

# CBT3306-Q100

Dual bus switch

Rev. 1 — 4 April 2013

Product data sheet

## 1. General description

The CBT3306-Q100 dual FET bus switch features independent line switches. Each switch is disabled when the associated output enable (nOE) input is HIGH.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 3) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 3)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$
- $5\ \Omega$  switch connection between two ports
- TTL-compatible input levels
- Multiple package options
- Latch-up protection exceeds 100 mA per JESD78B
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V

## 3. Ordering information

Table 1. Ordering information

Type number	Package		
	Name	Description	Version
CBT3306D-Q100	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1
CBT3306PW-Q100	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 4.4 mm	SOT530-1



## 4. Functional diagram

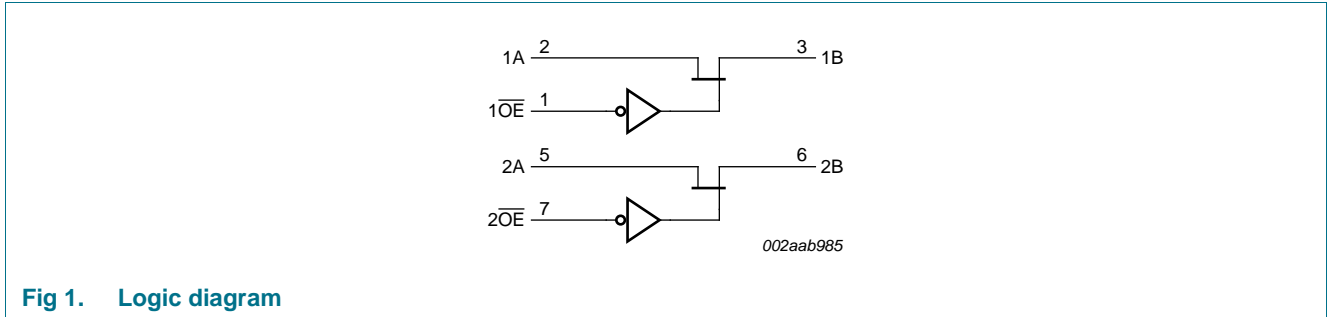


Fig 1. Logic diagram

## 5. Pinning information

### 5.1 Pinning

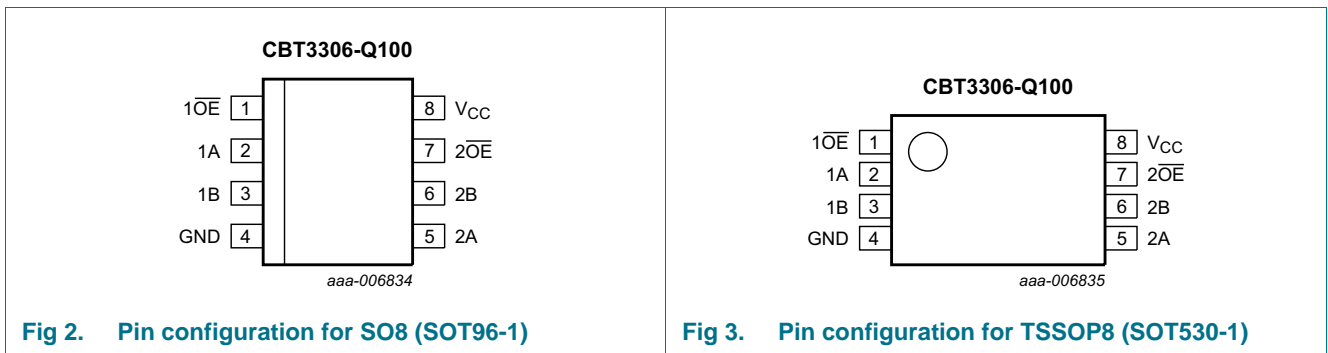


Fig 2. Pin configuration for SO8 (SOT96-1)

Fig 3. Pin configuration for TSSOP8 (SOT530-1)

### 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$\overline{1OE}, \overline{2OE}$	1, 7	output enable input
1A, 2A	2, 5	data input/output (A port)
1B, 2B	3, 6	data input/output (B port)
GND	4	ground (0 V)
V <sub>CC</sub>	8	positive supply voltage

