

# 74ALVC125

Quad buffer/line driver; 3-state

Rev. 02 — 10 January 2008

Product data sheet

## 1. General description

The 74ALVC125 is a quad non-inverting buffer/line driver with 3-state outputs. The 3-state outputs ( $nY$ ) are controlled by the output enable input ( $n\overline{OE}$ ). A HIGH on the  $n\overline{OE}$  pin causes the outputs to assume a high-impedance OFF-state.

## 2. Features

- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
  - ◆ JESD8-7 (1.65 V to 1.95 V)
  - ◆ JESD8-5 (2.3 V to 2.7 V)
  - ◆ JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A 115-A exceeds 200 V

## 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74ALVC125D	-40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74ALVC125PW	-40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74ALVC125BQ	-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

### 4. Functional diagram

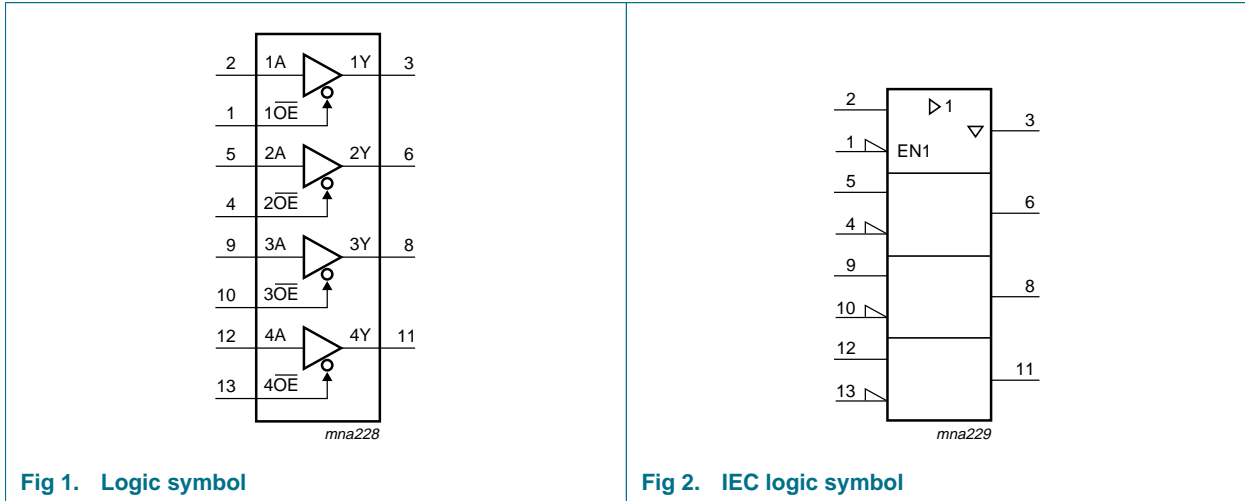


Fig 1. Logic symbol

Fig 2. IEC logic symbol

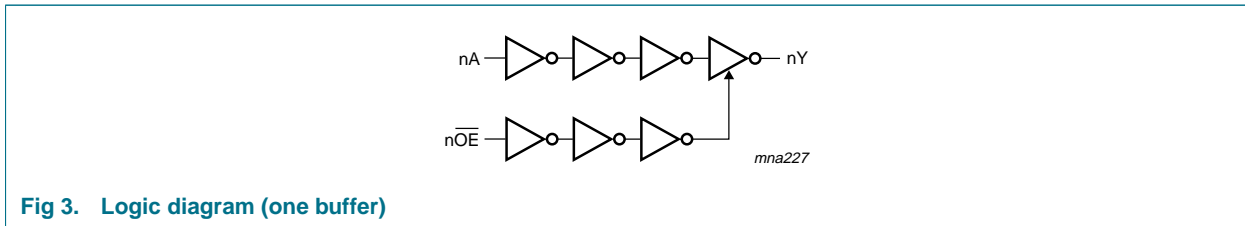


Fig 3. Logic diagram (one buffer)

