# 74AHC123A-Q100; 74AHCT123A-Q100

## Dual retriggerable monostable multivibrator with reset

Rev. 3 — 4 September 2023 Product data sheet

## 1. General description

The 74AHC123A-Q100; 74AHCT123A-Q100 is a dual retriggerable monostable multivibrator with reset. The basic output pulse width is programmed by selection of external components ($R_{EXT}$ and $C_{EXT}$). Once triggered this basic pulse width may be extended by retriggering either of the edge triggered inputs ($n\overline{A}$ or (nB). By repeating this process, the output pulse period (nQ = HIGH, $n\overline{Q}$ = LOW) can be made as long as desired. Alternatively, an output delay can be terminated at any time by a LOW-going edge on input $n\overline{RD}$. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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
- Wide supply voltage range from 2.0 V to 5.5 V
- DC triggered from active HIGH or active LOW inputs
- Retriggerable for very long pulses up to 100 % duty factor
- Direct reset terminates output pulse
- Overvoltage tolerant inputs to 5.5 V
- All inputs have a Schmitt-trigger action
- High noise immunity
- Input levels:
  - For 74AHC123A-Q100: CMOS level
  - For 74AHCT123A-Q100: TTL level
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- 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
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

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## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74AHC123AD-Q100<br>74AHCT123AD-Q100 | -40 °C to +125 °C | SO16 | plastic small outline package; 16 leads; body width 3.9 mm | SOT109-1 |
| 74AHC123APW-Q100<br>74AHCT123APW-Q100 | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |
| 74AHC123ABQ-Q100<br>74AHCT123ABQ-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 |

## 4. Functional diagram

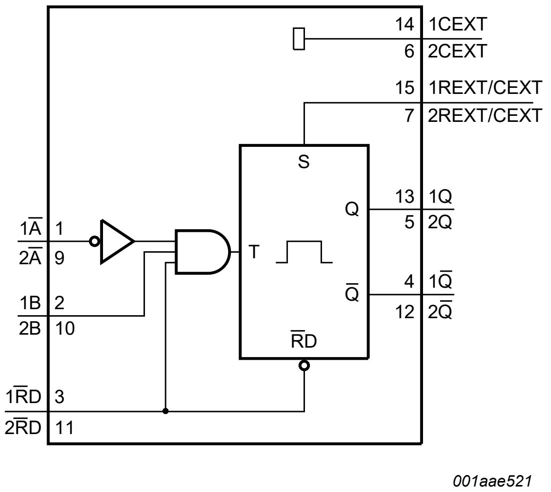



Fig. 1. Logic symbol

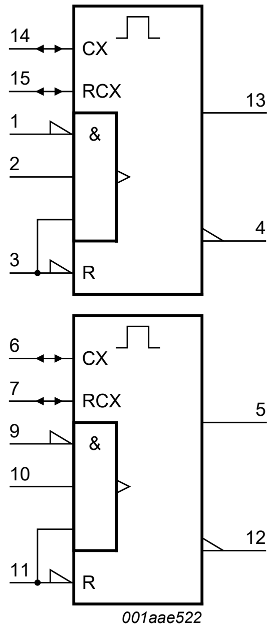



Fig. 2. IEC logic symbol

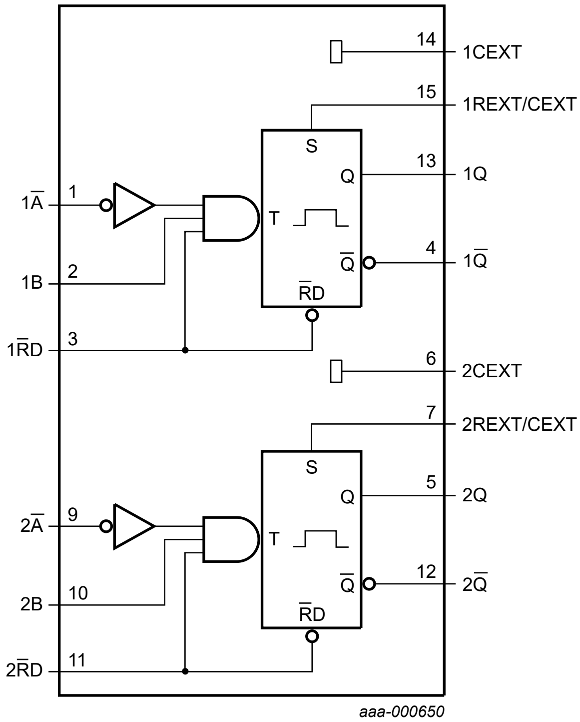
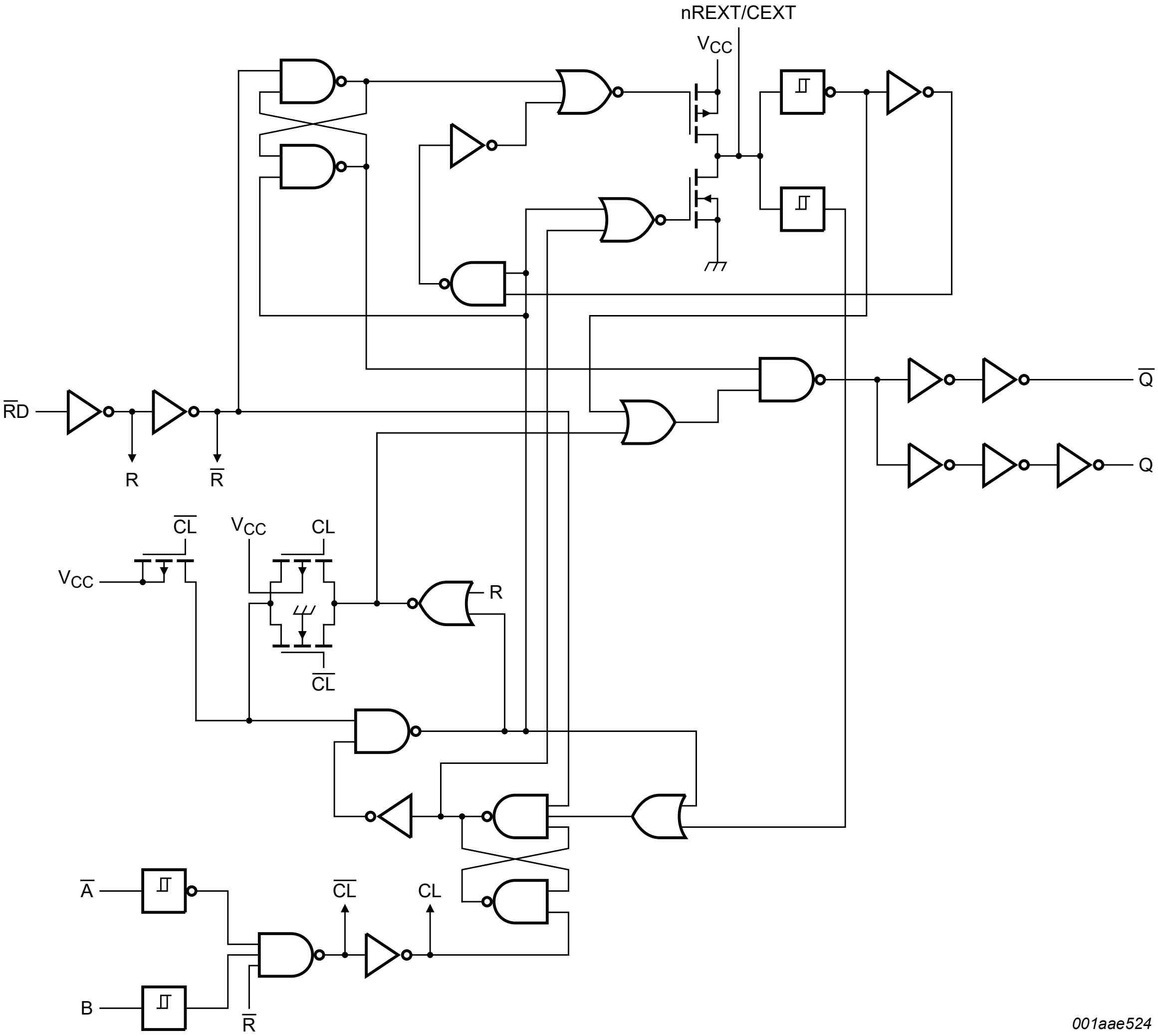



