

74ALVCH16543

16-bit D-type registered transceiver; 3-state

Rev. 3 — 15 December 2017

Product data sheet

1 General description

The 74ALVCH16543 is a dual octal registered transceiver. Each section contains two sets of D-type latches for temporary storage of the data flow in either direction.

Separate latch enable ($\overline{nLEAB}$, $\overline{nLEBA}$) and output enable ($\overline{nOEAB}$, $\overline{nOEB A}$) inputs are provided for each register to permit independent control in either direction of the data flow.

The 74ALVCH16543 contains two sections each consisting of two sets of eight D-type latches with separate inputs and controls for each set. For data flow from A to B, for example, the A-to-B enable ($\overline{nEAB}$) inputs must be LOW in order to enter data from $nA0$ to $nA7$, or take data from $nB0$ to $nB7$, as indicated in the function table. With $\overline{nEAB}$ LOW, a LOW signal on the A-to-B latch enable ($\overline{nLEAB}$) input makes the A-to-B latches transparent; a subsequent LOW-to-HIGH transition of the $\overline{nLEAB}$ signal stores the A data into the latches. With $\overline{nEAB}$ and $\overline{nOEAB}$ both LOW, the 3-state B output buffers are active and display the data present at the output of the A latches. Similarly, the $\overline{nEBA}$, $\overline{nLEBA}$ and $\overline{nOEB A}$ signals control the data flow from B-to-A.

Active bus hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

2 Features and benefits

- CMOS low power consumption
- Direct interface with TTL levels
- MULTIBYTE flow-through standard pin-out architecture
- Back-to-back registers for storage
- Output drive capability 50 Ω transmission lines at 85 °C
- All data inputs have bushold
- Low inductance multiple V_{CC} and GND pins for minimize noise and ground bounce
- Current drive ± 24 mA at $V_{CC} = 3.0$ V.
- 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	
74ALVCH16543DGG	-40 °C to +85 °C	TSSOP56	plastic thin shrink small outline package; 56 leads; body width 6.1 mm	SOT364-1

