

# 74AHC30-Q100; 74AHCT30-Q100

## 8-input NAND gate

Rev. 2 — 6 May 2020

Product data sheet

## 1. General description

The 74AHC30-Q100; 74AHCT30-Q100 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard No. 7-A.

The 74AHC30-Q100; 74AHCT30-Q100 provides an 8-input NAND function.

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
- Balanced propagation delays
- All inputs have Schmitt-trigger actions
- Inputs accept voltages higher than  $V_{CC}$
- Input levels:
  - For 74AHC30-Q100: CMOS level
  - For 74AHCT30-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  $\Omega$ )
- Multiple package options
- DHVQFN package with Side-Wettable Flanks enabling Automatic Optical Inspection (AOI) of solder joints

## 3. Ordering information

Table 1. Ordering information

| Type number     | Package           |          |  |          |
|-----------------|-------------------|----------|--|----------|
|                 | Temperature range | Name     | Description  | Version  |
| 74AHC30D-Q100   | -40 °C to +125 °C | SO14     | plastic small outline package; 14 leads; body width 3.9 mm   | SOT108-1 |
| 74AHCT30D-Q100  |                   |          |  |          |
| 74AHC30PW-Q100  | -40 °C to +125 °C | TSSOP14  | plastic thin shrink small outline package; 14 leads; body width 4.4 mm   | SOT402-1 |
| 74AHCT30PW-Q100 |                   |          |  |          |
| 74AHC30BQ-Q100  | -40 °C to +125 °C | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm | SOT762-1 |
| 74AHCT30BQ-Q100 |                   |          |  |          |

## 4. Marking

Table 2. Marking codes

| Type number     | Marking   |
|-----------------|-----------|
| 74AHC30D-Q100   | 74AHC30D  |
| 74AHCT30D-Q100  | 74AHCT30D |
| 74AHC30PW-Q100  | AHC30     |
| 74AHCT30PW-Q100 | AHCT30    |
| 74AHC30BQ-Q100  | AHC30     |
| 74AHCT30BQ-Q100 | AHT30     |

