74AHC2G125; 74AHCT2G125

Dual buffer/line driver; 3-state Rev. 4 — 2 January 2019

Product data sheet

1. General description

The 74AHC2G125 and 74AHCT2G125 are high-speed Si-gate CMOS devices. They provide a dual non-inverting buffer/line driver with 3-state output. The 3-state output is controlled by the output enable input (nOE). A HIGH at nOE causes the output to assume a high-impedance OFF-state.

The AHC device has CMOS input switching levels and supply voltage range 2 V to 5.5 V.

The AHCT device has TTL input switching levels and supply voltage range 4.5 V to 5.5 V.

2. Features and benefits

- Symmetrical output impedance
- High noise immunity
- · Low power dissipation
- Balanced propagation delays
- Multiple package options
- ESD protection:
 - HBM JESD22-A114E: exceeds 2000 V
 - MM JESD22-A115-A: exceeds 200 V
 - CDM JESD22-C101C: exceeds 1000 V
- Specified from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC2G125DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package;	SOT505-2
74AHCT2G125DP			8 leads; body width 3 mm; lead length 0.5 mm	
74AHC2G125DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package;	SOT765-1
74AHCT2G125DC	1		8 leads; body width 2.3 mm	

4. Marking

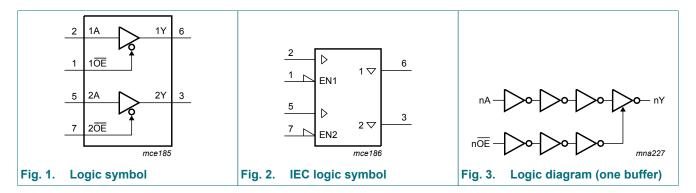
Table 2. Marking codes

Type number	Marking[1]
74AHC2G125DP	A25
74AHCT2G125DP	C25
74AHC2G125DC	A25
74AHCT2G125DC	C25

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

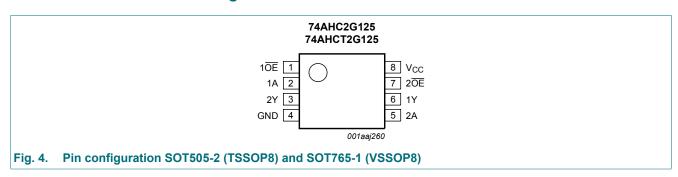


5. Functional diagram



6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1 OE , 2 OE	1, 7	output enable input (active LOW)
1A, 2A	2, 5	data input
GND	4	ground (0 V)
1Y, 2Y	6, 3	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

 $H = HIGH \text{ voltage level}; L = LOW \text{ voltage level}; X = don't \text{ care}; Z = high-impedance OFF-state.}$

	Input	Output
nŌĒ	nA	nY
L	L	L
L	Н	Н
Н	X	Z

8. Limiting values

Table 5. 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	+7.0	V
VI	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	$V_1 < -0.5 V$ [1]	-20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$ [1]	-	±20	mA
Io	output current	-0.5 V < V _O < V _{CC} + 0.5 V	-	±25	mA
I _{CC}	supply current		-	75	mA
I _{GND}	ground current		-75	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C [2]	-	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74	AHC2G1	25	74	74AHCT2G125			
			Min	Тур	Max	Min	Тур	Max		
V _{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V	
VI	input voltage		0	-	5.5	0	-	5.5	V	
Vo	output voltage		0	-	V _{CC}	0	-	V _{CC}	V	
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C	
Δt/ΔV	input transition rise and	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V	
	fall rate	V _{CC} = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V	

10. Static characteristics

Table 7. Static characteristics

Voltages are referenced to GND (ground = 0 V).

Symbol Parameter		Conditions	25 °C			_	°C to 5 °C	_	°C to 5 °C	Unit
		Min	Тур	Max	Min	Max	Min	Max]	
74AHC2	G125									
V _{IH}	V _{IH} HIGH-level input voltage	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		V _{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V _{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V_{IL}	LOW-level	V _{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V

3 / 12

^[2] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 mW/K.

