

# 74LVT125; 74LVTH125

3.3 V quad buffer; 3-state

Rev. 8 — 18 August 2021

Product data sheet

## 1. General description

The 74LVT125; 74LVTH125 is a quad buffer/line driver with 3-state outputs controlled by the output enable inputs ( $n\overline{OE}$ ). A HIGH on  $n\overline{OE}$  causes the outputs to assume a high impedance OFF-state. Bus hold data inputs eliminate the need for external pull-up resistors to define unused inputs. This device is fully specified for partial power down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the potentially damaging backflow current through the device when it is powered down.

## 2. Features and benefits

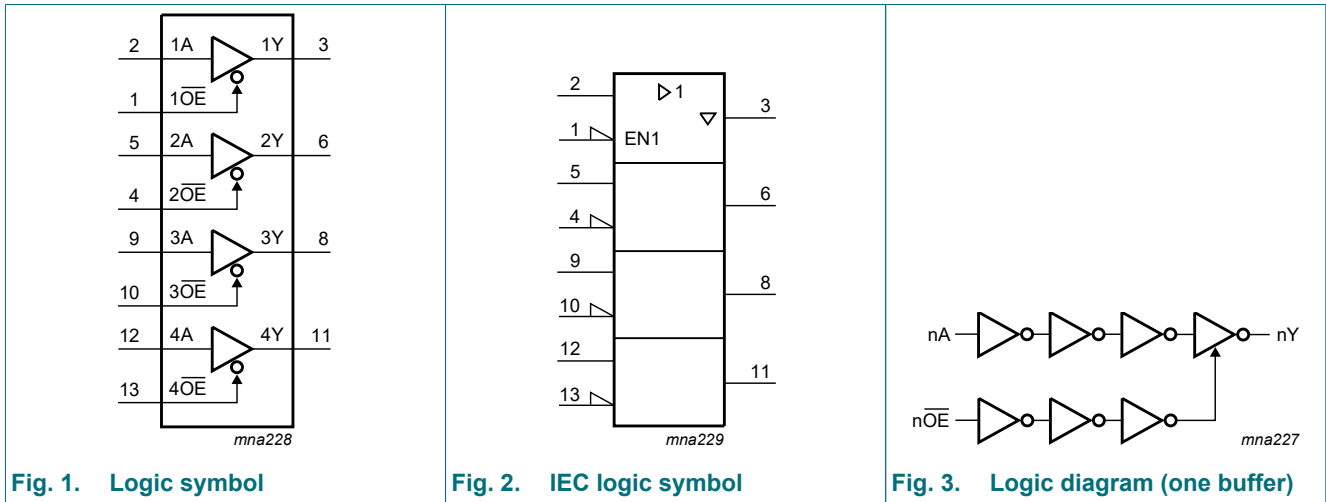
- Quad bus interface
- 3-state buffers
- Wide supply voltage range from 2.7 to 3.6 V
- BiCMOS high speed and output drive
- Output capability: +64 mA and -32 mA
- Direct interface with TTL levels
- Overvoltage tolerant inputs to 5.5 V
- Bus hold data inputs eliminate need for external pull-up resistors to hold unused inputs
- Live insertion and extraction permitted
- No bus current loading when output is tied to 5 V bus
- Power-up 3-state
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- Complies with JEDEC standard JESD8C (2.7 V to 3.6 V)
- ESD protection:
  - HBM EIA/JESD22-A114-A exceeds 2000V
  - MM EIA/JESD22-A115-A exceeds 200V
- Specified from -40 °C to 85 °C

