

# 74HC243

Quad bus transceiver; 3-state

Rev. 03 — 12 November 2004

Product data sheet

## 1. General description

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The 74HC243 is a high-speed Si-gate CMOS device and is pin compatible with low power Schottky TTL (LSTTL). The 74HC243 is specified in compliance with JEDEC standard no. 7A.

The 74HC243 is a quad bus transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74HC243 is designed for 4-line asynchronous 2-way data communications between data buses.

The output enable inputs ( $\overline{\text{OE}}\text{A}$  and  $\text{OEB}$ ) can be used to isolate the buses.

The 74HC243 is similar to the 74HC242 but has non-inverting (true) outputs.

## 2. Features

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- Non-inverting 3-state outputs
- 2-way asynchronous data bus communication
- Low-power dissipation
- Complies with JEDEC standard no. 7A
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-B exceeds 2000 V
  - ◆ MM EIA/JESD22-A115-A exceeds 200 V.
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+80\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$ .

**PHILIPS**

### 3. Quick reference data

**Table 1: Quick reference data**

$GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $t_r = t_f = 6\text{ ns}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PHL}$ , $t_{PLH}$	propagation delay An to Bn; Bn to An	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	6	-	ns
$C_I$	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
$C_{PD}$	power dissipation capacitance per transceiver	$V_I = GND\text{ to }V_{CC}$	[1]	26	-	pF

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

$\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

### 4. Ordering information

**Table 2: Ordering information**

Type number	Package			Version
	Temperature range	Name	Description	
74HC243N	-40 °C to +125 °C	DIP14	plastic dual in-line package; 14 leads (300 mil)	SOT27-1
74HC243D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HC243DB	-40 °C to +125 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1

