

# CBT3253A

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

Rev. 6 — 25 February 2021

Product data sheet

### 1. General description

The CBT3253A is a dual single-pole,4-throw bus switch. The device features two output enable inputs (  $n\overline{OE}$  ) and two select inputs (S0 and S1). When  $n\overline{OE}$  are LOW the switch is enabled and the select inputs can be used to connect the nA terminal to one of the four associated nB terminals.

### 2. Features and benefits

- 5  $\Omega$  switch connection between two ports
- Direct interface with TTL levels
- Overvoltage tolerant control inputs to 5.5 V
- 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 °C to +85 °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
CBT3253ADS	-40 °C to +85 °C	SSOP16 [1]	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

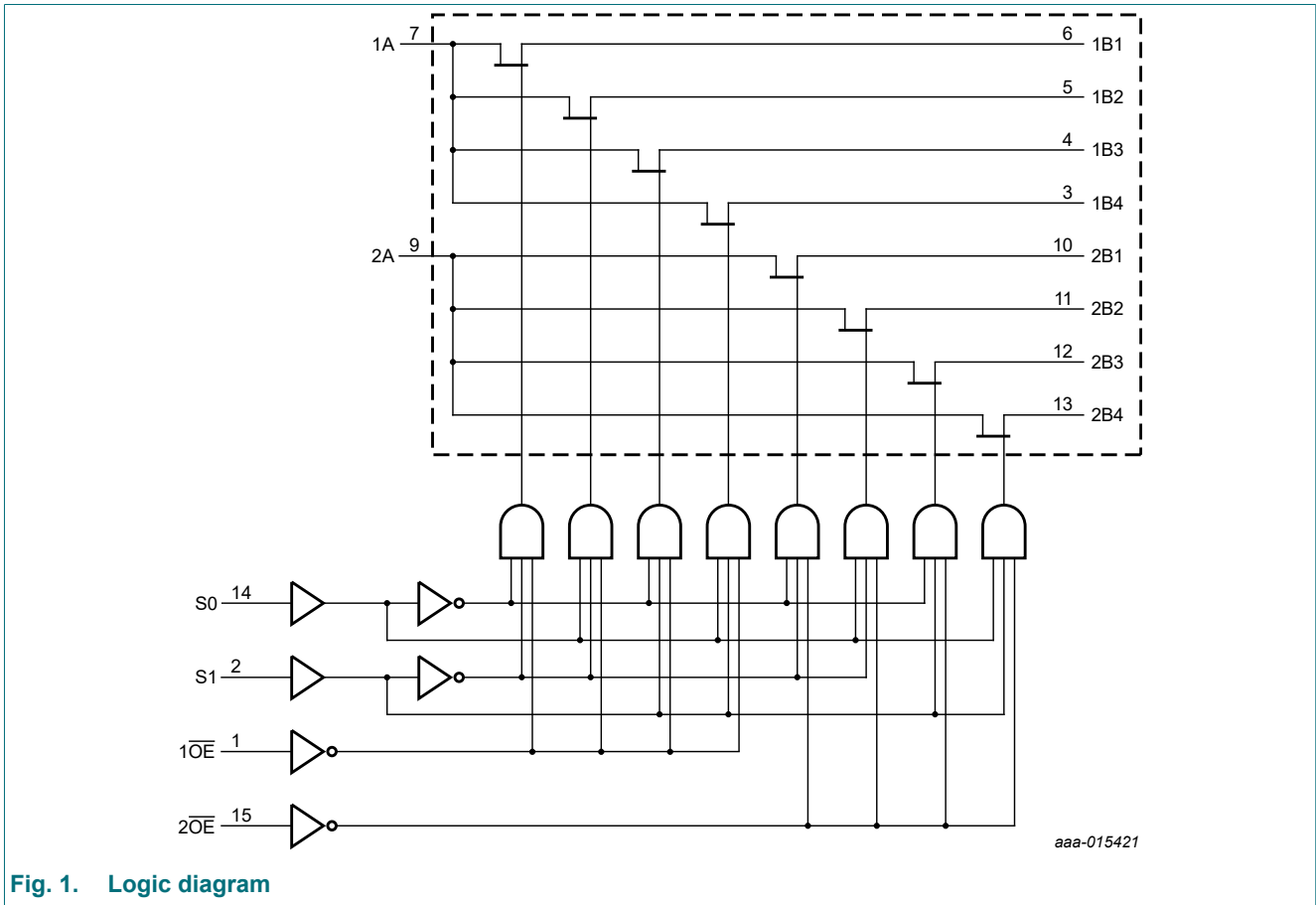


Fig. 1. Logic diagram

### 5. Pinning information

#### 5.1. Pinning

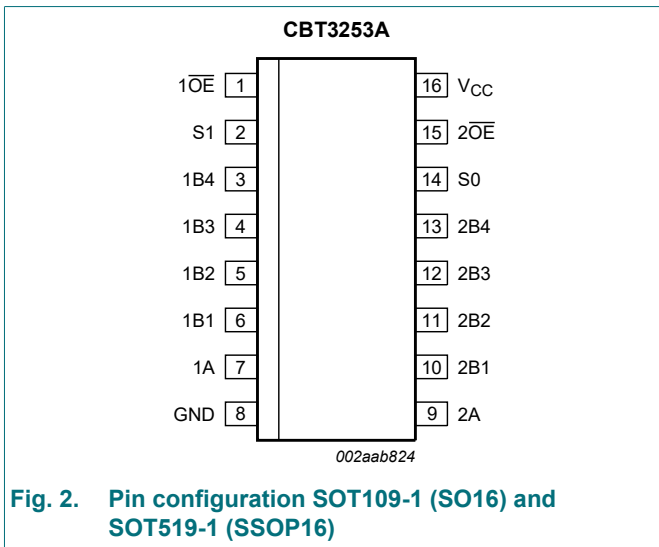


Fig. 2. Pin configuration SOT109-1 (SO16) and SOT519-1 (SSOP16)

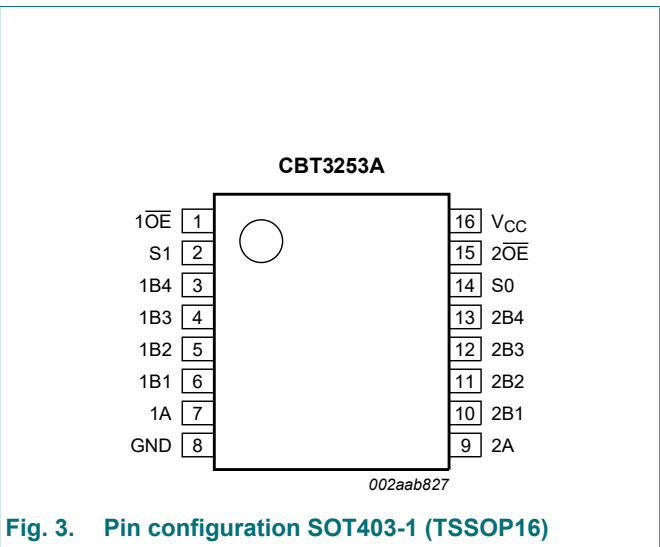


Fig. 3. Pin configuration SOT403-1 (TSSOP16)

## 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
V <sub>CC</sub>	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). Voltages are referenced to GND (ground = 0 V).

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	-	500	mW

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

## 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**

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).  $T_{amb} = -40\text{ °C}$  to  $+85\text{ °C}$ .

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	$V_I = V_{CC} = 5.0\text{ V}$ ; $I_O = -100\text{ }\mu\text{A}$	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 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 GND [2]	-	-	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 $0\text{ V}$ ; $n\overline{OE} = V_{CC}$	-	11.4	-	pF
		B port; $V_O = 3\text{ V}$ or $0\text{ V}$ ; $n\overline{OE} = V_{CC}$	-	3.8	-	pF
$C_{io(on)}$	on-state input/output capacitance	A port and B port	-	18.6	-	pF
$R_{ON}$	ON resistance	$V_{CC} = 4.5\text{ V}$ [3]				
		$V_I = 0\text{ V}$ ; $I_I = 64\text{ mA}$	-	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  $V_{CC} = 5\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ .

[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. The lowest voltage of the two (A or B) terminals determines the ON resistance.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

$T_{amb} = -40\text{ °C to }+85\text{ °C}$ ;  $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ ; for test circuit, see Fig. 6.

