

# CBT3126

## Quad FET bus switch

Rev. 03 — 9 December 2008

Product data sheet

## 1. General description

The CBT3126 is a quad FET bus switch with independent line switches. Each switch is disabled when the associated Output Enable (OE) input is LOW.

The CBT3126 is characterized for operation from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

## 2. Features

- Standard '126-type pinout
- Multiple package options
- $5\text{ }\Omega$  switch connection between two ports
- TTL-compatible input levels
- Minimal propagation delay through the switch
- Latch-up protection exceeds 500 mA per JEDEC standard JESD78 class II level A
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1000 V
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$

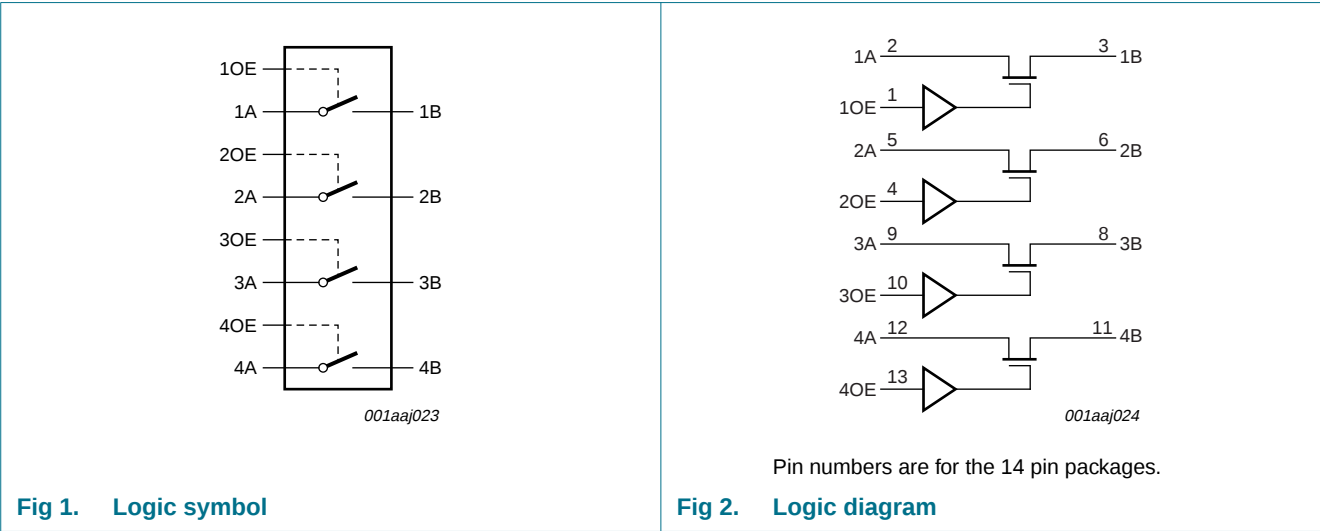
## 3. Ordering information

Table 1. Ordering information

| Type number | Temperature range                                              | Package               |                                                                                           |          |
|-------------|----------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------|----------|
|             |                                                                | Name                  | Description                                                                               | Version  |
| CBT3126D    | $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ | SO14                  | plastic small outline package; 14 leads;<br>body width 3.9 mm                             | SOT108-1 |
| CBT3126DB   | $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ | SSOP14                | plastic shrink small outline package; 14 leads;<br>body width 5.3 mm                      | SOT337-1 |
| CBT3126PW   | $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ | TSSOP14               | plastic thin shrink small outline package; 14 leads;<br>body width 4.4 mm                 | SOT402-1 |
| CBT3126DS   | $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ | SSOP16 <sup>[1]</sup> | plastic shrink small outline package; 16 leads;<br>body width 3.9 mm; lead pitch 0.635 mm | SOT519-1 |