### 5. Pinning information

#### 5.1 Pinning

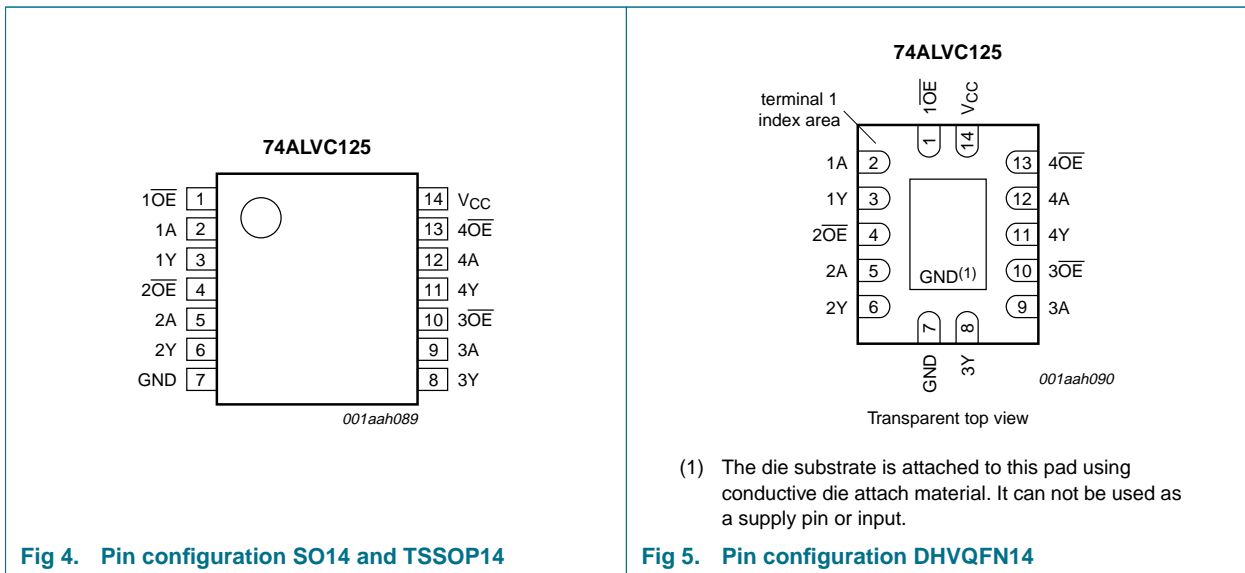


Fig 4. Pin configuration SO14 and TSSOP14

Fig 5. Pin configuration DHVQFN14

## 5.2 Pin description

Table 2. Pin description

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

## 6. Functional description

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

Input		Output	
n $\overline{\text{OE}}$	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

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	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-50	-	mA
V <sub>I</sub>	input voltage		[1] -0.5	+4.6	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
V <sub>O</sub>	output voltage	output HIGH or LOW state	[1][2] -0.5	V <sub>CC</sub> + 0.5	V
		output 3-state	-0.5	+4.6	V
		Power-down mode, V <sub>CC</sub> = 0 V	[2] -0.5	+4.6	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±50	mA
I <sub>CC</sub>	supply current		-	100	mA
I <sub>GND</sub>	ground current		-100	-	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	[3] -	500	mW

- [1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.  
 [2] When V<sub>CC</sub> = 0 V (Power-down mode), the output voltage can be 3.6 V in normal operation.  
 [3] For SO14 packages: above 70 °C derate linearly with 8 mW/K.  
 For TSSOP14 packages: above 60 °C derate linearly with 5.5 mW/K.  
 For DHVQFN20 packages: above 60 °C derate linearly with 4.5 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		1.65	3.6	V
$V_I$	input voltage		0	3.6	V
$V_O$	output voltage	output HIGH or LOW state	0	$V_{CC}$	V
		output 3-state	0	3.6	V
		Power-down mode; $V_{CC} = 0$ V	0	3.6	V
$T_{amb}$	ambient temperature	in free air	-40	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	0	20	ns/V
		$V_{CC} = 2.7$ V to 3.6 V	0	10	ns/V

