

# 74ALVCH162827

20-bit buffer/line driver; non-inverting; with 30  $\Omega$  termination resistors; 3-state

Rev. 2 — 19 January 2018

Product data sheet

## 1 General description

The 74ALVCH162827 20-bit buffers provide high performance bus interface buffering for wide data/address paths or buses carrying parity. They have NAND output enables ( $\overline{nOE1}$  and  $\overline{nOE2}$ ) for maximum control flexibility.

The 74ALVCH162827 is designed with 30  $\Omega$  series resistors in both the pull-up and pull-down output structures. This design reduces line noise in applications such as memory address drivers, clock drivers and bus receivers/transmitters.

To ensure the high impedance state during power up or power down,  $\overline{nOE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

The 74ALVCH162827 has active bus hold circuitry which is provided to hold unused or floating data inputs at a valid logic level. This feature eliminates the need for external pull-up or pull-down resistors.

## 2 Features and benefits

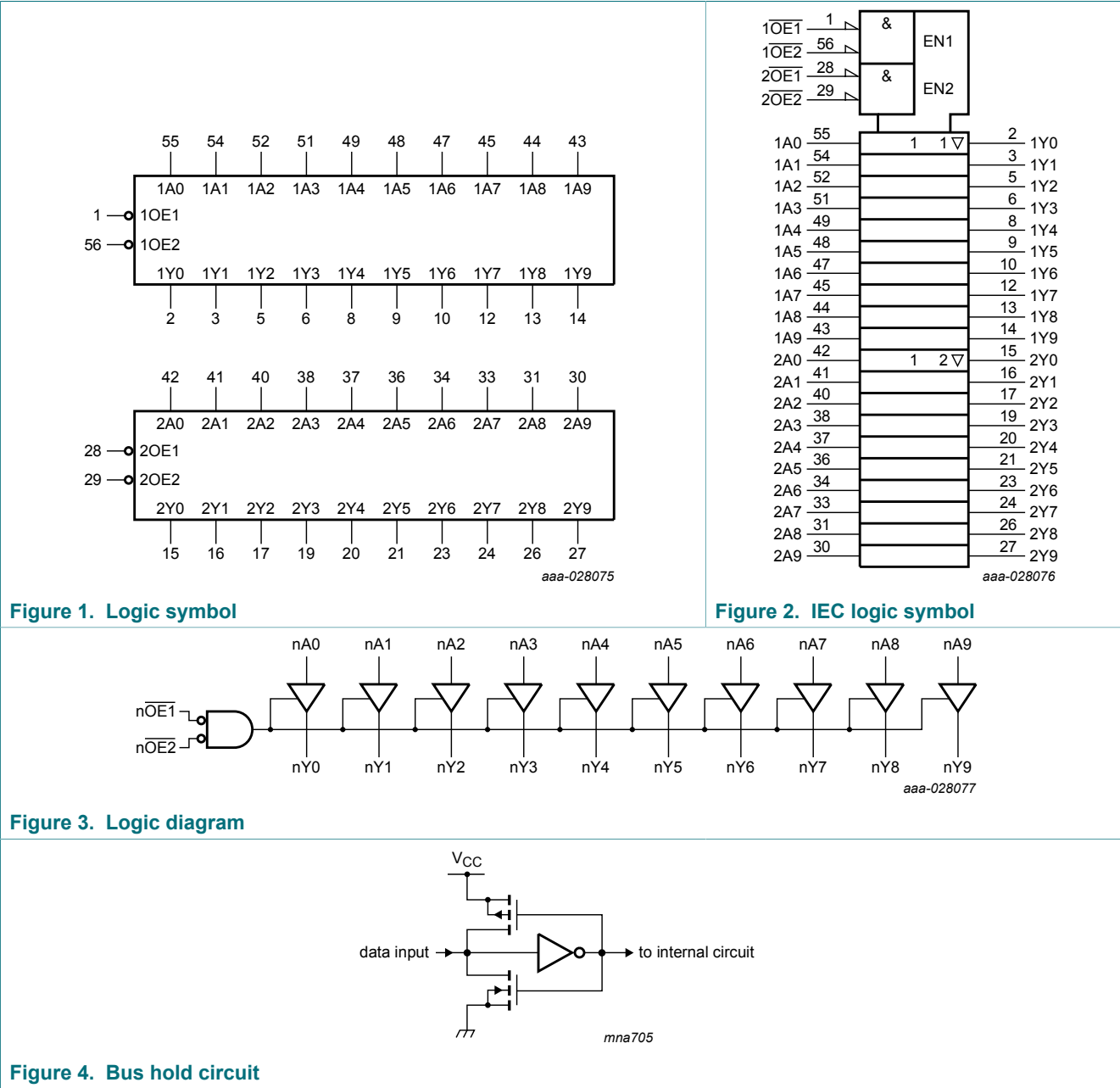
- CMOS low power consumption
- MultiByte flow-through standard pin-out architecture
- Low inductance multiple  $V_{CC}$  and GND pins for minimum noise and ground bounce
- Direct interface with TTL levels (2.7 V to 3.6 V)
- Bus hold on data inputs
- Current drive  $\pm 12$  mA at 3.0 V
- Integrated 30  $\Omega$  termination resistors
- Complies with JEDEC standards:
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 exceeds 2000 V
  - CDM JESD22-C101E exceeds 1000 V

