



# 74ALVT16827

20-bit buffer/line driver; non-inverting; 3-state

Rev. 5 — 25 June 2024

Product data sheet

## 1. General description

The 74ALVT16827 is a 20-bit buffer/line driver with 3-state outputs.

The device can be used as two 10-bit buffers or one 20-bit buffer. The device features output enable (nOE1 and nOE2) inputs, each controlling 10-bits. A HIGH on either nOE1 or nOE2 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

## 2. Features and benefits

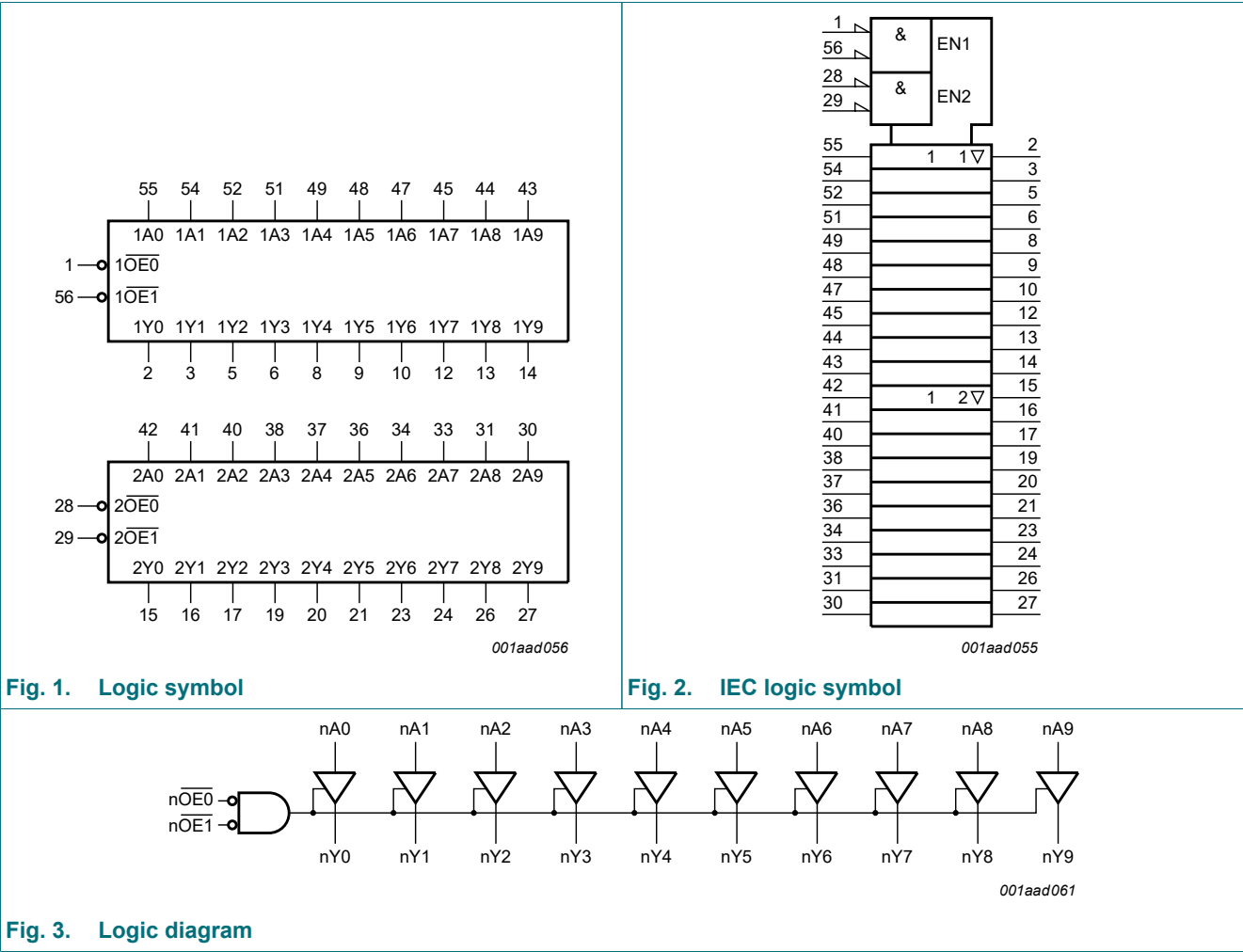
- Wide supply voltage range from 2.3 V to 3.6 V
- Overvoltage tolerant inputs to 5.5 V
- BiCMOS high speed and output drive
- Direct interface with TTL levels
- Bus hold on data inputs
- No bus current loading when output is tied to 5 V bus
- Power-up 3-state
- I<sub>OFF</sub> circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 500 mA per JESD 78 Class II Level B
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to 85 °C

