

# 74LVC126A-Q100

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

Rev. 2 — 21 August 2018

Product data sheet

## 1. General description

The 74LVC126A-Q100 consists of four non-inverting buffers/line drivers with 3-state outputs, which are controlled by the output enable input (nOE). A LOW at nOE causes the outputs to assume a high-impedance OFF-state.

Inputs can be driven from either 3.3 V or 5 V devices. When disabled, up to 5.5 V can be applied to the outputs.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- 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)
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

## 3. Ordering information

Table 1. Ordering information

Type number	Package				Version
	Temperature range	Name	Description		
74LVC126AD-Q100	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm		SOT108-1
74LVC126APW-Q100	-40 °C to +125 °C	TSSOP14	plastic thin small outline package; 14 leads; body width 4.4 mm		SOT402-1
74LVC126ABQ-Q100	-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

## 4. Functional diagram

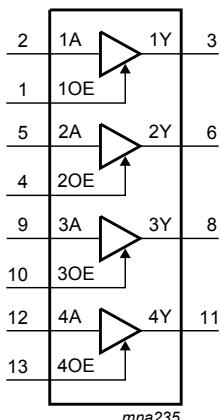


Fig. 1. Logic symbol

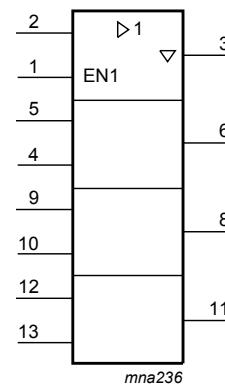


Fig. 2. IEC logic symbol

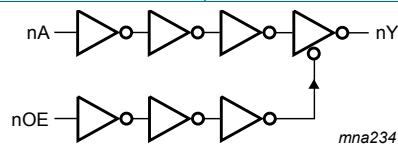


Fig. 3. Logic diagram

## 5. Pinning information

### 5.1. Pinning

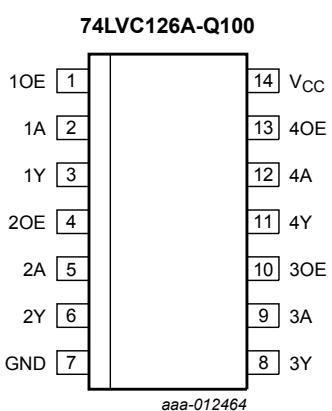
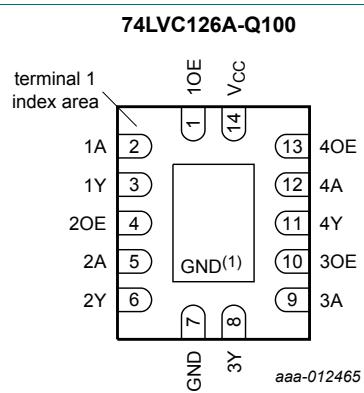


Fig. 4. Pin configuration SOT108-1 (SO14) and SOT402-1 (TSSOP14)



Transparent top view  
 (1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig. 5. Pin configuration SOT762-1 (DHVQFN14)

## 5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1OE, 2OE, 3OE, 4OE	1, 4, 10, 13	data enable input (active HIGH)
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 <sub>CC</sub>	14	supply voltage

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

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.5	+6.5	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	+6.5
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	[2]	-0.5	V <sub>CC</sub> + 0.5
		output 3-state	[2]	-0.5	+6.5
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		[3]	-65	+150
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C	-	500	mW

[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.

[3] For SO14 packages: above 70 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.

For TSSOP14 packages: above 60 °C the value of P<sub>tot</sub> derates linearly with 5.5 mW/K.

