

74HC126; 74HCT126

Quad buffer/line driver; 3-state

Rev. 4 — 1 December 2015

Product data sheet

1. General description

The 74HC126; 74HCT126 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 include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Inverting outputs
- Complies with JEDEC standard no. 7A
- Input levels:
 - ◆ For 74HC126: CMOS level
 - ◆ For 74HCT126: TTL level
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | |
|-------------|---|---------|---|----------|
| | Temperature range | Name | Description | Version |
| 74HC126D | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO14 | plastic small outline package; 14 leads; body width 3.9 mm | SOT108-1 |
| 74HCT126D | | | | |
| 74HC126DB | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SSOP14 | plastic shrink small outline package; 14 leads; body width 5.3 mm | SOT337-1 |
| 74HCT126DB | | | | |
| 74HC126PW | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |
| 74HCT126PW | | | | |

4. Functional diagram

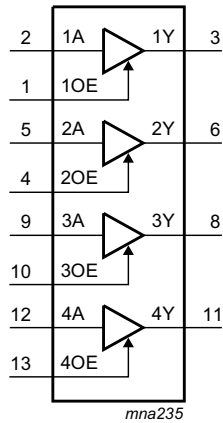


Fig 1. Logic symbol

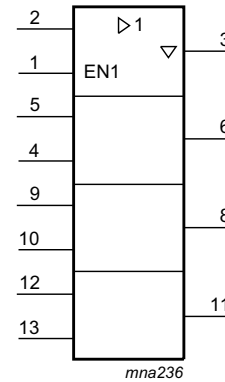


Fig 2. IEC logic symbol

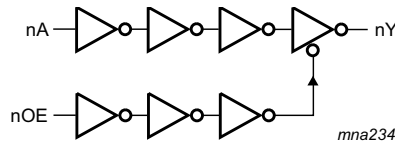


Fig 3. Logic diagram (one buffer/line driver)

5. Pinning information

5.1 Pinning

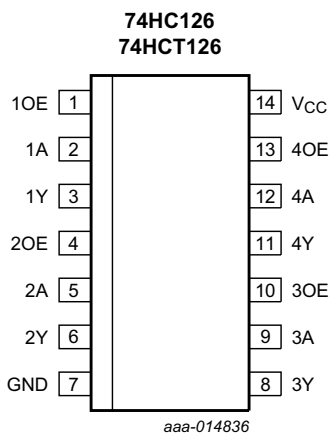


Fig 4. Pin configuration for SOT108-1

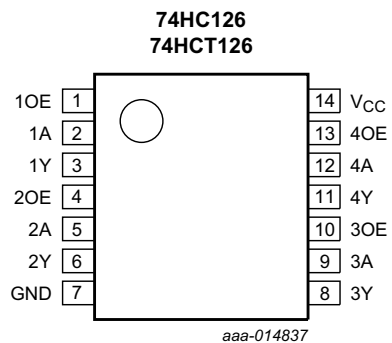


Fig 5. Pin configuration for SOT337-1 and SOT402-1

5.2 Pin description

Table 2. Pin description

| Symbol | Pin | Description |
|--------------------|--------------|---------------------------------|
| 1OE, 2OE, 3OE, 4OE | 1, 4, 10, 13 | data enable input (active HIGH) |
| 1A, 2A, 3A, 4A | 2, 5, 9, 12 | data input |
| 1Y, 2Y, 3Y, 4Y | 3, 6, 8, 11 | data output |
| GND | 7 | ground (0 V) |
| 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 level; L = LOW voltage level; 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 | V |
| I _{IK} | input clamping current | V _I < -0.5 V or V _I > V _{CC} + 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 | -0.5 V < V _O < V _{CC} + 0.5 V | - | ±35 | mA |
| I _{CC} | supply current | | - | 70 | mA |
| I _{GND} | ground current | | -70 | - | mA |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| P _{tot} | total power dissipation | T _{amb} = -40 °C to +125 °C | | | |
| | | SO14 and (T)SSOP14 packages ^[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 package: P_{tot} derates linearly with 8 mW/K above 70 °C.
For (T)SSOP14 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

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

| Symbol | Parameter | Conditions | 74HC126 | | | 74HCT126 | | | 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 |

