

# 74ALVCH16843

18-bit bus-interface D-type latch; 3-State

Rev. 3 — 20 November 2017

Product data sheet

## 1 General description

The 74ALVCH16843 has two 9-bit D-type latch featuring separate D-type inputs for each latch and 3-State outputs for bus oriented applications. The two sections of each register are controlled independently by the latch enable (nLE), clear (n $\overline{\text{CLR}}$ ), preset (n $\overline{\text{PRE}}$ ) and output enable (n $\overline{\text{OE}}$ ) control gates.

When n $\overline{\text{OE}}$  is LOW, the data in the registers appear at the outputs. When n $\overline{\text{OE}}$  is HIGH, the outputs are in the high impedance OFF state. Operation of the n $\overline{\text{OE}}$  input does not affect the state of the flip-flops.

The 74ALVCH16843 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

- Wide supply voltage range of 1.2V to 3.6V
- CMOS low power consumption
- Direct interface with TTL levels
- Current drive  $\pm 24$  mA at  $V_{\text{CC}} = 3.0$  V.
- MULTIBYTE flow-through standard pin-out architecture
- Low inductance multiple  $V_{\text{CC}}$  and GND pins for minimize noise and ground bounce
- All data inputs have bushold
- Output drive capability 50  $\Omega$  transmission lines at 85 °C
- 3-state non-inverting outputs for bus oriented applications
- 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			Version
	Temperature range	Name	Description	
74ALVCH16843DGG	-40 °C to +85 °C	TSSOP56	plastic thin shrink small outline package; 56 leads; body width 6.1 mm	SOT364-1