## 3. Ordering information

Table 1. Ordering information

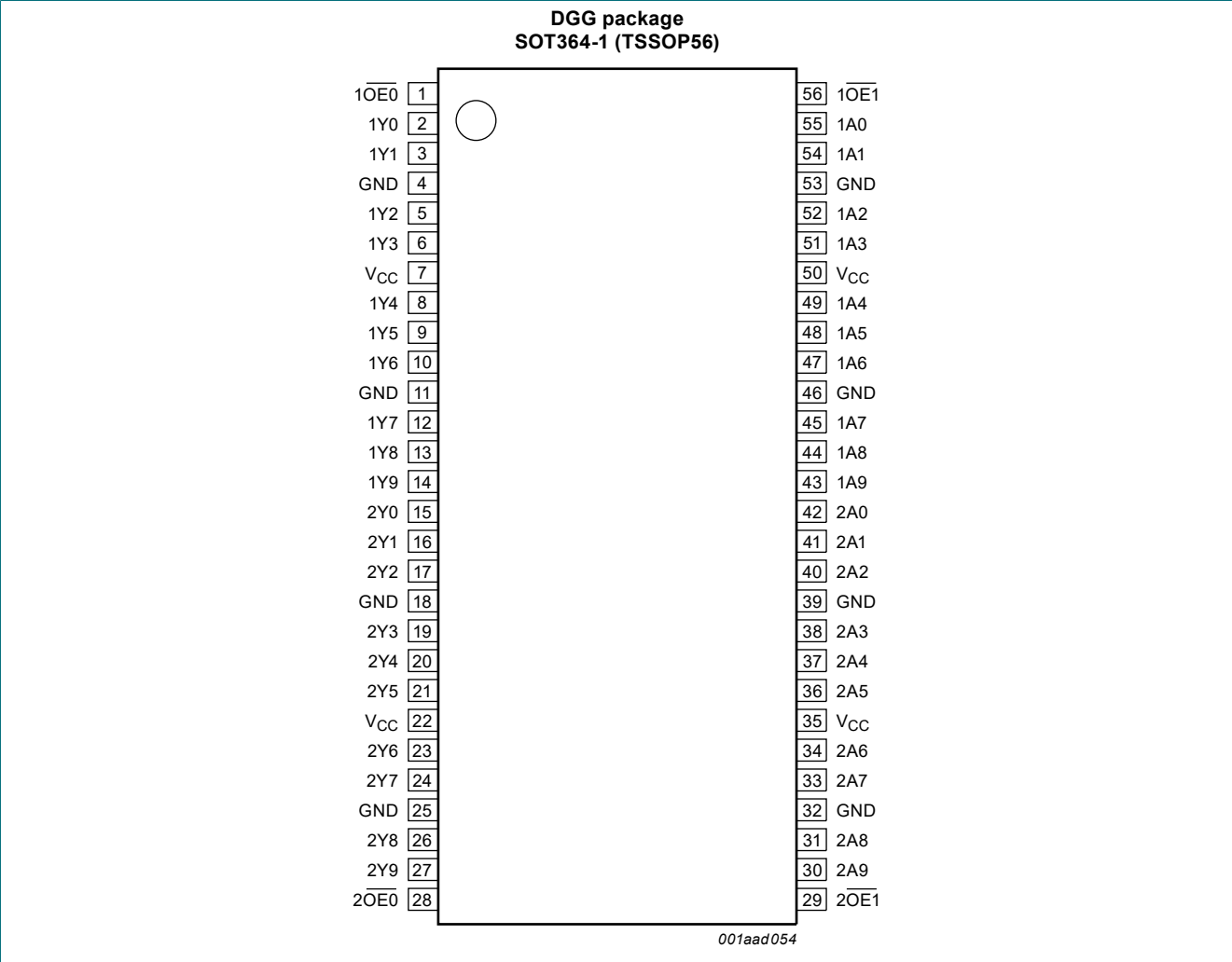
Type number	Package			
	Temperature range	Name	Description	Version
<a href="#">74ALVT16827DGG</a>	-40 °C to +85 °C	TSSOP56	plastic thin shrink small outline package; 56 leads; body width 6.1 mm	<a href="#">SOT364-1</a>

