

# 74ABT125

Quad buffer; 3-state

Rev. 7 — 25 November 2015

Product data sheet

## 1. General description

The 74ABT125 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT125 device is a quad buffer that is ideal for driving bus lines. The device features four output enable inputs ( $1\overline{OE}$ ,  $2\overline{OE}$ ,  $3\overline{OE}$ ,  $4\overline{OE}$ ), each controlling one of the 3-state outputs.

## 2. Features and benefits

- Quad bus interface
- 3-state buffers
- Live insertion and extraction permitted
- Output capability: HIGH –32 mA; LOW +64 mA
- Power-up 3-state
- Inputs are disabled during 3-state mode
- Latch-up protection exceeds 500 mA per JESD78 class II level A
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from –40 °C to +85 °C

## 3. Ordering information

Table 1. Ordering information

Type number	Package				Version
	Temperature range	Name	Description		
74ABT125D	–40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm		SOT108-1
74ABT125DB	–40 °C to +85 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm		SOT337-1
74ABT125PW	–40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm		SOT402-1
74ABT125BQ	–40 °C to +85 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm		SOT762-1

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## 4. Functional diagram

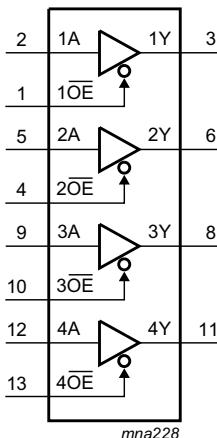


Fig 1. Logic symbol

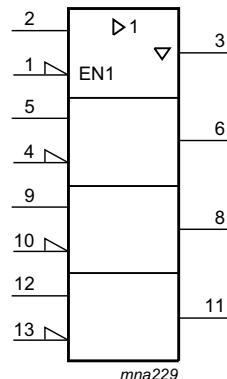


Fig 2. IEC logic symbol

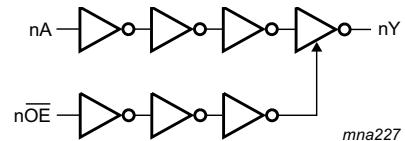


Fig 3. Logic diagram (one buffer)

## 5. Pinning information

### 5.1 Pinning

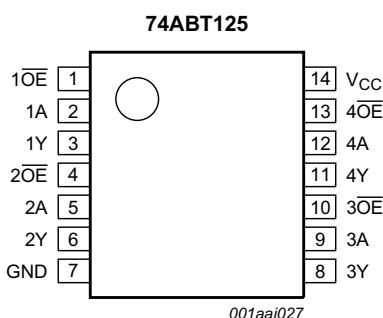
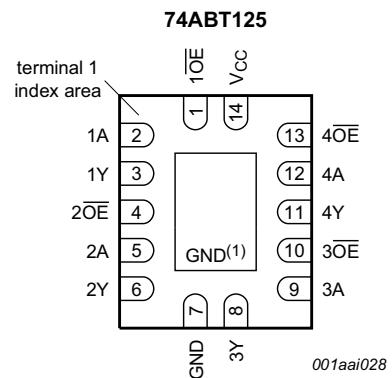


Fig 4. Pin configuration SO14 and (T)SSOP14



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 5. Pin configuration DHVQFN14

## 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1 $\overline{OE}$ to 4 $\overline{OE}$	1, 4, 10, 13	output enable input (active LOW)
1A to 4A	2, 5, 9, 12	data input
1Y to 4Y	3, 6, 8, 11	data output
GND	7	ground (0 V)
V <sub>CC</sub>	14	supply voltage

## 6. Functional description

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

Inputs		Output
nOE	nA	nY
L	L	L
L	H	H
H	X	Z

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

## 7. Limiting values

Table 4. Limiting values<sup>[1]</sup>

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		-1.2	+7.0	V
V <sub>O</sub>	output voltage	output in OFF-state or HIGH-state	-0.5	+5.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-18	-	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < 0 V	-50	-	mA
I <sub>O</sub>	output current	output in LOW-state	-	128	mA
T <sub>j</sub>	junction temperature		[2]	-	°C
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	[3]	-	mW