## 9. Static characteristics

**Table 6. Static characteristics**

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>(1)</sup>	Max	
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
		$V_{CC} = 2.3$ V to 2.7 V	1.7	-	-	V
		$V_{CC} = 2.7$ V to 3.6 V	2.0	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 1.65$ V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	-	-	0.7	V
		$V_{CC} = 2.7$ V to 3.6 V	-	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -100$ $\mu$ A; $V_{CC} = 1.65$ V to 3.6 V	$V_{CC} - 0.2$	-	-	V
		$I_O = -6$ mA; $V_{CC} = 1.65$ V	1.25	1.51	-	V
		$I_O = -12$ mA; $V_{CC} = 2.3$ V	1.8	2.10	-	V
		$I_O = -18$ mA; $V_{CC} = 2.3$ V	1.7	2.01	-	V
		$I_O = -12$ mA; $V_{CC} = 2.7$ V	2.2	2.53	-	V
		$I_O = -18$ mA; $V_{CC} = 3.0$ V	2.4	2.76	-	V
		$I_O = -24$ mA; $V_{CC} = 3.0$ V	2.2	2.68	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 100$ $\mu$ A; $V_{CC} = 1.65$ V to 3.6 V	-	-	0.2	V
		$I_O = 6$ mA; $V_{CC} = 1.65$ V	-	0.11	0.3	V
		$I_O = 12$ mA; $V_{CC} = 2.3$ V	-	0.17	0.4	V
		$I_O = 18$ mA; $V_{CC} = 2.3$ V	-	0.25	0.6	V
		$I_O = 12$ mA; $V_{CC} = 2.7$ V	-	0.16	0.4	V
		$I_O = 18$ mA; $V_{CC} = 3.0$ V	-	0.23	0.4	V
		$I_O = 24$ mA; $V_{CC} = 3.0$ V	-	0.30	0.55	V
$I_I$	input leakage current	$V_{CC} = 3.6$ V; $V_I = 3.6$ V or GND	-	$\pm 0.1$	$\pm 5$	$\mu$ A

**Table 6. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
$I_{OZ}$	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 1.65$ V to 3.6 V; $V_O = 3.6$ V or GND;	-	$\pm 0.1$	$\pm 10$	$\mu$ A
$I_{OFF}$	power-off leakage current	$V_{CC} = 0$ V; $V_I$ or $V_O = 0$ V to 3.6 V	-	$\pm 0.1$	$\pm 10$	$\mu$ A
$I_{CC}$	supply current	$V_{CC} = 3.6$ V; $V_I = V_{CC}$ or GND; $I_O = 0$ A	-	0.2	10	$\mu$ A
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 3.0$ V to 3.6 V; $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A	-	5	750	$\mu$ A
$C_I$	input capacitance		-	3.5	-	pF

[1] All typical values are measured at  $V_{CC} = 3.3$  V (unless stated otherwise) and  $T_{amb} = 25$  °C.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 8](#).