**Fig. 3. Functional diagram**

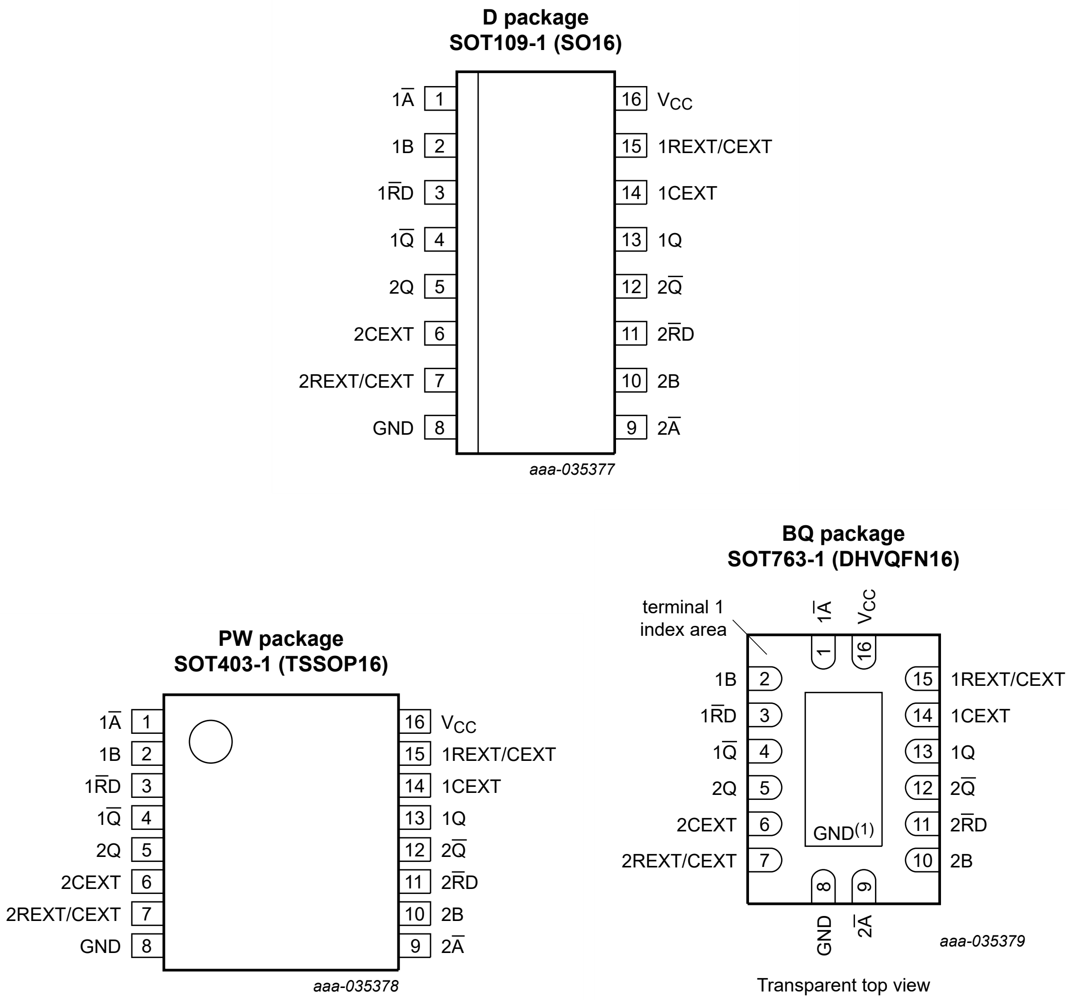



For minimum noise generation it is recommended to ground pins 6 (2CEXT) and 14 (1CEXT) externally to pin 8 (GND).

