

# 74ABT00

Quad 2-input NAND gate

Rev. 3 — 11 August 2016

Product data sheet

## 1. General description

The 74ABT00 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT00 is a quad 2-input NAND gate.

## 2. Features and benefits

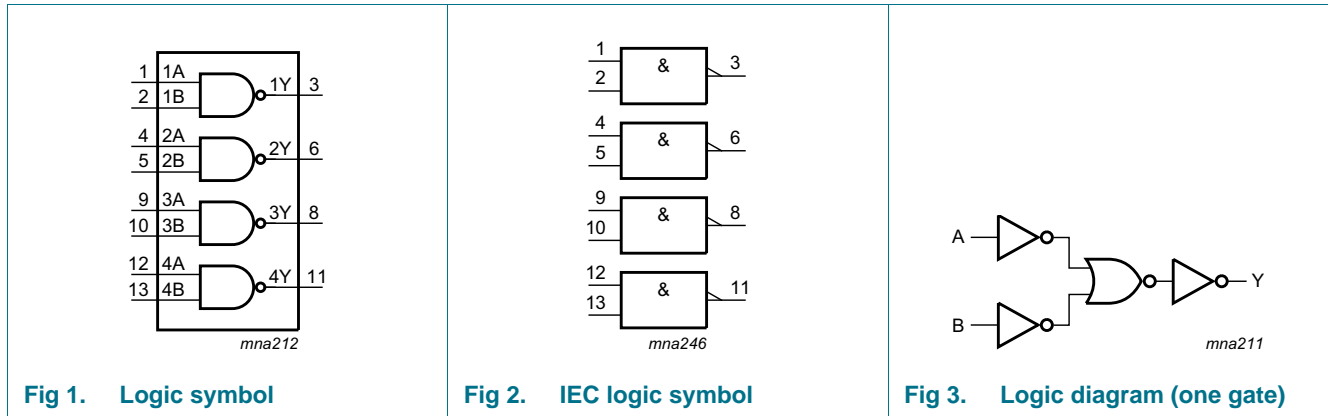
- Latch-up protection exceeds 500 mA per JESD78B class II level A
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from –40 °C to +85 °C

## 3. Ordering information

Table 1. Ordering information

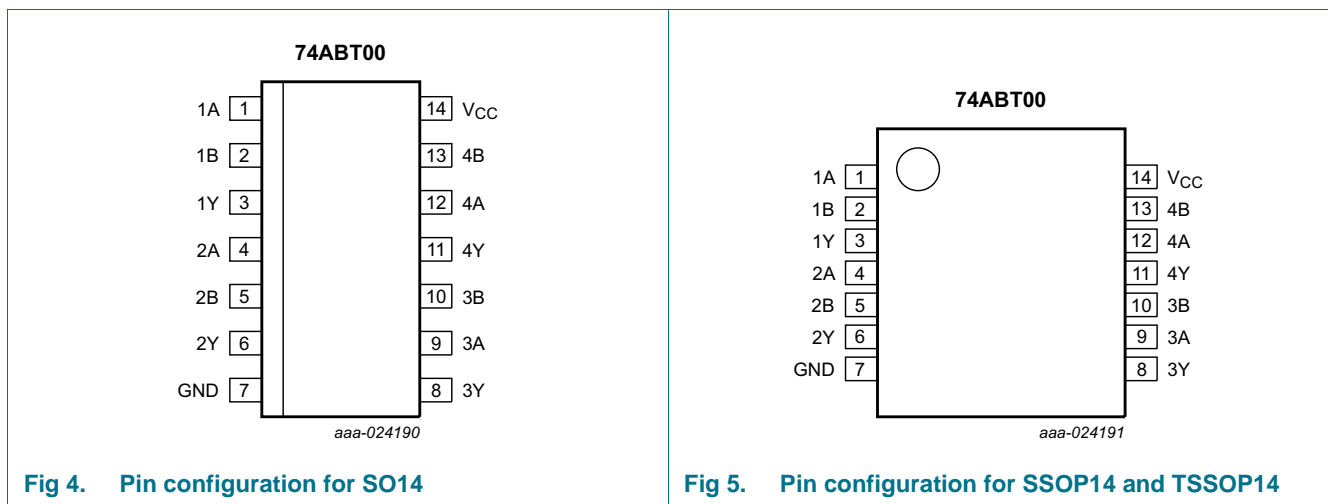
| Type number | Package           |         |  |          |
|-------------|-------------------|---------|--|----------|
|             | Temperature range | Name    | Description  | Version  |
| 74ABT00D    | –40 °C to +85 °C  | SO14    | plastic small outline package; 14 leads; body width 3.9 mm             | SOT108-1 |
| 74ABT00DB   | –40 °C to +85 °C  | SSOP14  | plastic shrink small outline package; 14 leads; body width 5.3 mm      | SOT337-1 |
| 74ABT00PW   | –40 °C to +85 °C  | TSSOP14 | plastic thin shrink small outline package; 14 leads; body width 4.4 mm | SOT402-1 |

