# 74HC4020; 74HCT4020

## 14-stage binary ripple counter

Rev. 9 — 27 March 2024 Product data sheet

## 1. General description

The 74HC4020; 74HCT4020 is a 14-stage binary ripple counter with a clock input ($\overline{CP}$), an overriding asynchronous master reset input (MR) and 12 buffered parallel outputs (Q0, and Q3 to Q13). 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. 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

- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- Input levels:
  - For 74HC4020: CMOS level
  - For 74HCT4020: TTL level
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

## 3. Applications

- Frequency dividing circuits
- Time delay circuits
- Control counters

## 4. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74HC4020D<br>74HCT4020D | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HC4020PW<br>74HCT4020PW | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HC4020BQ<br>74HCT4020BQ | -40 °C to +125 °C | DHVQFN16 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm | SOT763-1 |

## 5. Functional diagram

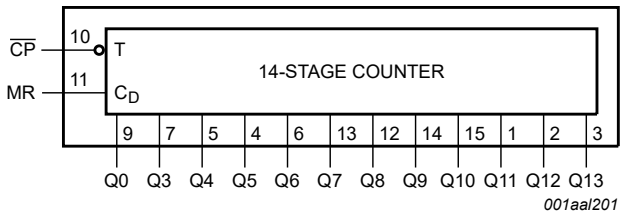



**Fig. 1. Functional diagram**

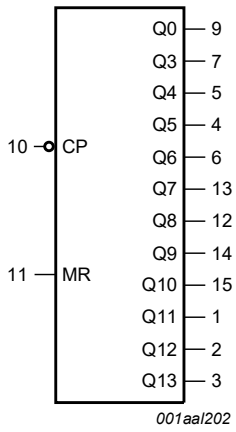



**Fig. 2. Logic symbol**

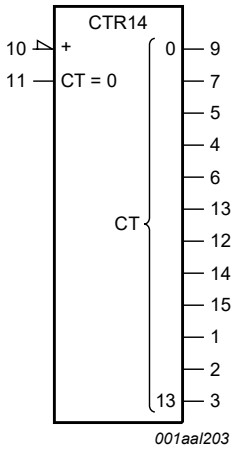



**Fig. 3. IEC logic symbol**

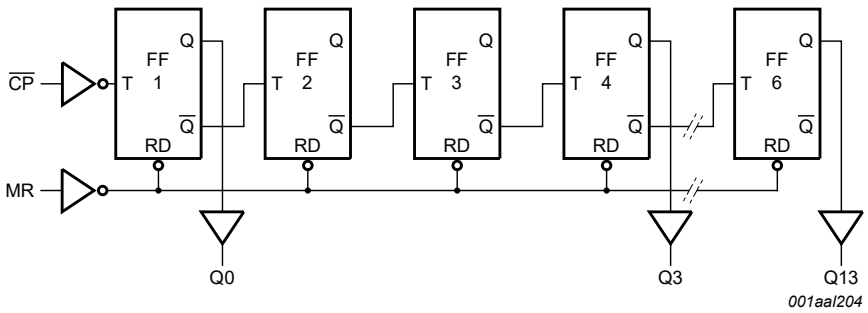
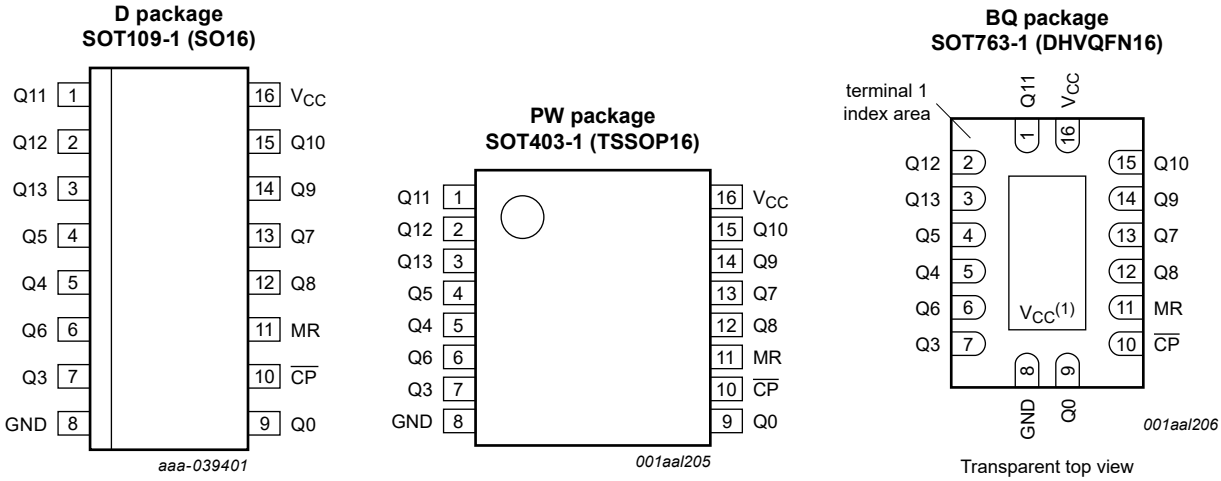



