Inverter with open-drain output Rev. 7 — 18 November 2014

#### 1. **General description**

74AHC1G06 and 74AHCT1G06 are high-speed Si-gate CMOS devices. They provide an inverting buffer. The output of these devices is an open-drain and can be connected to other open-drain outputs to implement active-LOW, wired-OR or active-HIGH, wired-AND functions. For digital operation this device must have a pull-up resistor to establish a logic HIGH-level.

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**

- High noise immunity
- Low power dissipation
- SOT353-1 and SOT753 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							
74AHC1G06GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package;	SOT353-1				
74AHCT1G06GW			5 leads; body width 1.25 mm					
74AHC1G06GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74AHCT1G06GV								



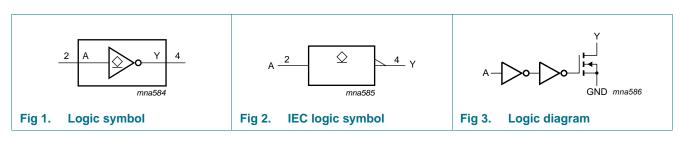
Inverter with open-drain output

### 4. Marking

Table 2.   Marking codes	
Type number	Marking <sup>[1]</sup>
74AHC1G06GW	AR
74AHC1G06GV	A06
74AHCT1G06GW	CR
74AHCT1G06GV	C06

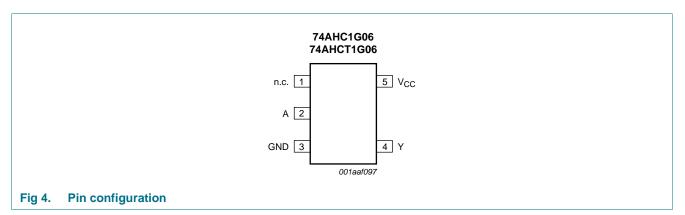
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3. Pin description						
Symbol	Pin	Description				
n.c.	1	not connected				
A	2	data input				
GND	3	ground (0 V)				
Y	4	data output				
V <sub>CC</sub>	5	supply voltage				

74AHC_AHCT1G06						
Product data	a sheet					

All information provided in this document is subject to legal disclaimers.

## 7. Functional description

#### Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state

Input	Output
A	Y
L	Z
Н	L

## 8. Limiting values

### Table 5.Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CC</sub>	supply voltage			-0.5	+7.0	V
VI	input voltage			-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V		-20	-	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V	<u>[1]</u>	-	±20	mA
lo	output current	V <sub>O</sub> > -0.5 V		-	±25	mA
Vo	output voltage	active mode	<u>[1]</u>	-0.5	+7.0	V
		high-impedance mode	<u>[1]</u>	-0.5	+7.0	V
I <sub>CC</sub>	supply current			-	75	mA
I <sub>GND</sub>	ground current			-75	-	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40 \text{ °C to } +125 \text{ °C}$	[2]	-	250	mW

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

[2] For both TSSOP5 and SC-74A packages: above 87.5 °C the value of Ptot derates linearly with 4.0 mW/K.

## 9. Recommended operating conditions

### Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G06			74AHCT1G06			Unit
			Min	Тур	Max	Min	Тур	Max	
V <sub>CC</sub>	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
V <sub>O</sub> out	output voltage	active mode	0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
		high-impedance mode	0	-	6.0	0	-	6.0	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC}$ = 3.3 V $\pm$ 0.3 V	-	-	100	-	-	-	ns/V
		$V_{CC}$ = 5.0 V $\pm$ 0.5 V	-	-	20	-	-	20	ns/V

Inverter with open-drain output

## **10. Static characteristics**

### Table 7.Static characteristics

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

Symbol Parameter		Conditions		25 °C		–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
For type	74AHC1G06	1				1	1	1	1	
VIH	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
	V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V	
VIL	LOW-level	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
input voltage	V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V	
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}$								
	output voltage	$I_0 = 50 \ \mu A; \ V_{CC} = 2.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 50 \ \mu A; \ V_{CC} = 3.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 50 \ \mu A; \ V_{CC} = 4.5 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_0 = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
lı	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μA
I <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH} \text{ or } V_{IL}; V_O = V_{CC} \text{ or}$ GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.25		±2.5		±10.0	μA
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	1.0	-	10	-	20	μA
CI	input capacitance		-	1.5	10	-	10	-	10	pF
For type	74AHCT1G06									
V <sub>IH</sub>	HIGH-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	$V_{CC}$ = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{CC} = 4.5 \text{ V}$								
	output voltage	$I_0 = 50 \mu\text{A}$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>OZ</sub>	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_O = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	±0.25		±2.5		±10.0	μΑ
I <sub>CC</sub>	supply current		-	-	1.0	-	10	-	20	μA
$\Delta I_{CC}$	additional supply current	per input pin; $V_1 = 3.4 V$ ; other inputs at $V_{CC}$ or GND; $I_O = 0 A$ ; $V_{CC} = 5.5 V$	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

Inverter with open-drain output

## **11. Dynamic characteristics**

### Table 8. Dynamic characteristics

GND = 0 V;  $t_r = t_f = \le 3.0$  ns. For test circuit see Figure 6.