5. Functional diagram

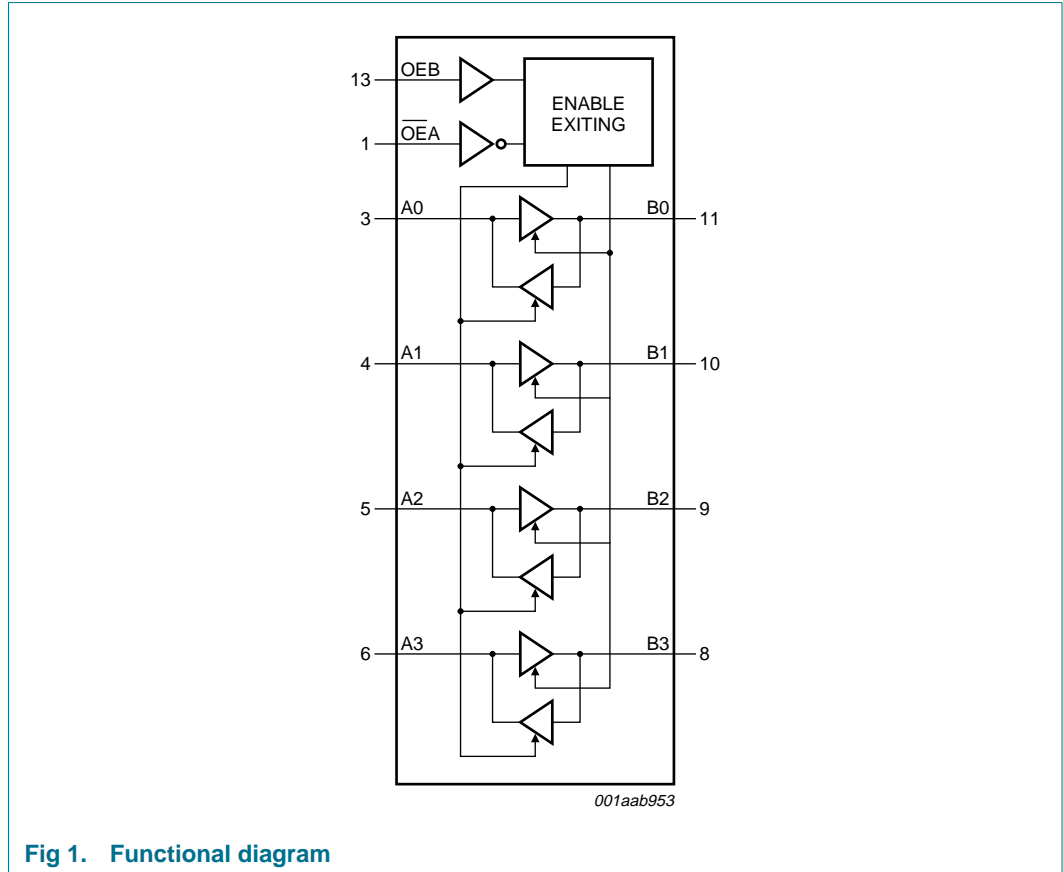


Fig 1. Functional diagram

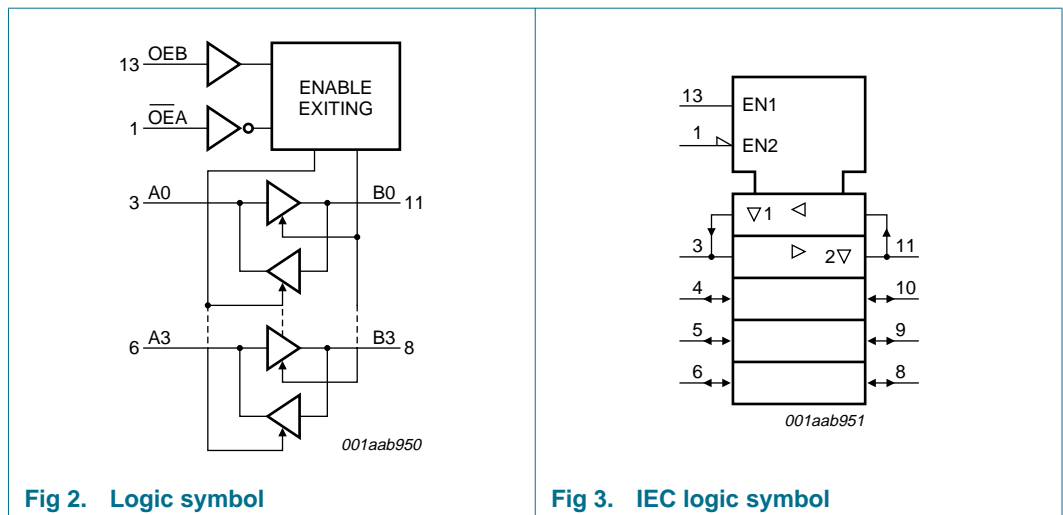
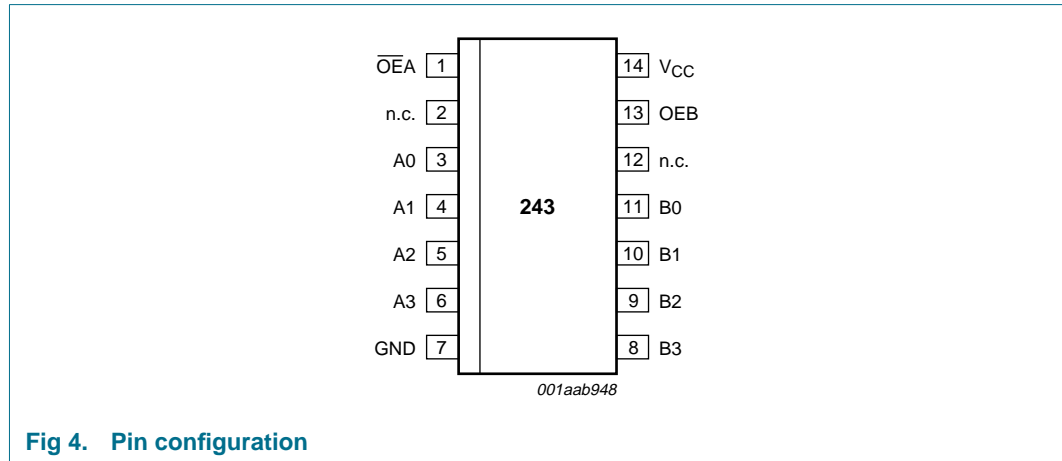


Fig 2. Logic symbol

Fig 3. IEC logic symbol

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
$\overline{\text{OE}}\text{A}$	1	output enable input (active LOW)
n.c.	2	not connected
A0	3	data input or output
A1	4	data input or output
A2	5	data input or output
A3	6	data input or output
GND	7	ground (0 V)
B3	8	data output or input
B2	9	data output or input
B1	10	data output or input
B0	11	data output or input
n.c.	12	not connected
OEB	13	output enable input
$V_{\text{CC}}$	14	positive supply voltage

## 7. Functional description

### 7.1 Function table

Table 4: Function table <sup>[1]</sup>

Control		Input or output	
OEA	OEB	An	Bn
L	L	input	B = A
H	L	Z	Z
L	H	Z	Z
H	H	A = B	input

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

## 8. Limiting values

Table 5: 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
$V_{CC}$	supply voltage		-0.5	+7	V
$I_{IK}$	input diode current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output diode current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_O$	output source or sink current	$V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$	-	$\pm 35$	mA
$I_{CC}, I_{GND}$	$V_{CC}$ or GND current		-	$\pm 70$	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	power dissipation				
	DIP14 package		<sup>[1]</sup> -	750	mW
	SO14 and SSOP16 packages		<sup>[2]</sup> -	500	mW

[1] Above 70 °C:  $P_{tot}$  derates linearly with 12 mW/K.