## 4. Functional diagram



## 5. Pinning information

### 5.1 Pinning



### 5.2 Pin description

Table 2. Pin description

| Symbol          | Pin          | Description    |
|-----------------|--------------|----------------|
| 1A to 4A        | 1, 4, 9, 12  | data input     |
| 1B to 4B        | 2, 5, 10, 13 | data input     |
| 1Y to 4Y        | 3, 6, 8, 11  | data output    |
| GND             | 7            | ground (0 V)   |
| V <sub>CC</sub> | 14           | supply voltage |

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

| Input |    | Output |
|-------|----|--------|
| nA    | nB | nY     |
| L     | X  | H      |
| X     | L  | H      |
| H     | H  | L      |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter               | Conditions          | Min                 | Max  | Unit |
|-----------|-------------------------|---------------------|---------------------|------|------|
| $V_{CC}$  | supply voltage          |                     | -0.5                | +7.0 | V    |
| $V_I$     | input voltage           |                     | <sup>[1]</sup> -1.2 | +7.0 | V    |
| $V_O$     | output voltage          | output HIGH or LOW  | <sup>[1]</sup> -0.5 | +5.5 | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V         | -18                 | -    | mA   |
| $I_{OK}$  | output clamping current | $V_O < 0$ V         | -50                 | -    | mA   |
| $I_O$     | output current          | output in LOW-state | -                   | 40   | mA   |
| $T_j$     | junction temperature    |                     | <sup>[2]</sup> -    | 150  | °C   |
| $T_{stg}$ | storage temperature     |                     | -65                 | +150 | °C   |

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

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

## 8. Recommended operating conditions

Table 5. Operating conditions

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

| Symbol              | Parameter                           | Conditions  | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|-------------|-----|-----|----------|------|
| $V_{CC}$            | supply voltage                      |             | 4.5 | -   | 5.5      | V    |
| $V_I$               | input voltage                       |             | 0   | -   | $V_{CC}$ | V    |
| $V_{IH}$            | HIGH-level input voltage            |             | 2.0 | -   | -        | V    |
| $V_{IL}$            | LOW-level input voltage             |             | -   | -   | 0.8      | V    |
| $I_{OH}$            | HIGH-level output current           |             | -15 | -   | -        | mA   |
| $I_{OL}$            | LOW-level output current            |             | -   | -   | 20       | mA   |
| $\Delta t/\Delta V$ | input transition rise and fall rate |             | 0   | -   | 5        | ns/V |
| $T_{amb}$           | ambient temperature                 | in free air | -40 | -   | +85      | °C   |