4 Functional diagram

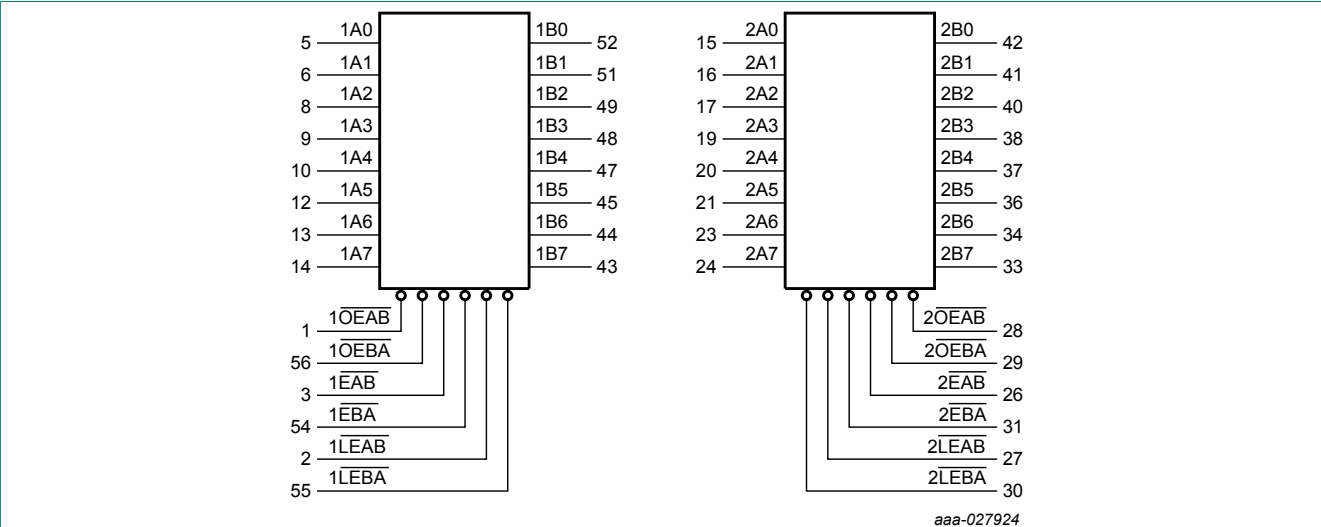


Figure 1. Logic symbol

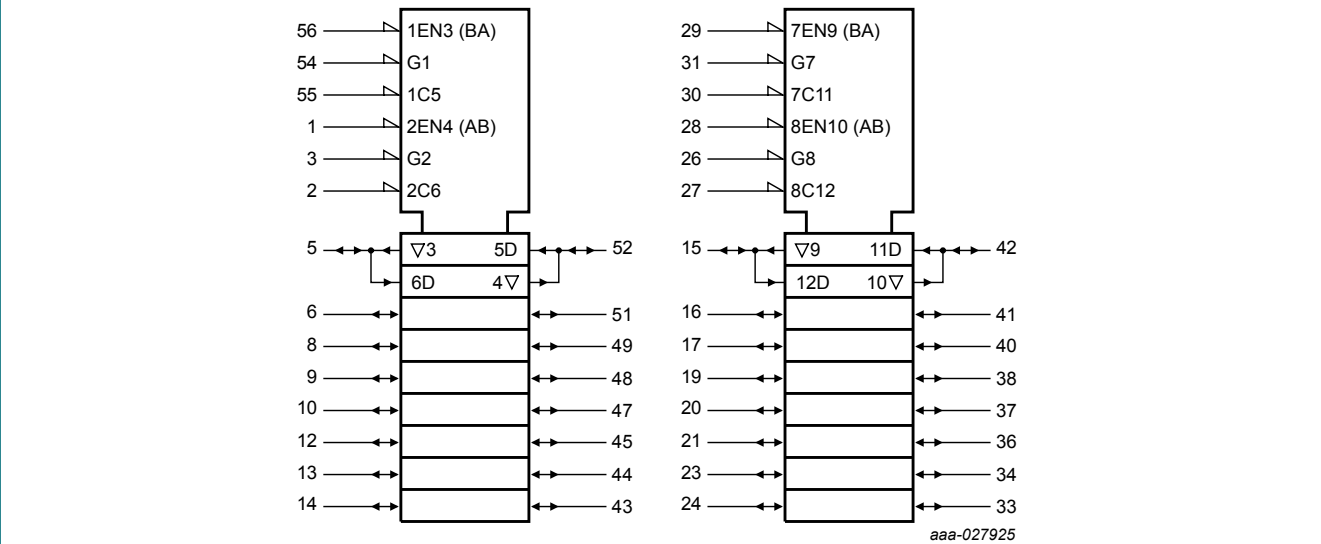


Figure 2. IEC logic symbol