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1A0, 1A1, 1A2, 1A3, 1A4, 1A5, 1A6, 1A7, 1A8, 1A9	55, 54, 52, 51, 49, 48, 47, 45, 44, 43	data input
2A0, 2A1, 2A2, 2A3, 2A4, 2A5, 2A6, 2A7, 2A8, 2A9	42, 41, 40, 38, 37, 36, 34, 33, 31, 30	data input
1Y0, 1Y1, 1Y2, 1Y3, 1Y4, 1Y5, 1Y6, 1Y7, 1Y8, 1Y9	2, 3, 5, 6, 8, 9, 10, 12, 13, 14	data output
2Y0, 2Y1, 2Y2, 2Y3, 2Y4, 2Y5, 2Y6, 2Y7, 2Y8, 2Y9	15, 16, 17, 19, 20, 21, 23, 24, 26, 27	data output
1OE0, 1OE1, 2OE0, 2OE1	1, 56, 28, 29	output enable inputs (active-LOW)
GND	4, 11, 18, 25, 32, 39, 46, 53	ground (0 V)
V <sub>CC</sub>	7, 22, 35, 50	positive voltage supply

6. Functional description

Table 3. Function table [1]

Input		Output	Operating mode
nOEn	nAn	nYn	
L	L	L	transparent
L	H	H	transparent
H	X	Z	High-impedance

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

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	+7.0	V
V <sub>I</sub>	input voltage		-1.2	+7.0	V
V <sub>O</sub>	output voltage	output in OFF or HIGH-state	-0.5	+5.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-18	-	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
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>stg</sub>	storage temperature		-65	+150	°C

- [1] The input and output voltage ratings may be exceeded if the input and output 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	V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		Unit
			Min	Max	Min	Max	
V <sub>CC</sub>	supply voltage		2.3	2.7	3.0	3.6	V
V <sub>I</sub>	input voltage		0	5.5	0	5.5	V
I <sub>OH</sub>	HIGH-level output current		-	-8	-	-32	mA
I <sub>OL</sub>	LOW-level output current	none	-	8	-	32	mA
		current duty cycle ≤ 50 %; f ≥ 1 kHz	-	24	-	64	mA
Δt/ΔV	input transition rise and fall rate	outputs enabled	-	10	-	10	ns/V
T <sub>amb</sub>	ambient temperature		-40	+85	-40	+85	°C