**Fig. 4. Functional diagram**

# 5. Pinning information

## 5.1. Pinning




(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

### 5.2. Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1$\overline{A}$ | 1 | negative-edge triggered input 1 |
| 1B | 2 | positive-edge triggered input 1 |
| 1$\overline{RD}$ | 3 | direct reset LOW and positive-edge triggered input 1 |
| 1$\overline{Q}$ | 4 | active LOW output 1 |
| 2Q | 5 | active HIGH output 2 |
| 2CEXT | 6 | external capacitor connection 2 |
| 2REXT/CEXT | 7 | external resistor and capacitor connection 2 |
| GND | 8 | ground (0 V) |
| 2$\overline{A}$ | 9 | negative-edge triggered input 2 |
| 2B | 10 | positive-edge triggered input 2 |
| 2$\overline{RD}$ | 11 | direct reset LOW and positive-edge triggered input 2 |
| 2$\overline{Q}$ | 12 | active LOW output 2 |
| 1Q | 13 | active HIGH output 1 |
| 1CEXT | 14 | external capacitor connection 1 |
| 1REXT/CEXT | 15 | external resistor and capacitor connection 1 |
| $V_{CC}$ | 16 | supply voltage |

## 6. Functional description

**Table 3. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care;*
*↑ = LOW-to-HIGH transition;*
*↓ = HIGH-to-LOW transition;*
*⊓ = one HIGH level output pulse;*
*⊔ = one LOW level output pulse.*

| Input | | | Output | |
|---|---|---|---|---|
| **n$\overline{RD}$** | **n$\overline{A}$** | **nB** | **nQ** | **n$\overline{Q}$** |
| L | X | X | L | H |
| X | H | X | L [1] | H [1] |
| X | X | L | L [1] | H [1] |
| H | L | ↑ | ⊓ | ⊔ |
| H | ↓ | H | ⊓ | ⊔ |
| ↑ | L | H | ⊓ | ⊔ |

[1] If the monostable multivibrator was triggered before this condition was established, the pulse will continue as programmed.

# 7. 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 |
| $V_I$ | input voltage | | | -0.5 | +7.0 | V |
| $I_{IK}$ | input clamping current | $V_I$ < -0.5 V | [1] | -20 | - | mA |
| $I_{OK}$ | output clamping current | $V_O$ < -0.5 V or $V_O$ > $V_{CC}$ + 0.5 V | [1] | - | ±20 | mA |
| $I_O$ | output current | $V_O$ = -0.5 V to ($V_{CC}$ + 0.5 V) | | - | ±25 | mA |
| $I_{CC}$ | supply current | | | - | 75 | mA |
| $I_{GND}$ | ground current | | | -75 | - | mA |
| $T_{stg}$ | storage temperature | | | -65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = -40 °C to +125 °C | [2] | - | 500 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] 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.

# 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

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

| Symbol | Parameter | Conditions | 74AHC123A-Q100 | | | 74AHCT123A-Q100 | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | |
| $V_{CC}$ | supply voltage | | 2.0 | 5.0 | 5.5 | 4.5 | 5.0 | 5.5 | V |
| $V_I$ | input voltage | | 0 | - | 5.5 | 0 | - | 5.5 | 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 | $V_{CC}$ = 3.3 V ± 0.3 V | - | - | 100 | - | - | - | ns/V |
| | | $V_{CC}$ = 5.0 V ± 0.5 V | - | - | 20 | - | - | 20 | ns/V |

# 9. Static characteristics

**Table 6. Static characteristics**

*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 | |
| **74AHC123A-Q100** | | | | | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 2.0 V | | 1.5 | - | - | 1.5 | - | 1.5 | - | V |
| | | $V_{CC}$ = 3.0 V | | 2.1 | - | - | 2.1 | - | 2.1 | - | V |
| | | $V_{CC}$ = 5.5 V | | 3.85 | - | - | 3.85 | - | 3.85 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 2.0 V | | - | - | 0.5 | - | 0.5 | - | 0.5 | V |
| | | $V_{CC}$ = 3.0 V | | - | - | 0.9 | - | 0.9 | - | 0.9 | V |
| | | $V_{CC}$ = 5.5 V | | - | - | 1.65 | - | 1.65 | - | 1.65 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | | | | |
| | | $I_O$ = -50 μA; $V_{CC}$ = 2.0 V | | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | $I_O$ = -50 μA; $V_{CC}$ = 3.0 V | | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | $I_O$ = -50 μA; $V_{CC}$ = 4.5 V | | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O$ = -4.0 mA; $V_{CC}$ = 3.0 V | | 2.58 | - | - | 2.48 | - | 2.40 | - | V |
| | | $I_O$ = -8.0 mA; $V_{CC}$ = 4.5 V | | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | | | | | | |
| | | $I_O$ = 50 μA; $V_{CC}$ = 2.0 V | | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O$ = 50 μA; $V_{CC}$ = 3.0 V | | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O$ = 50 μA; $V_{CC}$ = 4.5 V | | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 3.0 V | | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | | $I_O$ = 8.0 mA; $V_{CC}$ = 4.5 V | | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| $I_I$ | input leakage current | $V_I$ = 5.5 V or GND; $V_{CC}$ = 0 V to 5.5 V | | | | | | | | | |
| | | nREXT/CEXT | [1] | - | - | ±0.25 | - | ±2.5 | - | ±10.0 | μA |
| | | pins n$\overline{A}$, nB, n$\overline{RD}$ | | - | - | ±0.1 | - | ±1.0 | - | ±2.0 | μA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | | - | - | 4.0 | - | 40 | - | 80 | μA |
| | | active state (per circuit); $V_I$ = $V_{CC}$ or GND | [1] | | | | | | | | |
| | | $V_{CC}$ = 3.0 V | | - | 160 | 250 | - | 280 | - | 280 | μA |
| | | $V_{CC}$ = 4.5 V | | - | 380 | 500 | - | 650 | - | 650 | μA |
| | | $V_{CC}$ = 5.5 V | | - | 560 | 750 | - | 975 | - | 975 | μA |
| $C_I$ | input capacitance | | | - | 5.0 | 10 | - | 10 | - | 10 | pF |
| $C_O$ | output capacitance | | | - | 4.0 | - | - | - | - | - | pF |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| **74AHCT123A-Q100** | | | | | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | 2.0 | - | - | 2.0 | - | 2.0 | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 4.5 V to 5.5 V | - | - | 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 | | | | | | | | |
| | | $I_O$ = -50 μA | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O$ = -8.0 mA | 3.94 | - | - | 3.8 | - | 3.70 | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I = V_{IH}$ or $V_{IL}$; $V_{CC}$ = 4.5 V | | | | | | | | |
| | | $I_O$ = 50 μA | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O$ = 8.0 mA | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| $I_I$ | input leakage current | nREXT/CEXT; [1] $V_I$ = 5.5 V or GND; $V_{CC}$ = 0 V to 5.5 V | - | - | ±0.25 | - | ±2.5 | - | ±10.0 | μA |
| | | pins n$\overline{A}$, nB, n$\overline{RD}$; $V_I = V_{CC}$ or GND; $V_{CC}$ = 5.5 V | - | - | ±0.1 | - | ±1.0 | - | ±2.0 | μA |
| $I_{CC}$ | supply current | $V_I = V_{CC}$ or GND; $I_O$ = 0 A; $V_{CC}$ = 5.5 V | - | - | 4.0 | - | 40 | - | 80 | μA |
| | | active state (per circuit); [1] $V_I = V_{CC}$ or GND | | | | | | | | |
| | | $V_{CC}$ = 4.5 V | - | 380 | 500 | - | 650 | - | 650 | μA |
| | | $V_{CC}$ = 5.5 V | - | 560 | 750 | - | 975 | - | 975 | μA |
| $C_I$ | input capacitance | | - | 3 | 10 | - | 10 | - | 10 | pF |
| $C_O$ | output capacitance | | - | 4.0 | - | - | - | - | - | pF |