Symbol	Parameter	Conditions	Min	Max	Unit
$t_{pd}$	propagation delay	Sn to nA; see Fig. 4 [1] [2]	1.2	6.2	ns
		nA to nBn or nBn to nA; see Fig. 4 [1] [2]	-	0.25	ns
$t_{en}$	enable time	Sn to nBn; see Fig. 5 [3]	1.3	6.3	ns
		n $\overline{OE}$ to nA or nBn; see Fig. 5 [3]	1.4	6.4	ns
$t_{dis}$	disable time	Sn to nBn; see Fig. 5 [4]	1.1	7.2	ns
		n $\overline{OE}$ to nA or nBn; see Fig. 5 [4]	1.0	7	ns

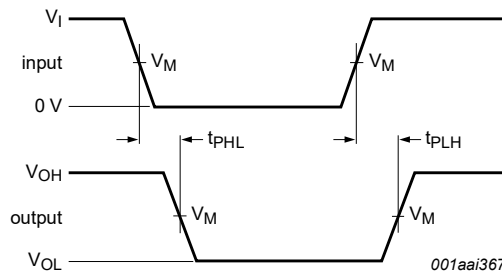
[1] This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON resistance of the switch and a load capacitance, when driven by an ideal voltage source (zero output impedance).

[2]  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

[3]  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

[4]  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .

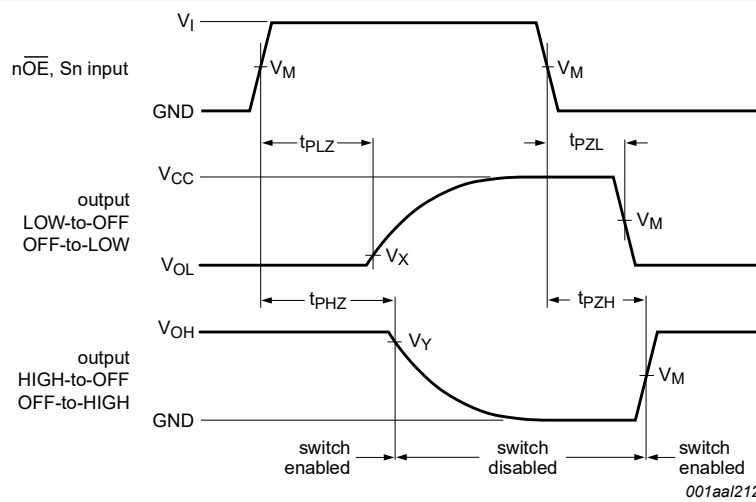
### 10.1. Waveforms and test circuit



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**



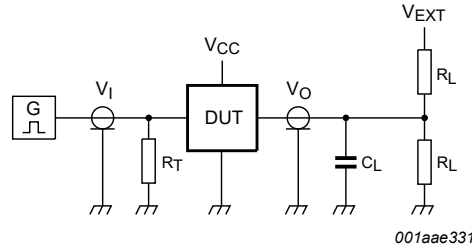
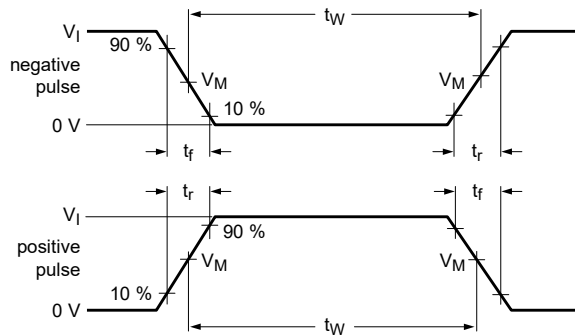
Measurement points are given in Table 8.