**Fig. 4. Logic diagram**

# 6. Pinning information

## 6.1. Pinning




(1) This is not a supply pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to $V_{CC}$.

## 6.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| Q0, Q3 to Q13 | 9, 7, 5, 4, 6, 13, 12, 14, 15, 1, 2, 3 | output |
| GND | 8 | ground (0 V) |
| $\overline{CP}$ | 10 | clock input (HIGH-to-LOW, edge-triggered) |
| MR | 11 | master reset input (active HIGH) |
| $V_{CC}$ | 16 | positive supply voltage |

# 7. Functional description

**Table 3. Function table**

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

| Input | | Output |
|---|---|---|
| $\overline{CP}$ | MR | Q0, Q3 to Q13 |
| ↑ | L | no change |
| ↓ | L | count |
| X | H | L |

## 7.1. Timing diagram

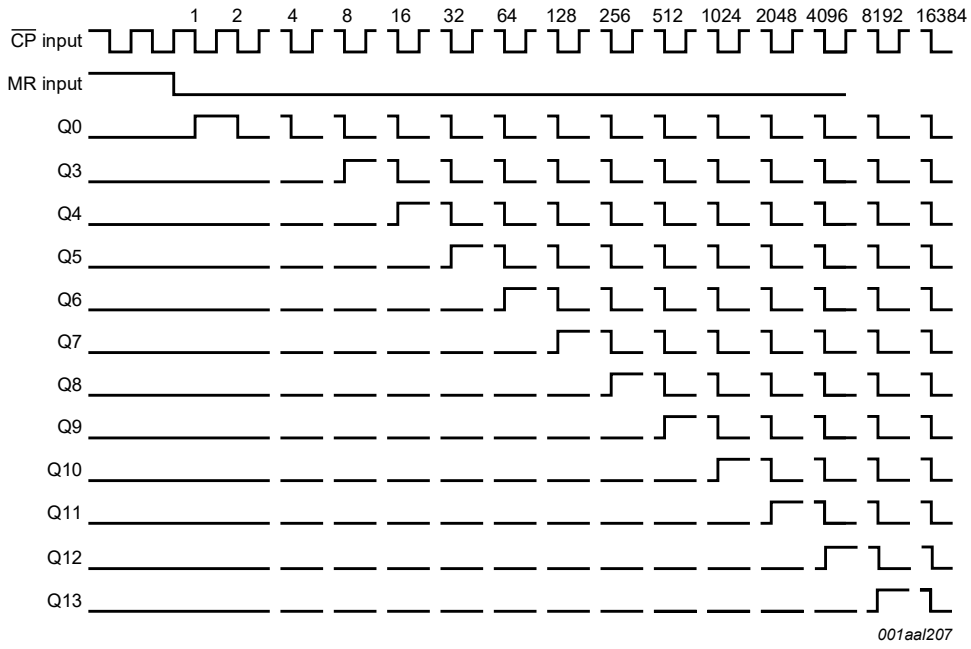



**Fig. 5. Timing diagram**

# 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 | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V | - | ±20 | mA |
| $I_O$ | output current | $-0.5$ V $< V_O < V_{CC} + 0.5$ 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 | $T_{amb}$ = -40 °C to +125 °C [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.
For SOT763-1 (DHVQFN16) package: $P_{tot}$ derates linearly with 11.2 mW/K above 106 °C.

