

CBT3126

Quad FET bus switch

Rev. 04 — 12 October 2009

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
- $5\ \Omega$ 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 $+85\text{ }^{\circ}\text{C}$

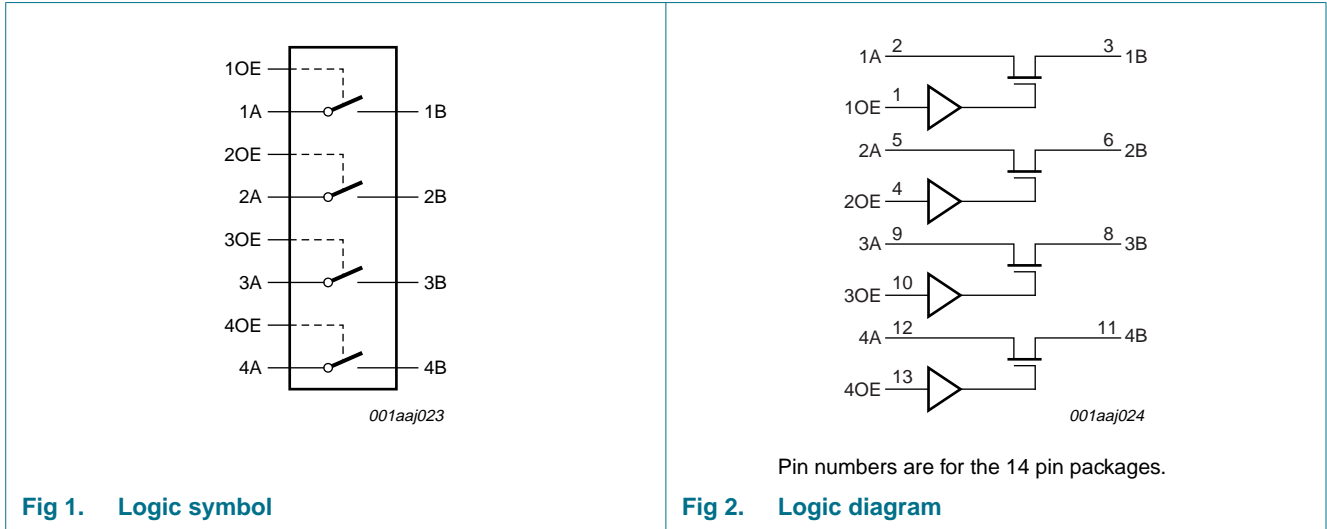
3. Ordering information

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; 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; 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; body width 4.4 mm | SOT402-1 |
| CBT3126DS | $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ | SSOP16 ^[1] | plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm | SOT519-1 |

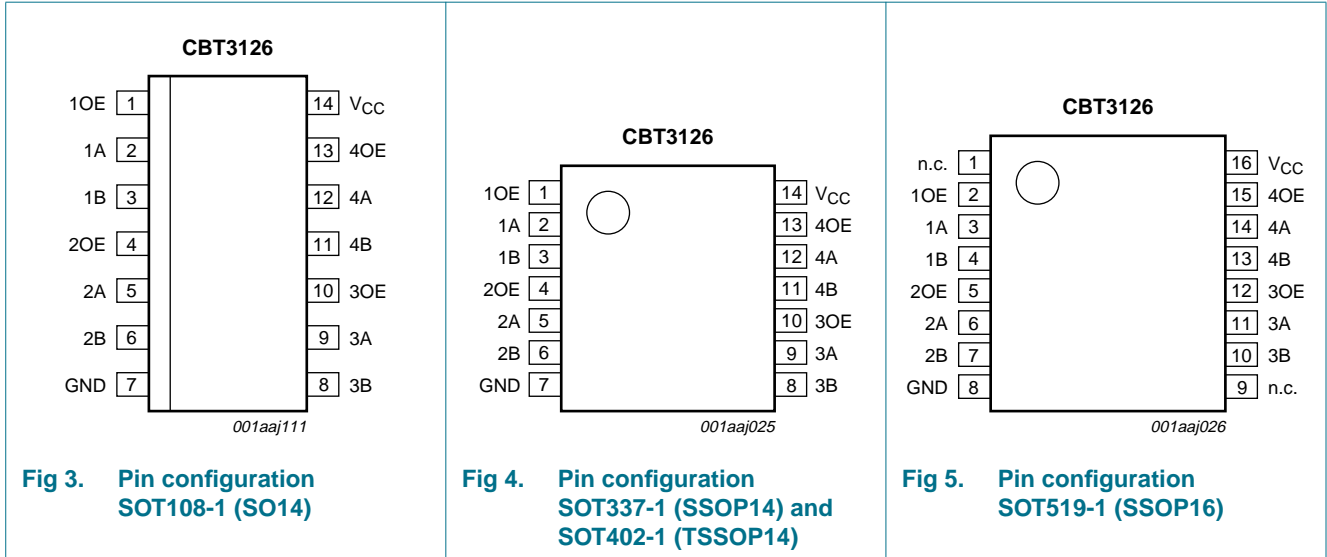
[1] Also known as QSOP16.

