# imall

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from, Europe, America and south Asia, supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts, Customers Priority, Honest Operation, and Considerate Service", our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip, ALPS, ROHM, Xilinx, Pulse, ON, Everlight and Freescale. Main products comprise IC, Modules, Potentiometer, IC Socket, Relay, Connector. Our parts cover such applications as commercial, industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



# Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832 Email & Skype: info@chipsmall.com Web: www.chipsmall.com Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# Single Schmitt trigger buffer

Rev. 1 — 8 March 2016

**Product data sheet** 

### 1. General description

The 74AHC1G17-Q100 and 74AHCT1G17-Q100 are single buffers with Schmitt-trigger inputs. Inputs are overvoltage tolerant. This feature allows the use of these devices as translators in mixed voltage environments.

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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

### 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Symmetrical output impedance
- High noise immunity
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- Low power dissipation
- Balanced propagation delays

### 3. Applications

- Wave and pulse shapers
- Astable multivibrators
- Monostable multivibrators



Single Schmitt trigger buffer

## 4. Ordering information

Table 1. Ordering information										
Type number Package										
	Temperature range	Name	Description	Version						
74AHC1G17GW-Q100	–40 °C to +125 °C		plastic thin shrink small outline package;	SOT353-1						
74AHCT1G17GW-Q100			5 leads; body width 1.25 mm							

### 5. Marking

#### Table 2.Marking codes

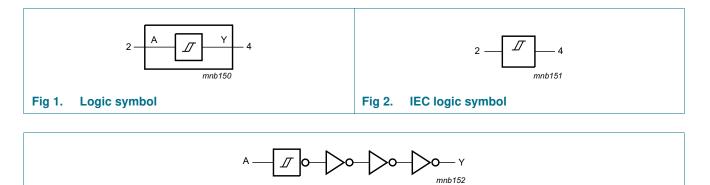
Type number	Marking code <sup>[1]</sup>
74AHC1G17GW-Q100	AJ
74AHCT1G17GW-Q100	CJ

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

### 6. Functional diagram

Logic diagram

Fig 3.

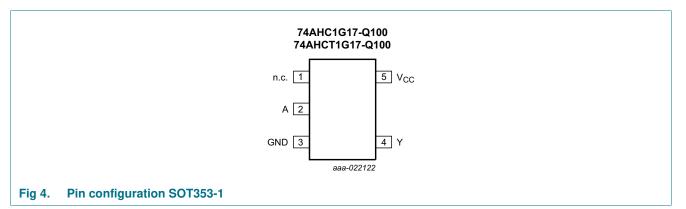


# 74AHC1G17-Q100; 74AHCT1G17-Q100

Single Schmitt trigger buffer

## 7. Pinning information

#### 7.1 Pinning



#### 7.2 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						

### 8. Functional description

#### Table 4.Function table

H = HIGH voltage level; L = LOW voltage level

Input	Output
Α	Y
L	L
Н	Н

Single Schmitt trigger buffer

### 9. 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>ОК</sub>	output clamping current	$V_O < -0.5 \ V$ or $V_O > V_{CC}$ + 0.5 V	[1]	-	±20	mA
lo	output current	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$		-	±25	mA
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	$T_{amb} = -40 \ ^{\circ}C \ to +125 \ ^{\circ}C$	[2]	-	250	mW

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

[2] For TSSOP5 package: above 87.5 °C the value of P<sub>tot</sub> derates linearly with 4.0 mW/K.

