74AHC1G02; 74AHCT1G02

2-input NOR gate Rev. 06 — 30 May 2007

Product data sheet

General description 1.

74AHC1G02 and 74AHCT1G02 are high-speed Si-gate CMOS devices. They provide a 2-input NOR function.

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**

- Symmetrical output impedance
- High noise immunity
- Low power dissipation
- Balanced propagation delays
- 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

Ordering information 3.

Table 1. **Ordering information**

Type number	Package	Package									
	Temperature range	Name	Description	Version							
74AHC1G02GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package;	SOT353-1							
74AHCT1G02GW			5 leads; body width 1.25 mm								
74AHC1G02GV	$-40~^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$	SC-74A	plastic surface-mounted package; 5 leads	SOT753							
74AHCT1G02GV											

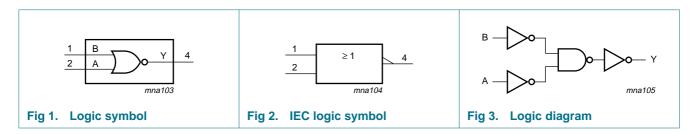


4. Marking

Table 2. Marking codes

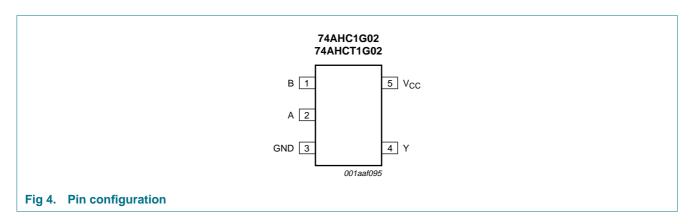
Type number	Marking
74AHC1G02GW	AB
74AHC1G02GV	A02
74AHCT1G02GW	СВ
74AHCT1G02GV	C02

5. Functional diagram



6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
В	1	data input B
A	2	data input A
GND	3	ground (0 V)
Υ	4	data output Y
V_{CC}	5	supply voltage

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Inputs		Output
Α	В	Υ
L	L	Н
L	Н	L
Н	L	L
Н	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_{CC}	supply voltage		-0.5	+7.0	V
V_{I}	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	$V_1 < -0.5 \text{ V}$	-20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±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 °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 Cond		Conditions	74AHC1G02			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
V_{I}	input voltage		0	-	5.5	0	-	5.5	V
V_{O}	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T _{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise	V_{CC} = 3.3 V \pm 0.3 V	-	-	100	-	-	-	ns/V
and fall rate	and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	-	20	-	-	20	ns/V

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

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	1
For type	74AHC1G02		'						'	
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	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
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL}								
	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 _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	$I_O = 50 \mu A$; $V_{CC} = 2.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A$; $V_{CC} = 3.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A$; $V_{CC} = 4.5 \text{ V}$	-	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
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
For type	74AHCT1G02									
V _{IH}	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	8.0	-	0.8	-	8.0	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	$I_{O} = -50 \mu\text{A}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -8.0 \text{ mA}$	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	Ι _O = 50 μΑ	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
lı	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

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Table 7. Static characteristics ... continued

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	
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; $V_I = 3.4 \text{ V}$; other inputs at V_{CC} or GND; $I_O = 0 \text{ A}$; $V_{CC} = 5.5 \text{ V}$	-	-	1.35	-	1.5	-	1.5	mA
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Dynamic characteristics Table 8.

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 t	Unit	
				Min	Тур	Max	Min	Max	Min	Max	
For type	74AHC1G02							'		'	
t _{pd}	propagation delay	A and B to Y; see <u>Figure 5</u>	[1]								
	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[2]									
	C _L = 15 pF		-	4.4	7.9	1.0	9.5	1.0	10.5	ns	
		$C_L = 50 pF$		-	6.3	11.4	1.0	13	1.0	14.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C _L = 15 pF		-	3.2	5.5	1.0	6.5	1.0	7.0	ns
		$C_L = 50 pF$		-	4.6	7.5	1.0	8.5	1.0	9.5	ns
C_{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$; $f = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	[4]	-	18	-	-	-	-	-	pF
For type	74AHCT1G02										
t _{pd}	propagation delay	A and B to Y; see Figure 5	<u>[1]</u>								
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C _L = 15 pF		-	3.5	5.5	1.0	6.5	1.0	7.0	ns
		C _L = 50 pF		-	4.9	7.5	1.0	8.5	1.0	9.5	ns
C _{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$; $f = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	<u>[4]</u>	-	19	-	-	-	-	-	pF

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

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.