## 3. Ordering information

Table 1. Ordering information

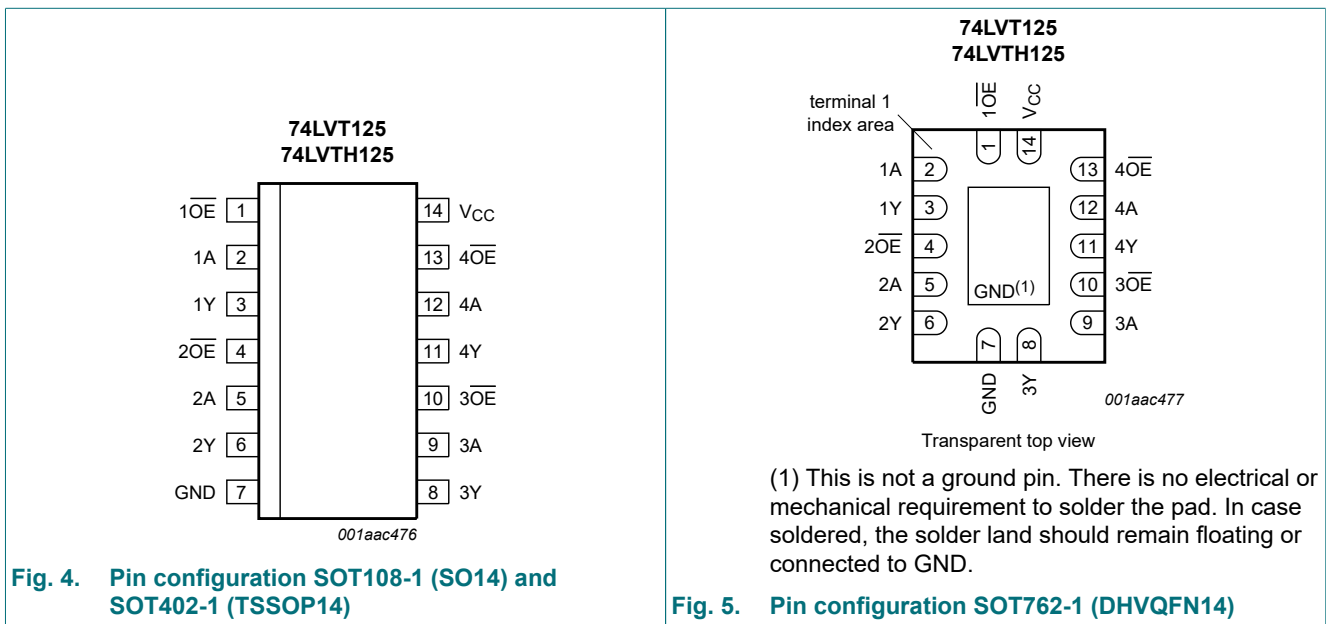
Type number	Package			Version
	Temperature range	Name	Description	
74LVT125D	-40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LVTH125D				
74LVT125PW	-40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74LVTH125PW				
74LVT125BQ	-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
74LVTH125BQ				

## 4. Functional diagram



## 5. Pinning information

### 5.1. Pinning



## 5.2. Pin description

Table 2. Pin description

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

## 6. Functional description

Table 3. Function table

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

Control	Input	Output
n $\overline{\text{OE}}$	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
V <sub>I</sub>	input voltage	[1]	-0.5	+7.0	V
V <sub>O</sub>	output voltage	output in OFF-state or HIGH-state [1]	-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-	-50	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
		output in HIGH-state	-	-64	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
T <sub>j</sub>	junction temperature	[2]	-	150	°C

[1] The input and output negative voltage ratings may be exceeded if the input and output clamp 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.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		2.7	-	3.6	V
V <sub>I</sub>	input voltage		0	-	5.5	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	none	-	-	32	mA
		current duty cycle ≤ 50 %; f ≥ 1 kHz	-	-	64	mA
Δt/ΔV	input transition rise and fall rate		0	-	10	ns/V
T <sub>amb</sub>	ambient temperature	in free air	-40	-	+85	°C

## 9. Static characteristics

**Table 6. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IK</sub>	input clamping voltage	I <sub>IK</sub> = -18 mA; V <sub>CC</sub> = 2.7 V	-	-0.9	-1.2	V
V <sub>OH</sub>	HIGH-level output voltage	I <sub>OH</sub> = -100 μA; V <sub>CC</sub> = 2.7 V to 3.6 V	V <sub>CC</sub> - 0.2	V <sub>CC</sub> - 0.1	-	V
		I <sub>OH</sub> = -8 mA; V <sub>CC</sub> = 2.7 V	2.4	2.5	-	V
		I <sub>OH</sub> = -32 mA; V <sub>CC</sub> = 3.0 V	2.0	2.2	-	V