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

[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

[3] SO14 packages: above 70 °C P<sub>tot</sub> derate linearly with 8 mW/K

SSOP14 and TSSOP14 packages: above 60 °C P<sub>tot</sub> derate linearly with 5.5 mW/K

DHVQFN14 packages: above 60 °C P<sub>tot</sub> derate linearly with 4.5 mW/K

## 8. Recommended operating conditions

**Table 5. Operating conditions**

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

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		4.5	5.5	V
V <sub>I</sub>	input voltage		0	V <sub>CC</sub>	V
V <sub>IH</sub>	HIGH-level input voltage		2.0	-	V
V <sub>IL</sub>	LOW-level Input voltage		-	0.8	V
I <sub>OH</sub>	HIGH-level output current		-32	-	mA
I <sub>OL</sub>	LOW-level output current		-	64	mA
Δt/ΔV	input transition rise and fall rate		-	10	ns/V
T <sub>amb</sub>	ambient temperature	in free air	-40	+85	°C

## 9. Static characteristics

**Table 6. Static characteristics**

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit	
			Min	Typ	Max	Min	Max		
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = -18 mA	-	-0.9	-1.2	-	-1.2	V	
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>							
		V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -3 mA	2.5	2.9	-	2.5	-	V	
		V <sub>CC</sub> = 5.0 V; I <sub>OH</sub> = -3 mA	3.0	3.4	-	3.0	-	V	
		V <sub>CC</sub> = 4.5 V; I <sub>OH</sub> = -32 mA	2.0	2.4	-	2.0	-	V	
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 64 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>	-	0.35	0.55	-	0.55	V	
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or 5.5 V	-	±0.01	±1.0	-	±1.0	μA	
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0.0 V; V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V	-	±5.0	±100	-	±100	μA	
I <sub>O(pu/pd)</sub>	power-up/power-down output current	V <sub>CC</sub> = 2.1 V; V <sub>O</sub> = 0.5 V; V <sub>I</sub> = GND or V <sub>CC</sub> ; OE = don't care	[1]	-	±5.0	±50	-	±50	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>							
		V <sub>O</sub> = 2.7 V	-	1.0	50	-	50	μA	
		V <sub>O</sub> = 0.5 V	-	-1.0	-50	-	-50	μA	
I <sub>CEx</sub>	output high leakage current	HIGH-state; V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	5.0	50	-	50	μA	
I <sub>O</sub>	output current	V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = 2.5 V	[2]	-50	-100	-180	-50	-180	mA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = GND or V <sub>CC</sub>							
		outputs HIGH-state	-	65	250	-	250	μA	
		outputs LOW-state	-	12	15	-	30	mA	
		outputs disabled	-	65	250	-	50	μA	

Table 6. Static characteristics ...continued

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		Unit
			Min	Typ	Max	Min	Max	
$\Delta I_{CC}$	additional supply current	per control pin; $V_{CC} = 5.5$ V; one control input at 3.4 V, other inputs at $V_{CC}$ or GND	[3]					
		outputs enabled	-	0.5	1.5	-	1.5	mA
		outputs disabled	-	50	250	-	250	mA
		one enable input at 3.4 V and other inputs at $V_{CC}$ or GND; outputs disabled	-	0.5	1.5	-	1.5	mA
$C_I$	input capacitance	$V_I = 0$ V or $V_{CC}$	-	4	-	-	-	pF
$C_O$	output capacitance	outputs disabled; $V_O = 0$ V or $V_{CC}$	-	7	-	-	-	pF

[1] This parameter is valid for any  $V_{CC}$  between 0 V and 2.1 V, with a transition time of up to 10 ms. From  $V_{CC} = 2.1$  V to  $V_{CC} = 5$  V  $\pm 10$  %, a transition time of up to 100  $\mu$ s is permitted.