## 5. Functional diagram

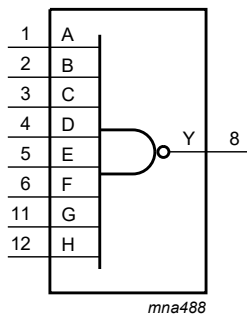


Fig. 1. Logic symbol

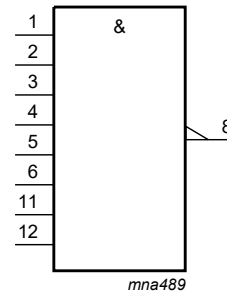


Fig. 2. IEC logic symbol

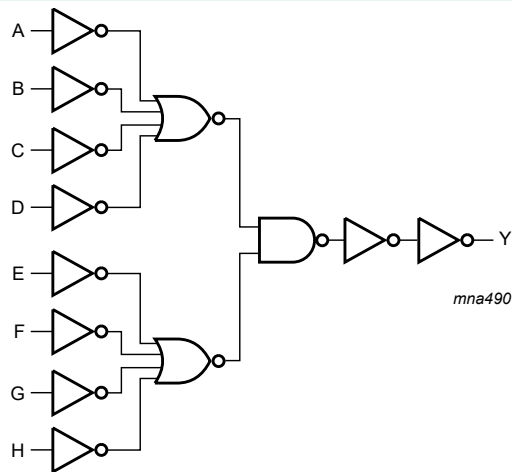
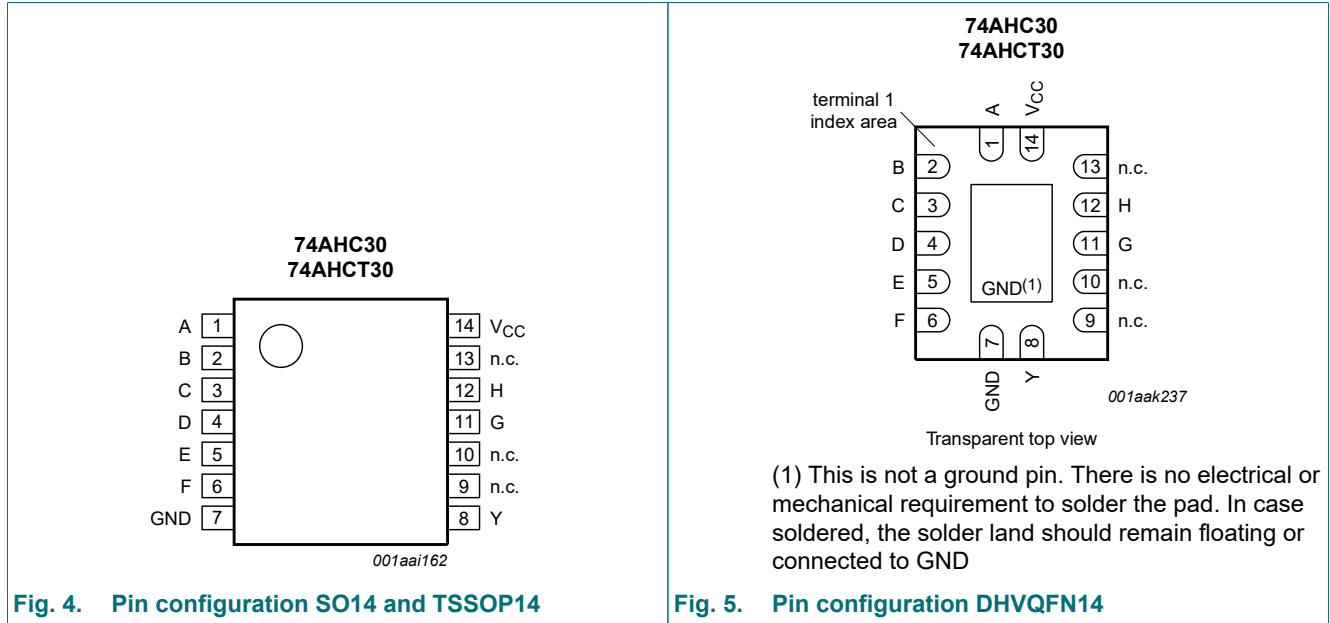


Fig. 3. Logic diagram

## 6. Pinning information

### 6.1. Pinning



### 6.2. Pin description

Table 3. Pin description

| Symbol          | Pin | Description    |
|-----------------|-----|----------------|
| A               | 1   | data input     |
| B               | 2   | data input     |
| C               | 3   | data input     |
| D               | 4   | data input     |
| E               | 5   | data input     |
| F               | 6   | data input     |
| GND             | 7   | ground (0 V)   |
| Y               | 8   | data output    |
| n.c.            | 9   | not connected  |
| n.c.            | 10  | not connected  |
| G               | 11  | data input     |
| H               | 12  | data input     |
| n.c.            | 13  | not connected  |
| V <sub>CC</sub> | 14  | supply voltage |

## 7. Functional description

**Table 4. Function table**

*H = HIGH voltage level; L = LOW voltage level; X = don't care.*

| Input |   |   |   |   |   |   |   | Output |
|-------|---|---|---|---|---|---|---|--------|
| A     | B | C | D | E | F | G | H | Y      |
| L     | X | X | X | X | X | X | X | H      |
| X     | L | X | X | X | X | X | X | H      |
| X     | X | L | X | X | X | X | X | H      |
| X     | X | X | L | X | X | X | X | H      |
| X     | X | X | X | L | X | X | X | H      |
| X     | X | X | X | X | L | X | X | H      |
| X     | X | X | X | X | X | L | X | H      |
| X     | X | X | X | X | X | X | L | H      |
| H     | H | H | H | H | H | H | H | L      |

## 8. Limiting values

**Table 5. 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  | +20  | mA   |
| $I_O$     | output current          | $V_O = -0.5$ V to $(V_{CC} + 0.5)$ V         | -25  | +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                |      |      |      |
|           |                         | SO14, TSSOP14 and DHVQFN14 [2]               | -    | 500  | mW   |

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

[2] For SOT108-1 (SO14) package:  $P_{tot}$  derates linearly with 10.1 mW/K above 100 °C.