## 3 Ordering information

Table 1. Ordering information

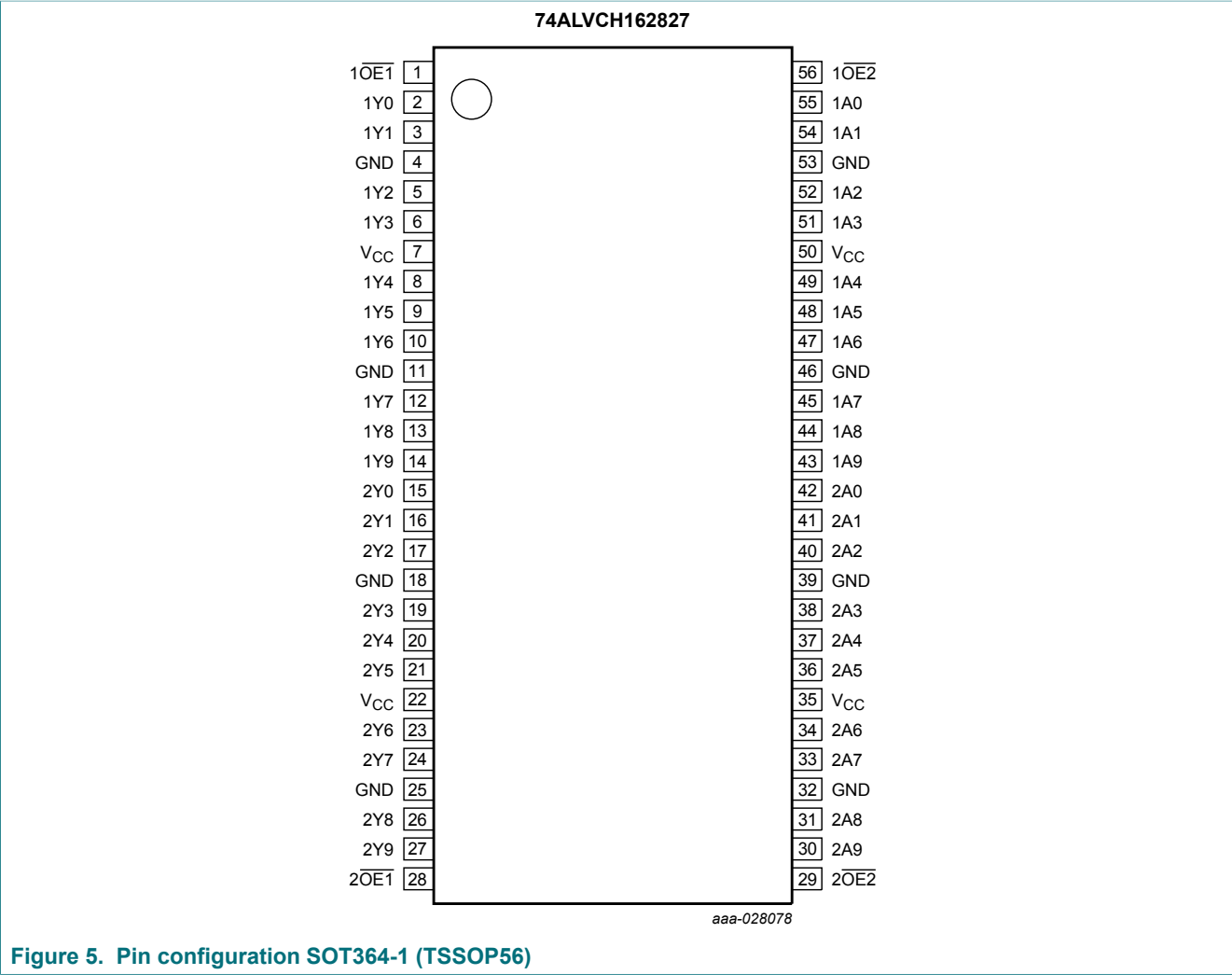
Type number	Package			
	Temperature range	Name	Description	Version
74ALVCH162827DGG	-40 °C to +85 °C	TSSOP56	plastic thin shrink small outline package; 56 leads; body width 6.1 mm	SOT364-1

