# 74HC4040-Q100; 74HCT4040-Q100

## 12-stage binary ripple counter

Rev. 1 — 24 March 2014 Product data sheet

## 1. General description

The 74HC4040-Q100; 74HCT4040-Q100 is a 12-stage binary ripple counter with a clock input ($\overline{CP}$), an overriding asynchronous master reset input (MR) and twelve parallel outputs (Q0 to Q11). 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 that enable 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 no. 7A
- Input levels:
  - For 74HC4040-Q100: CMOS level
  - For 74HCT4040-Q100: TTL level
- 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)
- Multiple package options

## 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 |
| 74HC4040D-Q100 | –40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74HCT4040D-Q100 | | | | |
| 74HC4040DB-Q100 | –40 °C to +125 °C | SSOP16 | plastic shrink small outline package; 16 leads; body width 5.3 mm | SOT338-1 |
| 74HCT4040DB-Q100 | | | | |
| 74HC4040PW-Q100 | –40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74HCT4040PW-Q100 | | | | |
| 74HC4040BQ-Q100 | –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 |
| 74HCT4040BQ-Q100 | | | | |

## 5. Functional diagram

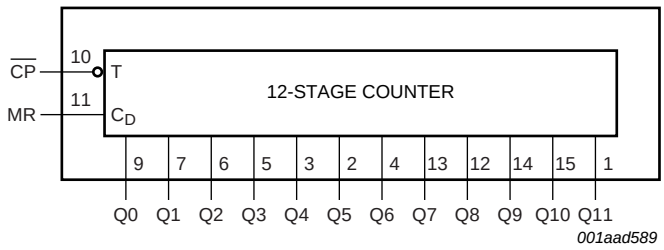



**Fig 1. Functional diagram**

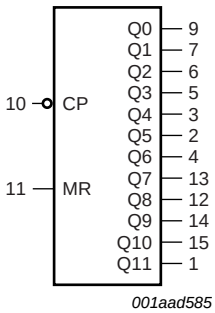



**Fig 2. Logic symbol**

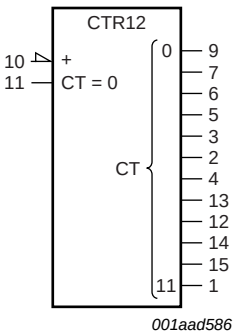



**Fig 3. IEC logic symbol**


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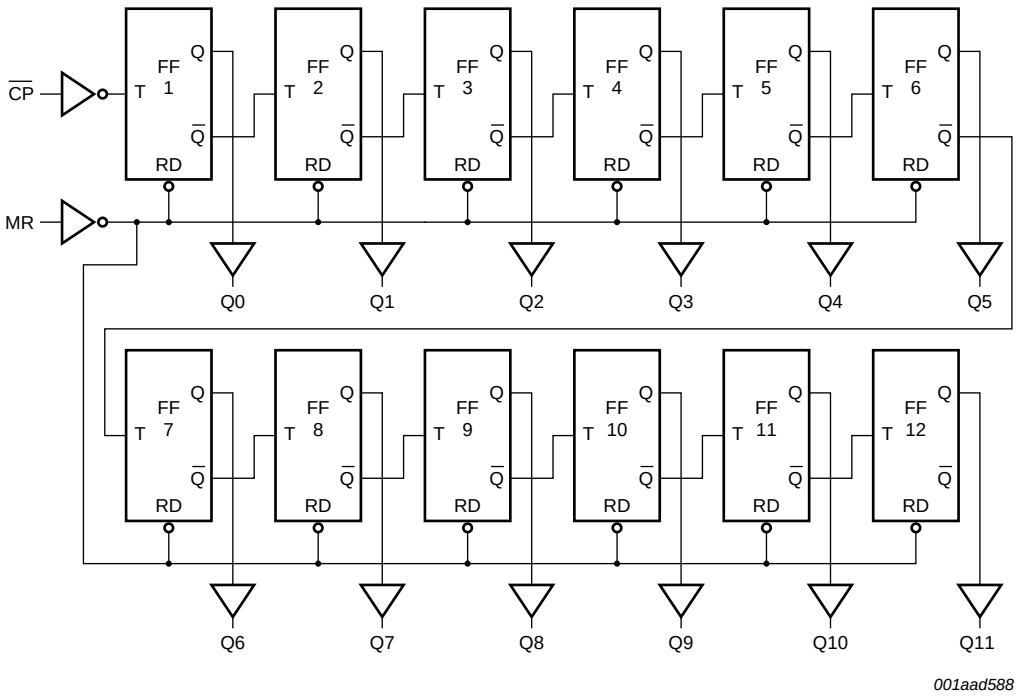