For DHVQFN14 packages: above 60 °C the value of P<sub>tot</sub> derates linearly with 4.5 mW/K.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CC}$	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
$V_I$	input voltage		0	-	5.5	V
$V_O$	output voltage	output HIGH or LOW state	0	-	$V_{CC}$	V
		output 3-state	0	-	5.5	V
$T_{amb}$	ambient temperature	in free air	-40	-	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65 \text{ V to } 2.7 \text{ V}$	0	-	20	ns/V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	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			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 1.2 \text{ V}$	1.08	-	-	1.08	-	V
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	$0.65V_{CC}$	-	-	$0.65V_{CC}$	-	V
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	-	-	1.7	-	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2.0	-	-	2.0	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 1.2 \text{ V}$	-	-	0.12	-	0.12	V
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	-	$0.35V_{CC}$	-	$0.35V_{CC}$	V
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	-	0.7	-	0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	-	-	0.8	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$						
		$I_O = -100 \mu\text{A}; V_{CC} = 1.65 \text{ V to } 3.6 \text{ V}$	$V_{CC} - 0.2$	-	-	$V_{CC} - 0.3$	-	V
		$I_O = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	-	-	1.05	-	V
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.8	-	-	1.65	-	V
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	-	-	2.05	-	V
		$I_O = -18 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.4	-	-	2.25	-	V
		$I_O = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.2	-	-	2.0	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$						
		$I_O = 100 \mu\text{A}; V_{CC} = 1.65 \text{ V to } 3.6 \text{ V}$	-	-	0.2	-	0.3	V
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.45	-	0.65	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.6	-	0.8	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	-	-	0.4	-	0.6	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.55	-	0.8	V

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
$I_I$	input leakage current	$V_{CC} = 3.6 \text{ V}$ ; $V_I = 5.5 \text{ V}$ or GND	-	$\pm 0.1$	$\pm 5$	-	$\pm 20$	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 3.6 \text{ V}$ ; $V_O = 5.5 \text{ V}$ or GND	-	$\pm 0.1$	$\pm 5$	-	$\pm 20$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0 \text{ V}$ ; $V_I$ or $V_O = 5.5 \text{ V}$	-	$\pm 0.1$	$\pm 10$	-	$\pm 20$	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 3.6 \text{ V}$ ; $V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}$	-	0.1	10	-	40	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 1.65 \text{ V}$ to $3.6 \text{ V}$ ; $V_I = V_{CC} - 0.6 \text{ V}$ ; $I_O = 0 \text{ A}$	-	5	500	-	5000	$\mu\text{A}$
$C_I$	input capacitance	$V_{CC} = 0 \text{ V}$ to $3.6 \text{ V}$ ; $V_I = \text{GND}$ to $V_{CC}$	-	4.0	-	-	-	$\text{pF}$

[1] All typical values are measured at  $V_{CC} = 3.3 \text{ V}$  (unless stated otherwise) and  $T_{amb} = 25 \text{ °C}$ .

## 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			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
$t_{pd}$	propagation delay	nA to nY; see <a href="#">Fig. 6</a> [2]						
		$V_{CC} = 1.2 \text{ V}$	-	11.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V}$ to $1.95 \text{ V}$	1.5	5.2	10.8	1.5	12.6	ns
		$V_{CC} = 2.3 \text{ V}$ to $2.7 \text{ V}$	1.0	2.8	5.6	1.0	6.6	ns
		$V_{CC} = 2.7 \text{ V}$	1.5	2.7	5.2	1.5	6.5	ns
		$V_{CC} = 3.0 \text{ V}$ to $3.6 \text{ V}$	1.0	2.4	4.7	1.0	6.0	ns
$t_{en}$	enable time	nOE to nY; see <a href="#">Fig. 7</a> [2]						
		$V_{CC} = 1.2 \text{ V}$	-	15.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V}$ to $1.95 \text{ V}$	2.4	6.7	12.9	2.4	15.0	ns
		$V_{CC} = 2.3 \text{ V}$ to $2.7 \text{ V}$	2.0	3.8	7.1	2.0	8.3	ns
		$V_{CC} = 2.7 \text{ V}$	1.5	3.1	6.3	1.5	8.0	ns
		$V_{CC} = 3.0 \text{ V}$ to $3.6 \text{ V}$	1.0	3.1	5.7	1.0	7.5	ns
$t_{dis}$	disable time	nOE to nY; see <a href="#">Fig. 7</a> [2]						
		$V_{CC} = 1.2 \text{ V}$	-	8.0	-	-	-	ns
		$V_{CC} = 1.65 \text{ V}$ to $1.95 \text{ V}$	1.0	3.3	10.0	1.0	11.5	ns
		$V_{CC} = 2.3 \text{ V}$ to $2.7 \text{ V}$	0.5	1.8	5.6	0.5	6.5	ns
		$V_{CC} = 2.7 \text{ V}$	1.5	3.4	6.7	1.5	8.5	ns
		$V_{CC} = 3.0 \text{ V}$ to $3.6 \text{ V}$	1.3	2.5	6.0	1.3	7.5	ns

