

74AHC126; 74AHCT126

Quad buffer/line driver; 3-state

Rev. 04 — 12 August 2009

Product data sheet

1. General description

The 74AHC126; 74AHCT126 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 74AHC126; 74AHCT126 provides four non-inverting buffer/line drivers with 3-state outputs. The 3-state outputs (nY) are controlled by the output enable input (nOE). A LOW-level at pin nOE causes the outputs to assume a high-impedance OFF-state.

The 74AHC126; 74AHCT126 is identical to the 74AHC125; 74AHCT125 but has active HIGH output enable inputs.

2. Features

- Balanced propagation delays
- All inputs have Schmitt-trigger action
- Inputs accept voltages higher than V_{CC}
- Input levels:
 - ◆ For 74AHC126: CMOS level
 - ◆ For 74AHCT126: TTL level
- ESD protection:
 - ◆ HBM JESD22-A114E exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101C exceeds 1000 V
- Multiple package options
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|---------------------------|-------------------|----------|--|----------|
| | Temperature range | Name | Description | |
| 74AHC126D 74AHCT126D | -40 °C to +125 °C | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74AHC126PW 74AHCT126PW | -40 °C to +125 °C | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74AHC126BQ 74AHCT126BQ | -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 |

4. Functional diagram

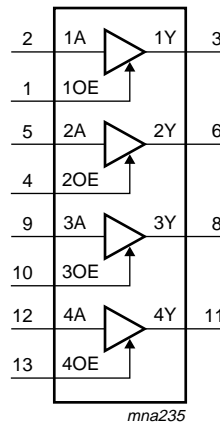


Fig 1. Functional diagram

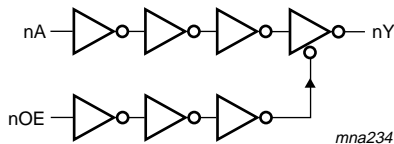


Fig 2. Logic symbol

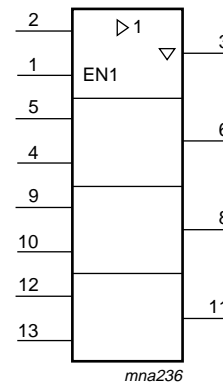
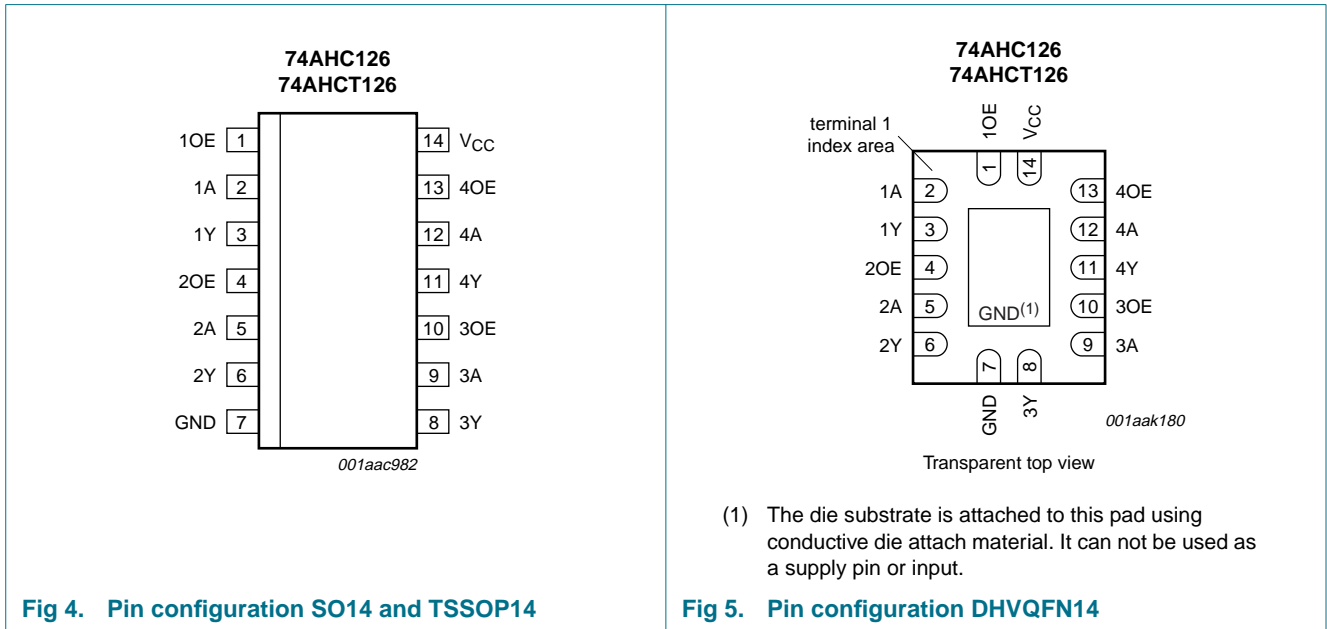