For SOT402-1 (TSSOP14) package:  $P_{tot}$  derates linearly with 7.3 mW/K above 81 °C.

For SOT762-1 (DHVQFN14) package:  $P_{tot}$  derates linearly with 9.6 mW/K above 98 °C.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

| Symbol           | Parameter                           | Conditions                      | 74AHC30-Q100 |     |                 | 74AHCT30-Q100 |     |                 | Unit |
|------------------|-------------------------------------|---------------------------------|--------------|-----|-----------------|---------------|-----|-----------------|------|
|                  |                                     |                                 | Min          | Typ | Max             | Min           | Typ | Max             |      |
| V <sub>CC</sub>  | supply voltage                      |                                 | 2.0          | 5.0 | 5.5             | 4.5           | 5.0 | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                                 | 0            | -   | 5.5             | 0             | -   | 5.5             | V    |
| V <sub>O</sub>   | output voltage                      |                                 | 0            | -   | V <sub>CC</sub> | 0             | -   | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                                 | -40          | +25 | +125            | -40           | +25 | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 3.3 V ± 0.3 V | -            | -   | 100             | -             | -   | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 5.0 V ± 0.5 V | -            | -   | 20              | -             | -   | 20              | ns/V |

## 10. Static characteristics

**Table 7. 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  |      |
| <b>74AHC30-Q100</b>                               |                           |   |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub>                                   | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V   | 1.5   | -    | -    | 1.5              | -    | 1.5               | -    | V    |
|   |                           | V <sub>CC</sub> = 3.0 V   | 2.1   | -    | -    | 2.1              | -    | 2.1               | -    | V    |
|   |                           | V <sub>CC</sub> = 5.5 V   | 3.85  | -    | -    | 3.85             | -    | 3.85              | -    | V    |
| V <sub>IL</sub>                                   | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V   | -     | -    | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|   |                           | V <sub>CC</sub> = 3.0 V   | -     | -    | 0.9  | -                | 0.9  | -                 | 0.9  | V    |
|   |                           | V <sub>CC</sub> = 5.5 V   | -     | -    | 1.65 | -                | 1.65 | -                 | 1.65 | V    |
| V <sub>OH</sub>                                   | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                       |       |      |      |                  |      |                   |      |      |
|   |                           | I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 2.0 V  | 1.9   | 2.0  | -    | 1.9              | -    | 1.9               | -    | V    |
|   |                           | I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 3.0 V  | 2.9   | 3.0  | -    | 2.9              | -    | 2.9               | -    | V    |
|   |                           | I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 4.5 V  | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|   |                           | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V   | 2.58  | -    | -    | 2.48             | -    | 2.40              | -    | V    |
| I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V | 3.94                      | -   | -     | 3.80 | -    | 3.70             | -    | V                 |      |      |
| V <sub>OL</sub>                                   | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                       |       |      |      |                  |      |                   |      |      |
|   |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 2.0 V   | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|   |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 3.0 V   | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|   |                           | I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V   | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|   |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V  | -     | -    | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>O</sub> = 8.0 mA; V <sub>CC</sub> = 4.5 V  | -                         | -   | 0.36  | -    | 0.44 | -                | 0.55 | V                 |      |      |
| I <sub>I</sub>                                    | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V                          | -     | -    | 0.1  | -                | 1.0  | -                 | 2.0  | μA   |
| I <sub>CC</sub>                                   | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V | -     | -    | 2.0  | -                | 20   | -                 | 40   | μA   |
| C <sub>I</sub>                                    | input capacitance         | V <sub>I</sub> = V <sub>CC</sub> or GND   | -     | 3    | 10   | -                | 10   | -                 | 10   | pF   |
| C <sub>O</sub>                                    | output capacitance        |   | -     | 4    | -    | -                | -    | -                 | -    | pF   |

