

# 74LVT126

3.3 V quad buffer; 3-state

Rev. 04 — 11 February 2005

Product data sheet

## 1. General description

The LVT126 is a high-performance BiCMOS product designed for  $V_{CC}$  operation at 3.3 V.

This device combines low static and dynamic power dissipation with high speed and high output drive. The 74LVT126 device is a quad buffer that is ideal for driving bus lines. The device features four output enable inputs (1OE, 2OE, 3OE and 4OE), each controlling one of the 3-state outputs.

## 2. Features

- Quad bus interface
- 3-state buffers
- Output capability: +64 mA and -32 mA
- TTL input and output switching levels
- Input and output interface capability to systems at 5 V supply
- Bus-hold data inputs eliminate the 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
- Latch-up protection:
  - ◆ JESD78: exceeds 500 mA
- ESD protection:
  - ◆ MIL STD 883 method 3015: exceeds 2000 V
  - ◆ Machine model: exceeds 200 V

## 3. Quick reference data

**Table 1: Quick reference data**

$GND = 0 V$ ;  $T_{amb} = 25^{\circ}C$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PLH}$	propagation delay nA to nY	$C_L = 50 \text{ pF}$ ; $V_{CC} = 3.3 \text{ V}$	-	2.3	-	ns
$t_{PHL}$	propagation delay nA to nY	$C_L = 50 \text{ pF}$ ; $V_{CC} = 3.3 \text{ V}$	-	2.4	-	ns
$C_I$	input capacitance	$V_I = 0 \text{ V}$ or $V_{CC}$	-	4	-	pF
$C_O$	output capacitance	outputs disabled; $V_O = 0 \text{ V}$ or $3.0 \text{ V}$	-	8	-	pF
$I_{CC}$	quiescent supply current	outputs disabled; $V_{CC} = 3.6 \text{ V}$	-	0.13	-	mA

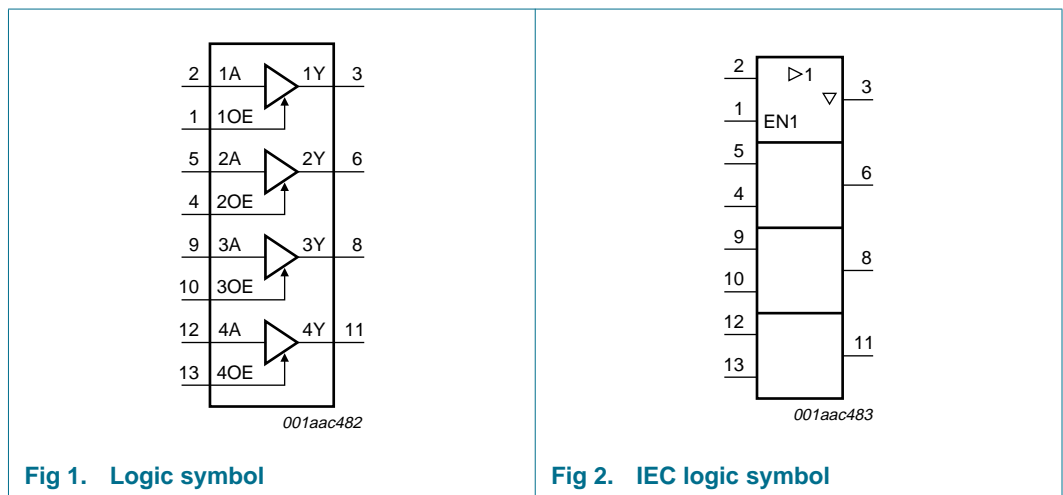
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## 4. Ordering information