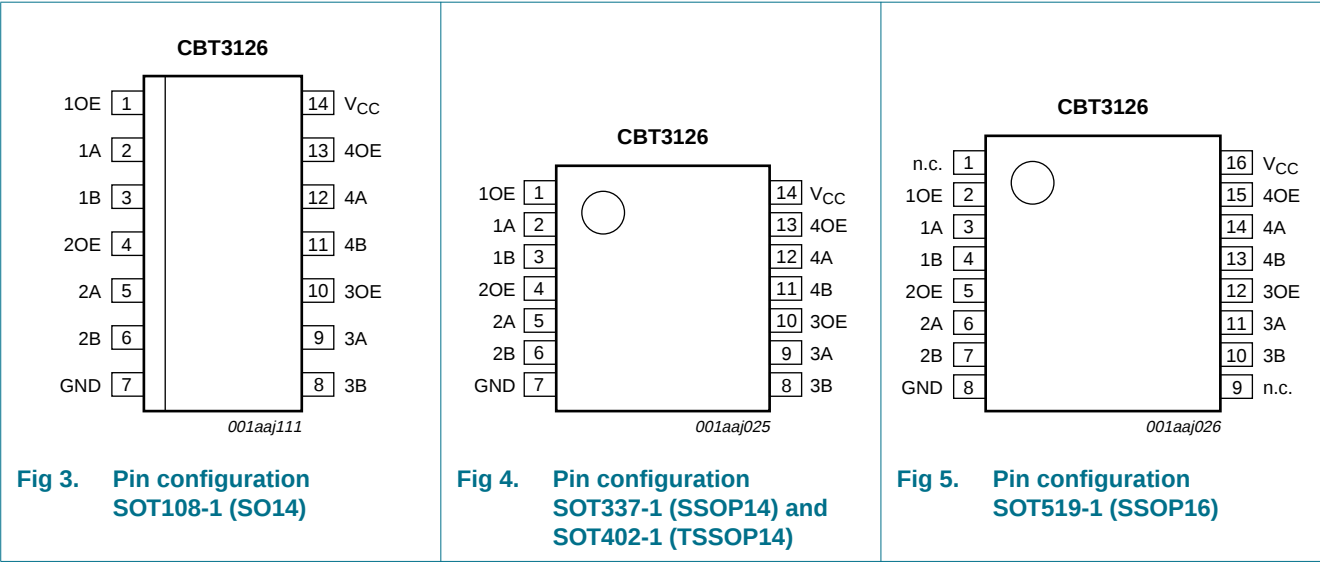
[1] Also known as QSOP16.

4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol     | Pin                            |              | Description         |
|------------|--------------------------------|--------------|---------------------|
|            | SOT108-1 SOT337-1 and SOT402-1 | SOT519-1     |                     |
| 1OE to 4OE | 1, 4, 10, 13                   | 2, 5, 12, 15 | output enable input |
| 1A to 4A,  | 2, 5, 9, 12                    | 3, 6, 11, 14 | A input/output      |
| 1B to 4B   | 3, 6, 8, 11                    | 4, 7, 10, 13 | B output/input      |

**Table 2.** Pin description ...continued

| Symbol          | Pin                            |          | Description             |
|-----------------|--------------------------------|----------|-------------------------|
|                 | SOT108-1 SOT337-1 and SOT402-1 | SOT519-1 |                         |
| GND             | 7                              | 8        | ground (0 V)            |
| V <sub>CC</sub> | 14                             | 16       | positive supply voltage |
| n.c.            | -                              | 1, 9     | not connected           |

## 6. Functional description

**Table 3.** Function selection

H = HIGH voltage level; L = LOW voltage level.

| Inputs | Switch                |
|--------|-----------------------|
| nOE    |                       |
| L      | nA to nB disconnected |
| H      | nA to nB connected    |

## 7. Limiting values

**Table 4.** Limiting values

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

| Symbol           | Parameter               | Conditions                                                 | Min      | Max  | Unit |
|------------------|-------------------------|------------------------------------------------------------|----------|------|------|
| V <sub>CC</sub>  | supply voltage          |                                                            | -0.5     | +7.0 | V    |
| V <sub>I</sub>   | input voltage           |                                                            | [1] -0.5 | +7.0 | V    |
| I <sub>CC</sub>  | supply current          | continuous current through each V <sub>CC</sub> or GND pin | -        | 128  | mA   |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < 0 V                                       | -50      | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                                            | -65      | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C                       | [2]      |      |      |
|                  |                         | SO14 package                                               | [3] -    | 500  | mW   |
|                  |                         | SSOP14 and SSOP16 package                                  | [4] -    | 500  | mW   |
|                  |                         | TSSOP14 package                                            | [4] -    | 500  | mW   |

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

[2] The package thermal impedance is calculated from JEDEC51-7.

[3] For SO14 package; P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.

[4] For SSOP14, SSOP16 and TSSOP14 packages; P<sub>tot</sub> derates linearly with 5.5 mW/K above 70 °C.