## 9. Static characteristics

**Table 6. Static characteristics**

At recommended operating conditions;  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ ; voltages are referred to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
<b><math>V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}</math></b>						
$V_{IK}$	input clamping voltage	$V_{CC} = 2.3\text{ V}$ ; $I_{IK} = -18\text{ mA}$	-	-0.85	-1.2	V
$V_{IH}$	HIGH-level input voltage		1.7	-	-	V
$V_{IL}$	LOW-level input voltage		-	-	0.7	V
$V_{OH}$	HIGH-level output voltage	$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$ ; $I_O = -100\text{ }\mu\text{A}$	$V_{CC} - 0.2$	$V_{CC}$	-	V
		$V_{CC} = 2.3\text{ V}$ ; $I_O = -8\text{ mA}$	1.8	2.1	-	V
$V_{OL}$	LOW-level output voltage	$V_{CC} = 2.3\text{ V}$ ; $I_O = 100\text{ }\mu\text{A}$	-	0.07	0.2	V
		$V_{CC} = 2.3\text{ V}$ ; $I_O = 24\text{ mA}$	-	0.3	0.5	V
$I_I$	input leakage current	all pins				
		$V_{CC} = 0\text{ V}$ or $2.7\text{ V}$ ; $V_I = 5.5\text{ V}$	-	0.1	10	$\mu\text{A}$
		control pins				
		$V_{CC} = 2.7\text{ V}$ ; $V_I = V_{CC}$ or GND	-	0.1	$\pm 1$	$\mu\text{A}$
		data pins [2]				
		$V_{CC} = 2.7\text{ V}$ ; $V_I = V_{CC}$	-	0.1	1	$\mu\text{A}$
		$V_{CC} = 2.7\text{ V}$ ; $V_I = 0\text{ V}$	-	0.1	-5	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_{CC} = 0\text{ V}$ ; $V_I$ or $V_O = 0\text{ V}$ to $4.5\text{ V}$	-	0.1	$\pm 100$	$\mu\text{A}$
$I_{BHL}$	bus hold LOW current	$V_{CC} = 2.5\text{ V}$ ; $V_I = 0.8\text{ V}$	-	115	-	$\mu\text{A}$
$I_{BHH}$	bus hold HIGH current	$V_{CC} = 2.5\text{ V}$ ; $V_I = 2.0\text{ V}$	-	-10	-	$\mu\text{A}$
$I_{EX}$	external current	output in HIGH-state when $V_O > V_{CC}$ ; $V_O = 5.5\text{ V}$ ; $V_{CC} = 2.3\text{ V}$	-	10	125	$\mu\text{A}$
$I_{O(pu/pd)}$	power-up/power-down output current	$V_{CC} \leq 1.2\text{ V}$ ; $V_O = 0.5\text{ V}$ to $V_{CC}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; $n\overline{OE}n = \text{don't care}$ [3]	-	1	100	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_{CC} = 2.7\text{ V}$ ; $V_I = V_{IL}$ or $V_{IH}$				
		output HIGH; $V_O = 2.3\text{ V}$	-	0.5	5	$\mu\text{A}$
		output LOW; $V_O = 0.5\text{ V}$	-	0.5	-5	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 2.7\text{ V}$ ; $V_I = \text{GND}$ or $V_{CC}$ ; $I_O = 0\text{ A}$				
		outputs HIGH	-	0.04	0.1	mA
		outputs LOW	-	3.6	5.0	mA
		outputs disabled [4]	-	0.04	0.1	mA
$\Delta I_{CC}$	additional supply current	per input pin; $V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$ ; one input at $V_{CC} - 0.6\text{ V}$ ; other inputs at $V_{CC}$ or GND [5]	-	0.04	0.4	mA
$C_I$	input capacitance	$V_I = 0\text{ V}$ or $V_{CC}$	-	3	-	pF
$C_O$	output capacitance	$V_O = 0\text{ V}$ or $V_{CC}$	-	9	-	pF
<b><math>V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}</math></b>						
$V_{IK}$	input clamping voltage	$V_{CC} = 3.0\text{ V}$ ; $I_{IK} = -18\text{ mA}$	-	-0.85	-1.2	V
$V_{IH}$	HIGH-level input voltage		2.0	-	-	V
$V_{IL}$	LOW-level input voltage		-	-	0.8	V

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>O</sub> = -100 µA	V <sub>CC</sub> - 0.2	V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 3.0 V; I <sub>O</sub> = -32 mA	2.0	2.3	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 3.0 V				
		I <sub>O</sub> = 100 µA	-	0.07	0.2	V
		I <sub>O</sub> = 16 mA	-	0.25	0.4	V
		I <sub>O</sub> = 32 mA	-	0.3	0.5	V
		I <sub>O</sub> = 64 mA	-	0.4	0.55	V
I <sub>I</sub>	input leakage current	control pins				
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	0.1	±1	µA
		V <sub>CC</sub> = 0 V or 3.6 V; V <sub>I</sub> = 5.5 V	-	0.1	10	µA
		data pins [2]				
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub>	-	0.5	1	µA
		V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V	-	0.1	-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	-	0.1	±100	µA
I <sub>BHL</sub>	bus hold LOW current	data inputs; V <sub>CC</sub> = 3 V; V <sub>I</sub> = 0.8 V	75	130	-	µA
I <sub>BHH</sub>	bus hold HIGH current	data inputs; V <sub>CC</sub> = 3 V; V <sub>I</sub> = 2.0 V	-75	-140	-	µA
I <sub>BHLO</sub>	bus hold LOW overdrive current	data inputs; V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V to 3.6 V [6]	500	-	-	µA
I <sub>BHHO</sub>	bus hold HIGH overdrive current	data inputs; V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 0 V to 3.6 V [6]	-500	-	-	µA
I <sub>EX</sub>	external 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	-	10	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> ; n $\overline{\text{OE}}$ n = don't care [7]	-	1	±100	µA
I <sub>OZ</sub>	OFF-state output current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>				
		output HIGH; V <sub>O</sub> = 3.0 V	-	0.5	5	µA
		output LOW; V <sub>O</sub> = 0.5 V	-	0.5	-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	-	0.07	0.1	mA
		outputs LOW	-	4.2	6	mA
		outputs disabled [4]	-	0.07	0.1	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; other inputs at V <sub>CC</sub> or GND [5]	-	0.04	0.4	mA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = 0 V or V <sub>CC</sub>	-	3	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = 0 V or V <sub>CC</sub>	-	9	-	pF

[1] All typical values for V<sub>CC</sub> = 2.5 V ± 0.2 V are measured at V<sub>CC</sub> = 2.5 V and T<sub>amb</sub> = 25 °C.