Fig 3. IEC logic symbol

5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|-----------------|-----|-------------------------------------|
| 10E | 1 | output enable input 1 (active HIGH) |
| 1A | 2 | data input 1 |
| 1Y | 3 | data output 1 |
| 2OE | 4 | output enable input 2 (active HIGH) |
| 2A | 5 | data input 2 |
| 2Y | 6 | data output 2 |
| GND | 7 | ground (0 V) |
| 3Y | 8 | data output 3 |
| 3A | 9 | data input 3 |
| 3OE | 10 | output enable input 3 (active HIGH) |
| 4Y | 11 | data output 4 |
| 4A | 12 | data input 4 |
| 4OE | 13 | output enable input 4 (active HIGH) |
| V _{CC} | 14 | supply voltage |

6. Functional description

Table 3. Function table^[1]

| Control | Input | Output |
|---------|-------|--------|
| nOE | nA | nY |
| H | L | L |
| H | H | H |
| L | X | Z |

- [1] H = HIGH voltage state;
 L = LOW voltage state;
 X = don't care;
 Z = high-impedance OFF-state.

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 | +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 | ^[2] - | 500 | mW |

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 [2] For SO14 packages: above 70 °C the value of P_{tot} derates linearly at 8 mW/K.
 For TSSOP14 packages: above 60 °C the value of P_{tot} derates linearly at 5.5 mW/K.
 For DHVQFN14 packages: above 60 °C the value of P_{tot} derates linearly at 4.5 mW/K.

8. Recommended operating conditions

Table 5. Operating conditions

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------|-------------------------------------|---|-----|-----|----------|------|
| 74AHC126 | | | | | | |
| V_{CC} | supply voltage | | 2.0 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | V |
| V_O | output voltage | | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | +25 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | - | - | 100 | ns/V |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | - | 20 | ns/V |
| 74AHCT126 | | | | | | |
| V_{CC} | supply voltage | | 4.5 | 5.0 | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | V |
| V_O | output voltage | | 0 | - | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | +25 | +125 | °C |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | - | - | 20 | ns/V |

9. 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 | |
| 74AHC126 | | | | | | | | | | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 2.0\text{ V}$ | 1.5 | - | - | 1.5 | - | 1.5 | - | V |
| | | $V_{CC} = 3.0\text{ V}$ | 2.1 | - | - | 2.1 | - | 2.1 | - | V |
| | | $V_{CC} = 5.5\text{ V}$ | 3.85 | - | - | 3.85 | - | 3.85 | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 2.0\text{ V}$ | - | - | 0.5 | - | 0.5 | - | 0.5 | V |
| | | $V_{CC} = 3.0\text{ V}$ | - | - | 0.9 | - | 0.9 | - | 0.9 | V |
| | | $V_{CC} = 5.5\text{ V}$ | - | - | 1.65 | - | 1.65 | - | 1.65 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}$ or V_{IL} | | | | | | | | |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 2.0\text{ V}$ | 1.9 | 2.0 | - | 1.9 | - | 1.9 | - | V |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 3.0\text{ V}$ | 2.9 | 3.0 | - | 2.9 | - | 2.9 | - | V |
| | | $I_O = -50\ \mu\text{A}; V_{CC} = 4.5\text{ V}$ | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O = -4.0\text{ mA}; V_{CC} = 3.0\text{ V}$ | 2.58 | - | - | 2.48 | - | 2.40 | - | V |
| | $I_O = -8.0\text{ mA}; V_{CC} = 4.5\text{ V}$ | 3.94 | - | - | 3.80 | - | 3.70 | - | V | |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}$ or V_{IL} | | | | | | | | |
| | | $I_O = 50\ \mu\text{A}; V_{CC} = 2.0\text{ V}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 50\ \mu\text{A}; V_{CC} = 3.0\text{ V}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 50\ \mu\text{A}; V_{CC} = 4.5\text{ V}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 4.0\text{ mA}; V_{CC} = 3.0\text{ V}$ | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | $I_O = 8.0\text{ mA}; V_{CC} = 4.5\text{ V}$ | - | - | 0.36 | - | 0.44 | - | 0.55 | V | |