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
$t_{sk(o)}$	output skew time	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ [3]	-	-	1.0	-	1.5	ns
$C_{PD}$	power dissipation capacitance	per buffer; $V_I = \text{GND to } V_{CC}$ [4]						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	-	6.0	-	-	-	pF
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	9.3	-	-	-	pF
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	-	12.2	-	-	-	pF

[1] Typical values are measured at  $T_{amb} = 25 \text{ °C}$  and  $V_{CC} = 1.2 \text{ V}, 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}$ , and  $3.3 \text{ V}$  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  $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$$

$f_i$  = input frequency in MHz;  $f_o$  = output frequency in MHz

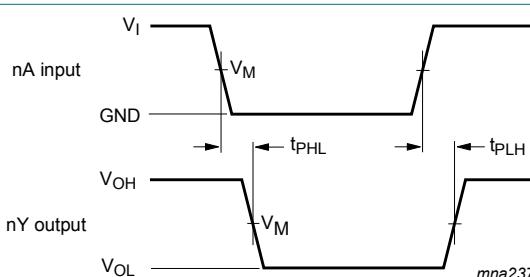
$C_L$  = output load capacitance in pF

$V_{CC}$  = supply voltage in Volts

$N$  = number of inputs switching

$$\sum (C_L \times V_{CC}^2 \times f_o) = \text{sum of the outputs}$$

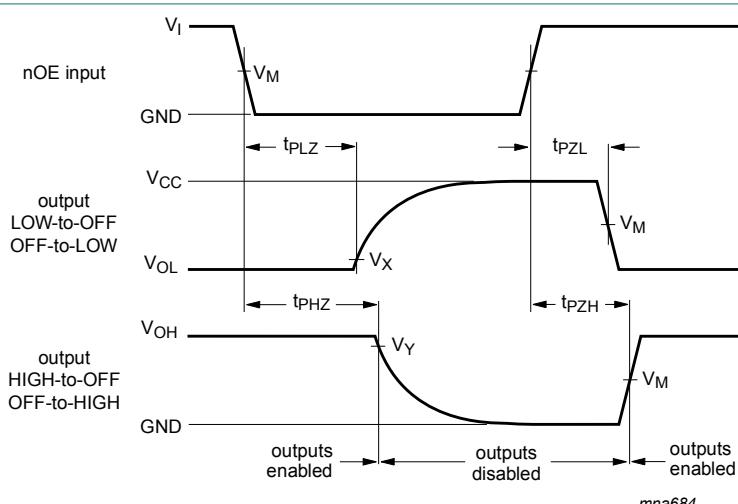
## 10.1. Waveforms and test circuit



Measurement points are given in [Table 8](#).

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

**Fig. 6. The input nA to output nY propagation delays**



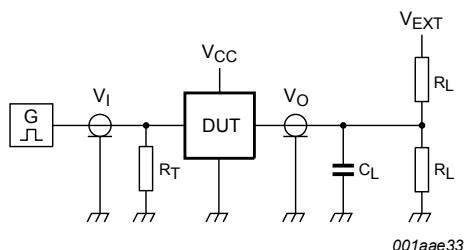
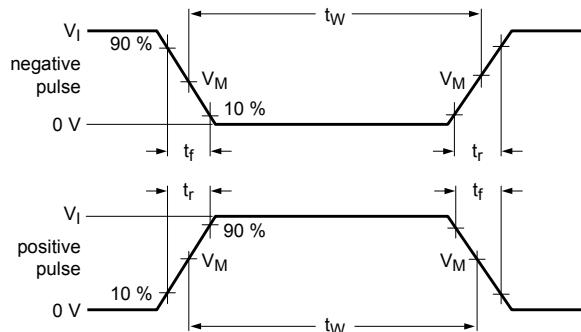
Measurement points are given in [Table 8](#).