**Fig 4. Logic diagram**


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# 6. Pinning information

## 6.1 Pinning

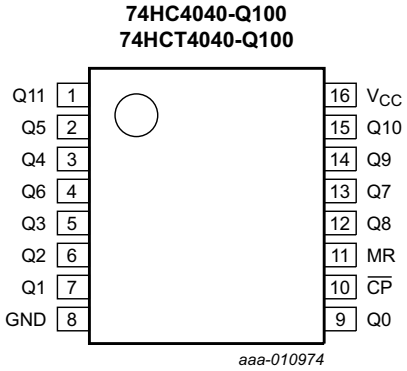
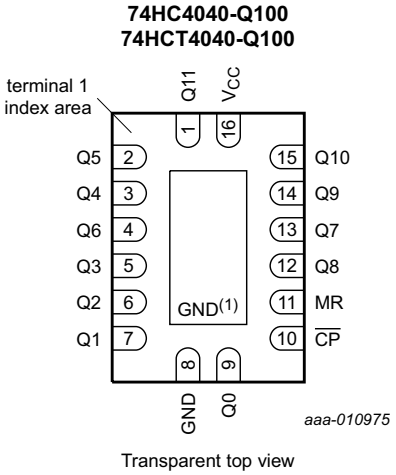



**Fig 5. Pin configuration SO16, SSOP16 and TSSOP16**




Transparent top view

(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

**Fig 6. Pin configuration DHVQFN16**

## 6.2 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| Q11 | 1 | output 11 |
| Q5 | 2 | output 5 |
| Q4 | 3 | output 4 |
| Q6 | 4 | output 6 |
| Q3 | 5 | output 3 |
| Q2 | 6 | output 2 |
| Q1 | 7 | output 1 |
| GND | 8 | ground (0 V) |
| Q0 | 9 | output 0 |
| $\overline{CP}$ | 10 | clock input (HIGH-to-LOW, edge-triggered) |
| MR | 11 | master reset input (active HIGH) |
| Q8 | 12 | output 8 |
| Q7 | 13 | output 7 |
| Q9 | 14 | output 9 |
| Q10 | 15 | output 10 |
| $V_{CC}$ | 16 | positive supply voltage |


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# 7. Functional description

## 7.1 Function table

**Table 3. Function table**

| Input | | Output |
|---|---|---|
| $\overline{CP}$ | MR | Q0 to Q11 |
| ↑ | L | no change |
| ↓ | L | count |
| X | H | L |