## 9. Static characteristics

Table 6. Static characteristics

| Symbol          | Parameter                   | Conditions  | 25 °C |            |           | –40 °C to +85 °C |           | Unit          |
|-----------------|-----------------------------|---|-------|------------|-----------|------------------|-----------|---------------|
|                 |                             |   | Min   | Typ        | Max       | Min              | Max       |               |
| $V_{IK}$        | input clamping voltage      | $V_{CC} = 4.5 \text{ V}$ ; $I_{IK} = -18 \text{ mA}$  | -1.2  | -0.9       | -         | -1.2             | -         | V             |
| $V_{OH}$        | HIGH-level output voltage   | $V_{CC} = 4.5 \text{ V}$ ; $I_{OH} = -15 \text{ mA}$ ;<br>$V_I = V_{IL}$ or $V_{IH}$  | 2.5   | 2.9        | -         | 2.5              | -         | V             |
| $V_{OL}$        | LOW-level output voltage    | $V_{CC} = 4.5 \text{ V}$ ; $I_{OL} = 20 \text{ mA}$ ;<br>$V_I = V_{IL}$ or $V_{IH}$   | -     | 0.35       | 0.5       | -                | 0.5       | V             |
| $I_I$           | input leakage current       | $V_{CC} = 5.5 \text{ V}$ ; $V_I = \text{GND}$ or $5.5 \text{ V}$  | -     | $\pm 0.01$ | $\pm 1.0$ | -                | $\pm 1.0$ | $\mu\text{A}$ |
| $I_{OFF}$       | power-off leakage current   | $V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O \leq 4.5 \text{ V}$  | -     | $\pm 5.0$  | $\pm 100$ | -                | $\pm 100$ | $\mu\text{A}$ |
| $I_{CEX}$       | output high leakage current | HIGH-state; $V_O = 5.5 \text{ V}$ ;<br>$V_{CC} = 5.5 \text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$                            | -     | 5.0        | 50        | -                | 50        | $\mu\text{A}$ |
| $I_O$           | output current              | $V_{CC} = 5.5 \text{ V}$ ; $V_O = 2.5 \text{ V}$ [1]  | -50   | -75        | -180      | -50              | -180      | mA            |
| $I_{CC}$        | supply current              | $V_{CC} = 5.5 \text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$   | -     | 2          | 50        | -                | 50        | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current   | per input pin; $V_{CC} = 5.5 \text{ V}$ ;<br>one input at $3.4 \text{ V}$ ;<br>other inputs at $V_{CC}$ or $\text{GND}$ [2] | -     | 0.25       | 500       | -                | 500       | $\mu\text{A}$ |
| $C_I$           | input capacitance           | $V_I = 0 \text{ V}$ or $V_{CC}$   | -     | 3          | -         | -                | -         | pF            |

[1] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[2] This is the increase in supply current for each input at  $3.4 \text{ V}$ .

## 10. Dynamic characteristics

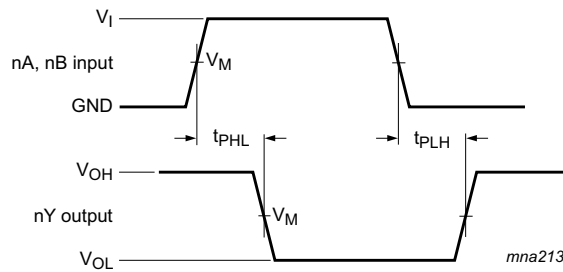
Table 7. Dynamic characteristics

$\text{GND} = 0 \text{ V}$ ; for test circuit, see [Figure 7](#).

| Symbol      | Parameter                     | Conditions                                 | 25 °C; $V_{CC} = 5.0 \text{ V}$ |     |     | –40 °C to +85 °C;<br>$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$ |     | Unit |
|-------------|-------------------------------|--|---------------------------------|-----|-----|---|-----|------|
|             |                               |  | Min                             | Typ | Max | Min   | Max |      |
| $t_{PLH}$   | LOW to HIGH propagation delay | nA, nB to nY; see <a href="#">Figure 6</a> | 1.0                             | 2.5 | 3.6 | 1.0   | 4.1 | ns   |
| $t_{PHL}$   | HIGH to LOW propagation delay | nA, nB to nY; see <a href="#">Figure 6</a> | 1.0                             | 2.0 | 2.8 | 1.0   | 3.4 | ns   |
| $t_{sk(o)}$ | output skew time              | [1]  | -                               | 0.4 | 0.5 | -   | 0.5 | ns   |

[1] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

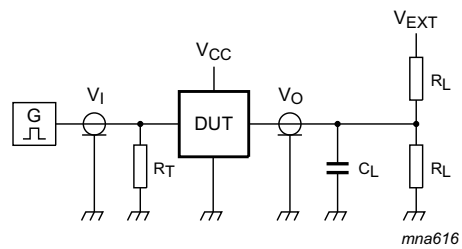
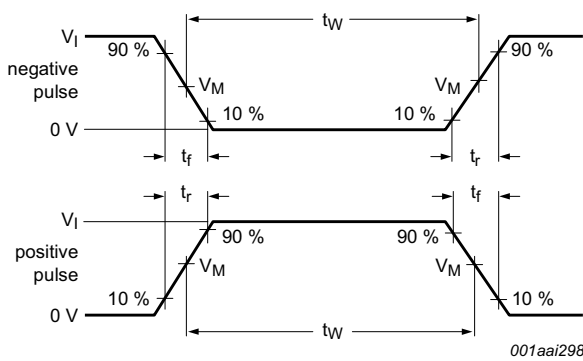
11. Waveforms



$V_M = 1.5\text{ V}$

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

Fig 6. Propagation delay input (nA, nB) to output (nY) and output skew time



a. Input pulse definition

Test data is given in [Table 8](#).