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
1OE1, 1OE2, 2OE1, 2OE2	1, 56, 28, 29	output enable input (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

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

Operating mode	Input		Output
	nOEn	nAn	nYn
transparent	L	L	L
transparent	L	H	H
High-impedance	H	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	+4.6	V
$V_I$	input voltage	[1]	-0.5	+4.6	V
$V_O$	output voltage	[1]	-0.5	$V_{CC} + 0.5$	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	$\pm 50$	mA
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 50$	mA
$I_{CC}$	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +85 °C [2]	-	600	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For TSSOP56 packages: above 55 °C derate linearly with 8 mW/K.

## 8 Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage	For maximum speed performance at $C_L = 30$ pF	2.3	2.7	V
		For maximum speed performance at $C_L = 50$ pF	3.0	3.6	V
$V_I$	input voltage		0	$V_{CC}$	V
$V_O$	output voltage		0	$V_{CC}$	V
$T_{amb}$	ambient temperature	in free air	-40	+85	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.3$ V to 3.0 V	0	20	ns/V
		$V_{CC} = 3.0$ V to 3.6 V	0	10	ns/V

## 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 referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.3$ to $2.7$ V	1.7	1.2	-	V
		$V_{CC} = 2.7$ to $3.6$ V	2.0	1.5	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.3$ to $2.7$ V	-	1.2	0.7	V
		$V_{CC} = 2.7$ to $3.6$ V	-	1.5	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -100\text{ }\mu\text{A}$ ; $V_{CC} = 2.3$ V to $3.6$ V	$V_{CC} - 0.2$	$V_{CC}$	-	V
		$I_O = -4\text{ mA}$ ; $V_{CC} = 2.3$ V	$V_{CC} - 0.4$	$V_{CC} - 0.11$	-	V
		$I_O = -6\text{ mA}$ ; $V_{CC} = 2.3$ V	$V_{CC} - 0.6$	$V_{CC} - 0.17$	-	V
		$I_O = -4\text{ mA}$ ; $V_{CC} = 2.7$ V	$V_{CC} - 0.5$	$V_{CC} - 0.09$	-	V
		$I_O = -8\text{ mA}$ ; $V_{CC} = 2.7$ V	$V_{CC} - 0.7$	$V_{CC} - 0.19$	-	V
		$I_O = -6\text{ mA}$ ; $V_{CC} = 3.0$ V	$V_{CC} - 0.6$	$V_{CC} - 0.13$	-	V
		$I_O = -12\text{ mA}$ ; $V_{CC} = 3.0$ V	$V_{CC} - 1.0$	$V_{CC} - 0.27$	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 100\text{ }\mu\text{A}$ ; $V_{CC} = 2.3$ V to $3.6$ V	-	GND	0.20	V
		$I_O = 4\text{ mA}$ ; $V_{CC} = 2.3$ V	-	0.07	0.40	V
		$I_O = 6\text{ mA}$ ; $V_{CC} = 2.3$ V	-	0.11	0.55	V
		$I_O = 4\text{ mA}$ ; $V_{CC} = 2.7$ V	-	0.06	0.40	V
		$I_O = 8\text{ mA}$ ; $V_{CC} = 2.7$ V	-	0.13	0.60	V
		$I_O = 6\text{ mA}$ ; $V_{CC} = 3.0$ V	-	0.09	0.55	V
		$I_O = 12\text{ mA}$ ; $V_{CC} = 3.0$ V	-	0.19	0.80	V
$I_I$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 2.3$ V to $3.6$ V	-	0.1	5	$\mu\text{A}$
$I_{BHL}$	bus hold LOW current	$V_{CC} = 2.3$ V; $V_I = 0.7$ V	45	-	-	$\mu\text{A}$
$I_{BHH}$	bus hold HIGH current	$V_{CC} = 2.3$ V; $V_I = 1.7$ V	-45	-	-	$\mu\text{A}$
		$V_{CC} = 3.0$ V; $V_I = 2.0$ V	-75	-175	-	$\mu\text{A}$
$I_{BHLO}$	bus hold LOW overdrive current	$V_{CC} = 3.6$ V	500	-	-	$\mu\text{A}$
$I_{BHHO}$	bus hold HIGH overdrive current	$V_{CC} = 3.6$ V	-500	-	-	$\mu\text{A}$
$I_{OZ}$	OFF-state output current	$V_{CC} = 2.3$ V to $3.6$ V; $V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND	-	0.1	10	$\mu\text{A}$
$I_{CC}$	supply current	$V_{CC} = 2.3$ to $3.6$ V; $V_I = V_{CC}$ or GND; $I_O = 0$ A	-	0.2	40	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	$V_{CC} = 2.3$ V to $3.6$ V; $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A	-	150	750	$\mu\text{A}$
$C_I$	input capacitance		-	5.0	-	pF

