1. General description

The 74LVC125A 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. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

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

- Overvoltage tolerant inputs to 5.5 V
- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low power consumption
- · Direct interface with TTL levels
- Complies with JEDEC standard:
 - JESD8-7A (1.65 V to 1.95 V)
 - JESD8-5A (2.3 V to 2.7 V)
 - JESD8-C/JESD36 (2.7 V to 3.6 V)
- I_{OFF} circuitry provides partial Power-down mode operation
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- · Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

3. Ordering information

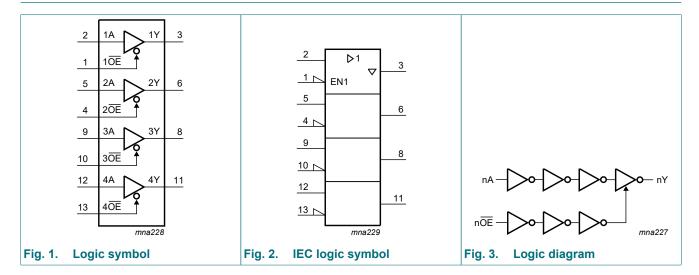
Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC125AD	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	<u>SOT108-1</u>
74LVC125APW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74LVC125ABQ	-40 °C to +125 °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
74LVC125ABZ	-40 °C to +125 °C	DHXQFN14	plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package; no leads; 14 terminals; 0.4 mm pitch; body 2 mm × 2 mm × 0.48 mm	SOT8014-1



Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

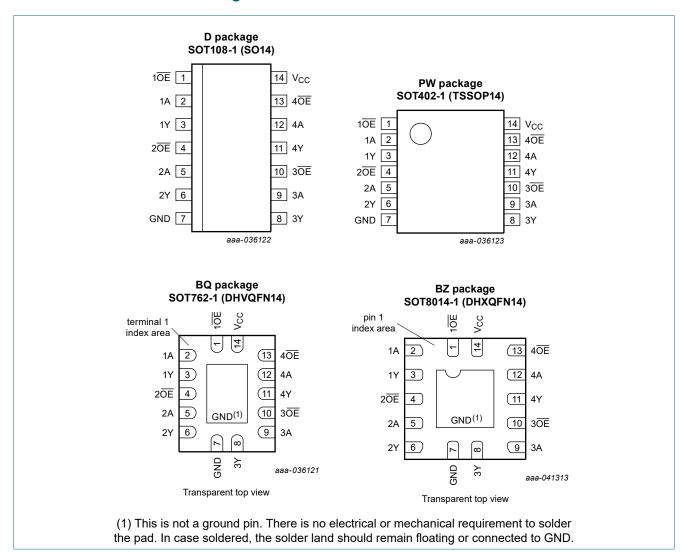
4. Functional diagram



Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1 OE , 2 OE , 3 OE , 4 OE	1, 4, 10, 13	data enable input (active LOW)
1A, 2A, 3A, 4A	2, 5, 9, 12	data input
1Y, 2Y, 3Y, 4Y	3, 6, 8, 11	data output
GND	7	ground (0 V)
V _{CC}	14	supply voltage

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Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

6. Functional description

Table 3. Function selection

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

Inputs nOE	Output	
nŌĒ	nA	nY
L	L	L
L	Н	Н
Н	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 _{CC}	supply voltage			-0.5	+6.5	V
I _{IK}	input clamping current	V _I < 0 V		-50	-	mA
VI	input voltage		[1]	-0.5	+6.5	V
I _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V		-	±50	mA
Vo	output voltage	output HIGH or LOW-state	[2]	-0.5	V _{CC} + 0.5	V
		output 3-state	[2]	-0.5	+6.5	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$		-	±50	mA
I _{CC}	supply current			-	100	mA
I_{GND}	ground current			-100	-	mA
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C				
		SOT108-1 (SO14) SOT402-1 (TSSOP14) SOT762-1 (DHVQFN14)	[3]	-	500	mW
		SOT8014-1 (DHXQFN14)	[4]	-	250	mW
T _{stg}	storage temperature			-65	+150	°C

- [1] The minimum input voltage ratings may be exceeded if the input current ratings are observed.
- [2] The output voltage ratings may be exceeded if the output current ratings are observed.
- For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C. For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C. For SOT762-1 (DHVQFN14) package: P_{tot} derates linearly with 9.6 mW/K above 98 °C.
- [4] For SOT8014-1 (DHXQFN14) package: P_{tot} derates linearly with 8.7 mW/K above 121 °C.

