74LVT125; 74LVTH125

3.3 V quad buffer; 3-state

Rev. 06 — 6 March 2006 Product data sheet

1. General description

The 74LVT125; 74LVTH125 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 74LVT125; 74LVTH125 device is a quad buffer that is ideal for driving bus lines. The device features four output enable inputs ($1\overline{OE}$, $2\overline{OE}$, $3\overline{OE}$ and $4\overline{OE}$), 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 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 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{PLH}	LOW-to-HIGH propagation delay nA to nY	C_L = 50 pF; V_{CC} = 3.3 V	-	2.7	-	ns
t_{PHL}	HIGH-to-LOW propagation delay nA to nY	C_L = 50 pF; V_{CC} = 3.3 V	-	2.9	-	ns

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Table 1. Quick reference data *...continued*

GND = 0 V; T_{amb} = 25 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_i	input capacitance	V_I = 0 V or 3.0 V	-	4	-	pF
C_o	output capacitance	outputs disabled; V_O = 0 V or 3.0 V	-	8	-	pF
I_{CC}	quiescent supply current	outputs disabled; V_{CC} = 3.6 V	-	0.13	-	mA

4. Ordering information

Table 2. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVT125D	–40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LVT125DB	–40 °C to +85 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1
74LVT125PW	–40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
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
74LVTH125D	–40 °C to +85 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74LVTH125DB	–40 °C to +85 °C	SSOP14	plastic shrink small outline package; 14 leads; body width 5.3 mm	SOT337-1
74LVTH125PW	–40 °C to +85 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74LVTH125BQ	–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

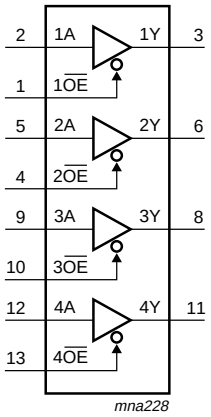


Fig 1. Logic symbol

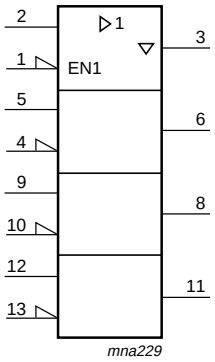


Fig 2. IEC logic symbol

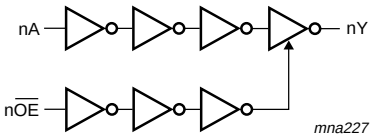


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

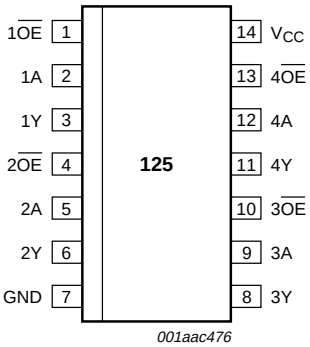
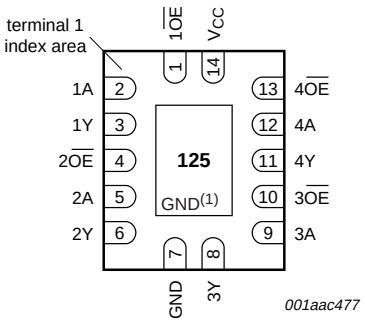


Fig 4. Pin configuration SO14, SSOP14 and TSSOP14



Transparent top view

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

Fig 5. Pin configuration DHVQFN14

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
1$\overline{OE}$	1	1 output enable input (active LOW)
1A	2	1 data input
1Y	3	1 data output
2$\overline{OE}$	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$\overline{OE}$	10	3 output enable input (active LOW)
4Y	11	4 data output
4A	12	4 data input
4$\overline{OE}$	13	4 output enable input (active LOW)
V_{CC}	14	supply voltage

7. Functional description

7.1 Function table

Table 4. Function table[1]

Control	Input	Output
n$\overline{OE}$	**nA**	**nY**
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.

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		[1]	–0.5	+7.0	V
V_O	output voltage	output in OFF-state or HIGH-state	[1]	–0.5	+7.0	V
I_{IK}	input clamping current	$V_I < 0$ V		-	–50	mA
I_{OK}	output clamping 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		[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.