[1] Voltage on nREXT/CEXT = 0.5 × $V_{CC}$ and pin nREXT/CEXT in OFF-state during test.

# 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

*GND = 0 V; For test circuit see Fig. 10.*

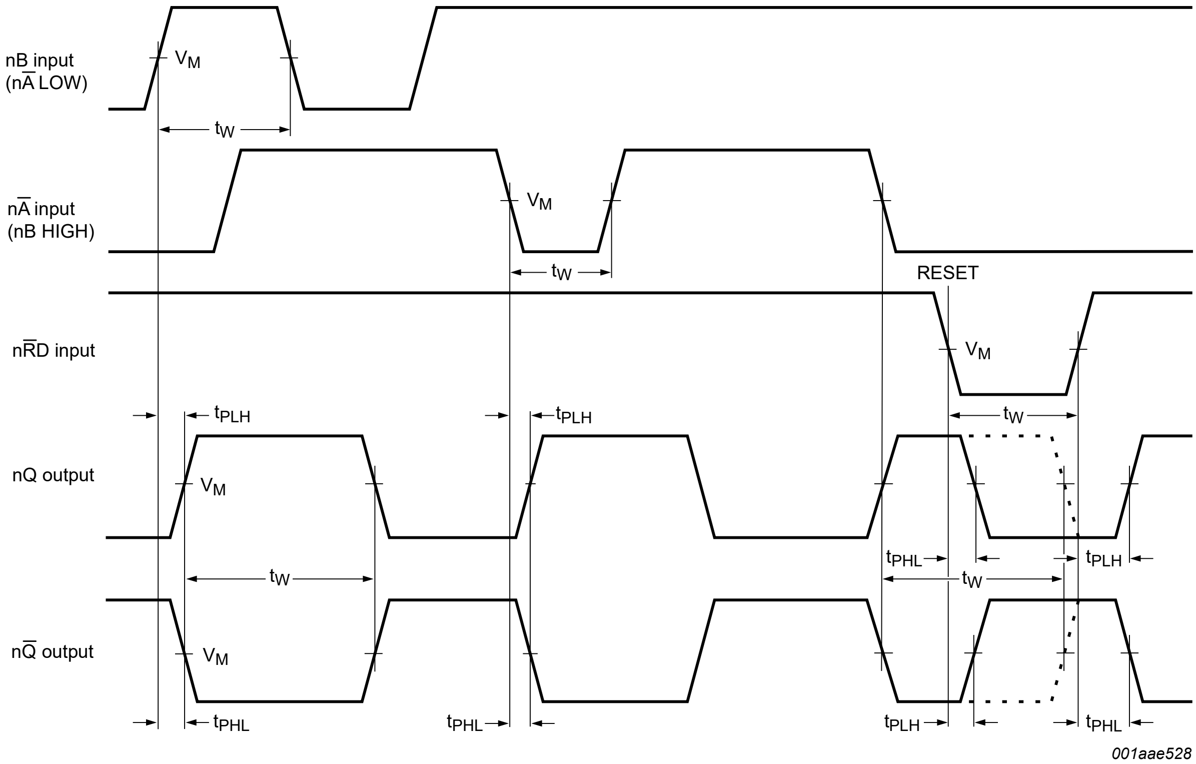
| Symbol | Parameter | Conditions | | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| **74AHC123A-Q100** | | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $n\overline{A}$ and nB to nQ and $n\overline{Q}$; see Fig. 5 | [2] | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 15 pF | | - | 7.4 | 20.6 | 1.0 | 24.0 | 1.0 | 26.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 50 pF | | - | 10.5 | 24.1 | 1.0 | 27.5 | 1.0 | 30.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | | - | 5.1 | 12.0 | 1.0 | 14.0 | 1.0 | 15.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | | - | 7.3 | 14.0 | 1.0 | 16.0 | 1.0 | 17.5 | ns |
| | | $n\overline{RD}$ to nQ and $n\overline{Q}$; see Fig. 5 | [2] | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 15 pF | | - | 8.2 | 22.4 | 1.0 | 26.0 | 1.0 | 28.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 50 pF | | - | 11.7 | 25.9 | 1.0 | 29.5 | 1.0 | 32.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | | - | 5.6 | 12.9 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | | - | 8.1 | 14.9 | 1.0 | 17.0 | 1.0 | 19.0 | ns |
| | | $n\overline{RD}$ to nQ and $n\overline{Q}$ (reset); see Fig. 5 | [2] | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 15 pF | | - | 6.4 | 15.8 | 1.0 | 18.5 | 1.0 | 20.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V; $C_L$ = 50 pF | | - | 9.2 | 19.3 | 1.0 | 22.0 | 1.0 | 24.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | | - | 4.4 | 9.4 | 1.0 | 11.0 | 1.0 | 12.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | | - | 6.3 | 11.4 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| $t_W$ | pulse width | inputs; $n\overline{A}$ = LOW; see Fig. 5 | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | inputs; nB = HIGH; see Fig. 5 | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | inputs; $n\overline{RD}$ = LOW; see Fig. 5 | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | outputs; $n\overline{Q}$ = LOW and nQ = HIGH; $C_L$ = 50 pF; see Fig. 5, Fig. 6, Fig. 7 and Fig. 8 | [3] | | | | | | | | |
| | | $C_{EXT}$ = 28 pF; $R_{EXT}$ = 2 kΩ | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | - | 115 | 240 | - | 300 | - | 300 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | - | 100 | 200 | - | 240 | - | 240 | ns |
| | | $C_{EXT}$ = 0.01 μF; $R_{EXT}$ = 10 kΩ | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 90 | 100 | 110 | 90 | 110 | 85 | 115 | μs |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 90 | 100 | 110 | 90 | 110 | 85 | 115 | μs |
| | | $C_{EXT}$ = 0.1 μF; $R_{EXT}$ = 10 kΩ; | | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 0.9 | 1 | 1.1 | 0.9 | 1.1 | 0.85 | 1.15 | ms |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 0.9 | 1 | 1.1 | 0.9 | 1.1 | 0.85 | 1.15 | ms |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| $t_{rtrig}$ | retrigger time | $n\overline{A}$ to nB; $C_{EXT}$ = 100 pF; $R_{EXT}$ = 1 kΩ; $C_L$ = 50 pF; see Fig. 6 and Fig. 8 | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 60 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 39 | - | - | - | - | - | ns |
| | | $n\overline{A}$ to nB; $C_{EXT}$ = 0.01 μF; $R_{EXT}$ = 1 kΩ; $C_L$ = 50 pF; see Fig. 6 and Fig. 8 | | | | | | | | |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 1.5 | - | - | - | - | - | μs |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 1.2 | - | - | - | - | - | μs |
