

CBT3257A

Quad 1-of-2 multiplexer/demultiplexer

Rev. 5 — 4 April 2013

Product data sheet

1. General description

The CBT3257A is a quad 1-of-2 high-speed TTL-compatible 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.

Output enable (\overline{OE}) and select-control (S) inputs select the appropriate nB1 and nB2 outputs for the nA input data.

The CBT3257A is characterized for operation from -40°C to $+85^{\circ}\text{C}$.

2. Features and benefits

- 5 Ω 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-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Specified from -40°C to $+85^{\circ}\text{C}$



3. Ordering information

Table 1. Ordering information

Type number	Temperature range	Package		
		Name	Description	Version
CBT3257AD	−40 °C to +85 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
CBT3257ADB	−40 °C to +85 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
CBT3257ADS	−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
CBT3257APW	−40 °C to +85 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
CBT3257ABQ	−40 °C to +85 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1

[1] Also known as QSOP16.

4. Functional diagram

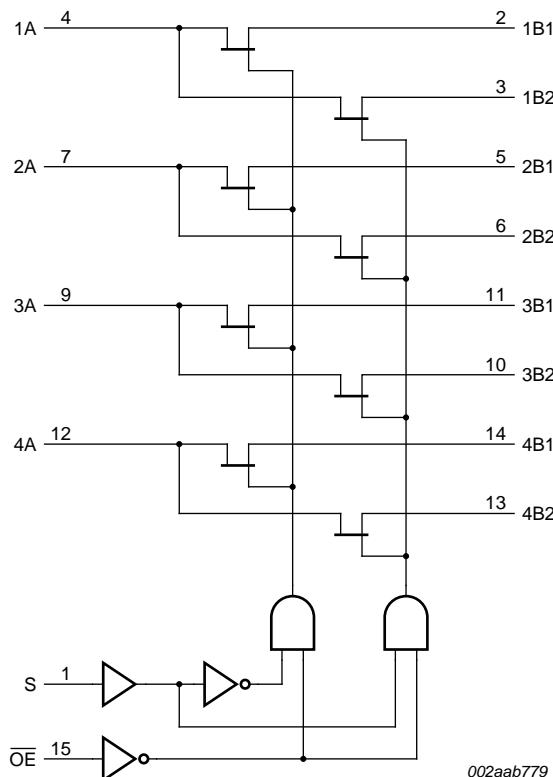


Fig 1. Logic diagram

5. Pinning information

5.1 Pinning

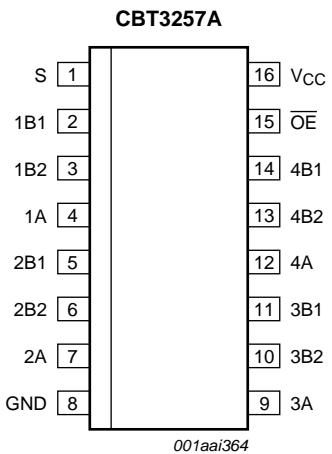


Fig 2. Pin configuration SOT109-1 (SO16) and SOT519-1 (SSOP16)

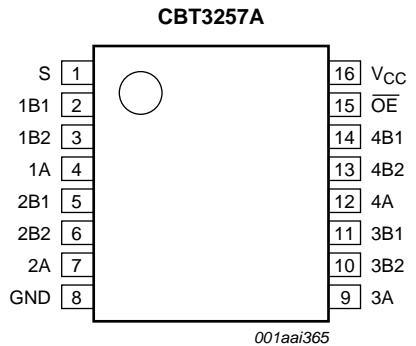
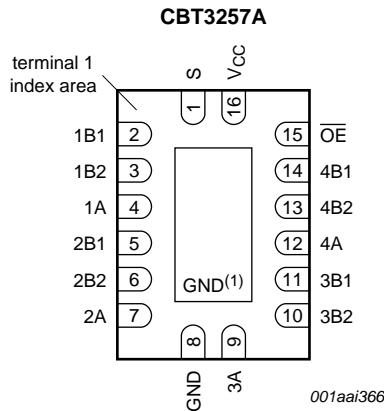


