

# 74ALVC125

## Quad buffer/line driver; 3-state

Rev. 4 — 30 April 2021

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 (nOE). A HIGH on the nOE pin causes the outputs to assume a high-impedance OFF-state.

### 2. Features and benefits

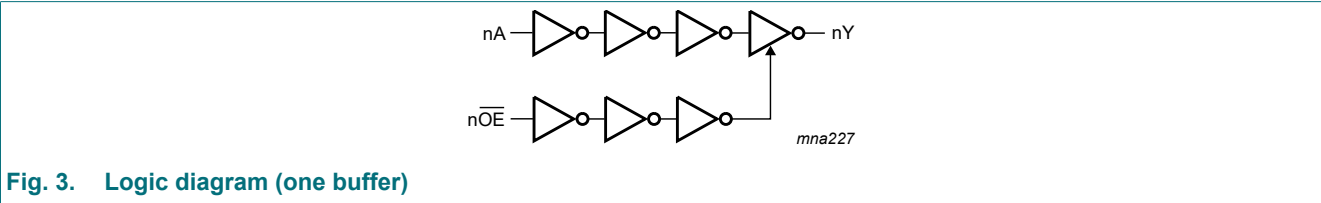
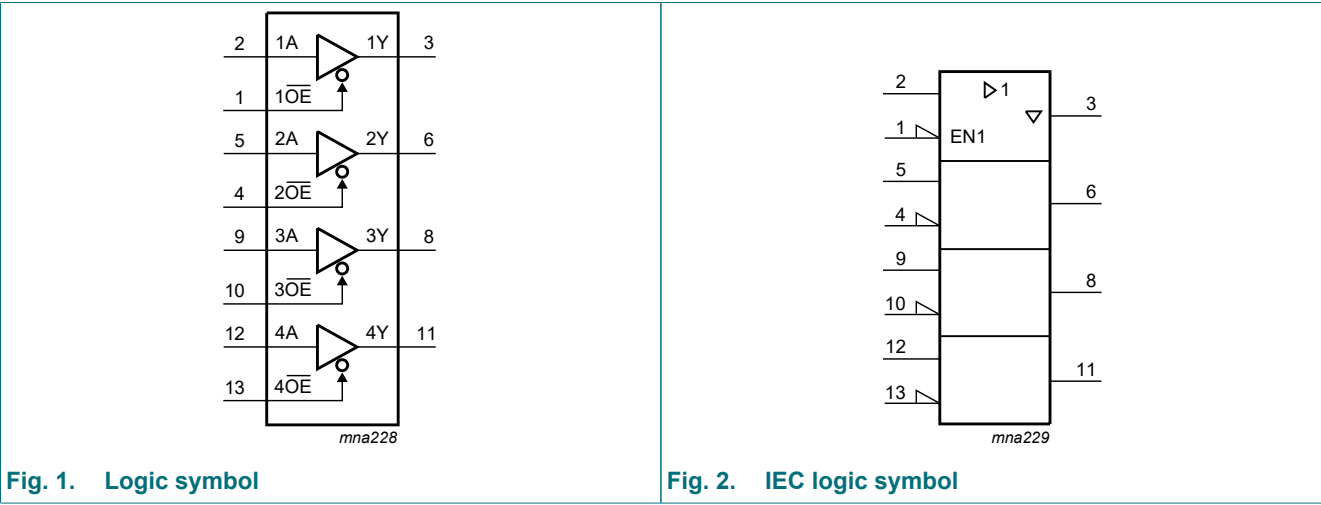
- Wide supply voltage range from 1.65 V to 3.6 V
- 3.6 V tolerant inputs/outputs
- CMOS low power consumption
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Power-down mode
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standards:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8B (2.7 V to 3.6 V)
- ESD protection:
  - MM JESD22-A115-A exceeds 200 V
  - HBM JESD22-A114E exceeds 2000 V
- Multiple package options
- Specified from -40 °C to +85 °C