$V_{OL}$  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	$V_{OL} + 0.3 V$	$V_{OH} - 0.3 V$



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	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	7.0 V	open

# 11. Package outline

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

SOT109-1

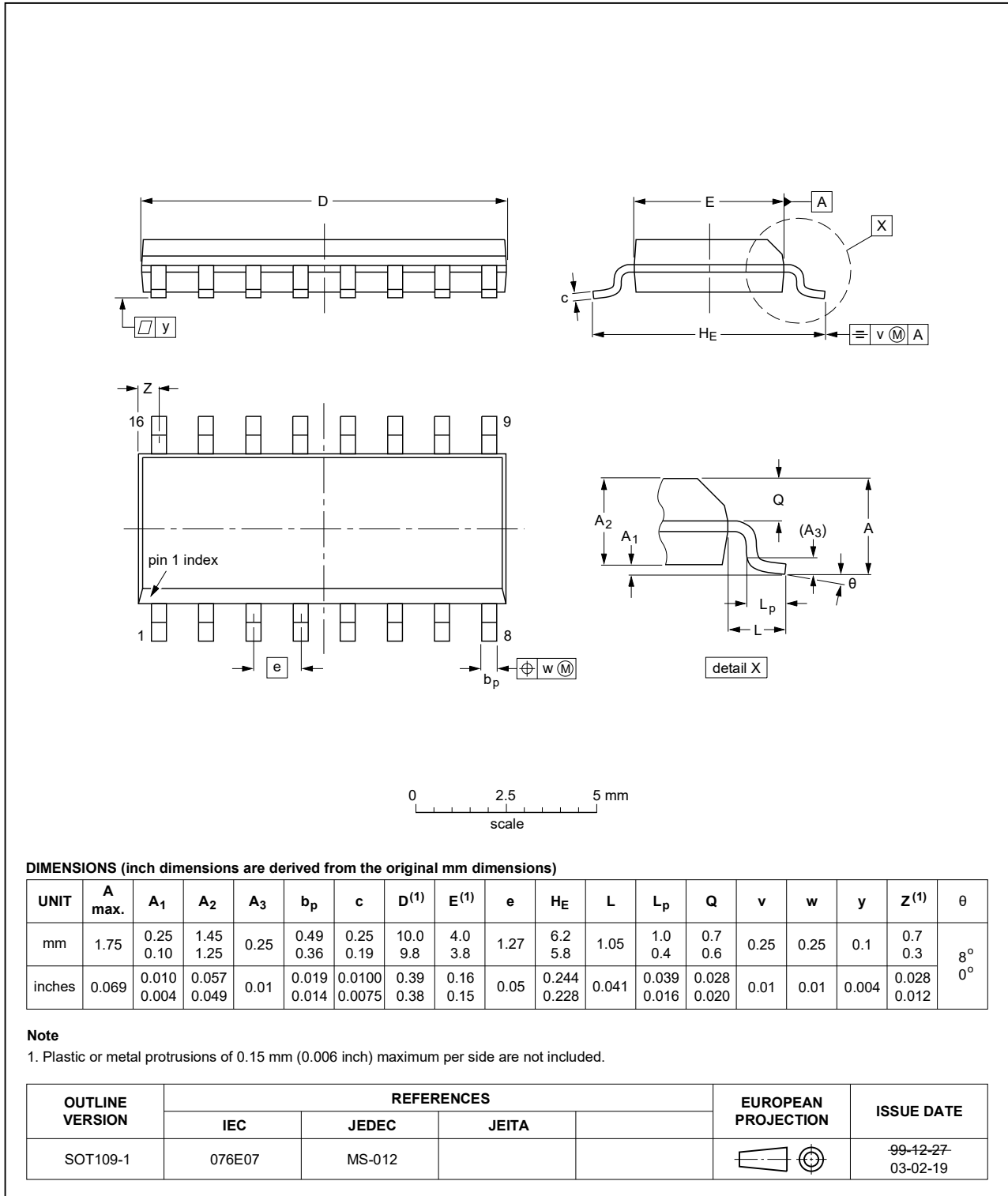


Fig. 7. Package outline SOT109-1 (SO16)