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | T _{amb} = -40 °C to +125 °C | | Unit |
|-----------------|---------------------------|--|--------------------------|------|------|--|------|---|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 74HC126 | | | | | | | | | | |
| 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 |
| 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 = -6.0 mA; V _{CC} = 4.5 V | 3.98 | 4.32 | - | 3.84 | - | 3.7 | - | 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 = 6.0 mA; V _{CC} = 4.5 V | - | 0.15 | 0.26 | - | 0.33 | - | 0.4 | V |
| I _{OZ} | OFF-state output current | I _O = 7.8 mA; V _{CC} = 6.0 V | - | 0.16 | 0.26 | - | 0.33 | - | 0.4 | V |
| | | V _I = V _{IH} or V _{IL} ; V _{CC} = 6.0 V; V _O = V _{CC} or GND | - | ±0.5 | - | ±5.0 | - | ±10 | - | μA |
| I _I | input leakage current | V _I = V _{CC} or GND; V _{CC} = 6.0 V | - | - | ±0.1 | - | ±1.0 | - | ±1.0 | μA |

Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | T _{amb} = -40 °C to +125 °C | | Unit |
|------------------|---------------------------|---|--------------------------|------|------|-------------------------------------|------|--------------------------------------|------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| 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 |
| 74HCT126 | | | | | | | | | | |
| 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 = -6.0 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 = 6.0 mA | - | 0.16 | 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 _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _{CC} = 5.5 V; V _O = V _{CC} or GND | - | - | ±0.5 | - | ±5.0 | - | ±10 | 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 |
| ΔI _{CC} | additional supply current | per input pin; I _O = 0 A; V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; nA, nOE inputs | - | 100 | 360 | - | 450 | - | 490 | μA |
| C _I | input capacitance | | - | 3.5 | - | - | - | - | - | pF |

10. Dynamic characteristics

Table 7. Dynamic characteristicsGND = 0 V; C_L = 50 pF; for test circuit, see [Figure 8](#).

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | Unit |
|-----------------|-------------------|---|--------------------------|-----|-----|--------------------------------------|--------------|------|
| | | | Min | Typ | Max | Max (85 °C) | Max (125 °C) | |
| 74HC126 | | | | | | | | |
| t _{pd} | propagation delay | nA to nY; see Figure 6 ^[1] | | | | | | |
| | | V _{CC} = 2.0 V | - | 30 | 100 | 125 | 150 | ns |
| | | V _{CC} = 4.5 V | - | 11 | 20 | 25 | 30 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 9 | - | - | - | ns |
| | | V _{CC} = 6.0 V | - | 9 | 17 | 21 | 26 | ns |

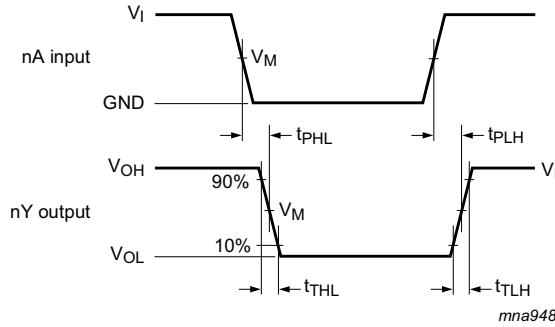
Table 7. Dynamic characteristics ...continued
GND = 0 V; C_L = 50 pF; for test circuit, see Figure 8.