## 6. Functional description

Table 3. Function selection<sup>[1]</sup>

Input	Input/output
nOE	nA, nB
L	nA = nB
H	Z

[1] H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

## 7. Limiting values

**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).<sup>[1]</sup>

$T_{amb} = -40\text{ °C to }+85\text{ °C}$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
$V_I$	input voltage		<sup>[2]</sup> -0.5	+7.0	V
$I_O$	output current		-	128	mA
$I_{IK}$	input clamping current	$V_{I/O} = 0\text{ V}$	-50	-	mA
$T_{stg}$	storage temperature		-65	+150	°C

[1] Stresses beyond the listed limits may damage the device permanently. These ratings are stress ratings only and functional operation of the device at or beyond the conditions indicated under [Section 8](#), is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[2] 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	Typ	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**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			Unit	
			Min	Typ <sup>[1]</sup>	Max		
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 4.5 V; I <sub>I</sub> = -18 mA	-	-	-1.2	V	
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V	-	-	±1	μA	
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0 mA; V <sub>I</sub> = V <sub>CC</sub> or GND	-	-	3	μA	
V <sub>pass</sub>	pass voltage	output HIGH; V <sub>I</sub> = V <sub>CC</sub> = 5.0 V; I <sub>O</sub> = -100 μA	3.6	3.9	4.2	V	
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 5.5 V; one input at 3.4 V, other inputs at V <sub>CC</sub> or GND	<sup>[2]</sup>	-	2.5	mA	
C <sub>I</sub>	input capacitance	control pin; V <sub>I</sub> = 3 V or 0 V	-	3.15	-	pF	
C <sub>io(off)</sub>	off-state input/output capacitance	port off; V <sub>I</sub> = 3 V or 0 V; n $\overline{OE}$ = V <sub>CC</sub>	-	6.45	-	pF	
R <sub>ON</sub>	ON resistance	V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 64 mA	<sup>[3]</sup>	-	3.4	5	Ω
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 0 V; I <sub>I</sub> = 30 mA	<sup>[3]</sup>	-	3.4	5	Ω
		V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = 2.4 V; I <sub>I</sub> = 15 mA	<sup>[3]</sup>	-	6.8	15	Ω

[1] All typical values are at V<sub>CC</sub> = 5 V, T<sub>amb</sub> = 25 °C.

[2] This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

[3] Measured by the voltage drop between the nA and the nB terminals at the indicated current through the switch. ON resistance is determined by the lowest voltage of the two (nA, nB) terminals.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

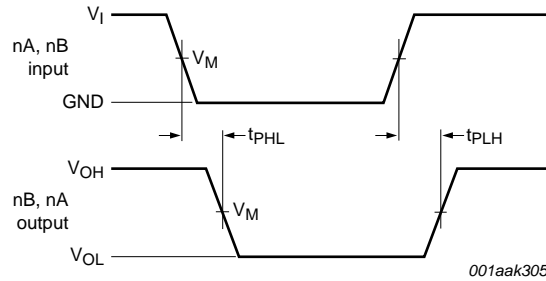
Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 6](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C			Unit
			Min	Typ	Max	
t <sub>pd</sub>	propagation delay	nA, nB to nB, nA; see <a href="#">Figure 4</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	<sup>[1][2]</sup>	-	0.25	ns
t <sub>en</sub>	enable time	n $\overline{OE}$ to nA, nB; see <a href="#">Figure 5</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	<sup>[2]</sup>	1.0	5.0	ns
t <sub>dis</sub>	disable time	n $\overline{OE}$ to nA, nB; see <a href="#">Figure 5</a> V <sub>CC</sub> = 5.0 V ± 0.5 V	<sup>[2]</sup>	1.0	5.0	ns

[1] The propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

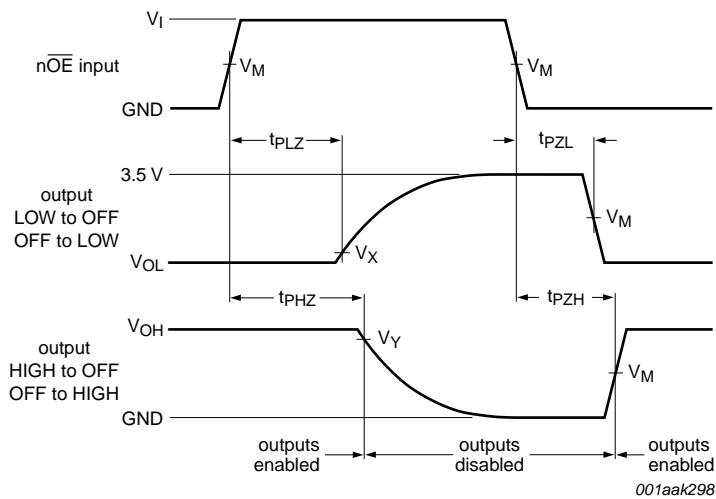
[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.  
t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