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 2.7 V				
		I <sub>OL</sub> = 100 μA	-	0.1	0.2	V
		I <sub>OL</sub> = 24 mA	-	0.3	0.5	V
		V <sub>CC</sub> = 3.0 V				
		I <sub>OL</sub> = 16 mA	-	0.25	0.4	V
		I <sub>OL</sub> = 32 mA	-	0.3	0.5	V
I <sub>I</sub>	input leakage current	all input pins				
		V <sub>CC</sub> = 0 V or 3.6 V; V <sub>I</sub> = 5.5 V	-	1	10	μA
		control pins				
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	±0.1	±1	μA
		data pins [2]				
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub>	-	0.1	1	μA
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V	-	-1	-5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 0 V to 4.5 V	-	1	±100	μA
I <sub>BHL</sub>	bus hold LOW current	V <sub>CC</sub> = 3 V; V <sub>I</sub> = 0.8 V [3]	75	150	-	μA
I <sub>BHH</sub>	bus hold HIGH current	V <sub>CC</sub> = 3 V; V <sub>I</sub> = 2.0 V	-	-150	-75	μA
I <sub>BHLO</sub>	bus hold LOW overdrive current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V to 3.6 V	500	-	-	μA
I <sub>BHHO</sub>	bus hold HIGH overdrive current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V to 3.6 V	-	-	-500	μA
I <sub>LO</sub>	output leakage current	output in HIGH-state when V <sub>O</sub> > V <sub>CC</sub> ; V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 3.0 V	-	60	125	μA
I <sub>O(pu/pd)</sub>	power-up/power-down output current	V <sub>CC</sub> ≤ 1.2 V; V <sub>O</sub> = 0.5 V to V <sub>CC</sub> ; V <sub>I</sub> = GND or V <sub>CC</sub> ; nOE = don't care [4]	-	±1	±100	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		output HIGH: V <sub>O</sub> = 3.0 V	-	1	5	μA
		output LOW: V <sub>O</sub> = 0.5 V	-	-1	-5	μA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A				
		outputs HIGH	-	0.13	0.19	mA
		outputs LOW	-	2	7	mA
		outputs disabled [5]	-	0.13	0.19	mA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 3 V to 3.6 V; one input at V <sub>CC</sub> - 0.6 V and other inputs at V <sub>CC</sub> or GND [6]	-	0.1	0.2	mA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = 0 V or 3.0 V	-	4	-	pF
C <sub>O</sub>	output capacitance	outputs disabled; V <sub>O</sub> = 0 V or 3.0 V	-	8	-	pF

[1] Typical values are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

[2] Unused pins at V<sub>CC</sub> or GND.

[3] This is the bus hold overdrive current required to force the input to the opposite logic state.

[4] This parameter is valid for any V<sub>CC</sub> between 0 V and 1.2 V with a transition time of up to 10 ms.

From V<sub>CC</sub> = 1.2 V to V<sub>CC</sub> = 3.0 V to 3.6 V a transition time of 100 μs is permitted. This parameter is valid for T<sub>amb</sub> = 25 °C only.

[5] I<sub>CC</sub> is measured with outputs pulled to V<sub>CC</sub> or GND.

[6] This is the increase in supply current for each input at the specified voltage level other than V<sub>CC</sub> or GND.