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 | |
| 1OE to 4OE | 1, 4, 10, 13 | | output enable input |
| 1A to 4A, | 2, 5, 9, 12 | | 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 _{CC} | 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 _{CC} | supply voltage | | -0.5 | +7.0 | V | |
| V _I | input voltage | | [1] -0.5 | +7.0 | V | |
| I _{SW} | switch current | continuous current through each switch | - | 128 | mA | |
| I _{IK} | input clamping current | V _I < 0 V | -50 | - | mA | |
| T _{stg} | storage temperature | | -65 | +150 | °C | |
| P _{tot} | total power dissipation | T _{amb} = -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 JE5D51-7.

[3] For SO14 package; P_{tot} derates linearly with 8 mW/K above 70 °C.

[4] For SSOP14, SSOP16 and TSSOP14 packages; P_{tot} 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_{CC} or GND to ensure proper device operation.

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

9. Static characteristics

Table 6. Static characteristics

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

| Symbol | Parameter | Conditions | Min | Typ ^[1] | 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 | $V_I = V_{CC} = 5.0\text{ V}$; $I_{SW} = -100\text{ }\mu\text{A}$ | - | 3.8 | - | V |
| I_I | input leakage current | $V_{CC} = 5.5\text{ V}$; $V_I = \text{GND}$ or 5.5 V | - | - | ± 1 | μA |
| I_{CC} | supply current | $V_{CC} = 5.5\text{ V}$; $I_{SW} = 0\text{ mA}$; $V_I = V_{CC}$ or GND | - | - | 3 | μA |
| ΔI_{CC} | additional supply current | control pins; per input; $V_{CC} = 5.5\text{ V}$; one input at 3.4 V , other inputs at V_{CC} or GND | ^[2] - | - | 2.5 | mA |
| C_I | input capacitance | control pins; $V_I = 3\text{ V}$ or 0 V | - | 1.7 | - | pF |
| $C_{io(off)}$ | off-state input/output capacitance | $V_O = 3\text{ V}$ or 0 V ; $nOE = V_{CC}$ | - | 3.4 | - | pF |
| R_{ON} | ON resistance | $V_{CC} = 4.0\text{ V}$ | ^[3] | | | |
| | | $V_I = 2.4\text{ V}$; $I_I = 15\text{ mA}$ | - | 16 | 22 | Ω |
| | | $V_{CC} = 4.5\text{ V}$ | | | | |
| | | $V_I = 0\text{ V}$; $I_I = 64\text{ mA}$ | - | 5 | 7 | Ω |
| | | $V_I = 0\text{ V}$; $I_I = 30\text{ mA}$ | - | 5 | 7 | Ω |
| | | $V_I = 2.4\text{ V}$; $I_I = 15\text{ mA}$ | - | 10 | 15 | Ω |