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{CC}	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
VI	input voltage		0	-	5.5	V
Vo	output voltage	output HIGH or LOW state	0	-	V _{CC}	V
		output 3-state	0	-	5.5	V
T _{amb}	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.3 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	S°C	-40 °C to	+125 °C	Unit
			Min	Typ [1]	Max	Min	Max	1
V _{IH}	HIGH-level input	V _{CC} = 1.2 V	1.08	-	-	1.08	-	V
	voltage	V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	-	-	0.65V _{CC}	-	V
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V _{IL}	LOW-level input	V _{CC} = 1.2 V	-	-	0.12	-	0.12	V
	voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35V _{CC}	-	0.35V _{CC}	V
	V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V	
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = -100 μA; V _{CC} = 1.65 V to 3.6 V	V _{CC} - 0.2	-	-	V _{CC} - 0.3	-	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	-	-	1.05	-	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.8	-	-	1.65	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	2.05	-	V
		I _O = -18 mA; V _{CC} = 3.0 V	2.4	-	-	2.25	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.2	-	-	2.0	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}						
	output voltage	I _O = 100 μA; V _{CC} = 1.65 V to 3.6 V	-	-	0.2	-	0.3	V
		I _O = 4 mA; V _{CC} = 1.65 V	-	-	0.45	-	0.65	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.6	-	0.8	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	-	0.6	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.8	V

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

Symbol	Parameter	Conditions	-40	°C to +85	°C	-40 °C to	+125 °C	Unit
			Min	Typ [1]	Max	Min	Max	
II	input leakage current	$V_{CC} = 3.6 \text{ V}; V_I = 5.5 \text{ V or GND}$	-	±0.1	±5	-	±20	μΑ
I _{OZ}	OFF-state output current	$V_I = V_{IH} \text{ or } V_{IL}; V_{CC} = 3.6 \text{ V}; $ $V_O = 5.5 \text{ V or GND}$	-	±0.1	±5	-	±20	μΑ
I _{OFF}	power-off leakage current	$V_{CC} = 0.0 \text{ V}; V_1 \text{ or } V_0 = 5.5 \text{ V}$	-	±0.1	±10	-	±20	μΑ
I _{CC}	supply current	$V_{CC} = 3.6 \text{ V}; V_I = V_{CC} \text{ or GND};$ $I_O = 0 \text{ A}$	-	0.1	10	-	40	μΑ
ΔI _{CC}	additional supply current	per input pin; $V_I = V_{CC} - 0.6 \text{ V}$; $I_O = 0 \text{ A}$; $V_{CC} = 2.7 \text{ V}$ to 3.6 V	-	5	500	-	5000	μΑ
Cı	input capacitance	$V_{CC} = 0 \text{ V to } 3.6 \text{ V}; V_I = \text{GND to } V_{CC}$	-	4.0	-	-	-	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 characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit see Fig. 6.

Symbol	Parameter	Conditions		-40	°C to +85	°C	-40 °C to	+125 °C	ns ns ns ns ns ns
				Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	nA to nY; see Fig. 4	[2]						
		V _{CC} = 1.2 V		-	12.0	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		1.5	5.4	11.0	1.5	12.8	ns
		V _{CC} = 2.3 V to 2.7 V		1.0	2.9	5.7	1.0	6.7	ns
		V _{CC} = 2.7 V		1.5	2.8	5.5	1.5	7.0	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.5	4.8	1.0	6.0	ns
t _{en}	enable time	nOE to nY; see Fig. 5	[2]						
		V _{CC} = 1.2 V		-	16.0	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		1.0	5.0	12.2	1.0	14.2	ns
		V _{CC} = 2.3 V to 2.7 V		0.5	2.9	6.8	0.5	7.9	ns
		V _{CC} = 2.7 V		1.5	3.1	6.6	1.5	8.5	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	2.3	5.4	1.0	7.0	ns
t _{dis}	disable time	n OE to nY; see <u>Fig. 5</u>	[2]						
		V _{CC} = 1.2 V		-	7.0	-	-	-	ns
		V _{CC} = 1.65 V to 1.95 V		2.2	4.6	7.5	2.2	8.7	ns
		V _{CC} = 2.3 V to 2.7 V		0.5	2.6	4.2	0.5	5.0	ns
		V _{CC} = 2.7 V		1.5	3.1	5.0	1.5	6.5	ns
		V _{CC} = 3.0 V to 3.6 V		1.0	3.2	4.6	1.0	6.0	ns

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Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