[1] All typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

## 10 Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V).  $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$ . For test circuit, see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$t_{pd}$	propagation delay	nAn to nYn; see <a href="#">Figure 6</a> <sup>[2]</sup>				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	2.9	4.6	ns
		$V_{CC} = 2.7\text{ V}$	-	3.1	4.7	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.5	2.9	4.2	ns
$t_{en}$	enable time	n $\overline{O}E$ n to nYn; see <a href="#">Figure 7</a> <sup>[2]</sup>				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.4	3.9	6.4	ns
		$V_{CC} = 2.7\text{ V}$	-	4.4	6.5	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.6	3.7	5.4	ns
$t_{dis}$	disable time	n $\overline{O}E$ n to nYn; see <a href="#">Figure 7</a> <sup>[2]</sup>				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	2.2	5.9	ns
		$V_{CC} = 2.7\text{ V}$	-	3.2	5.2	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.8	3.0	4.7	ns
$C_{PD}$	power dissipation capacitance	per latch; $V_I = \text{GND to }V_{CC}$ <sup>[3]</sup>				
		output enabled	-	14	-	pF
		output disabled	-	3	-	pF

[1] Typical values are measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$

Typical values for  $V_{CC} = 2.3\text{ V to }2.7\text{ V}$  are measured at  $V_{CC} = 2.5\text{ V}$

Typical values for  $V_{CC} = 3.0\text{ V to }3.6\text{ V}$  are measured at  $V_{CC} = 3.3\text{ V}$

[2]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ ;

$t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ ;

$t_{dis}$  is the same as  $t_{PHZ}$  and  $t_{PLZ}$ .

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

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

$N$  = number of inputs switching;