Symbol	Parameter	Conditions			25 °C		–40 °C	to +85 °C	–40 °C to +125 °C		Unit
			М	lin	Тур	Max	Min	Max	Min	Max	
For type	74AHC1G06										_
t <sub>PZL</sub> OFF-state		A to Y; see Figure 5									
	to LOW	$V_{CC}$ = 3.0 V to 3.6 V	[1]								
	propagation delay	C <sub>L</sub> = 15 pF		-	3.7	7.0	1.0	7.7	1.0	8.1	ns
		C <sub>L</sub> = 50 pF		-	5.2	10.0	1.0	11.0	1.0	11.5	ns
		$V_{CC}$ = 4.5 V to 5.5 V	[2]								
		C <sub>L</sub> = 15 pF		-	2.7	4.9	1.0	5.3	1.0	5.6	ns
		C <sub>L</sub> = 50 pF		-	3.8	7.0	1.0	7.5	1.0	8.0	ns
t <sub>PLZ</sub>	LOW to	A to Y; see Figure 5									
	OFF-state	$V_{CC}$ = 3.0 V to 3.6 V	[1]								
	propagation delay	C <sub>L</sub> = 15 pF		-	4.8	6.4	1.0	6.9	1.0	7.4	ns
	5	C <sub>L</sub> = 50 pF		-	6.9	10.0	1.0	10.5	1.0	11.0	ns
		$V_{CC}$ = 4.5 V to 5.5 V	[2]								
		C <sub>L</sub> = 15 pF		-	3.0	4.1	1.0	4.6	1.0	5.1	ns
		C <sub>L</sub> = 50 pF		-	4.3	6.5	1.0	7.0	1.0	7.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}; \text{ f} = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[3]	-	3	-	-	-	-	-	pF
For type	74AHCT1G06										
t <sub>PZL</sub>	OFF-state	A to Y; see Figure 5									
	to LOW propagation	$V_{CC}$ = 4.5 V to 5.5 V	[2]								
	delay	C <sub>L</sub> = 15 pF		-	3.0	5.3	1.0	6.0	1.0	6.3	ns
	5	C <sub>L</sub> = 50 pF		-	4.2	7.5	1.0	8.5	1.0	9.0	ns
t <sub>PLZ</sub>	LOW to	A to Y; see Figure 5									
	OFF-state propagation	$V_{CC}$ = 4.5 V to 5.5 V	[2]								
	delay	C <sub>L</sub> = 15 pF		-	3.2	4.6	1.0	5.1	1.0	5.6	ns
		C <sub>L</sub> = 50 pF		-	4.5	7.0	1.0	7.5	1.0	8.0	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}; \text{ f} = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[3]	-	4.5	-	-	-	-	-	pF

[1] Typical values are measured at  $V_{CC}$  = 3.3 V.

[2] Typical values are measured at  $V_{CC}$  = 5.0 V.

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

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

 $f_i$  = input frequency in MHz;

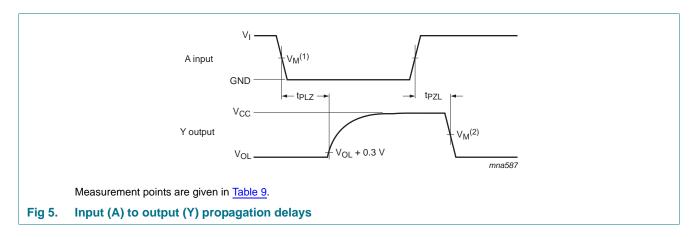
 $f_o$  = output frequency in MHz;