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

## 7.2 Timing diagram

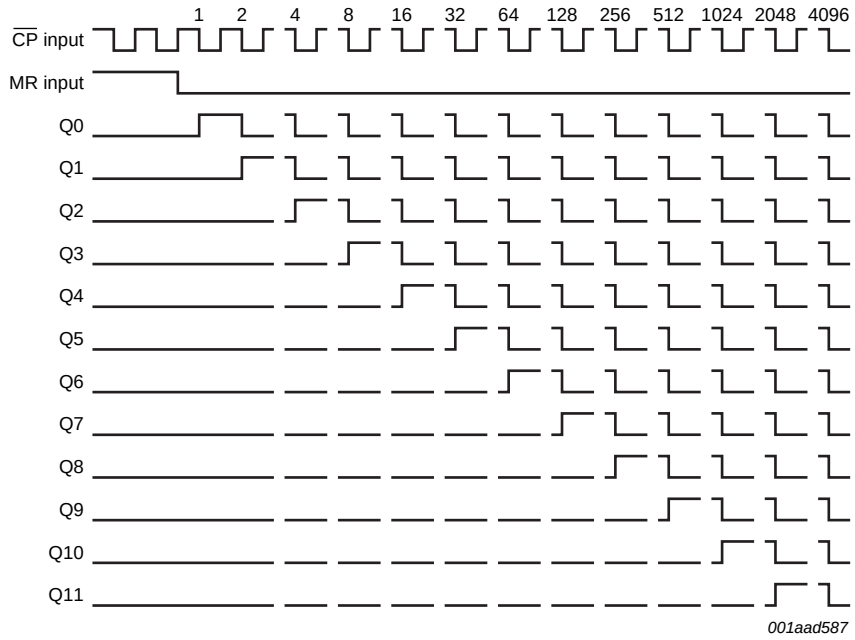



**Fig 7. Timing diagram**


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# 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 VI > $V_{CC}$ + 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 SO16, SSOP16, TSSOP16 and DHVQFN16 packages, above 70 °C, $P_{tot}$ derates linearly with 8 mW/K.

# 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

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

| Symbol | Parameter | Conditions | 74HC4040-Q100 | | | 74HCT4040-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 |
| Δt/ΔV | 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 | |
| **74HC4040-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 |


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**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 | |
| $V_{OH}$ | 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 |
| $I_{CC}$ | 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 |
| **74HCT4040-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 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 | - | 160 | μA |
| $\Delta I_{CC}$ | additional supply current | per input pin; $V_I = V_{CC}$ – 2.1 V; $I_O$ = 0 A; other inputs at $V_{CC}$ or GND; $V_{CC}$ = 4.5 V to 5.5 V | | | | | | | | |
| | | pin $\overline{CP}$ | - | 85 | 306 | - | 383 | - | 417 | μA |
| | | pin MR | - | 110 | 396 | - | 495 | - | 539 | μA |
| $C_I$ | input capacitance | | - | 3.5 | - | - | - | - | - | pF |


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## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

*GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit see Figure 9.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74HC4040-Q100** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Figure 8 [1] | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 47 | 150 | - | 190 | - | 225 | ns |
| | | $V_{CC}$ = 4.5 V | - | 17 | 30 | - | 38 | - | 45 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 14 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 14 | 26 | - | 33 | - | 38 | ns |
| | | Qn to Qn+1; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 28 | 100 | - | 125 | - | 150 | ns |
| | | $V_{CC}$ = 4.5 V | - | 10 | 20 | - | 25 | - | 30 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 8 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 6.0 V | - | 8 | 17 | - | 21 | - | 26 | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Qn; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | - | 61 | 185 | - | 230 | - | 280 | ns |
| | | $V_{CC}$ = 4.5 V | - | 22 | 37 | - | 46 | - | 56 | ns |
| | | $V_{CC}$ = 6.0 V | - | 18 | 31 | - | 39 | - | 48 | ns |
| $t_t$ | transition time | Qn; see Figure 8 [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 | $\overline{CP}$ input, HIGH or LOW; see Figure 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 |
| | | MR input, HIGH; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 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 |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 50 | 8 | - | 65 | - | 75 | - | ns |
| | | $V_{CC}$ = 4.5 V | 10 | 3 | - | 13 | - | 15 | - | ns |
| | | $V_{CC}$ = 6.0 V | 9 | 2 | - | 11 | - | 13 | - | ns |
| $f_{max}$ | maximum frequency | $\overline{CP}$ input; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 2.0 V | 6 | 27 | - | 4.8 | - | 4 | - | MHz |
| | | $V_{CC}$ = 4.5 V | 30 | 82 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 90 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 6.0 V | 35 | 98 | - | 28 | - | 24 | - | MHz |


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

*GND (ground = 0 V); $C_L$ = 50 pF unless otherwise specified; for test circuit see Figure 9.*