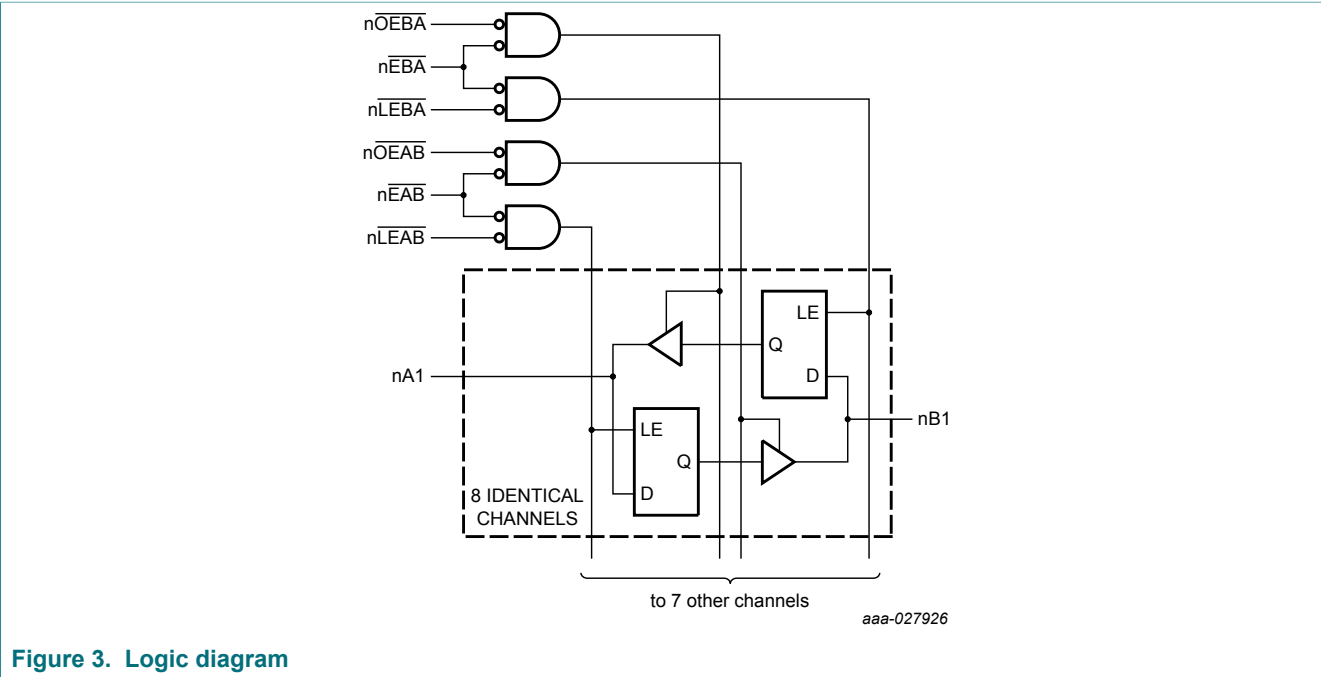


Figure 3. Logic diagram

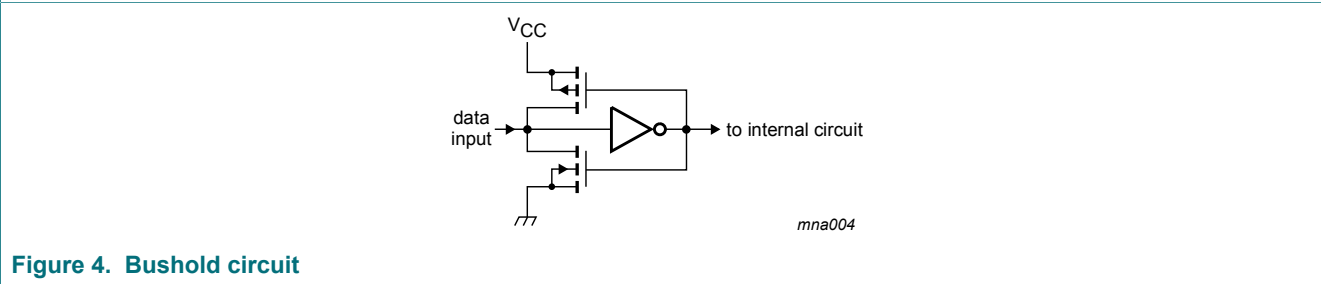
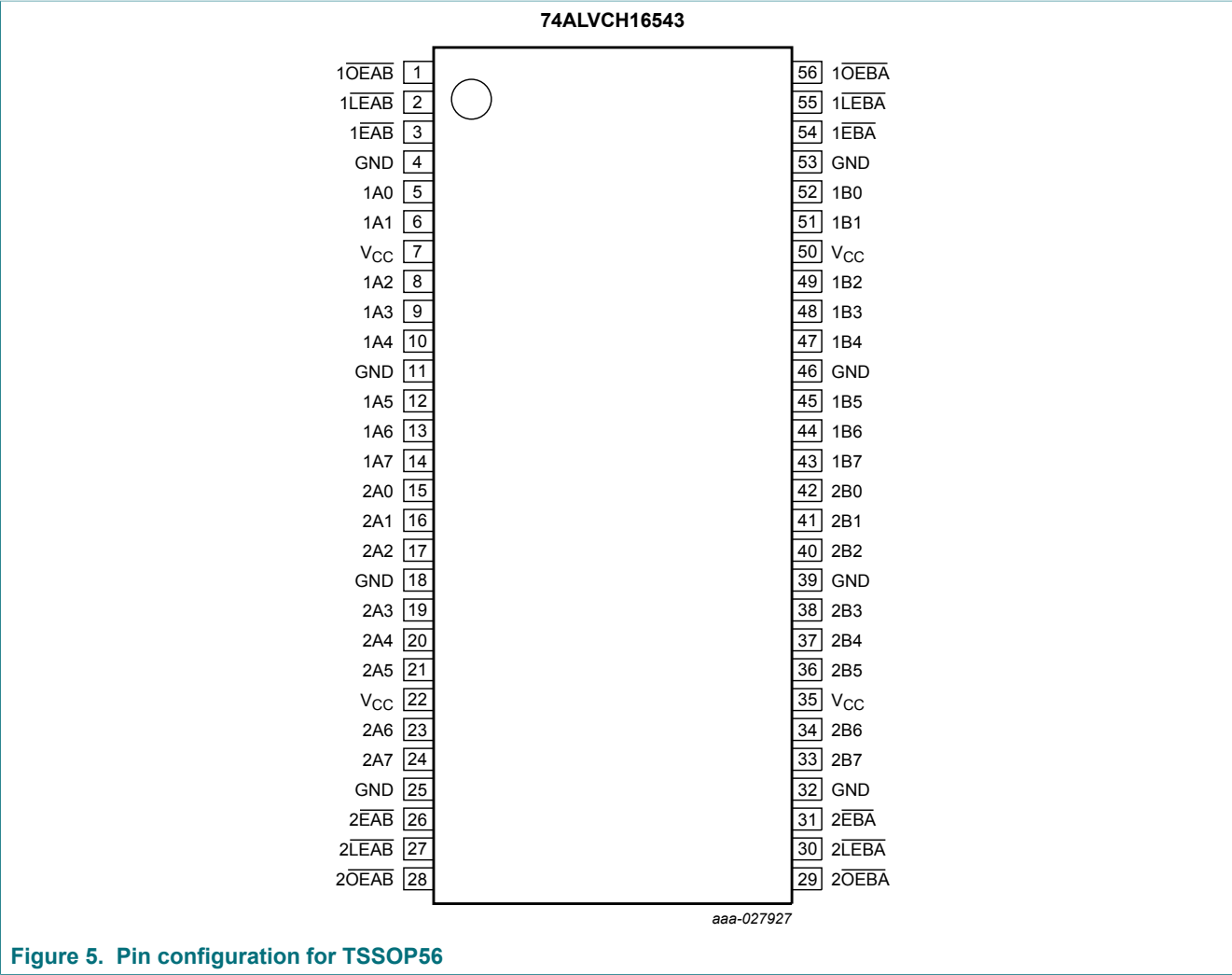