nexperia

4 Functional diagram

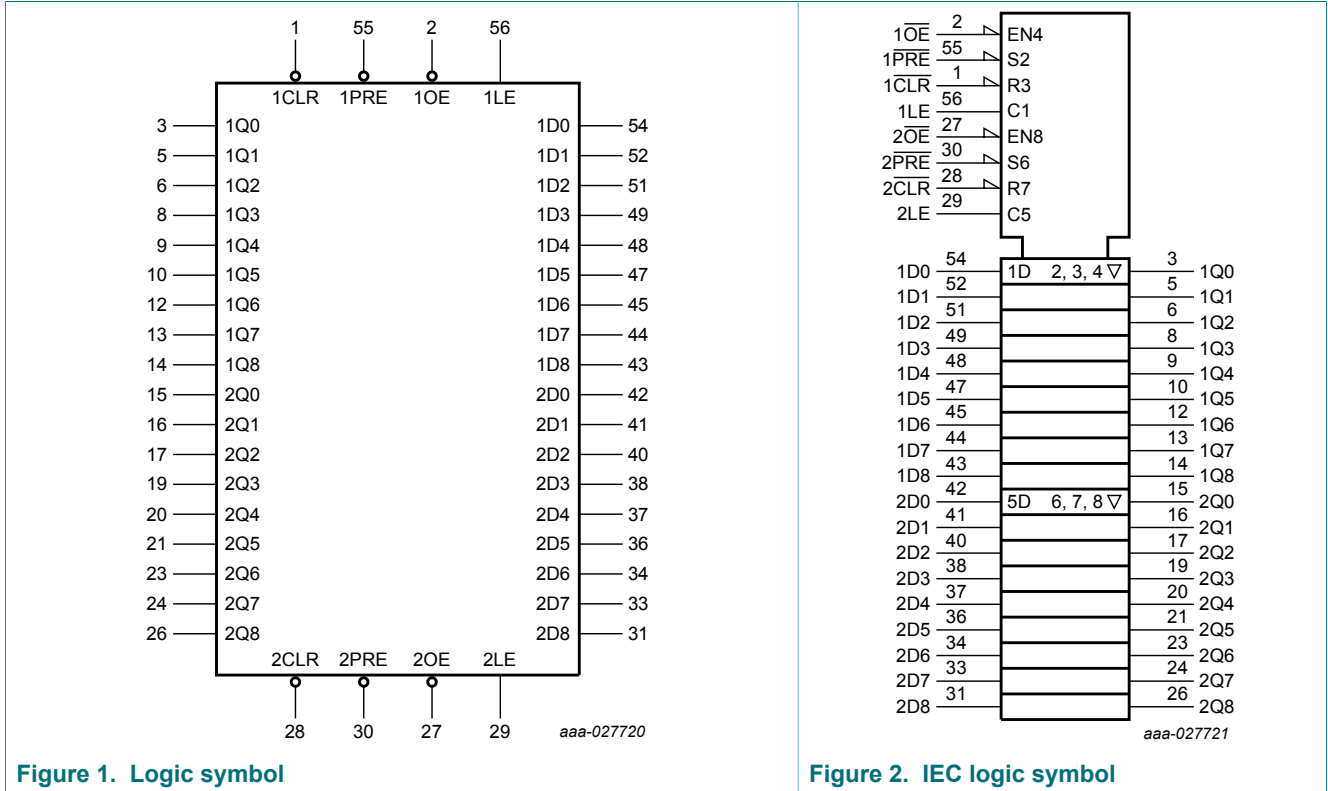


Figure 1. Logic symbol

Figure 2. IEC logic symbol

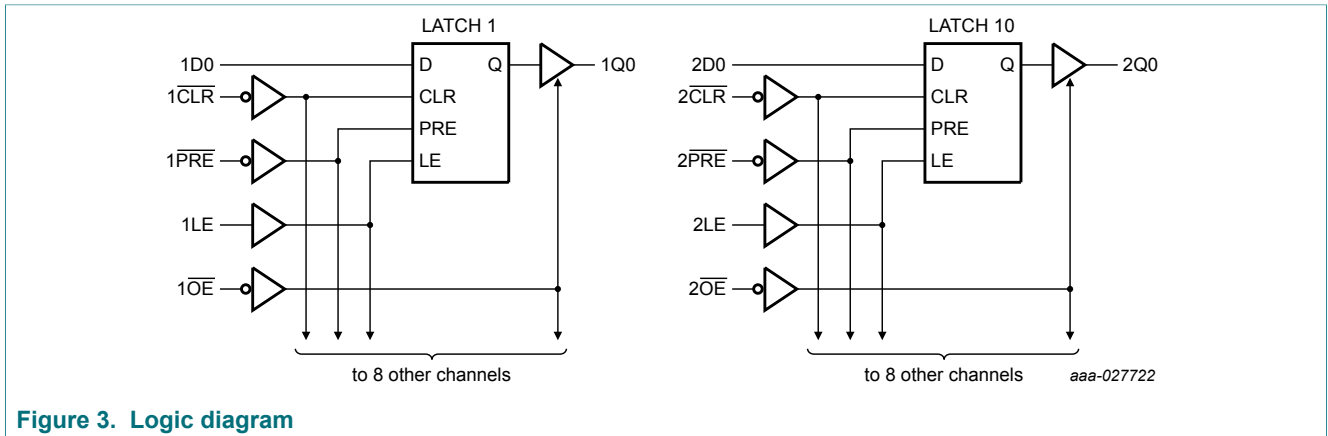


Figure 3. Logic diagram

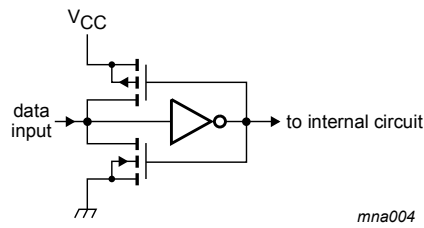


Figure 4. Bushold circuit

## 5 Pinning information

### 5.1 Pinning

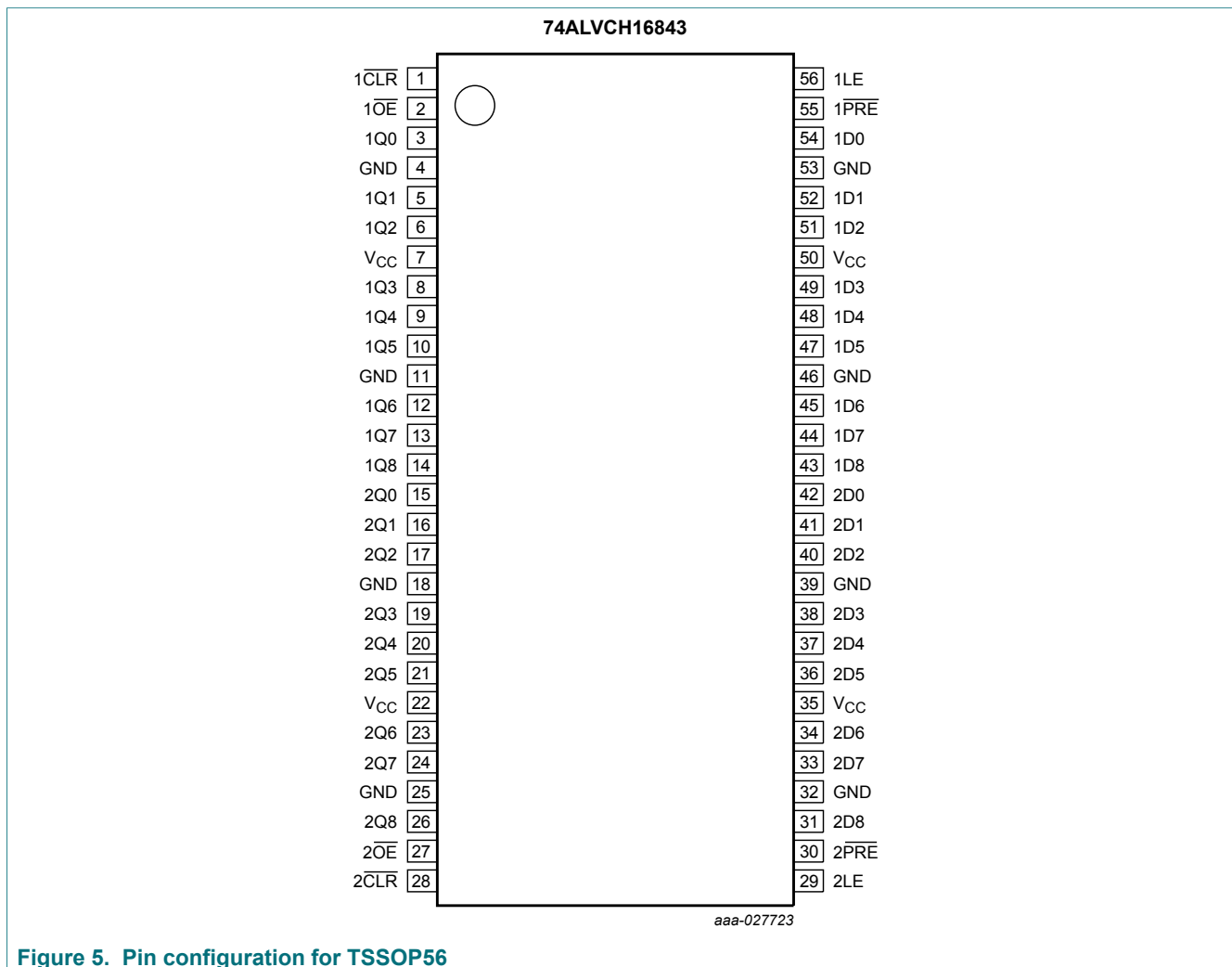


Figure 5. Pin configuration for TSSOP56

## 5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1D0, 1D1, 1D2, 1D3, 1D4, 1D5, 1D6, 1D7, 1D8	54, 52, 51, 49, 48, 47, 45, 44, 43	data inputs
1Q0, 1Q1, 1Q2, 1Q3, 1Q4, 1Q5, 1Q6, 1Q7, 1Q8	3, 5, 6, 8, 9, 10, 12, 13, 14	data outputs
2D0, 2D1, 2D2, 2D3, 2D4, 2D5, 2D6, 2D7, 2D8	42, 41, 40, 38, 37, 36, 34, 33, 31	data inputs
2Q0, 2Q1, 2Q2, 2Q3, 2Q4, 2Q5, 2Q6, 2Q7, 2Q8	15, 16, 17, 19, 20, 21, 23, 24, 26	data outputs
1 $\overline{OE}$ , 2 $\overline{OE}$	2, 27	output enable inputs (active LOW)
1PRE, 2PRE	55, 30	preset inputs (active LOW)
1 $\overline{CLR}$ , 2 $\overline{CLR}$	1, 28	clear inputs (active LOW)
1LE, 2LE	56, 29	latch enable inputs (active HIGH)
GND	4, 11, 18, 25, 32, 39, 46, 53	ground (0 V)
V <sub>CC</sub>	7, 22, 35, 50	supply voltage

## 6 Functional description

Table 3. Function selection <sup>[1]</sup>

Inputs					Output
nPRE	nCLR	nOE	nLE	nDn	nQn
L	X	L	X	X	H
H	L	L	X	X	L
H	H	L	H	L	L
H	H	L	H	H	H
H	H	L	L	X	NC
X	X	H	X	X	Z

[1] H = HIGH voltage level;  
 L = LOW voltage level;  
 X = don't care;  
 NC = no change;  
 Z = high-impedance OFF-state.