[2] Above 70 °C:  $P_{tot}$  derates linearly with 8 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		2.0	5.0	6.0	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times	$V_{CC} = 2.0\text{ V}$	-	-	1000	ns
		$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
		$V_{CC} = 6.0\text{ V}$	-	-	400	ns
$T_{amb}$	ambient temperature		-40	-	+125	°C

## 10. Static characteristics

**Table 7: Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	1.2	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	2.4	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	3.2	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	0.8	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	2.1	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	2.8	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	1.9	2.0	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	4.4	4.5	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$	5.9	6.0	-	V
		$I_O = -6.0\text{ mA}; V_{CC} = 4.5\text{ V}$	3.98	4.32	-	V
		$I_O = -7.8\text{ mA}; V_{CC} = 6.0\text{ V}$	5.48	5.81	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	-	0	0.1	V
		$I_O = 20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	-	0	0.1	V
		$I_O = 20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$	-	0	0.1	V
		$I_O = 6.0\text{ mA}; V_{CC} = 4.5\text{ V}$	-	0.15	0.26	V
		$I_O = 7.8\text{ mA}; V_{CC} = 6.0\text{ V}$	-	0.16	0.26	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0\text{ V}$	-	-	$\pm 0.1$	$\mu\text{A}$
$I_{OZ}$	3-state OFF-state current	$V_I = V_{IH}$ or $V_{IL}; V_{CC} = 6.0\text{ V}; V_O = V_{CC}$ or GND	-	-	$\pm 0.5$	$\mu\text{A}$
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}; V_{CC} = 6.0\text{ V}$	-	-	8.0	$\mu\text{A}$
$C_I$	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF

**Table 7: Static characteristics ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	-	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	-	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	-	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 2.0\text{ V}$	1.9	-	-	V
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 4.5\text{ V}$	4.4	-	-	V
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 6.0\text{ V}$	5.9	-	-	V
		$I_O = -6.0\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$	3.84	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 20\text{ }\mu\text{A}$ ; $V_{CC} = 2.0\text{ V}$	-	-	0.1	V
		$I_O = 20\text{ }\mu\text{A}$ ; $V_{CC} = 4.5\text{ V}$	-	-	0.1	V
		$I_O = 20\text{ }\mu\text{A}$ ; $V_{CC} = 6.0\text{ V}$	-	-	0.1	V
		$I_O = 6.0\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$	-	-	0.33	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0\text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
		$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 6.0\text{ V}$ ; $V_O = V_{CC}$ or GND	-	-	$\pm 5.0$	$\mu\text{A}$
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$ ; $V_{CC} = 6.0\text{ V}$	-	-	80	$\mu\text{A}$
<b><math>T_{amb} = -40\text{ °C to }+125\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	-	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	-	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	-	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 2.0\text{ V}$	1.9	-	-	V
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 4.5\text{ V}$	4.4	-	-	V
		$I_O = -20\text{ }\mu\text{A}$ ; $V_{CC} = 6.0\text{ V}$	5.9	-	-	V
		$I_O = -6.0\text{ mA}$ ; $V_{CC} = 4.5\text{ V}$	3.7	-	-	V
$I_{OL}$	LOW-level output current	$I_O = -7.8\text{ mA}$ ; $V_{CC} = 6.0\text{ V}$	5.2	-	-	V

**Table 7: Static characteristics ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>		-		
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.4	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	μA
I <sub>OZ</sub>	3-state OFF-state current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 6.0 V; V <sub>O</sub> = V <sub>CC</sub> or GND	-	-	±10.0	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	160	μA