Table 2: Ordering information

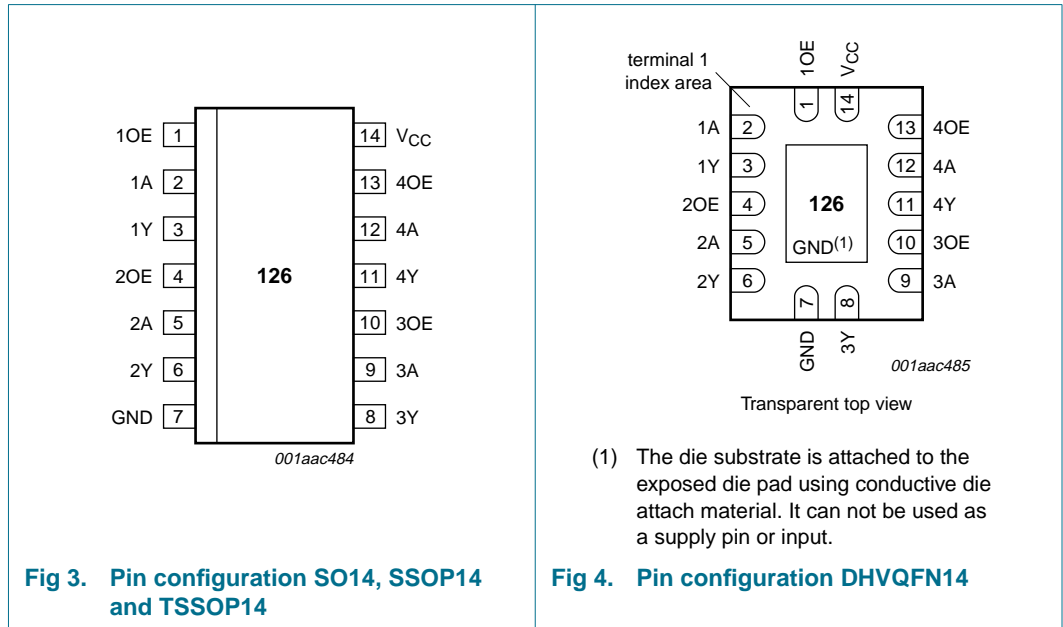
Type number	Package			Version
	Temperature range	Name	Description	
74LVT126D	-40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LVT126DB	-40 °C to +85 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1
74LVT126PW	-40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74LVT126BQ	-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

## 5. Functional diagram



## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
1OE	1	1 output enable input
1A	2	1 data input
1Y	3	1 data output
2OE	4	2 output enable input
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
3OE	10	3 output enable input
4Y	11	4 data output
4A	12	4 data input
4OE	13	4 output enable input
V <sub>CC</sub>	14	supply voltage

## 7. Functional description

### 7.1 Function table

Table 4: Function table <sup>[1]</sup>

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

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

## 8. Limiting values

Table 5: 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
$V_I$	input voltage		<sup>[1]</sup> -0.5	+7.0	V
$V_O$	output voltage	output in OFF-state or HIGH-state	<sup>[1]</sup> -0.5	+7.0	V
$I_{IK}$	input diode current	$V_I < 0$ V	-	-50	mA
$I_{OK}$	output diode current	$V_O < 0$ V	-	-50	mA
$I_O$	output current	output in LOW-state	-	128	mA
		output in HIGH-state	-	-64	mA
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		<sup>[2]</sup> -	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.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		2.7	-	3.6	V
$V_I$	input voltage		0	-	5.5	V
$V_{IH}$	HIGH-level input voltage		2.0	-	-	V
$V_{IL}$	LOW-level input voltage		-	-	0.8	V
$I_{OH}$	HIGH-level output current		-	-	-32	mA
$I_{OL}$	LOW-level output current	none	-	-	32	mA
		current duty cycle $\leq 50\%$ ; $f \geq 1$ kHz	-	-	64	mA
$\Delta t/\Delta V$	input transition rise or fall rate	outputs enabled	-	-	10	ns/V
$T_{amb}$	ambient temperature	in free air	-40	-	+85	°C