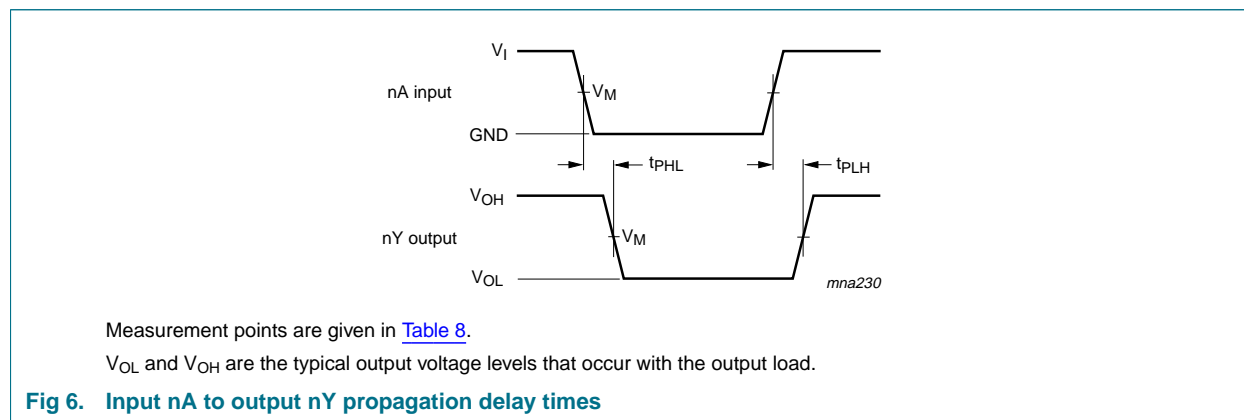
Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
$t_{pd}$	propagation delay	nA to nY; see <a href="#">Figure 6</a> <sup>[2]</sup>				
		$V_{CC} = 1.65$ V to 1.95 V	1.3	2.4	5.3	ns
		$V_{CC} = 2.3$ V to 2.7 V	1.0	1.7	3.2	ns
		$V_{CC} = 2.7$ V	-	2.0	3.1	ns
$t_{en}$	enable time	$V_{CC} = 3.0$ V to 3.6 V	1.1	1.8	2.8	ns
		n $\overline{OE}$ to nY; see <a href="#">Figure 7</a> <sup>[2]</sup>				
		$V_{CC} = 1.65$ V to 1.95 V	1.4	3.9	6.4	ns
		$V_{CC} = 2.3$ V to 2.7 V	1.0	2.2	4.1	ns
$t_{dis}$	disable time	$V_{CC} = 2.7$ V	-	2.7	4.3	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.0	1.9	3.5	ns
		n $\overline{OE}$ to nY; see <a href="#">Figure 7</a> <sup>[2]</sup>				
		$V_{CC} = 1.65$ V to 1.95 V	1.8	3.9	5.9	ns
		$V_{CC} = 2.3$ V to 2.7 V	1.0	2.1	3.4	ns
		$V_{CC} = 2.7$ V	-	2.9	4.0	ns
		$V_{CC} = 3.0$ V to 3.6 V	1.4	2.7	4.0	ns

**Table 7. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	
C <sub>PD</sub>	power dissipation capacitance	per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> ; V <sub>CC</sub> = 3.3 V <sup>[3]</sup>				
		outputs HIGH or LOW state	-	27	-	pF
		outputs 3-state	-	5	-	pF