Fig 3. Pin configuration SOT338-1 (SSOP16) and SOT403-1 (TSSOP16)



Transparent top view

- (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig 4. Pin configuration SOT763-1 (DHVQFN16)

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	select control input
1B1, 2B1, 3B1, 4B1,	2, 5, 11, 14	B1 outputs/inputs
1B2, 2B2, 3B2, 4B2	3, 6, 10, 13	B2 outputs/inputs
1A, 2A, 3A, 4A	4, 7, 9, 12	A inputs/outputs
GND	8	ground (0 V)
OE	15	output enable (active LOW)
V _{CC}	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
OE	S	
L	L	nA to nB1
L	H	nA to nB2
H	X	switch off

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 +85 °C			
		SO16 package	[2] -	500	mW
		SSOP16 package	[3] -	500	mW
		TSSOP16 package	[3] -	500	mW
		DHVQFN16 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] For SO16 package: P_{tot} derates linearly with 8 mW/K above 70 °C.

[3] For SSOP16 and TSSOP16 package: P_{tot} derates linearly with 5.5 mW/K above 70 °C.

[4] For DHVQFN16 package: P_{tot} derates linearly with 4.5 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

$T_{amb} = -40$ °C to +85 °C.

Symbol	Parameter	Conditions	Min	Typ ^[1]	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; $I_O = -100$ μA	3.6	3.9	4.2	V
I_I	input leakage current	$V_{CC} = 5.5$ V; $V_I = GND$ or 5.5 V	-	-	±1	μA
I_{CC}	supply current	$V_{CC} = 5.5$ V; $I_O = 0$ mA; $V_I = V_{CC}$ or GND	-	-	3	μA
ΔI_{CC}	additional supply current	per input; $V_{CC} = 5.5$ V; one input at 3.4 V, other inputs at V_{CC} or GND	[2]	-	-	mA
C_I	input capacitance	control pins; $V_I = 3$ V or 0 V	-	3.3	-	pF
$C_{io(off)}$	off-state input/output capacitance	A port; $V_O = 3$ V or 0 V; $\overline{OE} = V_{CC}$	-	9.9	-	pF
		B port; $V_O = 3$ V or 0 V; $\overline{OE} = V_{CC}$	-	6.4	-	pF
R_{ON}	ON resistance	$V_{CC} = 4.5$ V		[3]		
		$V_I = 0$ V; $I_I = 64$ mA	-	5	7	Ω
		$V_I = 0$ V; $I_I = 30$ mA	-	5	7	Ω
		$V_I = 2.4$ V; $I_I = 15$ mA	-	10	15	Ω

[1] All typical values are measured at $V_{CC} = 5$ V; $T_{amb} = 25$ °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 nA and the nBn terminals at the indicated current through the switch. The lowest voltage of the two (nA or nBn) terminals determines the ON resistance.

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 V ; for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Max	Unit
t_{pd}	propagation delay	nA to nBn or nBn to nA; see Figure 5	[1][2]	-	ns
		S to nA; see Figure 5	[1][2]	1.4	5.0
t_{en}	enable time	\overline{OE} to nA or nBn; see Figure 6	[2]	1.5	ns
		S to nBn; see Figure 6	[2]	1.4	5.2
t_{dis}	disable time	\overline{OE} to nA or nBn; see Figure 6	[2]	2.2	ns
		S to nBn; see Figure 6	[2]	1.0	5.0

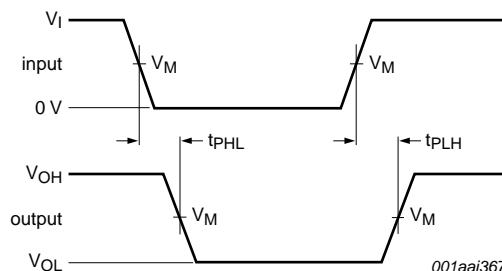
[1] This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical ON resistance of the switch and a load capacitance, when driven by an ideal voltage source (zero output impedance).