All typical values for V<sub>CC</sub> = 3.3 V ± 0.3 V 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 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> = 2.5 V ± 0.2 V a transition time of 100 µs is permitted. This parameter is valid for T<sub>amb</sub> = 25 °C only.

[4] I<sub>CC</sub> with outputs disabled is measured with outputs pulled up to V<sub>CC</sub> or pulled down to ground.

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

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

[7] 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> = 3.3 V ± 0.3 V a transition time of 100 µs is permitted. This parameter is valid for T<sub>amb</sub> = 25 °C only.

10. Dynamic characteristics

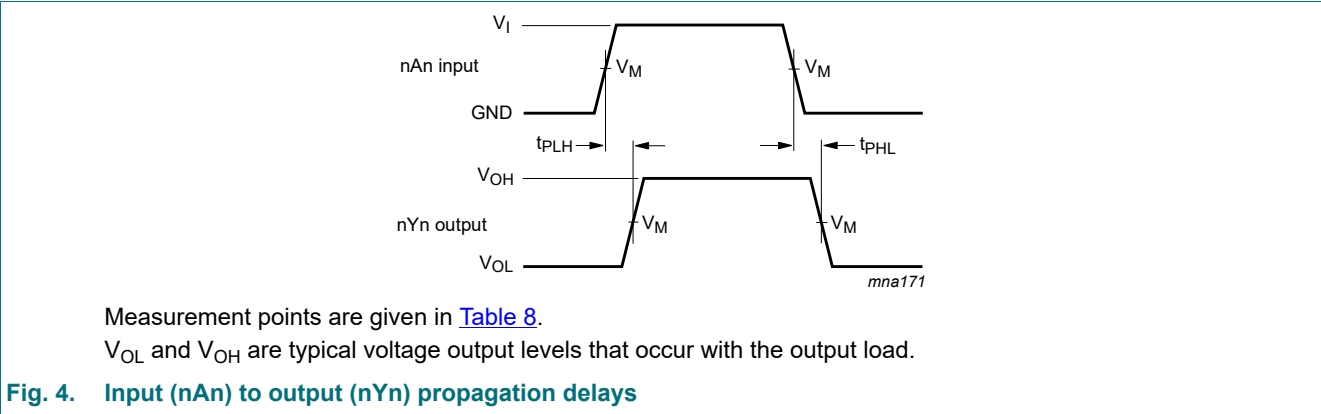
Table 7. Dynamic characteristics

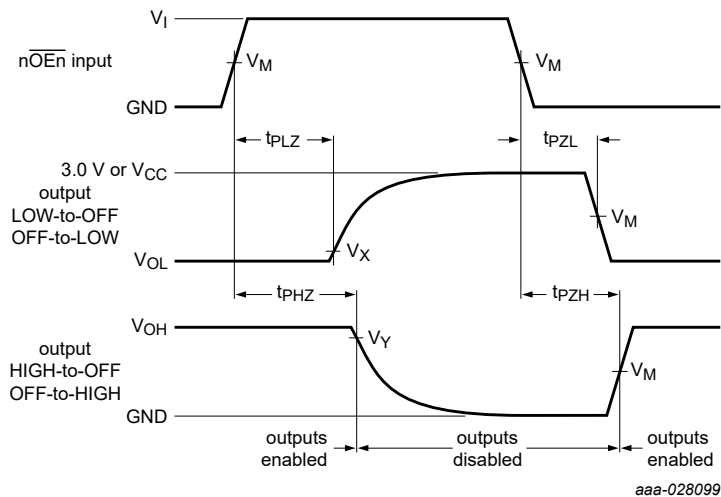
At recommended operating conditions;  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ ; Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