| Symbol               | Parameter                 | Conditions   | 25 °C |     |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|----------------------|---------------------------|--|-------|-----|------|------------------|------|-------------------|------|------|
|                      |                           |  | Min   | Typ | Max  | Min              | Max  | Min               | Max  |      |
| <b>74AHCT30-Q100</b> |                           |  |       |     |      |                  |      |                   |      |      |
| V <sub>IH</sub>      | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V   | 2.0   | -   | -    | 2.0              | -    | 2.0               | -    | V    |
| V <sub>IL</sub>      | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V   | -     | -   | 0.8  | -                | 0.8  | -                 | 0.8  | V    |
| V <sub>OH</sub>      | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |     |      |                  |      |                   |      |      |
|                      |                           | I <sub>O</sub> = -50 µA  | 4.4   | 4.5 | -    | 4.4              | -    | 4.4               | -    | V    |
|                      |                           | I <sub>O</sub> = -8.0 mA   | 3.94  | -   | -    | 3.80             | -    | 3.70              | -    | V    |
| V <sub>OL</sub>      | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |     |      |                  |      |                   |      |      |
|                      |                           | I <sub>O</sub> = 50 µA   | -     | 0   | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                      |                           | I <sub>O</sub> = 8.0 mA  | -     | -   | 0.36 | -                | 0.44 | -                 | 0.55 | V    |
| I <sub>I</sub>       | input leakage current     | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V   | -     | -   | 0.1  | -                | 1.0  | -                 | 2.0  | µA   |
| I <sub>CC</sub>      | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 5.5 V  | -     | -   | 2.0  | -                | 20   | -                 | 40   | µA   |
| ΔI <sub>CC</sub>     | additional supply current | per input pin;<br>V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other pins<br>at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 4.5 V to 5.5 V | -     | -   | 1.35 | -                | 1.5  | -                 | 1.5  | mA   |
| C <sub>I</sub>       | input capacitance         | V <sub>I</sub> = V <sub>CC</sub> or GND  | -     | 3   | 10   | -                | 10   | -                 | 10   | pF   |
| C <sub>O</sub>       | output capacitance        |  | -     | 4   | -    | -                | -    | -                 | -    | pF   |

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

| Symbol   | Parameter                     | Conditions   | 25 °C |        |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|--|-------------------------------|--|-------|--------|------|------------------|------|-------------------|------|------|
|  |                               |  | Min   | Typ[1] | Max  | Min              | Max  | Min               | Max  |      |
| <b>74AHC30-Q100</b>  |                               |  |       |        |      |                  |      |                   |      |      |
| $t_{pd}$   | propagation delay             | A, B, C, D, E, F, G, H to Y; see Fig. 6 and Fig. 7 [2] |       |        |      |                  |      |                   |      |      |
|  |                               | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                |       |        |      |                  |      |                   |      |      |
|  |                               | $C_L = 15\text{ pF}$                                   | -     | 5.0    | 9.5  | 1.0              | 11.0 | 1.0               | 12.0 | ns   |
|  |                               | $C_L = 50\text{ pF}$                                   | -     | 6.7    | 12.0 | 1.0              | 14.5 | 1.0               | 15.5 | ns   |
|  |                               | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                |       |        |      |                  |      |                   |      |      |
|  |                               | $C_L = 15\text{ pF}$                                   | -     | 3.6    | 6.5  | 1.0              | 7.5  | 1.0               | 8.0  | ns   |
| $C_{PD}$   | power dissipation capacitance | $f_i = 1\text{ MHz};$<br>$V_i = \text{GND to }V_{CC}$  | [3]   | -      | 10   | -                | -    | -                 | -    | pF   |
|  |                               | $C_L = 50\text{ pF}$                                   | -     | 4.9    | 8.0  | 1.0              | 9.5  | 1.0               | 10.5 | ns   |
| <b>74AHCT30-Q100; <math>V_{CC} = 4.5\text{ V to }5.5\text{ V}</math></b> |                               |  |       |        |      |                  |      |                   |      |      |
| $t_{pd}$   | propagation delay             | A, B, C, D, E, F, G, H to Y; see Fig. 6 and Fig. 7 [2] |       |        |      |                  |      |                   |      |      |
|  |                               | $C_L = 15\text{ pF}$                                   | -     | 3.3    | 6.5  | 1.0              | 7.5  | 1.0               | 8.0  | ns   |
|  |                               | $C_L = 50\text{ pF}$                                   | -     | 4.7    | 8.5  | 1.0              | 9.5  | 1.0               | 10.5 | ns   |
| $C_{PD}$   | power dissipation capacitance | $f_i = 1\text{ MHz};$<br>$V_i = \text{GND to }V_{CC}$  | [3]   | -      | 12   | -                | -    | -                 | -    | pF   |
|  |                               | $C_L = 50\text{ pF}$                                   | -     | 4.7    | 8.5  | 1.0              | 9.5  | 1.0               | 10.5 | ns   |