11. Waveforms



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

**Fig 4. The data input (nA, nB) to output (nB, nA) propagation delay times**



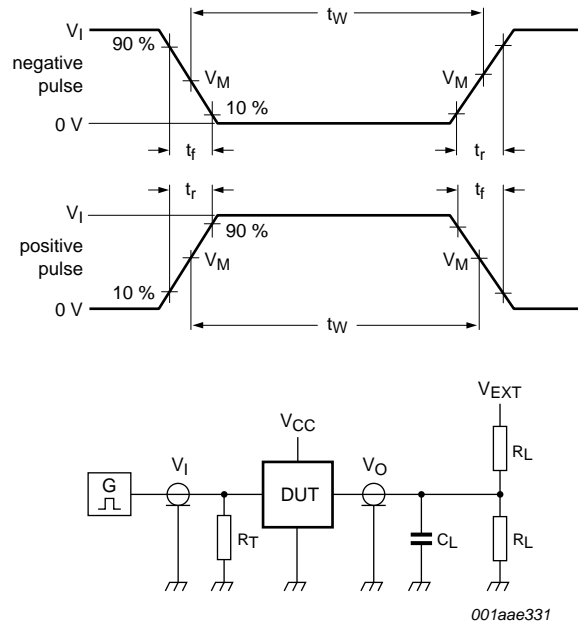
Measurement points are given in [Table 8](#).  
 Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig 5. Enable and disable times**

**Table 8. Measurement points**

Supply voltage	Input		Output		
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
$V_{CC} = 5.0\text{ V} \pm 0.5\text{ V}$	GND to 3.0 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$

12. Test information



Test data is given in [Table 9](#).

All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz; Z<sub>o</sub> = 50 Ω.

The outputs are measured one at a time with one transition per measurement.

Definitions for test circuit:

R<sub>L</sub> = Load resistance.

C<sub>L</sub> = Load capacitance including jig and probe capacitance.

R<sub>T</sub> = Termination resistance should be equal to output impedance Z<sub>o</sub> of the pulse generator.

V<sub>EXT</sub> = External voltage for measuring switching times.

Fig 6. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load		V <sub>EXT</sub>		
	V <sub>I</sub>	t <sub>r</sub> , t <sub>f</sub>	C <sub>L</sub>	R <sub>L</sub>	t <sub>PLH</sub> , t <sub>PHL</sub>	t <sub>PLZ</sub> , t <sub>PZL</sub>	t <sub>PHZ</sub> , t <sub>PZH</sub>
V <sub>CC</sub> = 5.0 V ± 0.5 V	GND to 3.0 V	≤ 2.5 ns	50 pF	500 Ω	open	7.0 V	open

13. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1

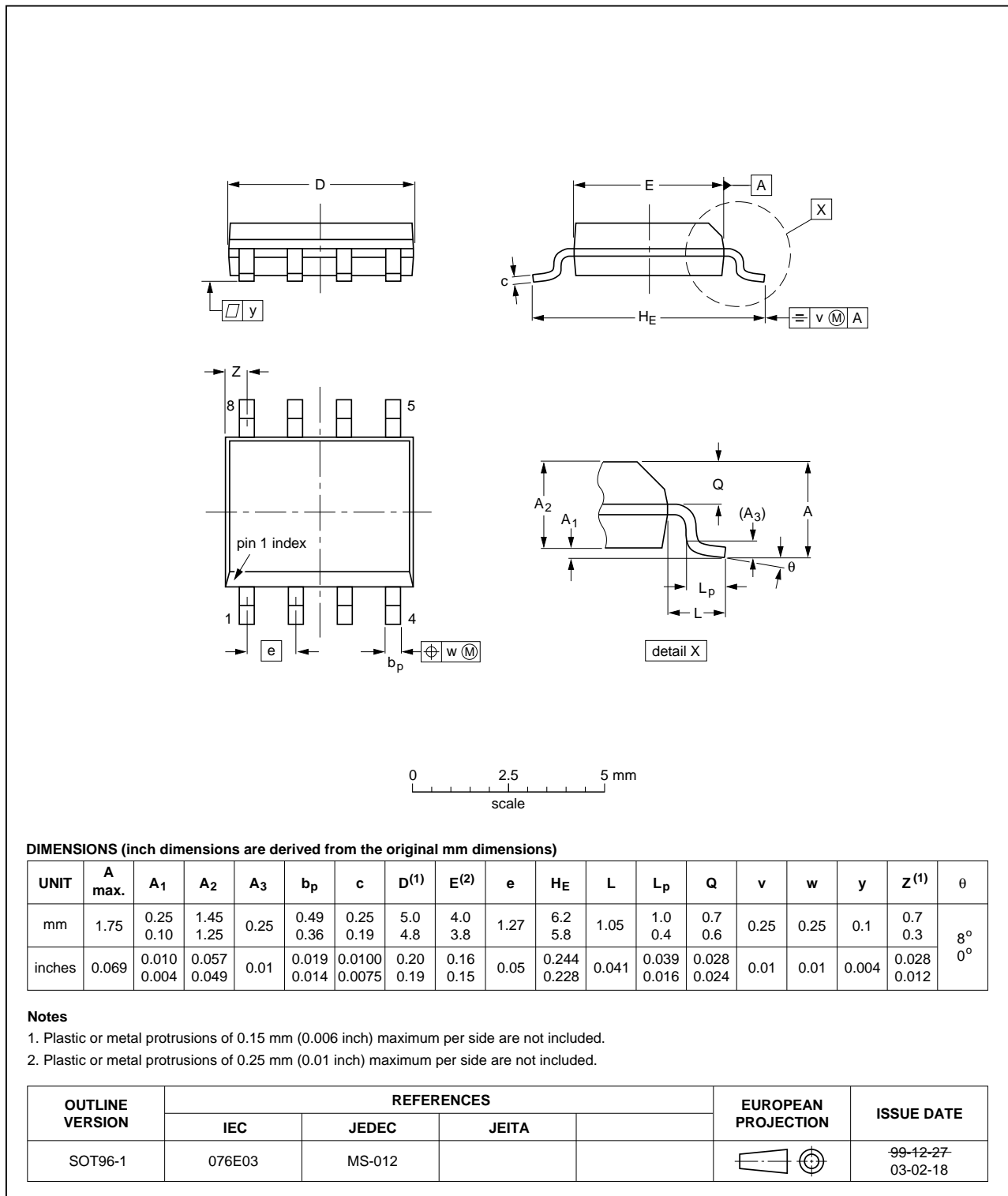


Fig 7. Package outline SOT96-1 (SO8)