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 | |
| I_I | input leakage current | $V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | μA |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$ | - | - | ± 0.25 | - | ± 2.5 | - | ± 10.0 | μA |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$ | - | - | 2.0 | - | 20 | - | 40 | μA |
| C_I | input capacitance | $V_I = V_{CC}$ or GND | - | 3 | 10 | - | 10 | - | 10 | pF |
| C_O | output capacitance | | - | 4 | - | - | - | - | - | pF |

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| | | | | | | | | | | |
|-----------------|---------------------------|---|------|-----|------------|------|-----------|------|------------|---------------|
| V_{IH} | HIGH-level input voltage | $V_{CC} = 4.5 \text{ V}$ to 5.5 V | 2.0 | - | - | 2.0 | - | 2.0 | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 4.5 \text{ V}$ to 5.5 V | - | - | 0.8 | - | 0.8 | - | 0.8 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$ $I_O = -50 \mu\text{A}$ | 4.4 | 4.5 | - | 4.4 | - | 4.4 | - | V |
| | | $I_O = -8.0 \text{ mA}$ | 3.94 | - | - | 3.80 | - | 3.70 | - | V |
| | | | | | | | | | | |
| V_{OL} | LOW-level output voltage | $V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$ $I_O = 50 \mu\text{A}$ | - | 0 | 0.1 | - | 0.1 | - | 0.1 | V |
| | | $I_O = 8.0 \text{ mA}$ | - | - | 0.36 | - | 0.44 | - | 0.55 | V |
| | | | | | | | | | | |
| I_I | input leakage current | $V_I = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V}$ to 5.5 V | - | - | 0.1 | - | 1.0 | - | 2.0 | μA |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND per input pin; other inputs at V_{CC} or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$ | - | - | ± 0.25 | - | ± 2.5 | - | ± 10.0 | μA |
| I_{CC} | supply current | $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$ | - | - | 2.0 | - | 20 | - | 40 | μA |
| ΔI_{CC} | additional supply current | per input pin; $V_I = V_{CC} - 2.1 \text{ V}$; other pins at V_{CC} or GND; $I_O = 0 \text{ A}$; $V_{CC} = 4.5 \text{ V}$ to 5.5 V | - | - | 1.35 | - | 1.5 | - | 1.5 | mA |
| C_I | input capacitance | $V_I = V_{CC}$ or GND | - | 3 | 10 | - | 10 | - | 10 | pF |
| C_O | output capacitance | | - | 4 | - | - | - | - | - | pF |

10. Dynamic characteristics

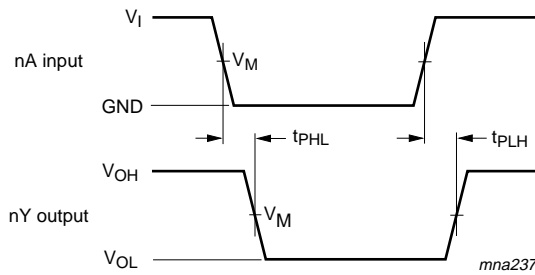
Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#).