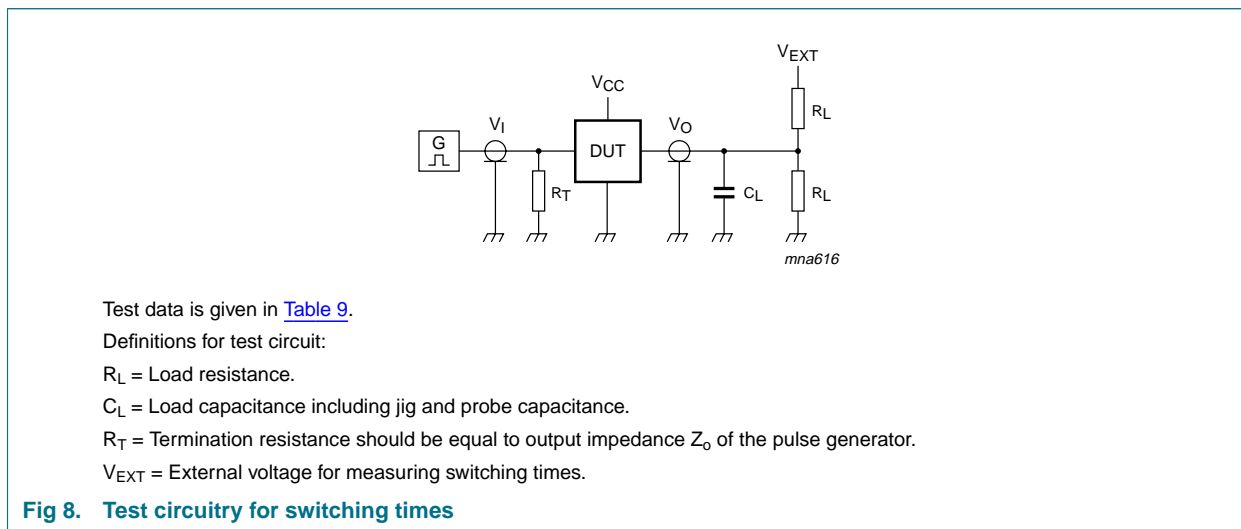
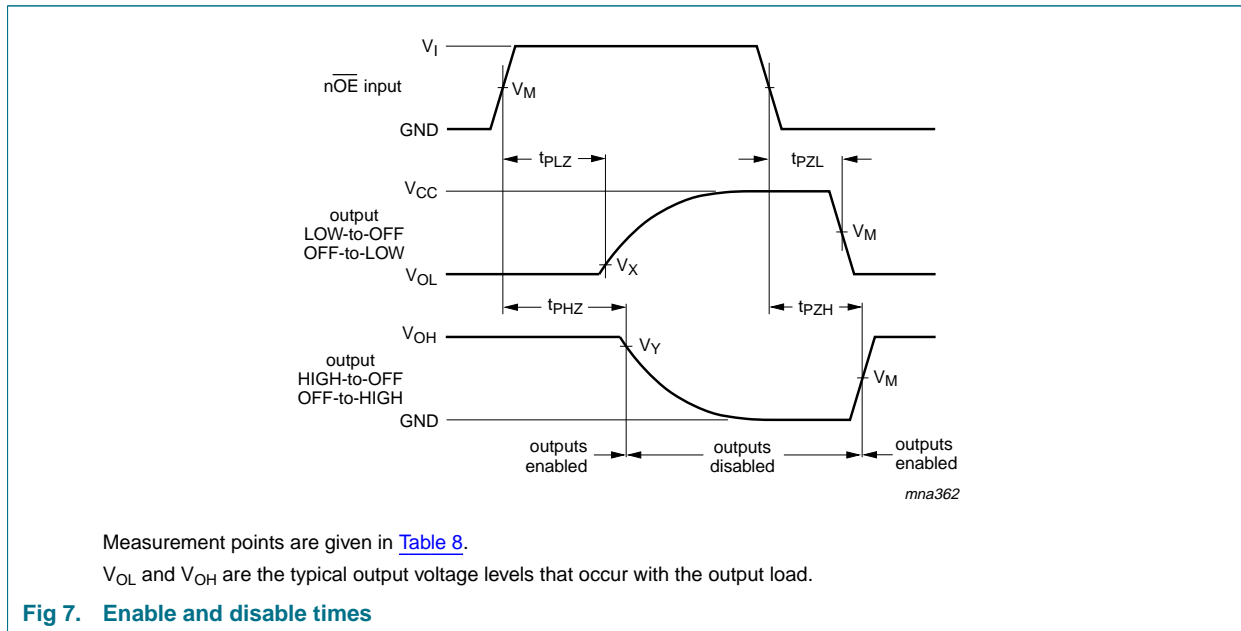
- [1] Typical values are measured at T<sub>amb</sub> = 25 °C
- [2] t<sub>pd</sub> is the same as t<sub>PHL</sub> and t<sub>PLH</sub>.  
 t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.  
 t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
- [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz; f<sub>o</sub> = output frequency in MHz  
 C<sub>L</sub> = output load capacitance in pF  
 V<sub>CC</sub> = supply voltage in Volts  
 N = number of inputs switching  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs

## 11. Waveforms



**Table 8. Measurement points**

Supply voltage	Input	Output		
		V <sub>M</sub>	V <sub>X</sub>	V <sub>Y</sub>
1.65 V to 1.95 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V
2.3 V to 2.7 V	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V <sub>OL</sub> + 0.15 V	V <sub>OH</sub> - 0.15 V
2.7 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V <sub>OL</sub> + 0.3 V	V <sub>OH</sub> - 0.3 V



**Table 9. Test data**

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.65 V to 1.95 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	6 V	GND

