

74AHC126; 74AHCT126

Quad buffer/line driver; 3-state

Rev. 5 — 28 April 2020

Product data sheet

1. General description

The 74AHC126; 74AHCT126 is a quad buffer/line driver with 3-state outputs controlled by the output enable inputs (nOE). A LOW on nOE causes the outputs to assume a high-impedance OFF-state. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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 °C to $+85\text{ °C}$ and from -40 °C to $+125\text{ °C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-------------|-------------------------------------|----------|---|----------|
| | Temperature range | Name | Description | Version |
| 74AHC126D | -40 °C to $+125\text{ °C}$ | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74AHCT126D | | | | |
| 74AHC126PW | -40 °C to $+125\text{ °C}$ | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74AHCT126PW | | | | |
| 74AHC126BQ | -40 °C to $+125\text{ °C}$ | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body $2.5 \times 3 \times 0.85\text{ mm}$ | SOT762-1 |
| 74AHCT126BQ | | | | |

4. Functional diagram

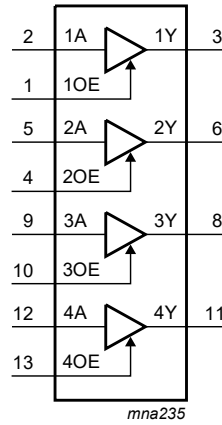


Fig. 1. Functional diagram

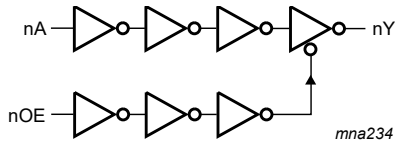


Fig. 2. Logic symbol

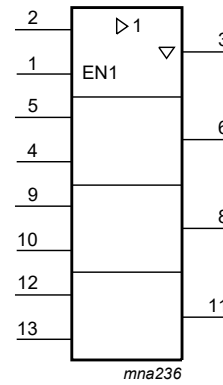
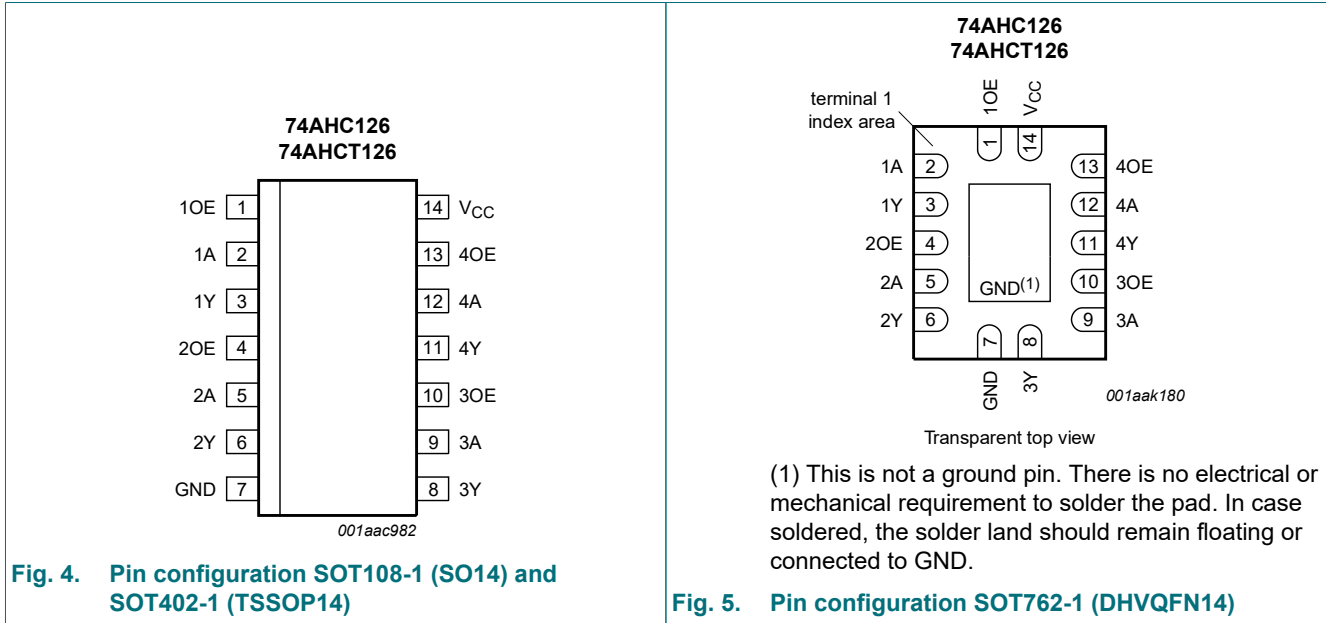