## 8. Recommended operating conditions

**Table 5.** Operating conditions

All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation.

| Symbol           | Parameter                | Conditions            | Min | Max | Unit |
|------------------|--------------------------|-----------------------|-----|-----|------|
| V <sub>CC</sub>  | supply voltage           |                       | 4.5 | 5.5 | V    |
| V <sub>IH</sub>  | HIGH-level input voltage |                       | 2.0 | -   | V    |
| V <sub>IL</sub>  | LOW-level input voltage  |                       | -   | 0.8 | V    |
| T <sub>amb</sub> | ambient temperature      | operating in free-air | -40 | +85 | °C   |

## 9. Static characteristics

**Table 6. Static characteristics**

$T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

| Symbol          | Parameter                          | Conditions                                                                                                                      | Min              | Typ <sup>[1]</sup> | Max     | Unit          |
|-----------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|---------|---------------|
| $V_{IK}$        | input clamping voltage             | $V_{CC} = 4.5\text{ V}$ ; $I_I = -18\text{ mA}$                                                                                 | -                | -                  | -1.2    | V             |
| $V_{pass}$      | pass voltage                       | $V_I = V_{CC} = 5.0\text{ V}$ ; $I_O = -100\text{ }\mu\text{A}$                                                                 | -                | 3.8                | -       | V             |
| $I_I$           | input leakage current              | $V_{CC} = 5.5\text{ V}$ ; $V_I = \text{GND}$ or $5.5\text{ V}$                                                                  | -                | -                  | $\pm 1$ | $\mu\text{A}$ |
| $I_{CC}$        | supply current                     | $V_{CC} = 5.5\text{ V}$ ; $I_O = 0\text{ mA}$ ;<br>$V_I = V_{CC}$ or $\text{GND}$                                               | -                | -                  | 3       | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current          | control pins; per input;<br>$V_{CC} = 5.5\text{ V}$ ; one input at $3.4\text{ V}$ ,<br>other inputs at $V_{CC}$ or $\text{GND}$ | <sup>[2]</sup> - | -                  | 2.5     | mA            |
| $C_I$           | input capacitance                  | control pins; $V_I = 3\text{ V}$ or $0\text{ V}$                                                                                | -                | 1.7                | -       | pF            |
| $C_{io(off)}$   | off-state input/output capacitance | $V_O = 3\text{ V}$ or $0\text{ V}$ ; $\text{OE} = V_{CC}$                                                                       | -                | 3.4                | -       | pF            |
| $R_{ON}$        | ON resistance                      | $V_{CC} = 4.0\text{ V}$                                                                                                         | <sup>[3]</sup> - | -                  | -       | -             |
|                 |                                    | $V_I = 2.4\text{ V}$ ; $I_I = 15\text{ mA}$                                                                                     | -                | 16                 | 22      | $\Omega$      |
|                 |                                    | $V_{CC} = 4.5\text{ V}$                                                                                                         | -                | -                  | -       | -             |
|                 |                                    | $V_I = 0\text{ V}$ ; $I_I = 64\text{ mA}$                                                                                       | -                | 5                  | 7       | $\Omega$      |
|                 |                                    | $V_I = 0\text{ V}$ ; $I_I = 30\text{ mA}$                                                                                       | -                | 5                  | 7       | $\Omega$      |
|                 |                                    | $V_I = 2.4\text{ V}$ ; $I_I = 15\text{ mA}$                                                                                     | -                | 10                 | 15      | $\Omega$      |

[1] All typical values are measured at  $V_{CC} = 5\text{ V}$ ;  $T_{amb} = 25^{\circ}\text{C}$ .

[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than  $V_{CC}$  or  $\text{GND}$ .

[3] Measured by the voltage drop between the A and the B terminals at the indicated current through the switch. ON resistance is determined by the lowest voltage of the two (A or B) terminals.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

$T_{amb} = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ;  $V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$ ; for test circuit see [Figure 8](#).

| Symbol    | Parameter         | Conditions                                         | Min                 | Max  | Unit |
|-----------|-------------------|----------------------------------------------------|---------------------|------|------|
| $t_{pd}$  | propagation delay | nA to nB or nB to nA; see <a href="#">Figure 6</a> | <sup>[1][2]</sup> - | 0.25 | ns   |
| $t_{en}$  | enable time       | OE to nA or nB; see <a href="#">Figure 7</a>       | <sup>[2]</sup> 1.6  | 4.5  | ns   |
| $t_{dis}$ | disable time      | OE to nA or nB; see <a href="#">Figure 7</a>       | <sup>[2]</sup> 1.0  | 5.4  | ns   |

[1] This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON resistance of the switch and a load capacitance, when driven by an ideal voltage source (zero output impedance).