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | Unit |
|------------------|-------------------------------|--|--------------------------|-----|-----|--------------------------------------|--------------|------|
| | | | Min | Typ | Max | Max (85 °C) | Max (125 °C) | |
| t _{en} | enable time | nOE to nY; see Figure 7 [1] | | | | | | |
| | | V _{CC} = 2.0 V | - | 41 | 125 | 155 | 190 | ns |
| | | V _{CC} = 4.5 V | - | 15 | 25 | 31 | 38 | ns |
| | | V _{CC} = 6.0 V | - | 12 | 21 | 26 | 32 | ns |
| t _{dis} | disable time | nOE to nY; see Figure 7 [1] | | | | | | |
| | | V _{CC} = 2.0 V | - | 41 | 125 | 155 | 190 | ns |
| | | V _{CC} = 4.5 V | - | 15 | 25 | 31 | 38 | ns |
| | | V _{CC} = 6.0 V | - | 12 | 21 | 26 | 32 | ns |
| t _t | transition time | see Figure 6 [1] | | | | | | |
| | | V _{CC} = 2.0 V | - | 14 | 60 | 75 | 90 | ns |
| | | V _{CC} = 4.5 V | - | 5 | 12 | 15 | 18 | ns |
| | | V _{CC} = 6.0 V | - | 4 | 10 | 13 | 15 | ns |
| C _{PD} | power dissipation capacitance | per package; V _I = GND to V _{CC} [2] | - | 23 | - | - | - | pF |
| 74HCT126 | | | | | | | | |
| t _{pd} | propagation delay | nA to nY; see Figure 6 [1] | | | | | | |
| | | V _{CC} = 4.5 V | - | 14 | 24 | 30 | 36 | ns |
| | | V _{CC} = 5.0 V; C _L = 15 pF | - | 11 | - | - | - | ns |
| t _{en} | enable time | nOE to nY; see Figure 7; V _{CC} = 4.5 V [1] | - | 13 | 25 | 31 | 38 | ns |
| t _{dis} | disable time | nOE to nY; see Figure 7; V _{CC} = 4.5 V [1] | - | 18 | 28 | 35 | 42 | ns |
| t _t | transition time | V _{CC} = 4.5 V; see Figure 6 [1] | - | 5 | 12 | 15 | 18 | ns |
| C _{PD} | power dissipation capacitance | per package; V _I = GND to V _{CC} - 1.5 V [2] | - | 24 | - | - | - | pF |

- [1] t_{pd} is the same as t_{PLH} and t_{PHL}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.
t_t is the same as t_{THL} and t_{TLH}.

- [2] 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.

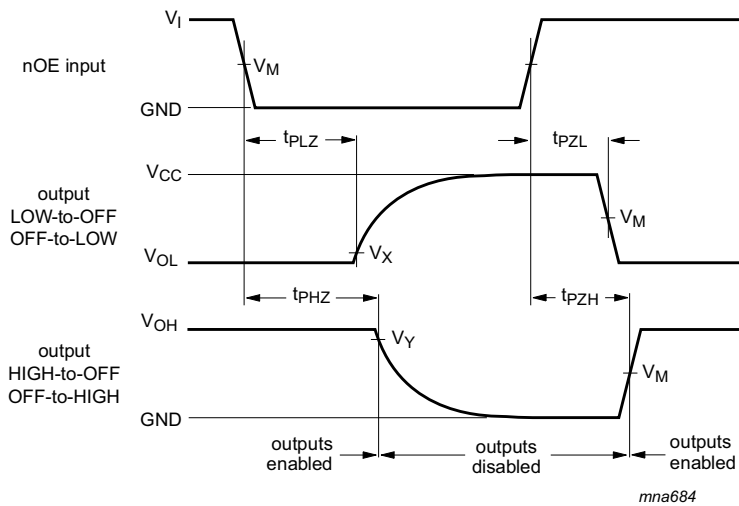
11. Waveforms and test circuit



Measurement points are given in [Table 8](#).

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 6. Input (nA) to output (nY) propagation delays



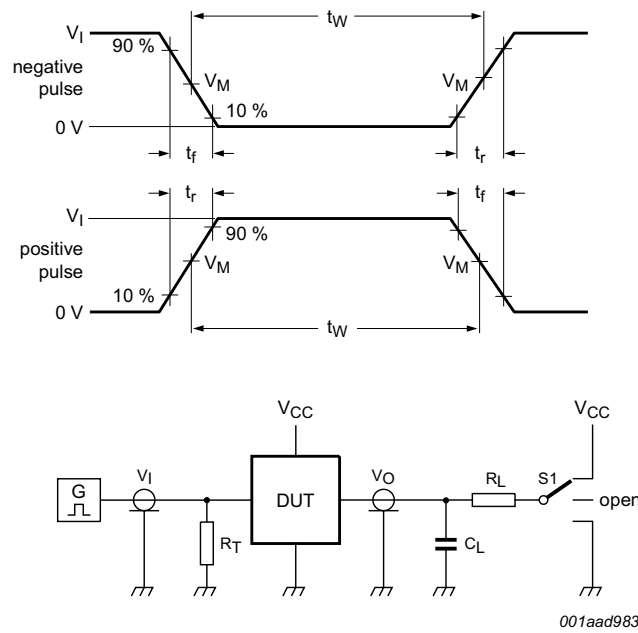
Measurement points are given in [Table 8](#).