## 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	For control pins <sup>[1]</sup>	-0.5	+4.6	V
		For data inputs <sup>[1]</sup>	-0.5	$V_{CC} + 0.5$	V
$V_O$	output voltage	<sup>[1]</sup>	-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 <sup>[2]</sup>	-	600	mW

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

[2] Above 55 °C the value of  $P_{tot}$  derates linearly with 8 mW/K.

## 8 Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage	maximum speed performance			
		$C_L = 30$ pF	2.3	2.7	V
		$C_L = 50$ 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	-	20	ns/V
		$V_{CC} = 3.0$ V to 3.6 V	-	10	ns/V

## 9 Static characteristics

**Table 6. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	1.2	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	1.5	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.3 V to 2.7 V	-	1.2	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	1.5	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 2.3 V to 3.6 V	V <sub>CC</sub> - 0.2	V <sub>CC</sub>	-	V
		I <sub>O</sub> = -6 mA; V <sub>CC</sub> = 2.3 V	V <sub>CC</sub> - 0.3	V <sub>CC</sub> - 0.08	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.3 V	V <sub>CC</sub> - 0.6	V <sub>CC</sub> - 0.26	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	V <sub>CC</sub> - 0.5	V <sub>CC</sub> - 0.14	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 3.0 V	V <sub>CC</sub> - 0.6	V <sub>CC</sub> - 0.09	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 2.3 V to 3.6 V	-	GND	0.20	V
		I <sub>O</sub> = 6 mA; V <sub>CC</sub> = 2.3 V	-	0.07	0.40	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.3 V	-	0.15	0.70	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	0.14	0.40	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	0.27	0.55	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 2.3 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND	-	0.1	5	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>CC</sub> = 2.3 V to 3.6 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND	-	0.1	10	μA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 2.3 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	0.2	40	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>CC</sub> = 2.3 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	150	750	μA
I <sub>BHL</sub>	bus hold LOW current	V <sub>CC</sub> = 2.3 V; V <sub>I</sub> = 0.7 V	45	-	-	μA
		V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 0.8 V	75	150	-	μA
I <sub>BHH</sub>	bus hold HIGH current	V <sub>CC</sub> = 2.3 V; V <sub>I</sub> = 1.7 V	-45	-	-	μA
		V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = 2.0 V	-75	-175	-	μA
I <sub>BHLO</sub>	bus hold LOW overdrive current	V <sub>CC</sub> = 3.6 V	500	-	-	μA
I <sub>BHHO</sub>	bus hold HIGH overdrive current	V <sub>CC</sub> = 3.6 V	-500	-	-	μA
C <sub>I</sub>	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**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 11](#);

$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$t_{pd}$	propagation delay	nDn to nQn; see <a href="#">Figure 6</a> <sup>[2]</sup>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.2	4.3	ns
		$V_{CC} = 2.7\text{ V}$	1.0	2.3	4.0	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.1	3.5	ns
		nLE to nQn; see <a href="#">Figure 7</a>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.3	4.6	ns
		$V_{CC} = 2.7\text{ V}$	1.0	2.1	3.9	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.0	3.5	ns
		n $\overline{\text{PRE}}$ to nQn; see <a href="#">Figure 6</a> <sup>[3]</sup>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.5	4.8	ns
		$V_{CC} = 2.7\text{ V}$	1.0	2.6	4.5	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.2	3.8	ns
		n $\overline{\text{CLR}}$ to nQn; see <a href="#">Figure 6</a>				
$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.5	4.8	ns		
$V_{CC} = 2.7\text{ V}$	1.0	2.5	4.3	ns		
$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.3	3.9	ns		
$t_{en}$	enable time	n $\overline{\text{OE}}$ to nQn; see <a href="#">Figure 10</a> <sup>[3]</sup>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.0	2.8	5.8	ns
		$V_{CC} = 2.7\text{ V}$	1.0	3.0	5.3	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.0	2.5	4.4	ns
$t_{dis}$	disable time	n $\overline{\text{OE}}$ to nQn; see <a href="#">Figure 10</a> <sup>[4]</sup>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	1.1	2.2	4.3	ns
		$V_{CC} = 2.7\text{ V}$	1.3	2.8	4.4	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	1.3	2.6	4.0	ns
$t_{su}$	set-up time	nDn to nLE; see <a href="#">Figure 8</a>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	0.5	-0.1	-	ns
		$V_{CC} = 2.7\text{ V}$	0.5	-0.3	-	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	0.5	0.0	-	ns
$t_h$	hold time	nDn to nLE; see <a href="#">Figure 8</a>				
		$V_{CC} = 2.3\text{ V}$ to $2.7\text{ V}$	0.9	0.5	-	ns
		$V_{CC} = 2.7\text{ V}$	0.9	0.5	-	ns
		$V_{CC} = 3.0\text{ V}$ to $3.6\text{ V}$	0.9	0.5	-	ns

