

# CBT3253A

## Dual 1-of-4 FET multiplexer/demultiplexer

Rev. 4 — 31 October 2014

Product data sheet

## 1. General description

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The CBT3253A is a dual 1-of-4 high-speed TTL-compatible FET multiplexer/demultiplexer. The low ON-resistance of the switch allows inputs to be connected to outputs without adding propagation delay or generating additional ground bounce noise.

When the output enable input ( $\overline{\text{nOE}}$ ) is LOW, the 1-of-4 multiplexer/demultiplexer is enabled. The data path is selected by the select control inputs (S0, S1). When  $\overline{\text{nOE}}$  is HIGH, the 1-of-4 multiplexer/demultiplexer is disabled. The switch terminals are in the high impedance OFF-state, independent of S0 and S1.

The CBT3253A is characterized for operation from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ .

## 2. Features and benefits

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- $5\ \Omega$  switch connection between two ports
- TTL-compatible input levels
- Minimal propagation delay through the switch
- Latch-up protection exceeds 100 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
- Multiple package options
- 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
CBT3253AD	-40 °C to +85 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
CBT3253ADB	-40 °C to +85 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
CBT3253ADS	-40 °C to +85 °C	SSOP16 <sup>[1]</sup>	plastic shrink small outline package; 16 leads; body width 3.9 mm; lead pitch 0.635 mm	SOT519-1
CBT3253APW	-40 °C to +85 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

[1] Also known as QSOP16.