## 11. Dynamic characteristics

**Table 8: Dynamic characteristics**GND = 0 V; t<sub>r</sub> = t<sub>f</sub> = 6 ns; C<sub>L</sub> = 50 pF; R<sub>L</sub> = 1000 Ω; see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay An to Bn; Bn to An	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	22	90	ns
		V <sub>CC</sub> = 4.5 V	-	8	18	ns
		V <sub>CC</sub> = 6.0 V	-	6	15	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	6	-	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	3-state output enable time $\overline{\text{OE}}\text{A}$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		V <sub>CC</sub> = 2.0 V	-	50	150	ns
		V <sub>CC</sub> = 4.5 V	-	18	30	ns
		V <sub>CC</sub> = 6.0 V	-	14	26	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	3-state output disable time $\overline{\text{OE}}\text{A}$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		V <sub>CC</sub> = 2.0 V	-	61	165	ns
		V <sub>CC</sub> = 4.5 V	-	22	33	ns
		V <sub>CC</sub> = 6.0 V	-	18	28	ns
t <sub>THL</sub> , t <sub>TLH</sub>	output transition time	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	14	60	ns
		V <sub>CC</sub> = 4.5 V	-	5	12	ns
		V <sub>CC</sub> = 6.0 V	-	4	10	ns
C <sub>PD</sub>	power dissipation capacitance per transceiver	V <sub>I</sub> = GND to V <sub>CC</sub>	[1]	-	26	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay An to Bn; Bn to An	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	-	115	ns
		V <sub>CC</sub> = 4.5 V	-	-	23	ns
		V <sub>CC</sub> = 6.0 V	-	-	20	ns

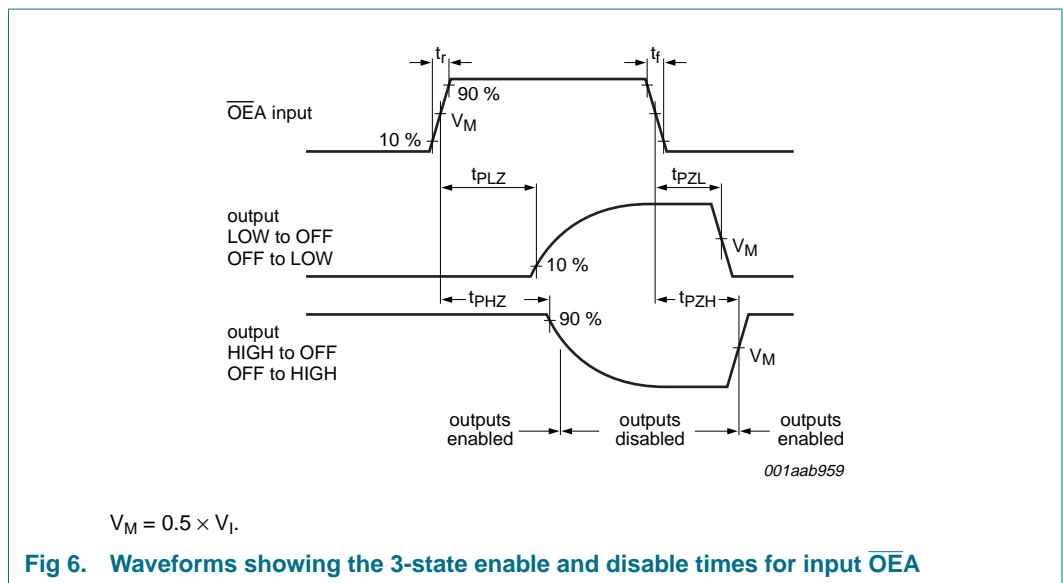
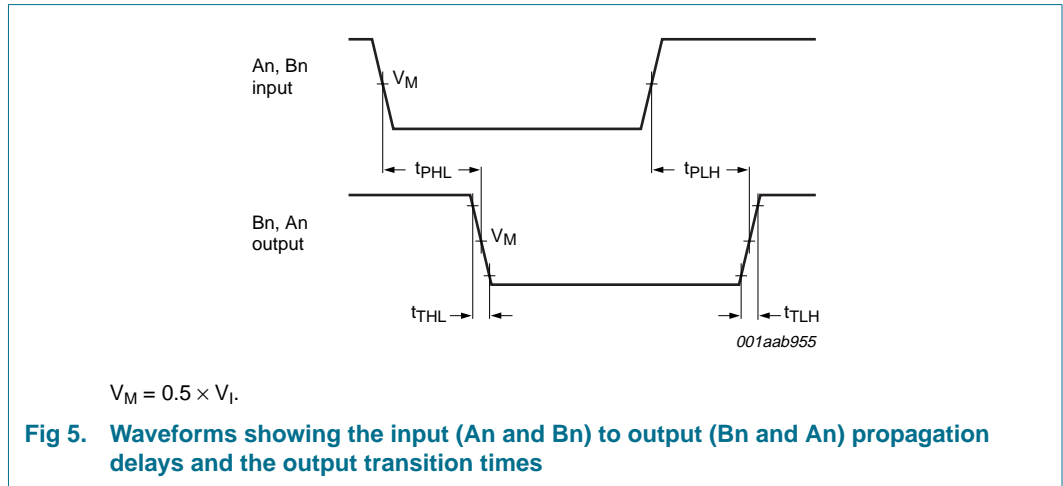