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +85 °C | | –40 °C to +125 °C | | Unit |
|--|-------------------------------|---|-------|--------------------|------|------------------|------|-------------------|------|------|
| | | | Min | Typ ^[1] | Max | Min | Max | Min | Max | |
| 74AHC126 | | | | | | | | | | |
| t_{pd} | propagation delay | nA to nY; see Figure 6 ^[2] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.7 | 8.0 | 1.0 | 9.5 | 1.0 | 10.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 6.7 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.3 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| t_{en} | enable time | nOE to nY; see Figure 7 ^[3] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 5.3 | 8.0 | 1.0 | 9.5 | 1.0 | 10.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 7.6 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.6 | 5.3 | 1.0 | 6.1 | 1.0 | 7.0 | ns |
| t_{dis} | disable time | nOE to nY; see Figure 7 ^[4] | | | | | | | | |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 6.6 | 9.7 | 1.0 | 11.5 | 1.0 | 12.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 9.4 | 13.2 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.7 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| C_{PD} | power dissipation capacitance | $f_i = 1\text{ MHz}; V_i = \text{GND to }V_{CC}$ ^[5] | - | 10 | - | - | - | - | - | pF |
| | | | | | | | | | | |
| 74AHCT126; $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | | | | | | | | | | |
| t_{pd} | propagation delay | nA to nY; see Figure 6 ^[2] | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.0 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| | | $C_L = 50\text{ pF}$ | - | 4.3 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t_{en} | enable time | nOE to nY; see Figure 7 ^[3] | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 3.3 | 5.1 | 1.0 | 6.0 | 1.0 | 6.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 4.7 | 7.1 | 1.0 | 8.0 | 1.0 | 9.0 | ns |
| t_{dis} | disable time | nOE to nY; see Figure 7 ^[4] | | | | | | | | |
| | | $C_L = 15\text{ pF}$ | - | 4.8 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| | | $C_L = 50\text{ pF}$ | - | 6.9 | 8.9 | 1.0 | 10.0 | 1.0 | 11.5 | ns |
| C_{PD} | power dissipation capacitance | $f_i = 1\text{ MHz}; V_i = \text{GND to }V_{CC}$ ^[5] | - | 12 | - | - | - | - | - | pF |
| | | | | | | | | | | |

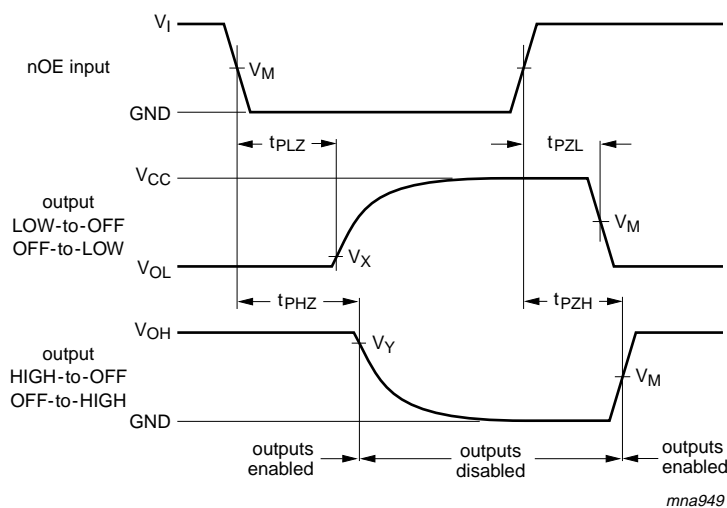
- [1] Typical values are measured at nominal supply voltage ($V_{CC} = 3.3\text{ V}$ and $V_{CC} = 5.0\text{ V}$).
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [3] t_{en} is the same as t_{PZL} and t_{PZH} .
- [4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [5] C_{PD} is used to determine the 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 the outputs.

11. Waveforms



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. Input to output propagation delays



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. Enable and disable times

Table 8. Measurement points

| Type | Input | | Output | |
|-----------|---------------------|---------------------|--------------------------|--------------------------|
| | V_M | V_M | V_X | V_Y |
| 74AHC126 | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |
| 74AHCT126 | 1.5 V | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |

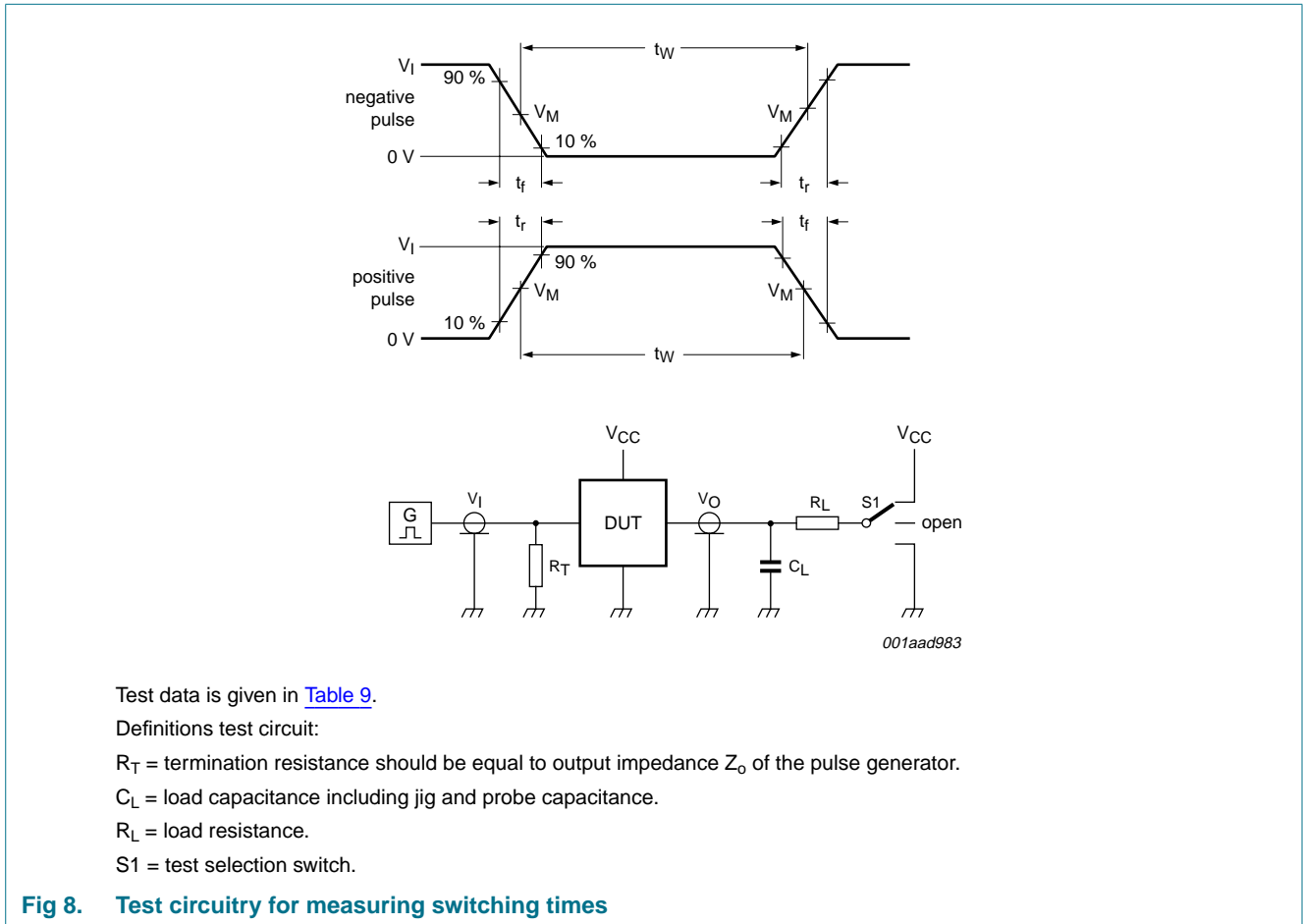


Fig 8. Test circuitry for measuring switching times

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} |
| 74AHC126 | V_{CC} | $\leq 3.0 \text{ ns}$ | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74AHCT126 | 3.0 V | $\leq 3.0 \text{ ns}$ | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |

