74AHC1G17; 74AHCT1G17

Single Schmitt trigger buffer Rev. 3 — 12 January 2022

Product data sheet

1. General description

The 74AHC1G17 and 74AHCT1G17 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.

2. Features and benefits

- Wide supply voltage range from 2.0 to 5.5 V
- Overvoltage tolerant inputs to 5.5 V
- · High noise immunity
- · CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level A
- · Symmetrical output impedance
- · Balanced propagation delays
- Input levels:
 - For 74AHC1G17: CMOS level
 - For 74AHCT1G17: TTL level
- 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. Applications

- · Wave and pulse shapers
- Astable multivibrators
- Monostable multivibrators

4. Ordering information

Table 1. Ordering information

Type number Package								
	Temperature range	Name	Description	Version				
74AHC1G17GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package;	SOT353-1				
74AHCT1G17GW			5 leads; body width 1.25 mm					
74AHC1G17GV	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753				
74AHCT1G17GV								



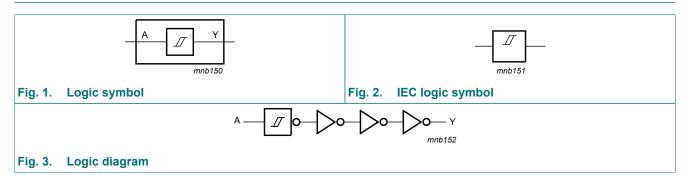
5. Marking

Table 2. Marking codes

Type number	Marking code[1]
74AHC1G17GW	AJ
74AHCT1G17GW	CJ
74AHC1G17GV	A17
74AHCT1G17GV	C17

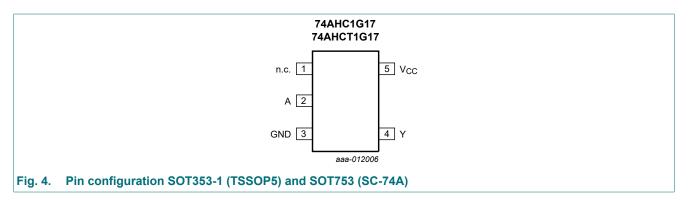
^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

6. Functional diagram



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)
Υ	4 data output	
V _{CC}	5	supply voltage

8. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Input	Output
A	Υ
L	L
Н	Н

9. Limiting values

Table 5. Limiting values

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

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 _I < -0.5 V	-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	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$	-	±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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	-	250	mW

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

10. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter	Conditions	74AHC1G17			74	Unit		
			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

Product data sheet

^[2] For SOT353-1 (TSSOP5) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C. For SOT753 (SC-74A) package: P_{tot} derates linearly with 3.8 mW/K above 85 °C.

11. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions		25 °C		-40 °C t	o +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	1
74AHC1	G17							<u> </u>	-	
V _{OH}	HIGH-level	$V_I = V_{T+}$ or V_{T-}								
	output voltage	I _O = -50 μA; 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 μA; 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 _{OL}	LOW-level	$V_I = V_{T+}$ or V_{T-}								
	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
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
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	1G17	I	I							
V _{OH}	HIGH-level	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$								
	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	$V_{I} = V_{T+} \text{ or } V_{T-}; V_{CC} = 4.5 \text{ V}$								
	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
I _I	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
ΔI _{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
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

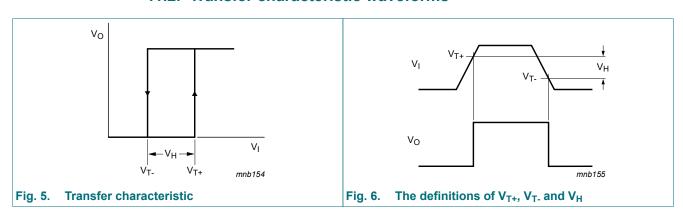
11.1. Transfer characteristics

Table 8. Transfer characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V). See Fig. 5 and Fig. 6.