Symbol	Parameter	Conditions		25 °C			°C to		°C to 5 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
V _{OH}	HIGH-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = -50 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I _O = -8.0 mA; V _{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	V
V _{OL}	LOW-level	V _I = V _{IH} or V _{IL}								
	output voltage	I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 50 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
	I _O = 4.0 mA; V _{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V	
		I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μA
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	2G125									
V_{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V_{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
l _{OZ}	OFF-state output current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	0.25	-	2.5	-	10	μA
l _l	input leakage current	V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
Δl _{CC}	additional supply current	per input pin; V _I = 3.4 V; other inputs at V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see Fig. 7.

Symbol Parameter		Conditions		25 °C		-	°C to 5 °C	_	°C to 5 °C	Unit
			Min	Typ [1]	Max	Min	Max	Min	Max	
74AHC2	G125									
t _{pd}	propagation	nA to nY; see Fig. 5 [2]								
	delay	V_{CC} = 3.0 V to 3.6 V; C_L = 15 pF	ı	4.7	8.0	1.0	9.5	1.0	11.5	ns
		V_{CC} = 3.0 V to 3.6 V; C_L = 50 pF	-	6.6	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 15 pF	ı	3.4	5.5	1.0	6.5	1.0	7.0	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	-	4.8	7.5	1.0	8.5	1.0	9.5	ns
t _{en}	enable time	nOE to nY; see Fig. 6 [2]								
		V_{CC} = 3.0 V to 3.6 V; C_L = 15 pF	-	5.0	8.0	1.0	9.5	1.0	11.5	ns
		V_{CC} = 3.0 V to 3.6 V; C_L = 50 pF	-	6.9	11.5	1.0	13.0	1.0	14.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 15 pF	-	3.6	5.1	1.0	6.0	1.0	6.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	-	4.9	7.5	1.0	8.5	1.0	9.5	ns
t _{dis}	disable time	nOE to nY; see Fig. 6 [2]								
		V_{CC} = 3.0 V to 3.6 V; C_L = 15 pF	-	6.0	9.7	1.0	11.5	1.0	12.5	ns
		V _{CC} = 3.0 V to 3.6 V; C _L = 50 pF	-	8.3	13.2	1.0	15.0	1.0	16.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 15 pF	-	4.1	6.8	1.0	8.0	1.0	8.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	-	5.7	8.8	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f_i = 1 MHz; [3] V_I = GND to V_{CC}	-	9	-	-	-	-	-	pF
74AHCT	2G125			'						
t _{pd}	propagation	nA to nY; see Fig. 5 [2]								
	delay	V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	-	3.4	5.5	1.0	6.5	1.0	6.5	ns
		V_{CC} = 4.5 V to 5.5 V; C_L = 50 pF	-	4.8	7.5	1.0	8.5	1.0	8.5	ns
t _{en}	enable time	nOE to nY; see Fig. 6 [2]								
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	-	3.9	5.1	1.0	6.0	1.0	6.0	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	-	5.1	7.5	1.0	8.5	1.0	8.5	ns
t _{dis}	disable time	nOE to nY; see Fig. 6 [2]								
		V _{CC} = 4.5 V to 5.5 V; C _L = 15 pF	-	4.5	6.8	1.0	8.0	1.0	8.0	ns
		V _{CC} = 4.5 V to 5.5 V; C _L = 50 pF	-	6.1	8.8	1.0	10.0	1.0	10.0	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f_i = 1 MHz; [3] V_I = GND to V_{CC}	-	11	-	-	-	-	-	pF

Typical values are measured at T_{amb} = 25 °C and V_{CC} = 3.3 V and 5.0 V respectively.

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

 f_i = input frequency in MHz;

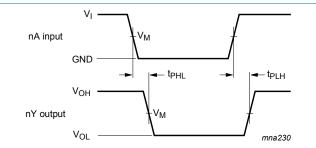
 f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

 t_{pd} is the same as t_{PLH} and t_{PHI} ; t_{en} is the same as t_{PZL} and t_{PZH} ; t_{dis} is the same as t_{PLZ} and t_{PHZ} . t_{PD} is used to determine the dynamic power dissipation t_{PD} (t_{PD}).