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

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

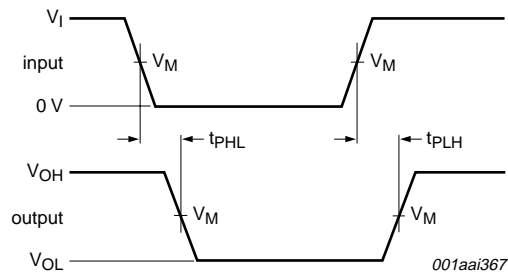
$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$; $V_{CC} = 4.5\text{ V}$ to 5.5 V ; for test circuit see [Figure 8](#).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------|--|---------------------|------|------|
| t_{pd} | propagation delay | nA to nB or nB to nA; see Figure 6 | ^{[1][2]} - | 0.25 | ns |
| t_{en} | enable time | nOE to nA or nB; see Figure 7 | ^[2] 1.6 | 4.5 | ns |
| t_{dis} | disable time | nOE to nA or nB; see Figure 7 | ^[2] 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).

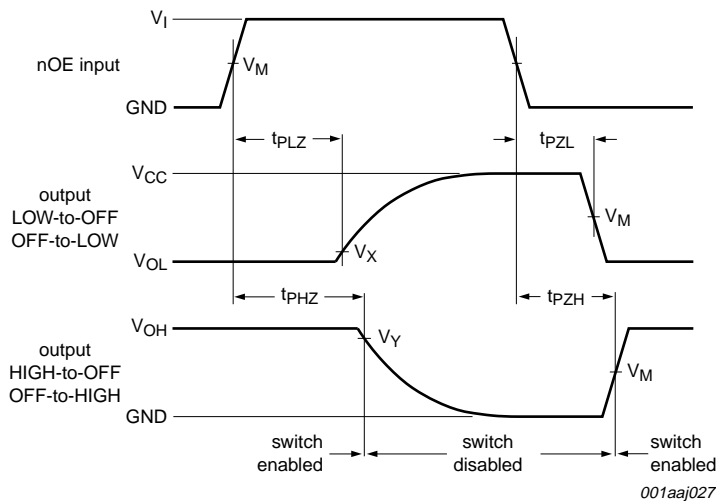
[2] t_{PLH} and t_{PHL} are the same as t_{pd} ;
 t_{PZL} and t_{PZH} are the same as t_{en} ;
 t_{PLZ} and t_{PHZ} are the same as t_{dis} .

11. AC waveforms



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. The input (nA, nB) to output (nB, nA) propagation delay times



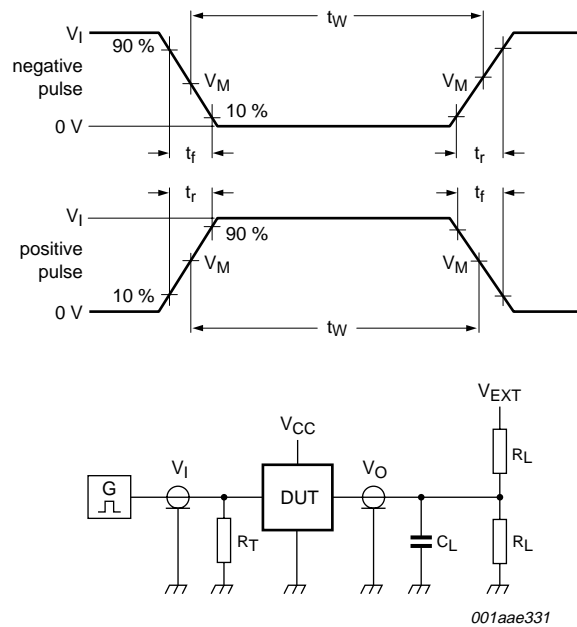
Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 7. Enable and disable times

Table 8. Measurement points

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

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 | ≤ 2.5 ns | 50 pF | 500 Ω | open | 7.0 V | open |