### 3. Ordering information

Table 1. Ordering information

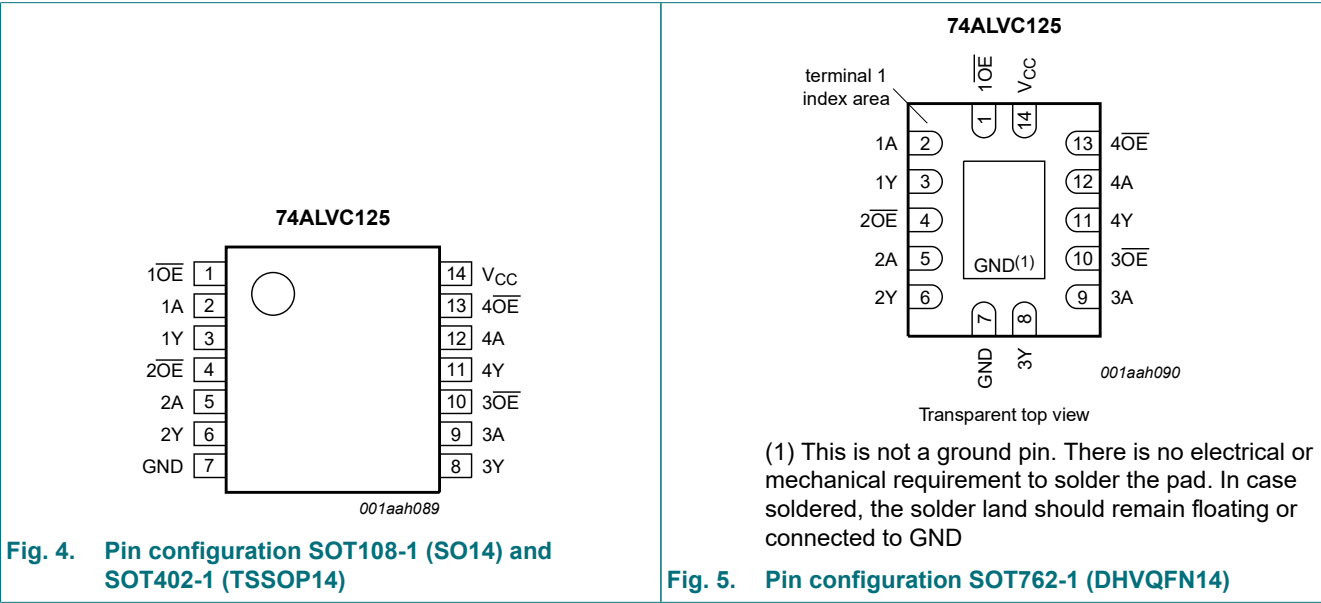
Type number	Package			
	Temperature range	Name	Description	Version
74ALVC125D	-40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74ALVC125PW	-40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74ALVC125BQ	-40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



## 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
nOE	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

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

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

## 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]	-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	-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 [2]	-	500	mW

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

[2] For SOT402-1 (TSSOP14) package: P<sub>tot</sub> derates linearly with 7.3 mW/K above 81 °C.

## 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 $V_{IL}$				
		$I_O = -100$ $\mu$ 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
$I_{OZ}$	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

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ[1]	Max	
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	0.2	10	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 3.0 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	5	750	μA
C <sub>I</sub>	input capacitance		-	3.5	-	pF

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 8.

Symbol	Parameter	Conditions	-40 °C to +85 °C			Unit
			Min	Typ[1]	Max	
t <sub>pd</sub>	propagation delay	nA to nY; see Fig. 6 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.3	2.4	5.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	1.7	3.2	ns
		V <sub>CC</sub> = 2.7 V	-	2.0	3.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.1	1.8	2.8	ns
t <sub>en</sub>	enable time	nOE to nY; see Fig. 7 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.4	3.9	6.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.2	4.1	ns
		V <sub>CC</sub> = 2.7 V	-	2.7	4.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	1.9	3.5	ns
t <sub>dis</sub>	disable time	nOE to nY; see Fig. 7 [2]				
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.8	3.9	5.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.0	2.1	3.4	ns
		V <sub>CC</sub> = 2.7 V	-	2.9	4.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.4	2.7	4.0	ns
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 [3]				
		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