Symbol	Parameter	Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G17									
V_{T+}	positive-going	V _{CC} = 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 _{CC} = 5.5 V	-	-	3.85	-	3.85	-	3.85	V
V _{T-}	negative-	V _{CC} = 3.0 V	0.9	-	-	0.9	-	0.9	-	V
	going threshold	V _{CC} = 4.5 V	1.35	-	-	1.35	-	1.35	-	V
	voltage	V _{CC} = 5.5 V	1.65	-	-	1.65	-	1.65	-	V
V _H	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 _{CC} = 5.5 V	0.5	-	1.6	0.5	1.6	0.45	1.6	V
74AHCT	1G17	,	'							
V_{T+}	positive-going	V _{CC} = 4.5 V	-	-	2.0	-	2.0	-	2.0	V
	threshold voltage	V _{CC} = 5.5 V	-	-	2.0	-	2.0	-	2.0	V
V _{T-}	negative-	V _{CC} = 4.5 V	0.5	-	-	0.5	-	0.5	-	V
th	going threshold voltage	V _{CC} = 5.5 V	0.6	-	-	0.6	-	0.6	-	V
V _H	hysteresis	V _{CC} = 4.5 V	0.4	-	1.4	0.4	1.4	0.35	1.4	V
	voltage	V _{CC} = 5.5 V	0.4	-	1.6	0.4	1.6	0.35	1.6	V

11.2. Transfer characteristic waveforms



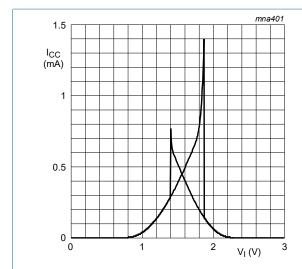


Fig. 7. Typical 74AHC1G17 transfer characteristics; $V_{CC} = 3.0 \text{ V}$

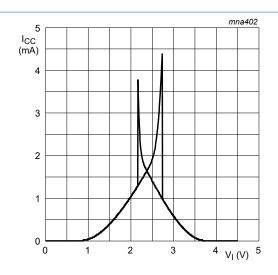


Fig. 8. Typical 74AHC1G17 transfer characteristics; V_{CC} = 4.5 V

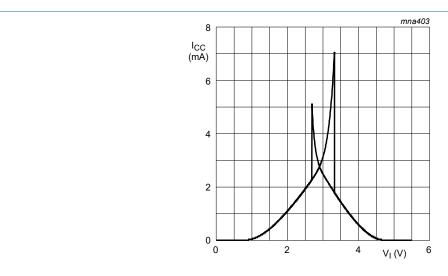


Fig. 9. Typical 74AHC1G17 transfer characteristics; $V_{CC} = 5.5 \text{ V}$

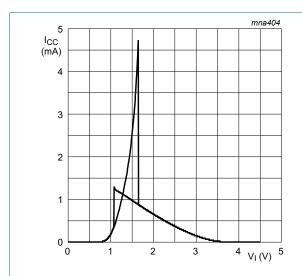


Fig. 10. Typical 74AHCT1G17 transfer characteristics; V_{CC} = 4.5 V

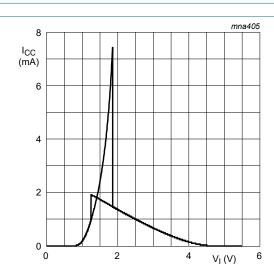


Fig. 11. Typical 74AHCT1G17 transfer characteristics; V_{CC} = 5.5 V

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12. Dynamic characteristics

Table 9. Dynamic characteristics

GND = 0 V; $t_r = t_f \le 3.0$ ns. For waveform, see Fig. 12. For test circuit, see Fig. 13.

