74AHC1G06; 74AHCT1G06

Inverter with open-drain output

Rev. 7 — 18 November 2014 Product data sheet

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	Version
74AHC1G06GW	−40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AHCT1G06GW				
74AHC1G06GV	−40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753
74AHCT1G06GV				

4. Marking

Table 2. Marking codes

Type number	Marking[1]
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

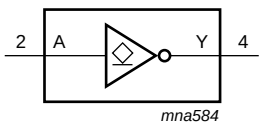


Fig 1. Logic symbol

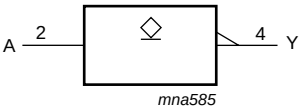


Fig 2. IEC logic symbol

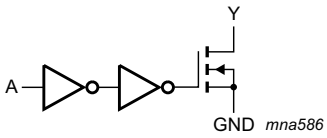


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

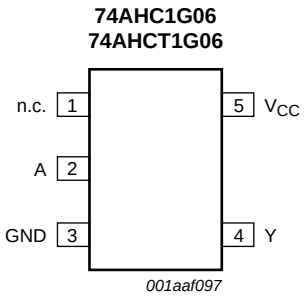


Fig 4. Pin configuration

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_{CC}	5	supply voltage

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
H	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_{CC}	supply voltage			−0.5	+7.0	V
V_I	input voltage			−0.5	+7.0	V
I_{IK}	input clamping current	$V_I < -0.5$ V		−20	-	mA
I_{OK}	output clamping current	$V_O < -0.5$ V	[1]	-	±20	mA
I_O	output current	$V_O > -0.5$ V		-	±25	mA
V_O	output voltage	active mode	[1]	−0.5	+7.0	V
		high-impedance mode	[1]	−0.5	+7.0	V
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.

[2] For both TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} 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	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	0	-	5.5	V
V_O	output voltage	active mode	0	-	V_{CC}	0	-	V_{CC}	V
		high-impedance mode	0	-	6.0	0	-	6.0	V
T_{amb}	ambient temperature		−40	+25	+125	−40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 3.3 V ± 0.3 V	-	-	100	-	-	-	ns/V
		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			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
For type 74AHC1G06										
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 input voltage	V_{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V_{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		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_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	μA
I_{OZ}	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	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	-	10	-	20	μA
C_I	input capacitance		-	1.5	10	-	10	-	10	pF
For type 74AHCT1G06										
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_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		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	μA
I_{OZ}	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	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	1.0	-	10	-	20	μA
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
C_I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

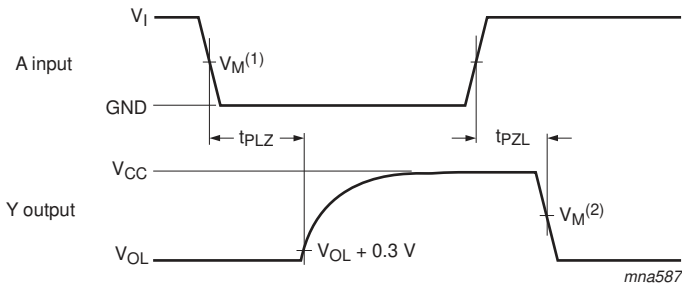
Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
For type 74AHC1G06										
t_{PZL}	OFF-state to LOW propagation delay	A to Y; see Figure 5								
		V_{CC} = 3.0 V to 3.6 V [1]								
		C_L = 15 pF	-	3.7	7.0	1.0	7.7	1.0	8.1	ns
		C_L = 50 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_L = 15 pF	-	2.7	4.9	1.0	5.3	1.0	5.6	ns
		C_L = 50 pF	-	3.8	7.0	1.0	7.5	1.0	8.0	ns
t_{PLZ}	LOW to OFF-state propagation delay	A to Y; see Figure 5								
		V_{CC} = 3.0 V to 3.6 V [1]								
		C_L = 15 pF	-	4.8	6.4	1.0	6.9	1.0	7.4	ns
		C_L = 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_L = 15 pF	-	3.0	4.1	1.0	4.6	1.0	5.1	ns
		C_L = 50 pF	-	4.3	6.5	1.0	7.0	1.0	7.5	ns
C_{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = GND to V_{CC} [3]	-	3	-	-	-	-	-	pF
For type 74AHCT1G06										
t_{PZL}	OFF-state to LOW propagation delay	A to Y; see Figure 5								
		V_{CC} = 4.5 V to 5.5 V [2]								
		C_L = 15 pF	-	3.0	5.3	1.0	6.0	1.0	6.3	ns
		C_L = 50 pF	-	4.2	7.5	1.0	8.5	1.0	9.0	ns
t_{PLZ}	LOW to OFF-state propagation delay	A to Y; see Figure 5								
		V_{CC} = 4.5 V to 5.5 V [2]								
		C_L = 15 pF	-	3.2	4.6	1.0	5.1	1.0	5.6	ns
		C_L = 50 pF	-	4.5	7.0	1.0	7.5	1.0	8.0	ns
C_{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f = 1 MHz; V_I = 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 (µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ 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