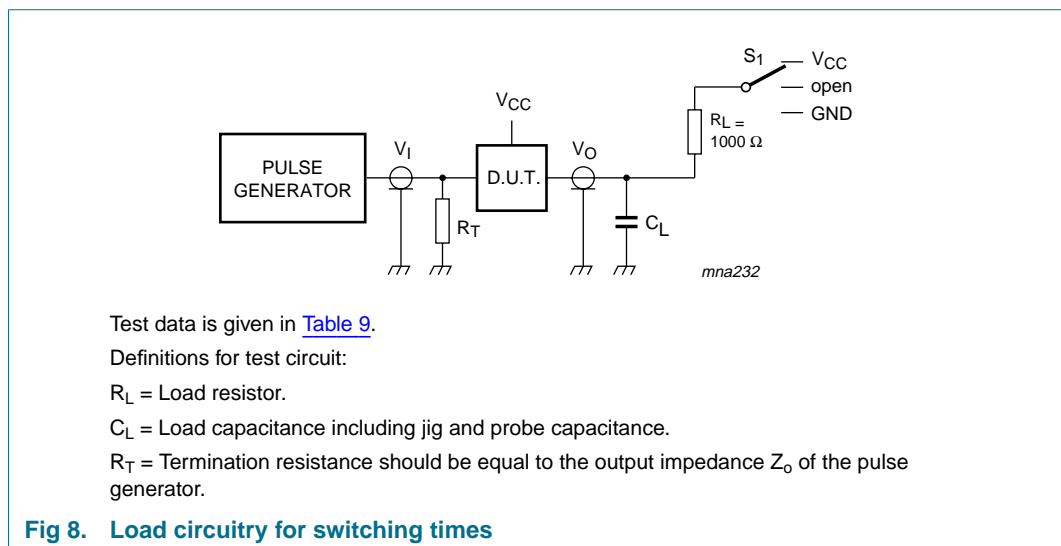
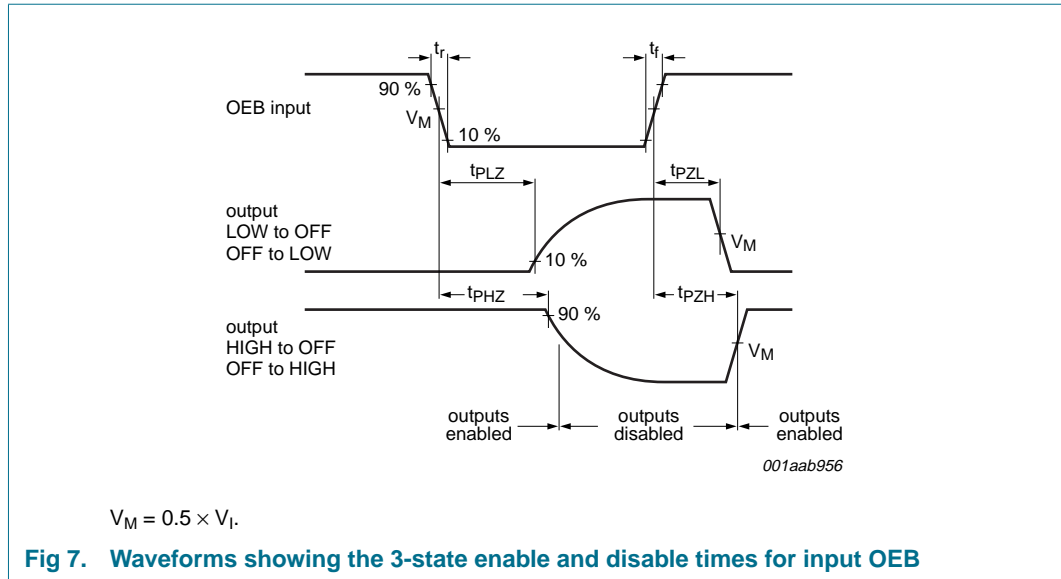
**Table 8: Dynamic characteristics ...continued**  
*GND = 0 V;  $t_r = t_f = 6 \text{ ns}$ ;  $C_L = 50 \text{ pF}$ ;  $R_L = 1000 \Omega$ ; see [Figure 8](#).*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}A$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	190	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	38	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	33	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}A$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	205	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	41	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	35	ns
$t_{THL}, t_{TLH}$	output transition time	see <a href="#">Figure 5</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	75	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	15	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	13	ns
<b><math>T_{amb} = -40 \text{ }^\circ\text{C to } +125 \text{ }^\circ\text{C}</math></b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn; Bn to An	see <a href="#">Figure 5</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	135	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	27	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	23	ns
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}A$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	225	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	45	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	38	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}A$ to An or Bn; OEB to An or Bn	see <a href="#">Figure 6</a> and <a href="#">7</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	250	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	50	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	43	ns
$t_{THL}, t_{TLH}$	output transition time	see <a href="#">Figure 5</a>				
		$V_{CC} = 2.0 \text{ V}$	-	-	90	ns
		$V_{CC} = 4.5 \text{ V}$	-	-	18	ns
		$V_{CC} = 6.0 \text{ V}$	-	-	15	ns