[1] Typical values are measured at nominal supply voltage ( $V_{CC} = 3.3\text{ V}$  and  $V_{CC} = 5.0\text{ V}$ ).

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

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = 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;

$\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

11.1. Waveforms

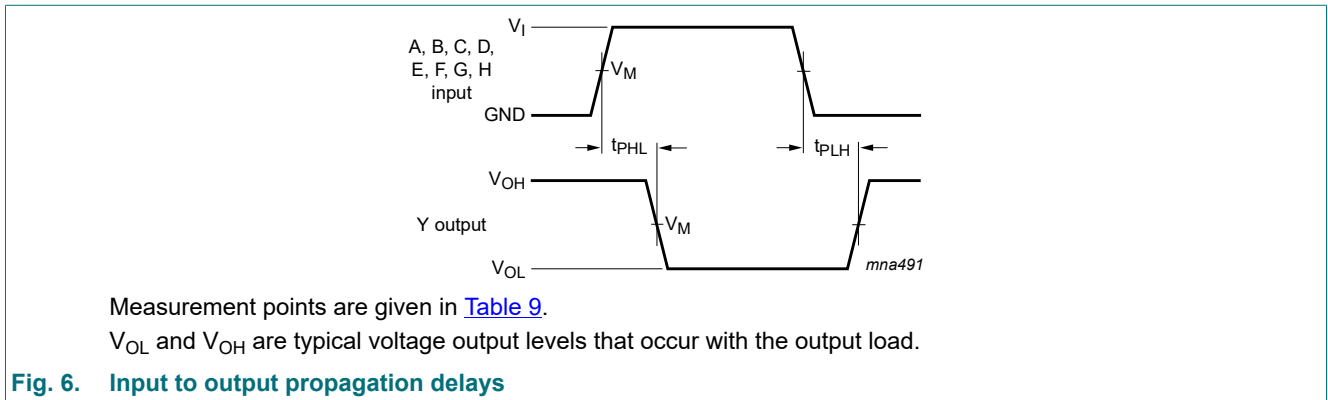


Table 9. Measurement points

| Type          | Input               |  | Output              |
|---------------|---------------------|--|---------------------|
|               | $V_M$               |  | $V_M$               |
| 74AHC30-Q100  | $0.5 \times V_{CC}$ |  | $0.5 \times V_{CC}$ |
| 74AHCT30-Q100 | 1.5 V               |  | $0.5 \times V_{CC}$ |