# 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

| Symbol | Parameter | Conditions | 74HC4020 | | | 74HCT4020 | | | 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 |
| Δt/ΔV | input transition rise and fall rate | except for Schmitt trigger inputs | | | | | | | |
| | | $V_{CC}$ = 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 |
| $T_{amb}$ | ambient temperature | | -40 | +25 | +125 | -40 | +25 | +125 | °C |

## 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 | |
| **74HC4020** | | | | | | | | | | |
| $V_{IH}$ | 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 | - | ±1 | 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 | |
| **74HCT4020** | | | | | | | | | | |
| $V_{IH}$ | 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; $V_{CC}$ = 4.5 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 |
| $I_I$ | input leakage current | $V_I$ = $V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±0.1 | - | ±1 | - | ±1 | 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 |
| $\Delta I_{CC}$ | additional supply current | $V_I$ = $V_{CC}$ - 2.1 V; $I_O$ = 0 A; other inputs at $V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V | | | | | | | | |
| | | pin MR | - | 110 | 396 | - | 495 | - | 539 | µA |
| | | pin $\overline{CP}$ | - | 85 | 306 | - | 383 | - | 417 | µA |
| $C_I$ | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

*GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit, see Fig. 8*

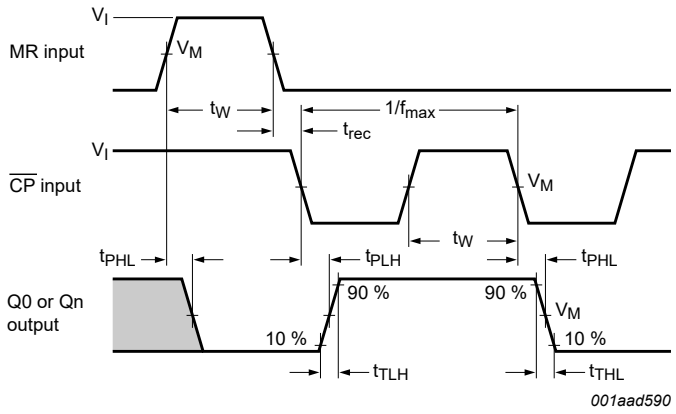
| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4020** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Fig. 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 39 | 140 | - | 175 | - | 210 | ns |
| | | $V_{CC}$ = 4.5 V | - | 14 | 28 | - | 35 | - | 42 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 11 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 11 | 24 | - | 30 | - | 36 | ns |
| | | Qn to Qn+1; see Fig. 7 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 22 | 75 | - | 95 | - | 110 | ns |
| | | $V_{CC}$ = 4.5 V | - | 8 | 15 | - | 19 | - | 22 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 6 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 6 | 13 | - | 16 | - | 19 | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Qn; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 55 | 170 | - | 215 | - | 225 | ns |
| | | $V_{CC}$ = 4.5 V | - | 20 | 34 | - | 43 | - | 51 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 17 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 16 | 29 | - | 37 | - | 43 | ns |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $t_t$ | transition time | Qn; see Fig. 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 | $\overline{CP}$ HIGH or LOW; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 14 | - | 100 | - | 120 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 4 | - | 20 | - | 24 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 3 | - | 17 | - | 20 | - | ns |
| | | MR HIGH; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 80 | 17 | - | 100 | - | 120 | - | ns |
| | | $V_{CC}$ = 4.5 V | 16 | 6 | - | 20 | - | 24 | - | ns |
| | | $V_{CC}$ = 6.0 V | 14 | 5 | - | 17 | - | 20 | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 50 | 6 | - | 65 | - | 75 | - | ns |
| | | $V_{CC}$ = 4.5 V | 10 | 2 | - | 13 | - | 15 | - | ns |
| | | $V_{CC}$ = 6.0 V | 9 | 2 | - | 11 | - | 13 | - | ns |
| $f_{max}$ | maximum frequency | see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 6.0 | 30 | - | 4.8 | - | 4.0 | - | MHz |
| | | $V_{CC}$ = 4.5 V | 30 | 92 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 101 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 6.0 V | 35 | 109 | - | 28 | - | 24 | - | MHz |
| $C_{PD}$ | power dissipation capacitance | [3] | - | 19 | - | - | - | - | - | pF |
| **74HCT4020** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Fig. 6 [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 18 | 36 | - | 45 | - | 54 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 15 | - | - | - | - | - | ns |
| | | Qn to Qn+1; see Fig. 7 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 8 | 15 | - | 19 | - | 22 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 6 | - | - | - | - | - | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Qn; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 22 | 45 | - | 56 | - | 68 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 19 | - | - | - | - | - | ns |
| $t_t$ | transition time | Qn; see Fig. 6 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 7 | 15 | - | 19 | - | 22 | ns |
| $t_W$ | pulse width | $\overline{CP}$ HIGH or LOW; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 20 | 7 | - | 25 | - | 30 | - | ns |
| | | MR HIGH; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 20 | 8 | - | 25 | - | 30 | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 10 | 2 | - | 13 | - | 15 | - | ns |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $f_{max}$ | maximum frequency | see Fig. 6 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 25 | 47 | - | 20 | - | 17 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 52 | - | - | - | - | - | MHz |
| $C_{PD}$ | power dissipation capacitance | [3] | - | 20 | - | - | - | - | - | pF |