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-state input voltage		2.0	-	-	V
V_{IL}	LOW-state input voltage		-	-	0.8	V
I_{OH}	HIGH-state output current		-	-	–32	mA
I_{OL}	LOW-state output current	none	-	-	32	mA
		current duty cycle ≤ 50 %; f ≥ 1 kHz	-	-	64	mA
$\Delta t/\Delta V$	input transition rise and fall rate		0	-	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
T_{amb} = −40 °C to +85 °C[1]							
V_{IK}	input clamping voltage	I_{IK} = −18 mA; V_{CC} = 2.7 V		-	−0.9	−1.2	V
V_{OH}	HIGH-state output voltage	I_{OH} = −100 µA; V_{CC} = 2.7 V to 3.6 V		V_{CC} − 0.2	V_{CC} − 0.1	-	V
		I_{OH} = −8 mA; V_{CC} = 2.7 V		2.4	2.5	-	V
		I_{OH} = −32 mA; V_{CC} = 3.0 V		2.0	2.2	-	V
V_{OL}	LOW-state output voltage	V_{CC} = 2.7 V					
		I_{OL} = 100 µA		-	0.1	0.2	V
		I_{OL} = 24 mA		-	0.3	0.5	V
		V_{CC} = 3.0 V					
		I_{OL} = 16 mA		-	0.25	0.4	V
		I_{OL} = 32 mA		-	0.3	0.5	V
		I_{OL} = 64 mA		-	0.4	0.55	V
I_{LI}	input leakage current						
	all input pins	V_{CC} = 0 V or 3.6 V; V_I = 5.5 V		-	1	10	µA
	control pins	V_{CC} = 3.6 V; V_I = V_{CC} or GND		-	±0.1	±1	µA
	data pins	V_{CC} = 3.6 V	[2]				
		V_I = V_{CC}		-	0.1	1	µA
		V_I = 0 V		-	−1	−5	µA
I_{OFF}	power-off leakage current	V_{CC} = 0 V; V_I or V_O = 0 V to 4.5 V		-	1	±100	µA
I_{HOLD}	bus hold current data input	V_{CC} = 3 V	[3]				
		V_I = 0.8 V		75	150	-	µA
		V_I = 2.0 V		−75	−150	-	µA
		V_{CC} = 0 V to 3.6 V					
		V_I = 3.6 V		±500	-	-	µA
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	µA
$I_{O(pu/pd)}$	power-up/power-down output current	V_{CC} ≤ 1.2 V; V_O = 0.5 V to V_{CC}; V_I = GND or V_{CC}; $n\overline{OE}$ = don't care	[4]	-	±1	±100	µA
I_{OZ}	OFF-state output current	V_{CC} = 3.6 V; V_I = V_{IH} or V_{IL}					
		output HIGH: V_O = 3.0 V		-	1	5	µA
		output LOW: V_O = 0.5 V		-	−1	−5	µA
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

Table 7. Static characteristics *…continued*

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
ΔI_{CC}	additional quiescent 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 3.0 V		-	4	-	pF
C_o	output capacitance	outputs disabled; V_O = 0 V or 3.0 V		-	8	-	pF

[1] Typical values are measured at V_{CC} = 3.3 V 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} = 3.0 V to 3.6 V a transition time of 100 µs is permitted. This parameter is valid for T_{amb} = 25 °C only.

[5] I_{CC} is measured with outputs pulled 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