### 4. Functional diagram

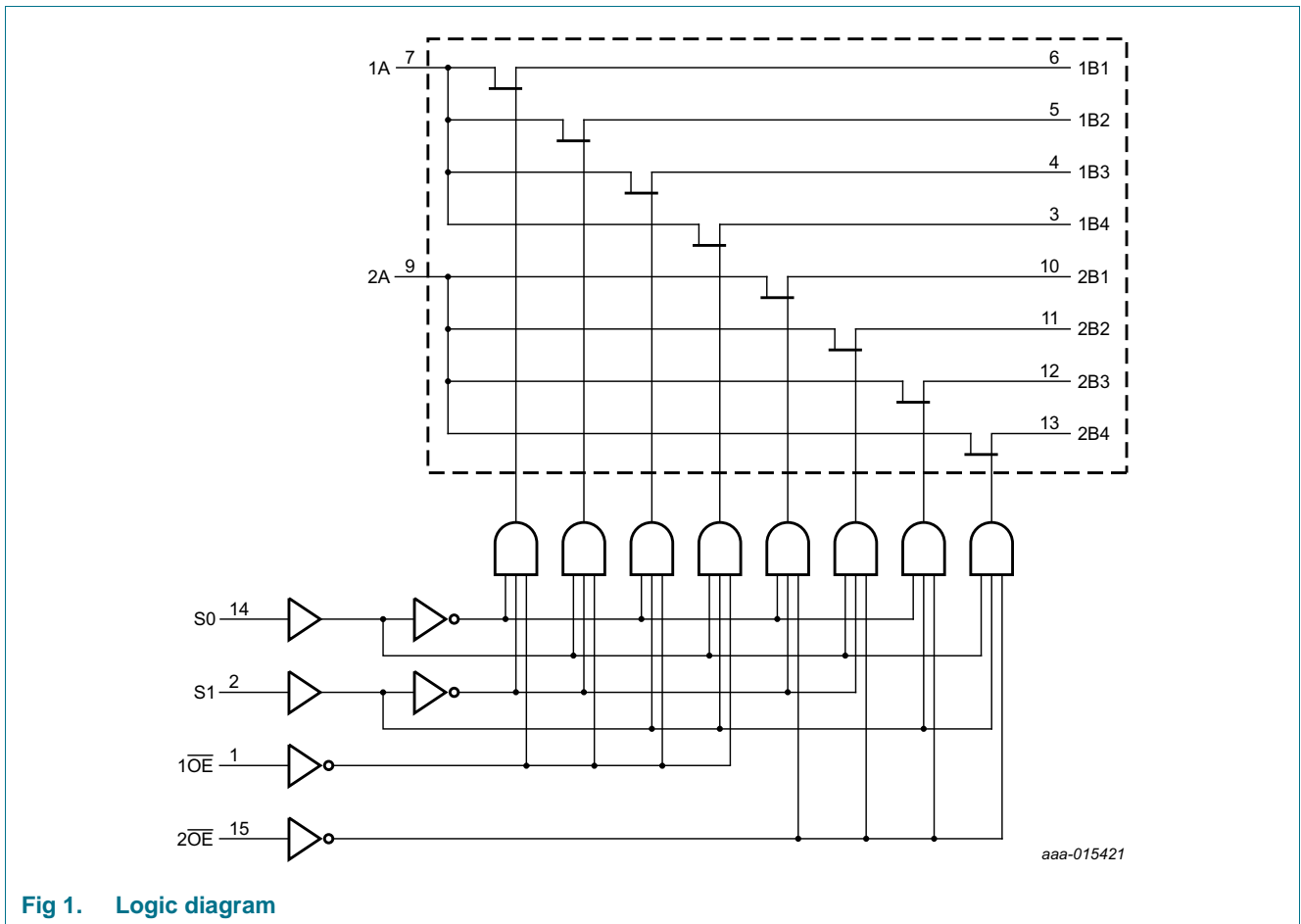
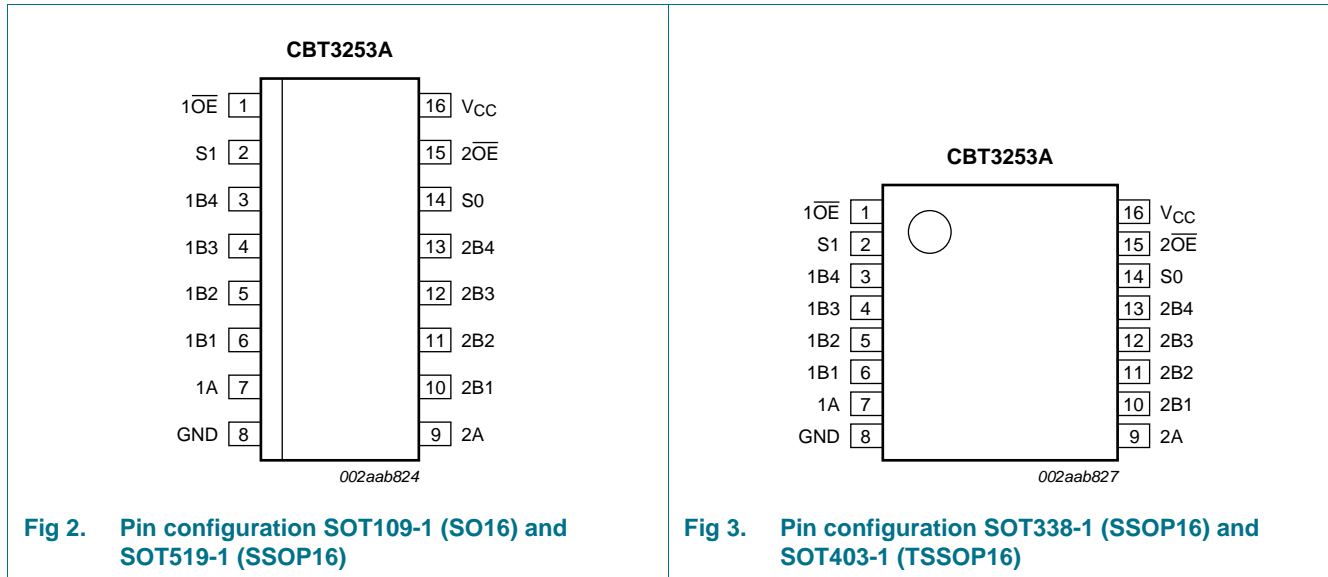