10.1. Waveforms and test circuit

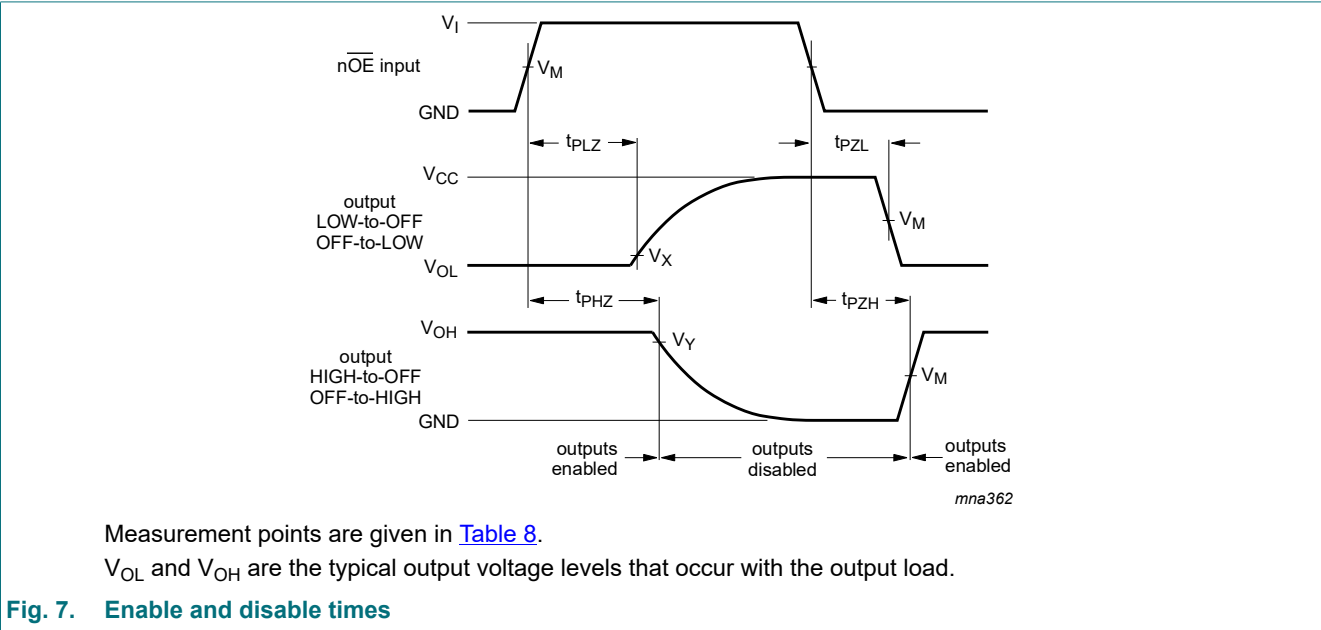
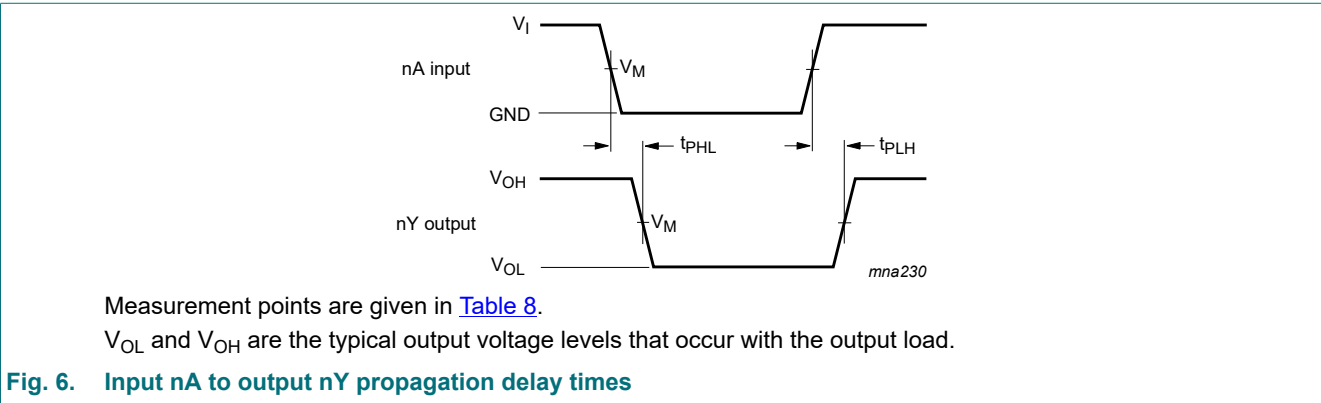
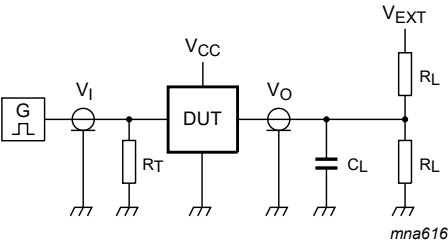