 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in Volts

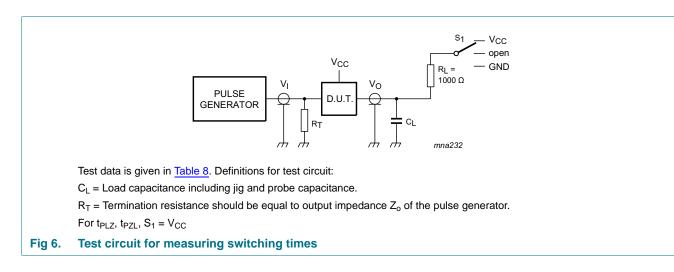
Inverter with open-drain output

### 12. Waveforms



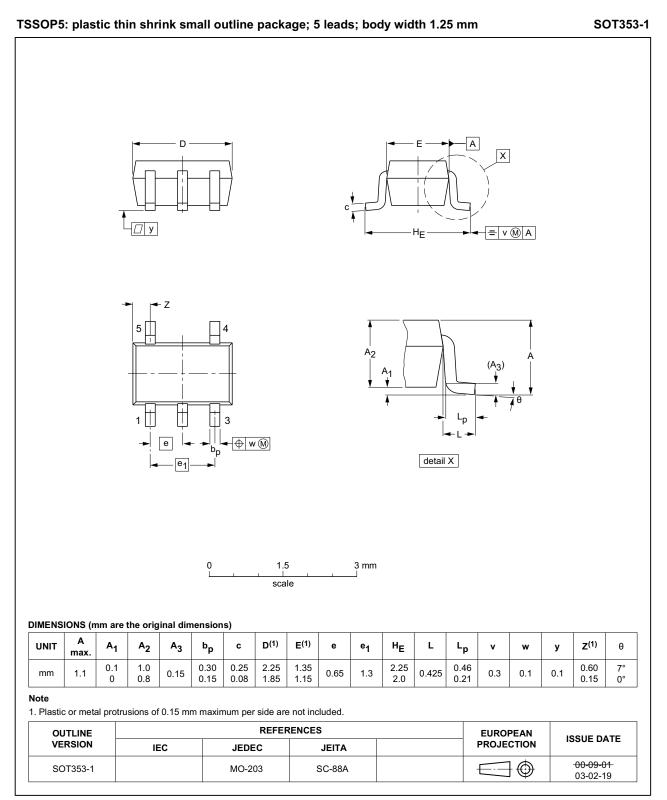
#### Table 9.Measurement point

Туре	Input	Output	
	VI	V <sub>M</sub> <sup>(1)</sup>	V <sub>M</sub> <sup>(2)</sup>
74AHC1G06	GND to V <sub>CC</sub>	$0.5  imes V_{CC}$	$0.5  imes V_{CC}$
74AHCT1G06	GND to 3.0 V	1.5 V	$0.5  imes V_{CC}$



Inverter with open-drain output

### 13. Package outline



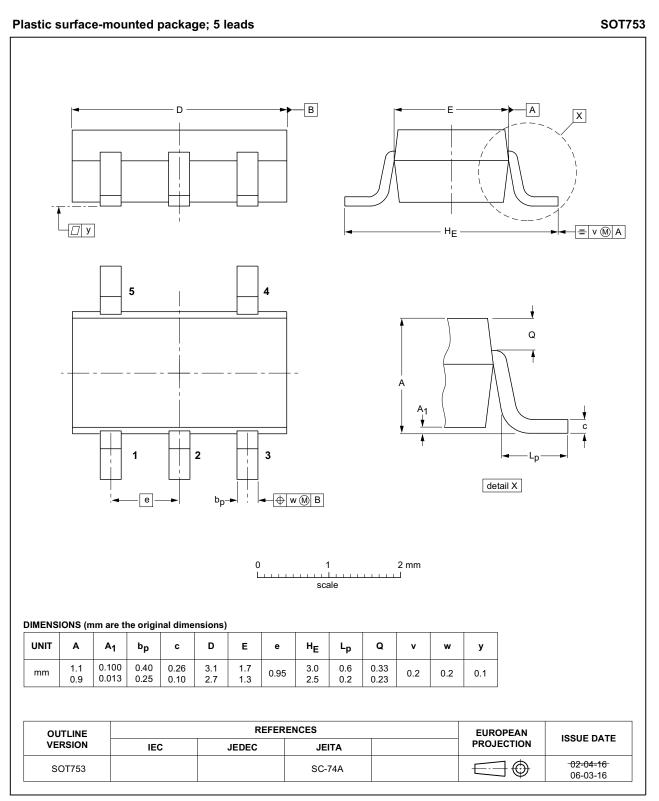
#### Fig 7. Package outline SOT353-1 (TSSOP5)

All information provided in this document is subject to legal disclaimers.

74AHC\_AHCT1G06

© NXP Semiconductors N.V. 2014. All rights reserved.

Inverter with open-drain output



### Fig 8. Package outline SOT753 (SC-74A)

All information provided in this document is subject to legal disclaimers.