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
t <sub>W</sub>	pulse width	nLE HIGH; see <a href="#">Figure 7</a>				
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	0.5	-	ns
		V <sub>CC</sub> = 2.7 V	1.5	0.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	0.5	-	ns
		nPRE LOW; see <a href="#">Figure 9</a>				
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	0.5	-	ns
		V <sub>CC</sub> = 2.7 V	1.5	0.6	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	0.5	-	ns
		nCLR LOW; see <a href="#">Figure 9</a>				
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	0.5	-	ns
		V <sub>CC</sub> = 2.7 V	1.5	0.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	0.5	-	ns
t <sub>rec</sub>	recovery time	nPRE to nLE; see <a href="#">Figure 9</a>				
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	1.1	-	ns
		V <sub>CC</sub> = 2.7 V	0.8	-0.2	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	0.4	-	ns
		nCLR to nLE; see <a href="#">Figure 9</a>				
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.5	1.0	-	ns
		V <sub>CC</sub> = 2.7 V	0.6	-0.4	-	ns
V <sub>CC</sub> = 3.0 V to 3.6 V	0.8	0.2	-	ns		
C <sub>PD</sub>	power dissipation capacitance	per latch; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[5]</sup>				
		transparent mode; outputs enabled	-	17	-	pF
		transparent mode; outputs disabled	-	3	-	pF
		clocked mode; outputs enabled	-	19	-	pF
		clocked mode; outputs disabled	-	9	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C

Typical values for V<sub>CC</sub> = 2.3 V to 2.7 V are measured at V<sub>CC</sub> = 2.5 V.

Typical values for V<sub>CC</sub> = 3.0 V to 3.6 V are measured at V<sub>CC</sub> = 3.3 V.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[3] t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.