[2] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[3] This is the increase in supply current for each input at 3.4 V.

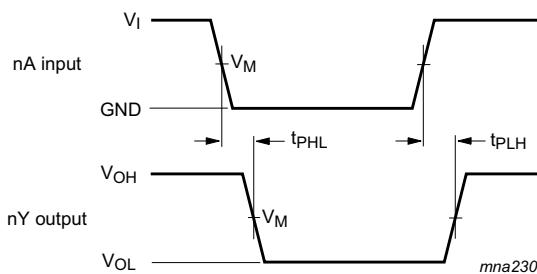
## 10. Dynamic characteristics

Table 7. Dynamic characteristics

$GND = 0$  V. Test circuit is shown in [Figure 8](#).

Symbol	Parameter	Conditions	25 °C; $V_{CC} = 5.0$ V			-40 °C to +85 °C; $V_{CC} = 5.0$ V $\pm 0.5$ V		Unit
			Min	Typ	Max	Min	Max	
$t_{PLH}$	LOW to HIGH propagation delay	nA to nY, see <a href="#">Figure 6</a>	1.0	2.8	4.1	1.0	4.6	ns
$t_{PHL}$	HIGH to LOW propagation delay	nA to nY; see <a href="#">Figure 6</a>	1.0	3.1	4.6	1.0	4.9	ns
$t_{PZH}$	OFF-state to HIGH propagation delay	$n\overline{OE}$ to nY; see <a href="#">Figure 7</a>	1.0	3.2	5.0	1.0	5.9	ns
$t_{PZL}$	OFF-state to LOW propagation delay	$n\overline{OE}$ to nY; see <a href="#">Figure 7</a>	1.0	4.2	6.2	1.0	6.8	ns
$t_{PHZ}$	HIGH to OFF-state propagation delay	$n\overline{OE}$ to nY; see <a href="#">Figure 7</a>	1.0	4.1	5.4	1.0	6.2	ns
$t_{PLZ}$	LOW to OFF-state propagation delay	$n\overline{OE}$ to nY; see <a href="#">Figure 7</a>	1.5	2.8	5.0	1.5	5.5	ns

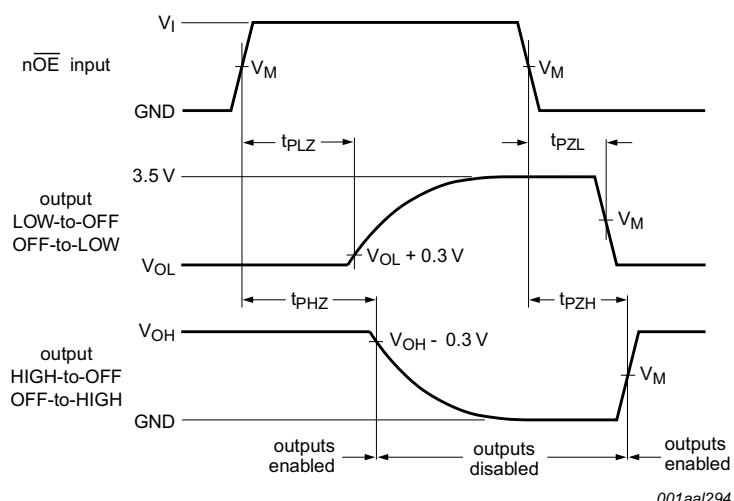
## 11. Waveforms



$$V_M = 1.5 \text{ V}$$

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

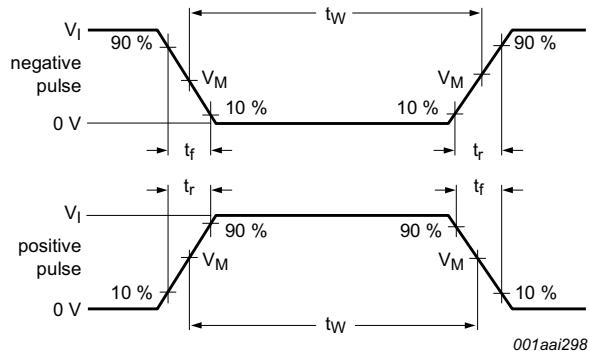
**Fig 6. Propagation delay input (nA) to output (nY)**