13. Package outline

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

SOT108-1

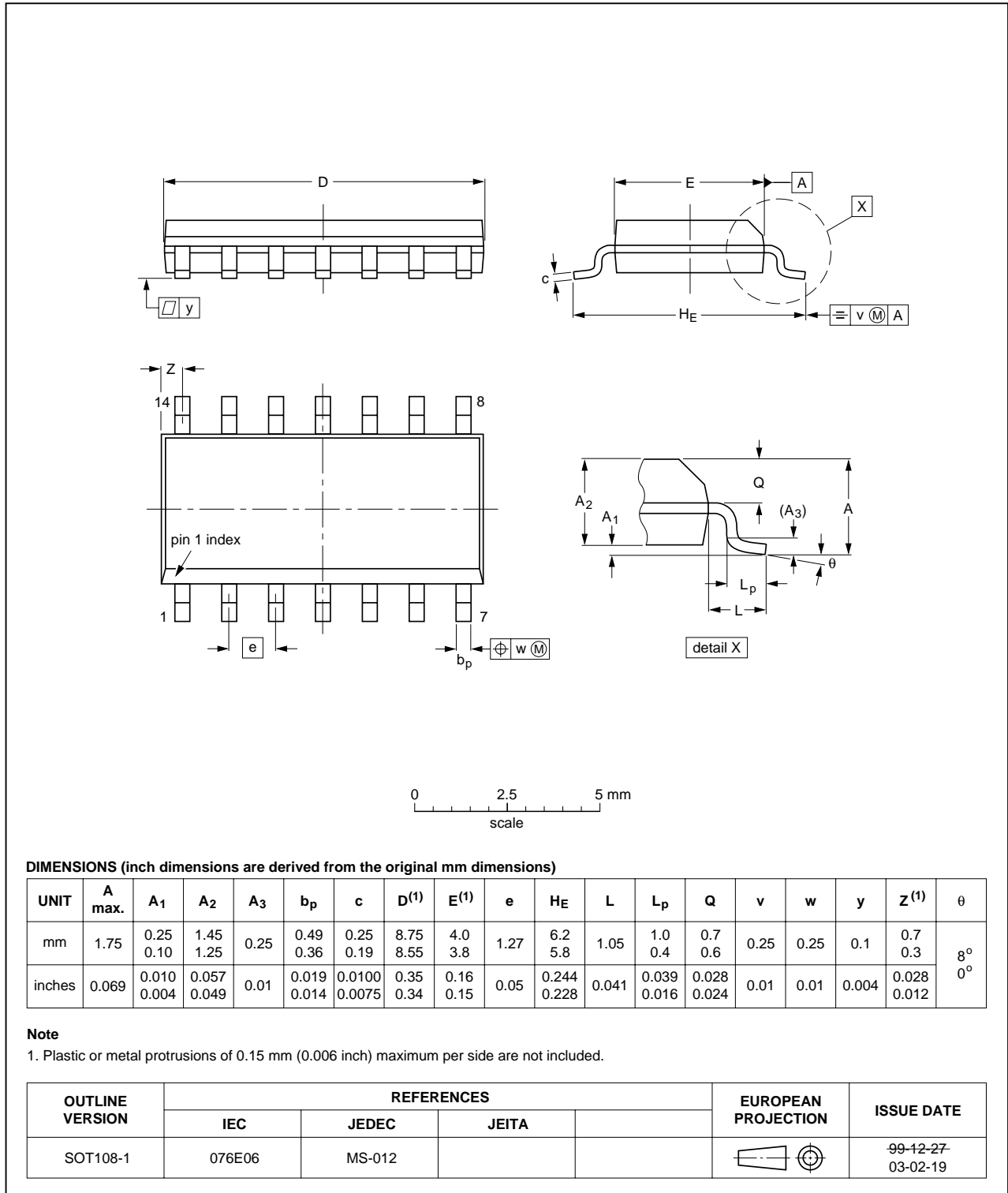


Fig 9. Package outline SOT108-1 (SO14)