| $C_{PD}$ | power dissipation capacitance | $C_L$ = 50 pF; $f_i$ = 1 MHz; $V_I$ = GND to $V_{CC}$ [4] | - | 57 | - | - | - | - | - | pF |
| **74AHCT123A-Q100** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | $n\overline{A}$ and nB to nQ and $n\overline{Q}$; see Fig. 5 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | - | 5.0 | 12.0 | 1.0 | 14.0 | 1.0 | 15.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | - | 7.1 | 14.0 | 1.0 | 16.0 | 1.0 | 17.5 | ns |
| | | $n\overline{RD}$ to nQ and $n\overline{Q}$; see Fig. 5 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | - | 5.2 | 12.9 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | - | 7.5 | 14.9 | 1.0 | 17.0 | 1.0 | 18.5 | ns |
| | | $n\overline{RD}$ to nQ and $n\overline{Q}$ (reset); see Fig. 5 [2] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 15 pF | - | 4.7 | 9.4 | 1.0 | 11.0 | 1.0 | 12.0 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V; $C_L$ = 50 pF | - | 6.7 | 11.4 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| $t_W$ | pulse width | inputs; $n\overline{A}$ = LOW; $C_L$ = 50 pF; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | inputs; nB = HIGH; $C_L$ = 50 pF; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | inputs; $n\overline{RD}$ = LOW; $C_L$ = 50 pF; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 5.0 | - | - | 5.0 | - | 5.0 | - | ns |
| | | outputs; $n\overline{Q}$ = LOW and nQ = HIGH; $C_L$ = 50 pF; $C_{EXT}$ = 28 pF; $R_{EXT}$ = 2 kΩ; see Fig. 5, Fig. 6, Fig. 7 and Fig. 8 [3] | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 100 | 200 | - | 240 | - | 240 | ns |
| | | $C_{EXT}$ = 0.01 μF; $R_{EXT}$ = 10 kΩ | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 90 | 100 | 110 | 90 | 110 | 85 | 115 | μs |
| | | $C_{EXT}$ = 0.1 μF; $R_{EXT}$ = 10 kΩ | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 0.9 | 1 | 1.1 | 0.9 | 1.1 | 0.85 | 1.15 | ms |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| $t_{rtrig}$ | retrigger time | $n\overline{A}$ to nB; $C_{EXT}$ = 100 pF; $R_{EXT}$ = 1 kΩ; $C_L$ = 50 pF; see Fig. 6 and Fig. 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 60 | - | - | - | - | - | ns |
| | | $n\overline{A}$ to nB; $C_{EXT}$ = 0.01 µF; $R_{EXT}$ = 1 kΩ; $C_L$ = 50 pF; see Fig. 6 and Fig. 8 | | | | | | | | |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 1.5 | - | - | - | - | - | µs |
| $C_{PD}$ | power dissipation capacitance | $C_L$ = 50 pF; $f_i$ = 1 MHz; $V_I$ = GND to $V_{CC}$ [4] | - | 58 | - | - | - | - | - | pF |
| **External components** | | | | | | | | | | |
| $R_{EXT}$ | external resistance | $V_{CC}$ = 2.0 V | 5 | - | - | - | - | - | - | kΩ |
| | | $V_{CC}$ > 3.0 V | 1 | - | - | - | - | - | - | kΩ |
| $C_{EXT}$ | external capacitance | $V_{CC}$ = 2.0 V [5] | - | - | - | - | - | - | - | pF |
| | | $V_{CC}$ > 3.0 V [5] | - | - | - | - | - | - | - | pF |

[1] Typical values are measured at nominal supply voltage ($V_{CC}$ = 3.3 V and $V_{CC}$ = 5.0 V).
[2] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$; $C_{EXT}$ = 0 pF; $R_{EXT}$ = 5 kΩ.
[3] For $C_{EXT}$ ≥ 10 nF the typical value of the pulse width $t_W$ (µs) = $C_{EXT}$ (nF) × $R_{EXT}$ (kΩ).
[4] $C_{PD}$ is used to determine the dynamic power dissipation $P_D$ (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;
$C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in V.
[5] $C_{EXT}$ has no limits.