## 10. Recommended operating conditions

#### Table 6. Recommended operating conditions

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

Symbol Parameter		Conditions	74AHC1G17-Q100			74AHCT1G17-Q100			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
Vo	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C

Single Schmitt trigger buffer

# 11. 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 t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G17-Q100					1	1	1	I	
		$V_{I} = V_{T+} \text{ or } V_{T-}$								
	output voltage	$I_{O} = -50 \ \mu A; V_{CC} = 2.0 \ V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_{O} = -50 \ \mu A; V_{CC} = 3.0 \ V$	2.9	3.0	-	2.9	-	2.9	-	V
		$I_{O} = -50 \ \mu A; V_{CC} = 4.5 \ V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	V
		$I_{O} = -8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{T+} \text{ or } V_{T-}$								
	output voltage	$I_{O} = 50 \ \mu A; V_{CC} = 2.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O} = 50 \ \mu A; V_{CC} = 3.0 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O} = 50 \ \mu A; V_{CC} = 4.5 \ V$	-	0	0.1	-	0.1	-	0.1	V
		$I_{O} = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_{O} = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	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>CC</sub>	supply current		-	-	1.0	-	10	-	40	μA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	1G17-Q100	1							1	
V <sub>OH</sub>	HIGH-level	$V_{I} = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5 V$								
	output voltage	I <sub>O</sub> = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_{I} = V_{T+}$ or $V_{T-}$ ; $V_{CC} = 4.5 V$								
	output voltage	l <sub>O</sub> = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		l <sub>O</sub> = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
l <sub>l</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	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	-	40	μA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = 3.4 V; other inputs at V <sub>CC</sub> or GND; $I_O = 0 A$ ; V <sub>CC</sub> = 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

74AHC\_AHCT1G17\_Q100

Single Schmitt trigger buffer

#### **11.1 Transfer characteristics**

#### Table 8.Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). See Figure 7 and Figure 8.

Symbol	Parameter	Conditions		25 °C		–40 °C	to +85 °C	–40 °C t	o +125 °C	Unit
		Min	Тур	Max	Min	Max	Min	Max	1	
74AHC1	G17-Q100									_
$V_{T+}$	positive-going	V <sub>CC</sub> = 3.0 V	-	-	2.2	-	2.2	-	2.2	V
	threshold voltage	$V_{CC} = 4.5 V$	-	-	3.15	-	3.15	-	3.15	V
	voltage	V <sub>CC</sub> = 5.5 V	-	-	3.85	-	3.85	-	3.85	V
$V_{T-}$	negative-going	V <sub>CC</sub> = 3.0 V	0.9	-	-	0.9	-	0.9	-	V
	threshold	$V_{CC} = 4.5 V$	1.35	-	-	1.35	-	1.35	-	V
	voltage	V <sub>CC</sub> = 5.5 V	1.65	-	-	1.65	-	1.65	-	V
V <sub>H</sub>	V <sub>H</sub> hysteresis	$V_{CC} = 3.0 V$	0.3	-	1.2	0.3	1.2	0.25	1.2	V
	voltage	$V_{CC} = 4.5 V$	0.4	-	1.4	0.4	1.4	0.35	1.4	V
		V <sub>CC</sub> = 5.5 V	0.5	-	1.6	0.5	1.6	0.45	1.6	V
74AHCT	1G17-Q100									
$V_{T+}$	positive-going	$V_{CC} = 4.5 V$	-	-	2.0	-	2.0	-	2.0	V
	threshold voltage	V <sub>CC</sub> = 5.5 V	-	-	2.0	-	2.0	-	2.0	V
V <sub>T-</sub>	negative-going	$V_{CC} = 4.5 V$	0.5	-	-	0.5	-	0.5	-	V
threshold voltage	V <sub>CC</sub> = 5.5 V	0.6	-	-	0.6	-	0.6	-	V	
V <sub>H</sub>	hysteresis	$V_{CC} = 4.5 V$	0.4	-	1.4	0.4	1.4	0.35	1.4	V
	voltage	V <sub>CC</sub> = 5.5 V	0.4	-	1.6	0.4	1.6	0.35	1.6	V

Single Schmitt trigger buffer

### **12. Dynamic characteristics**

#### Table 9. Dynamic characteristics

GND = 0 V;  $t_r = t_f \le 3.0 \text{ ns. For waveform, see <u>Figure 5</u>. For test circuit, see <u>Figure 6</u>.$ 