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

SOT337-1

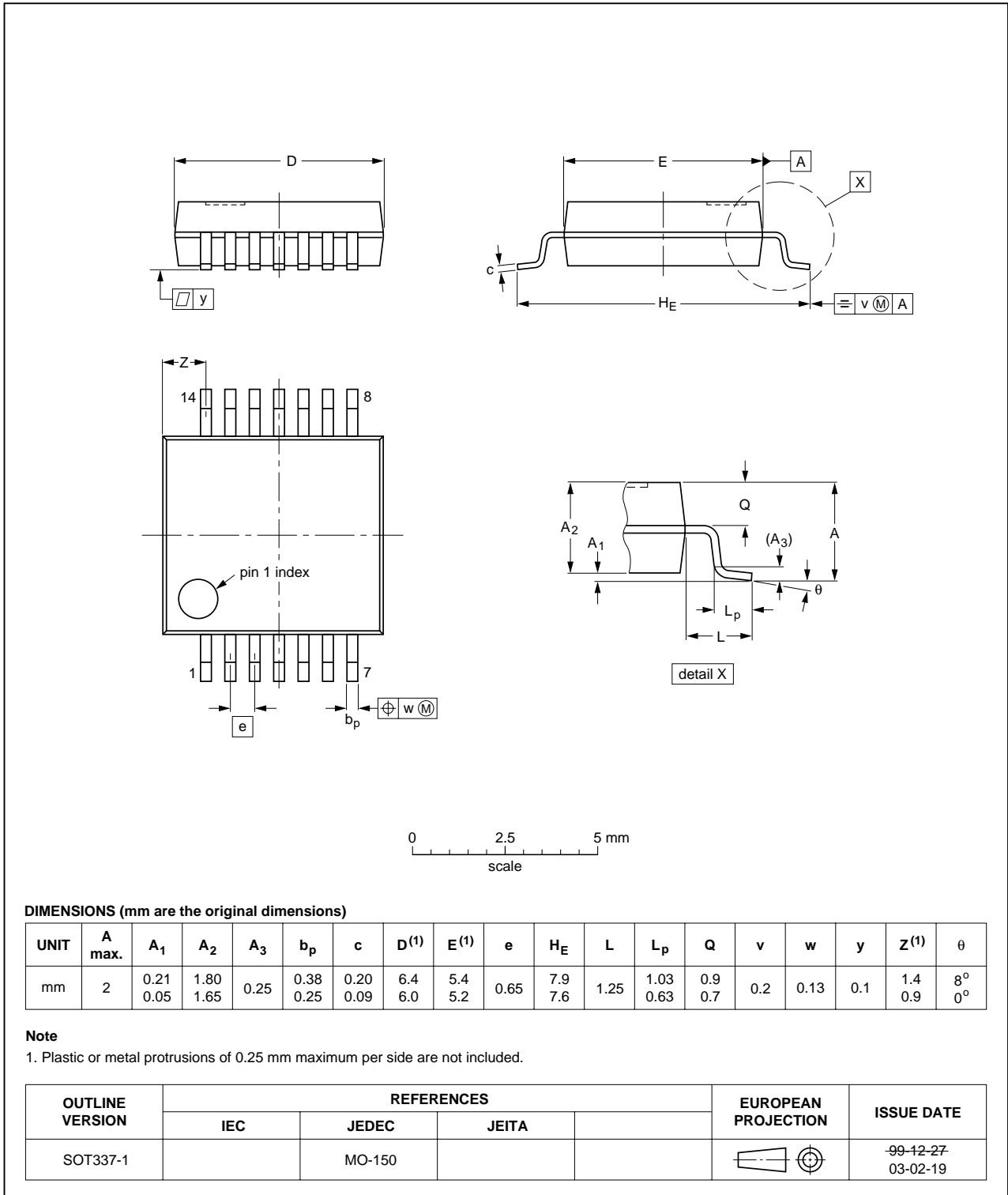


Fig 10. Package outline SOT337-1 (SSOP14)