## 10.1. Waveforms and test circuit

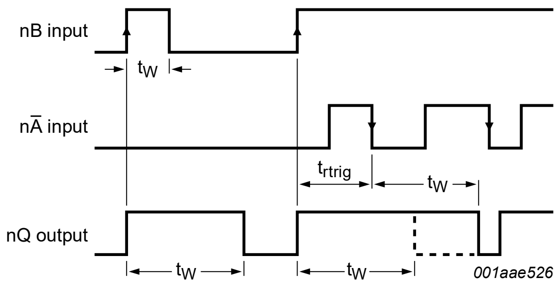



Measurement points are given in Table 8.

**Fig. 5. Propagation delay input (n$\overline{A}$, nB, n$\overline{RD}$) to output (nQ, n$\overline{Q}$)**

**Table 8. Measurement points**

| Type | Input | Output |
|---|---|---|
| | $V_M$ | $V_M$ |
| 74AHC123A-Q100 | 0.5 × $V_{CC}$ | 0.5 × $V_{CC}$ |
| 74AHCT123A-Q100 | 1.5 V | 0.5 × $V_{CC}$ |




n$\overline{RD}$ = HIGH

**Fig. 6. Output pulse control using retrigger pulse**

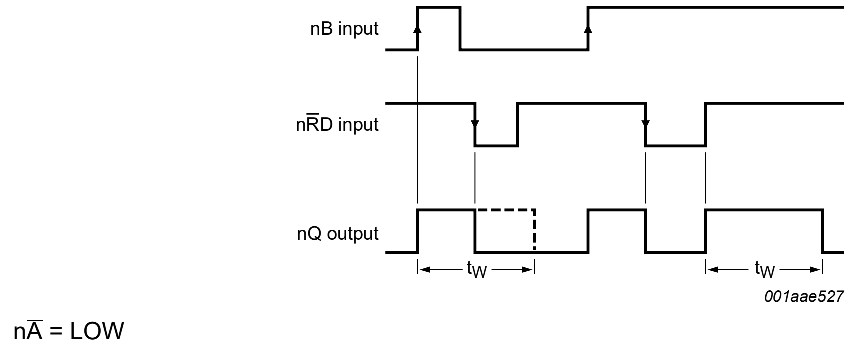



**Fig. 7. Output pulse control using reset input nR̅D̅**

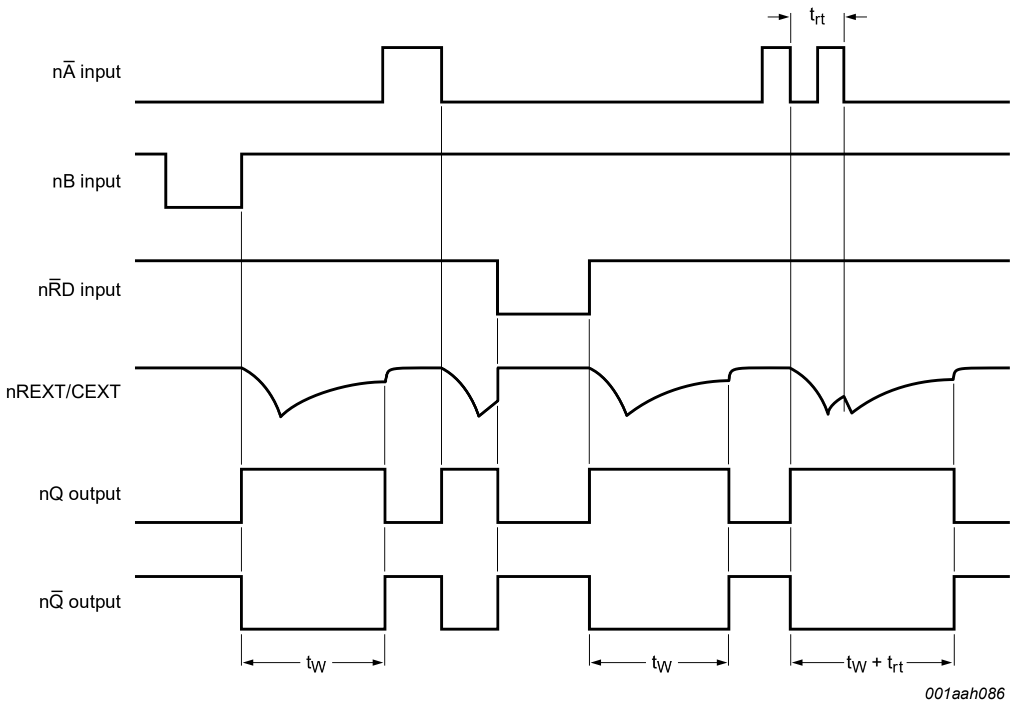



**Fig. 8. Input and output timing**

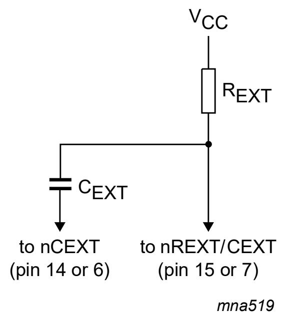
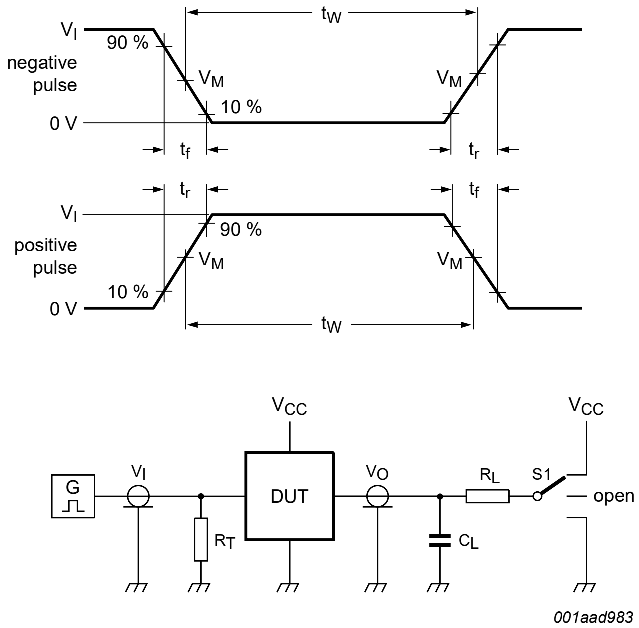