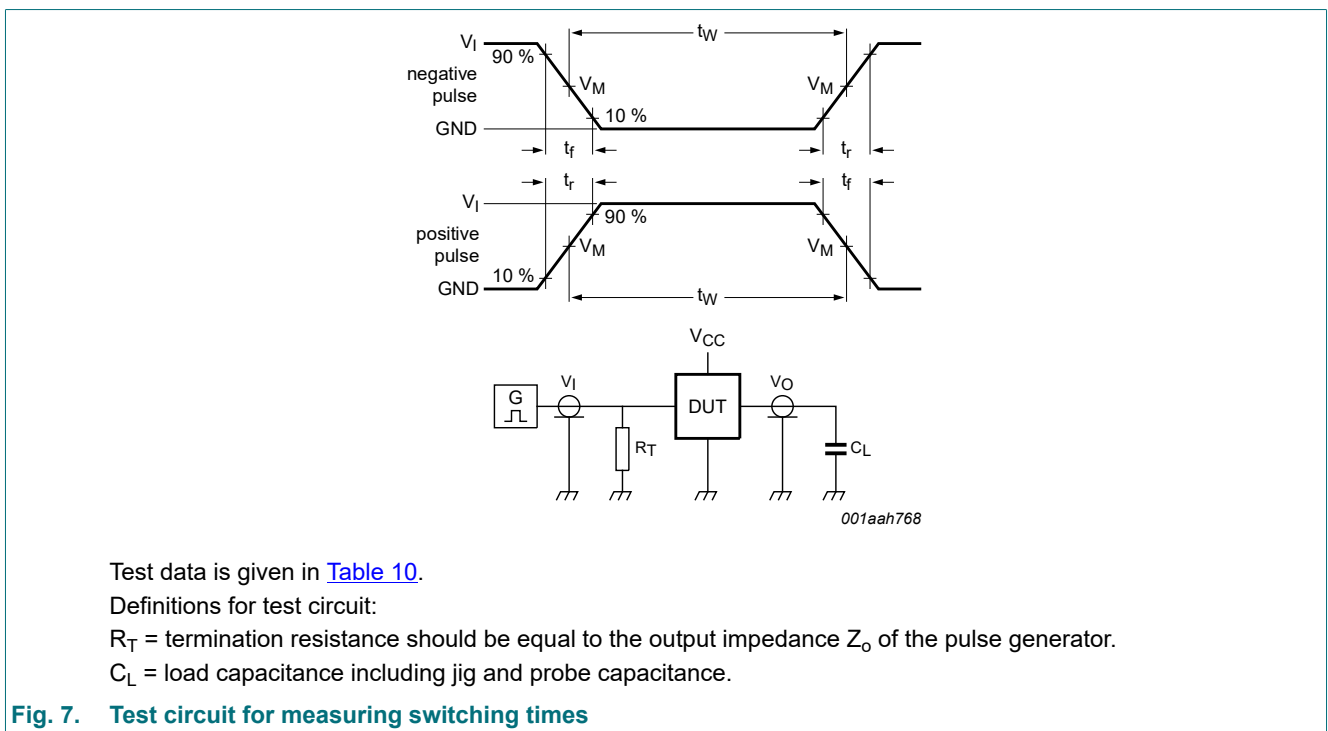


Table 10. Test data

| Type          | Input    |               | Load         | Test               |
|---------------|----------|---------------|--------------|--------------------|
|               | $V_I$    | $t_r, t_f$    | $C_L$        |                    |
| 74AHC30-Q100  | $V_{CC}$ | $\leq 3.0$ ns | 15 pF, 50 pF | $t_{PLH}, t_{PHL}$ |
| 74AHCT30-Q100 | 3.0 V    | $\leq 3.0$ ns | 15 pF, 50 pF | $t_{PLH}, t_{PHL}$ |