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $C_{PD}$ | power dissipation capacitance | $V_I$ = GND to $V_{CC}$ [3] | - | 20 | - | - | - | - | - | pF |
| **74HCT4040-Q100** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $\overline{CP}$ to Q0; see Figure 8 [1] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 19 | 40 | - | 50 | - | 60 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 16 | - | - | - | - | - | ns |
| | | Qn to Qn+1; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 10 | 20 | - | 25 | - | 30 | ns |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 8 | - | - | - | - | - | ns |
| $t_{PHL}$ | HIGH to LOW propagation delay | MR to Qn; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 23 | 45 | - | 56 | - | 68 | ns |
| $t_t$ | transition time | Qn; see Figure 8 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 7 | 15 | - | 19 | - | 22 | ns |
| $t_W$ | pulse width | $\overline{CP}$ input, HIGH or LOW; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 16 | 7 | - | 20 | - | 24 | - | ns |
| | | MR input, HIGH; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 16 | 6 | - | 20 | - | 24 | - | ns |
| $t_{rec}$ | recovery time | MR to $\overline{CP}$; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 10 | 2 | - | 13 | - | 15 | - | ns |
| $f_{max}$ | maximum frequency | $\overline{CP}$ input; see Figure 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | 30 | 72 | - | 24 | - | 20 | - | MHz |
| | | $V_{CC}$ = 5.0 V; $C_L$ = 15 pF | - | 79 | - | - | - | - | - | MHz |
| $C_{PD}$ | power dissipation capacitance | $V_I$ = GND to $V_{CC}$ [3] | - | 20 | - | - | - | - | - | pF |

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

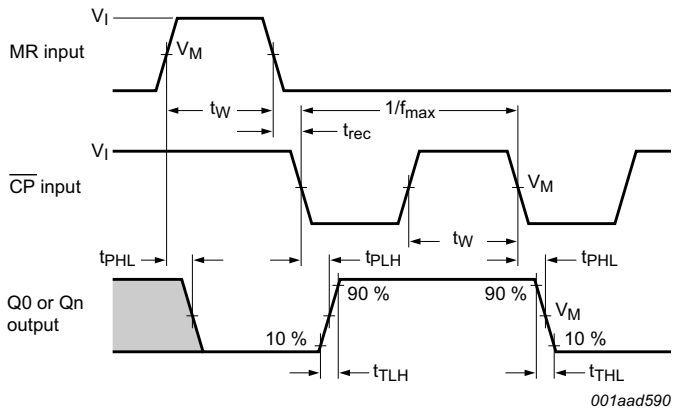
[2] $t_t$ is the same as $t_{THL}$, $t_{TLH}$.

[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.


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## 12. Waveform and test circuit



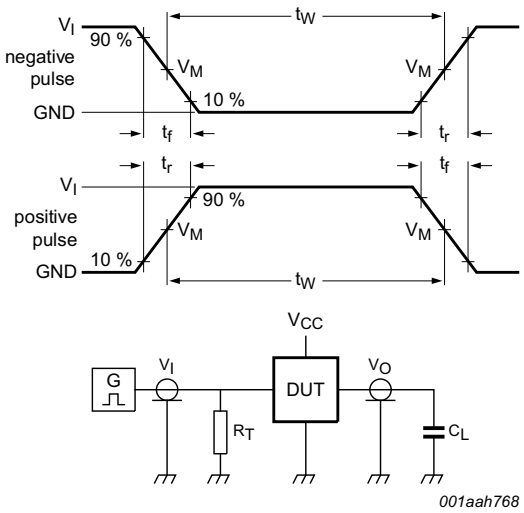

74HC4040-Q100: $V_M$ = 50 %; $V_I$ = GND to $V_{CC}$.

74HCT4040-Q100: $V_M$ = 1.3 V; $V_I$ = GND to 3 V.

**Fig 8. Clock propagation delays, pulse width, transition times, maximum pulse frequency and master resets**


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Test data is given in Table 8.

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 9. Test circuit for measuring switching times**