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

10.1 Waveforms and test circuit

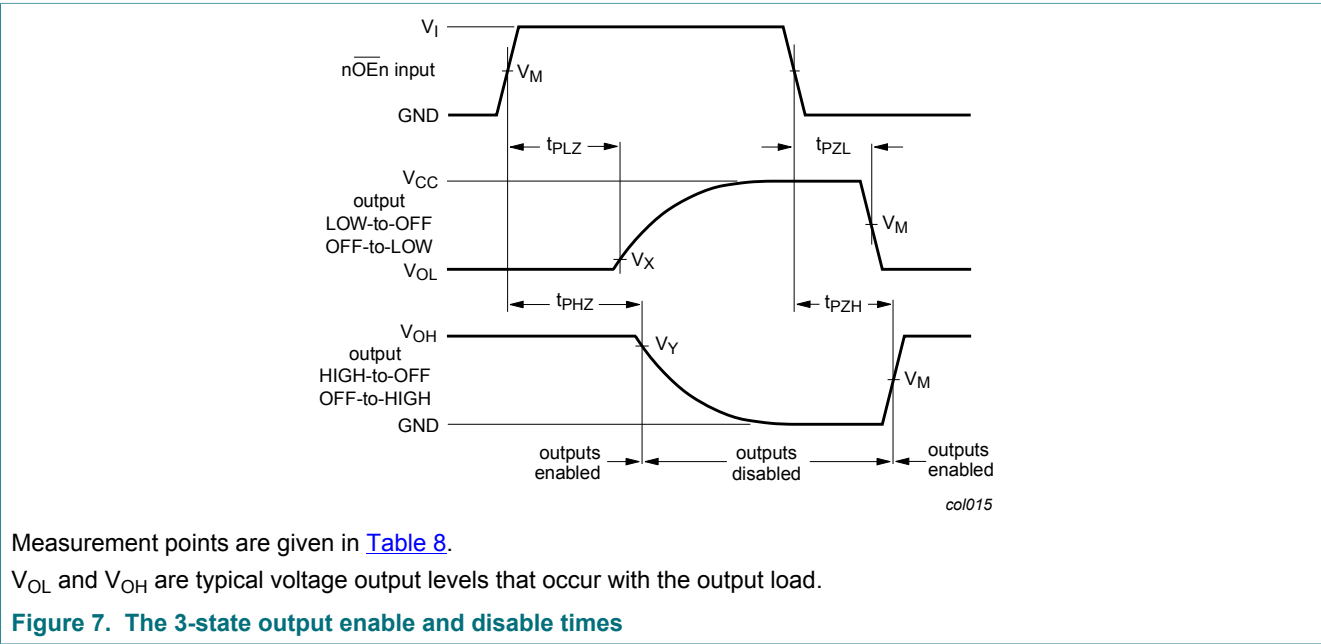
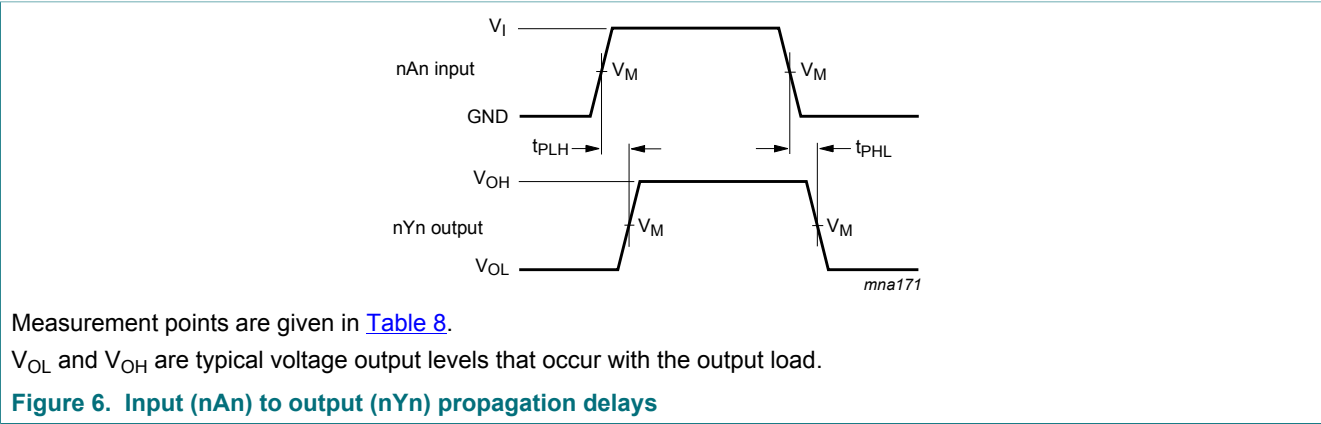
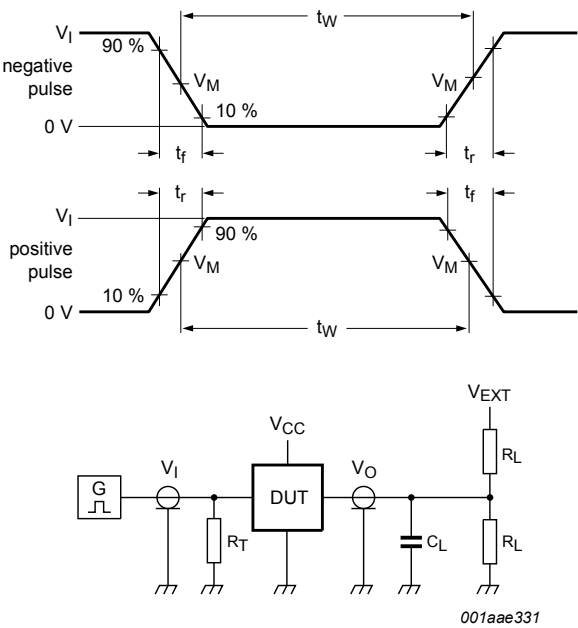


Table 8. Measurement points

Supply voltage	Input		Output		
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_X$	$V_Y$
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  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