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

$R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

$V_{EXT}$  = External voltage for measuring switching times.

b. Test circuit

Fig 7. Test circuit for measuring switching times

Table 8. Test data

| Input |       |        |                      | Load  |              | $V_{EXT}$          |
|-------|-------|--------|----------------------|-------|--------------|--------------------|
| $V_I$ | $f_i$ | $t_W$  | $t_r, t_f$           | $C_L$ | $R_L$        | $t_{PHL}, t_{PLH}$ |
| 3.0 V | 1 MHz | 500 ns | $\leq 2.5\text{ ns}$ | 50 pF | 500 $\Omega$ | open               |

12. Package outline

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

SOT108-1

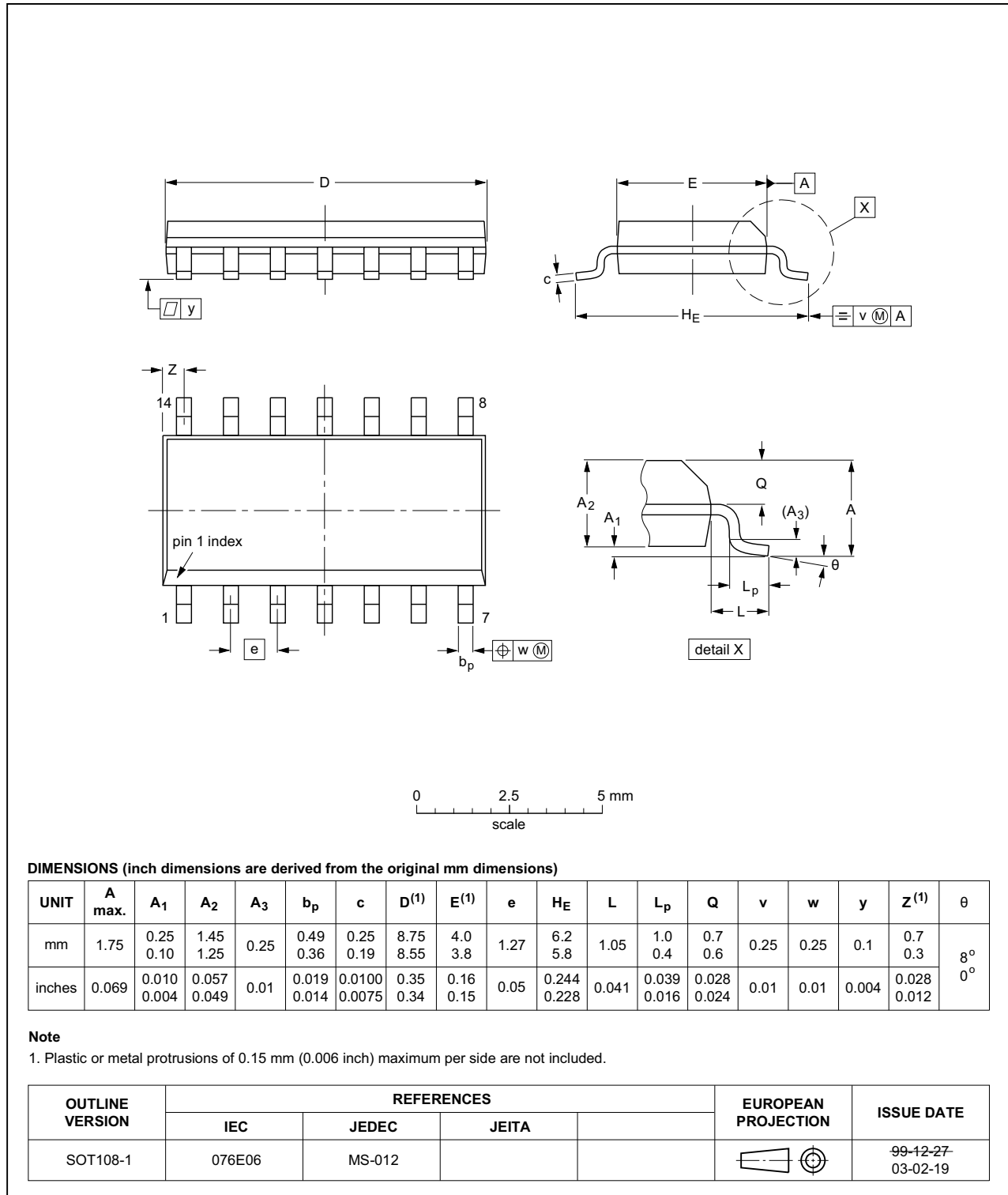


Fig 8. Package outline SOT108-1 (SO14)

