

# 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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

## 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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## 3. Ordering information

Table 1. Ordering information

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

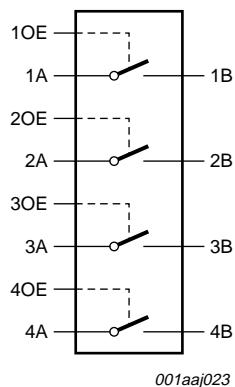
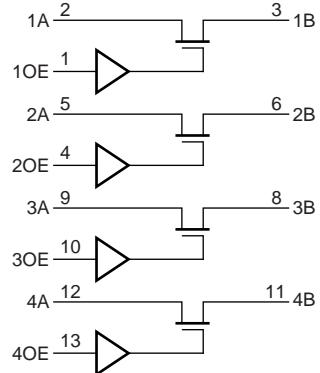


Fig 1. Logic symbol



Pin numbers are for the 14 pin packages.

Fig 2. Logic diagram

## 5. Pinning information

### 5.1 Pinning

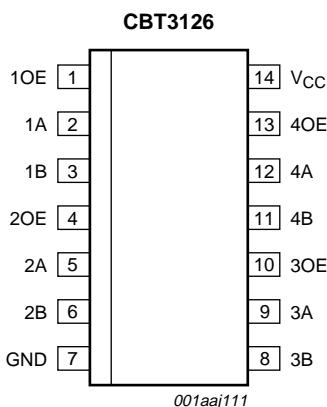


Fig 3. Pin configuration SOT108-1 (SO14)

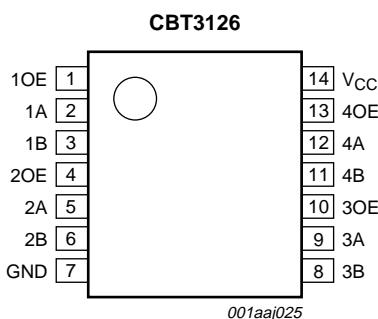


Fig 4. Pin configuration SOT337-1 (SSOP14) and SOT402-1 (TSSOP14)

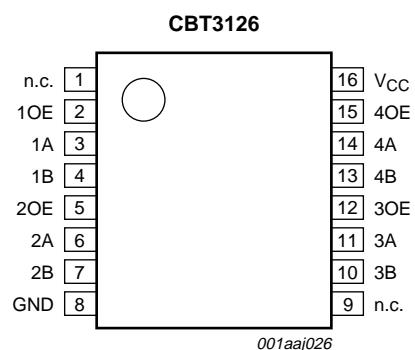


Fig 5. Pin configuration SOT519-1 (SSOP16)

### 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>sw</sub>	switch current	continuous current through each switch	-	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 JESD51-7.

[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**

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

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

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

[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**

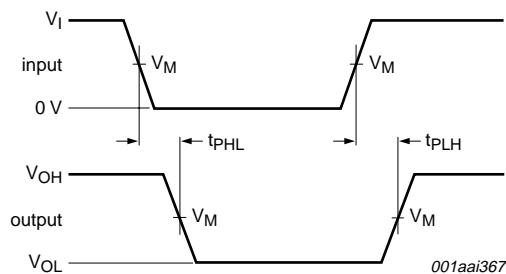
$T_{amb} = -40^{\circ}C$  to  $+85^{\circ}C$ ;  $V_{CC} = 4.5$  V to  $5.5$  V; for test circuit see [Figure 8](#).

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

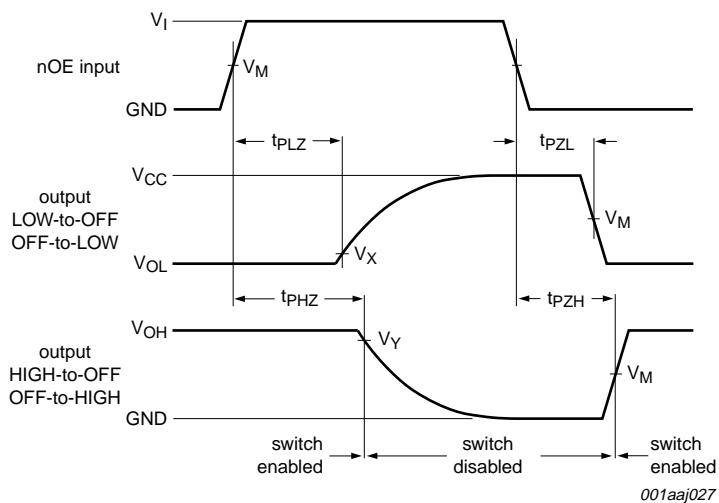
## 11. AC waveforms



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](#).