12. Package outline

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

SOT108-1

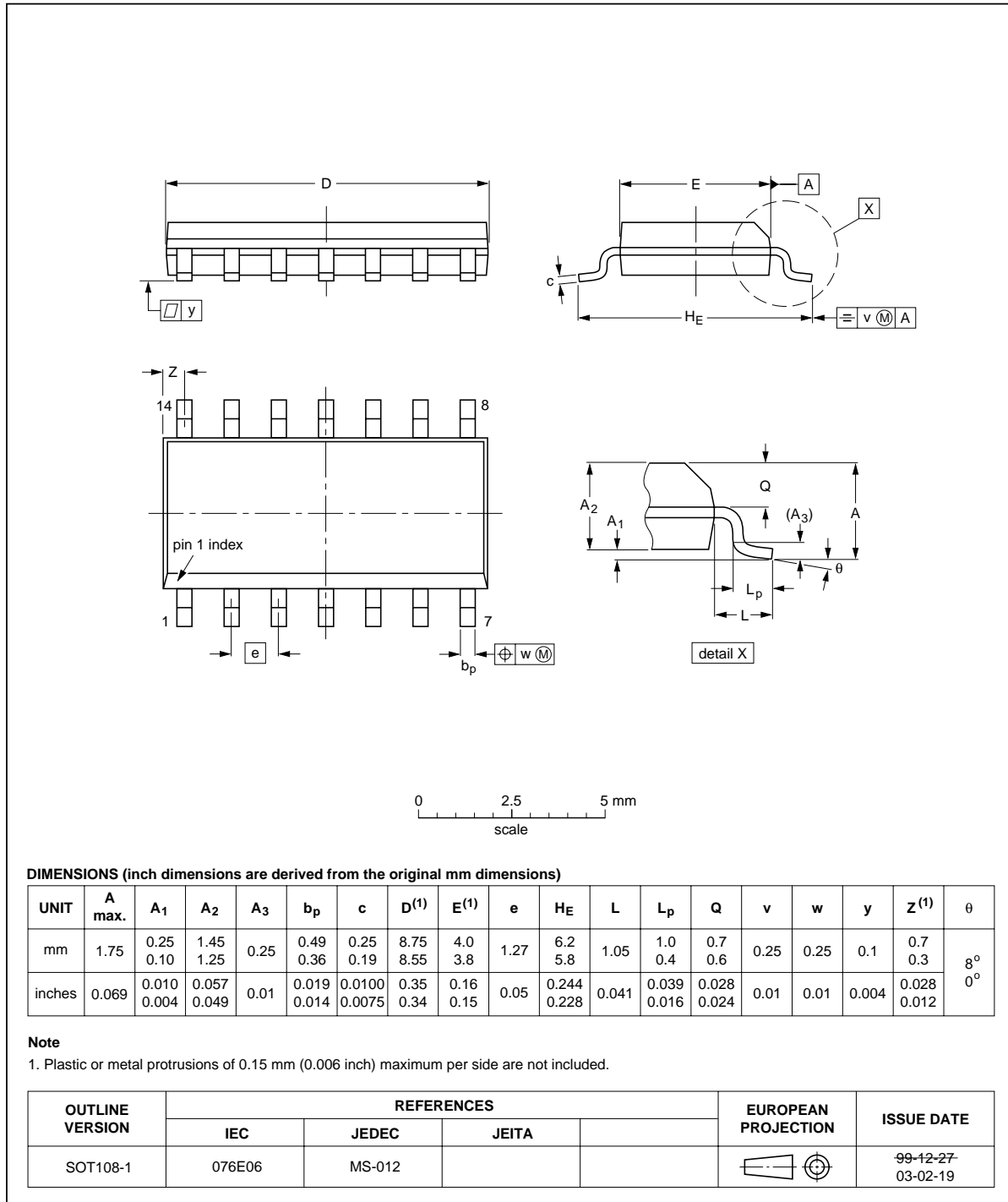


Fig 9. Package outline SOT108-1 (SO14)