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

SOT337-1

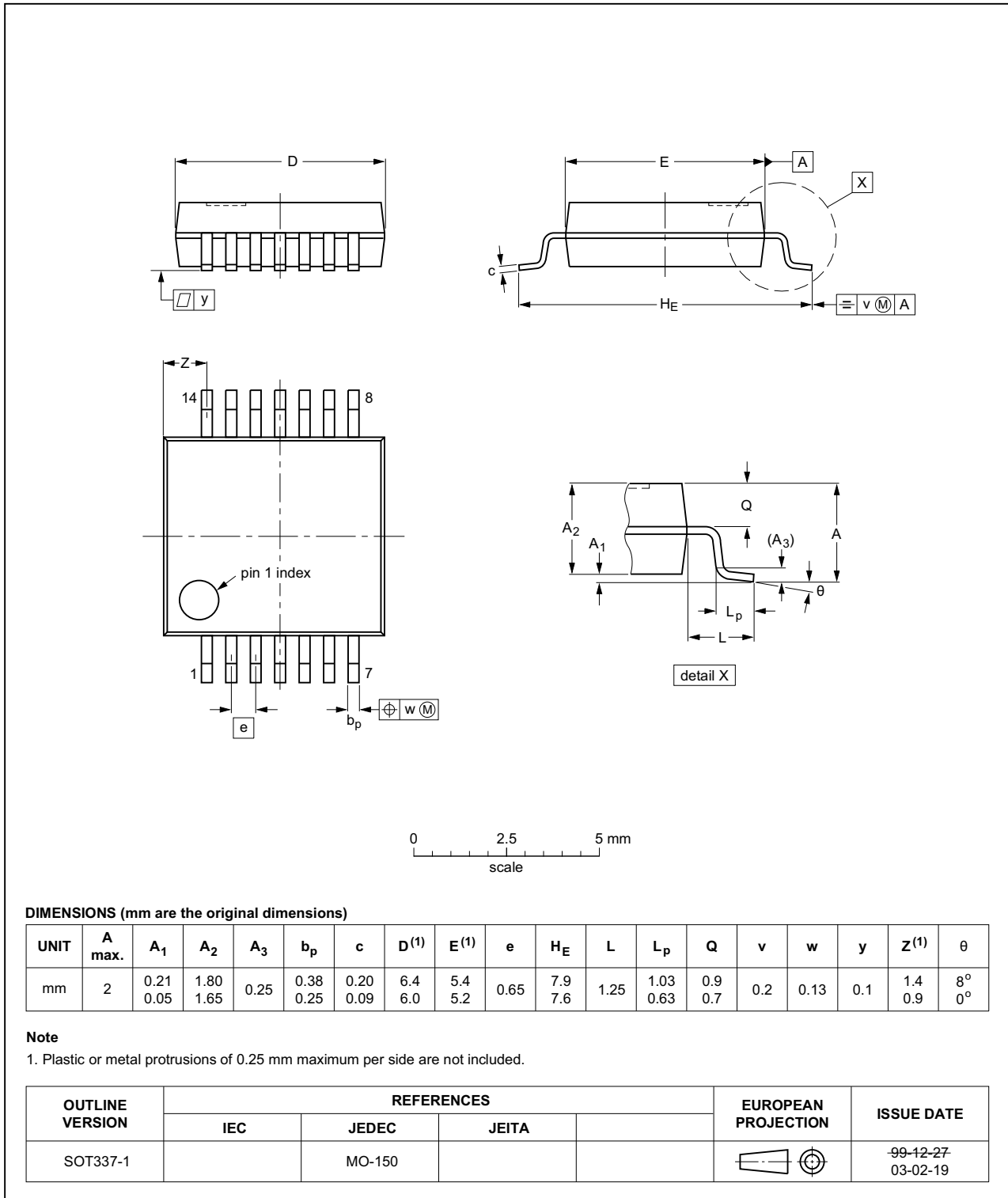


Fig 9. Package outline SOT337-1 (SSOP14)