Fig. 3. IEC logic symbol

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

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

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

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 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.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol | Parameter | Conditions | 74AHC126 | | | 74AHCT126 | | | 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} = 3.0 V to 3.6 V | - | - | 100 | - | - | - | ns/V |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 20 | - | - | 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 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 | - | - | 3.80 | - | 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 | - | - | 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 V | - | - | ±0.25 | - | ±2.5 | - | ±10.0 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 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 |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|-------|-----|-------|------------------|------|-------------------|-------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74AHCT126 | | | | | | | | | | |
| 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 | - | - | 3.80 | - | 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 | V _I = 5.5 V or GND; V _{CC} = 0 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 V | - | - | ±0.25 | - | ±2.5 | - | ±10.0 | µA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 2.0 | - | 20 | - | 40 | µA |
| ΔI _{CC} | additional supply current | per input pin; V _I = V _{CC} - 2.1 V; other pins at V _{CC} or GND; I _O = 0 A; V _{CC} = 4.5 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 Fig. 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 Fig. 6 [2] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.7 | 8.0 | 1.0 | 9.5 | 1.0 | 10.0 | ns |
| | | C _L = 50 pF | - | 6.7 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.3 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| | | C _L = 50 pF | - | 4.7 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |

| 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 _{en} | enable time | nOE to nY; see Fig. 7 [3] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 5.3 | 8.0 | 1.0 | 9.5 | 1.0 | 10.0 | ns |
| | | C _L = 50 pF | - | 7.6 | 11.5 | 1.0 | 13.0 | 1.0 | 14.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.6 | 5.3 | 1.0 | 6.1 | 1.0 | 7.0 | ns |
| | | C _L = 50 pF | - | 5.1 | 7.6 | 1.0 | 8.7 | 1.0 | 9.5 | ns |
| t _{dis} | disable time | nOE to nY; see Fig. 7 [4] | | | | | | | | |
| | | V _{CC} = 3.0 V to 3.6 V | | | | | | | | |
| | | C _L = 15 pF | - | 6.6 | 9.7 | 1.0 | 11.5 | 1.0 | 12.5 | ns |
| | | C _L = 50 pF | - | 9.4 | 13.2 | 1.0 | 15.0 | 1.0 | 16.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.7 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| | | C _L = 50 pF | - | 6.7 | 8.8 | 1.0 | 10.0 | 1.0 | 11.0 | ns |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; V _i = GND to V _{CC} [5] | - | 10 | - | - | - | - | - | pF |
| 74AHCT126 | | | | | | | | | | |
| t _{pd} | propagation delay | nA to nY; see Fig. 6 [2] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.0 | 5.5 | 1.0 | 6.5 | 1.0 | 7.0 | ns |
| | | C _L = 50 pF | - | 4.3 | 7.5 | 1.0 | 8.5 | 1.0 | 9.5 | ns |
| t _{en} | enable time | nOE to nY; see Fig. 7 [3] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 3.3 | 5.1 | 1.0 | 6.0 | 1.0 | 6.5 | ns |
| | | C _L = 50 pF | - | 4.7 | 7.1 | 1.0 | 8.0 | 1.0 | 9.0 | ns |
| t _{dis} | disable time | nOE to nY; see Fig. 7 [4] | | | | | | | | |
| | | V _{CC} = 4.5 V to 5.5 V | | | | | | | | |
| | | C _L = 15 pF | - | 4.8 | 6.8 | 1.0 | 8.0 | 1.0 | 8.5 | ns |
| | | C _L = 50 pF | - | 6.9 | 8.9 | 1.0 | 10.0 | 1.0 | 11.5 | ns |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; V _i = GND to V _{CC} [5] | - | 12 | - | - | - | - | - | 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}.

[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).

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

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;

∑(C_L × V_{CC}² × f_o) = sum of the outputs.