Figure 4. Bushold circuit

5 Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A0, 1A1, 1A2, 1A3, 1A4, 1A5, 1A6, 1A7	5, 6, 8, 9, 10, 12, 13, 14	data inputs/outputs
2A0, 2A1, 2A2, 2A3, 2A4, 2A5, 2A6, 2A7	15, 16, 17, 19, 20, 21, 23, 24	data inputs/outputs
1B0, 1B1, 1B2, 1B3, 1B4, 1B5, 1B6, 1B7	52, 51, 49, 48, 47, 45, 44, 43	data inputs/outputs
2B0, 2B1, 2B2, 2B3, 2B4, 2B5, 2B6, 2B7	42, 41, 40, 38, 37, 36, 34, 33	data inputs/outputs
1 $\overline{\text{OEAB}}$, 2 $\overline{\text{OEAB}}$	1, 28	A to B output enable inputs (active LOW)
1 $\overline{\text{OEBA}}$, 2 $\overline{\text{OEBA}}$	56, 29	B to A output enable inputs (active LOW)
1EAB, 2EAB	3, 26	A to B enable inputs (active LOW)
1 $\overline{\text{EBA}}$, 2 $\overline{\text{EBA}}$	54, 31	B to A enable inputs (active LOW)
1 $\overline{\text{LEAB}}$, 2 $\overline{\text{LEAB}}$	2, 27	A to B latch enable inputs (active LOW)
1 $\overline{\text{LEBA}}$, 2 $\overline{\text{LEBA}}$	55, 30	B to A latch enable inputs (active LOW)
GND	4, 11, 18, 25, 32, 39, 46, 53	ground (0 V)
V _{CC}	7, 22, 35, 50	supply voltage

6 Functional description

Table 3. Function selection ^[1]

Inputs				Outputs	Status
n $\overline{\text{OEAB}}$ or n $\overline{\text{OEBA}}$	nEAB or nEBA	n $\overline{\text{LEAB}}$ or n $\overline{\text{LEBA}}$	nAn or nBn	nBn or nAn	
H	X	X	X	Z	disabled
X	H	X	X	Z	disabled
L	↑	L	h	Z	disabled + latch
L	↑	L	l	Z	disabled + latch
L	L	↑	h	H	latch + display
L	L	↑	l	L	latch + display
L	L	L	H	H	transparent
L	L	L	L	L	transparent
L	L	H	X	NC	hold

[1] H = HIGH voltage level;

h = HIGH voltage level one set-up time prior to the LOW-to-HIGH transition of n $\overline{\text{LEAB}}$, n $\overline{\text{LEBA}}$, nEAB or nEBA;

L = LOW voltage level;

l = LOW voltage level one set-up time prior to the LOW-to-HIGH transition of n $\overline{\text{LEAB}}$, n $\overline{\text{LEBA}}$, nEAB or nEBA;

X = don't care;

↑ = LOW-to-HIGH transition of n $\overline{\text{LEAB}}$, n $\overline{\text{LEBA}}$, nEAB or nEBA;