Symbol	Parameter	Conditions	-40	°C to +85	°C	-40 °C to	Unit	
			Min	Typ [1]	Max	Min	Max	
t _{sk(o)}	output skew time	V _{CC} = 3.0 V to 3.6 V [3]	-	-	1.0	-	1.5	ns
C _{PD}	power dissipation	per buffer; $V_I = GND$ to V_{CC} [4]						
	capacitance	V _{CC} = 1.65 V to 1.95 V	-	6.0	-	-	-	pF
		V _{CC} = 2.3 V to 2.7 V	-	9.4	-	-	-	pF
		V _{CC} = 3.0 V to 3.6 V	-	12.4	-	-	-	pF

- [1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.2 V, 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
 - t_{en} is the same as t_{PZL} and t_{PZH} .
 - t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [3] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
- [4] 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

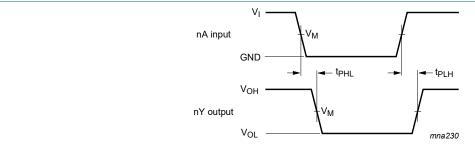
C_L = output load capacitance in pF

V_{CC} = supply voltage in Volts

N = number of inputs switching

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of the outputs.

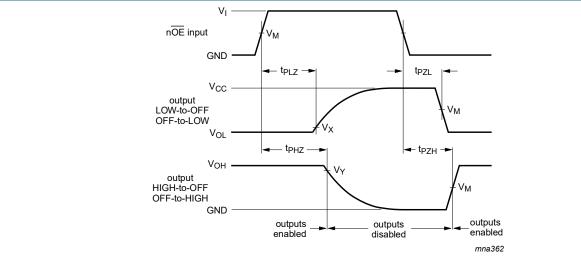
10.1. Waveforms and test circuit



Measurement points are given in Table 8.

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

Fig. 4. The input nA to output nY propagation delays



Measurement points are given in Table 8.

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

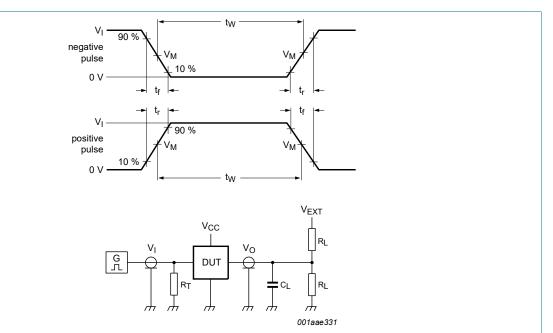
Fig. 5. 3-state enable and disable times

Product data sheet

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

Table 8. Measurement points

Supply voltage	Input		Output			
V _{CC}	V _I	V _M	V _M	V _X	V _Y	
1.2 V	V _{CC}	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V	
1.65 V to 1.95 V	V _{CC}	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V	
2.3 V to 2.7 V	V _{CC}	0.5 × V _{CC}	0.5 × V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V	
2.7 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	2.7 V	1.5 V	1.5 V	V _{OL} + 0.3 V	V _{OH} - 0.3 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_0 of the pulse generator.

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

Fig. 6. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load	Load		V _{EXT}		
V _{CC}	V _I	t _r , t _f	CL	R _L	t _{PLH} , t _{PHL}	t _{PLZ} , t _{PZL}	t _{PHZ} , t _{PZH}	
1.2 V	V _{CC}	≤ 2 ns	30 pF	1 kΩ	open	2 × V _{CC}	GND	
1.65 V to 1.95 V	V _{CC}	≤ 2 ns	30 pF	1 kΩ	open	2 × V _{CC}	GND	
2.3 V to 2.7 V	V _{CC}	≤ 2 ns	30 pF	500 Ω	open	2 × V _{CC}	GND	
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	2 × V _{CC}	GND	
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	2 × V _{CC}	GND	