[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} .

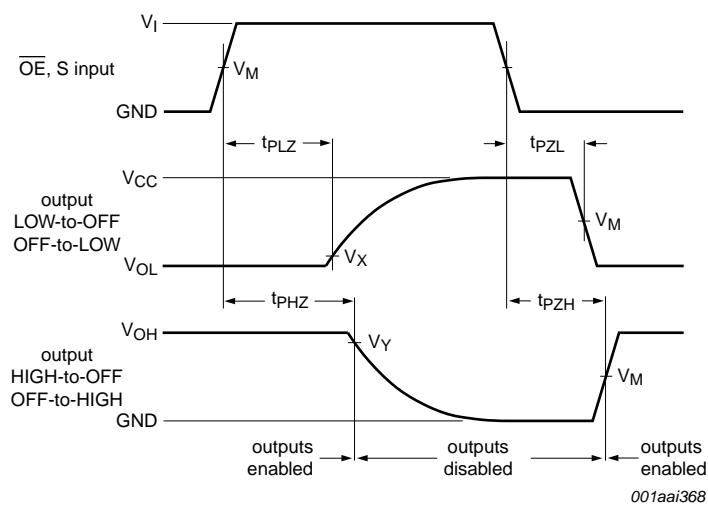
11. AC waveforms



Measurement points are given in [Table 8](#).

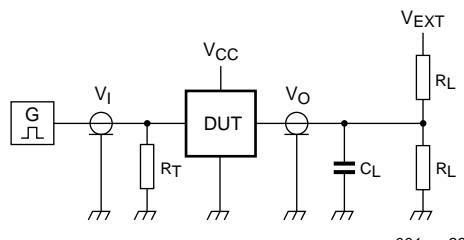
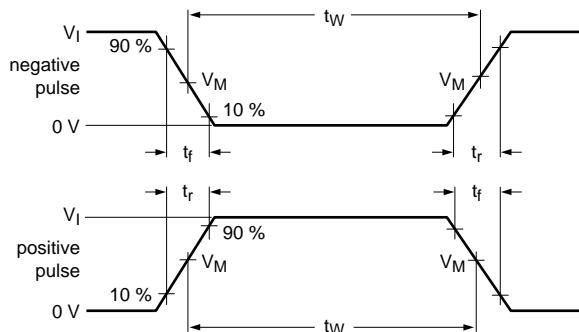
V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 5. The input (nA; nBn) to output (nBn; nA) or input (S) to output (nA) propagation delay 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



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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 7. Test circuit for measuring switching times