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	[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	-	± 50	mA
I_O	output current	$V_O = 0$ V to V_{CC}	-	± 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] 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	Typ	Max	Unit
V_{CC}	supply voltage	maximum speed performance				
		$C_L = 30$ pF	2.3	2.5	2.7	V
		$C_L = 50$ pF	3.0	3.3	3.6	V
		low-voltage applications	1.2	2.4	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 ^[1]	Max	Unit
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.3\text{ V}$ to 2.7 V	1.7	1.2	-	V
		$V_{CC} = 2.7\text{ V}$ to 3.6 V	2.0	1.5	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.3\text{ V}$ to 2.7 V	-	1.2	0.7	V
		$V_{CC} = 2.7\text{ V}$ to 3.6 V	-	1.5	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = -100\text{ }\mu\text{A}$; $V_{CC} = 2.3\text{ V}$ to 3.6 V	$V_{CC} - 0.2$	V_{CC}	-	V
		$I_O = -6\text{ mA}$; $V_{CC} = 2.3\text{ V}$	$V_{CC} - 0.3$	$V_{CC} - 0.08$	-	V
		$I_O = -12\text{ mA}$; $V_{CC} = 2.3\text{ V}$	$V_{CC} - 0.6$	$V_{CC} - 0.26$	-	V
		$I_O = -12\text{ mA}$; $V_{CC} = 2.7\text{ V}$	$V_{CC} - 0.5$	$V_{CC} - 0.14$	-	V
		$I_O = -12\text{ mA}$; $V_{CC} = 3.0\text{ V}$	$V_{CC} - 0.6$	$V_{CC} - 0.09$	-	V
		$I_O = -24\text{ mA}$; $V_{CC} = 3.0\text{ V}$	$V_{CC} - 1.0$	$V_{CC} - 0.28$	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 100\text{ }\mu\text{A}$; $V_{CC} = 2.3\text{ V}$ to 3.6 V	-	GND	0.20	V
		$I_O = 6\text{ mA}$; $V_{CC} = 2.3\text{ V}$	-	0.07	0.40	V
		$I_O = 12\text{ mA}$; $V_{CC} = 2.3\text{ V}$	-	0.15	0.70	V
		$I_O = 12\text{ mA}$; $V_{CC} = 2.7\text{ V}$	-	0.14	0.40	V
		$I_O = 24\text{ mA}$; $V_{CC} = 3.0\text{ V}$	-	0.27	0.55	V
I_I	input leakage current	$V_{CC} = 2.3\text{ V}$ to 3.6 V ; $V_I = V_{CC}$ or GND	-	0.1	5	μA
I_{OZ}	OFF-state output current	$V_{CC} = 2.3\text{ V}$ to 3.6 V ; $V_I = V_{IH}$ or V_{IL} ; $V_O = V_{CC}$ or GND	-	0.1	10	μA
I_{CC}	supply current	$V_{CC} = 2.3\text{ V}$ to 3.6 V ; $V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$	-	0.2	40	μA
ΔI_{CC}	additional supply current	per data I/O pin; $V_{CC} = 2.3\text{ V}$ to 3.6 V ; $V_I = V_{CC} - 0.6\text{ V}$; $I_O = 0\text{ A}$	-	150	750	μA
I_{BHL}	bus hold LOW current	$V_{CC} = 2.3\text{ V}$; $V_I = 0.7\text{ V}$	45	-	-	μA
		$V_{CC} = 3.0\text{ V}$; $V_I = 0.8\text{ V}$	75	150	-	μA
I_{BHH}	bus hold HIGH current	$V_{CC} = 2.3\text{ V}$; $V_I = 1.7\text{ V}$	-45	-	-	μA
		$V_{CC} = 3.0\text{ V}$; $V_I = 2.0\text{ V}$	-75	-175	-	μA
I_{BHLO}	bus hold LOW overdrive current	$V_{CC} = 3.6\text{ V}$	500	-	-	μA
I_{BHHO}	bus hold HIGH overdrive current	$V_{CC} = 3.6\text{ V}$	-500	-	-	μA
C_I	input capacitance		-	4.0	-	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 10](#). $T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
t_{pd}	propagation delay	nAn to nBn; nBn to nAn; see Figure 6 ^[2]				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	3.4	5.1	ns
		$V_{CC} = 2.7\text{ V}$	-	2.9	4.8	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	3.8	4.3	ns
		nLEAB to nBn; nLEBA to nAn; see Figure 7				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	3.3	6.5	ns
		$V_{CC} = 2.7\text{ V}$	-	3.6	6.2	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.4	3.1	5.0	ns
t_{en}	enable time	nOEBA to nAn; nOEAB to nBn; see Figure 8 ^[3]				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	3.3	6.8	ns
		$V_{CC} = 2.7\text{ V}$	-	3.4	6.3	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	2.9	5.3	ns
		nEBA to nAn; nEAB to nBn; see Figure 8				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	3.3	7.2	ns
		$V_{CC} = 2.7\text{ V}$	-	3.5	6.9	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	3.0	5.6	ns
t_{dis}	disable time	nOEBA to nAn; nOEAB to nBn; see Figure 8 ^[4]				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	2.9	5.7	ns
		$V_{CC} = 2.7\text{ V}$	-	3.3	4.8	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	3.2	4.6	ns
		nEBA to nAn; nEAB to nBn; see Figure 8				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.3	3.3	6.1	ns
		$V_{CC} = 2.7\text{ V}$	-	3.5	6.2	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.1	3.3	5.1	ns
t_W	pulse width	nLEAB, nLEBA LOW; see Figure 7				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	3.3	1.2	-	ns
		$V_{CC} = 2.7\text{ V}$	3.3	1.3	-	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	3.3	0.9	-	ns
t_{su}	set-up time	nAn to nLEAB; nBn to nLEBA; nAn to nEAB; nBn to nEBA; see Figure 9				
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.2	0.2	-	ns
		$V_{CC} = 2.7\text{ V}$	0.8	0.2	-	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.3	0.1	-	ns

Symbol	Parameter	Conditions	Min	Typ ^[1]	Max	Unit
t_h	hold time	nAn to nLEAB; nBn to nLEBA; nAn to nEAB; nBn to nEBA; see Figure 9				
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.2	0.2	-	ns
		$V_{CC} = 2.7 \text{ V}$	0.4	0.1	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	0.7	0.2	-	ns
C_{PD}	power dissipation capacitance	per latch; $V_I = \text{GND to } V_{CC}$ ^[5]				
		outputs enabled	-	44	-	pF
		outputs disabled	-	14	-	pF

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

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_{PLH} and t_{PHL} .

