

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

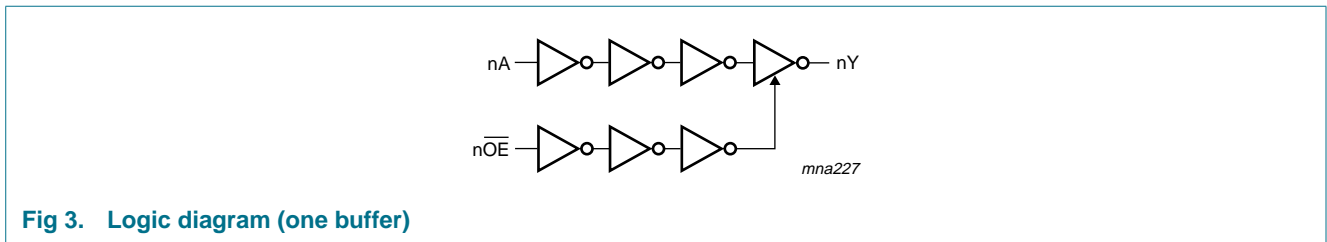
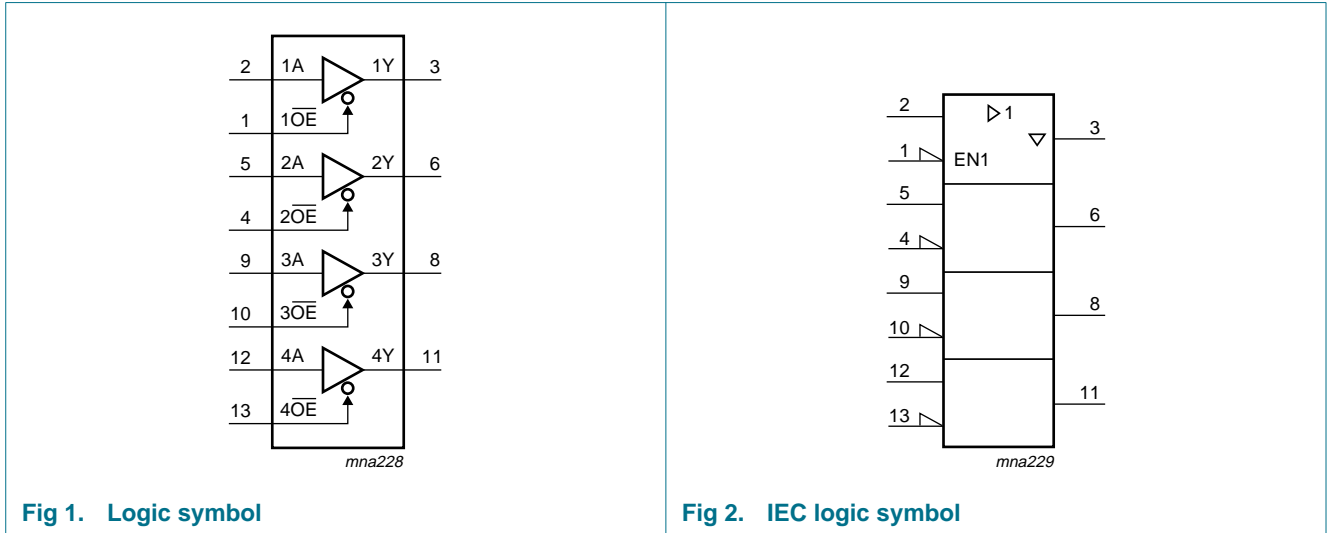
- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
 - ◆ JESD8-7 (1.65 V to 1.95 V)
 - ◆ JESD8-5 (2.3 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