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

**Fig. 7. 3-state enable and disable times**

Table 8. Measurement points

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
$V_{CC} < 2.7 \text{ V}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
$V_{CC} \geq 2.7 \text{ V}$	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$



001aae331

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. 8. Test circuit for measuring switching times

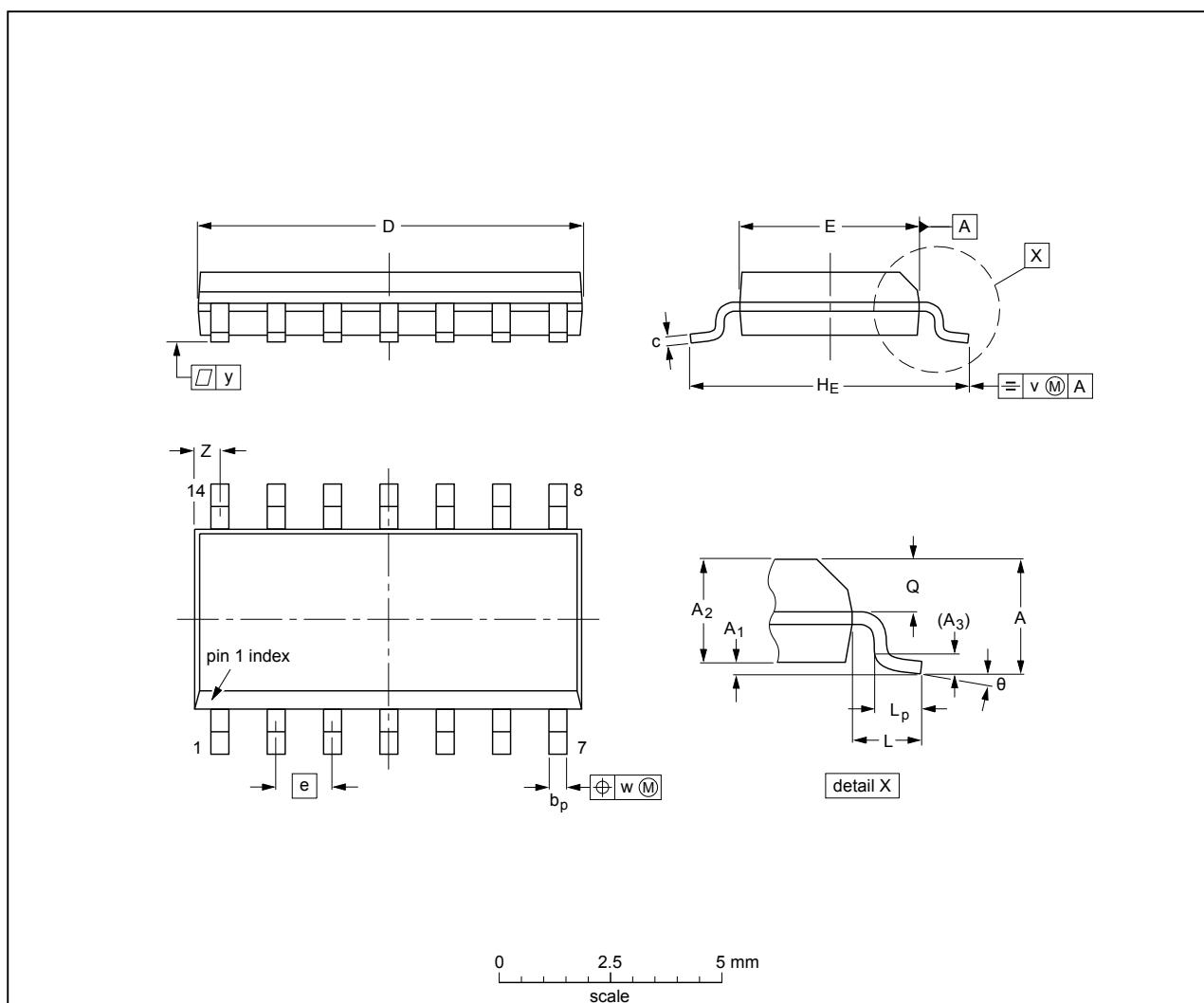
Table 9. Test data

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.2 V	$V_{CC}$	$\leq 2 \text{ ns}$	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
1.65 V to 1.95 V	$V_{CC}$	$\leq 2 \text{ ns}$	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2 \text{ ns}$	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5 \text{ ns}$	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND

## 11. 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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75 0.10	0.25 1.45	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° 0°
inches	0.069 0.004	0.010 0.049	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)

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

SOT402-1

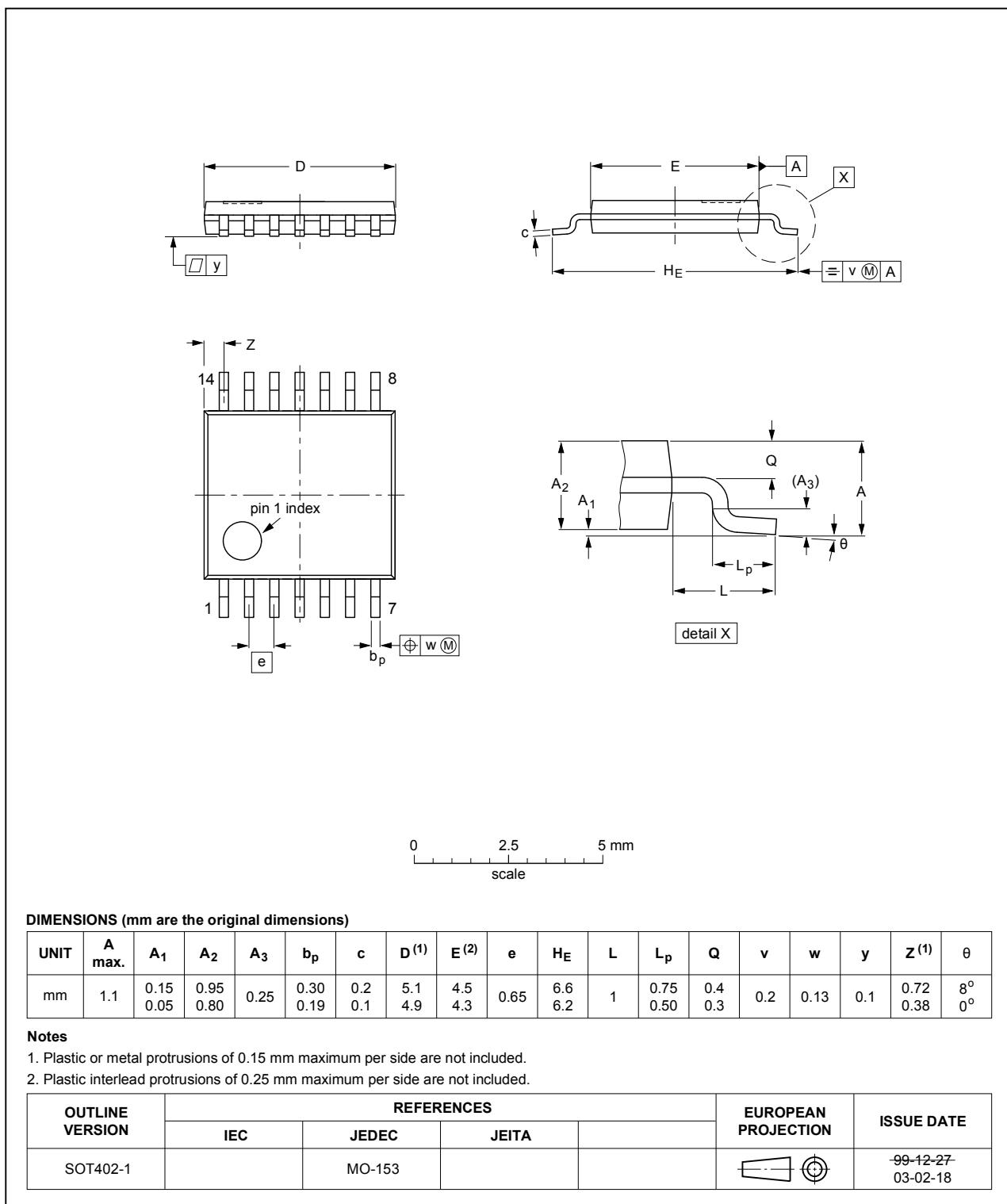


Fig. 10. Package outline SOT402-1 (TSSOP14)