[3] t_{en} is the same as t_{PZL} and t_{PZH} .

[4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

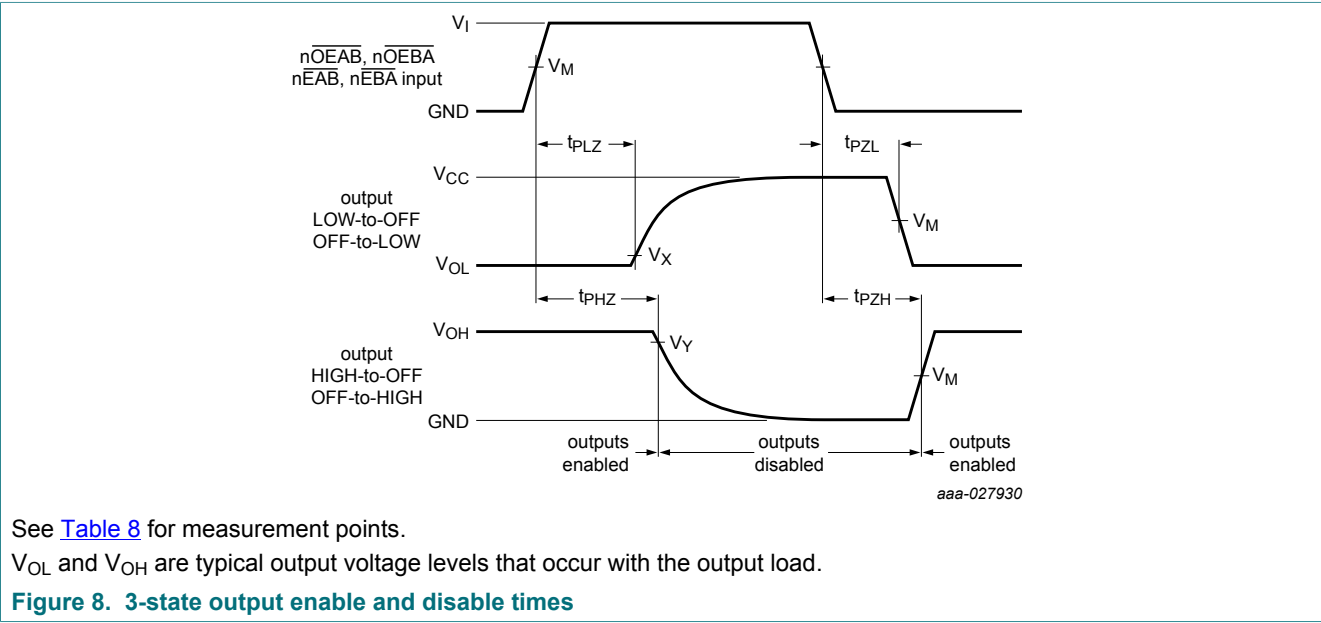
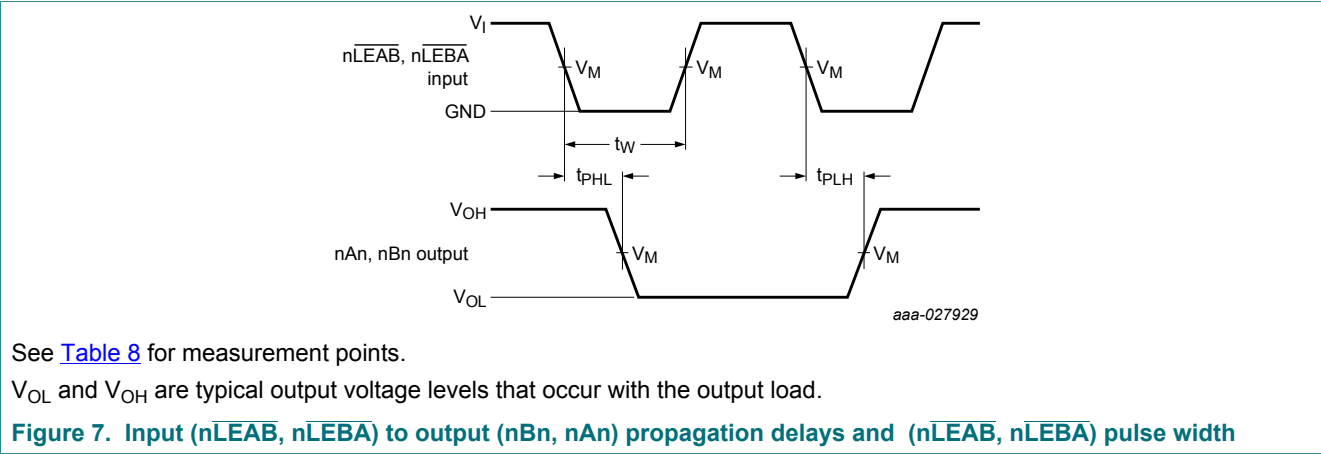
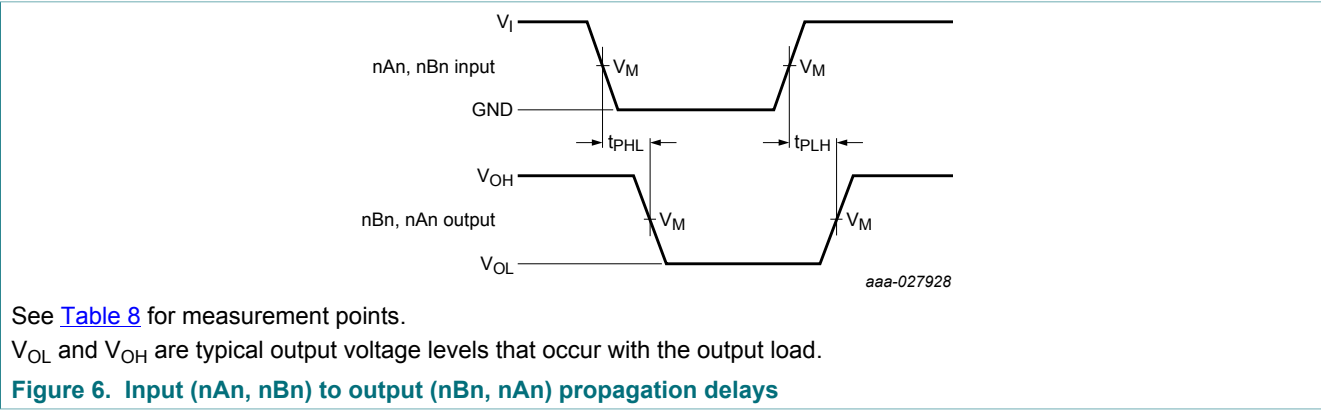
C_L = output load capacitance in pF;