$$V_M = 1.5 \text{ V}$$

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

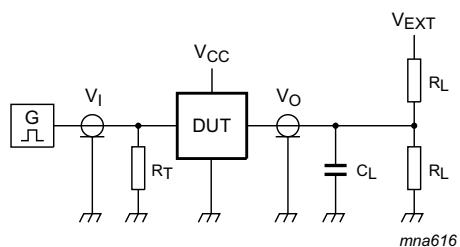
Fig 7. Enable and disable times



a. Input pulse definition

Test data is given in [Table 8](#).

Test circuit definitions:

 $R_L$  = Load resistance. $C_L$  = Load capacitance including jig and probe capacitance. $R_T$  = Termination resistance should be equal to output impedance  $Z_0$  of the pulse generator. $V_{EXT}$  = Test voltage for switching times.

b. Test circuit

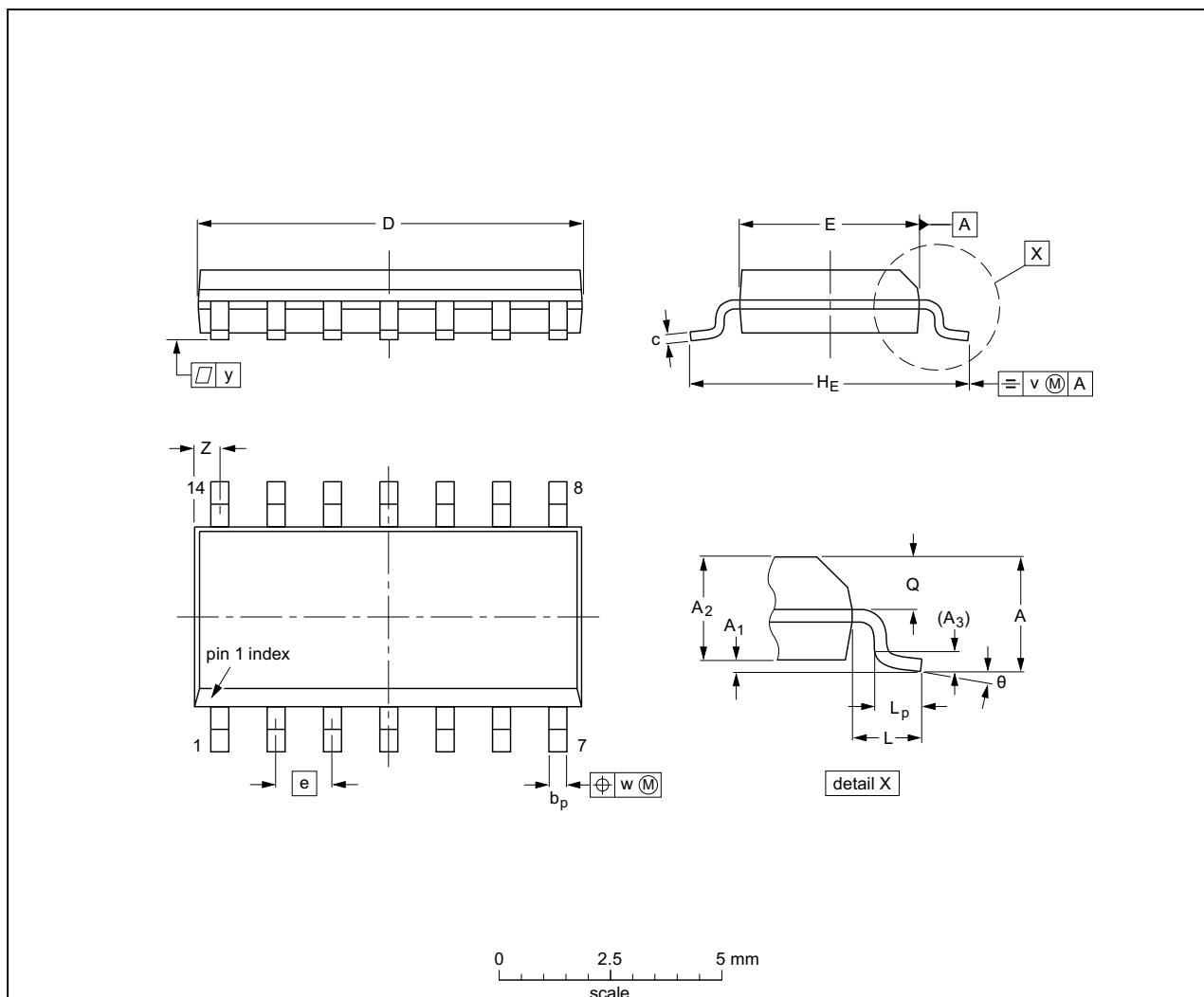
Fig 8. **Test circuit for measuring switching times****Table 8. Test data**