[2]  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ ;  
 $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ ;  
 $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

11. AC waveforms

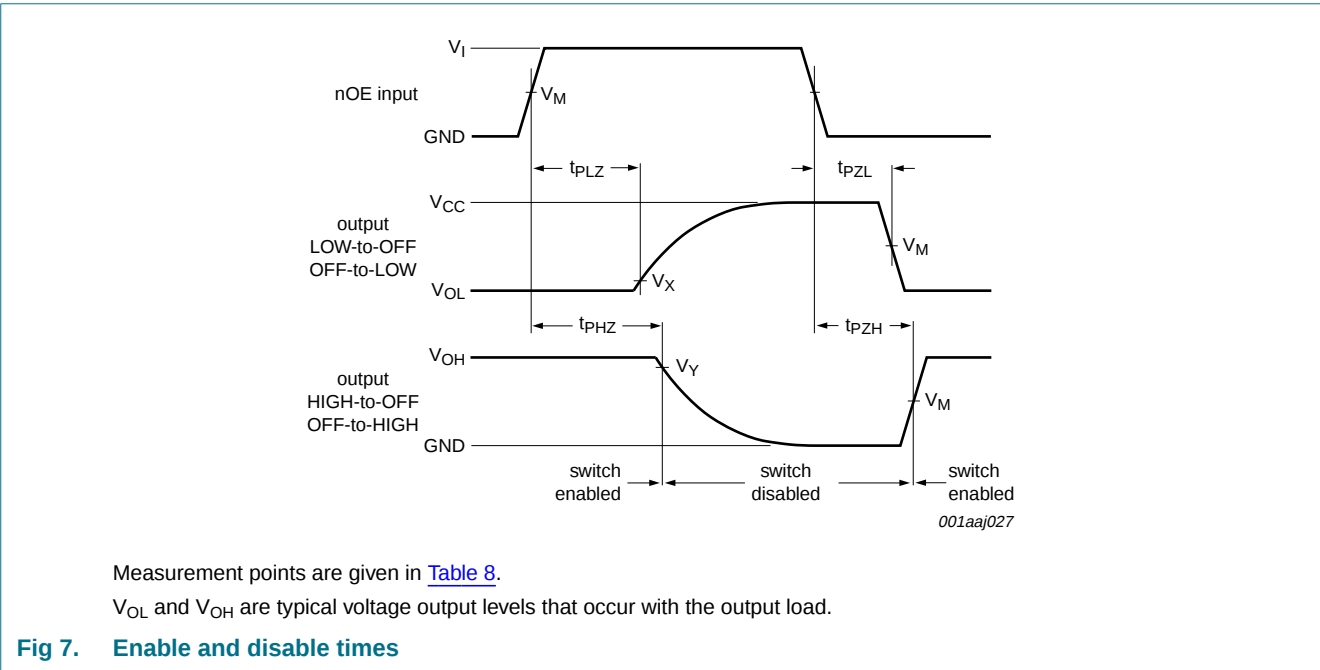
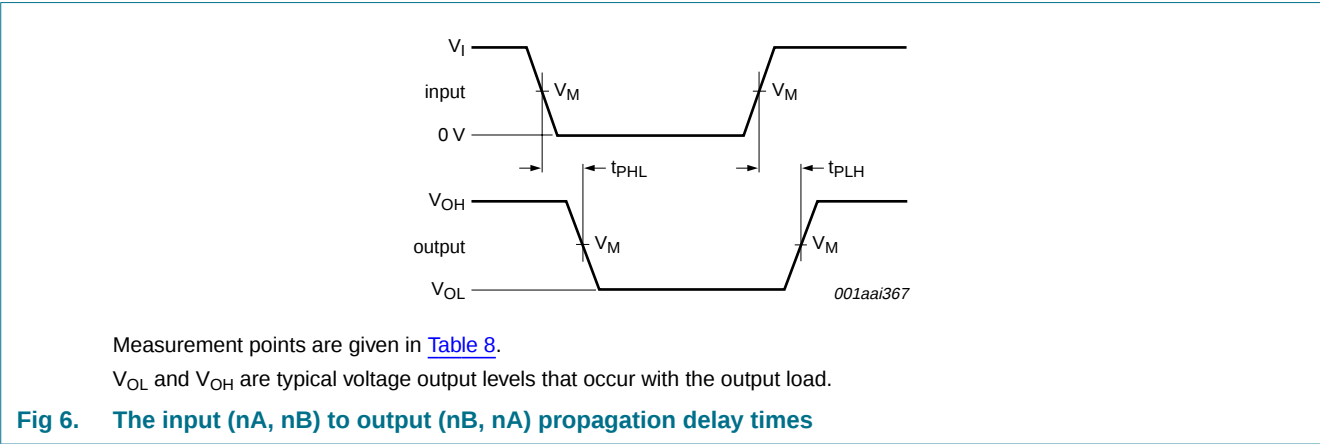
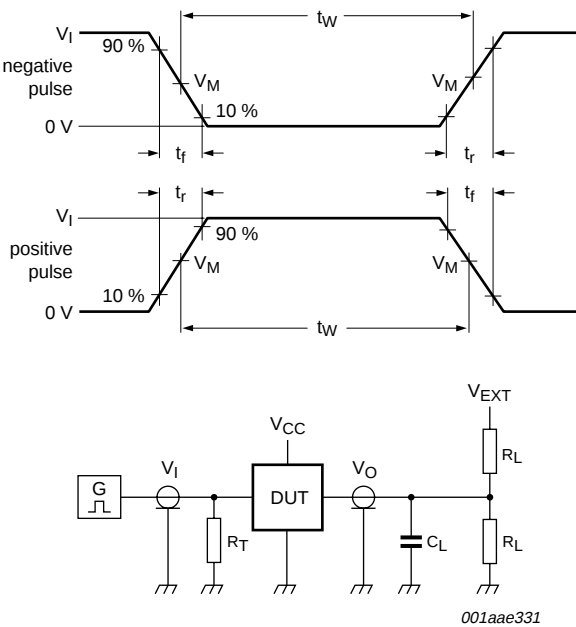