## 10. Static characteristics

**Table 7: Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b><math>T_{amb} = -40\text{ °C to }+85\text{ °C}</math> [1]</b>							
$V_{IK}$	input diode voltage	$I_{IK} = -18\text{ mA}$ ; $V_{CC} = 2.7\text{ V}$	-	-0.9	-1.2	V	
$V_{OH}$	HIGH-level output voltage	$I_{OH} = -100\text{ }\mu\text{A}$ ; $V_{CC} = 2.7\text{ V to }3.6\text{ V}$ ;	$V_{CC} - 0.2$	$V_{CC} - 0.1$	-	V	
		$I_{OH} = -8\text{ mA}$ ; $V_{CC} = 2.7\text{ V}$	2.4	2.5	-	V	
		$I_{OH} = -32\text{ mA}$ ; $V_{CC} = 3.0\text{ V}$	2.0	2.2	-	V	
$V_{OL}$	LOW-level output voltage	$V_{CC} = 2.7\text{ V}$					
		$I_{OL} = 100\text{ }\mu\text{A}$	-	0.1	0.2	V	
		$I_{OL} = 24\text{ mA}$	-	0.3	0.5	V	
		$V_{CC} = 3.0\text{ V}$					
		$I_{OL} = 16\text{ mA}$	-	0.25	0.4	V	
		$I_{OL} = 32\text{ mA}$	-	0.3	0.5	V	
$I_{LI}$	input leakage current	$I_{OL} = 64\text{ mA}$	-	0.4	0.55	V	
		all input pins	$V_{CC} = 0\text{ V or }3.6\text{ V}$ ; $V_I = 5.5\text{ V}$	-	1	10	$\mu\text{A}$
		control pins	$V_{CC} = 3.6\text{ V}$ ; $V_{CC}$ or GND	-	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
		data pins	$V_{CC} = 3.6\text{ V}$ ; $V_I = V_{CC}$	[2] -	0.1	1	$\mu\text{A}$
		$V_{CC} = 3.6\text{ V}$ ; $V_I = 0\text{ V}$	[2] -	-1	-5	$\mu\text{A}$	
$I_{OFF}$	power-down output current	$V_{CC} = 0\text{ V}$ ; $V_I$ or $V_O = 0\text{ V to }4.5\text{ V}$	-	1	$\pm 100$	$\mu\text{A}$	
$I_{HOLD}$	bus hold current A input	$V_{CC} = 3\text{ V}$ ; $V_I = 0.8\text{ V}$	[3] 75	150	-	$\mu\text{A}$	
		$V_{CC} = 3\text{ V}$ ; $V_I = 2.0\text{ V}$	-75	-150	-	$\mu\text{A}$	
		$V_{CC} = 0\text{ V to }3.6\text{ V}$ ; $V_I = 3.6\text{ V}$	$\pm 500$	-	-	$\mu\text{A}$	

**Table 7: Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{EX}$	external current into output	output in HIGH-state when $V_O > V_{CC}$ ; $V_O = 5.5$ V and $V_{CC} = 3.0$ V	-	60	125	$\mu$ A
$I_{PU}, I_{PD}$	power-up or power-down 3-state output current	$V_{CC} \leq 1.2$ V; $V_O = 0.5$ V to $V_{CC}$ ; $V_I = GND$ or $V_{CC}$ ; nOE = don't care	[4] -	$\pm 1$	$\pm 100$	$\mu$ A
$I_{OZ}$	3-state output current	$V_{CC} = 3.6$ V				
		output HIGH: $V_O = 3.0$ V	-	1	5	$\mu$ A
		output LOW: $V_O = 0.5$ V	-	-1	-5	$\mu$ A
$I_{CC}$	quiescent supply current	$V_{CC} = 3.6$ V; $V_I = GND$ or $V_{CC}$ ; $I_O = 0$ A				
		outputs HIGH	-	0.13	0.19	mA
		outputs LOW	-	2	7	mA
		outputs disabled	[5] -	0.13	0.19	mA
$\Delta I_{CC}$	additional supply current per input pin	$V_{CC} = 3$ V to 3.6 V; one input at $V_{CC} - 0.6$ V and other inputs at $V_{CC}$ or GND	[6] -	0.1	0.2	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 3.0 V	-	8	-	pF

- [1] Typical values are measured at nominal  $V_{CC}$  and  $T_{amb} = 25$  °C.
- [2] Unused pins at  $V_{CC}$  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  $V_{CC}$  between 0 V and 1.2 V with a transition time of up to 10 ms. From  $V_{CC} = 1.2$  V to  $V_{CC} = 3.3$  V  $\pm 0.3$  V a transition time of 100  $\mu$ s is permitted. This parameter is valid for  $T_{amb} = 25$  °C only.
- [5] Measured with outputs pulled up to  $V_{CC}$  or GND.
- [6] This is the increase in supply current for each input at the specified voltage level other than  $V_{CC}$  or GND.

## 11. Dynamic characteristics

**Table 8: Dynamic characteristics**

GND = 0 V;  $t_r = t_f = 2.5$  ns;  $C_L = 50$  pF;  $R_L = 500$   $\Omega$ ; for test circuit see [Figure 7](#).