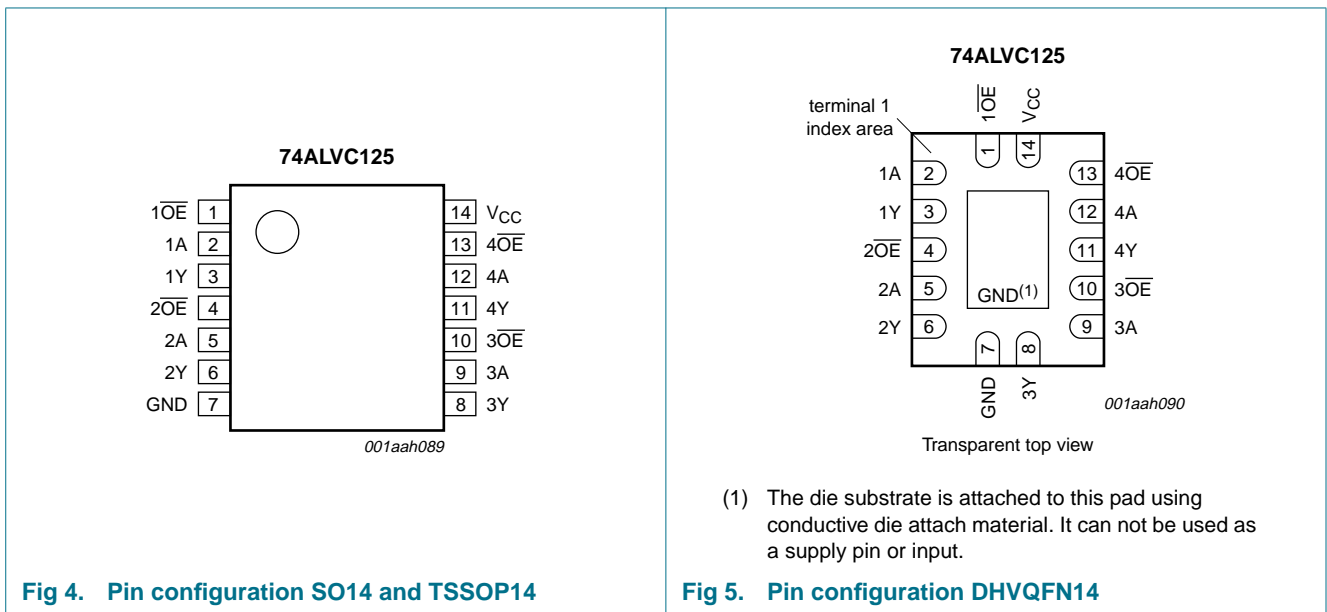
Type number	Package			Version
	Temperature range	Name	Description	
74ALVC125D	-40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74ALVC125PW	-40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74ALVC125BQ	-40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



5. Pinning information

5.1 Pinning



(1) The die substrate is attached to this pad using conductive die attach material. It can not be used as a supply pin or input.

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 _{CC}	14	supply voltage
GND	7	ground (0 V)

6. Functional description

Table 3. Function table^[1]

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 _{CC}	supply voltage		-0.5	+4.6	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
V _I	input voltage		[1] -0.5	+4.6	V
I _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V	-	±50	mA
V _O	output voltage	output HIGH or LOW state	[1][2] -0.5	V _{CC} + 0.5	V
		output 3-state	-0.5	+4.6	V
		Power-down mode, V _{CC} = 0 V	[2] -0.5	+4.6	V
I _O	output current	V _O = 0 V to V _{CC}	-	±50	mA
I _{CC}	supply current		-	100	mA
I _{GND}	ground current		-100	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	T _{amb} = -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_{CC} = 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 ^[1]	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}				
		$I_O = -100$ μ 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}				
		$I_O = 100$ μ 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	-	± 0.1	± 5	μ 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 ^[1]	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;	-	± 0.1	± 10	μ A
I_{OFF}	power-off leakage current	$V_{CC} = 0$ V; V_I or $V_O = 0$ V to 3.6 V	-	± 0.1	± 10	μ A
I_{CC}	supply current	$V_{CC} = 3.6$ V; $V_I = V_{CC}$ or GND; $I_O = 0$ A	-	0.2	10	μ A
ΔI_{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	μ 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 characteristicsVoltages are referenced to GND (ground = 0 V). For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ ^[1]	Max	
t_{pd}	propagation delay	nA to nY; see Figure 6 ^[2]				
		$V_{CC} = 1.65$ 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 Figure 7 ^[2]				
		$V_{CC} = 1.65$ 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 Figure 7 ^[2]				
		$V_{CC} = 1.65$ 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 ^[1]	Max	
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} ; V _{CC} = 3.3 V ^[3]				
		outputs HIGH or LOW state	-	27	-	pF
		outputs 3-state	-	5	-	pF