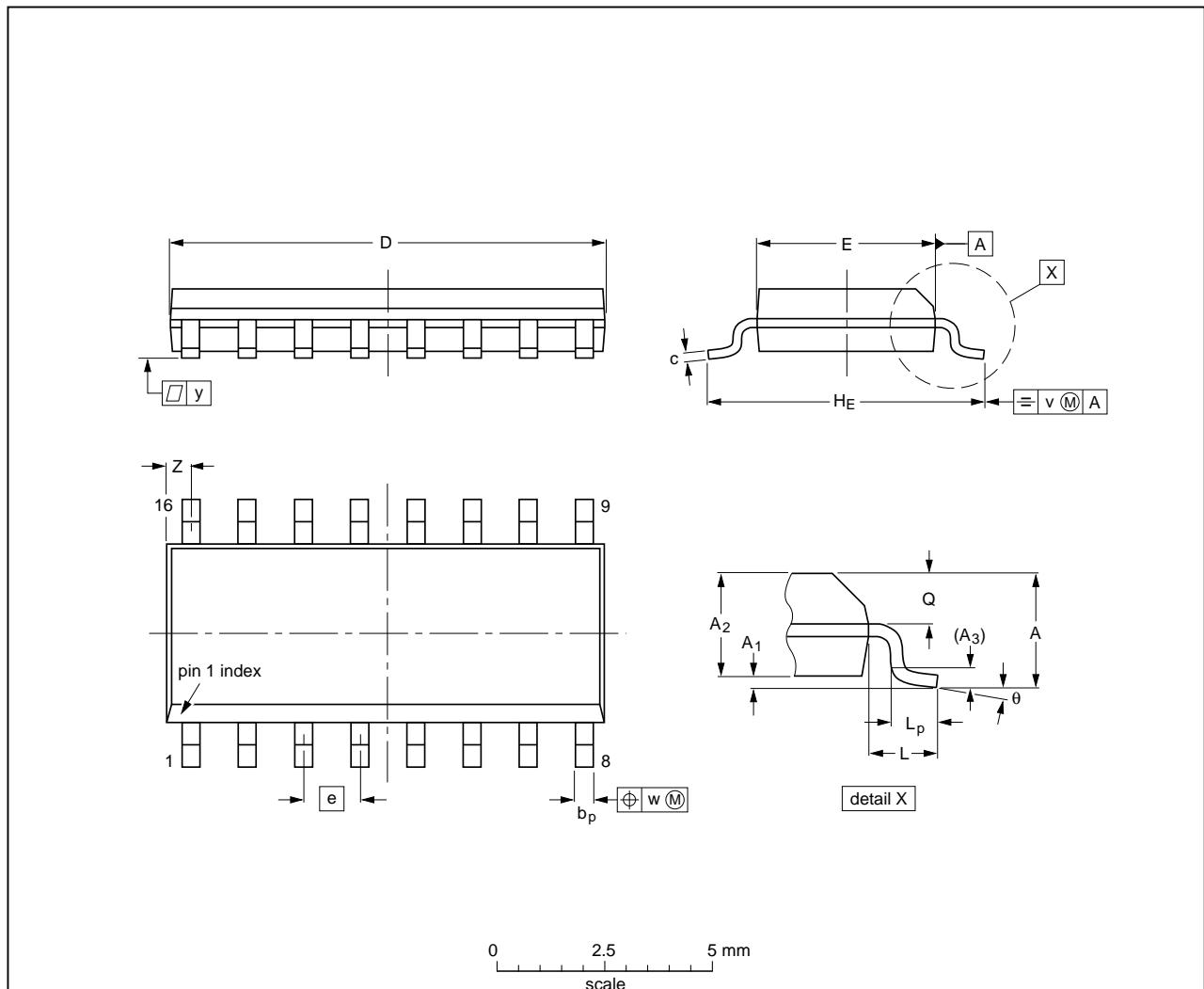
Table 9. Test data

Supply voltage	Input	Load	V_{EXT}				
V_{CC}	V_I	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

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

SOT109-1



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

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	θ
mm	1.75 0.10	0.25 0.36	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	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 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	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			
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig 8. Package outline SOT109-1 (SO16)