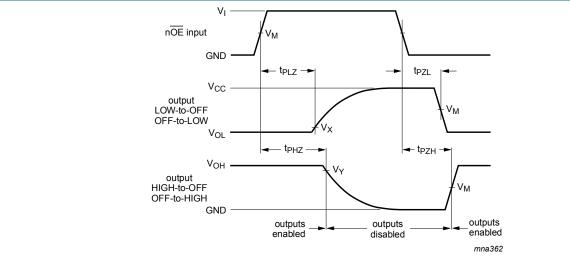
11.1. Waveforms and test circuit



Measurement points are given in Table 9.

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

Fig. 5. Input (nA) to output (nY) propagation delays



Measurement points are given in Table 9.

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

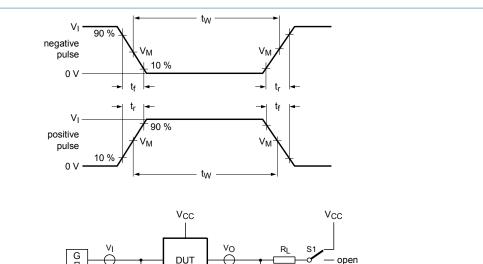
Fig. 6. Enable and disable times

Table 9. Measurement points

Туре	Input	Output				
	V _M	V _M	V _X	V _Y		
74AHC2G125	0.5V _{CC}	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V		
74AHCT2G125	1.5 V	0.5V _{CC}	V _{OL} + 0.3 V	V _{OH} - 0.3 V		

001aad983

Dual buffer/line driver; 3-state



Test data is given in <u>Table 10</u>.

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator.

 C_L = Load capacitance including jig and probe capacitance.

 R_L = Load resistance.

Definitions test circuit:

S1 = Test selection switch.

Fig. 7. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position		
	V _I	t _r , t _f	CL	R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t_{PZL}, t_{PLZ}
74AHC2G125	V _{CC}	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}
74AHCT2G125	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}

12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

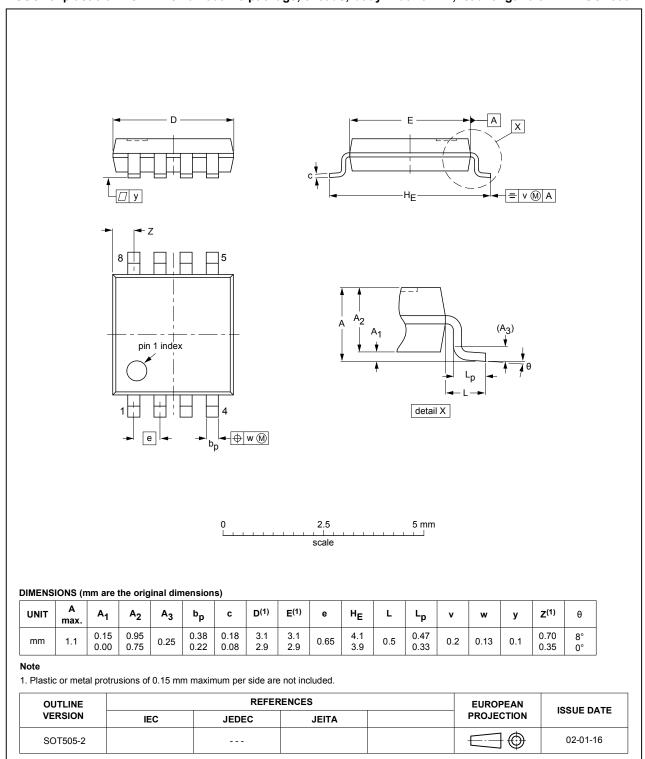


Fig. 8. Package outline SOT505-2 (TSSOP8)