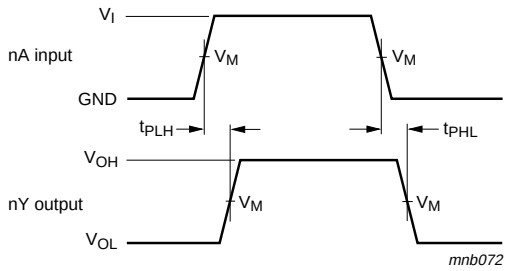
Table 8. Dynamic characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = –40 °C to +85 °C[1]						
t_{PLH}	LOW-to-HIGH propagation delay nAn to nY	see Figure 6				
		V_{CC} = 2.7 V	-	-	4.5	ns
		V_{CC} = 3.0 V to 3.6 V	1.0	2.7	4.0	ns
t_{PHL}	HIGH-to-LOW propagation delay nAn to nY	see Figure 6				
		V_{CC} = 2.7 V	-	-	4.9	ns
		V_{CC} = 3.0 V to 3.6 V	1.0	2.9	3.9	ns
t_{PZH}	output enable time $n\overline{OE}$ to nY	see Figure 7				
		V_{CC} = 2.7 V	-	-	6.0	ns
		V_{CC} = 3.0 V to 3.6 V	1.0	3.4	4.7	ns
t_{PZL}	output enable time $n\overline{OE}$ to nY	see Figure 7				
		V_{CC} = 2.7 V	-	-	6.5	ns
		V_{CC} = 3.0 V to 3.6 V	1.1	3.4	4.7	ns
t_{PHZ}	output disable time $n\overline{OE}$ to nY	see Figure 7				
		V_{CC} = 2.7 V	-	-	5.7	ns
		V_{CC} = 3.0 V to 3.6 V	1.8	3.7	5.1	ns
t_{PLZ}	output disable time $n\overline{OE}$ to nY	see Figure 7				
		V_{CC} = 2.7 V	-	-	4.0	ns
		V_{CC} = 3.0 V to 3.6 V	1.3	2.6	4.5	ns

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

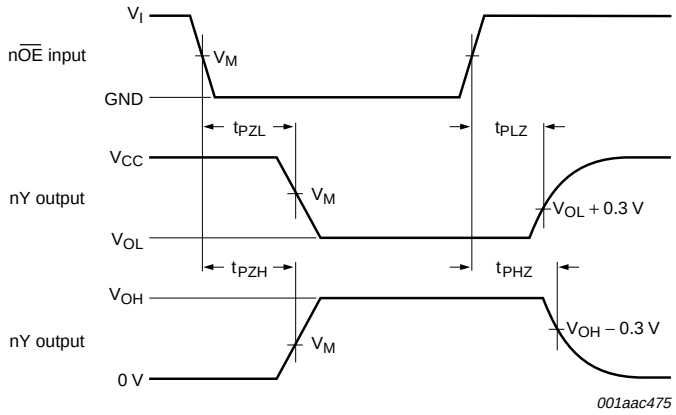
12. Waveforms



V_M = 1.5 V.

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

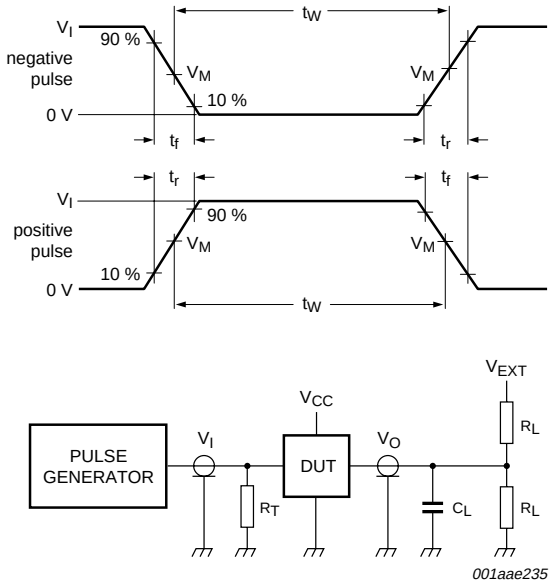
Fig 6. Propagation delay input (nA) to output (nY)



V_M = 1.5 V.

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

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



Test data is given in Table 9.

Definitions test circuit:

R_L = Load resistor.

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.