Table 8. Measurement points

| Input | Output |                         |                         |
|-------|--------|-------------------------|-------------------------|
| $V_M$ | $V_M$  | $V_X$                   | $V_Y$                   |
| 1.5 V | 1.5 V  | $V_{OL} + 0.3\text{ V}$ | $V_{OH} - 0.3\text{ V}$ |

12. Test information



Test data is given in [Table 9](#).  
Definitions for test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

Fig 8. Test circuit for measuring switching times

Table 9. Test data

| Supply voltage | Input        |               | Load  |              | $V_{EXT}$          |                    |                    |
|----------------|--------------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$       | $V_I$        | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PLZ}, t_{PZL}$ | $t_{PHZ}, t_{PZH}$ |
| 4.5 V to 5.5 V | GND to 3.0 V | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | 7.0 V              | open               |

13. Package outline

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

SOT108-1

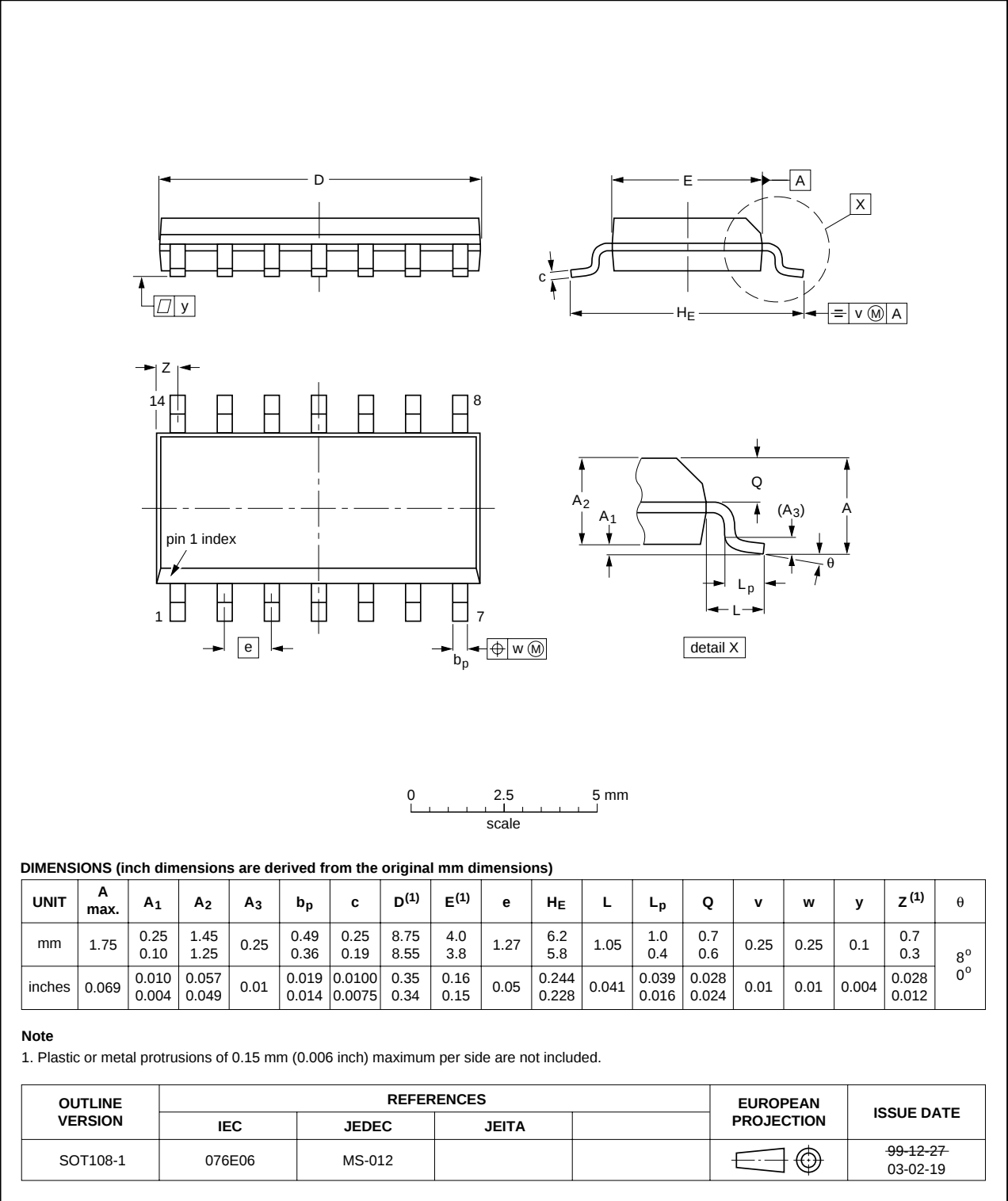


Fig 9. Package outline SOT108-1 (SO14)

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

SOT337-1

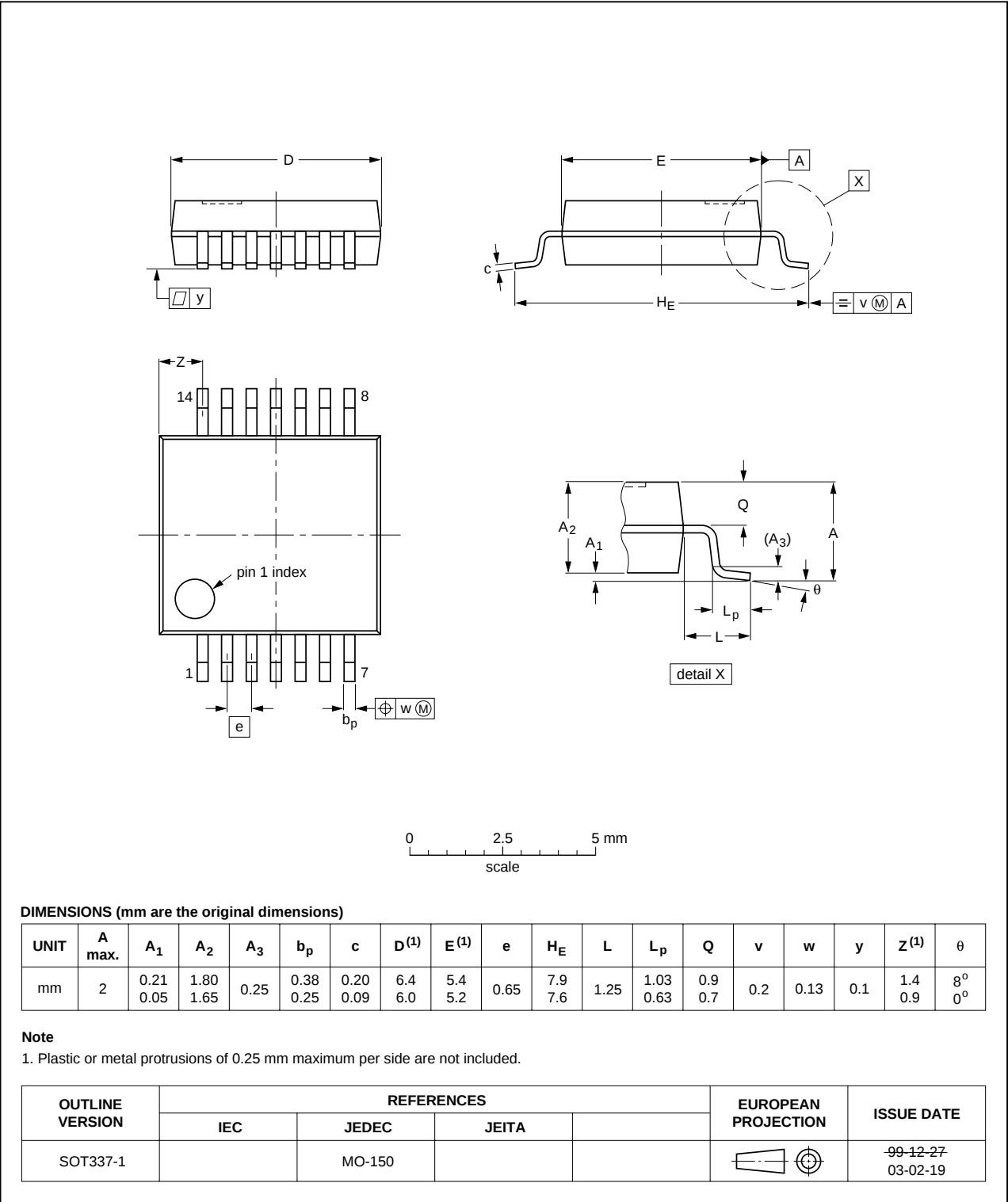


Fig 10. Package outline SOT337-1 (SSOP14)