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

SOT402-1

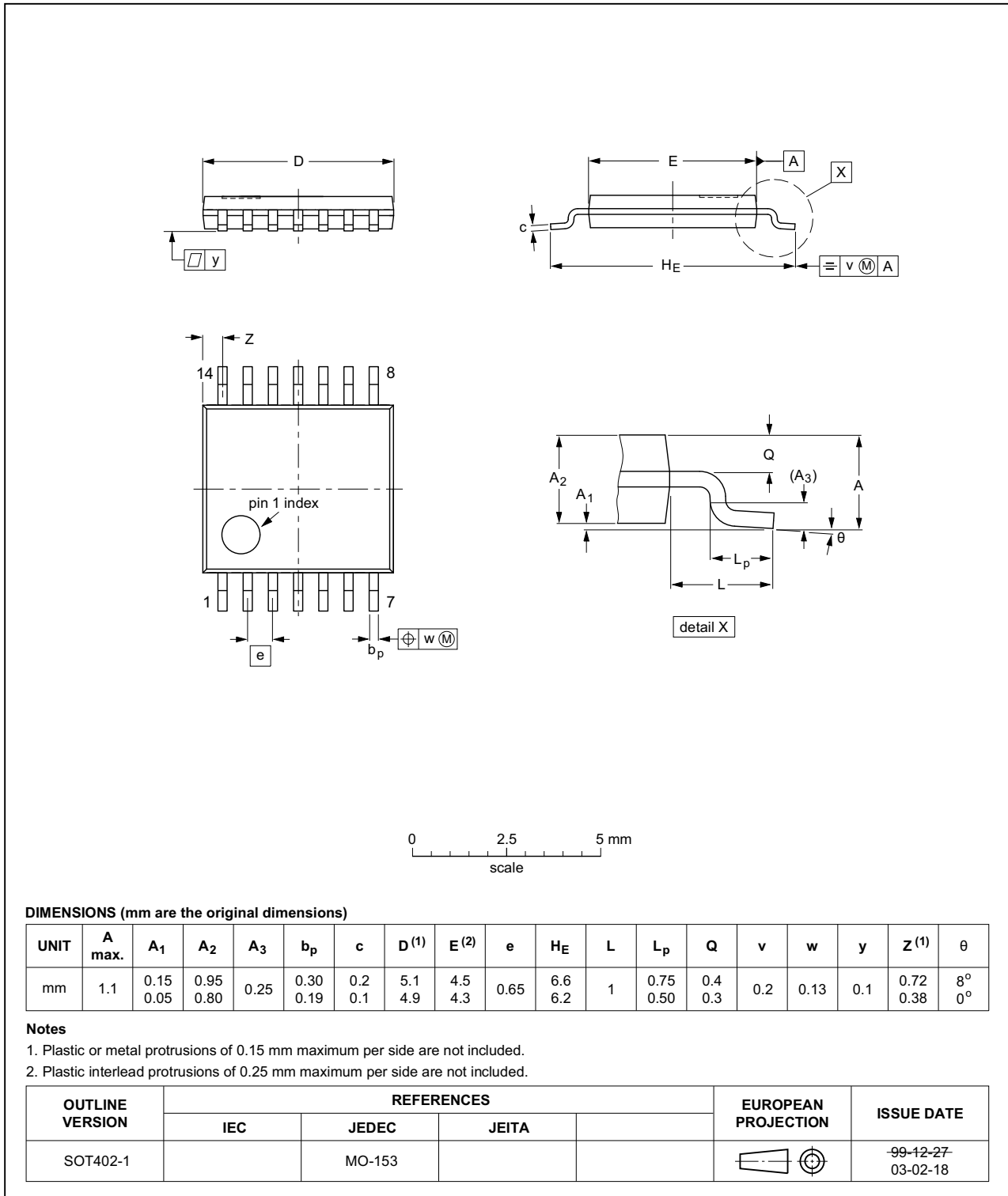


Fig 10. Package outline SOT402-1 (TSSOP14)



## 13. Abbreviations

Table 9. Abbreviations

| Acronym | Description                                     |
|---------|---|
| BiCMOS  | Bipolar Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                               |
| ESD     | ElectroStatic Discharge                         |
| HBM     | Human Body Model                                |
| MM      | Machine Model                                   |

## 14. Revision history

Table 10. Revision history

| Document ID    | Release date   | Data sheet status     | Change notice | Supersedes  |
|----------------|--|-----------------------|---------------|-------------|
| 74ABT00 v.3    | 20160811   | Product data sheet    | -             | 74ABT00 v.2 |
| Modifications: | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul> |                       |               |             |
| 74ABT00 v.2    | 19950918   | Product specification | -             | -           |

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### 15.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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".

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