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

SOT402-1

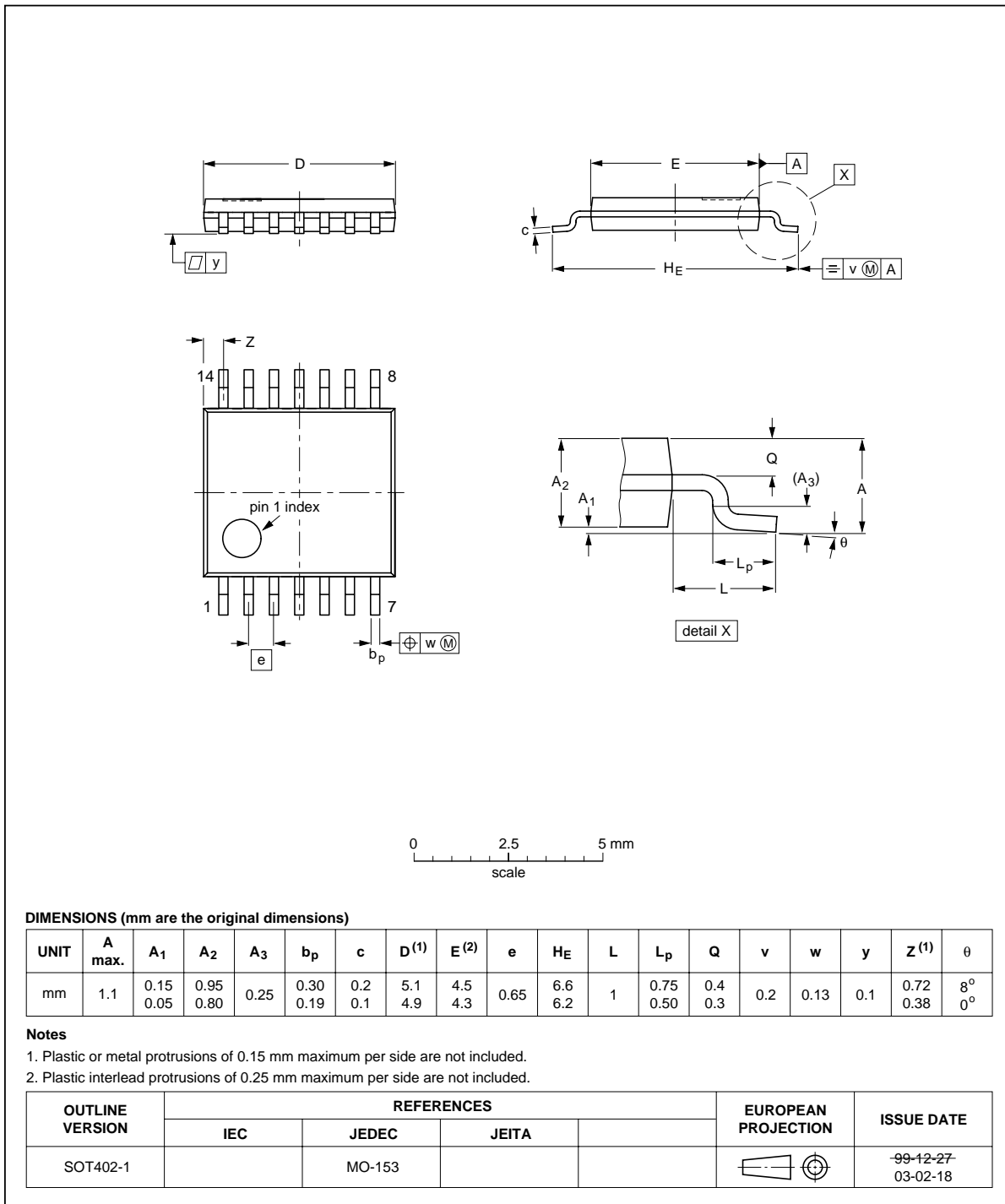


Fig 10. Package outline SOT402-1 (TSSOP14)