Symbol	Parameter	Conditions	Min	Typ[1]	Max	Unit
<b>V<sub>CC</sub> = 2.5 V ± 0.2 V</b>						
t <sub>PLH</sub>	LOW to HIGH propagation delay	nAn to nYn; see Fig. 4	1.0	2.0	2.9	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	nAn to nYn; see Fig. 4	1.0	2.0	3.0	ns
t <sub>PZH</sub>	OFF-state to HIGH propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	2.0	3.2	5.5	ns
t <sub>PZL</sub>	OFF-state to LOW propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.7	2.9	4.3	ns
t <sub>PHZ</sub>	HIGH to OFF-state propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.8	2.8	5.1	ns
t <sub>PLZ</sub>	LOW to OFF-state propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.4	2.3	3.9	ns
<b>V<sub>CC</sub> = 3.3 V ± 0.3 V</b>						
t <sub>PLH</sub>	LOW to HIGH propagation delay	nAn to nYn; see Fig. 4	0.7	1.5	2.2	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	nAn to nYn; see Fig. 4	0.8	1.6	2.3	ns
t <sub>PZH</sub>	OFF-state to HIGH propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.6	2.6	3.8	ns
t <sub>PZL</sub>	OFF-state to LOW propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.4	2.3	3.2	ns
t <sub>PHZ</sub>	HIGH to OFF-state propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	2.3	3.2	4.8	ns
t <sub>PLZ</sub>	LOW to OFF-state propagation delay	n $\overline{\text{OEn}}$ to nYn; see Fig. 5	1.5	2.5	3.8	ns

[1] All typical values for V<sub>CC</sub> = 2.5 V ± 0.2 V are measured at V<sub>CC</sub> = 2.5 V and T<sub>amb</sub> = 25 °C.  
All typical values for V<sub>CC</sub> = 3.3 V ± 0.3 V are measured at V<sub>CC</sub> = 3.3 V and T<sub>amb</sub> = 25 °C.

10.1. Waveforms and test circuit





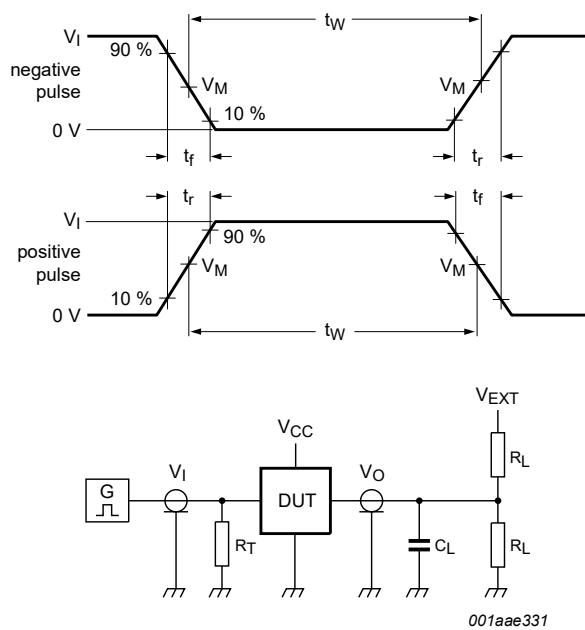
Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.

Fig. 5. The 3-state output enable and disable times

Table 8. Measurement points

$V_{CC}$	Input		Output		
	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
$V_{CC} \leq 2.7\text{ V}$	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
$V_{CC} \geq 3.0\text{ V}$	3.0 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$





Test data is given in [Table 9](#).  
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. 6. Test circuit for measuring switching times

Table 9. Test data

Input				Load		$V_{EXT}$		
$V_I$	$f_i$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHZ}, t_{PZH}$	$t_{PLZ}, t_{PZL}$	$t_{PLH}, t_{PHL}$
3.0 V or $V_{CC}$ whichever is less	$\leq 10$ MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	GND	6 V or $V_{CC} \times 2$	open