## 10. Dynamic characteristics

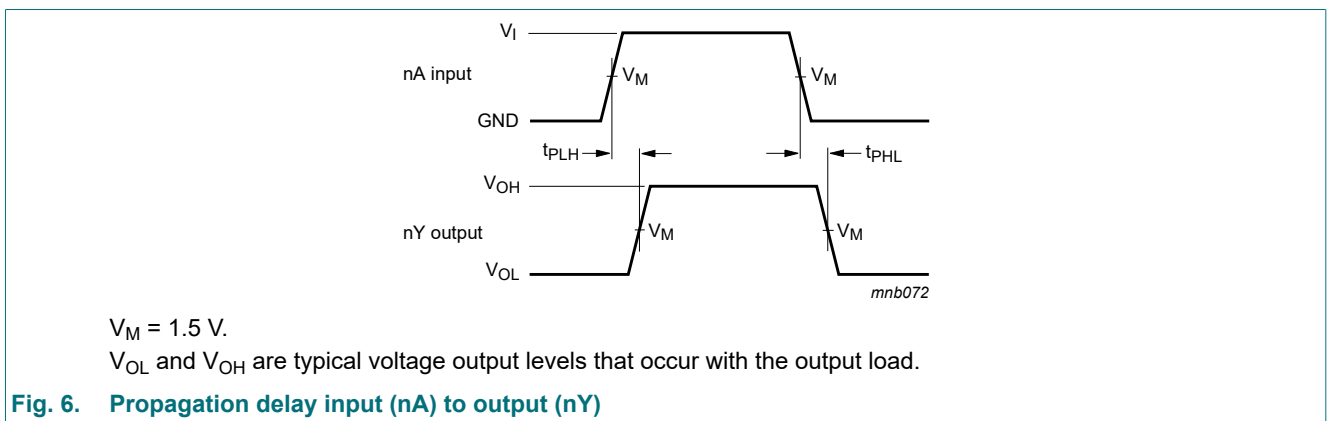
**Table 7. Dynamic characteristics**

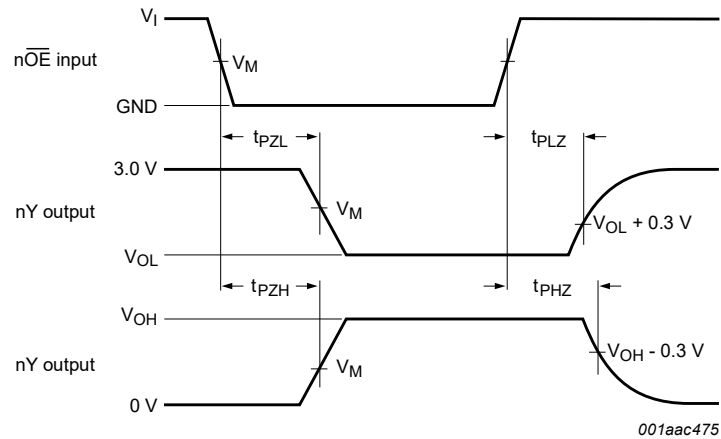
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 8.

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
t <sub>PLH</sub>	LOW to HIGH propagation delay	nAn to nY; see Fig. 6				
		V <sub>CC</sub> = 2.7 V	-	-	4.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.7	4.0	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	nAn to nY; see Fig. 6				
		V <sub>CC</sub> = 2.7 V	-	-	4.9	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	2.9	3.9	ns
t <sub>PZH</sub>	OFF-state to HIGH propagation delay	n $\overline{\text{OE}}$ to nY; see Fig. 7				
		V <sub>CC</sub> = 2.7 V	-	-	6.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	3.4	4.7	ns
t <sub>PZL</sub>	OFF-state to LOW propagation delay	n $\overline{\text{OE}}$ to nY; see Fig. 7				
		V <sub>CC</sub> = 2.7 V	-	-	6.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.1	3.4	4.7	ns
t <sub>PHZ</sub>	HIGH to OFF-state propagation delay	n $\overline{\text{OE}}$ to nY; see Fig. 7				
		V <sub>CC</sub> = 2.7 V	-	-	5.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.8	3.7	5.1	ns
t <sub>PLZ</sub>	LOW to OFF-state propagation delay	n $\overline{\text{OE}}$ to nY; see Fig. 7				
		V <sub>CC</sub> = 2.7 V	-	-	4.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.3	2.6	4.5	ns