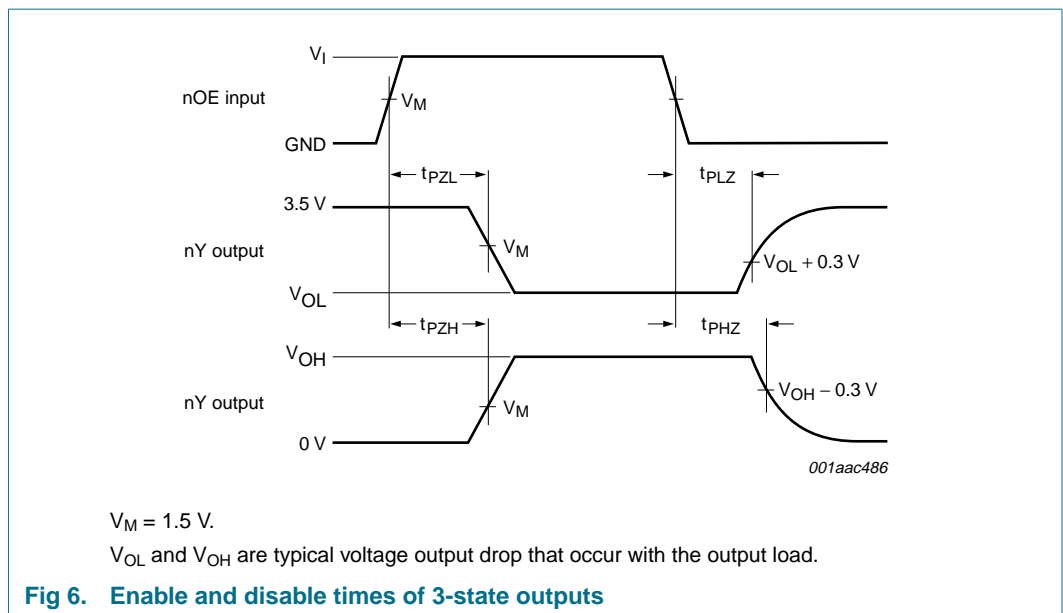
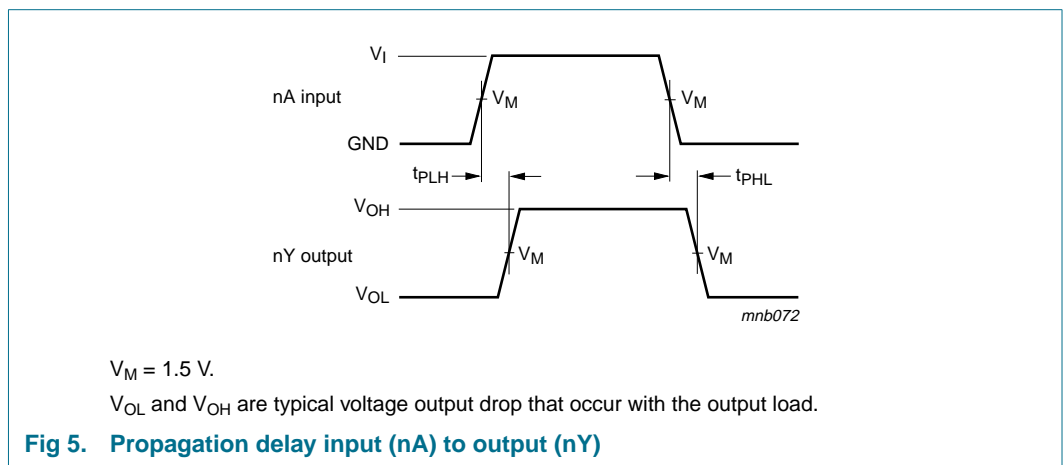
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C [1]</b>						
$t_{PLH}$	propagation delay nA to nY	$V_{CC} = 2.7$ V	-	-	4.5	ns
		$V_{CC} = 3.3$ V $\pm 0.3$ V	1.0	2.3	3.8	ns
$t_{PHL}$	propagation delay nA to nY	$V_{CC} = 2.7$ V	-	-	4.4	ns
		$V_{CC} = 3.3$ V $\pm 0.3$ V	1.0	2.4	3.9	ns
$t_{PZH}$	output enable time nOE to nY	$V_{CC} = 2.7$ V	-	-	6.1	ns
		$V_{CC} = 3.3$ V $\pm 0.3$ V	1.0	3.6	5.4	ns
$t_{PZL}$	output enable time nOE to nY	$V_{CC} = 2.7$ V	-	-	5.8	ns
		$V_{CC} = 3.3$ V $\pm 0.3$ V	1.1	3.6	5.2	ns