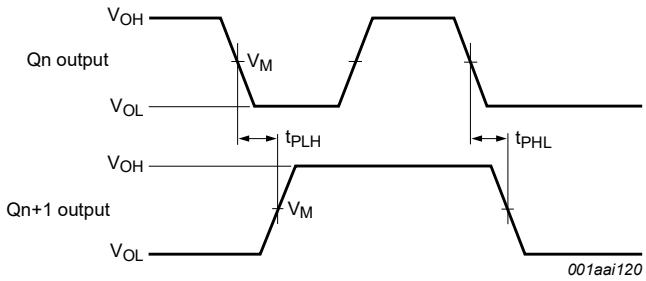
[1] $t_{pd}$ is the same as $t_{PHL}$ and $t_{PLH}$.
[2] $t_t$ is the same as $t_{THL}$ and $t_{TLH}$.
[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz;
$f_o$ = output frequency in MHz;
$\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in V.

## 11.1. Waveforms and test circuit




Measurement points are given in Table 8.
$V_{OL}$ and $V_{OH}$ are typical voltage output levels that occur with the output load.

**Fig. 6. Clock timing, propagation delays and pulse widths**



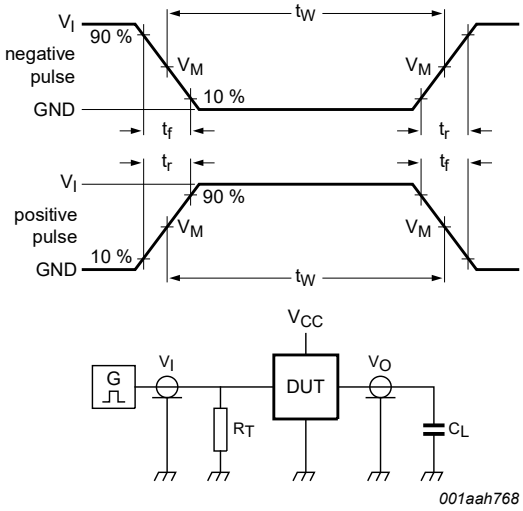

Measurement points are given in Table 8.

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

**Fig. 7. Waveforms showing the output Qn to output Qn+1 propagation delays**

**Table 8. Measurement points**

| Type | Input | Output |
|---|---|---|
| | $V_M$ | $V_M$ |
| 74HC4020 | 0.5 × $V_{CC}$ | 0.5 × $V_{CC}$ |
| 74HCT4020 | 1.3 V | 1.3 V |




Test data is given in Table 9.

Definitions 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.