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $C_L$  = output load capacitance in pF;  
 $V_{CC}$  = supply voltage in V;  
 $N$  = number of inputs switching;  
 $\sum(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

12. Waveforms





**Table 9: Test data**

Supply	Input	Load	$S_1$
$V_{CC}$	$V_I$	$C_L$ $R_L$	$t_{PZL}, t_{PLZ}$ $t_{PZH}, t_{PHZ}$ $t_{PHL}, t_{PLH}$
2.0 V	$V_{CC}$	50 pF    1 kΩ	$V_{CC}$ GND    open
4.5 V	$V_{CC}$	50 pF    1 kΩ	$V_{CC}$ GND    open
6.0 V	$V_{CC}$	50 pF    1 kΩ	$V_{CC}$ GND    open
5.0 V	$V_{CC}$	15 pF    1 kΩ	$V_{CC}$ GND    open

13. Package outline

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1

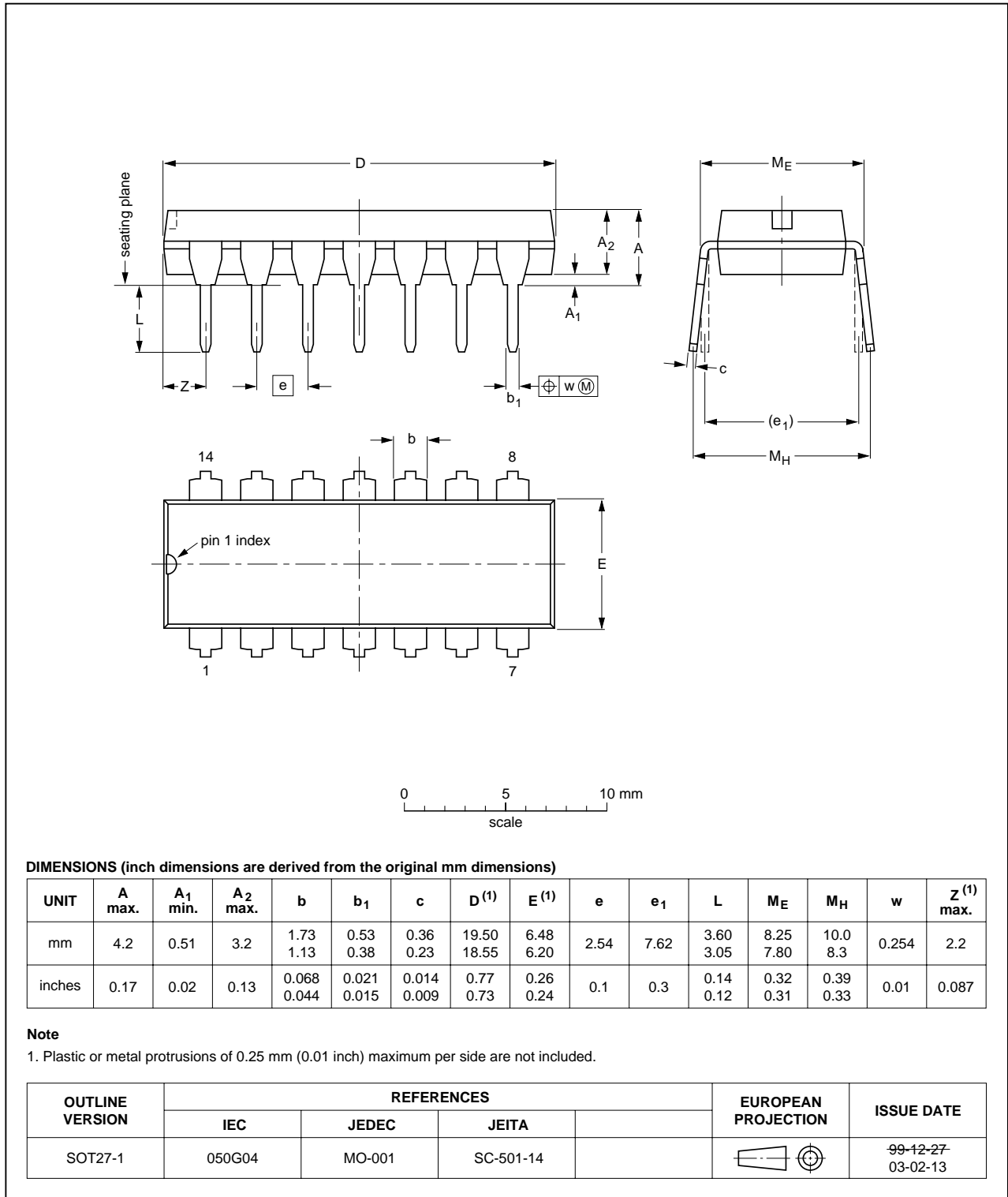


Fig 9. Package outline SOT27-1 (DIP14)

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

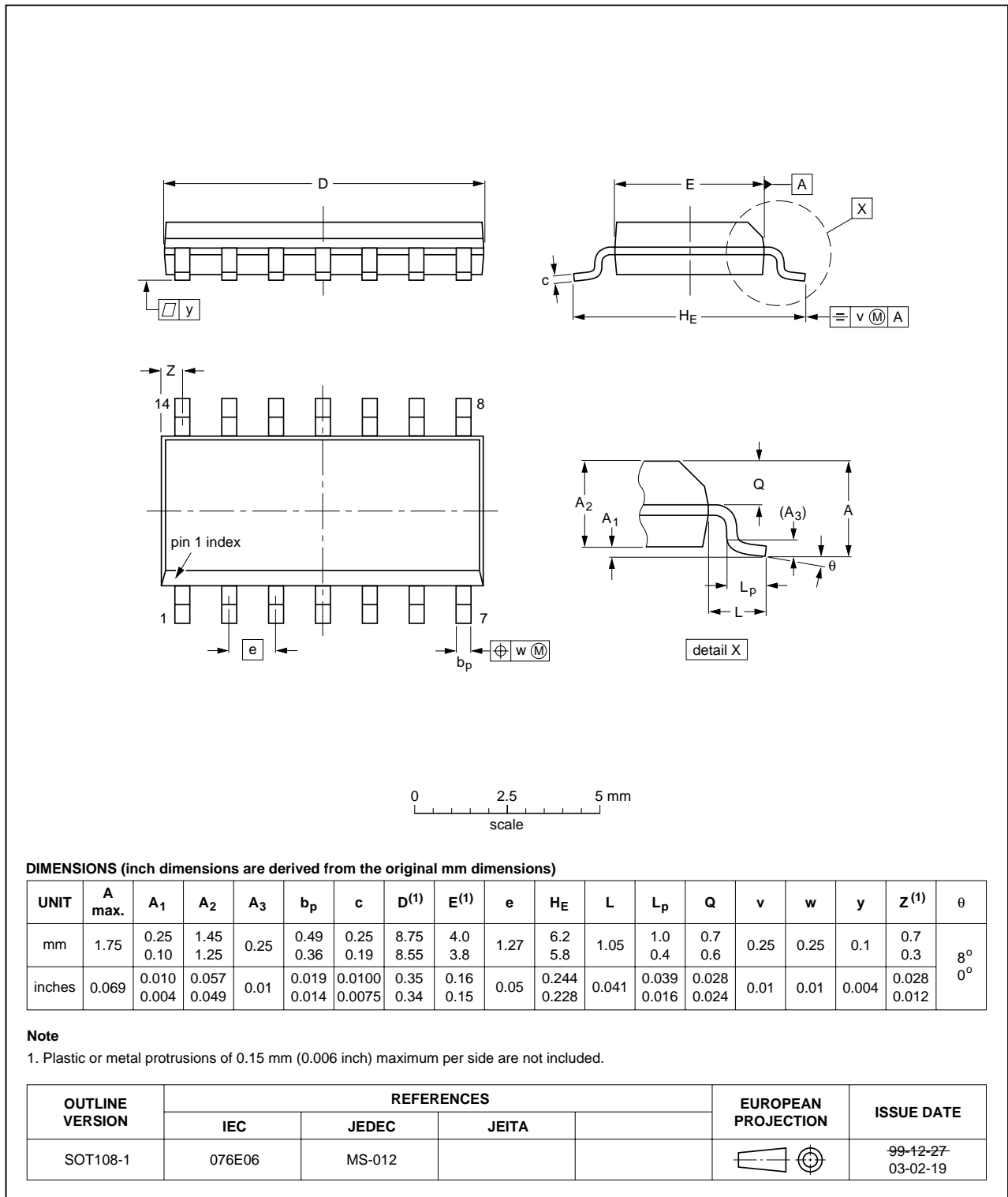


Fig 10. Package outline SOT108-1 (SO14)