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

SOT402-1

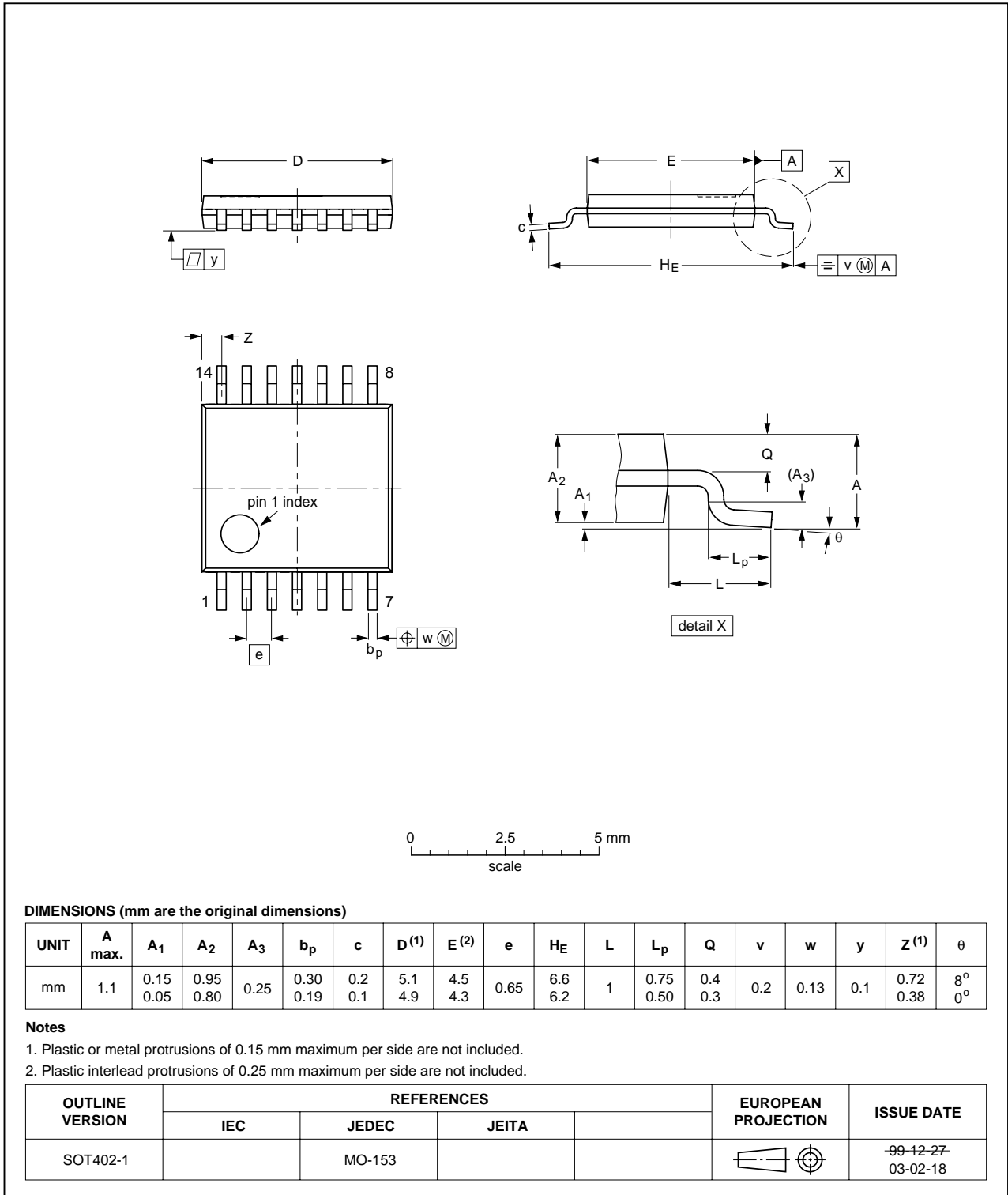


Fig 11. Package outline SOT402-1 (TSSOP14)