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

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

^[4] 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:

12. Waveforms

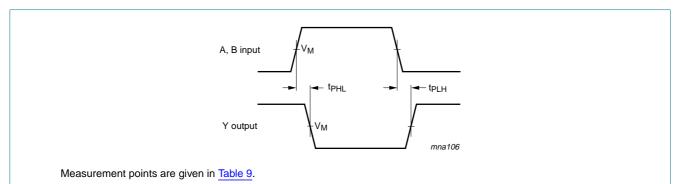
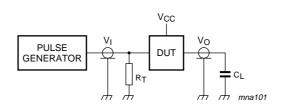


Fig 5. The inputs (A and B) to output (Y) propagation delays

Table 9. Measurement point

Туре	Input	Output	
	V _I	V _M	V _M
74AHC1G02	GND to V _{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74AHCT1G02	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.

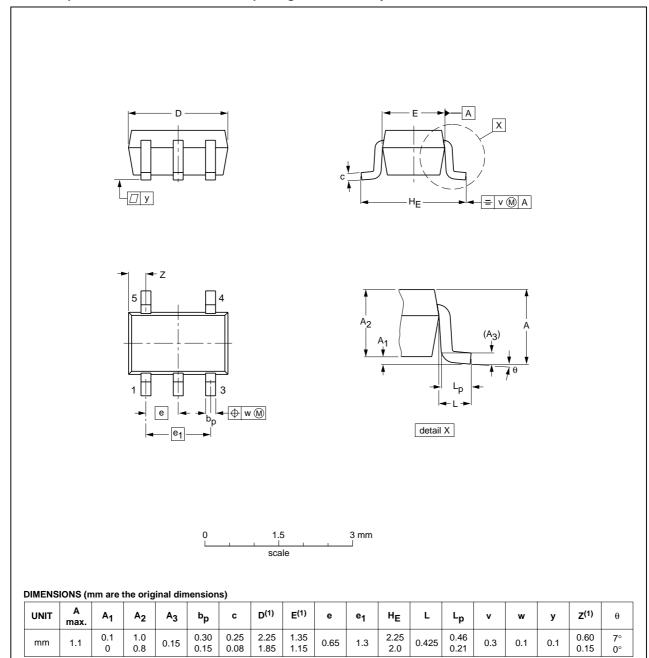
 R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

Fig 6. Load circuitry for switching times

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



Note

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

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
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

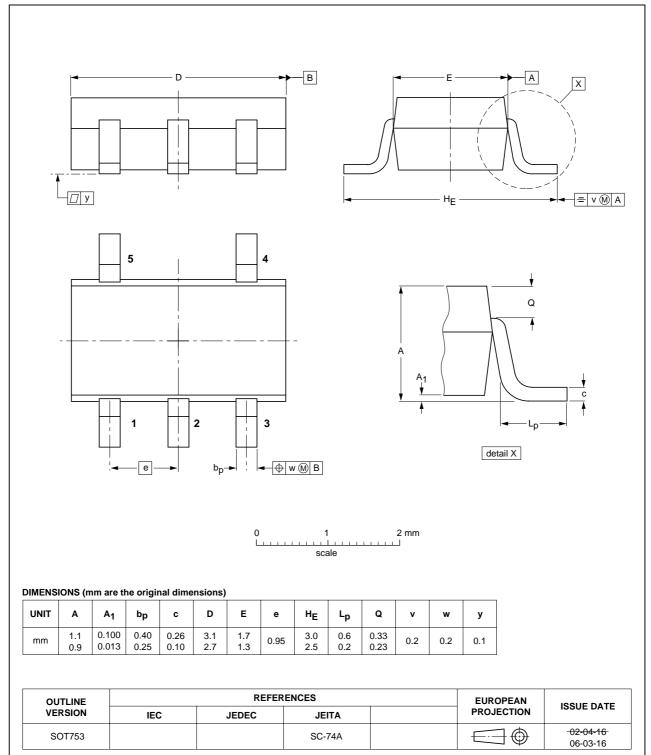


Fig 8. Package outline SOT753 (SC-74A)

14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
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_AHCT1G02_6	20070530	Product data sheet	-	74AHC_AHCT1G02_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 SO 	T353 changed to SOT353-1 in	Section 3 and Secti	<u>on 13</u> .	
	 Quick referer 	nce data and Soldering section	is removed.		
74AHC_AHCT1G02_5	20020527	Product specification	-	74AHC_AHCT1G02_4	
74AHC_AHCT1G02_4	20020215	Product specification	-	74AHC_AHCT1G02_3	
74AHC_AHCT1G02_3	20010131	Product specification	-	74AHC_AHCT1G02_2	
74AHC_AHCT1G02_2	19990127	Product specification	-	74AHC_AHCT1G02_1	
74AHC_AHCT1G02_N_1	19981125	Preliminary specification	-	-	

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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.
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- [2] The term 'short data sheet' is explained in section "Definitions"
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