V_{CC} = supply voltage in 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



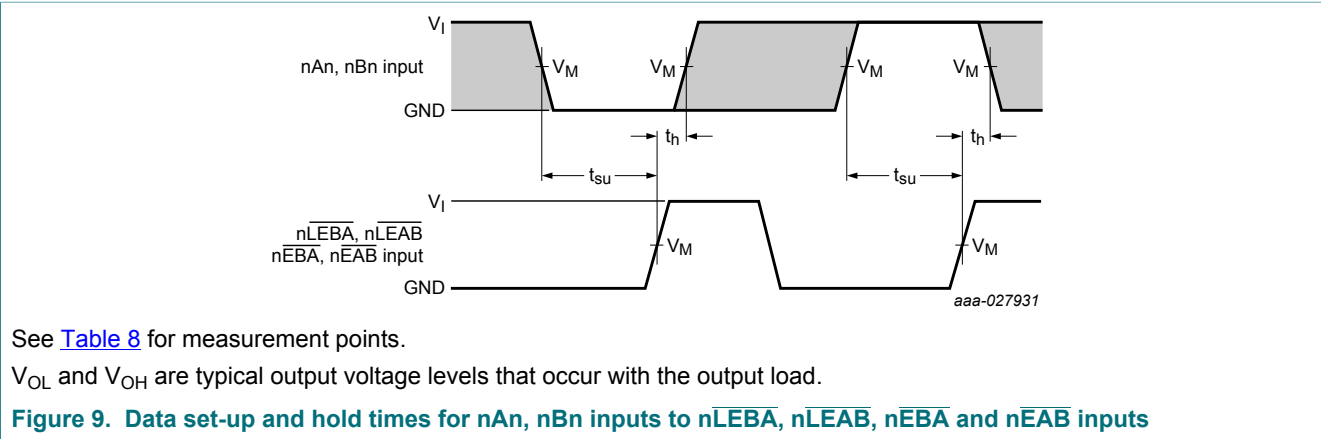
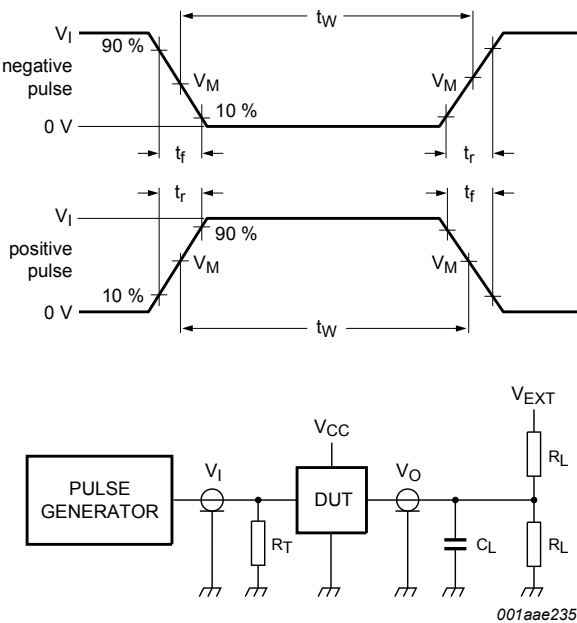


Table 8. Measurement points

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	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$



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} = External voltage for measuring switching times.