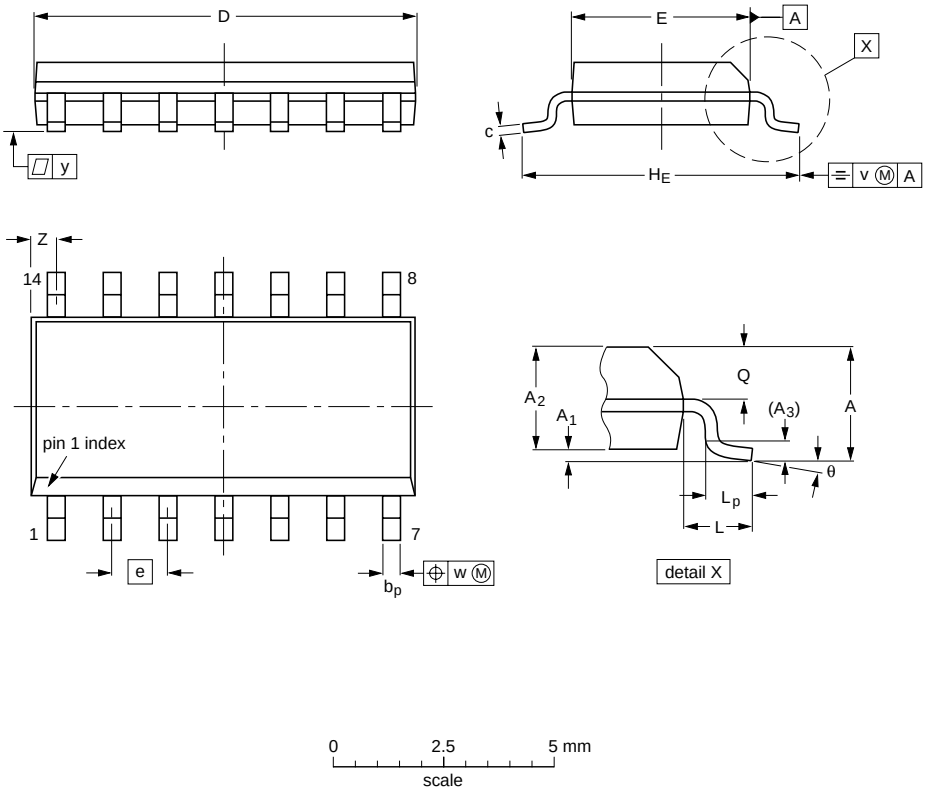
Fig 8. Load circuitry for switching times

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	≤ 10 MHz	500 ns	≤ 2.5 ns	50 pF	500 Ω	GND	6 V	open

13. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

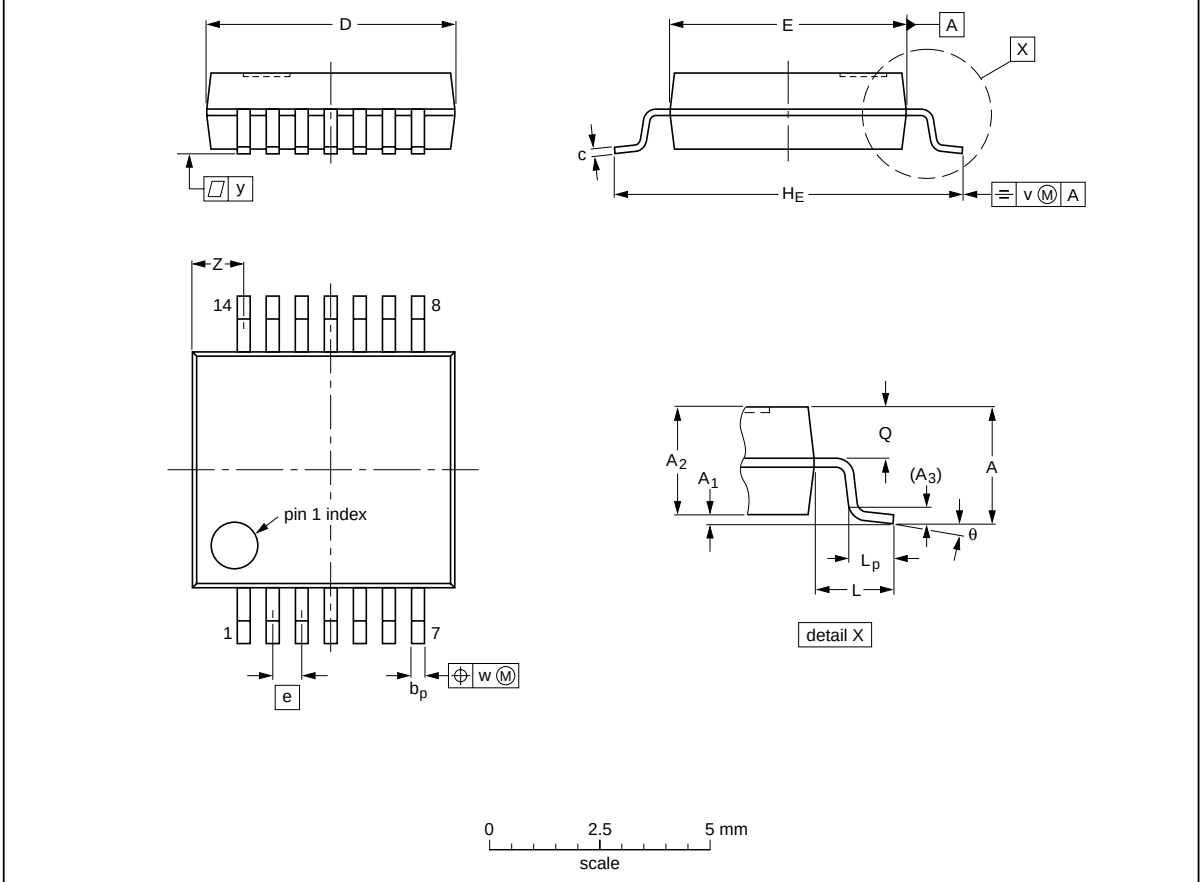
Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT108-1	076E06	MS-012				~~99-12-27~~ 03-02-19