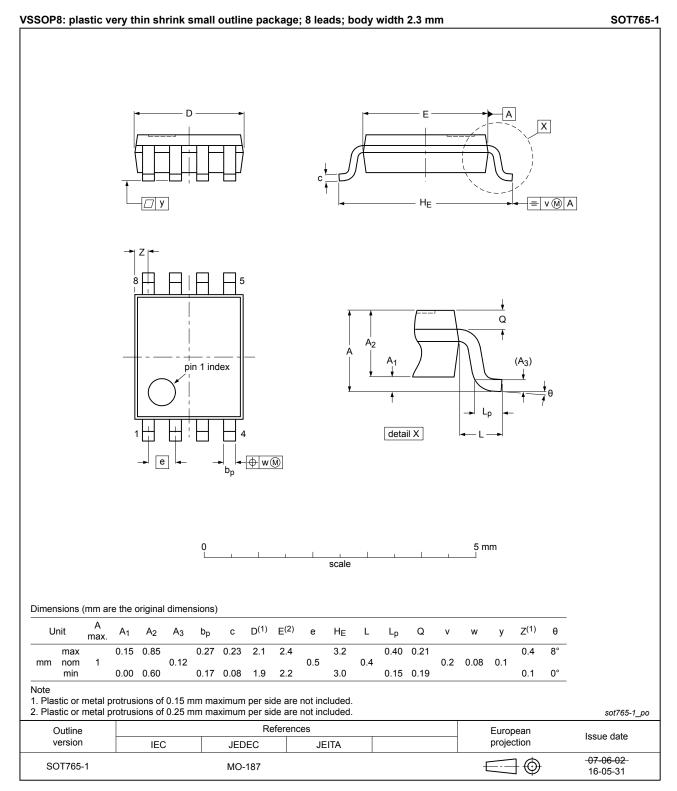


Fig. 9. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 11. Abbreviations

Table 1117 toble 1 actions					
Acronym	Description				
CDM	Charged Device Model				
CMOS	Complementary Metal-Oxide Semiconductor				
DUT	Device Under Test				
ESD	ElectroStatic Discharge				
HBM	Human Body Model				
MM	Machine Model				
TTL	Transistor-Transistor Logic				

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AHC_AHCT2G125 v.4	20190102	Product data sheet	-	74AHC_AHCT2G125 v.3	
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. Type numbers 74AHC2G125GD and 74AHCT2G125GD (SOT996-2) removed. Package outline drawing SOT765-1 (VSSOP8) updated. 				
74AHC_AHCT2G125 v.3	20130506	Product data sheet	-	74AHC_AHCT2G125 v.2	
Modifications:	For type number 74AHC2G125GD and 74AHCT2G125GD XSON8U has changed to XSON8.				
74AHC_AHCT2G125 v.2	20081222	Product data sheet	-	74AHC_AHCT2G125 v.1	
Modifications:	 The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Added type number 74AHC2G125GD and 74AHCT2G125GD (XSON8U package). 				
74AHC_AHCT2G125 v.1	20040113	Product specification	-	-	

15. 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.

- Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- 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.

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.

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.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

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 sustained.

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.

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 benefits	1
3. Ordering information	1
4. Marking	1
5. Functional diagram	2
6. Pinning information	2
6.1. Pinning	2
6.2. Pin description	2
7. Functional description.	2
8. Limiting values	3
9. Recommended operatir	g conditions3
10. Static characteristics	3
11. Dynamic characteristic	cs5
11.1. Waveforms and test c	ircuit6
12. Package outline	8
13. Abbreviations	10
14. Revision history	10
15. Legal information	11

For more information, please visit: http://www.nexperia.com For sales office addresses, please send an email to: salesaddresses@nexperia.com Date of release: 2 January 2019

[©] Nexperia B.V. 2019. All rights reserved

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Nexperia:

<u>74AHC2G125DC,125</u> <u>74AHC2G125DP,125</u> <u>74AHCT2G125DC,125</u> <u>74AHCT2G125DD,125</u> <u>74AHC2G125GD,125</u> <u>74AHCT2G125GD,125</u>