Input			Load		$V_{EXT}$			
$V_I$	$f_I$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
3.0 V	1 MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	open	7.0 V

## 12. Package outline

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

SOT108-1



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

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75 0.10	0.25 1.25	1.45	0.25	0.49 0.36	0.25 0.19	8.75 8.55	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	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	0° 0°

### 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			
SOT108-1	076E06	MS-012				99-12-27 03-02-19

Fig 9. Package outline SOT108-1 (SO14)

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

SOT337-1

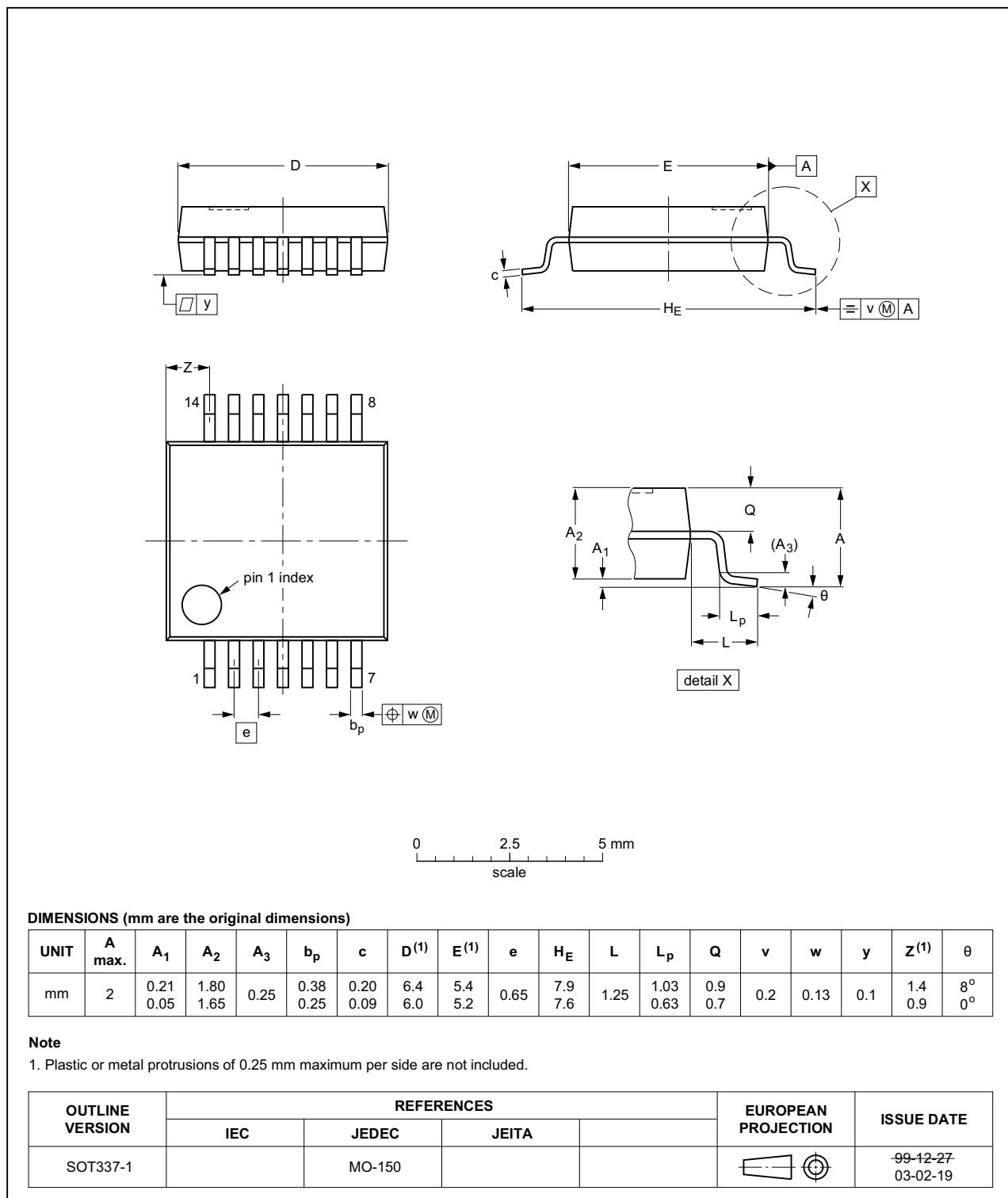


Fig 10. Package outline SOT337-1 (SSOP14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1