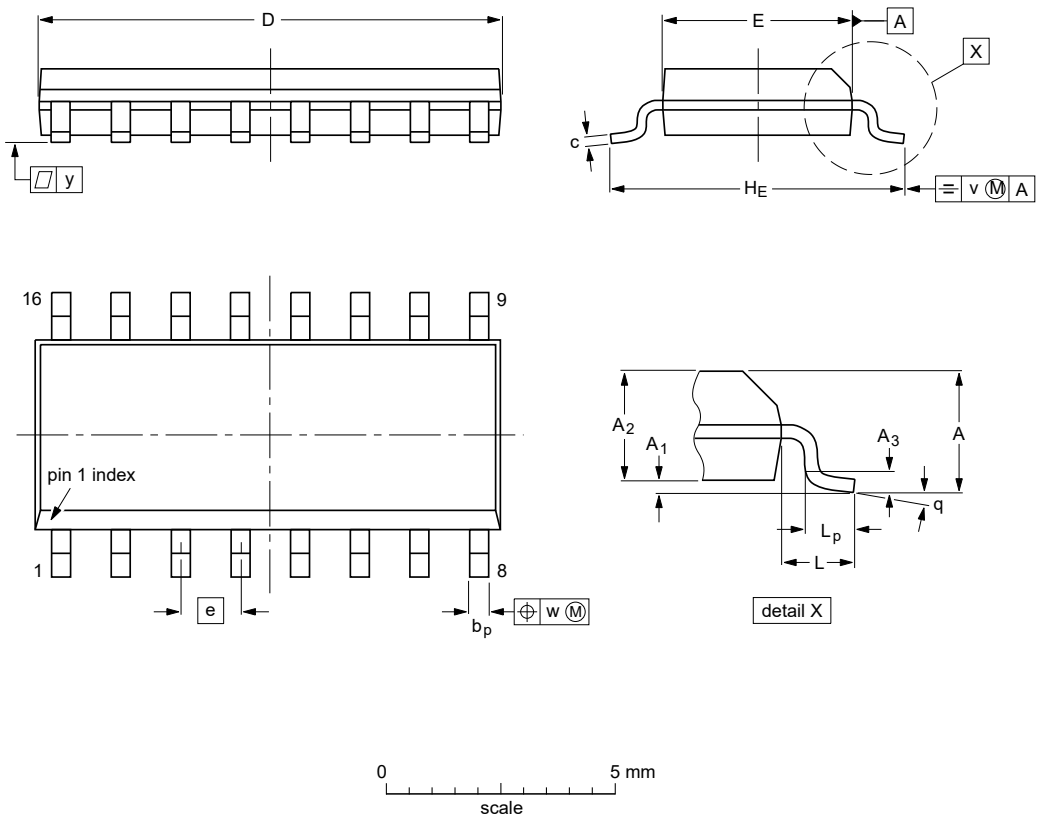
**Fig. 8. Test circuit for measuring switching times**

**Table 9. Test data**

| Type | Input | | Load |
|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ |
| 74HC4020 | $V_{CC}$ | 6 ns | 15 pF, 50 pF |
| 74HCT4020 | 3 V | 6 ns | 15 pF, 50 pF |

## 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 | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | v | w | y | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1.75 | 0.25 | | | 0.51 | 0.25 | 10.0 | 4.0 | | 6.2 | | 1.27 | | | | 8° |
| | nom | | | | 0.25 | | | | | 1.27 | | 1.05 | | 0.2 | 0.25 | 0.1 | |
| | min | | 0.10 | 1.25 | | 0.31 | 0.10 | 9.8 | 3.8 | | 5.8 | | 0.4 | | | | 0° |
| inches | max | 0.069 | 0.010 | | | 0.020 | 0.010 | 0.394 | 0.16 | | 0.244 | | 0.05 | | | | 8° |
| | nom | | | | 0.01 | | | | | 0.05 | | 0.041 | | 0.008 | 0.01 | 0.004 | |
| | min | | 0.004 | 0.049 | | 0.012 | 0.004 | 0.386 | 0.15 | | 0.228 | | 0.016 | | | | 0° |