Fig 9. Package outline SOT108-1 (SO14)

SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm **SOT337-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.4 0.9	8° 0°

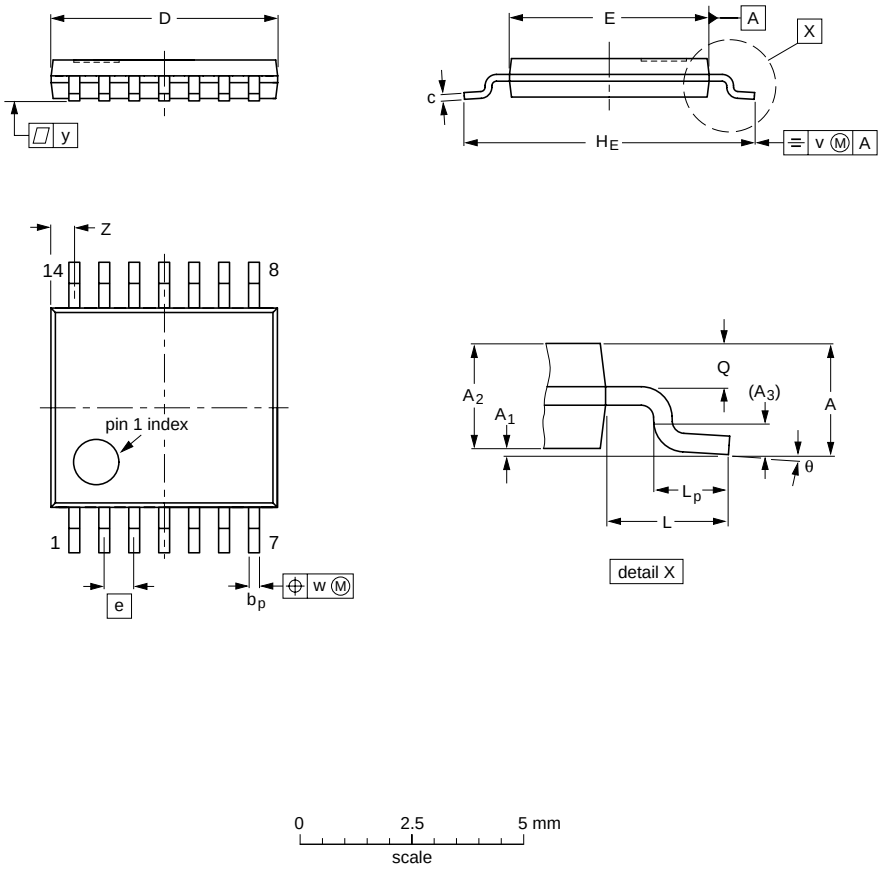
Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT337-1		MO-150				~~99-12-27~~ 03-02-19

Fig 10. Package outline SOT337-1 (SSOP14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm **SOT402-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