74AHC\_AHCT1G06

Inverter with open-drain output

## 14. Abbreviations

Table 10. Abbreviations					
Acronym	Description				
CDM	Charged Device Model				
DUT	Device Under Test				
ESD	ElectroStatic Discharge				
НВМ	Human Body Model				
MM	Machine Model				
TTL	Transistor-Transistor Logic				

## 15. Revision history

### Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes					
74AHC_AHCT1G06 v.7	20141118	Product data sheet	-	74AHC_AHCT1G06 v.6					
Modifications:	• <u>Section 4</u> : ta	4: table note added.							
74AHC_AHCT1G06 v.6	20070607	Product data sheet	-	74AHC_AHCT1G06 v.5					
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> </ul>								
	<ul> <li>Legal texts I</li> </ul>	nave been adapted to the new	company name whe	ere appropriate.					
	<ul> <li>Package SC</li> </ul>	T353 changed to SOT353-1 i	n <u>Section 3</u> and <u>Sec</u>	tion 13.					
	Quick refere	ence data and Soldering section	ons removed.						
74AHC_AHCT1G06 v.5	20021002	Product specification	-	74AHC_AHCT1G06 v.4					
74AHC_AHCT1G06 v.4	20020528	Product specification	-	74AHC_AHCT1G06 v.3					
74AHC_AHCT1G06 v.3	20020221	Product specification	-	74AHC_AHCT1G06 v.2					
74AHC_AHCT1G06 v.2	20010209	Product specification	-	74AHC_AHCT1G06 v.1					
74AHC_AHCT1G06 v.1	20000501	Product specification	-	-					

## 16. Legal information

### 16.1 Data sheet status

Document status[1][2]	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 <a href="http://www.nxp.com">http://www.nxp.com</a>.

### 16.2 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. NXP Semiconductors 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 NXP Semiconductors 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 NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 16.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors 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. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors 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, NXP Semiconductors' 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 NXP Semiconductors.

Right to make changes — NXP Semiconductors 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 — NXP Semiconductors 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 NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors 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. NXP Semiconductors 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 NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors 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.

NXP Semiconductors 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 NXP Semiconductors 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). NXP 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 — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <a href="http://www.nxp.com/profile/terms">http://www.nxp.com/profile/terms</a>, 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. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors 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.

© NXP Semiconductors N.V. 2014. All rights reserved.

74AHC AHCT1G06

### Inverter with open-drain output

**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 NXP Semiconductors 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. NXP Semiconductors 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 NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' 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.

### 16.4 Trademarks

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

### 17. Contact information

For more information, please visit: http://www.nxp.com

For sales office addresses, please send an email to: salesaddresses@nxp.com

Inverter with open-drain output

### **18. Contents**

1	General description 1
2	Features and benefits 1
3	Ordering information 1
4	Marking 2
5	Functional diagram 2
6	Pinning information 2
6.1	Pinning
6.2	Pin description 2
7	Functional description 3
8	Limiting values 3
9	Recommended operating conditions 3
10	Static characteristics 4
11	Dynamic characteristics 5
12	Waveforms 6
13	Package outline 7
14	Abbreviations
15	Revision history
16	Legal information 10
16.1	Data sheet status 10
16.2	Definitions 10
16.3	Disclaimers
16.4	Trademarks 11
17	Contact information 11
18	Contents 12

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

© NXP Semiconductors N.V. 2014.

All rights reserved.

For more information, please visit: http://www.nxp.com For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 18 November 2014 Document identifier: 74AHC\_AHCT1G06

## **X-ON Electronics**

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Buffers & Line Drivers category:

Click to view products by NXP manufacturer:

Other Similar products are found below :

5962-9217601MSA 634810D 875140G HEF4022BP HEF4043BP NL17SG125DFT2G NL17SZ126P5T5G NLU1GT126CMUTCG NLU3G16AMX1TCG NLV27WZ125USG MC74HCT365ADTR2G BCM6306KMLG 54FCT240CTDB Le87401NQC Le87402MQC 028192B 042140C 051117G 070519XB 065312DB 091056E 098456D NL17SG07DFT2G NL17SG17DFT2G NL17SG34DFT2G NL17SZ07P5T5G NL17SZ125P5T5G NLU1GT126AMUTCG NLV27WZ16DFT2G 5962-8982101PA 5962-9052201PA 74LVC07ADR2G MC74VHC1G125DFT1G NL17SH17P5T5G NL17SZ125CMUTCG NLV17SZ07DFT2G NLV37WZ17USG NLVHCT244ADTR2G NC7WZ17FHX 74HCT126T14-13 NL17SH125P5T5G NLV14049UBDTR2G NLV37WZ07USG 74VHC541FT(BE) RHFAC244K1 74LVC1G17FW4-7 74LVC1G126FZ4-7 BCM6302KMLG 74LVC1G07FZ4-7 74LVC1G125FW4-7