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

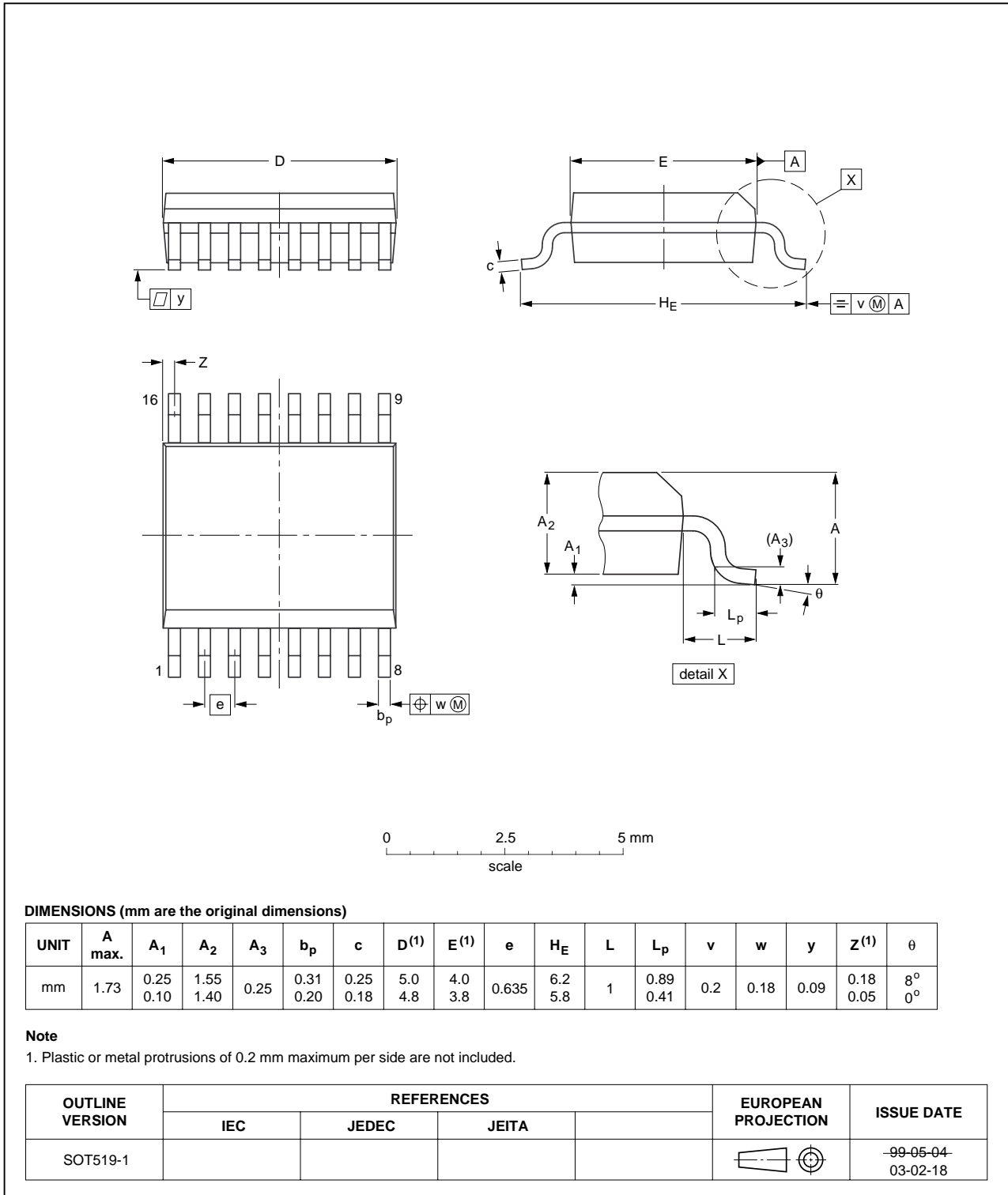


Fig 12. Package outline SOT519-1 (SSOP16)

14. Abbreviations

Table 10. Abbreviations

| Acronym | Description |
|---------|-----------------------------|
| CDM | Charged Device Model |
| DUT | Device Under Test |
| 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_4 | 20091012 | Product data sheet | - | CBT3126_3 |
| Modifications: | • Section 7 "Limiting values" changed I_{CC} to I_{SW} . | | | |
| CBT3126_3 | 20081209 | Product data sheet | - | CBT3126_2 |
| CBT3126_2 | 20081023 | Product data sheet | - | CBT3126_1 |
| CBT3126_1 | 20011212 | Product data sheet | - | - |

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| 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".

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