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

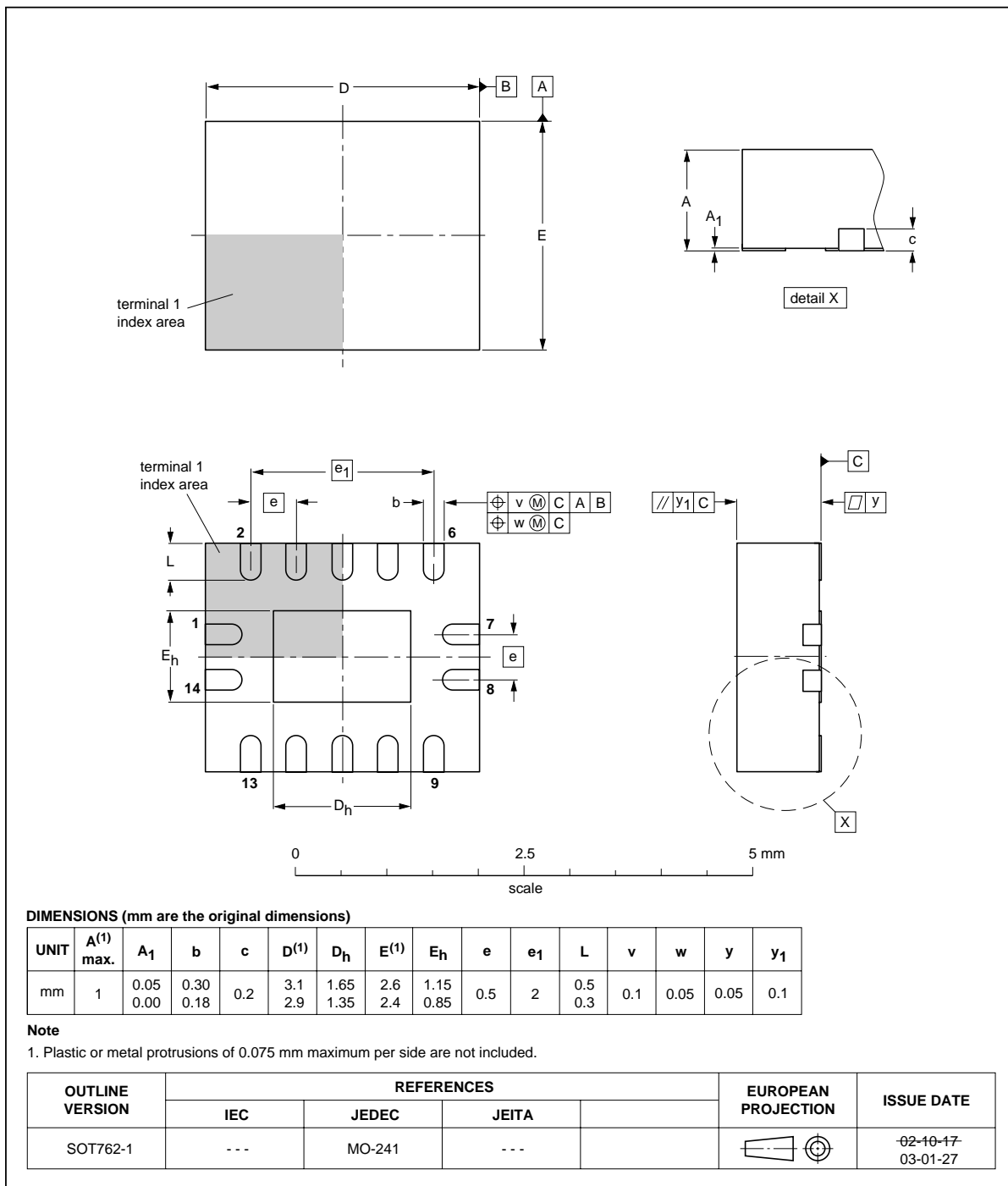


Fig 11. Package outline SOT762-1 (DHVQFN14)

## 13. 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

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVC125_2	20080110	Product data sheet	-	74ALVC125_1
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 3</a>: DHVQFN14 package added.</li> <li><a href="#">Section 7</a>: derating values added for DHVQFN14 package.</li> <li><a href="#">Section 12</a>: outline drawing added for DHVQFN14 package.</li> </ul>			
74ALVC125_1	20021118	Product specification	-	-

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

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## 17. Contents

<b>1</b>	<b>General description</b> .....	<b>1</b>
<b>2</b>	<b>Features</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>11</b>
<b>14</b>	<b>Revision history</b> .....	<b>11</b>
<b>15</b>	<b>Legal information</b> .....	<b>12</b>
15.1	Data sheet status .....	12
15.2	Definitions .....	12
15.3	Disclaimers .....	12
15.4	Trademarks .....	12
<b>16</b>	<b>Contact information</b> .....	<b>12</b>
<b>17</b>	<b>Contents</b> .....	<b>13</b>

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Date of release: 10 January 2008

Document identifier: 74ALVC125\_2