**Fig. 9. Timing component connections**




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

$R_L$ = Load resistance

S1 = Test selection switch

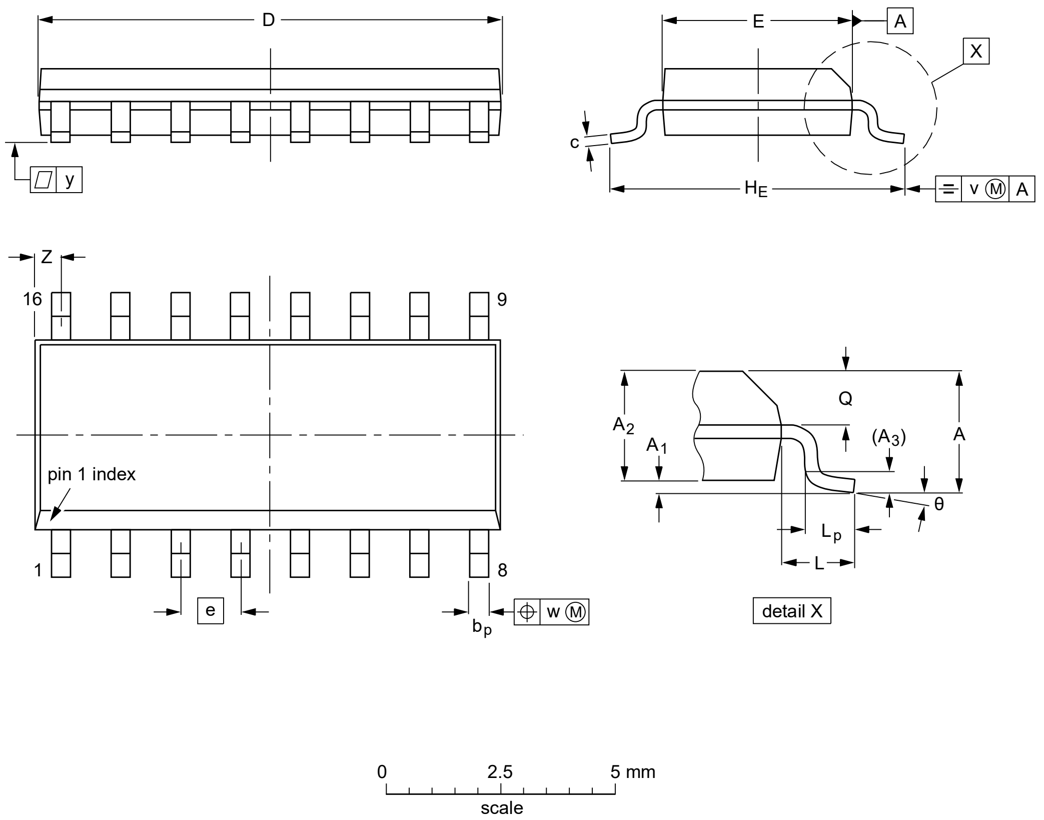
**Fig. 10. Test circuit for measuring switching times**

**Table 9. Test data**

| Type | Input | | Load | | S1 position | | |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r$, $t_f$ | $C_L$ | $R_L$ | $t_{PHL}$, $t_{PLH}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 74AHC123A-Q100 | $V_{CC}$ | 3.0 ns | 15 pF, 50 pF | 1 kΩ | open | GND | $V_{CC}$ |
| 74AHCT123A-Q100 | 3.0 V | 3.0 ns | 15 pF, 50 pF | 1 kΩ | open | GND | $V_{CC}$ |

# 11. 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°<br>0° |
| 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 | |