Table 8. Measurement points

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
1.65 V to 1.95 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
2.3 V to 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$
3.0 V to 3.6 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$



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 circuit for measuring 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	$V_{CC}$	$\leq 2.0$ ns	30 pF	1 k $\Omega$	open	2 x $V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 $\Omega$	open	2 x $V_{CC}$	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

11. Package outline

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

SOT108-1

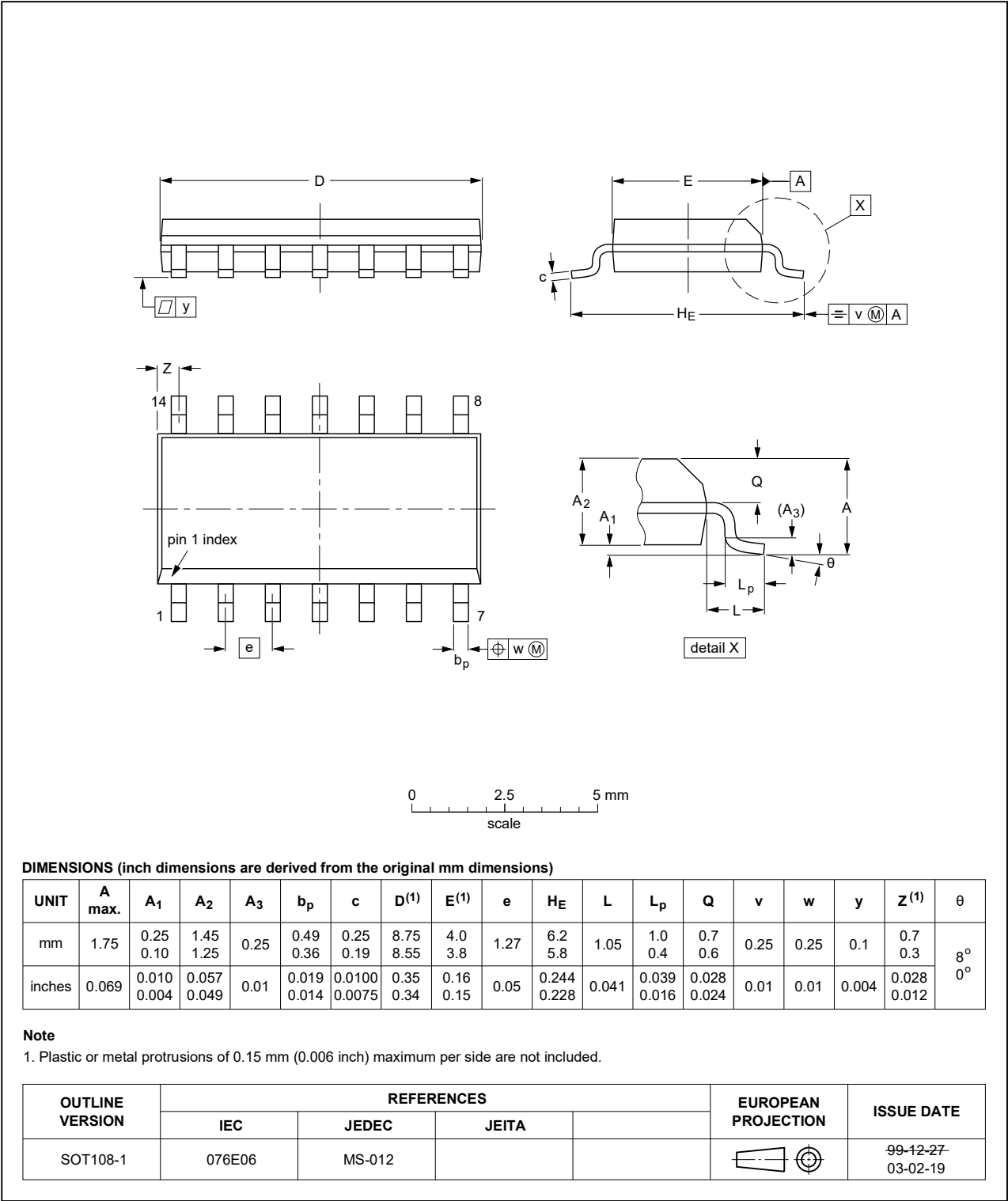


Fig. 9. Package outline SOT108-1 (SO14)