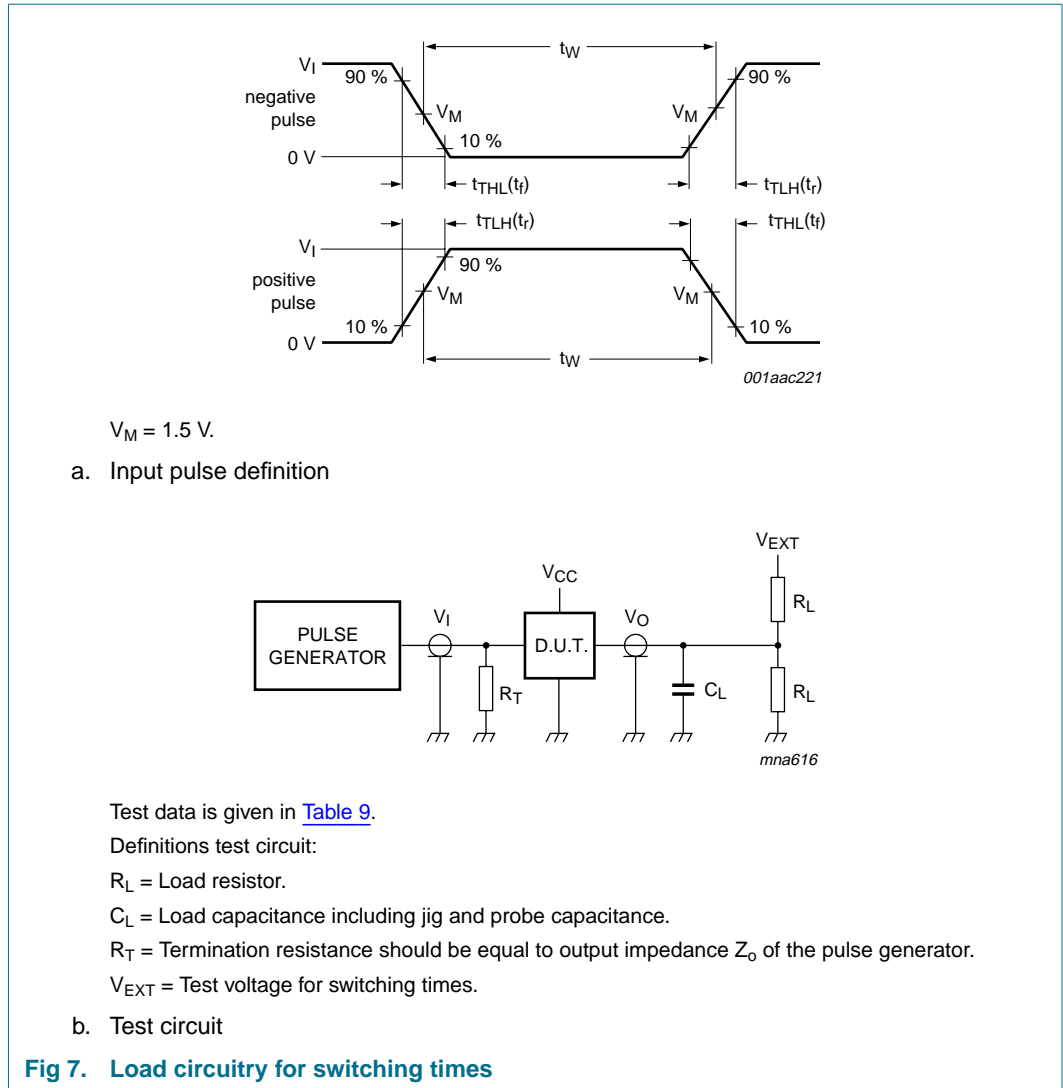
**Table 8: Dynamic characteristics ...continued**  
*GND = 0 V;  $t_r = t_f = 2.5$  ns;  $C_L = 50$  pF;  $R_L = 500$   $\Omega$ ; for test circuit see [Figure 7](#).*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PHZ}$	output disable time nOE to nY	$V_{CC} = 2.7$ V	-	-	4.3	ns
		$V_{CC} = 3.3$ V $\pm$ 0.3 V	1.0	2.2	3.8	ns
$t_{PLZ}$	output disable time nOE to nY	$V_{CC} = 2.7$ V	-	-	6.1	ns
		$V_{CC} = 3.3$ V $\pm$ 0.3 V	1.3	3.6	5.5	ns

[1] Typical values are at  $V_{CC} = 3.3$  V and  $T_{amb} = 25$  °C.