Fig 1. Logic diagram

## 5. Pinning information

### 5.1 Pinning



**Fig 2. Pin configuration SOT109-1 (SO16) and SOT519-1 (SSOP16)**

**Fig 3. Pin configuration SOT338-1 (SSOP16) and SOT403-1 (TSSOP16)**

### 5.2 Pin description

**Table 2. Pin description**

Symbol	Pin	Description
1OE, 2OE	1, 15	output enable (active LOW)
S1, S0	2, 14	select control input
1B4, 1B3, 1B2, 1B1	3, 4, 5, 6	1B outputs/inputs
1A	7	1A input/output
GND	8	ground (0 V)
2A	9	2A input/output
2B1, 2B2, 2B3, 2B4	10, 11, 12, 13	2B outputs/inputs
VCC	16	positive supply voltage

## 6. Functional description

**Table 3. Function selection**

H = HIGH voltage level; L = LOW voltage level; X = Don't care.

Inputs				Switch
1OE	2OE	S1	S0	
X	H	X	X	disconnect 2A to 2Bn
H	X	X	X	disconnect 1A to 1Bn
L	L	L	L	1A to 1B1 and 2A to 2B1
L	L	L	H	1A to 1B2 and 2A to 2B2
L	L	H	L	1A to 1B3 and 2A to 2B3
L	L	H	H	1A to 1B4 and 2A to 2B4

## 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 +85 °C			
		SO16 package	[2] -	500	mW
		SSOP16 package	[3] -	500	mW
		TSSOP16 package	[3] -	500	mW

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

[2] For SO16 package: P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.

[3] For SSOP16 and TSSOP16 package: 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**

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

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	$V_I = V_{CC} = 5.0\text{ V}$ ; $I_O = -100\text{ }\mu\text{A}$	3.6	3.9	4.2	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	$V_{CC} = 5.5\text{ V}$ ; $I_O = 0\text{ mA}$ ; $V_I = V_{CC}$ or $\text{GND}$	-	-	3	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input; $V_{CC} = 5.5\text{ V}$ ; one input at $3.4\text{ V}$ , 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 $0\text{ V}$	-	4.5	-	pF
$C_{io(off)}$	off-state input/output capacitance	A port; $V_O = 3\text{ V}$ or $0\text{ V}$ ; $\overline{nOE} = V_{CC}$	-	11.4	-	pF
		B port; $V_O = 3\text{ V}$ or $0\text{ V}$ ; $\overline{nOE} = V_{CC}$	-	3.8	-	pF
$C_{io(on)}$	on-state input/output capacitance	A port and B port	-	18.6	-	pF
$R_{ON}$	ON resistance	$V_{CC} = 4.5\text{ V}$ <sup>[3]</sup>				
		$V_I = 0\text{ V}$ ; $I_I = 64\text{ mA}$	-	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  $V_{CC} = 5\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

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

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

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

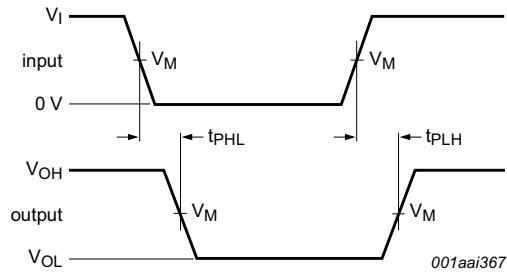
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$ ; for test circuit, see [Figure 6](#).

Symbol	Parameter	Conditions	Min	Max	Unit
$t_{pd}$	propagation delay	nA to nBn or nBn to nA; see <a href="#">Figure 4</a> <sup>[1][2]</sup>	-	0.25	ns
		Sn to nA; see <a href="#">Figure 4</a> <sup>[1][2]</sup>	1.2	6.2	ns
$t_{en}$	enable time	Sn to nBn; see <a href="#">Figure 5</a> <sup>[2]</sup>	1.3	6.3	ns
		$\overline{nOE}$ to nA or nBn; see <a href="#">Figure 5</a> <sup>[2]</sup>	1.4	6.4	ns
$t_{dis}$	disable time	Sn to nBn; see <a href="#">Figure 5</a> <sup>[2]</sup>	1.1	7.2	ns
		$\overline{nOE}$ to nA or nBn; see <a href="#">Figure 5</a> <sup>[2]</sup>	1.0	7	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).