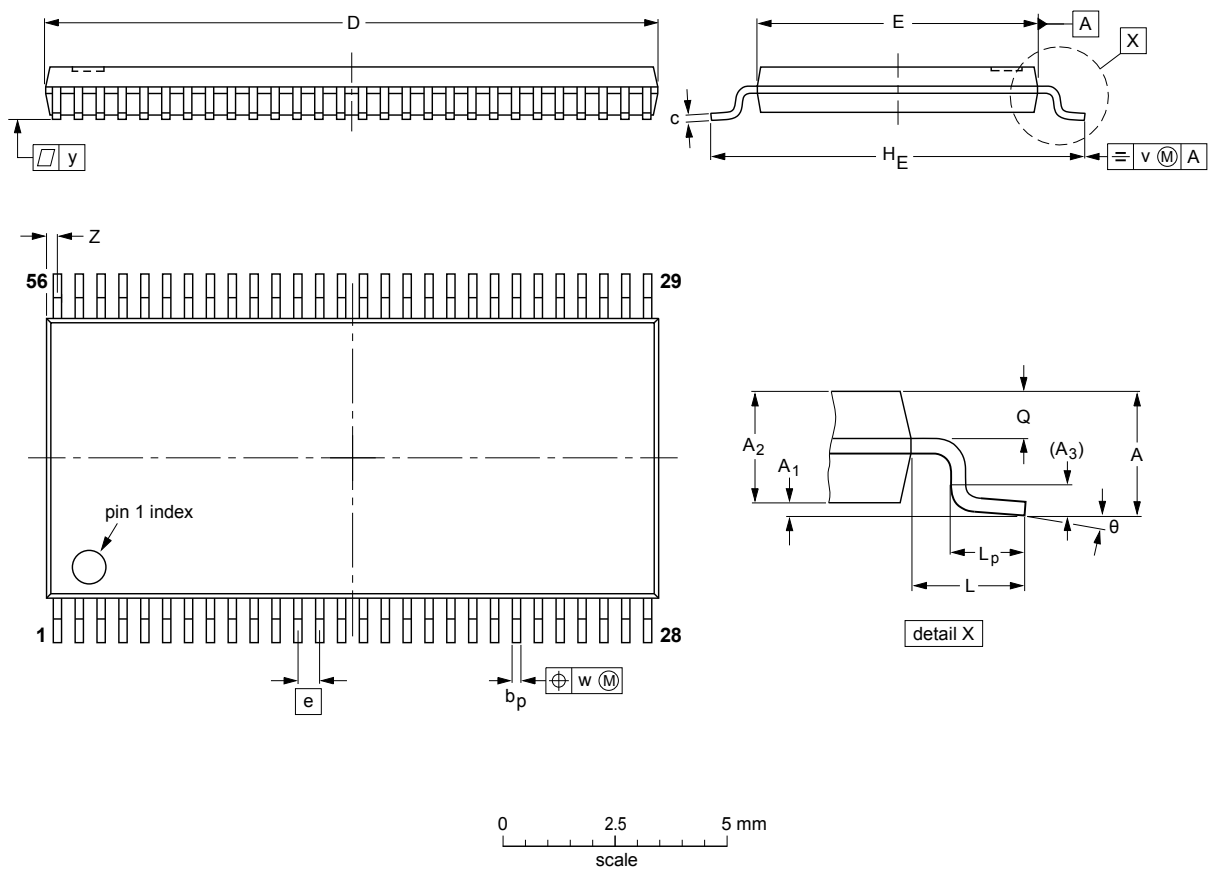
Figure 8. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load		$V_{EXT}$		
$V_{CC}$	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
2.3 V to 2.7 V	$V_{CC}$	$\leq 2.0$ ns	30 pF	500 Ω	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 Ω	open	$2 \times V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 Ω	open	$2 \times V_{CC}$	GND

11 Package outline

TSSOP56: plastic thin shrink small outline package; 56 leads; body width 6.1 mm SOT364-1



DIMENSIONS (mm are the original 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>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z	θ
mm	1.2	0.15 0.05	1.05 0.85	0.25	0.28 0.17	0.2 0.1	14.1 13.9	6.2 6.0	0.5	8.3 7.9	1	0.8 0.4	0.50 0.35	0.25	0.08	0.1	0.5 0.1	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			
SOT364-1		MO-153				99-12-27 03-02-19

Figure 9. Package outline SOT364-1 (TSSOP56)

## 12 Abbreviations

Table 10. Abbreviations

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

## 13 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVCH162827 v.2	20180119	Product data sheet	-	74ALVCH162827 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>			
74ALVCH162827 v.1	19980929	Product specification	-	-

## 14 Legal information

### 14.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.nexperia.com>.

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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.