## 12. Waveforms





**Table 9: 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	$\leq 10 \text{ MHz}$	500 ns	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	GND	6 V	open



13. Package outline

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

SOT108-1



Fig 8. Package outline SO14 (SOT108-1)

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

SOT337-1

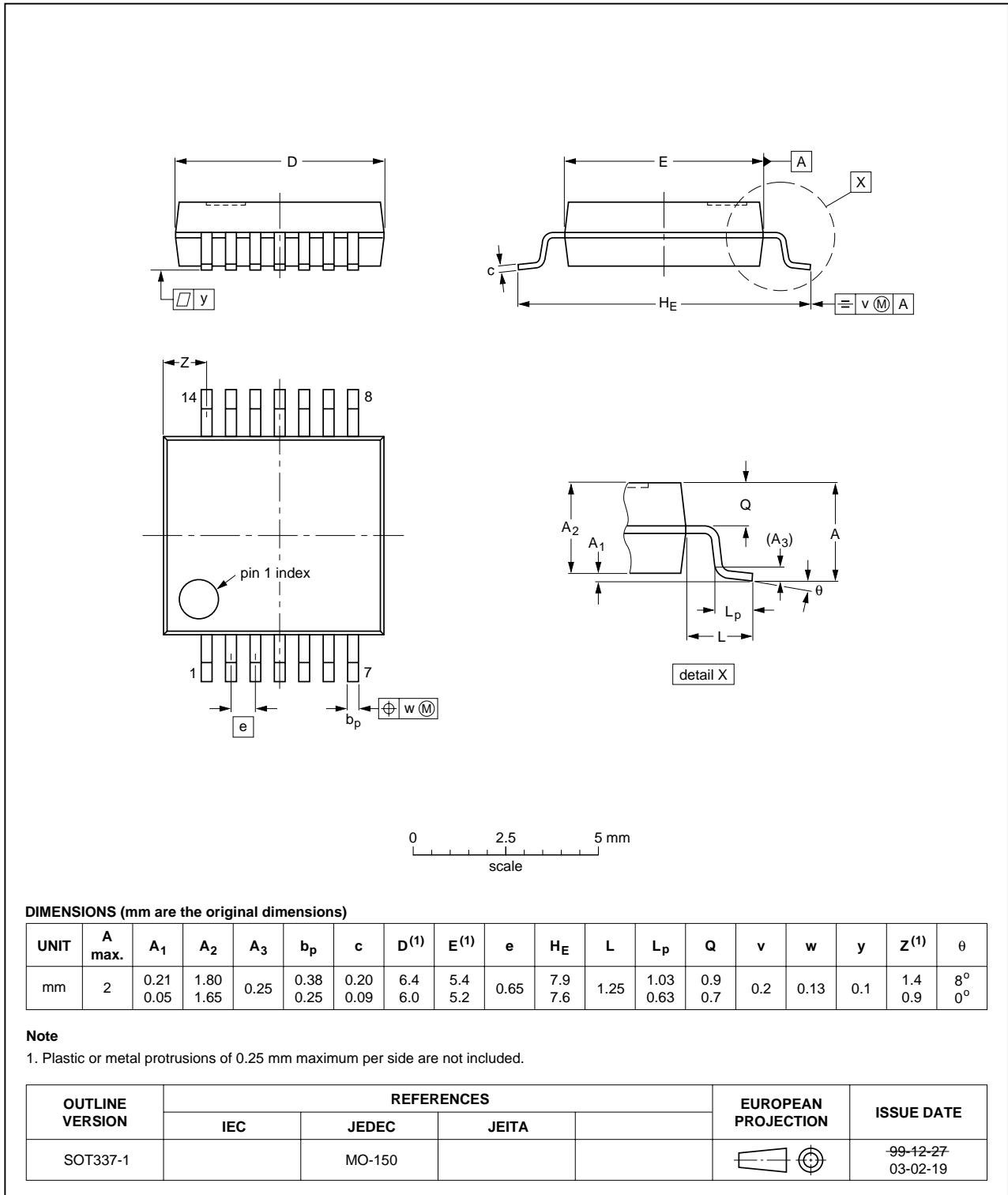


Fig 9. Package outline SSOP14 (SOT337-1)