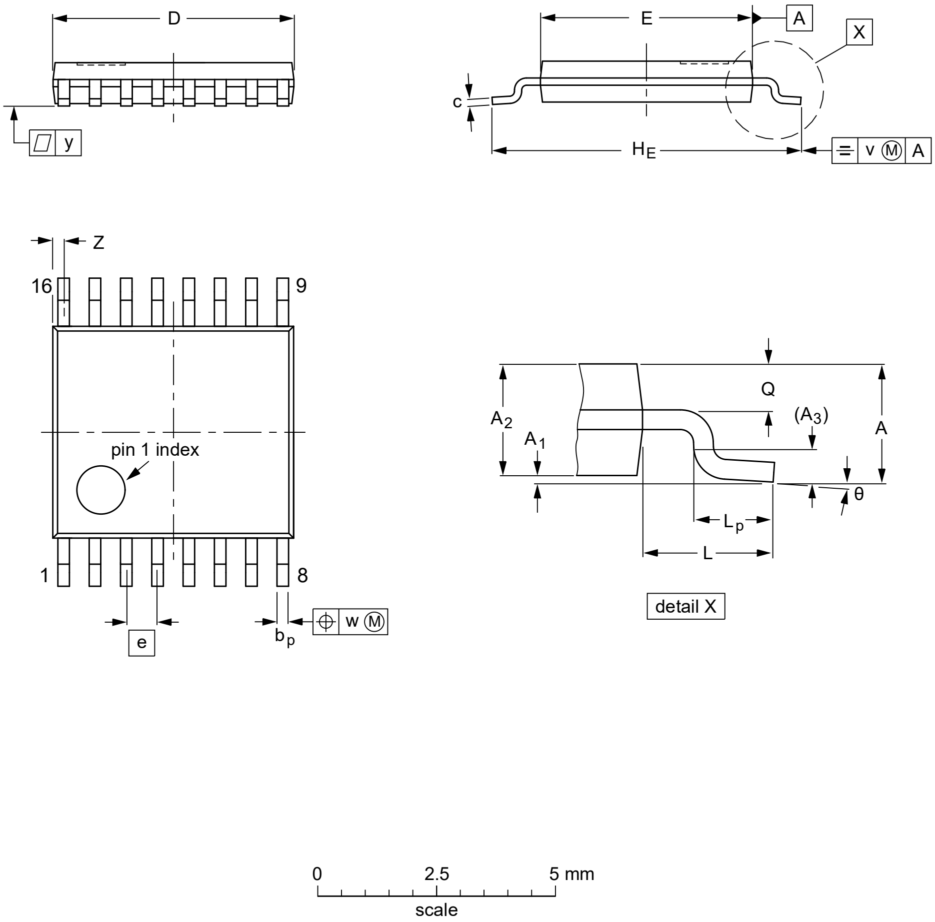
**Note**

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. 11. Package outline SOT109-1 (SO16)**

**TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm** **SOT403-1**




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

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D [(1)] | E [(2)] | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z [(1)] | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<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.

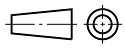
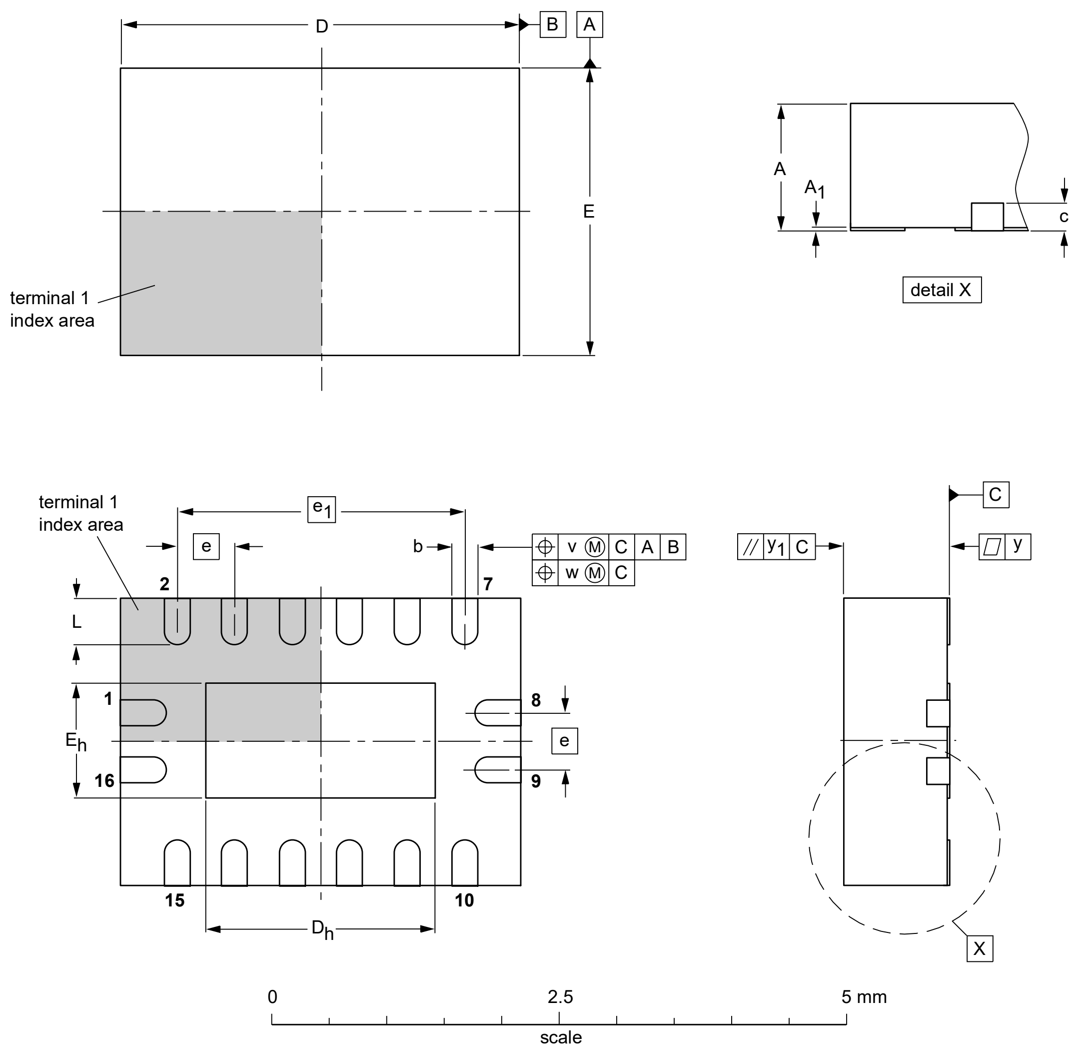
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT403-1 | | MO-153 | | |  | ~~99-12-27~~<br>03-02-18 |

**Fig. 12. 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. 13. Package outline SOT763-1 (DHVQFN16)**

## 12. 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 |

## 13. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74AHC_AHCT123A_Q100 v.3 | 20230904 | Product data sheet | - | 74AHC_AHCT123A_Q100 v.2 |
| Modifications: | • Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74AHC_AHCT123A_Q100 v.2 | 20200617 | Product data sheet | - | 74AHC_AHCT123A_Q100 v.1 |
| 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>• Section 1 and Section 2 updated.<br>• Table 4: Derating values for $P_{tot}$ total power dissipation updated. | | | |
| 74AHC_AHCT123A_Q100 v.1 | 20130523 | Product data sheet | - | - |

# 14. 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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