[1] Typical values are measured at T_{amb} = 25 °C

[2] t_{pd} is the same as t_{PHL} and t_{PLH}.

t_{en} is the same as t_{PZH} and t_{PZL}.

t_{dis} is the same as t_{PHZ} and t_{PLZ}.

[3] C_{PD} is used to determine the dynamic power dissipation (P_D 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_i = input frequency in MHz; f_o = output frequency in MHz

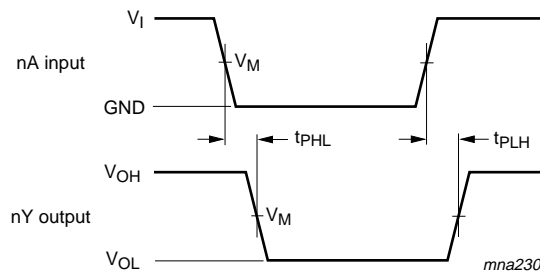
C_L = output load capacitance in pF

V_{CC} = supply voltage in Volts

N = number of inputs switching

Σ(C_L × V_{CC}² × f_o) = sum of the outputs

11. Waveforms



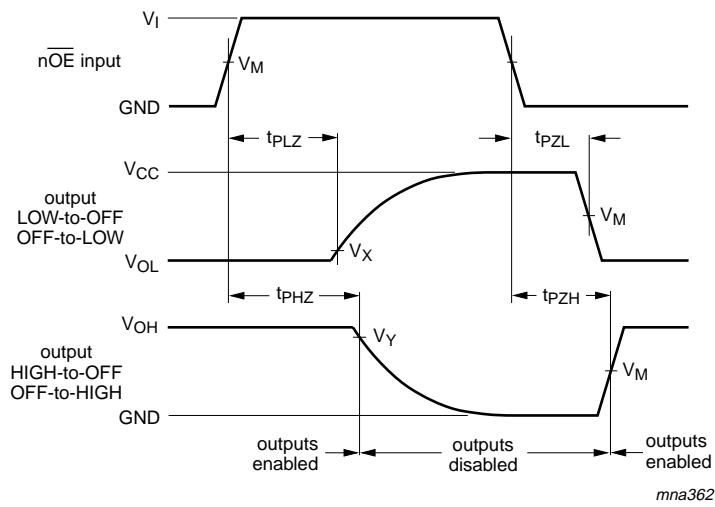
Measurement points are given in [Table 8](#).

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

Fig 6. Input nA to output nY propagation delay times

Table 8. Measurement points

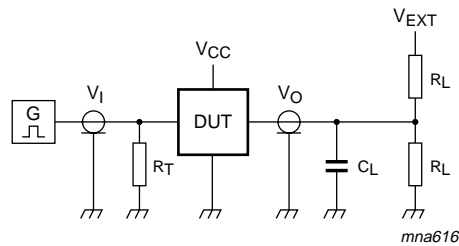
Supply voltage	Input	Output		
V _{CC}	V _M	V _M	V _X	V _Y
1.65 V to 1.95 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V
2.3 V to 2.7 V	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V
2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V
3.0 V to 3.6 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 V



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

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

Fig 7. Enable and disable times



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 output impedance Z_o of the pulse generator.

V_{EXT} = External voltage for measuring switching times.