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

SOT402-1

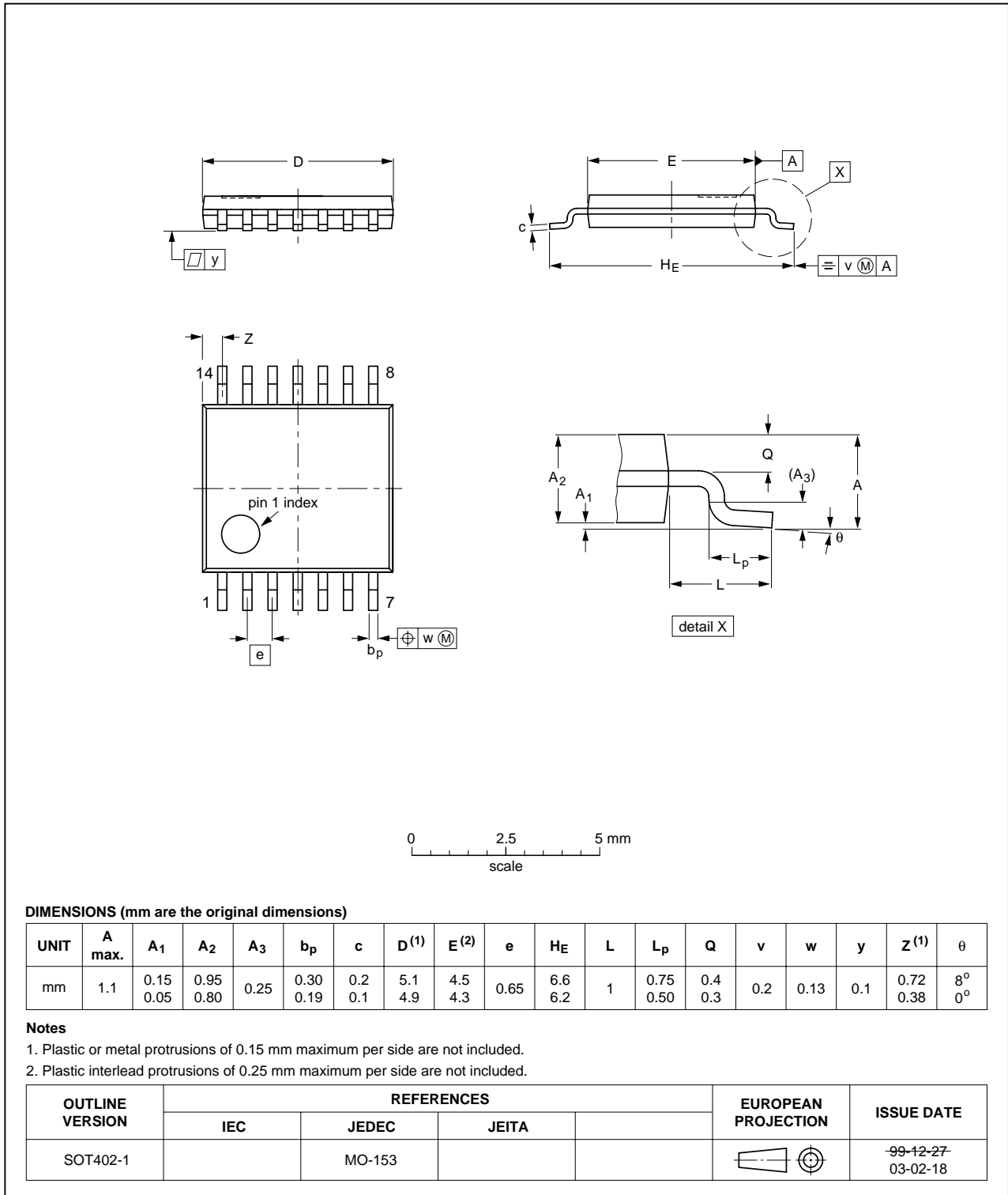


Fig 10. Package outline TSSOP14 (SOT402-1)