Symbol	Parameter	Conditions			25 °C		–40 °C	to +85 °C	–40 °C t	o +125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	-
74AHC1	G17-Q100			1	1	1					-
	propagation	A to Y;	[1]								
	delay	$V_{CC} = 3.0 \text{ V} \text{ to } 3.6 \text{ V}$	[2]								
		C <sub>L</sub> = 15 pF		-	4.2	12.8	1.0	15.0	1.0	16.5	ns
		C <sub>L</sub> = 50 pF		-	6.0	16.3	1.0	18.5	1.0	20.5	ns
		$V_{CC}$ = 4.5 V to 5.5 V	[3]								
	C <sub>L</sub> = 15 pF		-	3.2	8.6	1.0	10.0	1.0	11.0	ns	
		C <sub>L</sub> = 50 pF		-	4.6	10.6	1.0	12.0	1.0	13.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}; f = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[4]	-	12	-	-	-	-	-	pF
74AHCT	1G17-Q100				1	1					+
t <sub>pd</sub>	propagation delay	A to Y; V <sub>CC</sub> = 4.5 V to 5.5 V	<u>[1][3]</u>								
		C <sub>L</sub> = 15 pF		-	4.1	7.0	1.0	8.0	1.0	9.0	ns
		C <sub>L</sub> = 50 pF		-	5.9	8.5	1.0	10.0	1.0	11.0	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $V_I = GND$ to $V_{CC}$	[4]	-	13	-	-	-	-	-	pF

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

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

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

[4]  $C_{PD}$  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:

 $f_i = input frequency in MHz;$ 

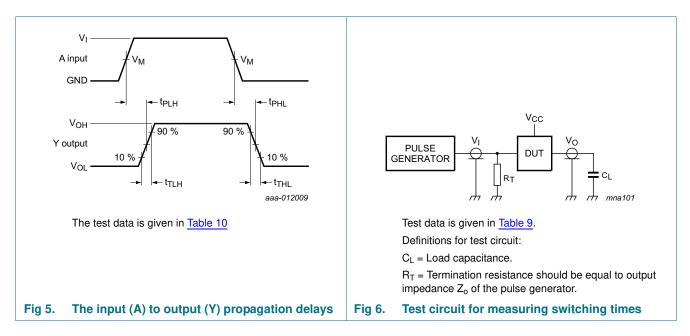
 $f_o$  = output frequency in MHz;

 $C_L$  = output load capacitance in pF;

 $V_{CC}$  = supply voltage in Volts.