**Table 8. Test data**

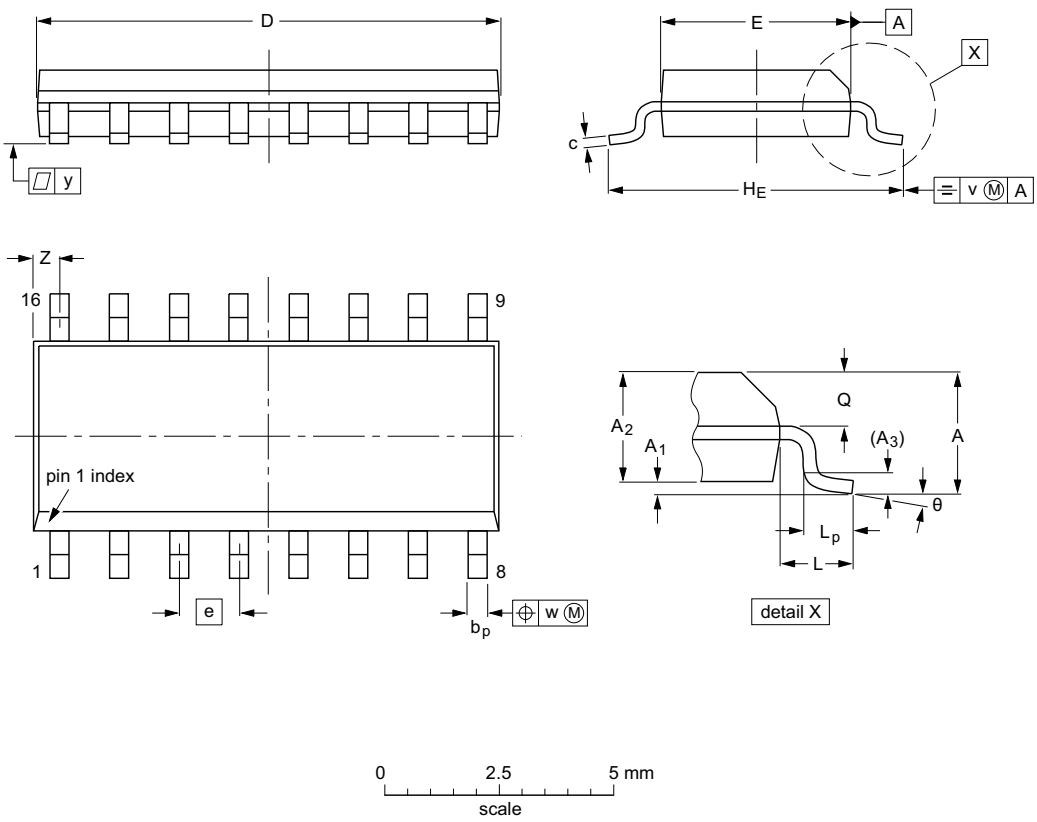
| Type | Input | | Load | Test |
|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | |
| 74HC4040-Q100 | $V_{CC}$ | 6.0 ns | 15 pF, 50 pF | $t_{PLH}$, $t_{PHL}$ |
| 74HCT4040-Q100 | 3.0 V | 6.0 ns | 15 pF, 50 pF | $t_{PLH}$, $t_{PHL}$ |


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## 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.

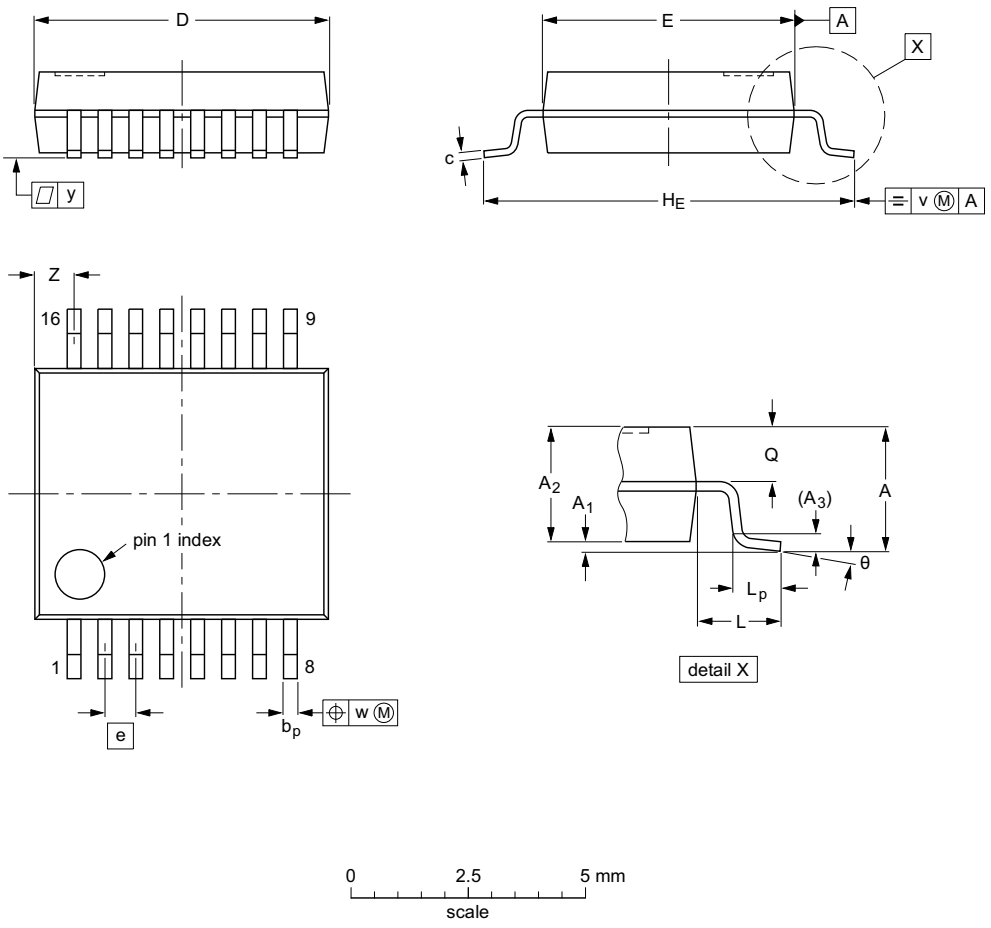
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT109-1 | 076E07 | MS-012 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 10. Package outline SOT109-1 (SO16)**