11. Package outline

TSSOP56: plastic thin shrink small outline package; 56 leads; body width 6.1 mm

SOT364-1

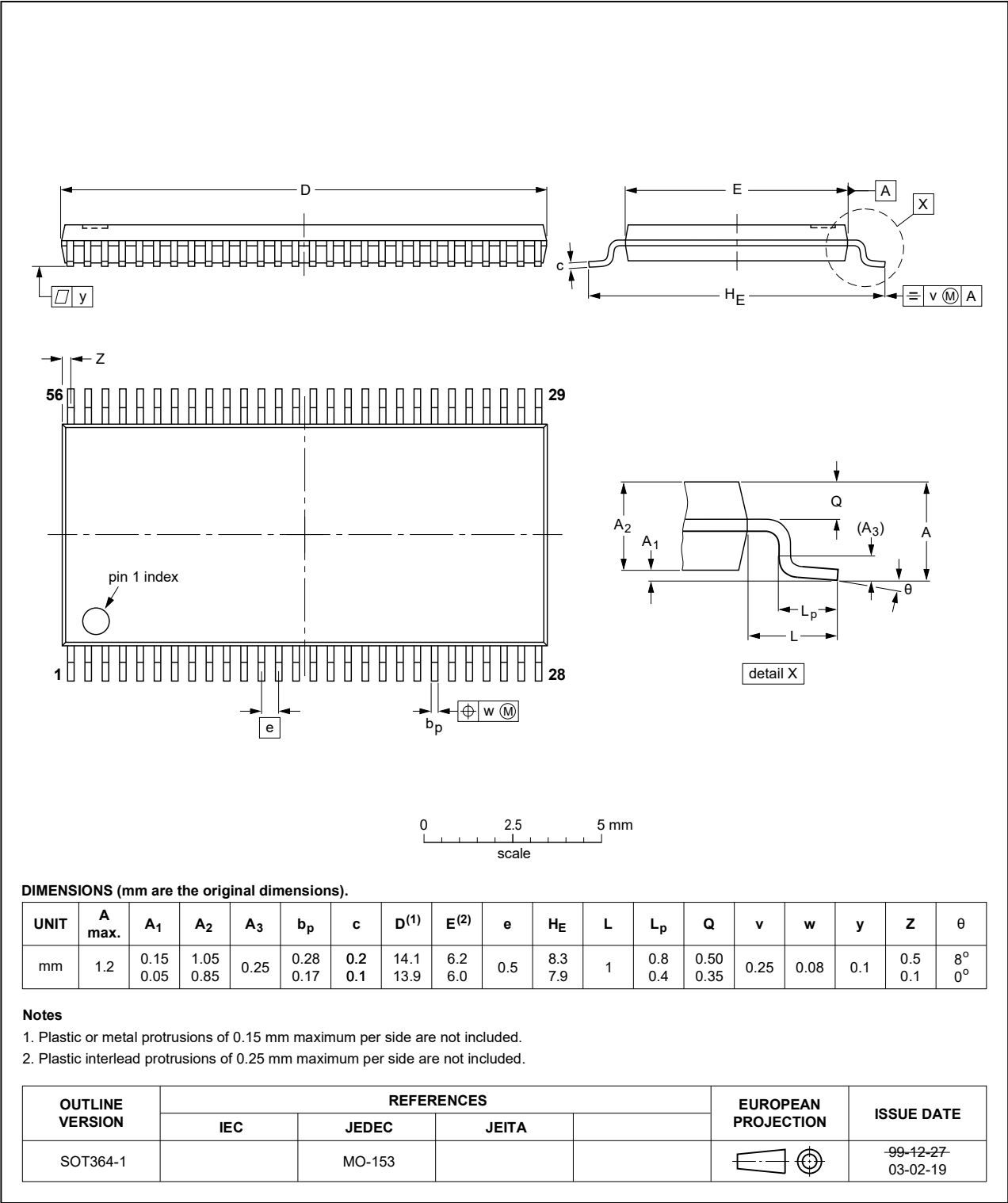


Fig. 7. Package outline SOT364-1 (TSSOP56)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
BiCMOS	Bipolar Complementary Metal Oxide Semiconductor
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVT16827 v.5	20240625	Product data sheet	-	74ALVT16827 v.4
Modifications:	<ul style="list-style-type: none"><li><a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li><li><a href="#">Section 1</a> updated.</li></ul>			
74ALVT16827 v.4	20180124	Product data sheet	-	74ALVT16827 v.3
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 number 74ALVT16827DL (SOT371-1 / SSOP56) removed.</li></ul>			
74ALVT16827 v.3	20050602	Product data sheet	-	74ALVT16827 v.2
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="#">Section 2</a>: modified 'JEDEC Std 17' into 'JESD78'.</li><li><a href="#">Section 10</a>: changed values in column 'min'</li></ul>			
74ALVT16827 v.2	19980213	Product specification	-	74ALVT16827 v.1
74ALVT16827 v.1	19960619	Product specification	-	-

## 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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For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

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