12. Package outline

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

SOT108-1

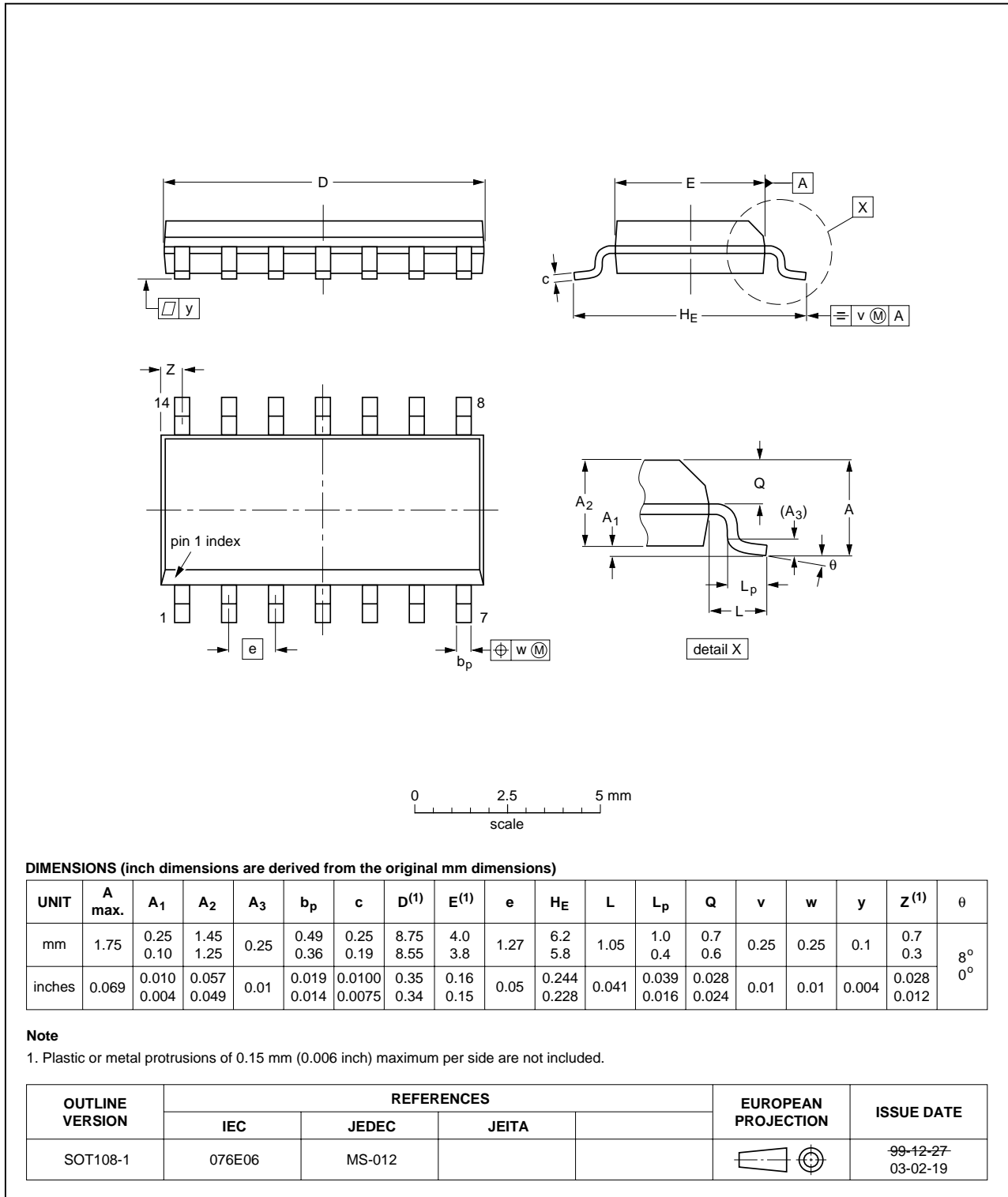


Fig 9. Package outline SOT108-1 (SO14)