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

SOT338-1

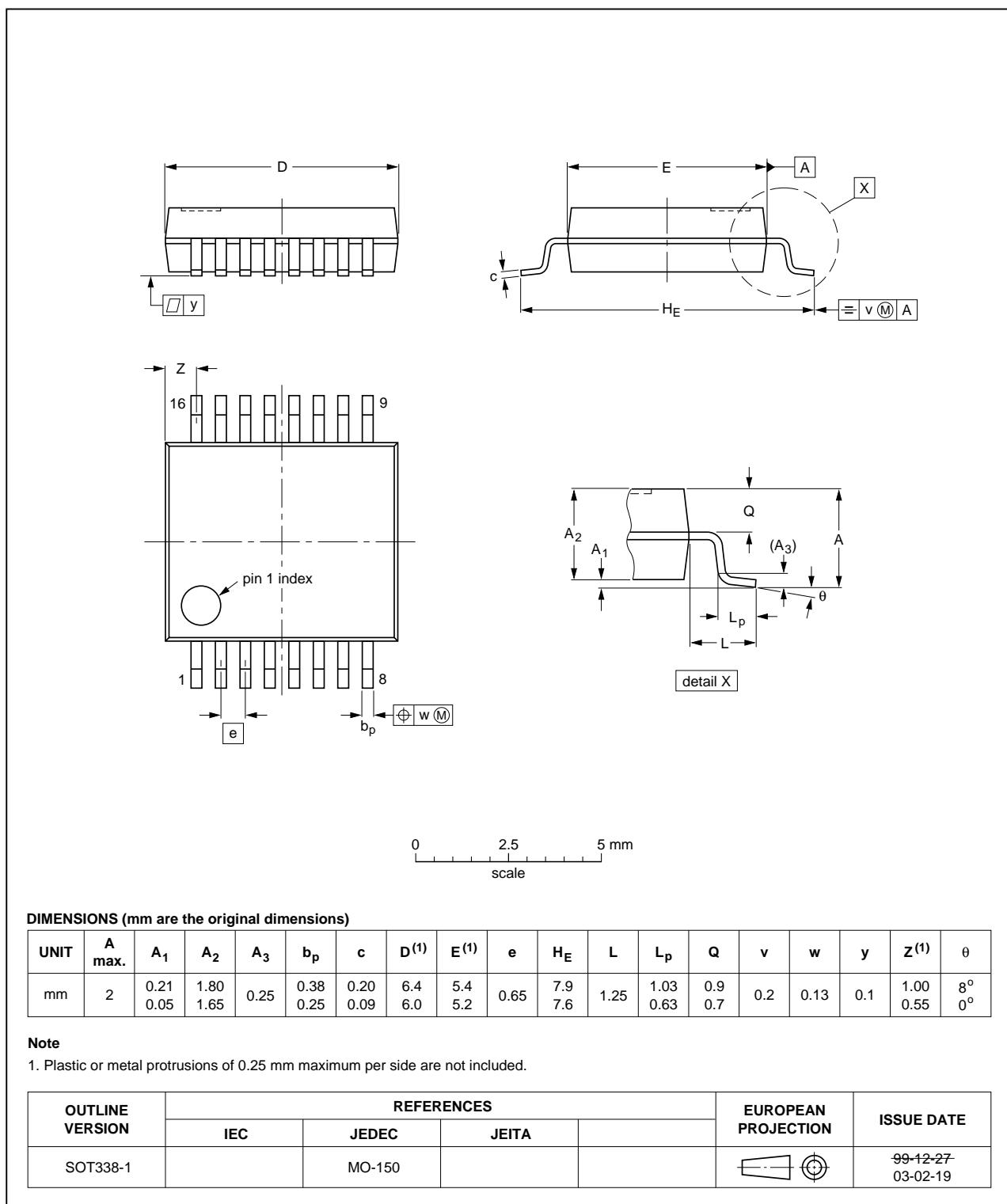


Fig 9. Package outline SOT338-1 (SSOP16)

