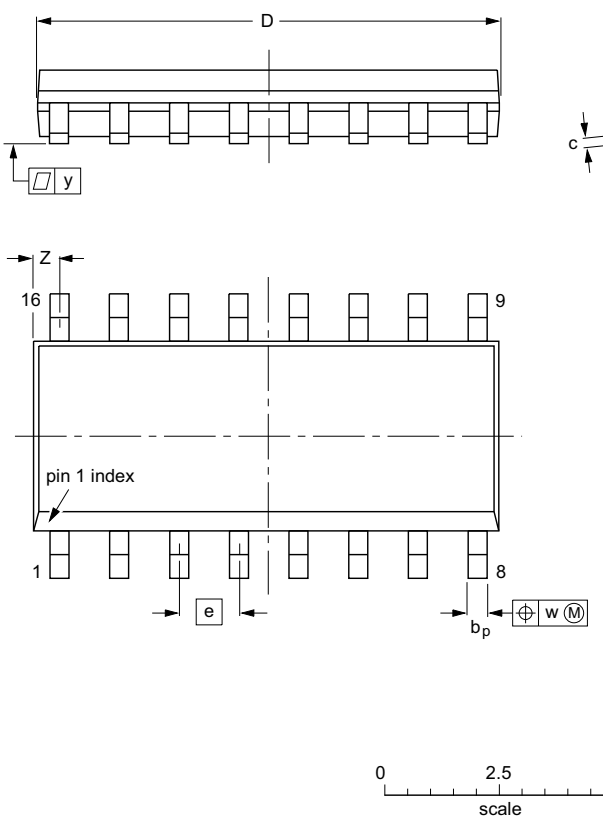
**Fig 7. Test circuit for measuring switching times**

**Table 9. Test data**

| Type | Input | | Load | | S1 position |
|---|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PHL}$, $t_{PLH}$ |
| 74HC4520 | GND to $V_{CC}$ | 6 ns | 15 pF, 50 pF | 1 kΩ | open |
| 74HCT4520 | GND to 3 V | 6 ns | 15 pF, 50 pF | 1 kΩ | open |

## 13. 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<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 10.0<br>9.8 | 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 | 0.39<br>0.38 | 0.16<br>0.15 | 0.05 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.020 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

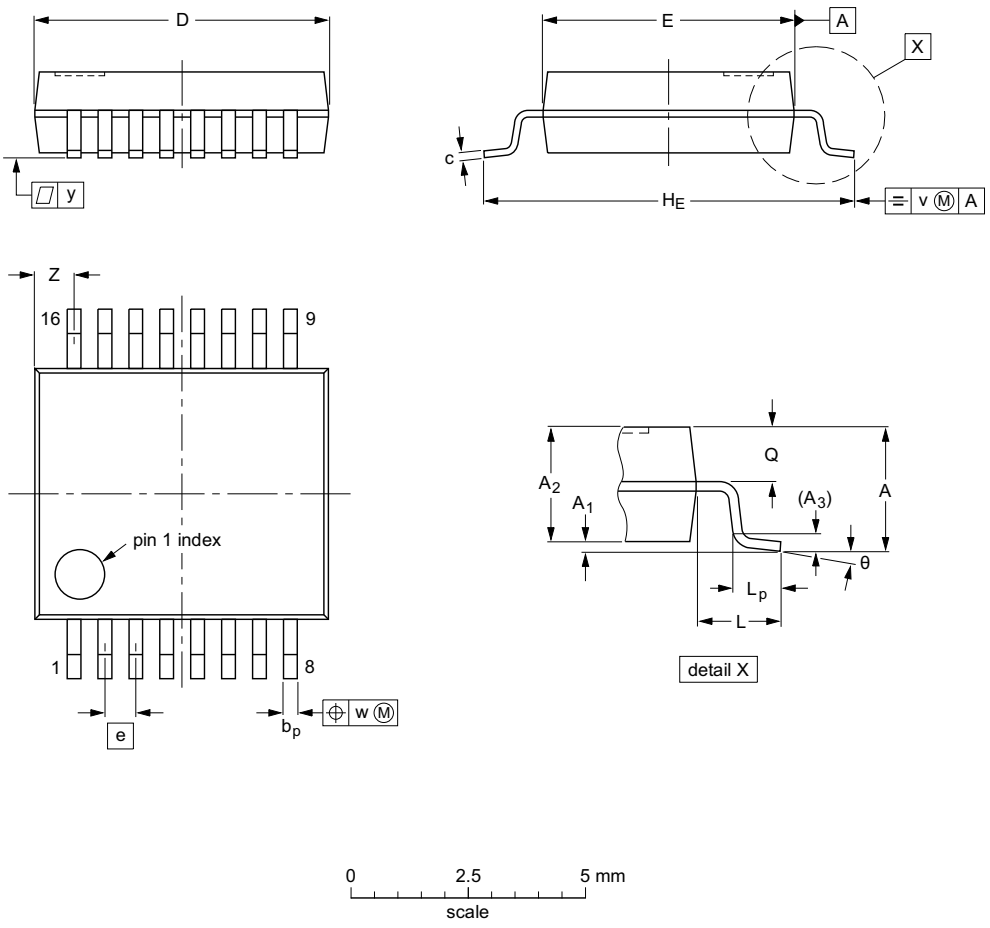
**Note**

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 | | | |
| SOT109-1 | 076E07 | MS-012 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 8. Package outline SOT109-1 (SO16)**

**SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm** **SOT338-1**




**DIMENSIONS (mm are the original 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 | 2 | 0.21<br>0.05 | 1.80<br>1.65 | 0.25 | 0.38<br>0.25 | 0.20<br>0.09 | 6.4<br>6.0 | 5.4<br>5.2 | 0.65 | 7.9<br>7.6 | 1.25 | 1.03<br>0.63 | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 1.00<br>0.55 | 8°<br>0° |

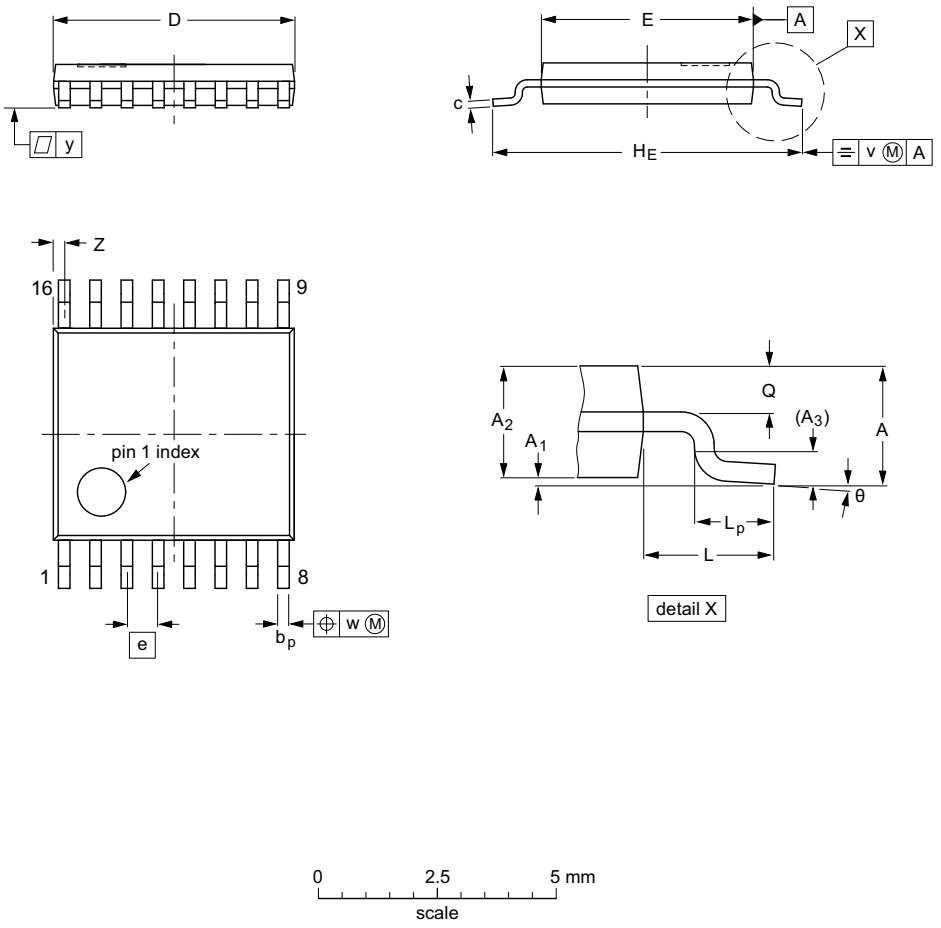
**Note**

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT338-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 9. Package outline SOT338-1 (SSOP16)**

**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<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 | 0.40<br>0.06 | 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 | | | |
| SOT403-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig 10. Package outline SOT403-1 (TSSOP16)**

## 14. Abbreviations

**Table 10. Abbreviations**

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

## 15. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT4520 v.4 | 20160510 | Product data sheet | - | 74HC_HCT4520 v.3 |
| Modifications: | • Type numbers 74HC4520N and 74HCT4520N (SOT38-4) removed. | | | |
| 74HC_HCT4520 v.3 | 20141204 | Product data sheet | - | 74HC_HCT4520_CNV v.2 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| 74HC_HCT4520_CNV v.2 | 19930927 | 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: 10 May 2016**