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 4.4 mm

SOT530-1

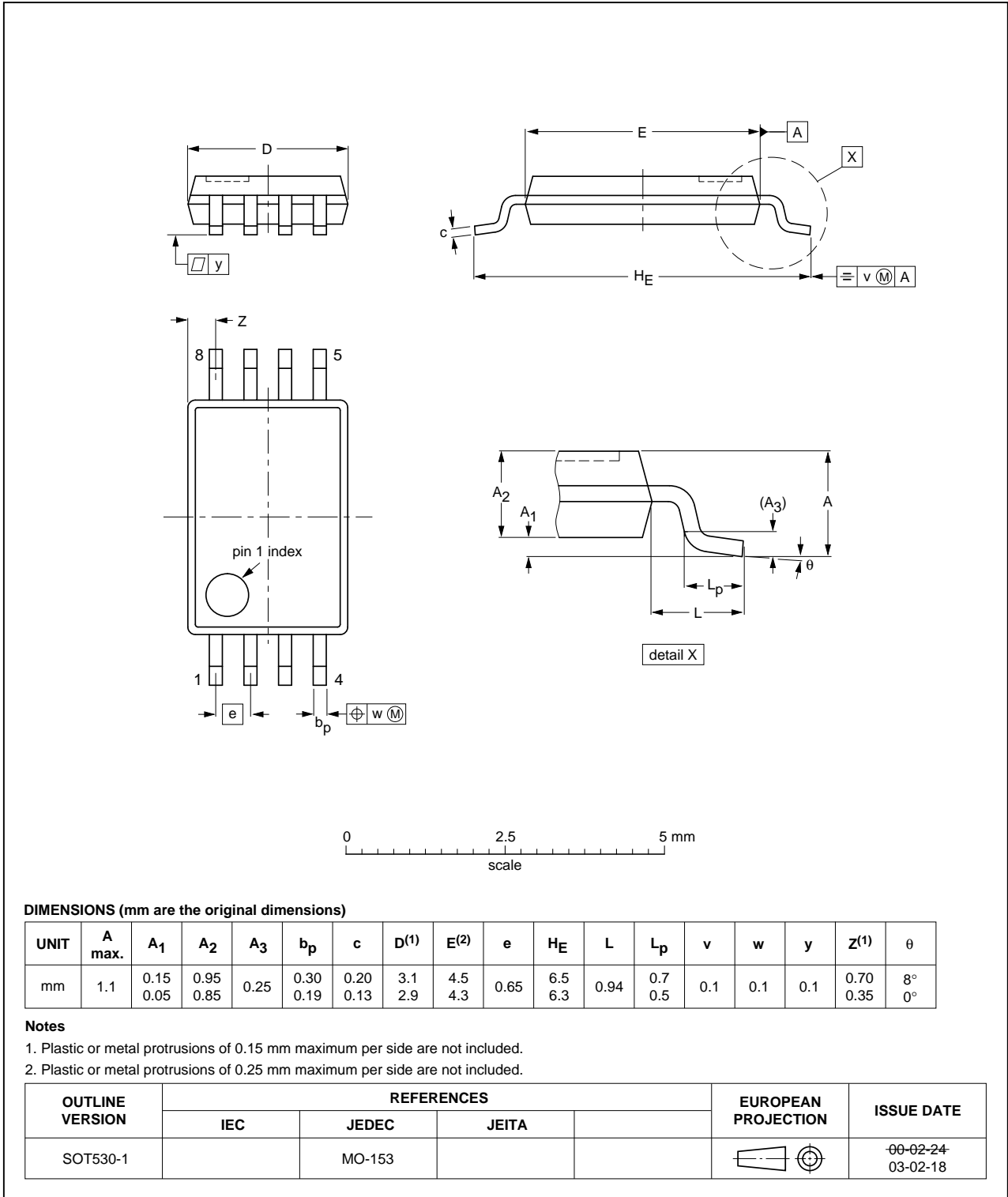


Fig 8. Package outline SOT530-1 (TSSOP8)



## 14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
ESD	ElectroStatic Discharge
FET	Field Effect Transistor
HBM	Human Body Model
MIL	Military
PRR	Pulse Rate Repetition
TTL	Transistor-Transistor Logic

## 15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
CBT3306_Q100 v.1	20130404	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.
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Product [short] data sheet	Production	This document contains the product specification.

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## 18. Contents

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<b>1</b>	<b>General description</b> .....	<b>1</b>
<b>2</b>	<b>Features and benefits</b> .....	<b>1</b>
<b>3</b>	<b>Ordering information</b> .....	<b>1</b>
<b>4</b>	<b>Functional diagram</b> .....	<b>2</b>
<b>5</b>	<b>Pinning information</b> .....	<b>2</b>
5.1	Pinning .....	2
5.2	Pin description .....	2
<b>6</b>	<b>Functional description</b> .....	<b>2</b>
<b>7</b>	<b>Limiting values</b> .....	<b>3</b>
<b>8</b>	<b>Recommended operating conditions</b> .....	<b>3</b>
<b>9</b>	<b>Static characteristics</b> .....	<b>4</b>
<b>10</b>	<b>Dynamic characteristics</b> .....	<b>4</b>
<b>11</b>	<b>Waveforms</b> .....	<b>5</b>
<b>12</b>	<b>Test information</b> .....	<b>6</b>
<b>13</b>	<b>Package outline</b> .....	<b>7</b>
<b>14</b>	<b>Abbreviations</b> .....	<b>9</b>
<b>15</b>	<b>Revision history</b> .....	<b>9</b>
<b>16</b>	<b>Legal information</b> .....	<b>10</b>
16.1	Data sheet status .....	10
16.2	Definitions .....	10
16.3	Disclaimers .....	10
16.4	Trademarks .....	11
<b>17</b>	<b>Contact information</b> .....	<b>11</b>
<b>18</b>	<b>Contents</b> .....	<b>12</b>

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