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

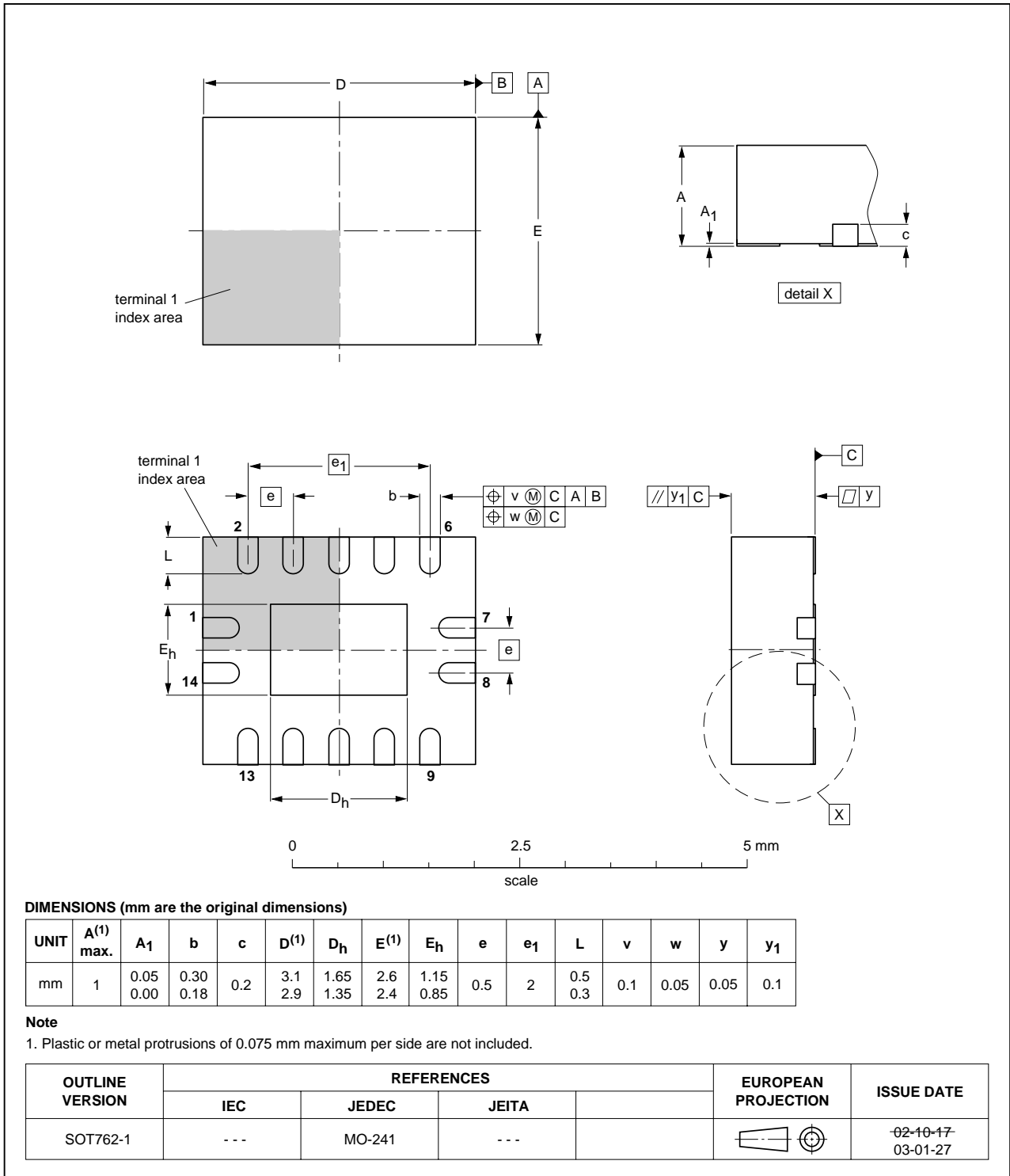


Fig 11. Package outline DHVQFN14 (SOT762-1)

## 14. Revision history

**Table 10: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74LVT126_4	20050211	Product data sheet	-	9397 750 14553	74LVT126_3
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li><li><a href="#">Figure 4</a>: added <a href="#">Figure note 1</a>.</li></ul>				
74LVT126_3	20040624	Product data sheet	-	9397 750 13542	74LVT126_2
74LVT126_2	19980219	Product specification	-	9397 750 03515	74LVT126_1
74LVT126_1	-	-	-	-	-

## 15. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 16. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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