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

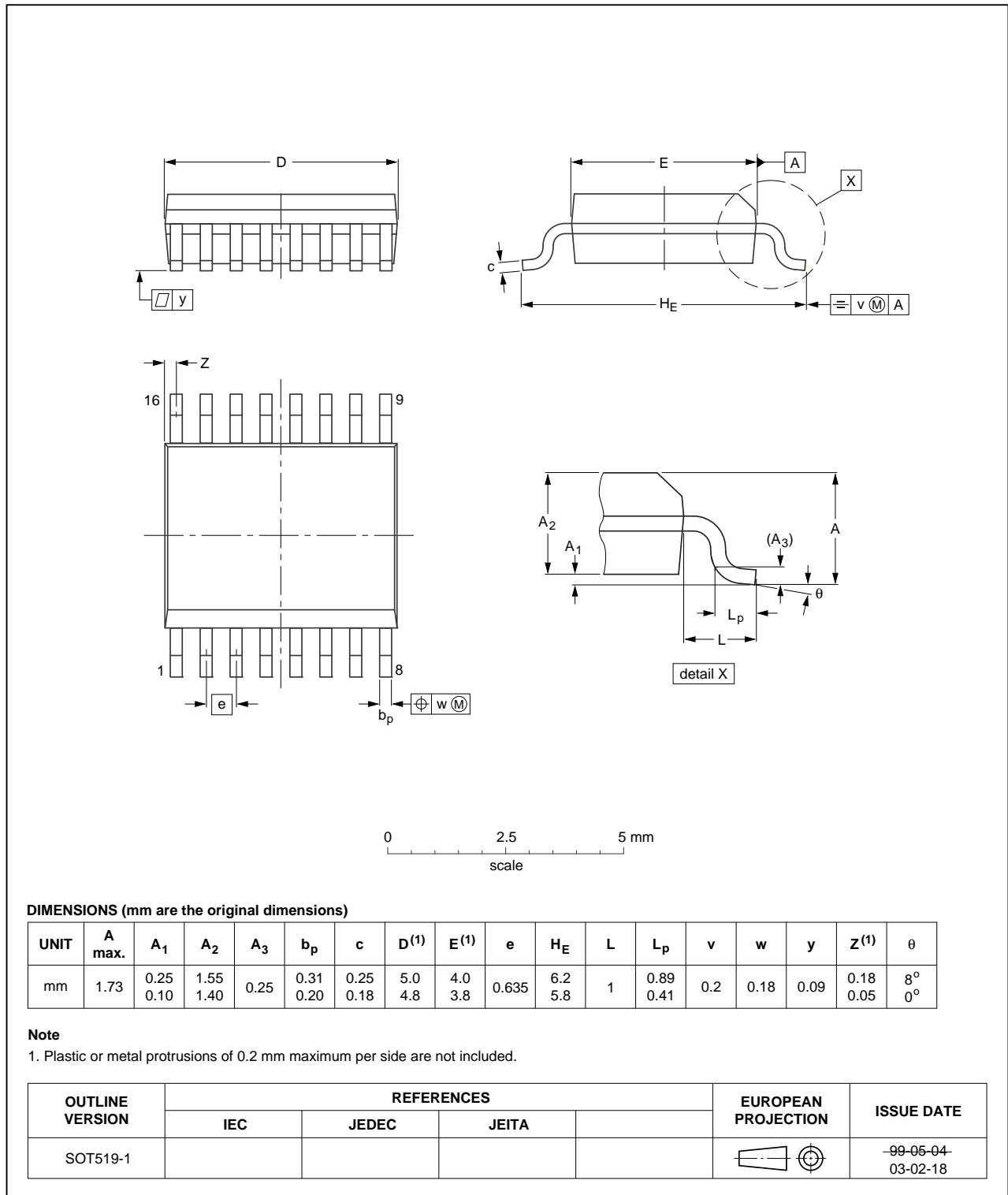


Fig 10. Package outline SOT519-1 (SSOP16)