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

SOT402-1

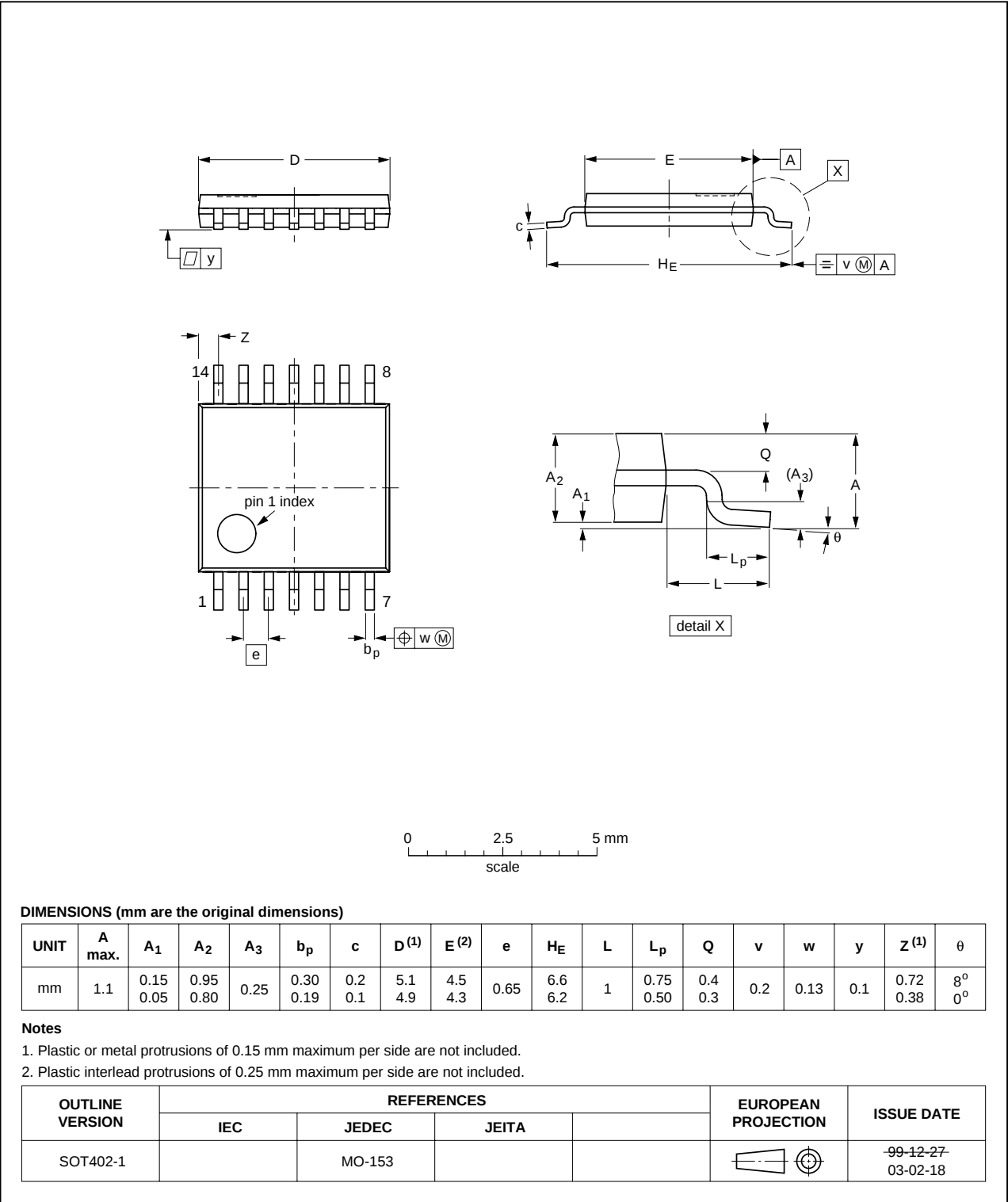


Fig 11. Package outline SOT402-1 (TSSOP14)