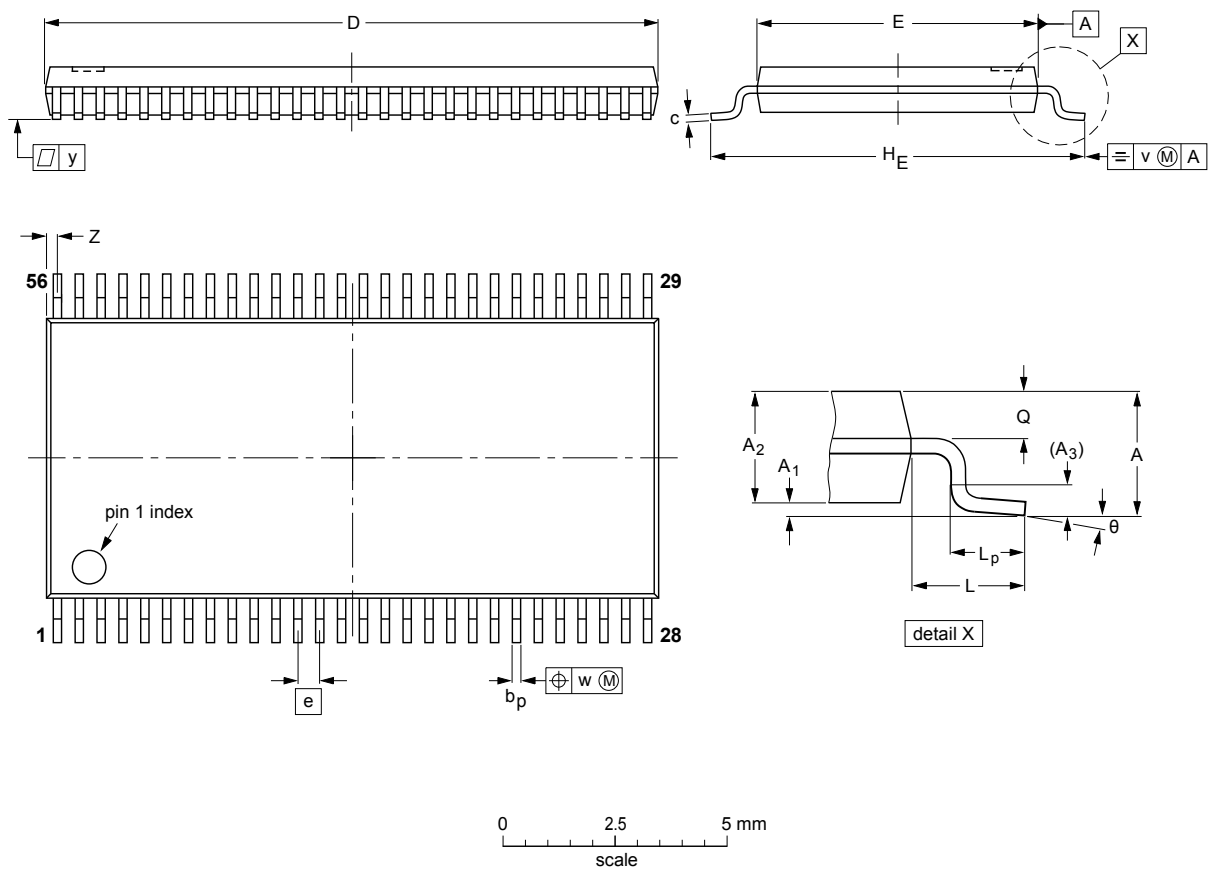
Figure 10. Test circuit for measuring switching times

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}	≤ 2.0 ns	500 Ω	30 pF	GND	$2 \times V_{CC}$	open
2.7 V	2.7 V	≤ 2.5 ns	500 Ω	50 pF	GND	$2 \times V_{CC}$	open
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	500 Ω	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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	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 11. 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
74ALVCH16543 v.3	20171215	Product data sheet	-	74ALVCH16543 v.2
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.			
74ALVCH16543 v.2	19991123	Product specification	-	74ALVCH16543 v.1
74ALVCH16543 v.1	19980831	Product specification	-	-

14 Legal information

14.1 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 URL <http://www.nexperia.com>.

14.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

14.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia. In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical

systems or equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products. Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications. In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer

design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

14.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Contents

1 General description 1

2 Features and benefits1

3 Ordering information 2

4 Functional diagram2

5 Pinning information4

5.1 Pinning4

5.2 Pin description5

6 Functional description5

7 Limiting values6

8 Recommended operating conditions6

9 Static characteristics7

10 Dynamic characteristics8

10.1 Waveforms and test circuit 10

11 Package outline13

12 Abbreviations 14

13 Revision history 14

14 Legal information 15

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