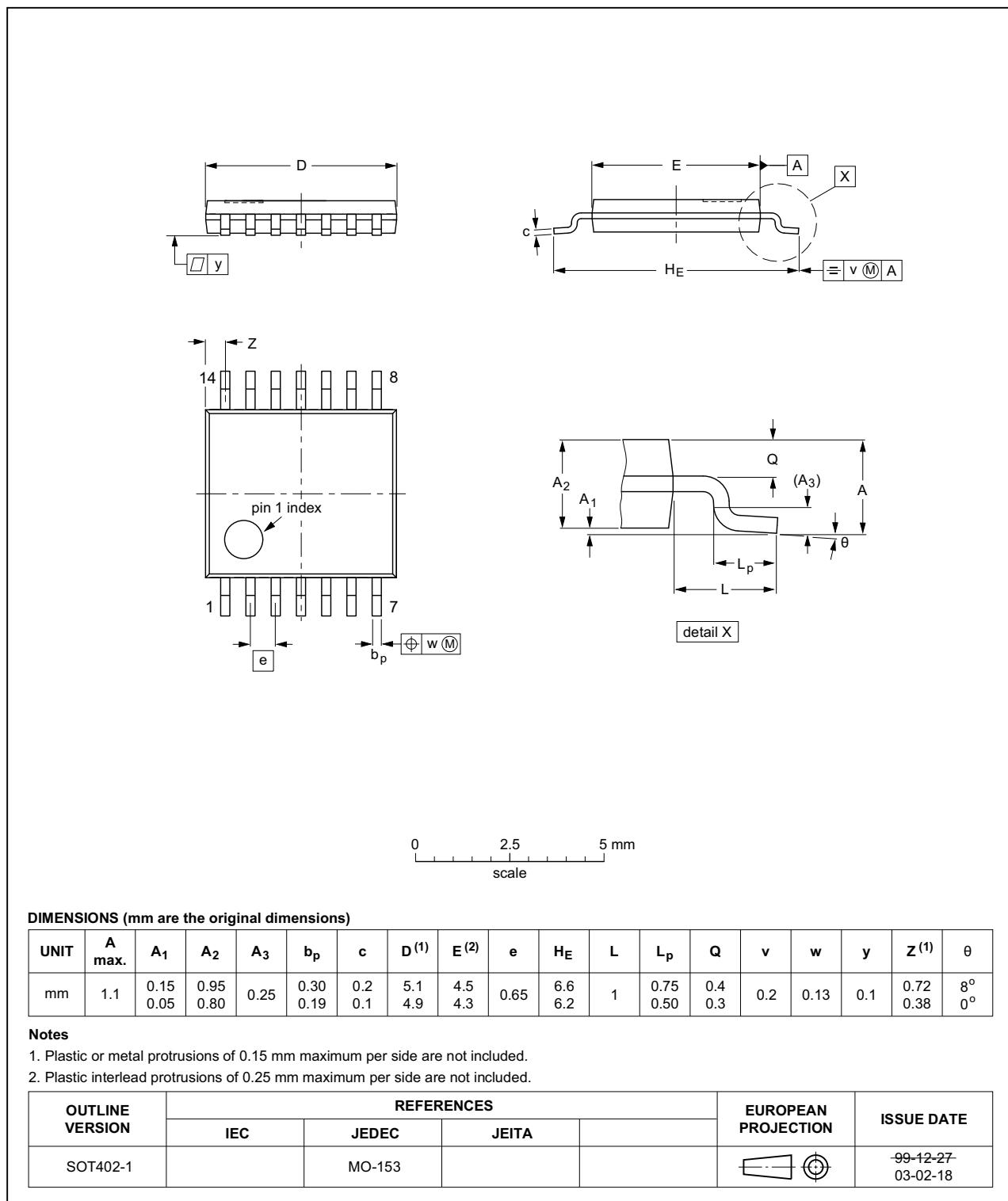


Fig 11. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1

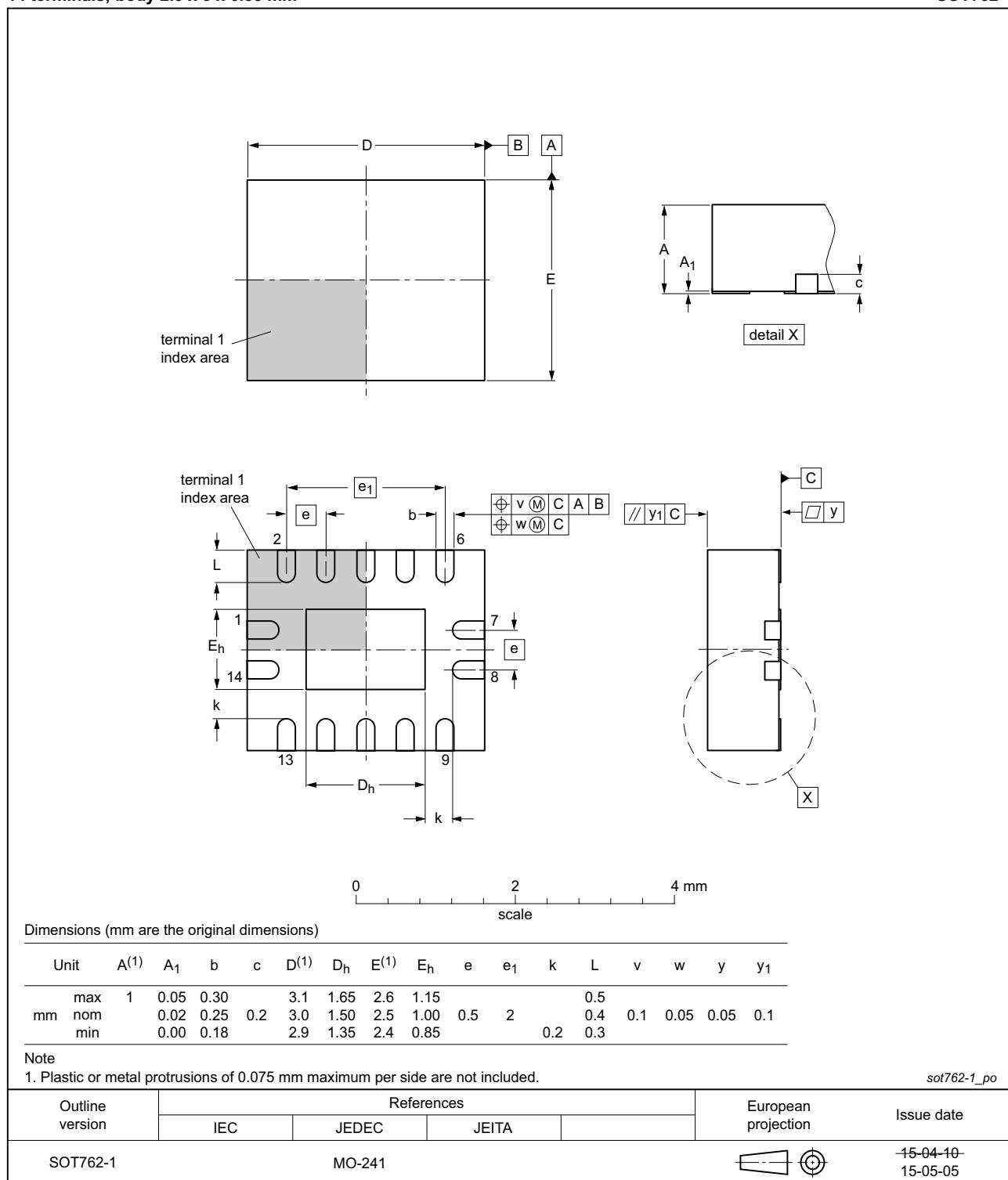


Fig 12. Package outline SOT762-1 (DHVQFN14)

## 13. Abbreviations

**Table 9. Abbreviations**

Acronym	Description
BiCMOS	BipolarCMOS
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 14. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ABT125 v.7	20151125	Product data sheet	-	74ABT125 v.6
Modifications:	<ul style="list-style-type: none"> <li>• Type number 74ABT125N (SOT27-1) removed.</li> </ul>			
74ABT125 v.6	20111103	Product data sheet	-	74ABT125 v.5
Modifications:	<ul style="list-style-type: none"> <li>• Legal pages updated</li> </ul>			