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**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.

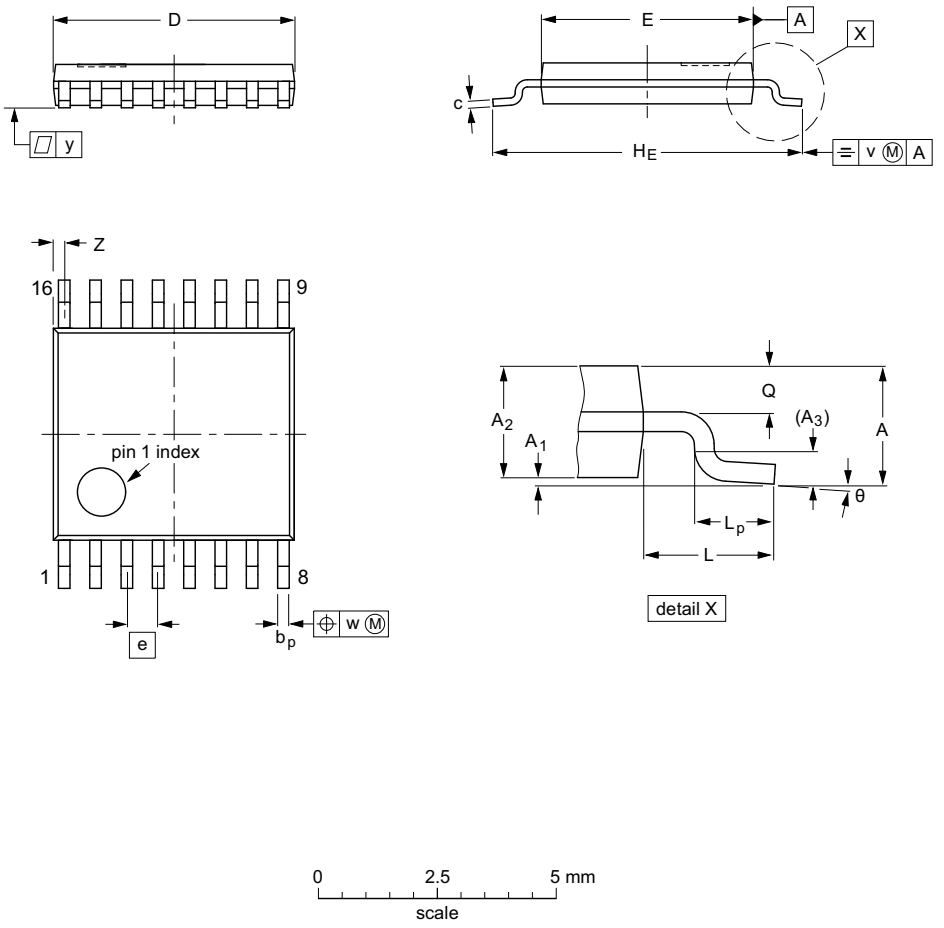
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT338-1 | | MO-150 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 11. Package outline SOT338-1 (SSOP16)**


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**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 | $8^o$<br>$0^o$ |