Single Schmitt trigger buffer

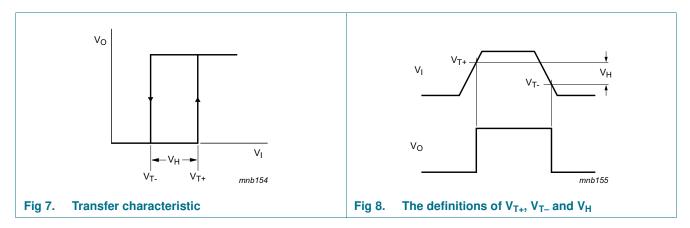
### 13. Waveforms



#### Table 10. Test data

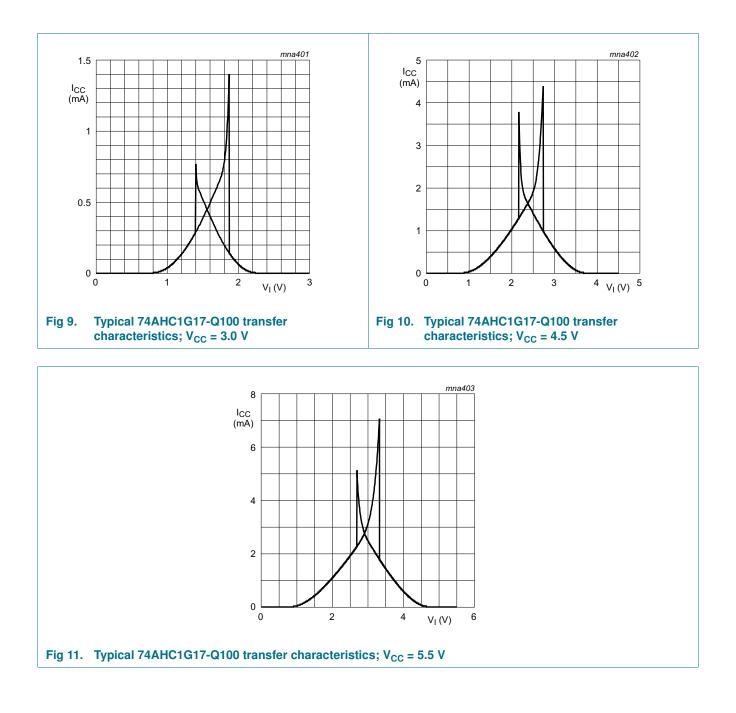
Type number	Input	Output	
	V <sub>I</sub> V <sub>M</sub>		V <sub>M</sub>
74AHC1G17-Q100	GND to V <sub>CC</sub>	$0.5  imes V_{CC}$	$0.5  imes V_{CC}$
74AHCT1G17-Q100	GND to 3.0 V	1.5 V	$0.5  imes V_{CC}$

#### 13.1 Transfer characteristic waveforms



# 74AHC1G17-Q100; 74AHCT1G17-Q100

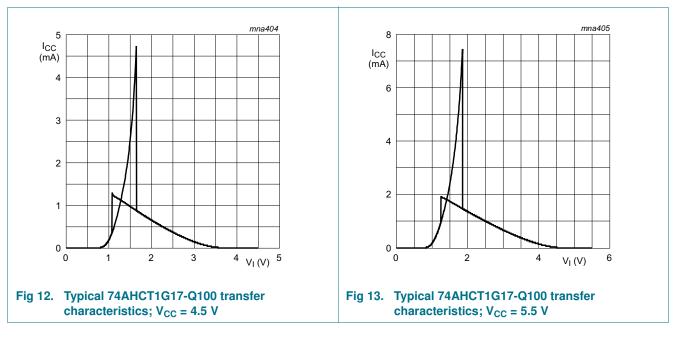
Single Schmitt trigger buffer



© Nexperia B.V. 2017. All rights reserved 9 of 16

# 74AHC1G17-Q100; 74AHCT1G17-Q100

Single Schmitt trigger buffer



#### 14. Application information

The slow input rise and fall times cause additional power dissipation, which can be calculated using the following formula:

 $P_{add} = f_i \times (t_r \times \Delta I_{CC(AV)} + t_f \times \Delta I_{CC(AV)}) \times V_{CC}$  where:

 $P_{add}$  = additional power dissipation ( $\mu$ W);

 $f_i = input frequency (MHz);$ 

 $t_r$  = input rise time (ns); 10 % to 90 %;

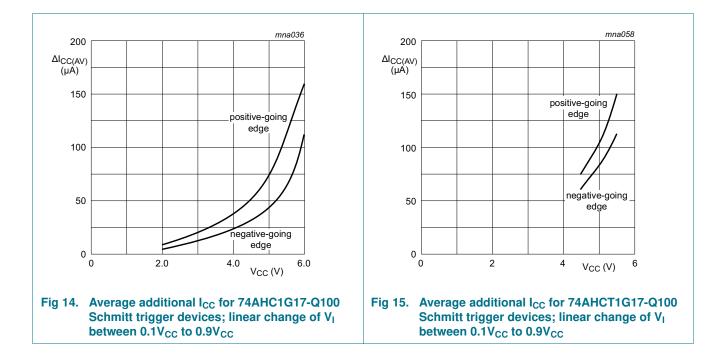
 $t_f$  = input fall time (ns); 90 % to 10 %;

 $\Delta I_{CC(AV)}$  = average additional supply current (µA).

Average additional  $I_{CC}$  differs with positive or negative input transitions, as shown in Figure 14 and Figure 15.