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

SOT402-1

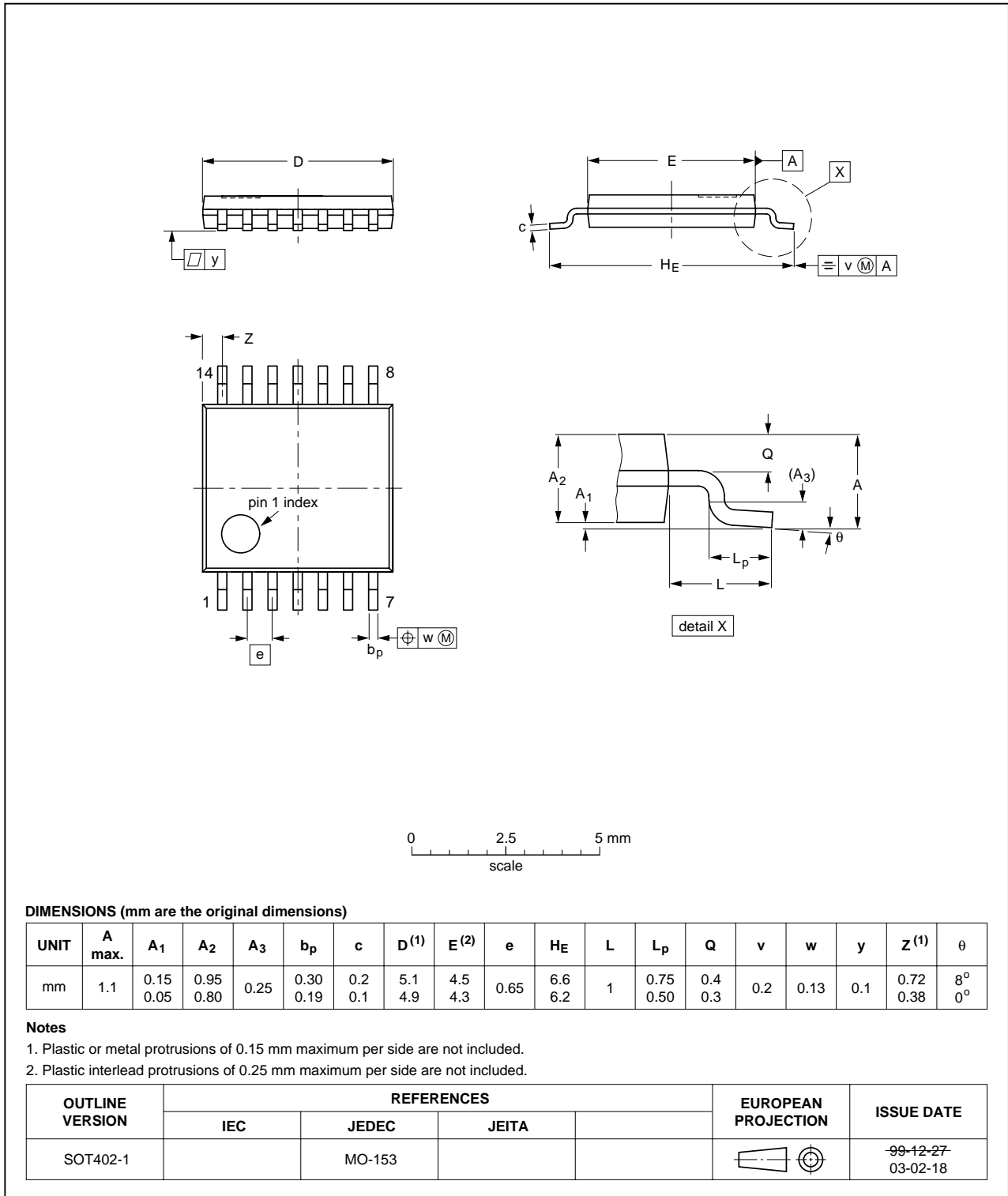


Fig 10. Package outline SOT402-1 (TSSOP14)