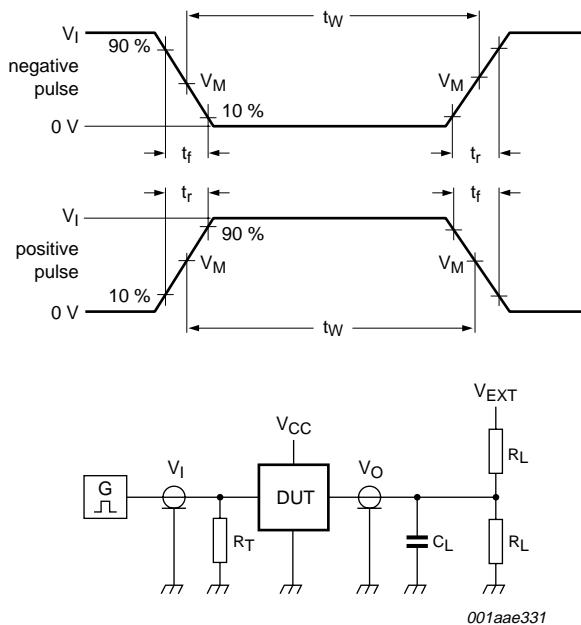
$V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 7. Enable and disable times**

**Table 8. Measurement points**

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

## 12. Test information



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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**