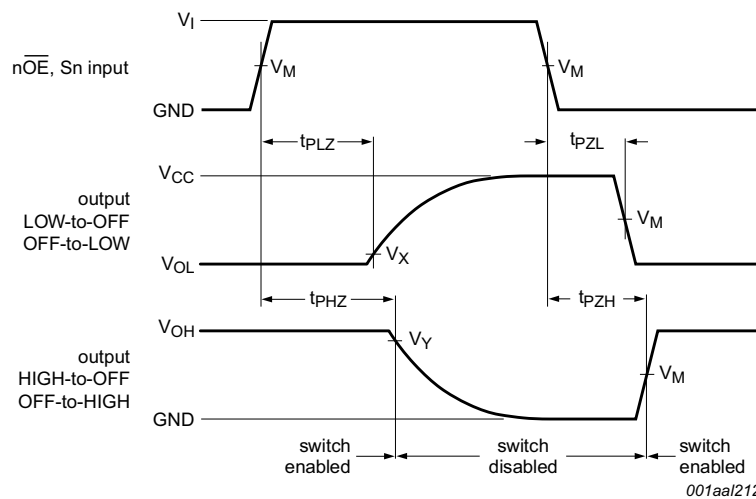
[2]  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .  
 $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

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 4. The input (nA; nBn) to output (nBn; nA) or input (Sn) to output (nA) propagation delay times**



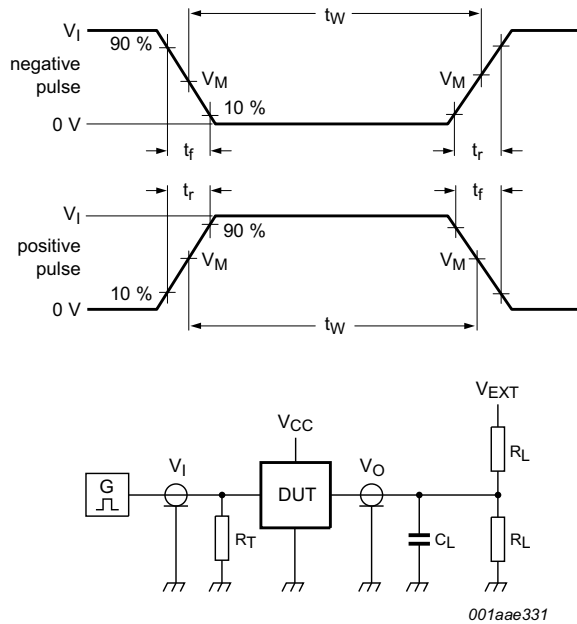
Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

**Fig 5. Enable and disable times**

**Table 8. Measurement points**

Supply voltage	Input		Output		
$V_{CC}$	$V_i$	$V_M$	$V_M$	$V_X$	$V_Y$
4.5 V to 5.5 V	GND to 3.0 V	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 6. 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