[1] Typical values are at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

### 10.1. Waveforms and test circuit

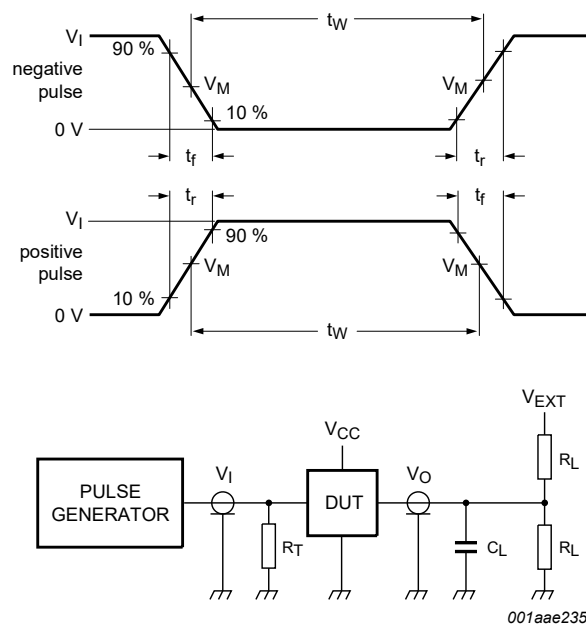




$V_M = 1.5V$ .

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

Fig. 7. Enable and disable times of 3-state outputs



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

Definitions 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.

$V_{EXT}$  = Test voltage for switching times.

Fig. 8. Test circuit for measuring switching times

Table 8. Test data

Input				Load		$V_{EXT}$		
$V_I$	$f_i$	$t_w$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHZ}, t_{PZH}$	$t_{PLZ}, t_{PZL}$	$t_{PLH}, t_{PHL}$
2.7 V	$\leq 10$ MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	GND	6 V	open