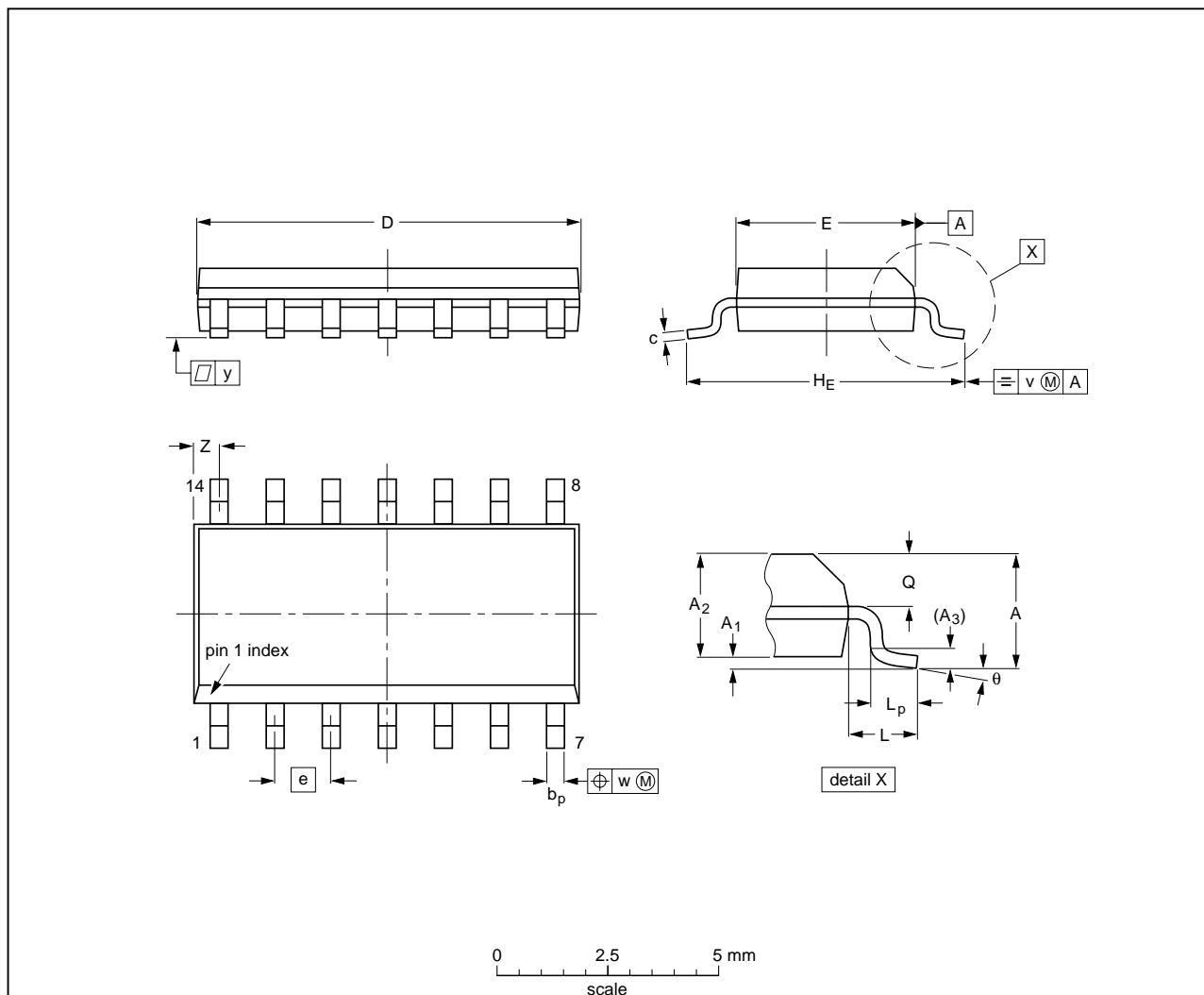
**Table 9. Test data**

Supply voltage	Input	Load	Load	External voltage			
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
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



### DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75 0.10	0.25 1.25	1.45	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069 0.004	0.010 0.049	0.057	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

### Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT108-1	076E06	MS-012			99-12-27 03-02-19

Fig 9. Package outline SOT108-1 (SO14)