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

11. Package outline

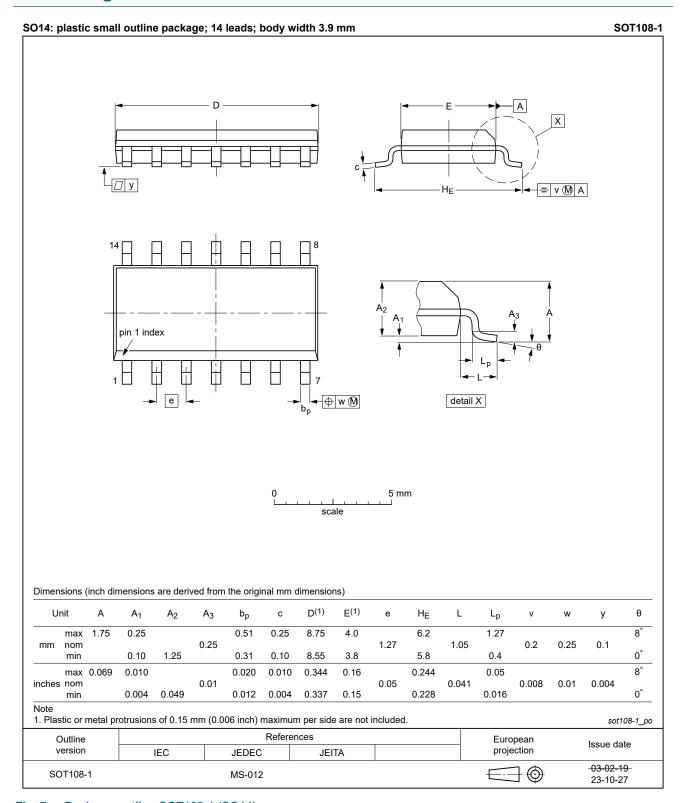


Fig. 7. Package outline SOT108-1 (SO14)

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

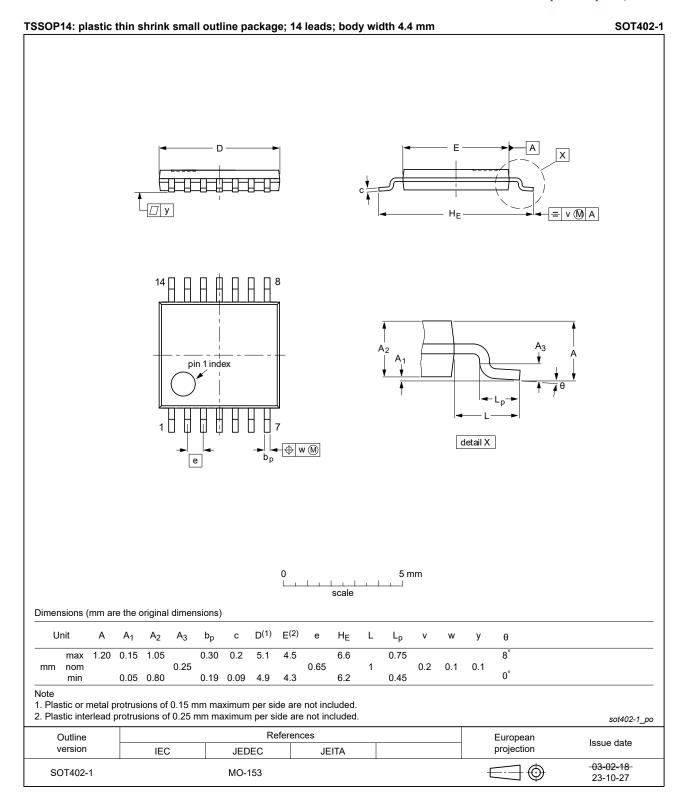


Fig. 8. Package outline SOT402-1 (TSSOP14)

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Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

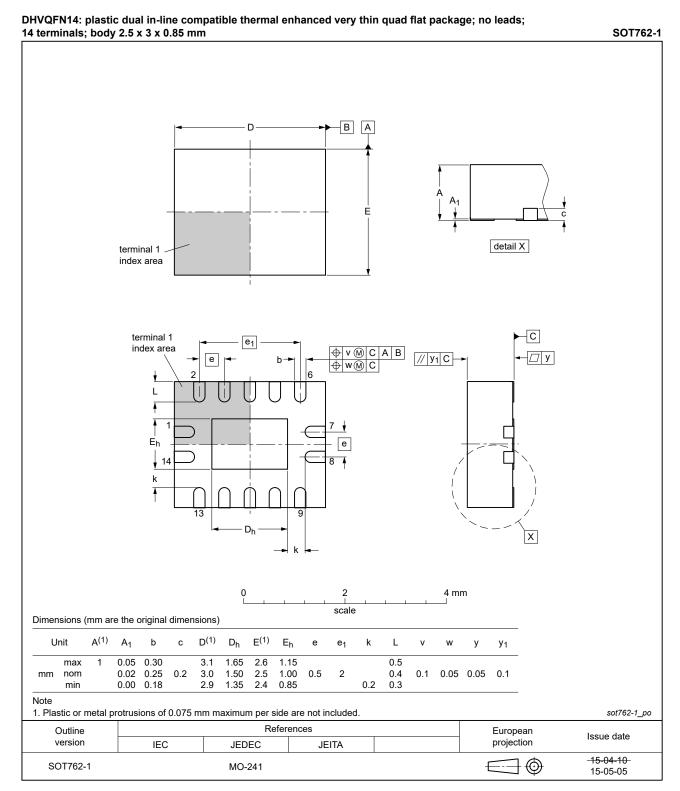


Fig. 9. Package outline SOT762-1 (DHVQFN14)