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

SOT403-1

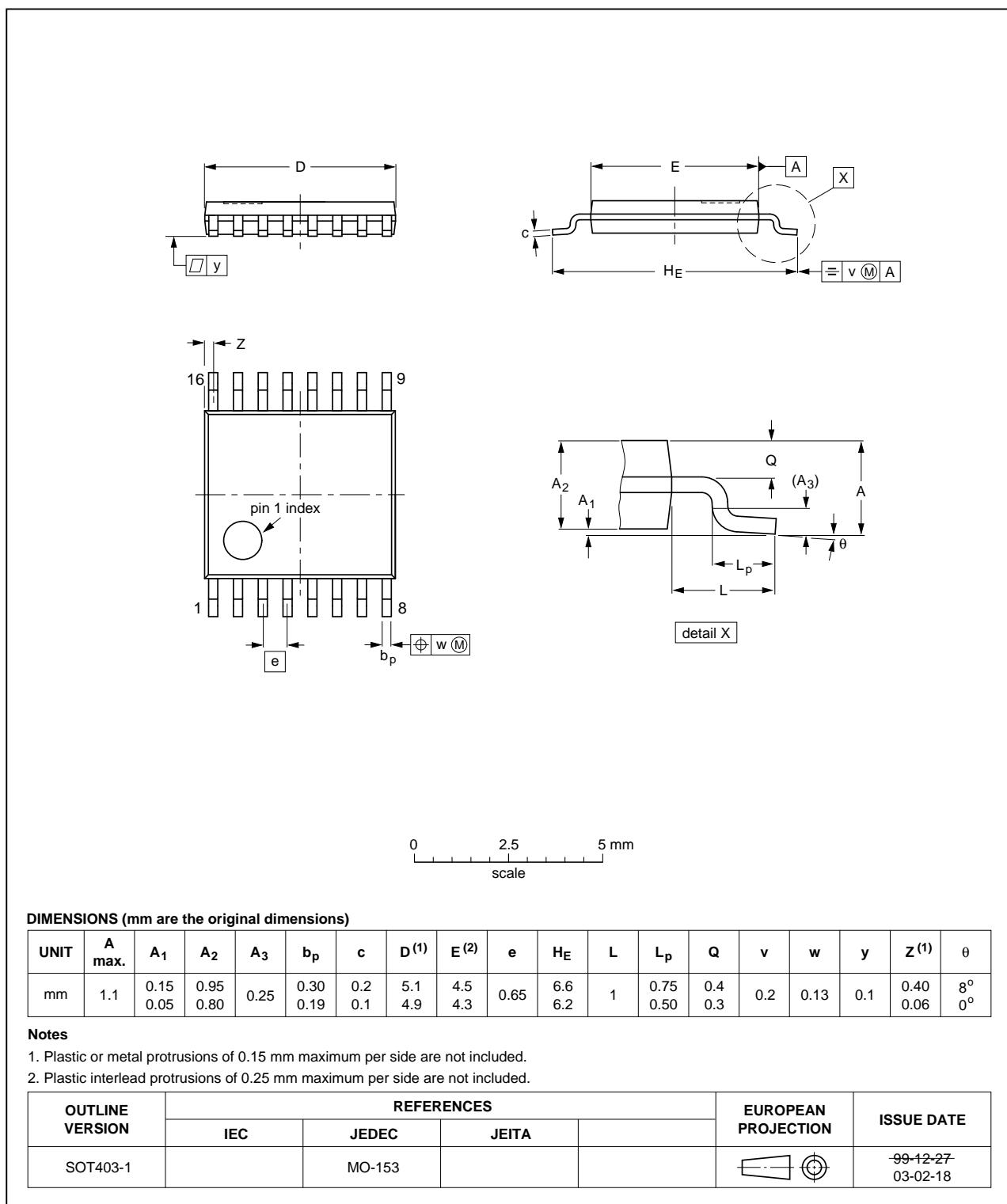


Fig 11. Package outline SOT403-1 (TSSOP16)

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads;
16 terminals; body 2.5 x 3.5 x 0.85 mm