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

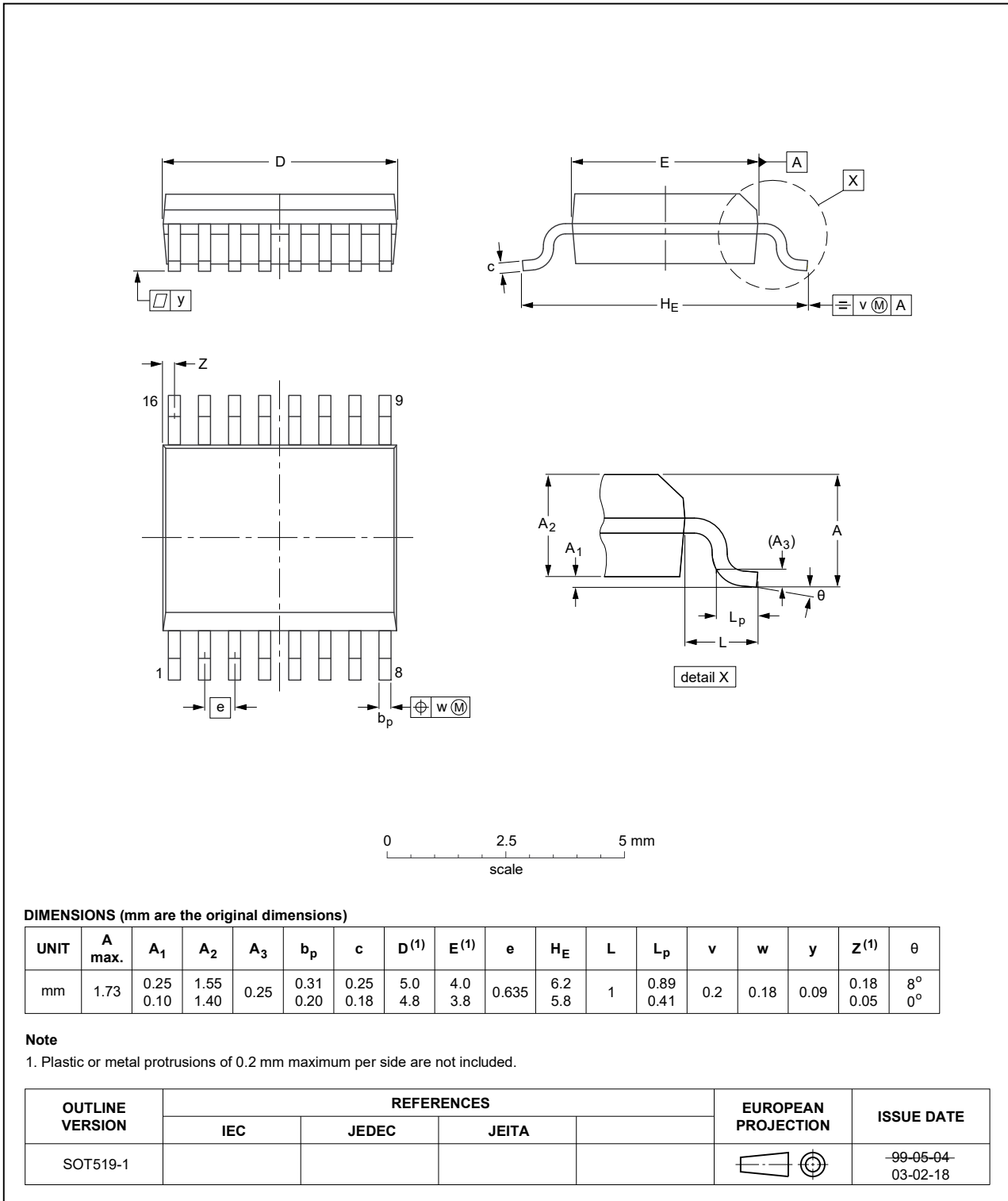


Fig. 8. Package outline SOT519-1 (SSOP16)