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

SOT337-1

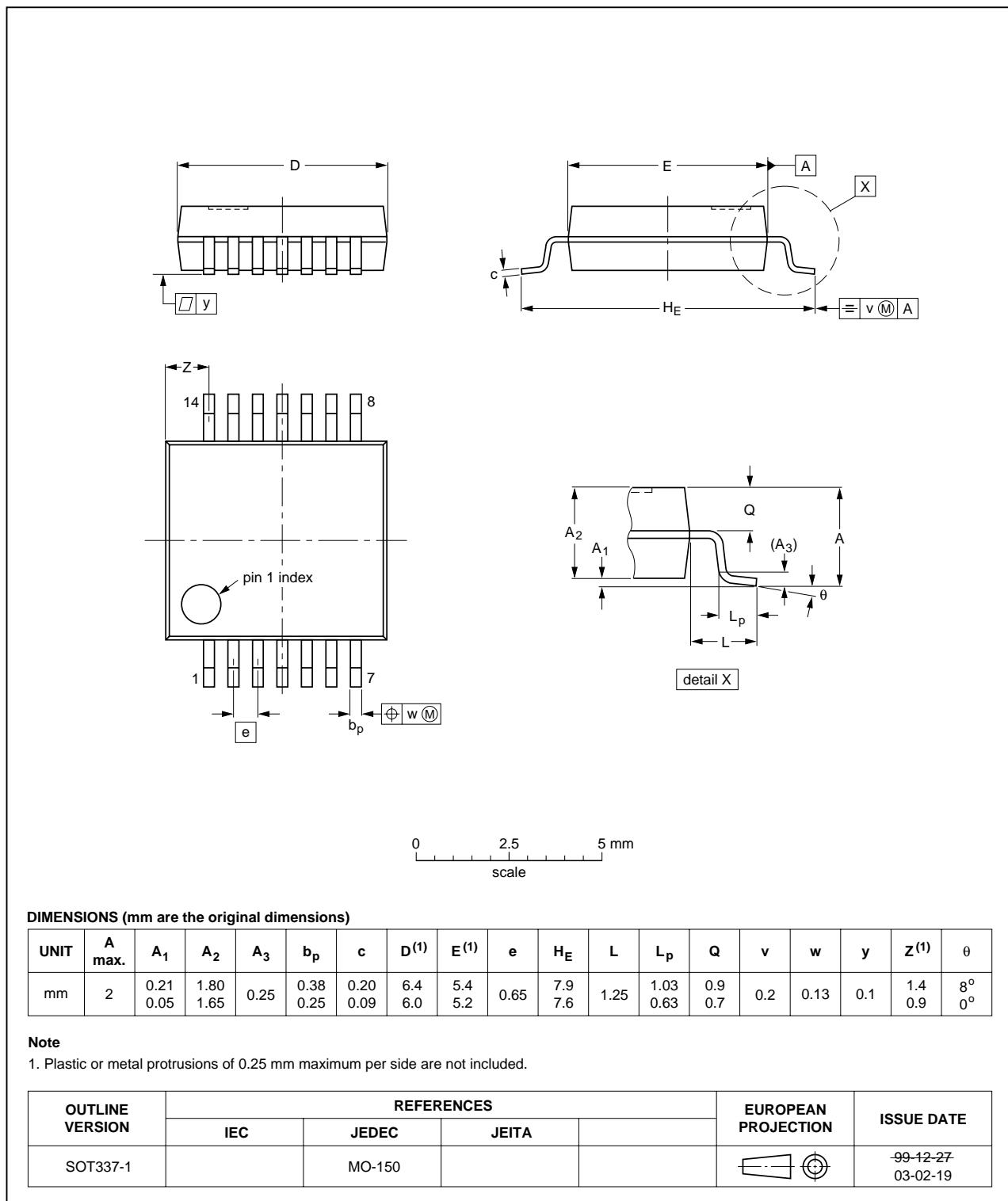


Fig 10. Package outline SOT337-1 (SSOP14)

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

SOT402-1

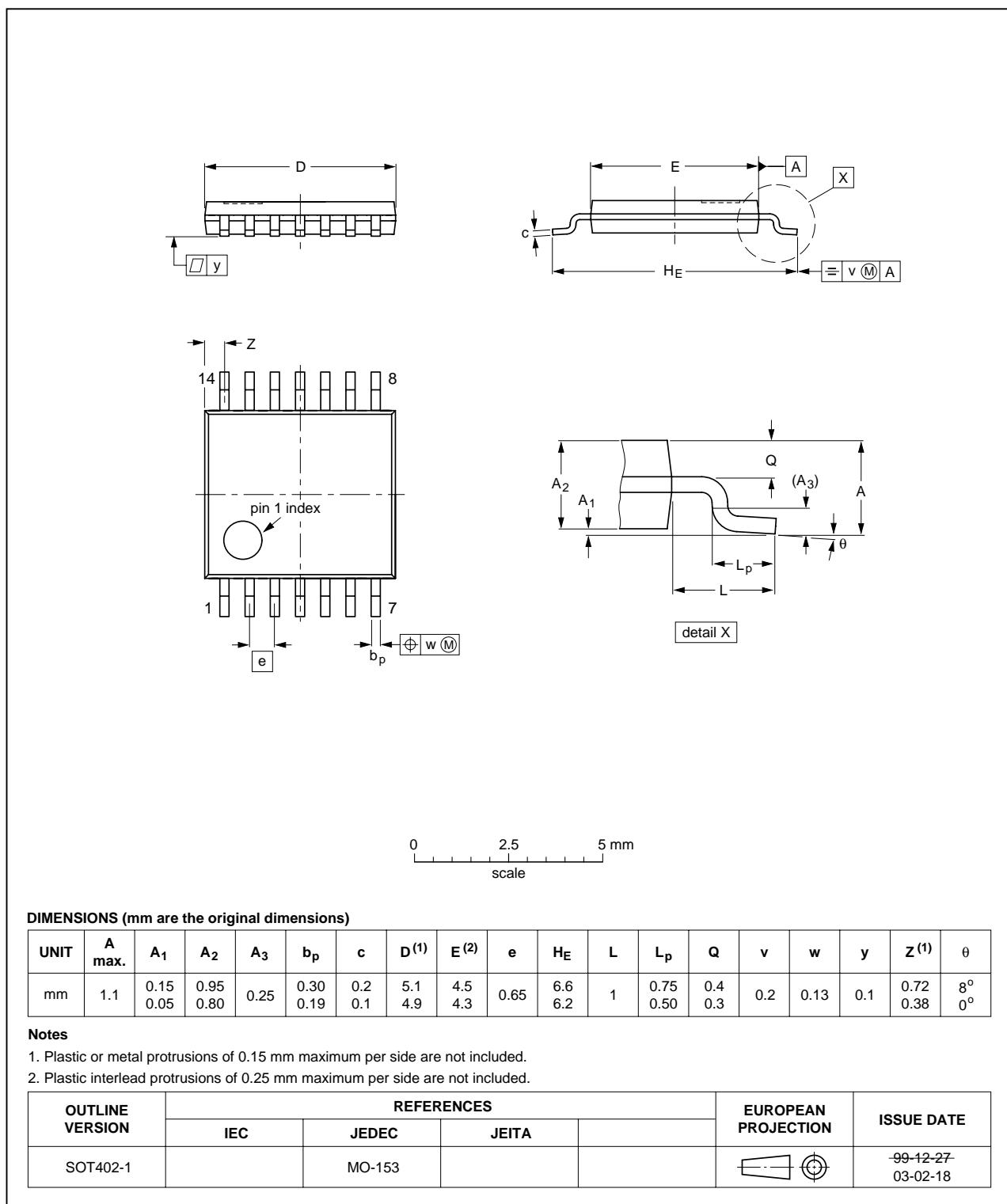


Fig 11. Package outline SOT402-1 (TSSOP14)