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

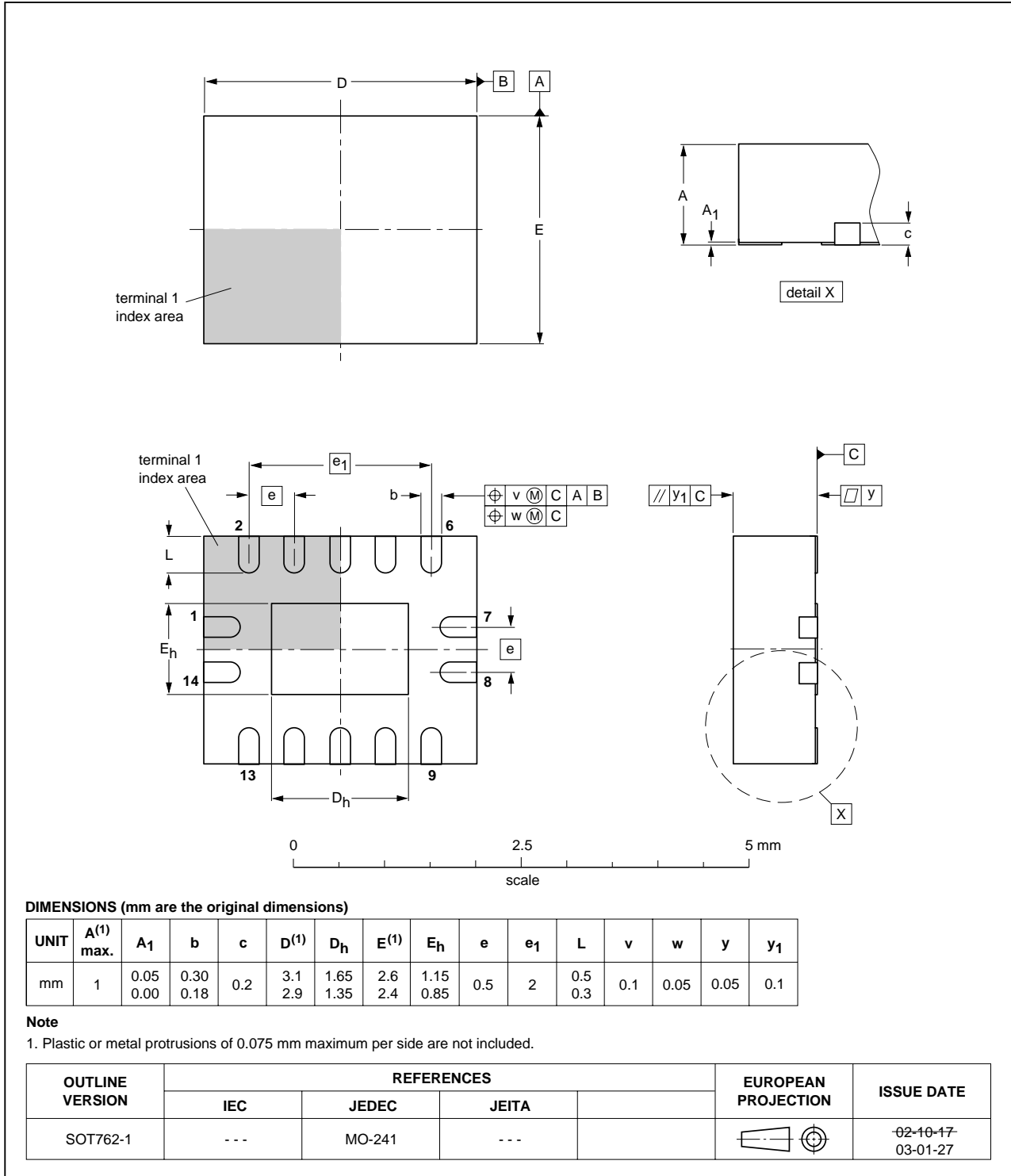


Fig 11. Package outline SOT762-1 (DHVQFN14)

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 |
| LSTTL | Low-power Schottky Transistor-Transistor Logic |
| MM | Machine Model |

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|--|---------------------------|---------------|-------------------|
| 74AHC_AHCT126_4 | 20090812 | Product data sheet | - | 74AHC_AHCT126_3 |
| Modifications: | <ul style="list-style-type: none"> Added type numbers 74AHC126BQ and 74AHCT126BQ (DHVQFN14 package) | | | |
| 74AHC_AHCT126_3 | 20080425 | Product data sheet | - | 74AHC_AHCT126_2 |
| 74AHC_AHCT126_2 | 19990929 | Product specification | - | 74AHC_AHCT126_N_1 |
| 74AHC_AHCT126_N_1 | 19990112 | Preliminary specification | - | - |

15. Legal information

15.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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