SOT763-1

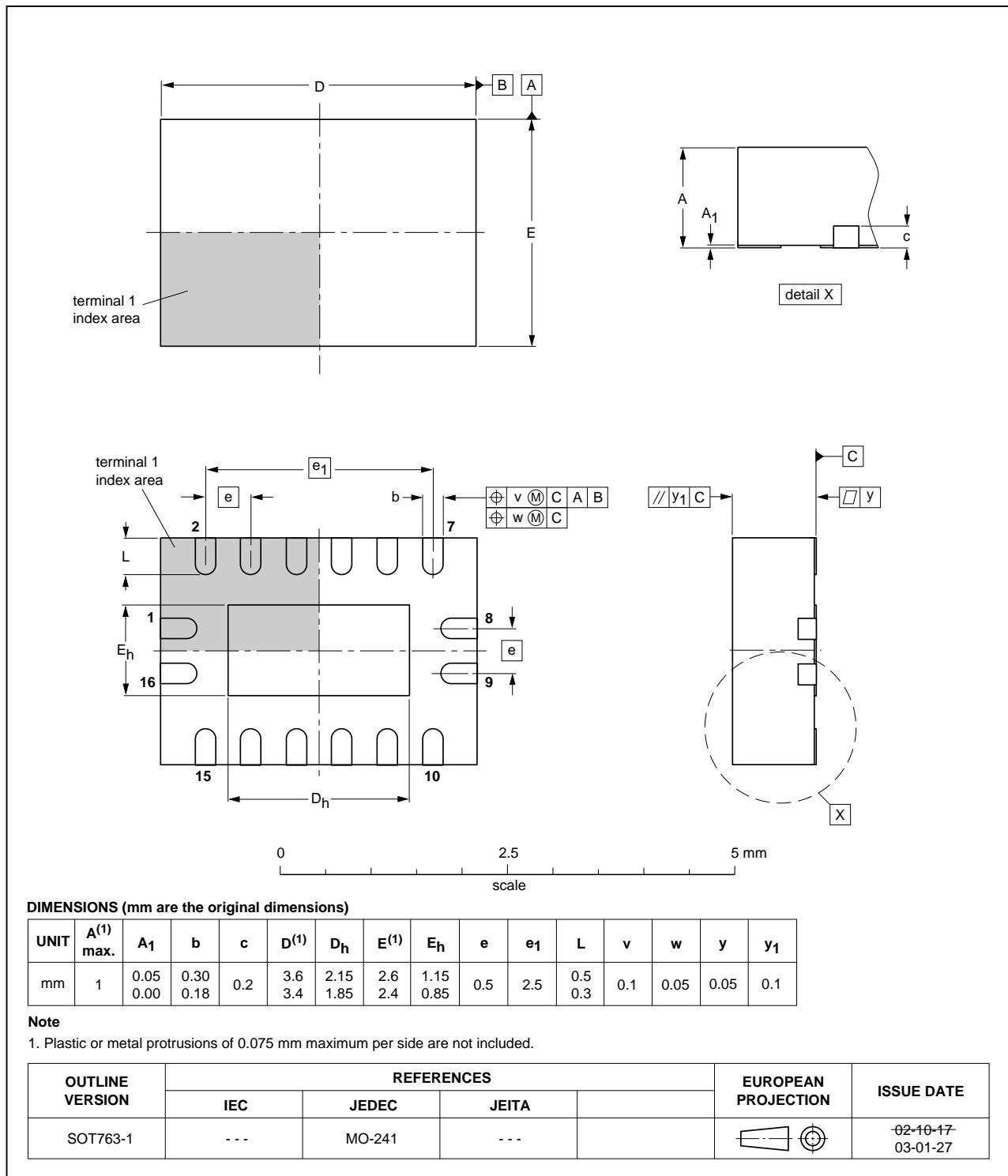


Fig 12. Package outline SOT763-1 (DHVQFN16)

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
CBT3257A v.5	20130404	Product data sheet	-	CBT3257A v.4
Modifications:		• Table 6 "Static characteristics" : values for pass voltage modified.		
CBT3257A v.4	20090319	Product data sheet	-	CBT3257A v.3
CBT3257A v.3	20080704	Product data sheet	-	CBT3257A v.2
CBT3257A v.2	20070704	Product data sheet	-	CBT3257A v.1
CBT3257A v.1	20051027	Product data sheet	-	-

16. Legal information

16.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
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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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