11. Package outline

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

SOT108-1

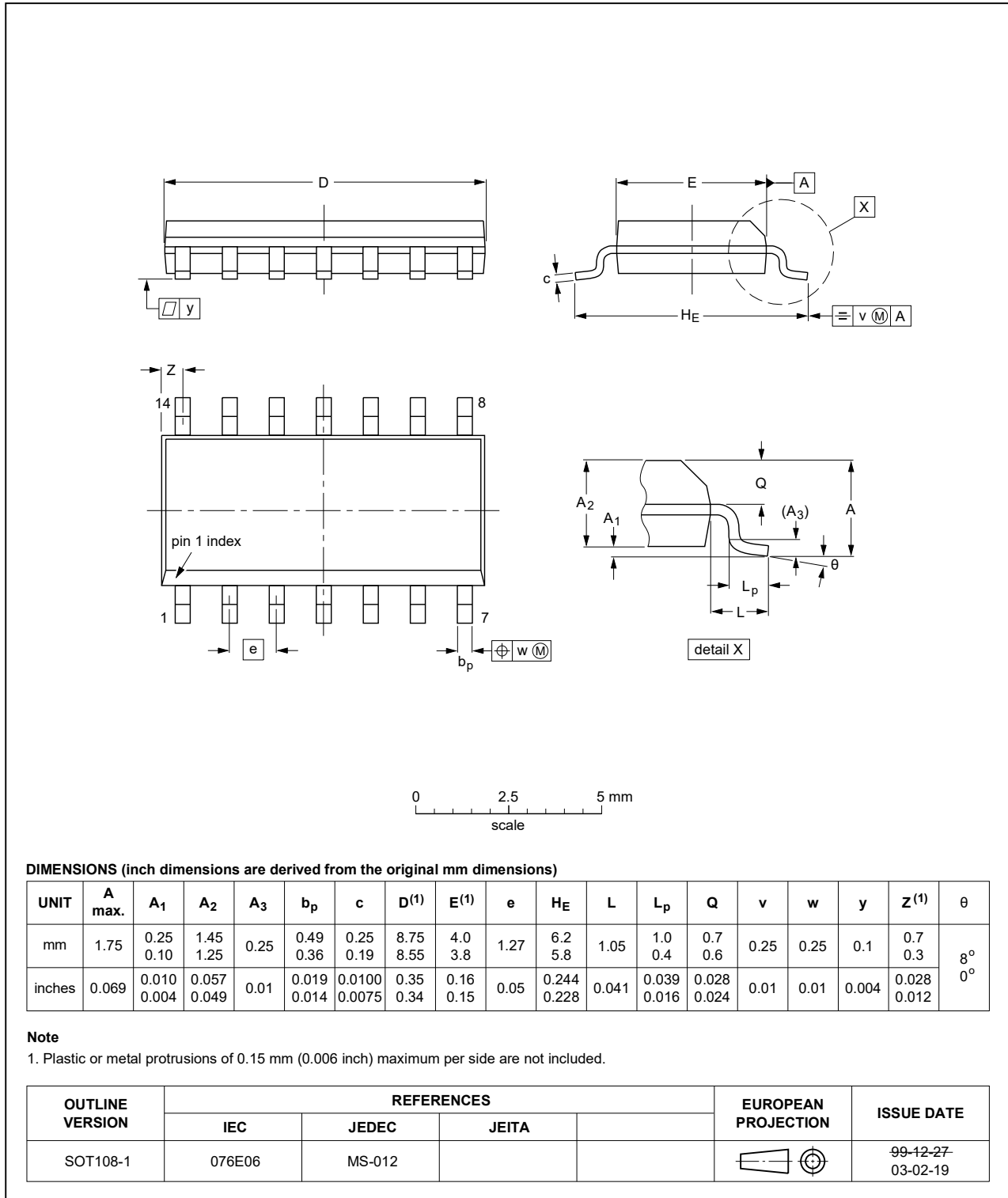


Fig. 9. Package outline SOT108-1 (SO14)