**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.

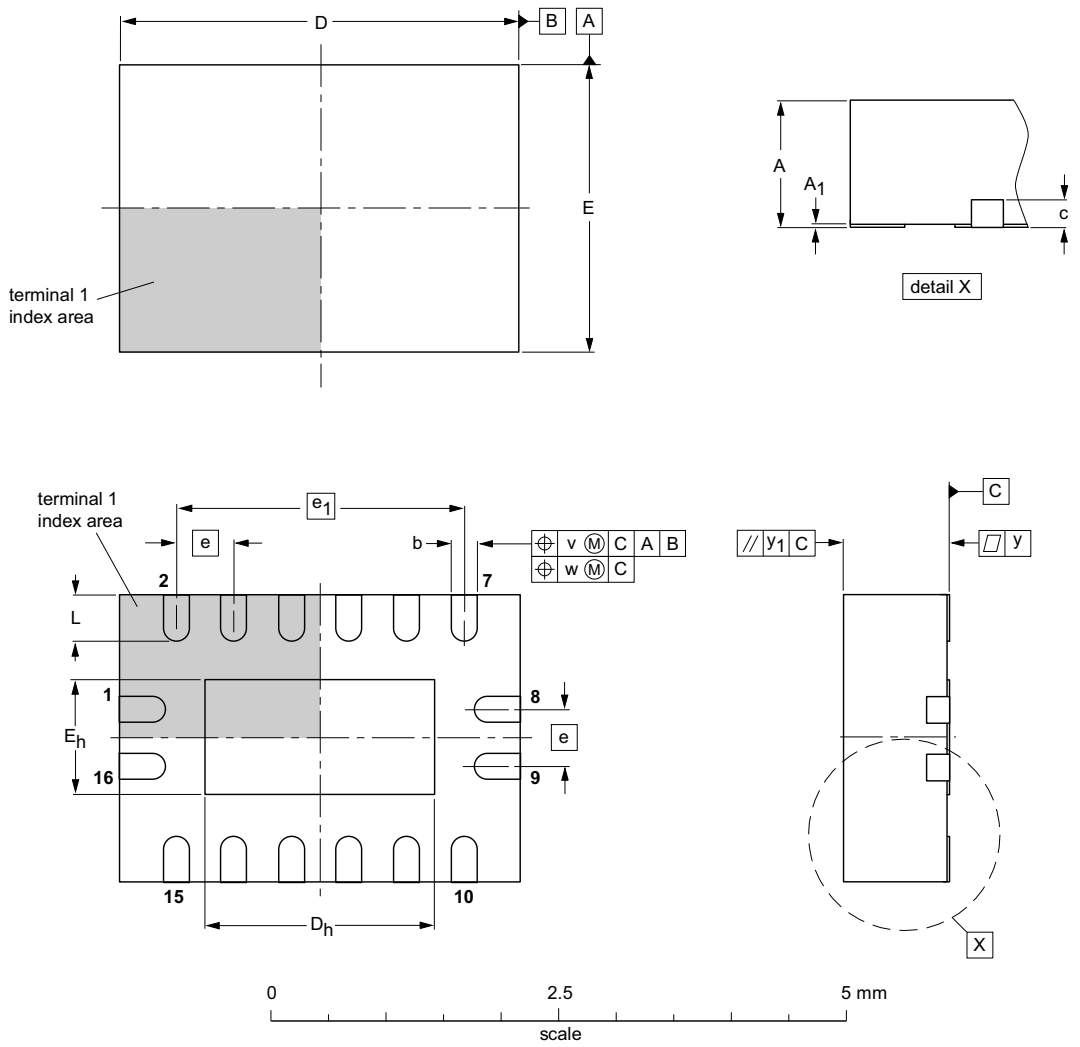
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT403-1 | | MO-153 | | | | ~~99-12-27~~<br>03-02-18 |

**Fig 12. Package outline SOT403-1 (TSSOP16)**


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**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 13. Package outline SOT763-1 (DHVQFN16)**


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## 14. Abbreviations

**Table 9. Abbreviations**

| Acronym | Description |
|---|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MIL | Military |
| TTL | Transistor-Transistor Logic |

## 15. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74HC_HCT4040_Q100 v.1 | 20140324 | Product data sheet | - | - |


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[2] The term 'short data sheet' is explained in section "Definitions".

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