Symbol	Parameter	Conditions			25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
				Min	Тур	Max	Min	Max	Min	Max	
74AHC1	G17										
t _{pd}	propagation	A to Y	[1]								
	delay	V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	4.2	12.8	1.0	15.0	1.0	16.5	ns
		C _L = 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 _L = 15 pF		-	3.2	8.6	1.0	10.0	1.0	11.0	ns
		C _L = 50 pF		-	4.6	10.6	1.0	12.0	1.0	13.5	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC}	[4]	-	12	-	-	-	-	-	pF
74AHCT	1G17										
t _{pd}	propagation delay	A to Y V _{CC} = 4.5 V to 5.5 V	[1] [3]								
		C _L = 15 pF		-	4.1	7.0	1.0	8.0	1.0	9.0	ns
		C _L = 50 pF		-	5.9	8.5	1.0	10.0	1.0	11.0	ns
C _{PD}	power dissipation capacitance	per buffer; C _L = 50 pF; f = 1 MHz; V _I = GND to V _{CC}	[4]	-	13	-	-	-	-	-	pF

 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ 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 Volt.

 t_{pd} is the same as t_{PLH} and t_{PHL} . Typical values are measured at V_{CC} = 3.3 V. Typical values are measured at V_{CC} = 5.0 V.

^[4] C_{PD} is used to determine the dynamic power dissipation P_D (μ W).

12.1. Waveform and test circuit

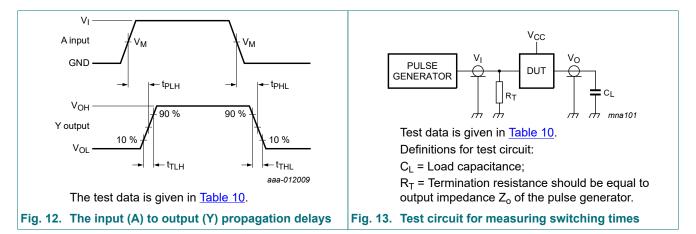


Table 10. Test data

Table 191 1000 data								
Type number	Input	Output						
	V _I	V _M	V _M					
74AHC1G17	GND to V _{CC}	0.5 × V _{CC}	0.5× V _{CC}					
74AHCT1G17	GND to 3.0 V	1.5 V	0.5 × V _{CC}					

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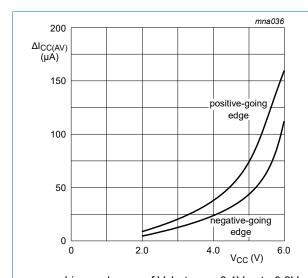
13. Application information

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:

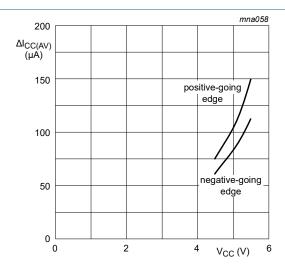
- P_{add} = additional power dissipation (μW);
- f_i = input frequency (MHz);
- t_r = input rise time (ns); 10 % to 90 %;
- t_f = input fall time (ns); 90 % to 10 %;
- ΔI_{CC(AV)} = average additional supply current (µA).

Average additional I_{CC} differs with positive or negative input transitions, as shown in <u>Fig. 14</u> and Fig. 15.