Product data sheet

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

DHXQFN14: plastic, leadless dual in-line compatible thermal enhanced extreme thin quad flat package; no leads; 14 terminals; 0.4 mm pitch; body 2 mm x 2 mm x 0.48 mm

SOT8014-1

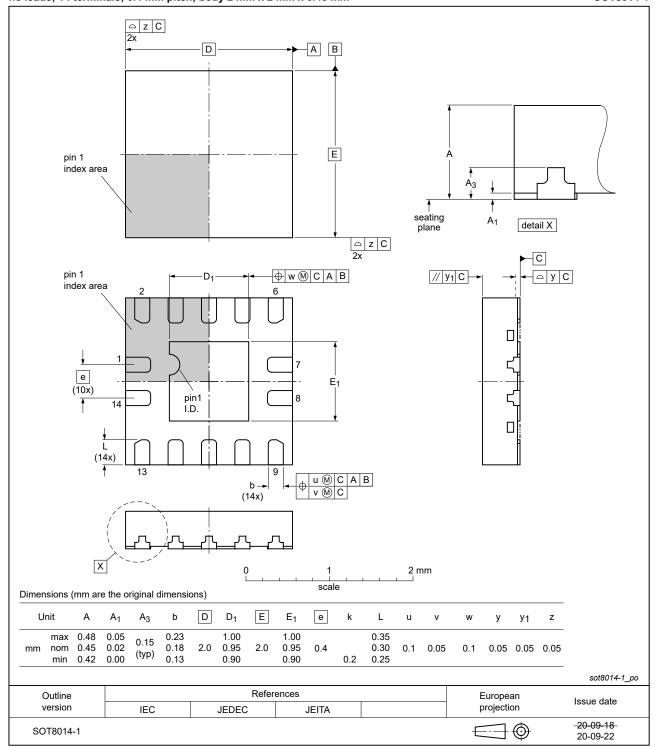


Fig. 10. Package outline SOT8014-1 (DHXQFN14)

Product data sheet

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

12. Abbreviations

Table 10. Abbreviations

Acronym	Description	
CDM	Charged Device Model	
CMOS	nplementary Metal-Oxide Semiconductor	
DUT	Device Under Test	
ESD	ElectroStatic Discharge	
НВМ	Human Body Model	
TTL	Transistor-Transistor Logic	

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74LVC125A v.12	20250502	Product data sheet	-	74LVC125A v.11	
Modifications:	Type number 74LVC125ABZ (SOT8014-1/DHXQFN14) added.				
74LVC125A v.11	20240212	Product data sheet	-	74LVC125A v.10	
Modifications:	• Fig. 7, Fig. 8: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153.				
74LVC125A v.10	20230803	Product data sheet	-	74LVC125A v.9	
Modifications:	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74LVC125A v.9	20210917	Product data sheet	-	74LVC125A v.8	
Modifications:	 Type number 74LVC125ADB (SOT337-1/SSOP14) removed. Section 1 and Section 2 updated. 				
74LVC125A v.8	20200505	Product data sheet	-	74LVC125A v.7	
Modifications:	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Table 4: Derating values for P_{tot} total power dissipation updated. Table 8: Added measurement points for V_X and V_Y. Fig. 9: Package outline drawing SOT762-1 (DHVQFN14) updated. 				
74LVC125A v.7	20130411	Product data sheet	-	74LVC125A v.6	
Modifications:	Features list corrected (errata)				
74LVC125A v.6	20130305	Product data sheet	-	74LVC125A v.5	
74LVC125A v.5	20120208	Product data sheet	-	74LVC125A v.4	
74LVC125A v.4	20030507	Product specification	-	74LVC125A v.3	
74LVC125A v.3	20020308	Product specification	-	74LVC125A v.2	
74LVC125A v.2	19980428	Product specification	-	74LVC125A v.1	
74LVC125A v.1	19970801	Product specification	-	-	

Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

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.
Product [short] data sheet	Production	This document contains the product specification.

- 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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Quad buffer/line driver with 5 V tolerant input/outputs; 3-state

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