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

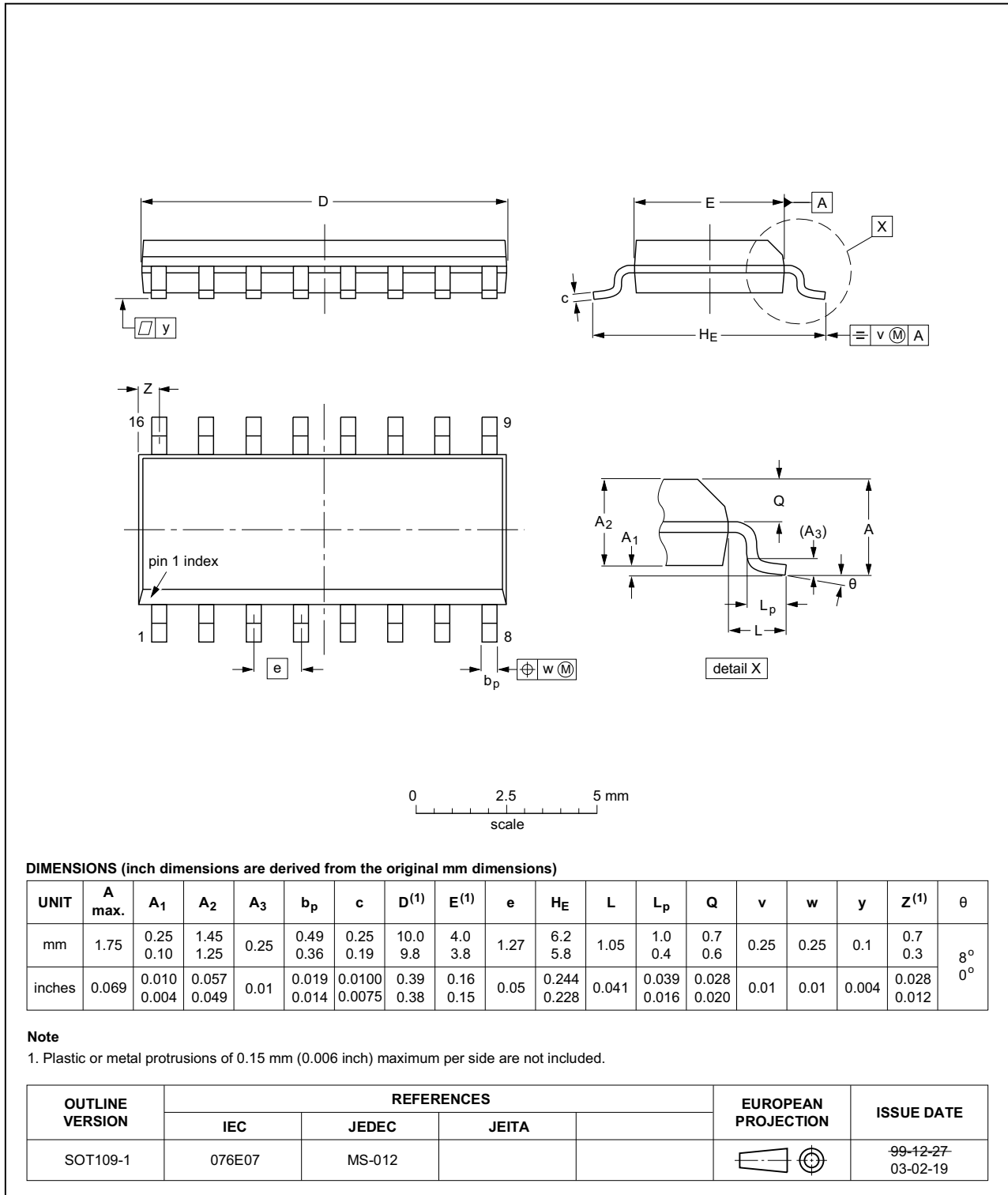


Fig 7. Package outline SOT109-1 (SO16)



SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

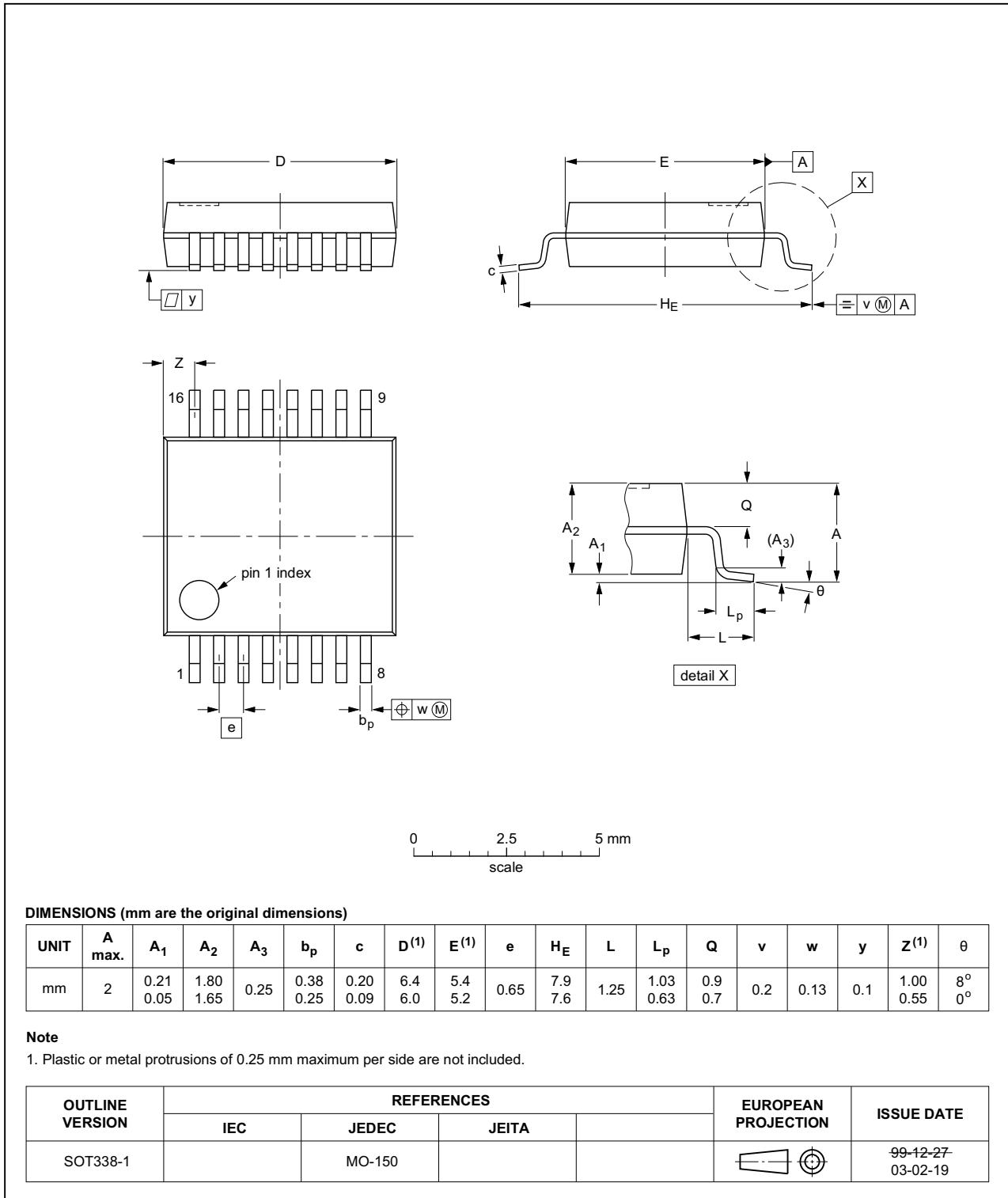


Fig 8. Package outline SOT338-1 (SSOP16)