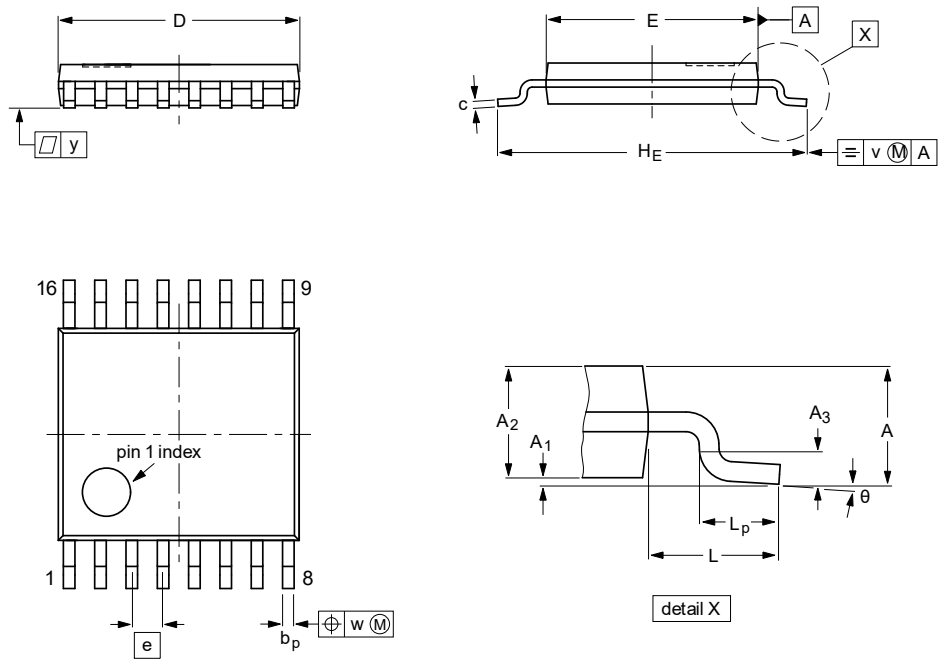
Note
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

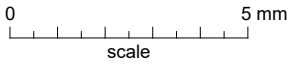
*sot109-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT109-1 | | MS-012 | | | | ~~03-02-19~~ 23-10-27 |

**Fig. 9. 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 | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | v | w | y | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 1.20 | 0.15 | 1.05 | | 0.30 | 0.2 | 5.1 | 4.5 | | 6.6 | | 0.75 | | | | 8° |
| | nom | | | | 0.25 | | | | | 0.65 | | 1 | | 0.2 | 0.1 | 0.1 | |
| | min | | 0.05 | 0.80 | | 0.19 | 0.09 | 4.9 | 4.3 | | 6.2 | | 0.45 | | | | 0° |

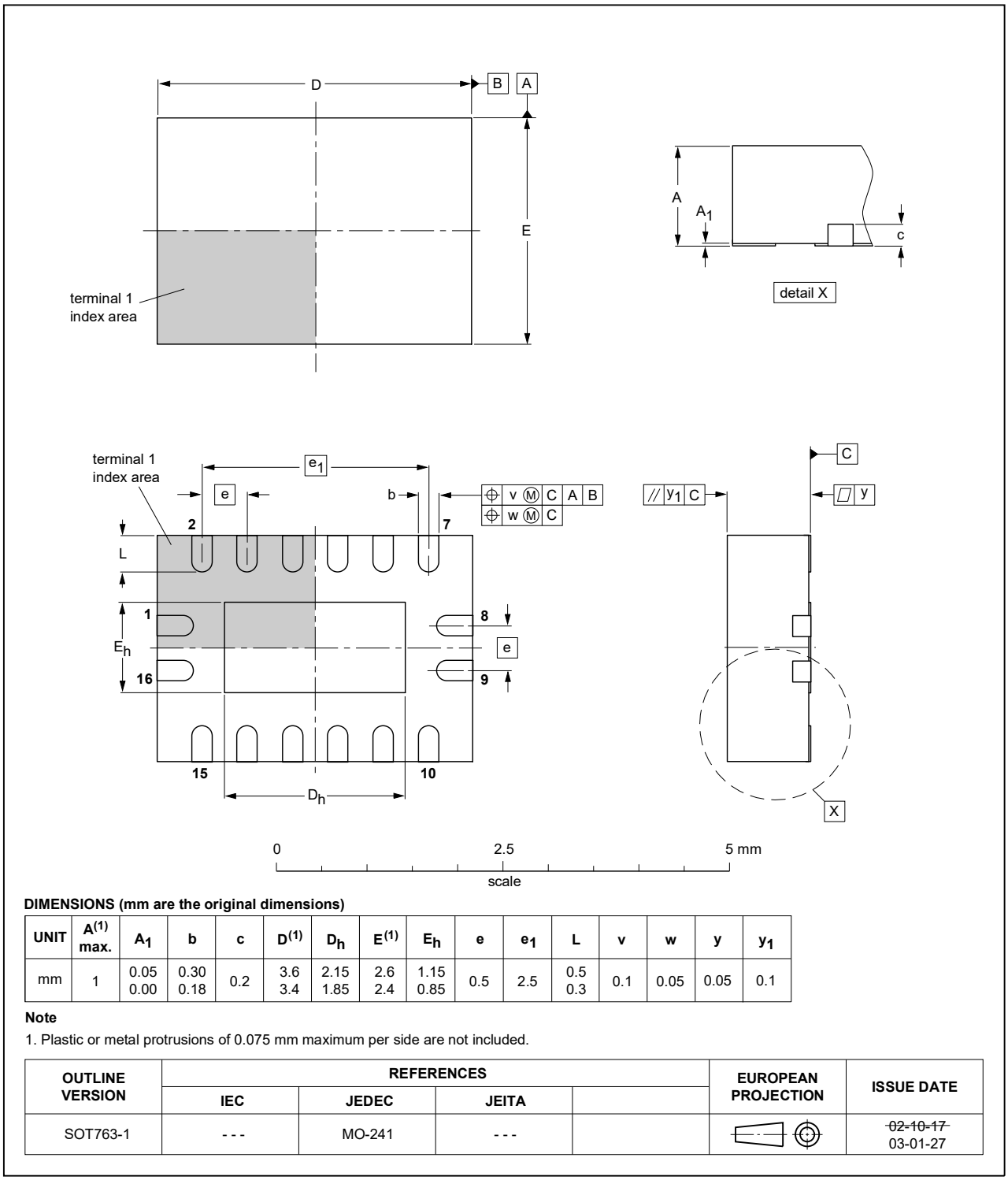
Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