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

SOT402-1

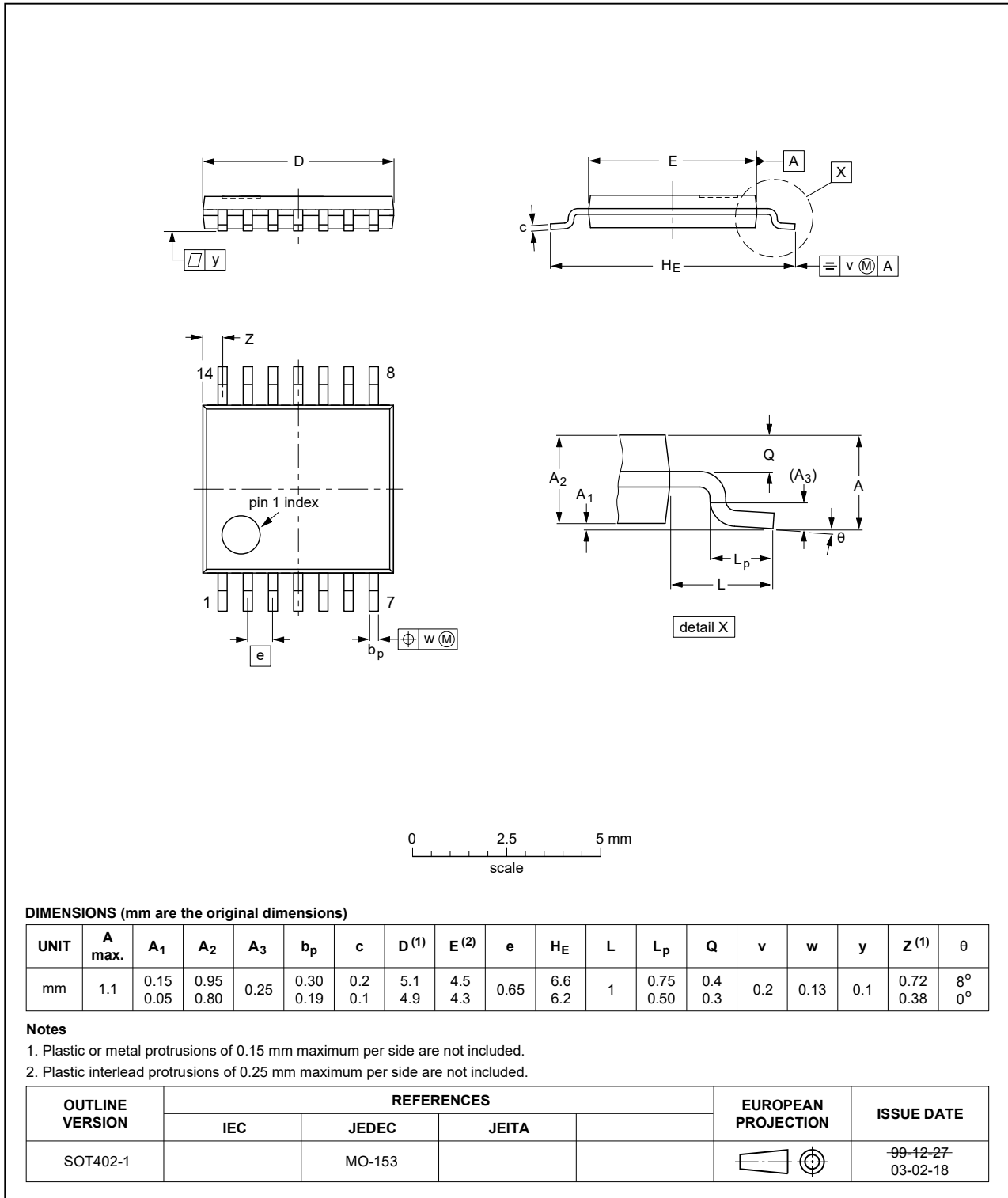


Fig. 10. Package outline SOT402-1 (TSSOP14)