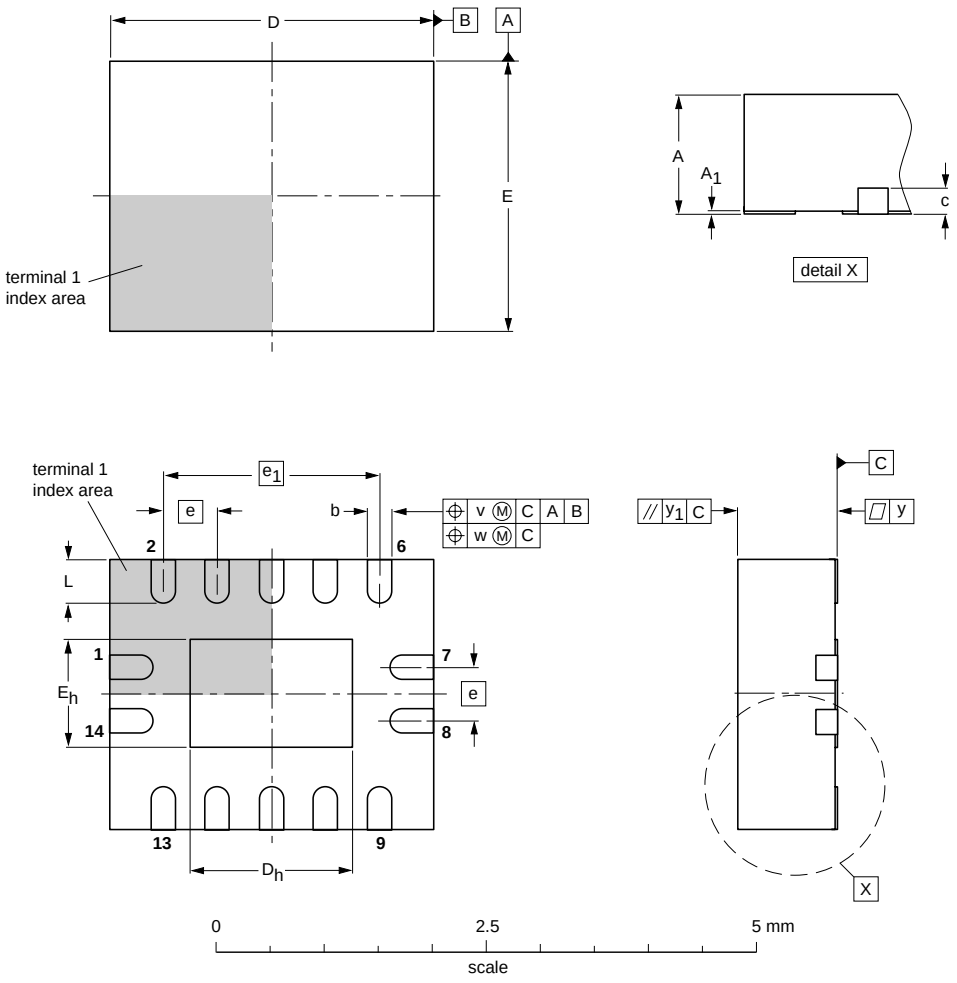
Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT402-1		MO-153				~~99-12-27~~ 03-02-18

Fig 11. 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**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.1 2.9	1.65 1.35	2.6 2.4	1.15 0.85	0.5	2	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT762-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig 12. Package outline SOT762-1 (DHVQFN14)

14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
TTL	Transistor-Transistor Logic

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVT_LVTH125_6	20060306	Product data sheet	-	74LVT125_5 (9397 750 14703)
Modifications:	• Section 4: Added type numbers 74LVTH125D, 74LVTH125DB, 74LVTH125PW and 74LVTH125BQ.			
74LVT125_5	20050210	Product data sheet	-	74LVT125_4 (9397 750 14552)
74LVT125_4	20050207	Product data sheet	-	74LVT125_3 (9397 750 13535)
74LVT125_3	20040624	Product data sheet	-	74LVT125_2 (9397 750 03514)
74LVT125_2	19980219	Product specification	-	74LVT125_1
74LVT125_1	-	-	-	-

16. Legal information

16.1 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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.semiconductors.philips.com.

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