10.1. Waveforms and test circuit

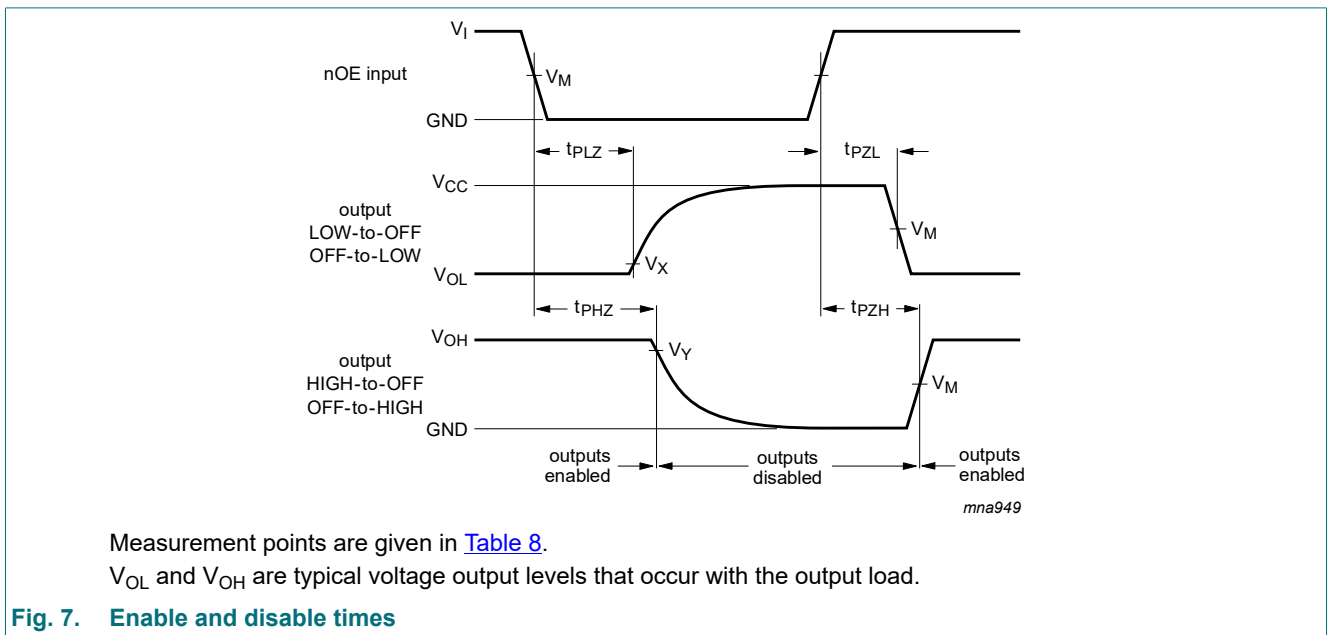
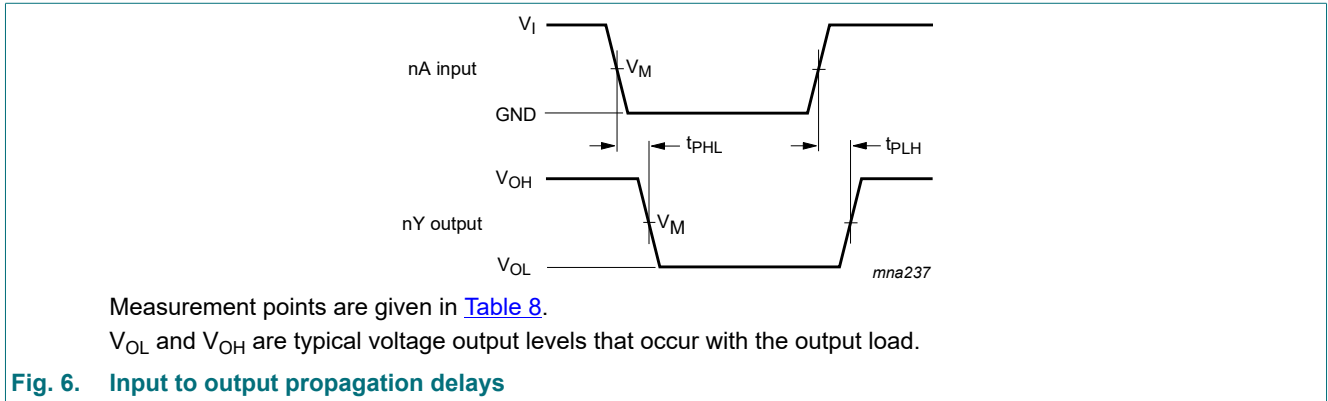


Table 8. Measurement points

| 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 | $0.5 \times V_{CC}$ | $V_{OL} + 0.3 \text{ V}$ | $V_{OH} - 0.3 \text{ V}$ |