## 12. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

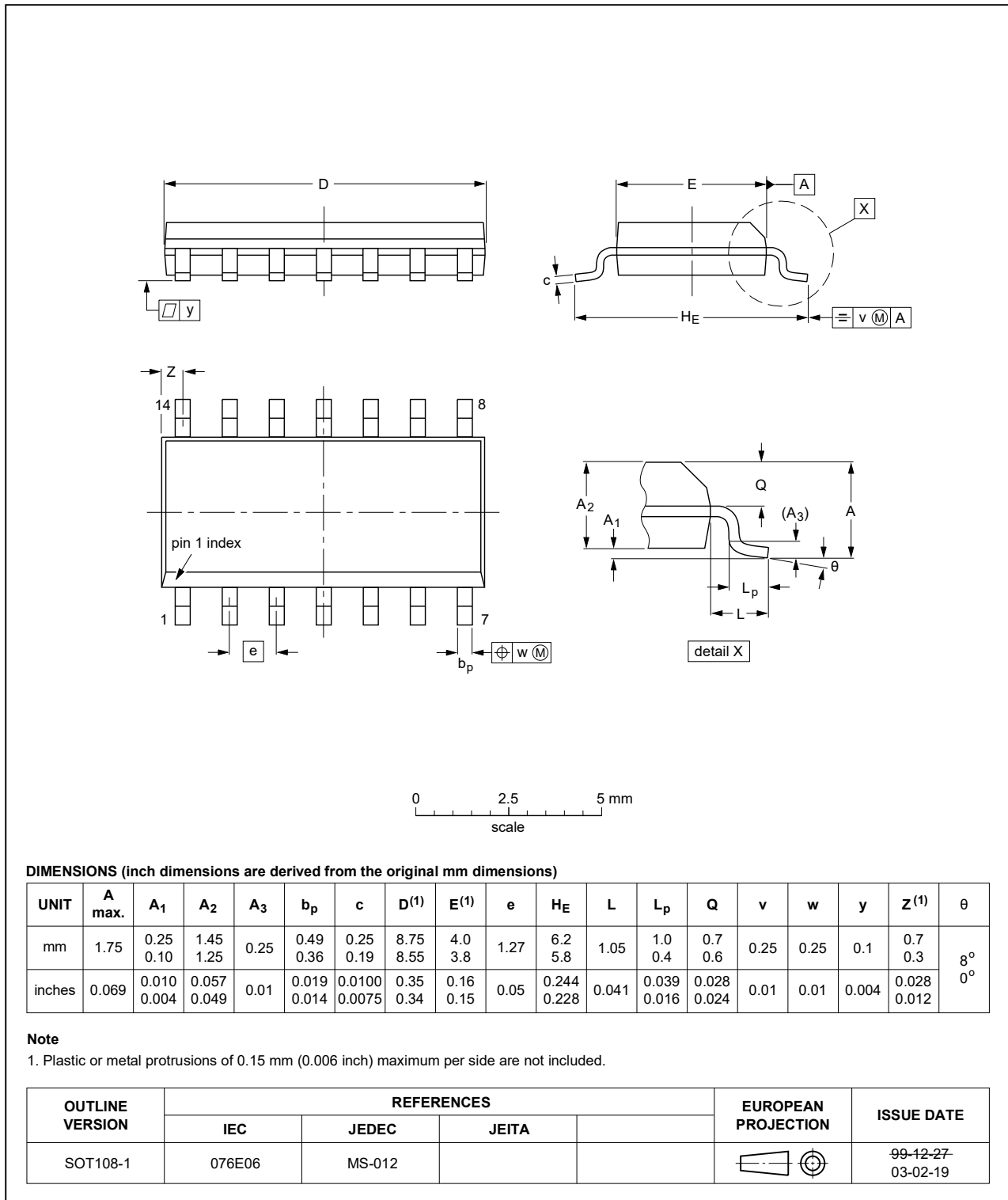


Fig. 8. Package outline SOT108-1 (SO14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