SSOP16: plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm    SOT519-1

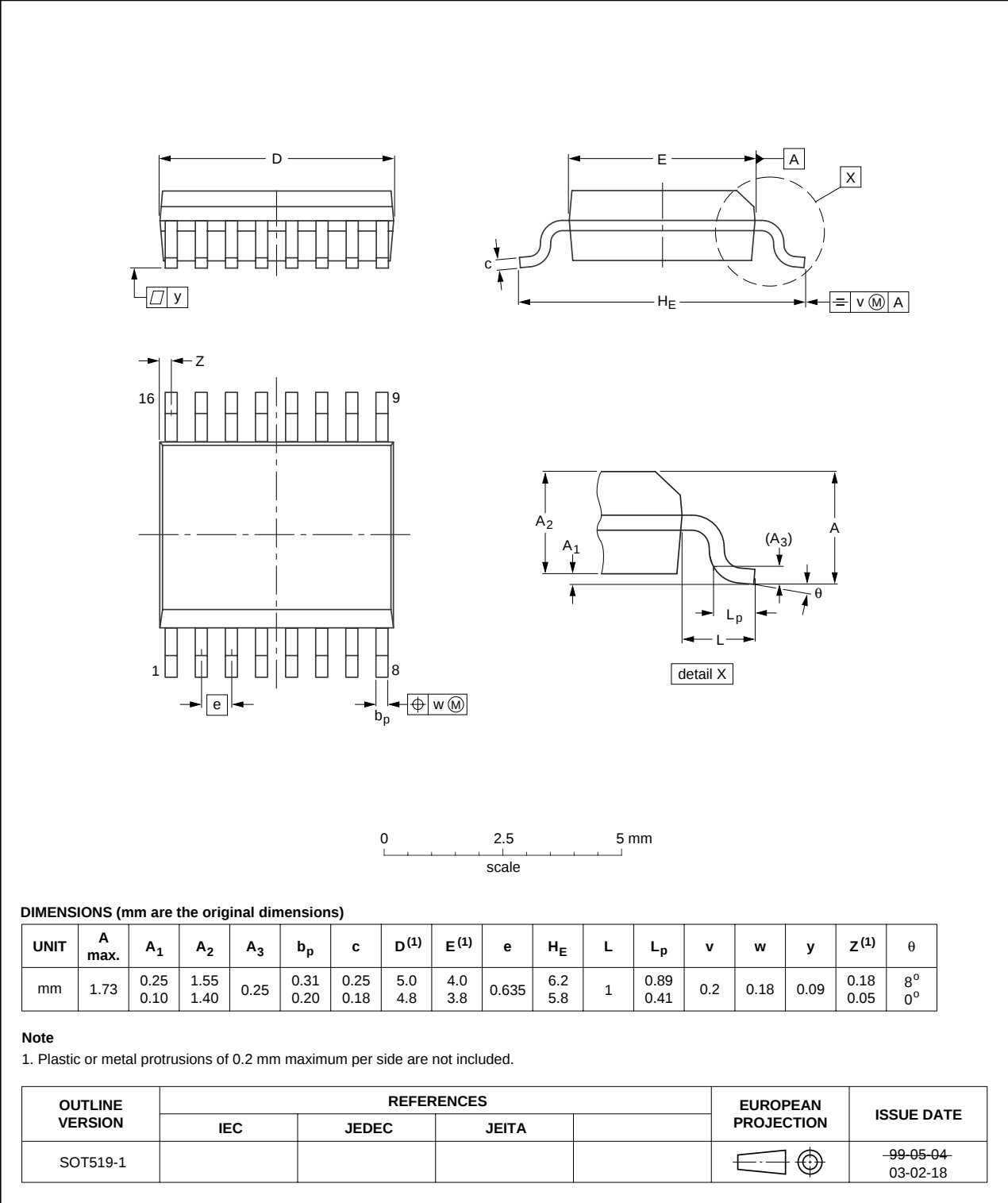


Fig 12. Package outline SOT519-1 (SSOP16)

## 14. Abbreviations

Table 10. Abbreviations

| Acronym | Description                 |
|---------|-----------------------------|
| CDM     | Charged Device Model        |
| ESD     | ElectroStatic Discharge     |
| HBM     | Human Body Model            |
| MM      | Machine Model               |
| TTL     | Transistor-Transistor Logic |

## 15. Revision history

Table 11. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Data sheet status  | Change notice | Supersedes |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|------------|
| CBT3126_3      | 20081209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | CBT3126_2  |
| Modifications: | <ul style="list-style-type: none"><li>• <a href="#">Section 5 "Pinning information"</a> SOT108-1 pin configuration drawing added.</li><li>• <a href="#">Section 5 "Pinning information"</a> SOT337-4 number changed to SOT337-1</li><li>• <a href="#">Section 9 "Static characteristics"</a> in <math>C_{io(off)}</math> conditions <math>\overline{OE}</math> changed to OE</li><li>• <a href="#">Section 13 "Package outline"</a> SOT109-1, SOT338-1, SOT403-1 and SOT763-1 package outline drawings removed.</li><li>• <a href="#">Section 13 "Package outline"</a> SOT108-1, SOT337-1 and SOT402-1 package outline drawings added.</li></ul> |                    |               |            |
| CBT3126_2      | 20081023                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | CBT3126_1  |
| CBT3126_1      | 20011212                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | -          |

## 16. Legal information

### 16.1 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. |
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| 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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