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

SOT337-1

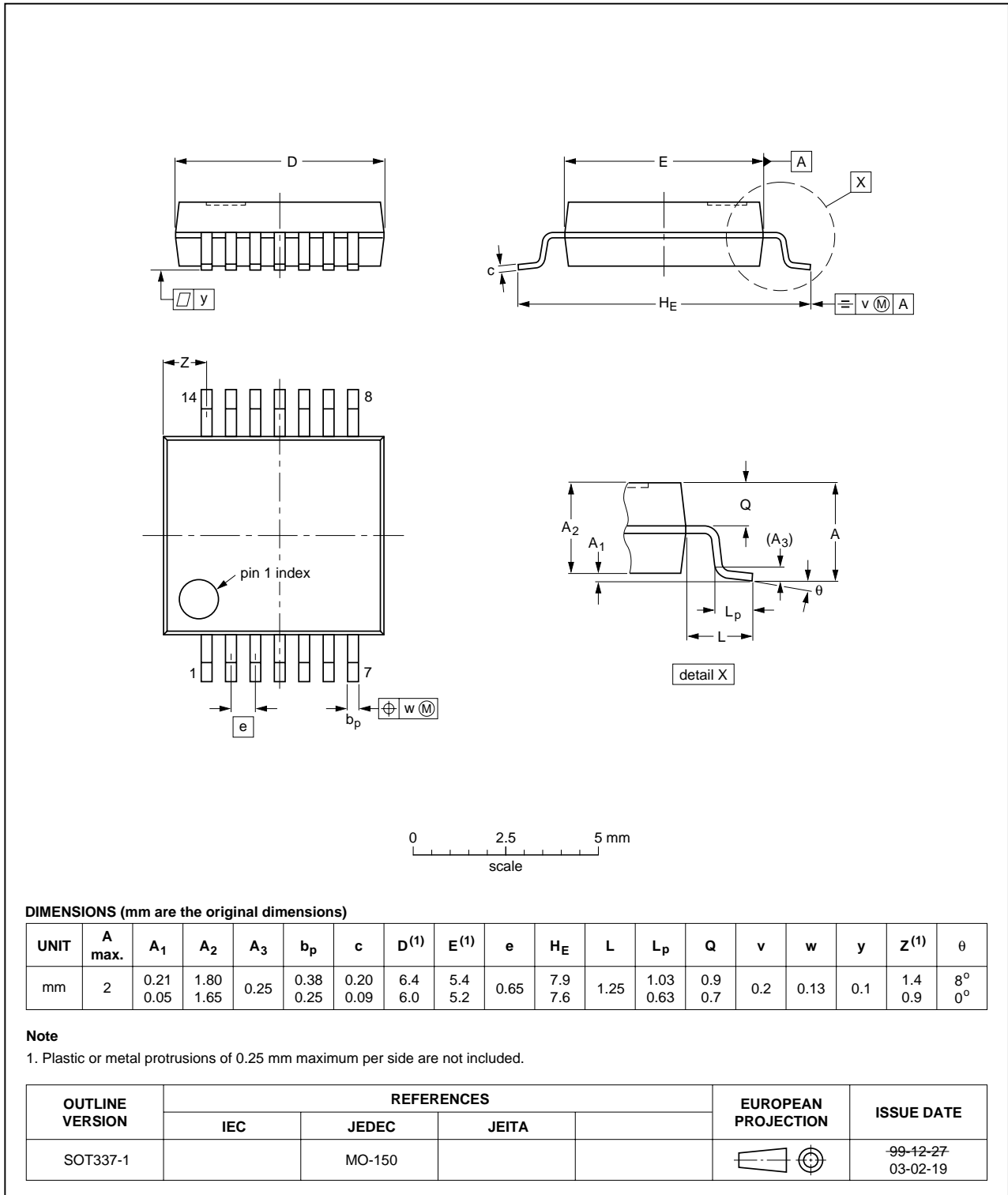


Fig 11. Package outline SOT337-1 (SSOP14)

## 14. Revision history

**Table 10: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74HC243_3	20041112	Product data sheet	-	9397 750 13808	74HC_HCT243_CNV_2
Modifications:	<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the current presentation and information standard of Philips Semiconductors.</li><li>• Removed type number 74HCT243.</li><li>• Inserted family specification.</li></ul>				
74HC_HCT243_CNV_2	19970828	Product specification	-	-	74HC_HCT243_1
74HC_HCT243_1	19901201	Product specification	-	-	-

## 15. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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