12. Waveforms

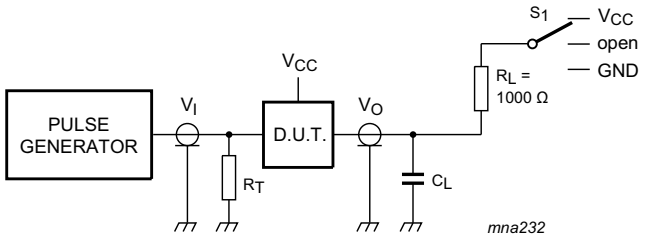


Measurement points are given in Table 9.

Fig 5. Input (A) to output (Y) propagation delays

Table 9. Measurement point

Type	Input		Output
	V_I	$V_M^{(1)}$	$V_M^{(2)}$
74AHC1G06	GND to V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74AHCT1G06	GND to 3.0 V	1.5 V	$0.5 \times V_{CC}$



Test data is given in Table 8. Definitions for test circuit:

C_L = Load capacitance including jig and probe capacitance.

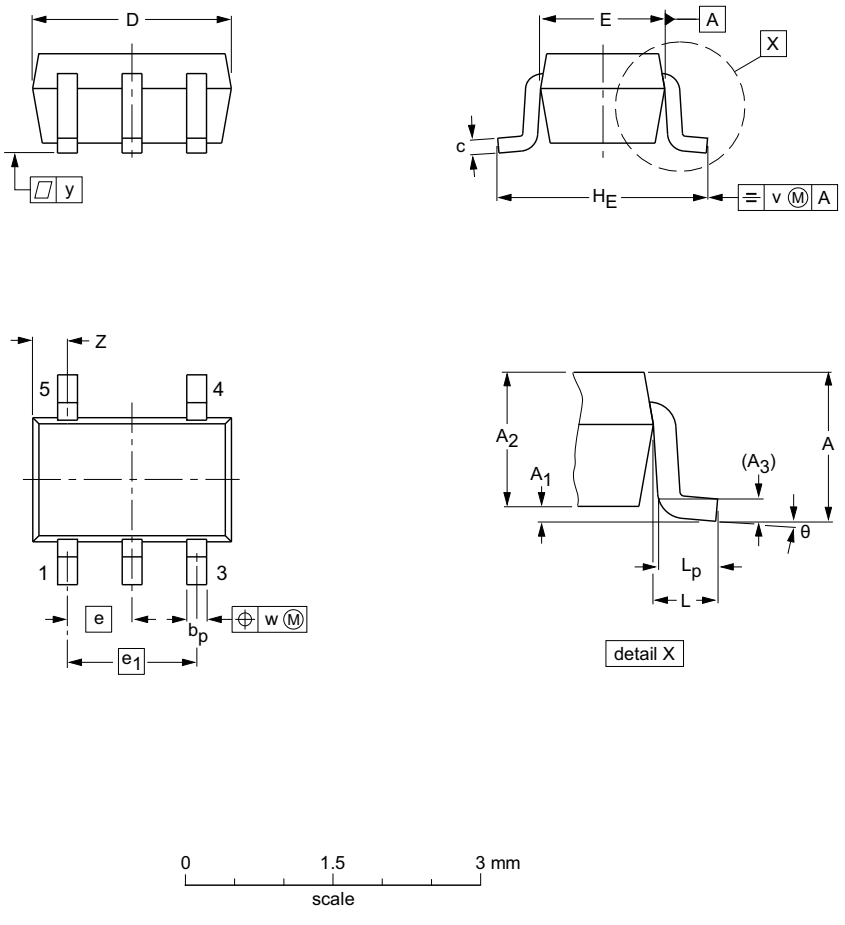
R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

For t_{PLZ}, t_{PZL}, $S_1 = V_{CC}$

Fig 6. Test circuit for measuring switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm **SOT353-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