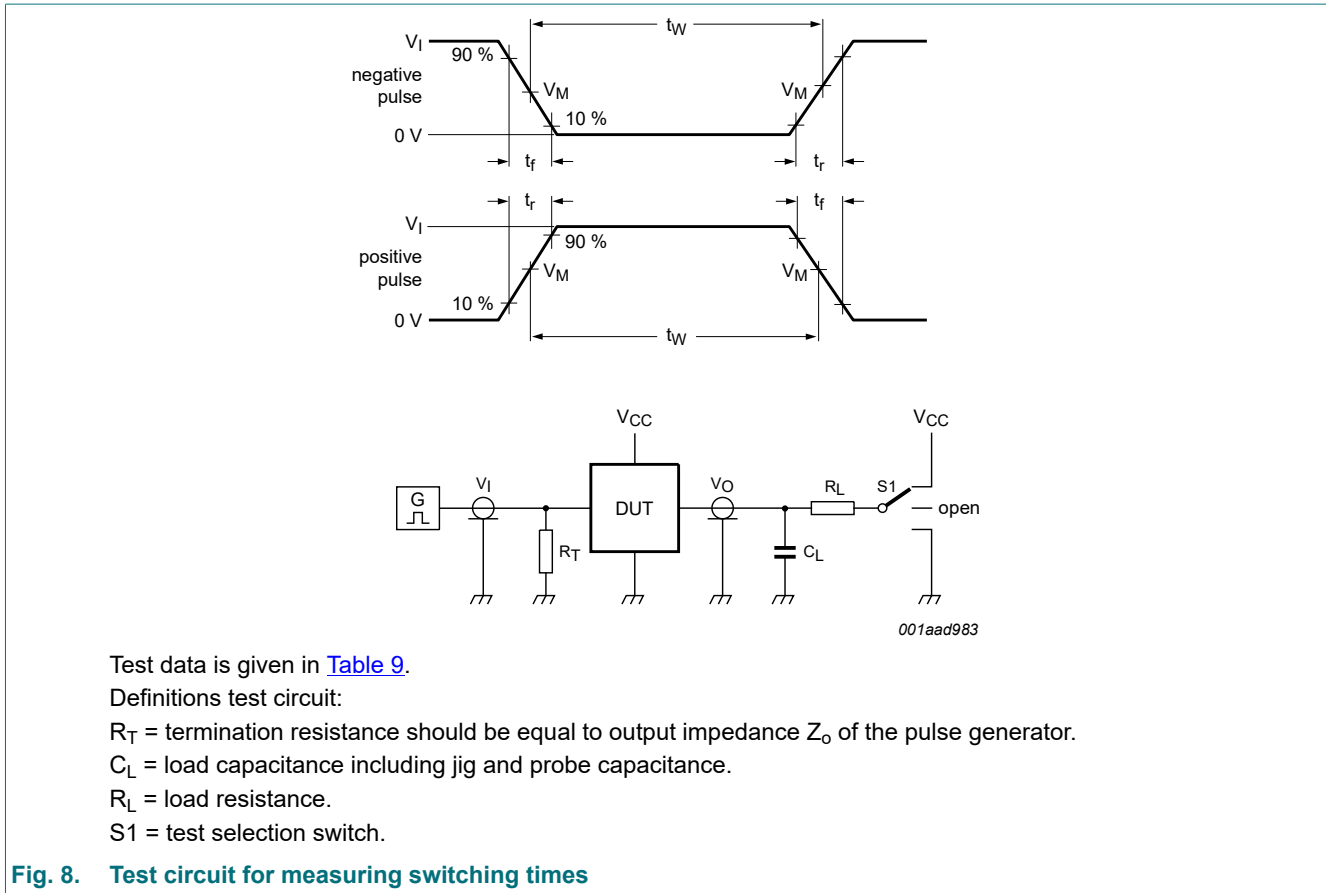


Fig. 8. Test circuit for measuring switching times

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

11. Package outline

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

SOT108-1

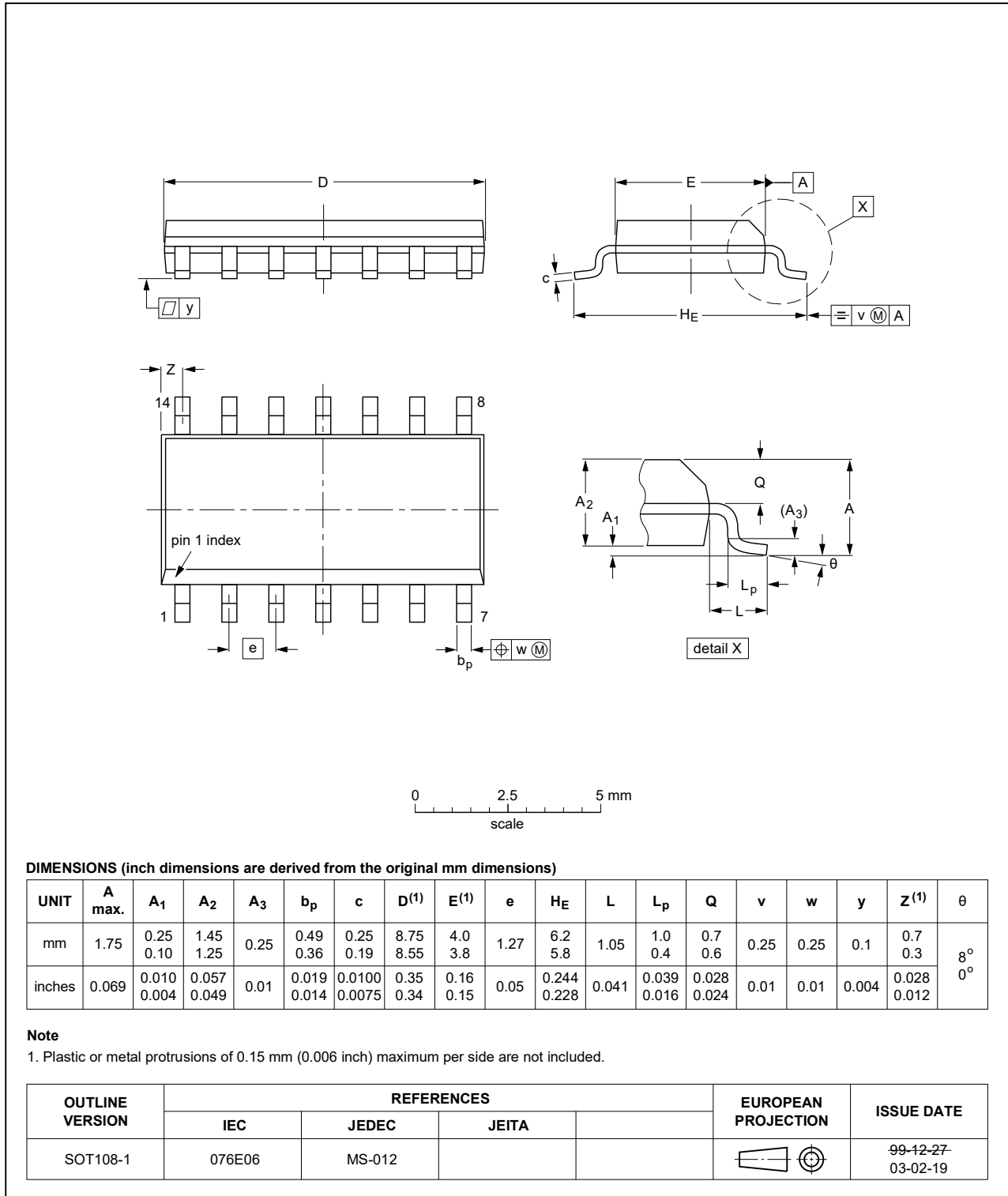


Fig. 9. Package outline SOT108-1 (SO14)

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)

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 |
| MM | Machine Model |

13. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|---|---------------------------|---------------|-------------------|
| 74AHC_AHCT126 v.5 | 20200428 | Product data sheet | - | 74AHC_AHCT126 v.4 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Section 1: updated. Table 4: Derating values for P_{tot} total power dissipation have been updated. Table 6: Conditions for I_{OZ} corrected. Package outline drawing of SOT762-1 (Fig. 11) modified. | | | |
| 74AHC_AHCT126 v.4 | 20090812 | Product data sheet | - | 74AHC_AHCT126 v.3 |
| Modifications: | <ul style="list-style-type: none"> Added type numbers 74AHC126BQ and 74AHCT126BQ (DHVQFN14 package) | | | |
| 74AHC_AHCT126 v.3 | 20080425 | Product data sheet | - | 74AHC_AHCT126 v.2 |
| 74AHC_AHCT126 v.2 | 19990929 | Product specification | - | 74AHC_AHCT126 v.1 |
| 74AHC_AHCT126 v.1 | 19990112 | Preliminary specification | - | - |

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. |

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