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

SOT402-1

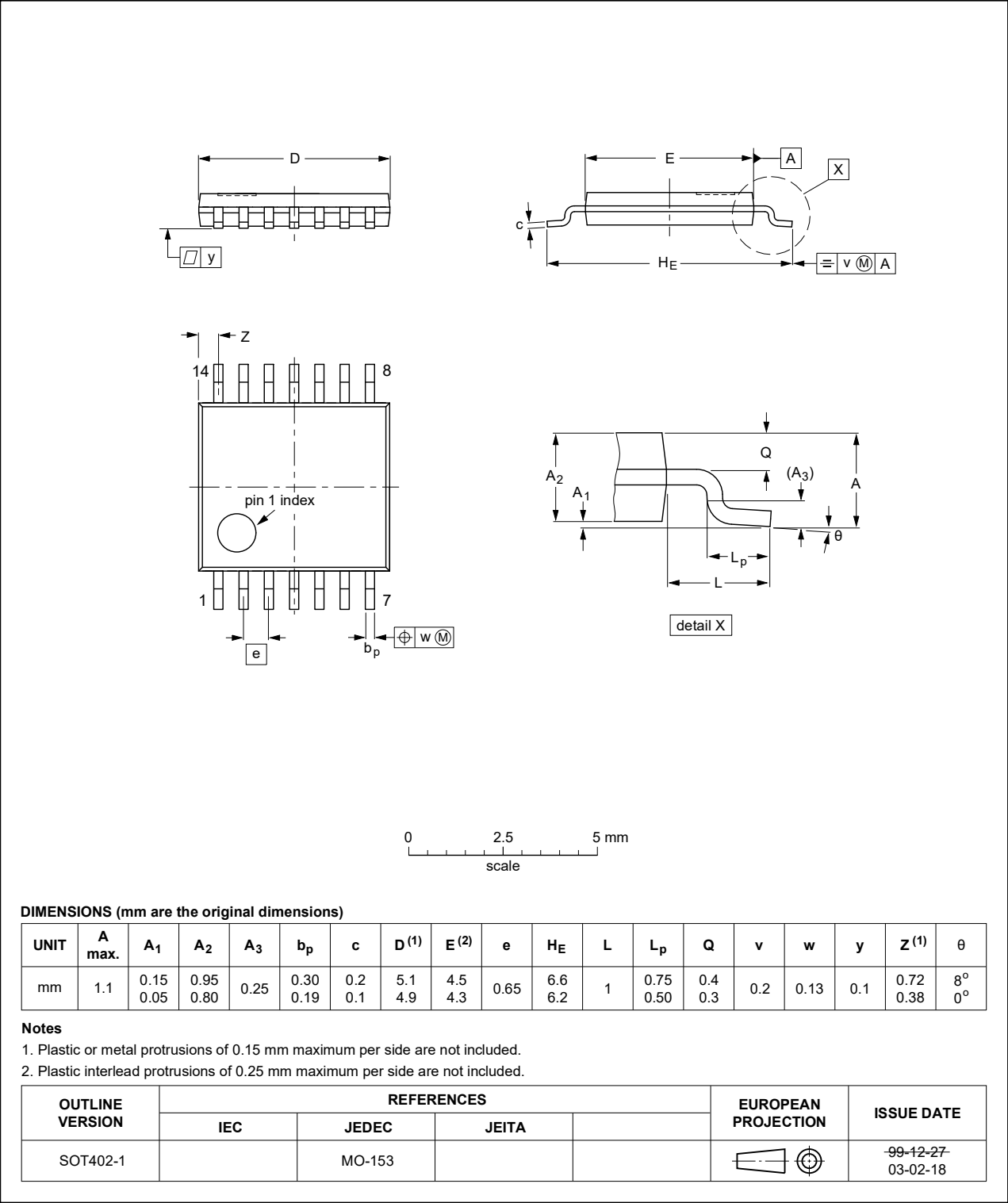
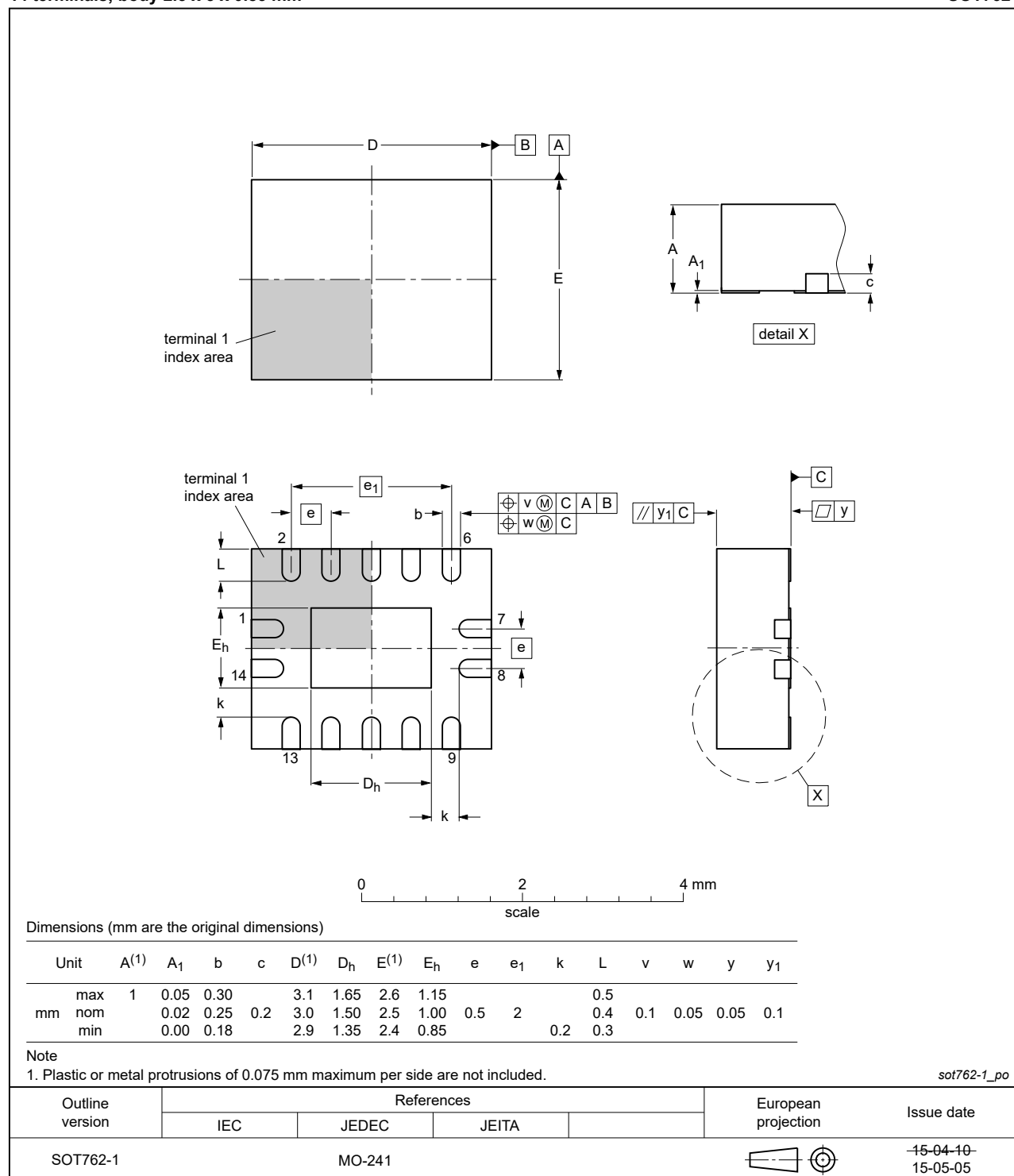


Fig. 10. Package outline SOT402-1 (TSSOP14)

**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)**

## 12. Abbreviations

Table 10. Abbreviations

Acronym	Description
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVC125 v.4	20210430	Product data sheet	-	74ALVC125 v.3
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 2</a>: Reference to JESD36 removed.</li> <li>• <a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated (errata).</li> </ul>			
74ALVC125 v.3	20200924	Product data sheet	-	74ALVC125 v.2
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation have been updated.</li> <li>• Package outline drawing of SOT762-1 (<a href="#">Fig. 11</a>) updated.</li> </ul>			
74ALVC125 v.2	20080110	Product data sheet	-	74ALVC125 v.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 11</a>: outline drawing added for DHVQFN14 package.</li> </ul>			
74ALVC125 v.1	20021118	Product specification	-	-

## 14. Legal information

### 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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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