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

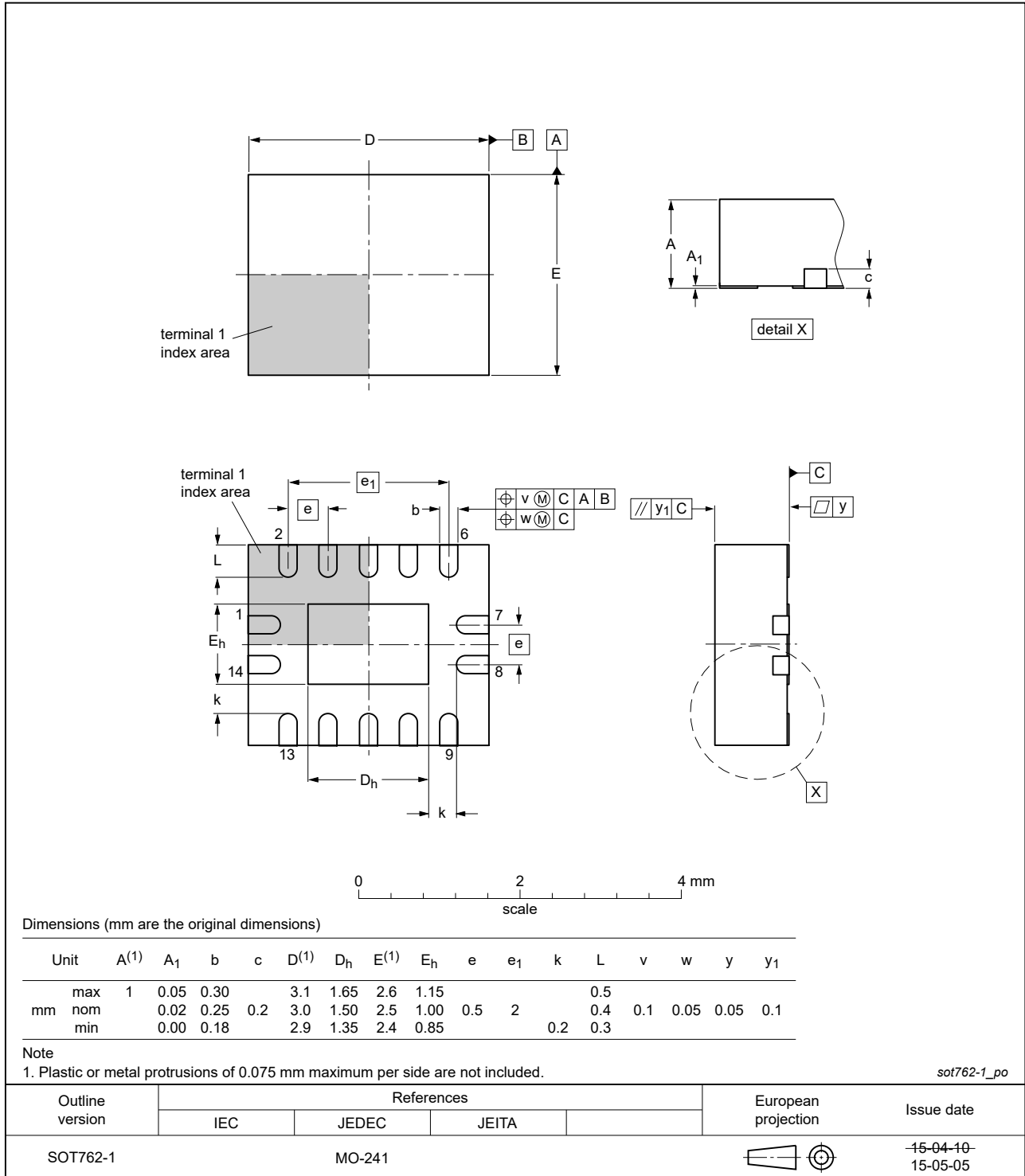


Fig. 11. Package outline SOT762-1 (DHVQFN14)

## 12. Abbreviations

Table 9. Abbreviations

Acronym	Description
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 13. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH125 v.8	20210818	Product data sheet	-	74LVT_LVTH125 v.7
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>Type numbers 74LVT125DB and 74LVTH125DB (SOT337-1/SSOP14) removed.</li> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li><a href="#">Fig. 7</a> aligned with test conditions (errata).</li> </ul>			
74LVT_LVTH125 v.7	20160531	Product data sheet	-	74LVT125 v.6
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> </ul>			
74LVT_LVTH125 v.6	20060306	Product data sheet	-	74LVT125 v.5
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 3</a>: Added type numbers 74LVTH125D, 74LVTH125DB, 74LVTH125PW and 74LVTH125BQ.</li> </ul>			
74LVT125 v.5	20050210	Product data sheet	-	74LVT125 v.4
74LVT125 v.4	20050207	Product data sheet	-	74LVT125 v.3
74LVT125 v.3	20040624	Product data sheet	-	74LVT125 v.2
74LVT125 v.2	19980219	Product specification	-	74LVT125 v.1
74LVT125 v.1	-	-	-	-

## 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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## Contents

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<b>1. General description</b> .....	<b>1</b>
<b>2. Features and benefits</b> .....	<b>1</b>
<b>3. Ordering information</b> .....	<b>1</b>
<b>4. Functional diagram</b> .....	<b>2</b>
<b>5. Pinning information</b> .....	<b>2</b>
5.1. Pinning.....	2
5.2. Pin description.....	3
<b>6. Functional description</b> .....	<b>3</b>
<b>7. Limiting values</b> .....	<b>4</b>
<b>8. Recommended operating conditions</b> .....	<b>4</b>
<b>9. Static characteristics</b> .....	<b>4</b>
<b>10. Dynamic characteristics</b> .....	<b>6</b>
10.1. Waveforms and test circuit.....	6
<b>11. Package outline</b> .....	<b>8</b>
<b>12. Abbreviations</b> .....	<b>11</b>
<b>13. Revision history</b> .....	<b>11</b>
<b>14. Legal information</b> .....	<b>12</b>

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