[4] t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

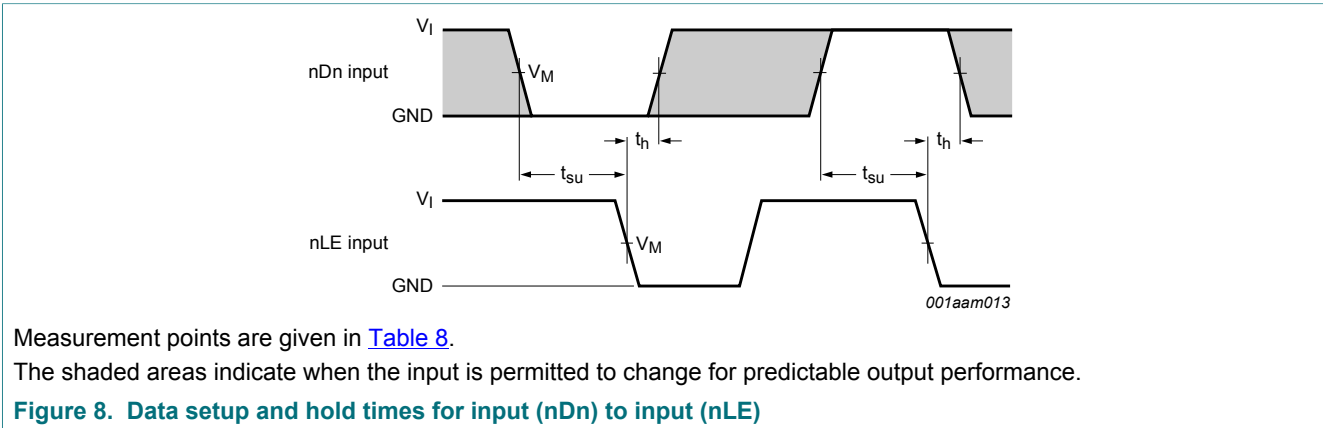
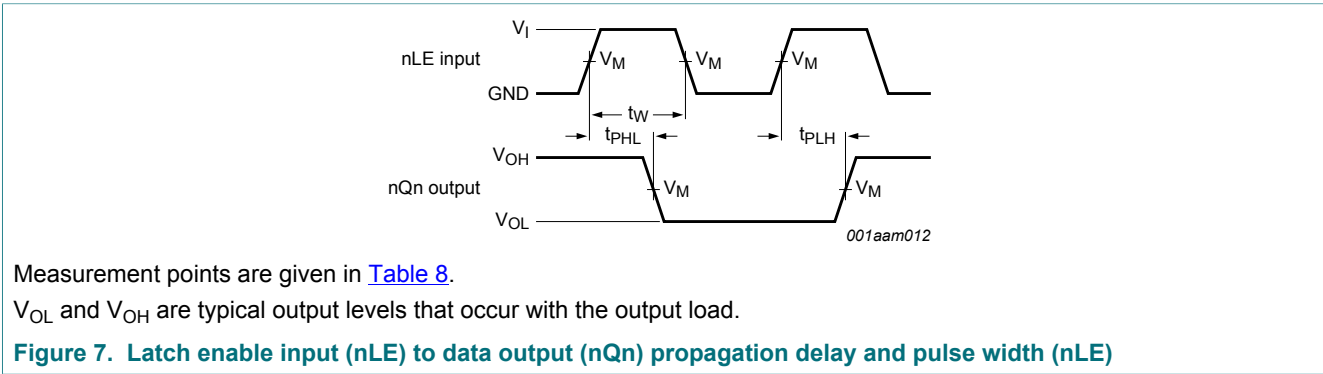
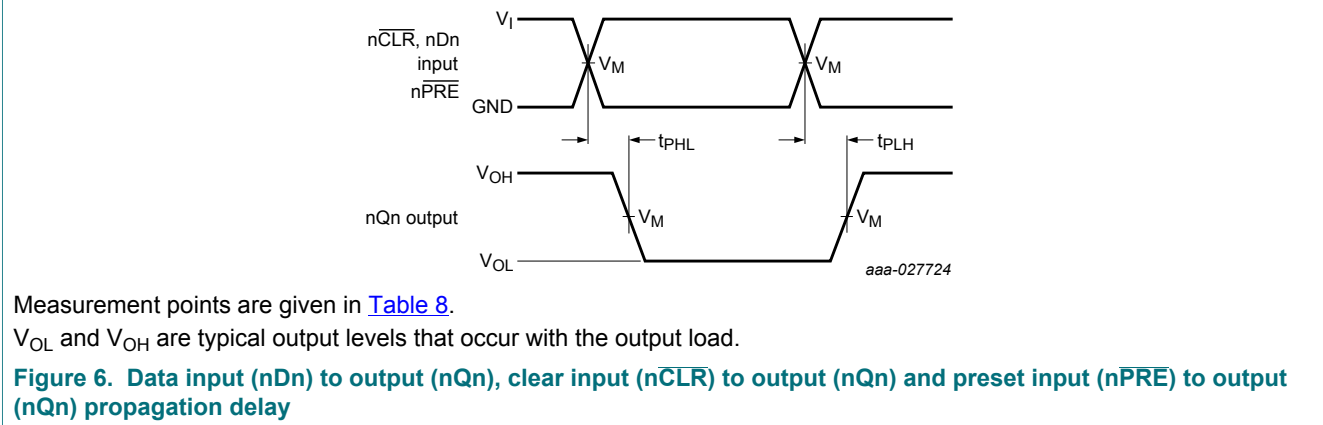
V<sub>CC</sub> = supply voltage in Volts;

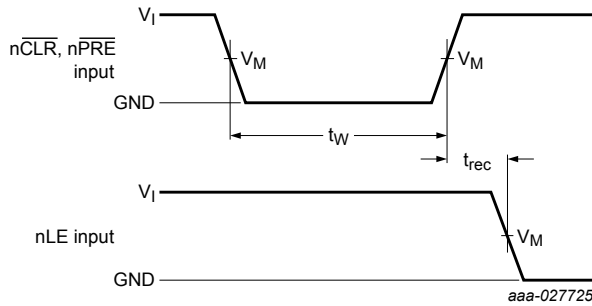
N = total load switching outputs;