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

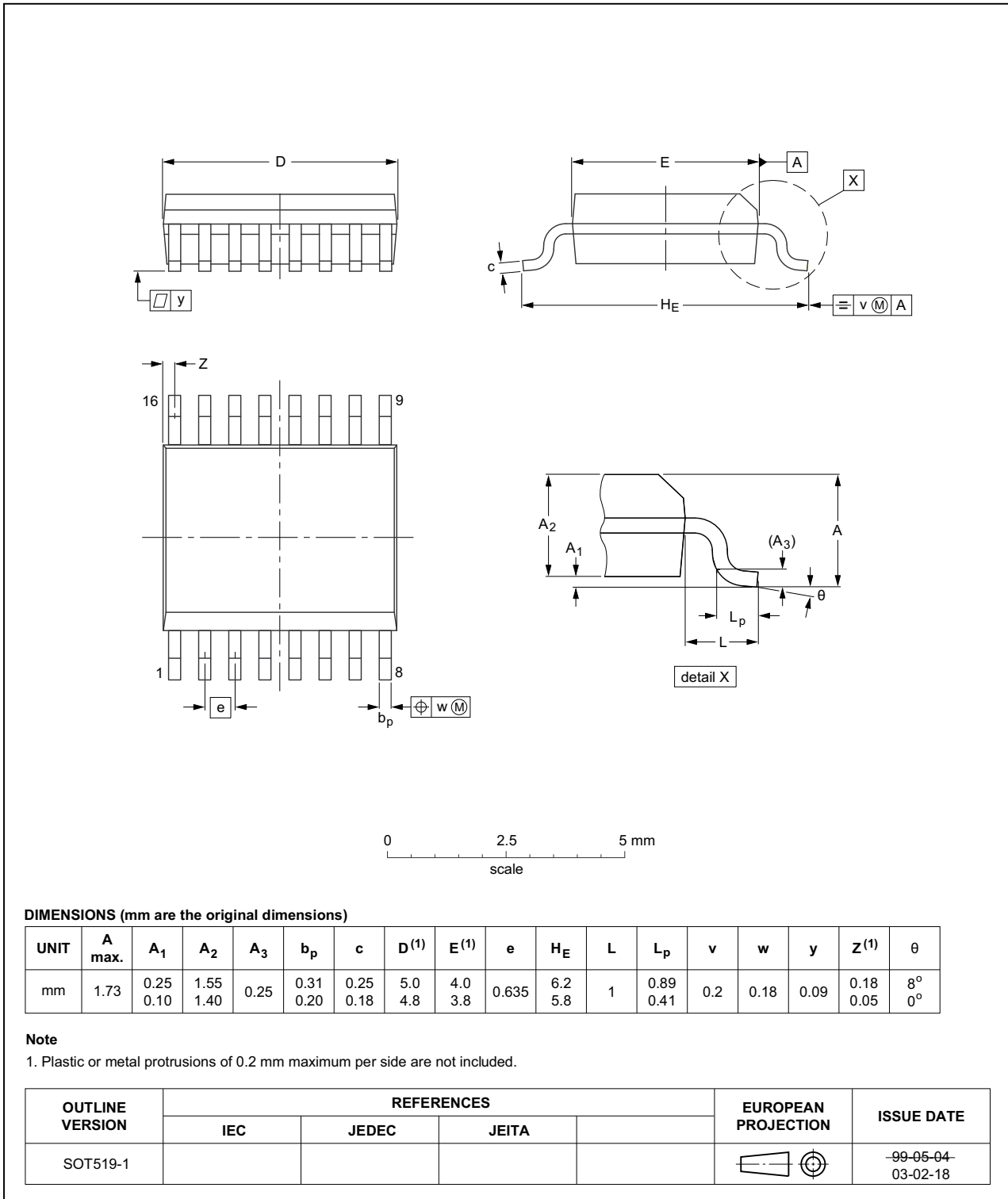


Fig 9. Package outline SOT519-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