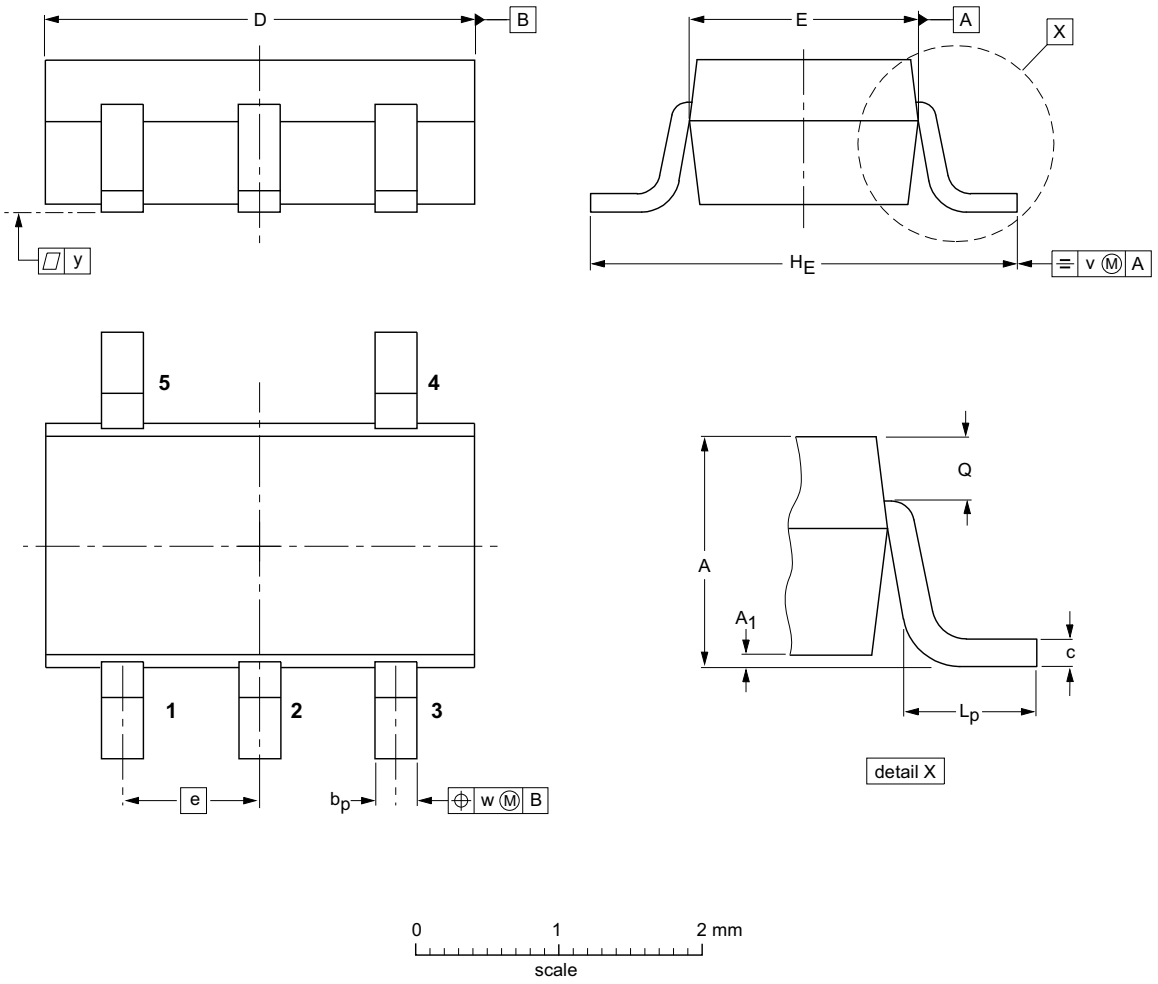
Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT353-1		MO-203	SC-88A			~~00-09-01~~ 03-02-19

Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads **SOT753**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			~~02-04-16~~ 06-03-16

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

14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	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:	• Section 4: table note added.			
74AHC_AHCT1G06 v.6	20070607	Product data sheet	-	74AHC_AHCT1G06 v.5
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. • Package SOT353 changed to SOT353-1 in Section 3 and Section 13. • Quick reference data and Soldering sections 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[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.nxp.com.

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18. Contents

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Document identifier: 74AHC_AHCT1G06