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

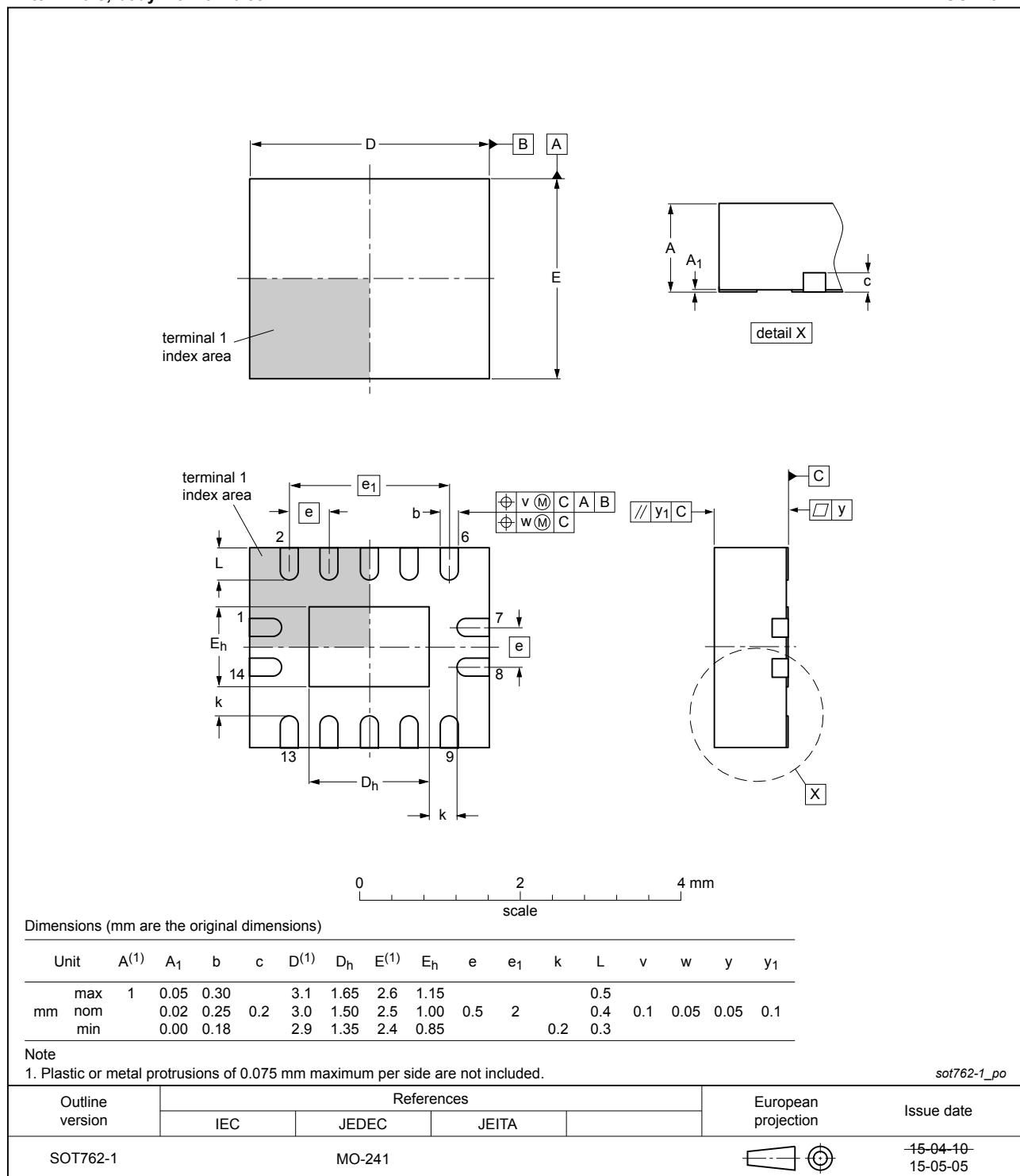


Fig. 11. Package outline SOT762-1 (DHVQFN14)

## 12. Abbreviations

**Table 10. Abbreviations**

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

## 13. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC126A_Q100 v.2	20180821	Product data sheet	-	74LVC126A_Q100 v.1
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></ul>			
74LVC126A_Q100 v.1	20140526	Product data sheet	-	-

## 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.

- [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 <https://www.nexperia.com>.

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