Fig 8. Test circuitry for switching times

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}	≤ 2.0 ns	30 pF	1 k Ω	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND

12. Package outline

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

SOT108-1

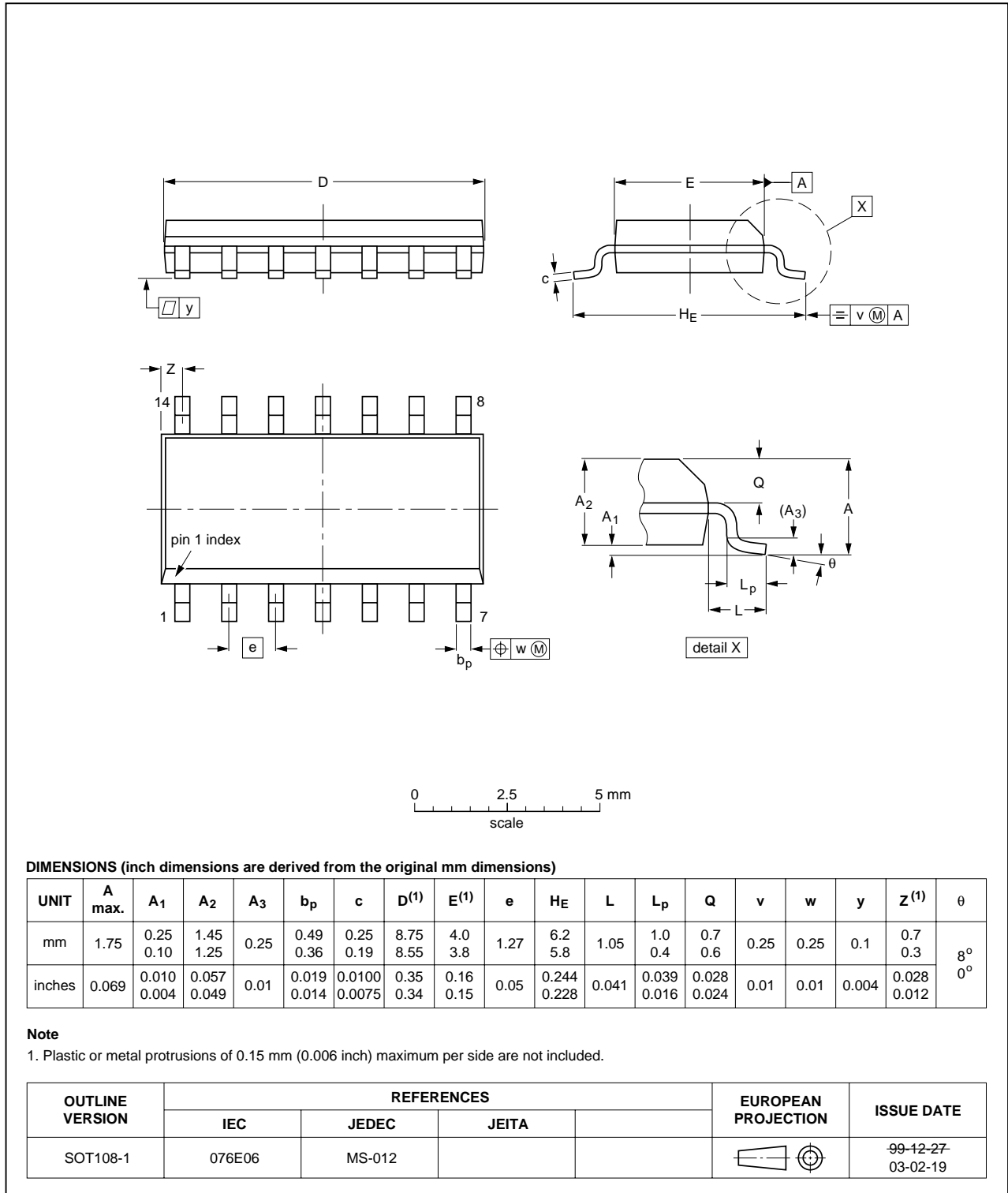


Fig 9. Package outline SOT108-1 (SO14)