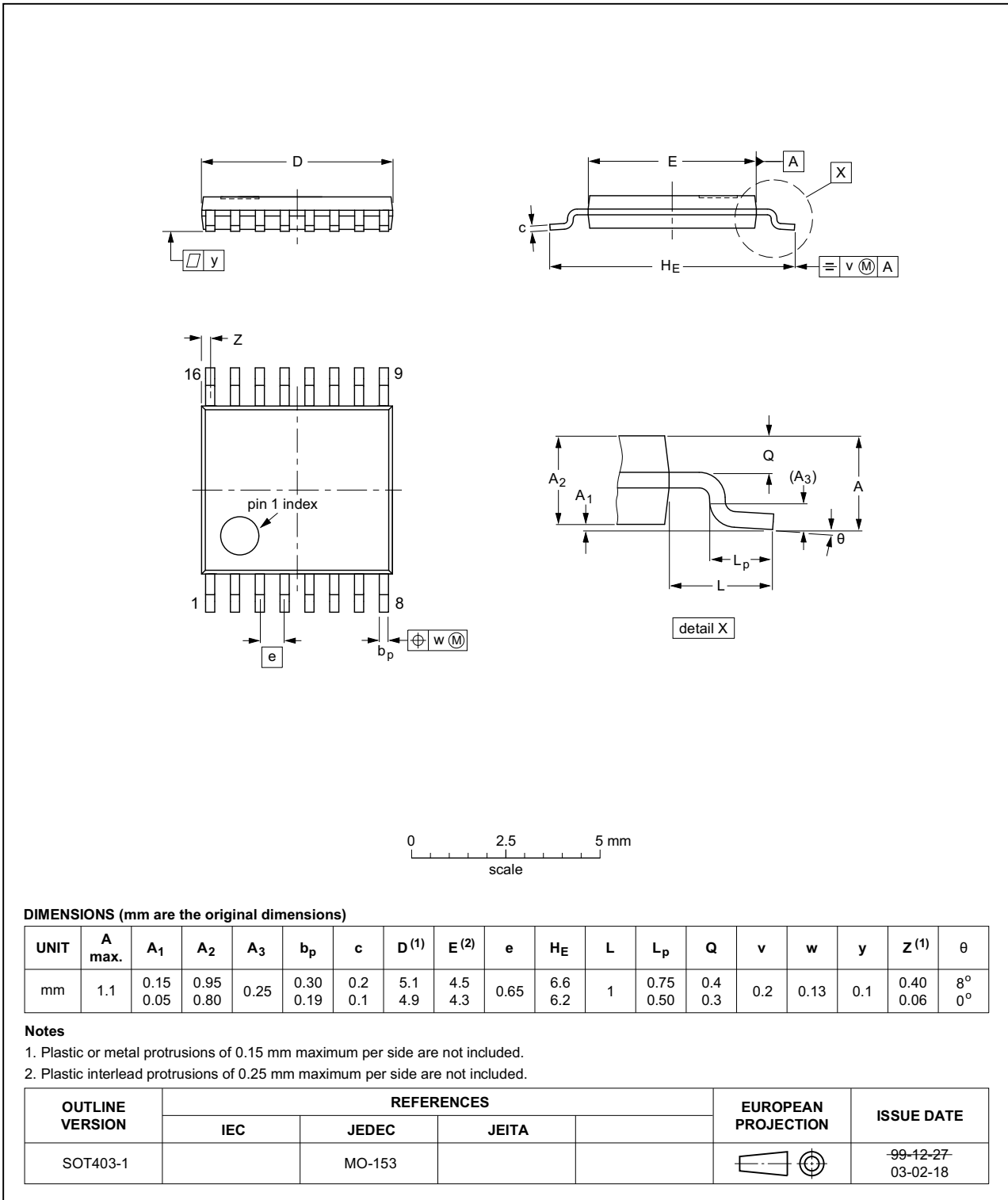


Fig 10. Package outline SOT403-1 (TSSOP16)

## 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
CBT3253A v.4	20141031	Product data sheet	-	CBT3253A v.3
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 1 “General description”</a>: text changed to align with the function of the device.</li> <li>• <a href="#">Figure 1 “Logic diagram”</a>: schematic changed..</li> <li>• <a href="#">Table 3 “Function selection”</a>: switch description changed to align with the function of the device.</li> <li>• <a href="#">Table 7 “Dynamic characteristics”</a>: typo corrected, the conditions for enable and disable times are swapped.</li> </ul>			
CBT3253A v.3	20130924	Product data sheet	-	CBT3253A v.2
Modifications:	<a href="#">Table 6 “Static characteristics”</a> values for pass voltage modified.			
CBT3253A v.2	20070208	Product data sheet	-	CBT3253A v.1
CBT3253A v.1	20051024	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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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[2] The term 'short data sheet' is explained in section "Definitions".

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