Logic levels: V_{OL} and V_{OH} are typical output voltage 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 |
| 74HC126 | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{CC}$ | $0.9V_{CC}$ |
| 74HCT126 | 1.3 V | 1.3 V | $0.1V_{CC}$ | $0.9V_{CC}$ |



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 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} |
| 74HC126 | V_{CC} | 6 ns | 15 pF, 50 pF | 1 k Ω | open | GND | V_{CC} |
| 74HCT126 | 3 V | 6 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

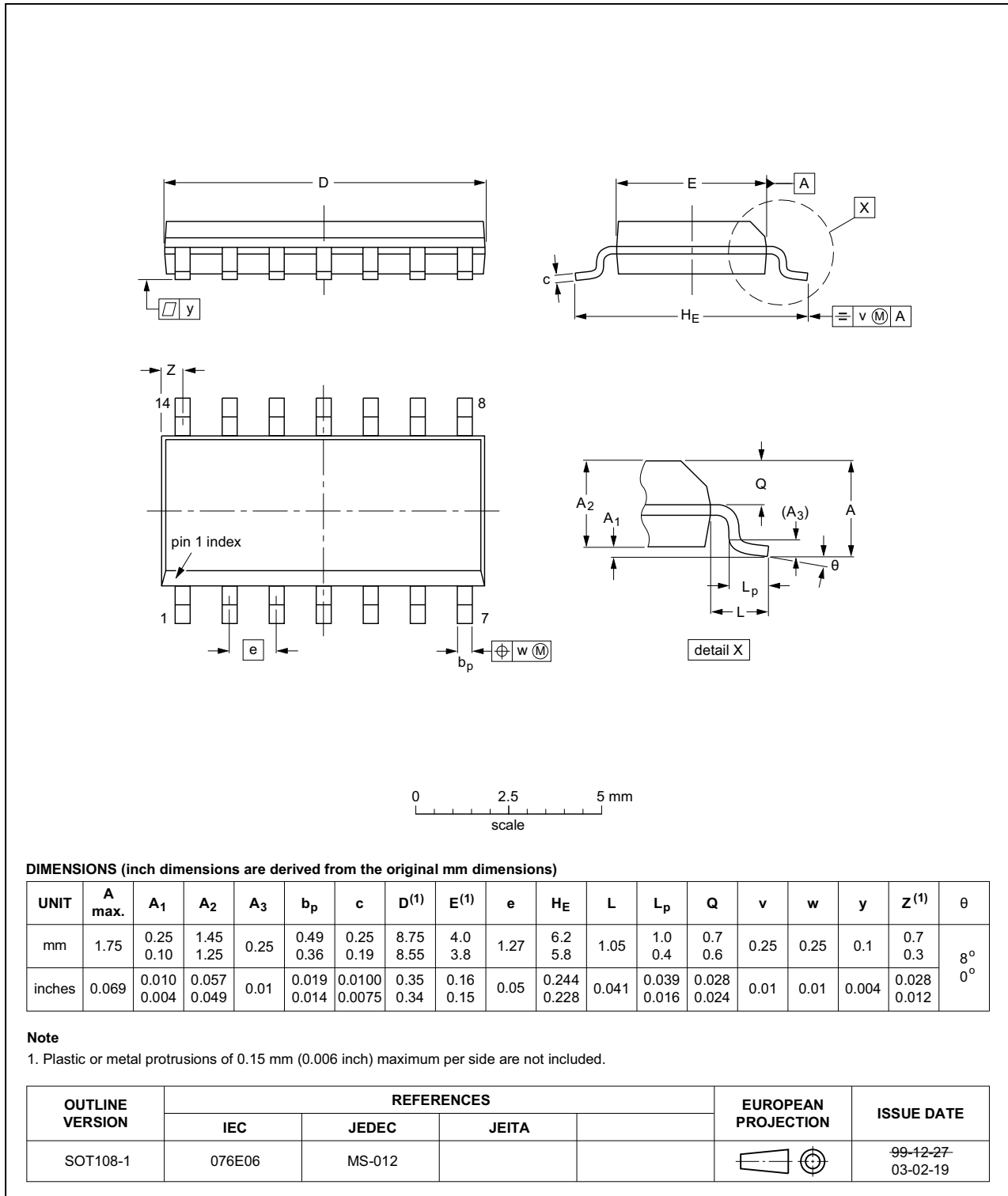


Fig 9. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

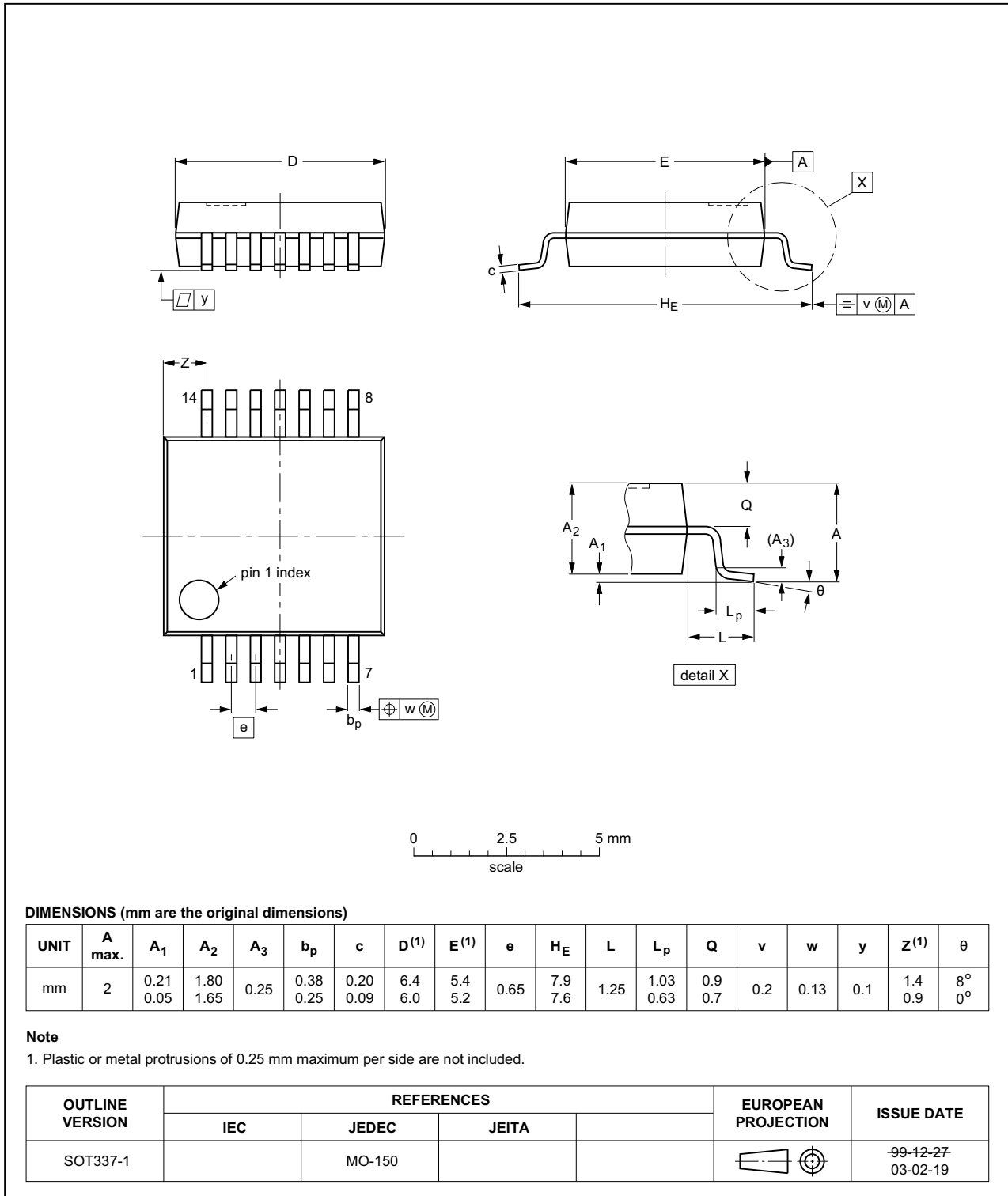


Fig 10. Package outline SOT337-1 (SSOP14)