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

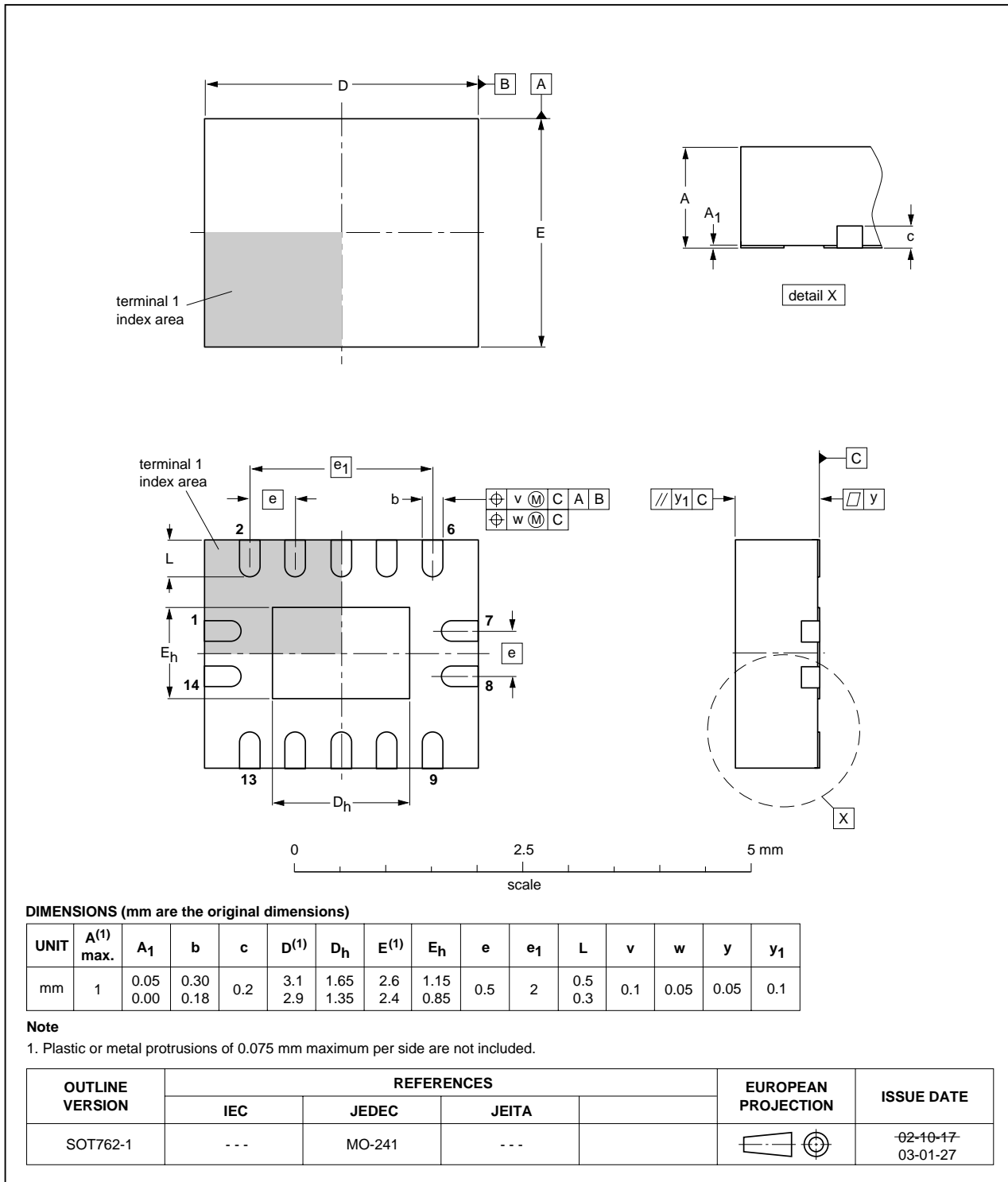


Fig 11. Package outline SOT762-1 (DHVQFN14)

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"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 3: DHVQFN14 package added. • Section 7: derating values added for DHVQFN14 package. • Section 12: outline drawing added for DHVQFN14 package. 			
74ALVC125_1	20021118	Product specification	-	-

15. Legal information

15.1 Data sheet status

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

[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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Телефон: 8 (812) 309-75-97 (многоканальный)

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Web: <http://oceanchips.ru/>

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