*sot403-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT403-1 | | MO-153 | | | | ~~03-02-18~~ 23-10-27 |

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

**DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm** **SOT763-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | $A^{(1)}$ max. | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1 | 0.05<br>0.00 | 0.30<br>0.18 | 0.2 | 3.6<br>3.4 | 2.15<br>1.85 | 2.6<br>2.4 | 1.15<br>0.85 | 0.5 | 2.5 | 0.5<br>0.3 | 0.1 | 0.05 | 0.05 | 0.1 |

**Note**

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT763-1 | - - - | MO-241 | - - - | | | ~~02-10-17~~<br>03-01-27 |

**Fig. 11. Package outline SOT763-1 (DHVQFN16)**

## 13. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description |
|---|---|
| CDM | Charged Device Model |
| CMOS | Complementary Metal Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| TTL | Transistor-Transistor Logic |

## 14. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT4020 v.9 | 20240327 | Product data sheet | - | 74HC_HCT4020 v.8 |
| Modifications: | • Section 2: ESD specification updated according to the latest JEDEC standard.<br>• Fig. 9, Fig. 10: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153 | | | |
| 74HC_HCT4020 v.8 | 20210907 | Product data sheet | - | 74HC_HCT4020 v.7 |
| Modifications: | • Type number 74HC4020DB (SOT338-1/SSOP16) removed. | | | |
| 74HC_HCT4020 v.7 | 20200618 | Product data sheet | - | 74HC_HCT4020 v.6 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Type number 74HCT4020DB (SOT338-1/SSOP16) removed.<br>• Section 1 and Section 2 updated.<br>• Table 4: Derating values for $P_{tot}$ total power dissipation have been updated. | | | |
| 74HC_HCT4020 v.6 | 20160203 | Product data sheet | - | 74HC_HCT4020 v.5 |
| Modifications: | • Type numbers 74HC4020N and 74HCT4020N (SOT38-4) removed. | | | |
| 74HC_HCT4020 v.5 | 20120806 | Product data sheet | - | 74HC_HCT4020 v.4 |
| Modifications: | • Measurement points added to Fig. 6 (errata). | | | |
| 74HC_HCT4020 v.4 | 20111213 | Product data sheet | - | 74HC_HCT4020 v.3 |
| Modifications: | • Legal pages updated. | | | |
| 74HC_HCT4020 v.3 | 20100120 | Product data sheet | - | 74HC_HCT4020 v.2 |
| 74HC_HCT4020 v.2 | 19970901 | Product specification | - | - |

# 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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