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

SOT402-1

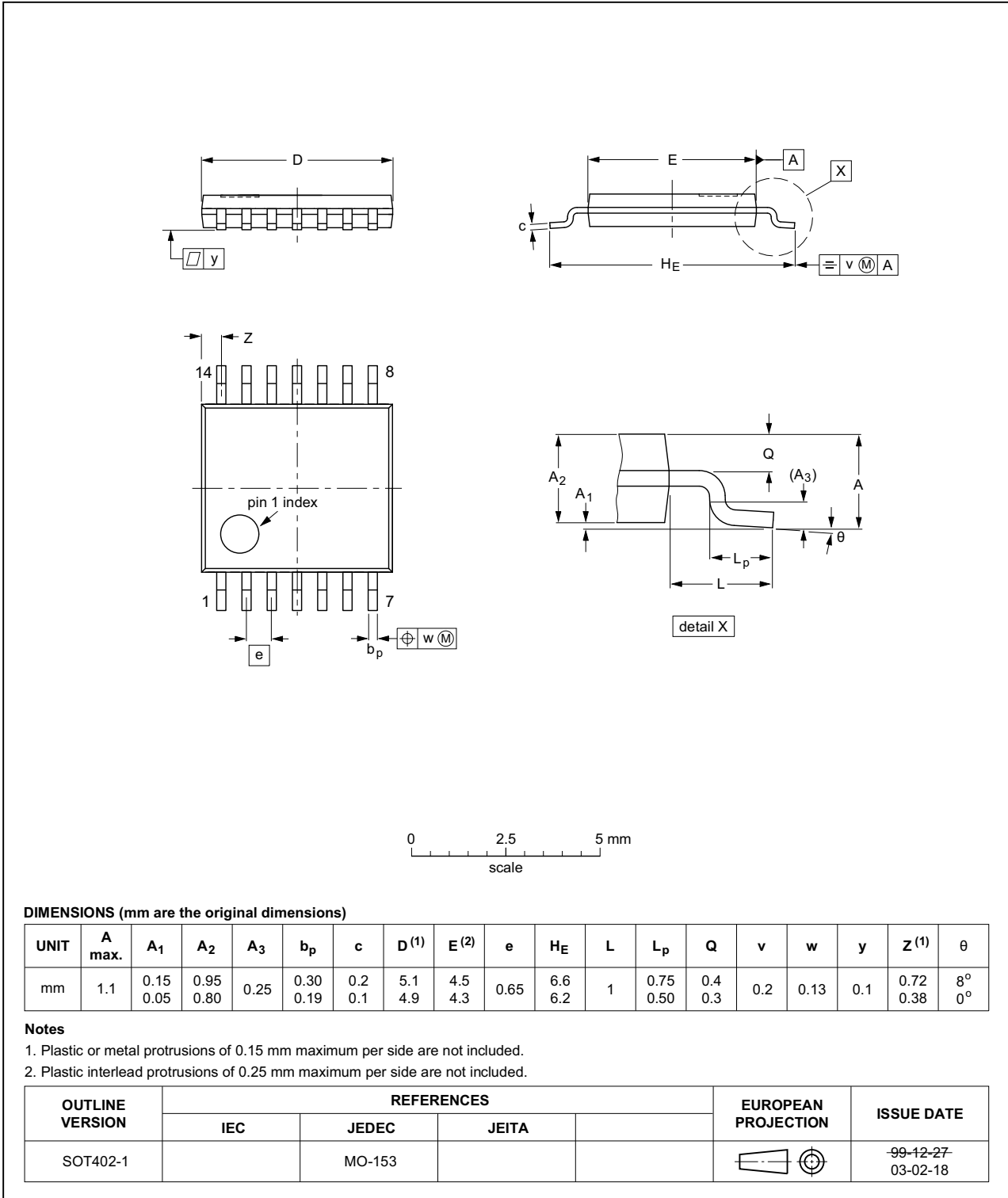


Fig 11. Package outline SOT402-1 (TSSOP14)

13. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|---|
| CMOS | Complementary Metal-Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |
| TTL | Transistor-Transistor Logic |

14. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------|---|-----------------------|---------------|---------------------|
| 74HC_HCT126 v.4 | 20151201 | Product data sheet | - | 74HC_HCT126 v.3 |
| Modifications: | <ul style="list-style-type: none"> Type numbers 74HC126N and 74HCT126N (SOT27-1) removed. | | | |
| 74HC_HCT126 v.3 | 20140922 | Product data sheet | - | 74HC_HCT126_CNV v.2 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. | | | |
| 74HC_HCT126_CNV v.2 | 19901201 | Product 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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