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

SOT403-1

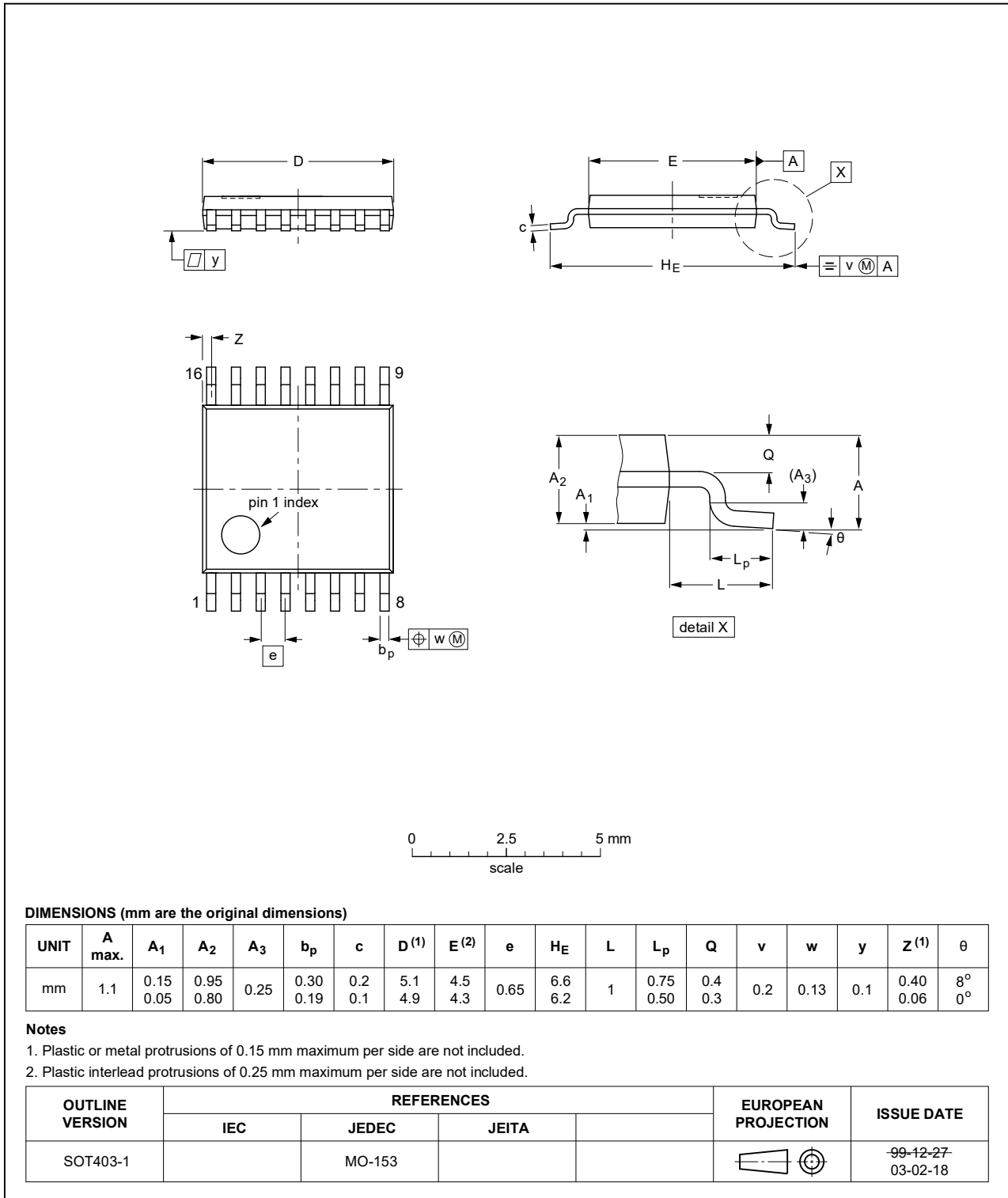


Fig. 9. Package outline SOT403-1 (TSSOP16)

## 12. 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

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
CBT3253A v.6	20210225	Product data sheet	-	CBT3253A v.5
Modifications:	<ul style="list-style-type: none"> <li>Type number CBT3253ADB (SOT338-1 / SSOP16) removed.</li> </ul>			
CBT3253A v.5	20170509	Product data sheet	-	CBT3253A v.4
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
CBT3253A v.4	20141031	Product data sheet	-	CBT3253A v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 1</a>: text changed to align with the function of the device.</li> <li><a href="#">Fig. 1</a>: schematic changed.</li> <li><a href="#">Section 6</a>: switch description changed to align with the function of the device.</li> <li><a href="#">Section 10</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:	<ul style="list-style-type: none"> <li><a href="#">Section 9</a>: values for pass voltage modified.</li> </ul>			
CBT3253A v.2	20070208	Product data sheet	-	CBT3253A v.1
CBT3253A v.1	20051024	Product data sheet	-	-

## 14. Legal information

### Data sheet status

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 25 February 2021