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



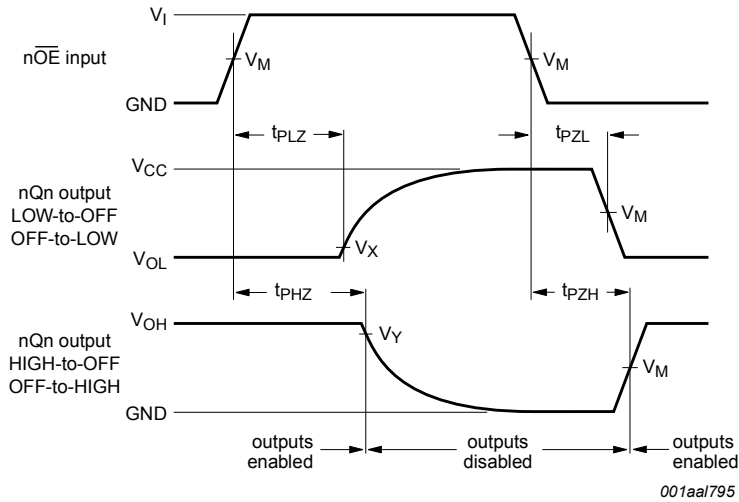
10.1 Waveforms and test circuit





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

**Figure 9. Clear (nCLR) and preset (nPRE) pulse width, the clear (nCLR) and preset (nPRE) to latch (nLE) recovery time**



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

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

**Figure 10. 3-State enable and disable times**

**Table 8. Measurement points**

Input		Output			
$V_{CC}$	$V_I$	$V_M$	$V_M$	$V_x$	$V_y$
2.3 V to 2.7 V	$V_{CC}$	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
2.7 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$