74ABT125 v.5	20101124	Product data sheet	-	74ABT125 v.4
74ABT125 v.4	20100427	Product data sheet	-	74ABT125 v.3
74ABT125 v.3	20080429	Product data sheet	-	74ABT125 v.2
74ABT125 v.2	19980116	Product specification	-	74ABT125 v.1
74ABT125 v.1	19960305	-	-	-

## 15. Legal information

### 15.1 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.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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## 17. 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 .....	3
<b>6</b>	<b>Functional description</b> .....	<b>3</b>
<b>7</b>	<b>Limiting values</b> .....	<b>3</b>
<b>8</b>	<b>Recommended operating conditions</b> .....	<b>4</b>
<b>9</b>	<b>Static characteristics</b> .....	<b>4</b>
<b>10</b>	<b>Dynamic characteristics</b> .....	<b>5</b>
<b>11</b>	<b>Waveforms</b> .....	<b>6</b>
<b>12</b>	<b>Package outline</b> .....	<b>8</b>
<b>13</b>	<b>Abbreviations</b> .....	<b>12</b>
<b>14</b>	<b>Revision history</b> .....	<b>12</b>
<b>15</b>	<b>Legal information</b> .....	<b>13</b>
15.1	Data sheet status .....	13
15.2	Definitions.....	13
15.3	Disclaimers.....	13
15.4	Trademarks.....	14
<b>16</b>	<b>Contact information</b> .....	<b>14</b>
<b>17</b>	<b>Contents</b> .....	<b>15</b>

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