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

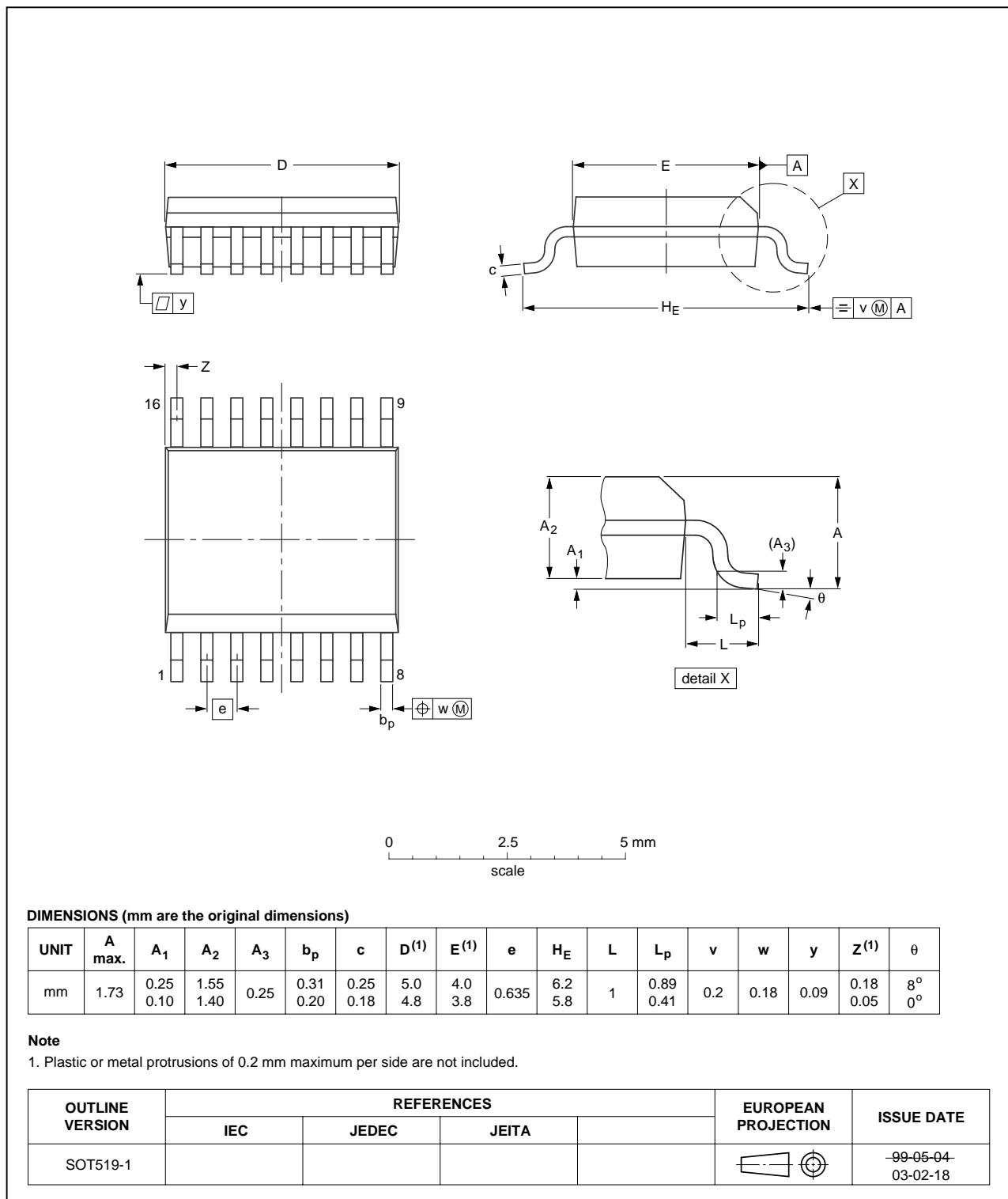


Fig 12. Package outline SOT519-1 (SSOP16)

## 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:		• <a href="#">Section 7 "Limiting values"</a> 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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### 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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