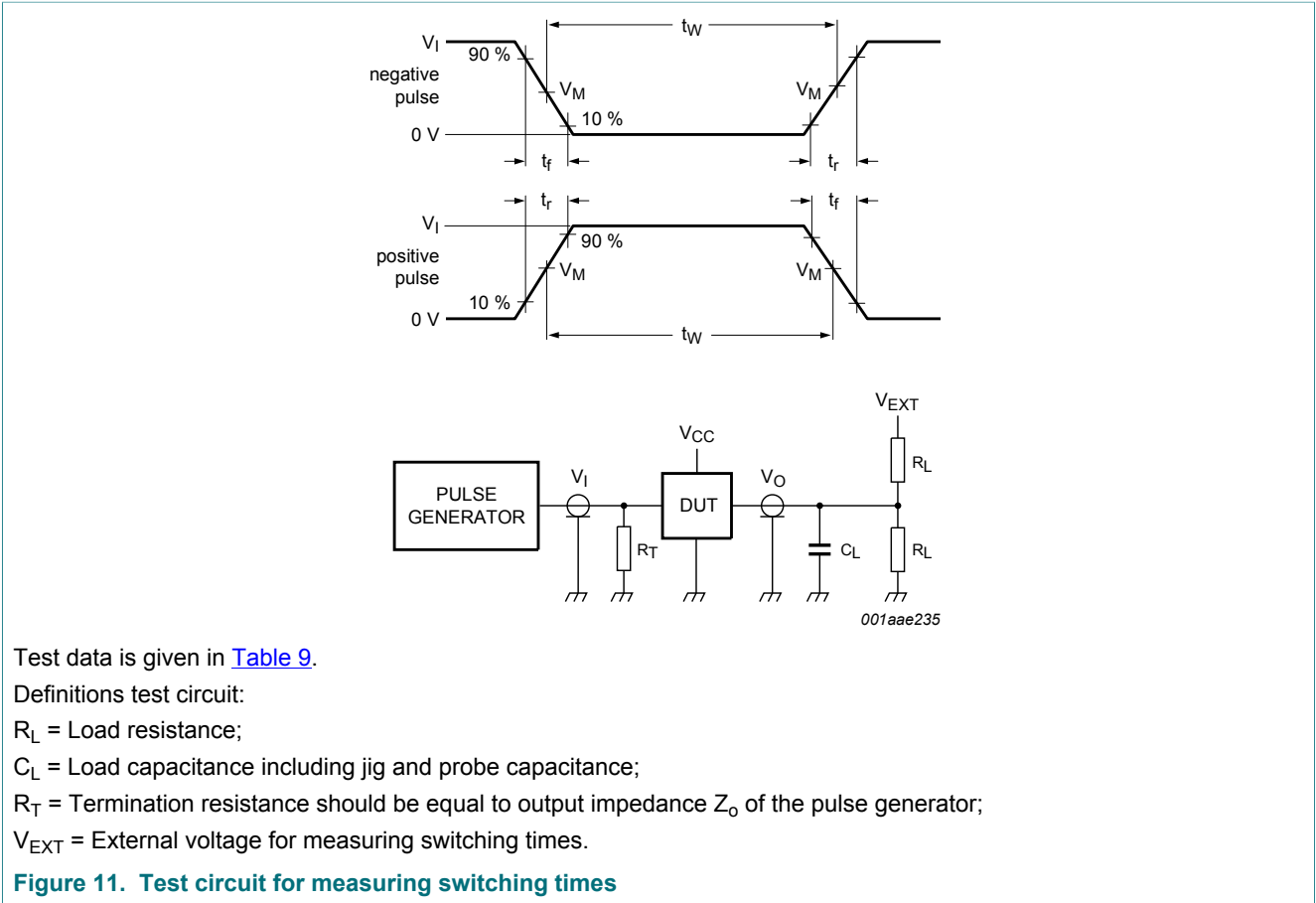


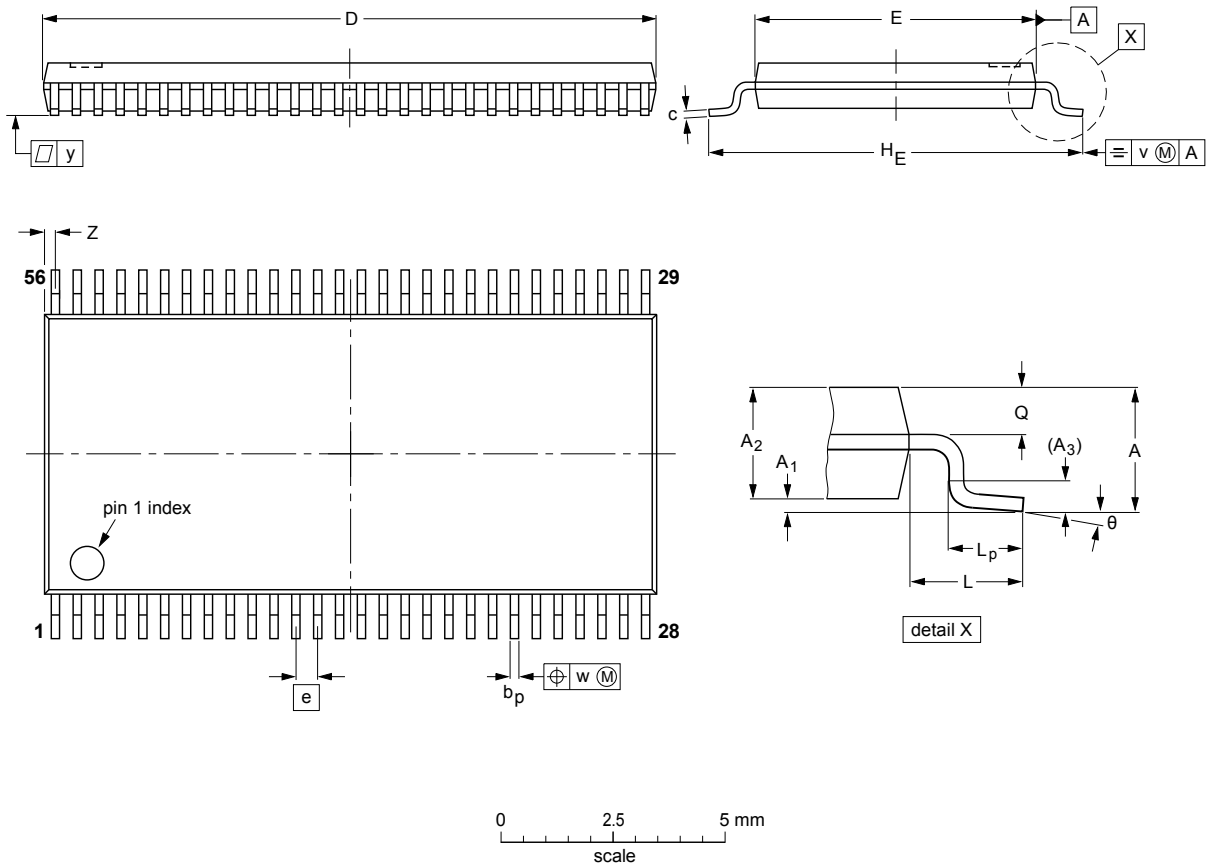
Table 9. Test data

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

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 12. 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
74ALVCH16843 v.3	20171120	Product data sheet	-	74ALVCH16843 v.2
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>			
74ALVCH16843 v.2	19980804	Product specification	-	74ALVCH16843 v.2
74ALVCH16843 v.1	19980804	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'.

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

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