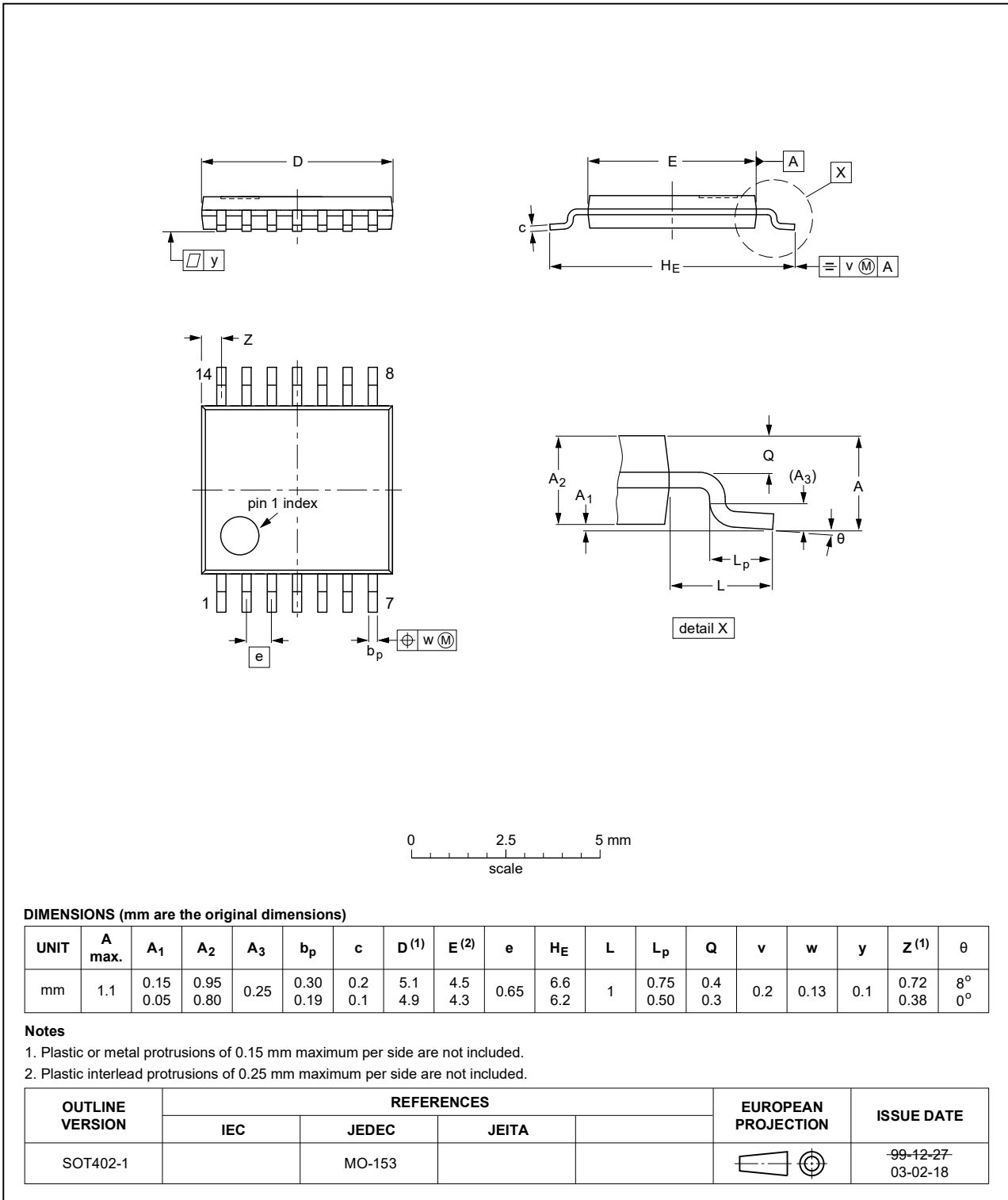


Fig. 9. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1



Fig. 10. Package outline SOT762-1 (DHVQFN14)

## 13. Abbreviations

Table 11. Abbreviations

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

## 14. Revision history

Table 12. Revision history

| Document ID           | Release date  | Data sheet status  | Change notice | Supersedes            |
|-----------------------|---|--------------------|---------------|-----------------------|
| 74AHC_AHCT30_Q100 v.2 | 20200506  | Product data sheet | -             | 74AHC_AHCT30_Q100 v.1 |
| Modifications:        | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Table 5</a>: Derating values for <math>P_{tot}</math> total power dissipation have been updated.</li> <li>Package outline drawing of SOT762-1 (<a href="#">Fig. 10</a>) updated.</li> </ul> |                    |               |                       |
| 74AHC_AHCT30_Q100 v.1 | 20131120  | Product data sheet | -             | -                     |

## 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>.

### Definitions

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Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

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- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.