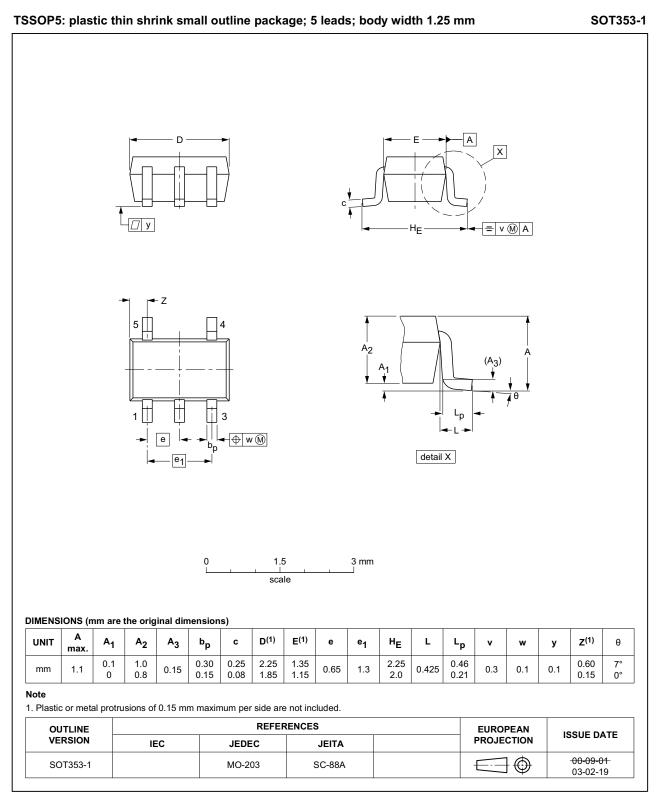
# 74AHC1G17-Q100; 74AHCT1G17-Q100

Single Schmitt trigger buffer



Single Schmitt trigger buffer

### 15. Package outline



#### Fig 16. Package outline SOT353-1 (TSSOP5)

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

74AHC\_AHCT1G17\_Q100

Single Schmitt trigger buffer

# 16. Abbreviations

Table 11. Abbr	Table 11. Abbreviations						
Acronym	Description						
CDM	Charged Device Model						
CMOS	Complementary Metal-Oxide Semiconductor						
DUT	Device Under Test						
ESD	ElectroStatic Discharge						
НВМ	Human Body Model						
MM	Machine Model						
TTL	Transistor-Transistor Logic						
MIL	Military						

# 17. Revision history

#### Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G17_Q100 v.1	20160308	Product data sheet	-	-

### **18. Legal information**

#### 18.1 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 http://www.nexperia.com.

#### 18.2 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.

#### 18.3 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 in automotive applications — This Nexperia product has been qualified for use in automotive

applications. Unless otherwise agreed in writing, the product is 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 a 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 <a href="http://www.nexperia.com/profile/terms">http://www.nexperia.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. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

```
74AHC_AHCT1G17_Q100
```

#### Single Schmitt trigger buffer

**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.

**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.

#### 18.4 Trademarks

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

### **19. Contact information**

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

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

# 74AHC1G17-Q100; 74AHCT1G17-Q100

Single Schmitt trigger buffer

### 20. Contents

1	General description 1
2	Features and benefits 1
3	Applications
4	Ordering information 2
5	Marking 2
6	Functional diagram 2
7	Pinning information 3
7.1	Pinning 3
7.2	Pin description 3
8	Functional description 3
9	Limiting values 3
10	Recommended operating conditions 4
11	Static characteristics 5
11.1	Transfer characteristics 6
12	Dynamic characteristics 7
13	Waveforms 8
13.1	Transfer characteristic waveforms
14	Application information 10
15	Package outline 12
16	Abbreviations 13
17	Revision history 13
18	Legal information 14
18.1	Data sheet status 14
18.2	Definitions 14
18.3	Disclaimers
18.4	Trademarks
19	Contact information 15
20	Contents 16