Linear change of V_{I} between $0.1V_{CC}$ to $0.9V_{CC}$

Fig. 14. Average additional I_{CC} for 74AHC1G17 Schmitt trigger devices



Linear change of V_I between 0.1V_{CC} to 0.9V_{CC}

Fig. 15. Average additional I_{CC} for 74AHCT1G17 Schmitt trigger devices

14. Package outline

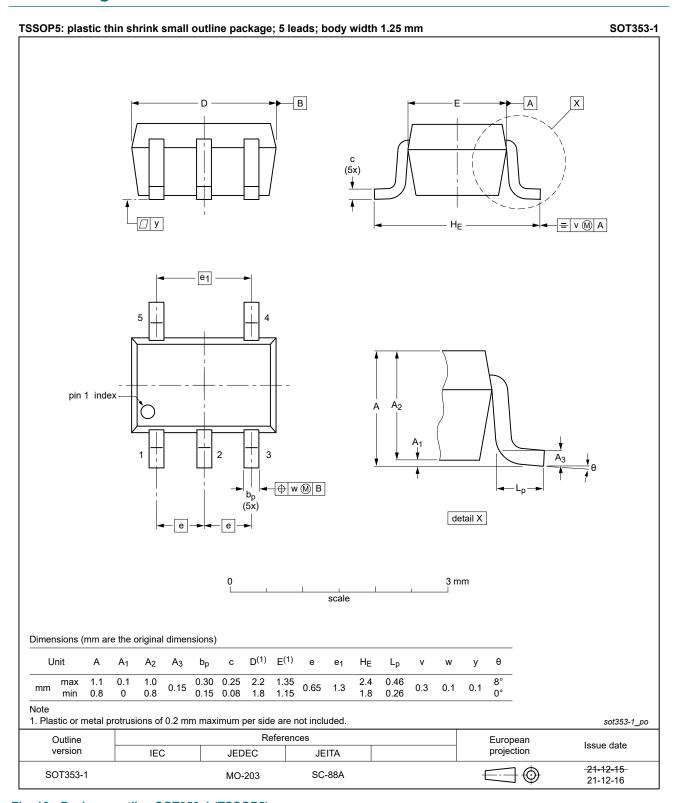


Fig. 16. Package outline SOT353-1 (TSSOP5)

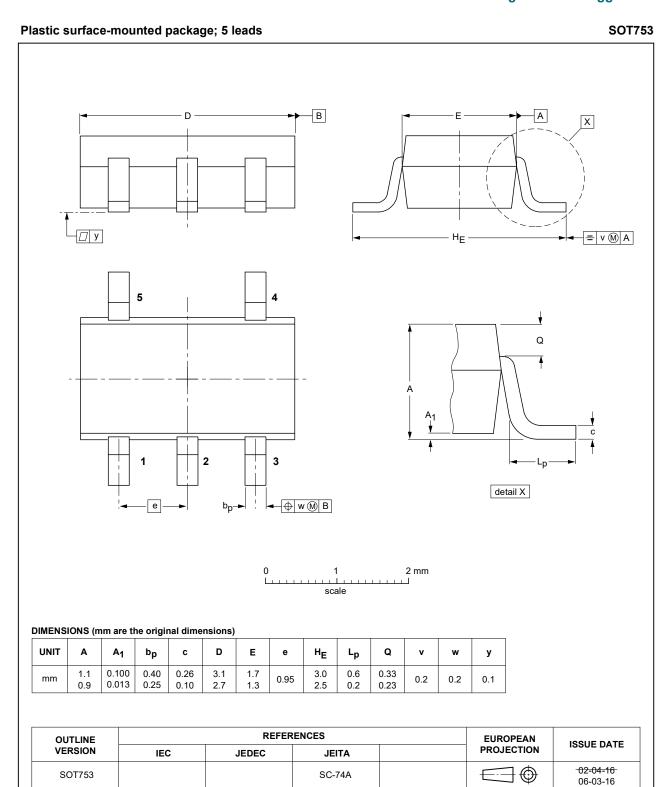


Fig. 17. Package outline SOT753 (SC-74A)

15. Abbreviations

Table 11. Abbreviations

14010 1117 (001011410110					
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				

16. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes			
74AHC_AHCT1G17 v.3	20220112	Product data sheet	-	74AHC_AHCT1G17 v.2			
Modifications:	Nexperia. Legal texts have Section 2 upda Fig. 16: Packa	this data sheet has been redest we been adapted to the new co ated. ge outline drawing for SOT353 ating values for P _{tot} total powe	ompany name where	appropriate.			
74AHC_AHCT1G17 v.2	20161005	Product data sheet	-	74AHC_AHCT1G17 v.1			
Modifications:	Type numbers removed.	numbers 74AHC1G17GF, 74AHC1G17GM, 74AHCT1G17GF and 74AHCT1G17GM red.					
74AHC_AHCT1G17 v.1	20140318	Product data sheet	-	-			

17. 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.
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