74AHC2G00; 74AHCT2G00

Dual 2-input NAND gate Rev. 5 — 7 March 2019

Product data sheet

1. General description

The 74AHC2G00; 74AHCT2G00 are high-speed Si-gate CMOS devices. They provide two 2-input NAND gates.

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

- Symmetrical output impedance
- High noise immunity
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101C exceeds 1000 V
- Low power dissipation
- Balanced propagation delays
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package							
	Temperature range	Name	Description	Version				
74AHC2G00DP	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm	SOT505-2				
74AHC2G00DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package;	SOT765-1				
74AHCT2G00DC			8 leads; body width 2.3 mm					

4. Marking

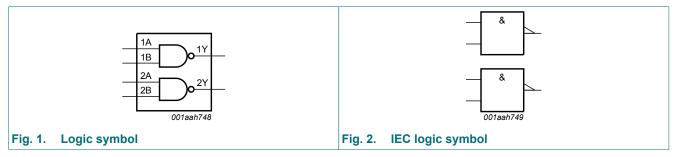
Table 2. Marking

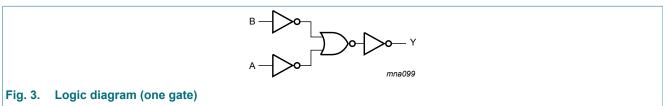
Type number	Marking code[1]				
74AHC2G00DP	A00				
74AHC2G00DC	A00				
74AHCT2G00DC	C00				

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



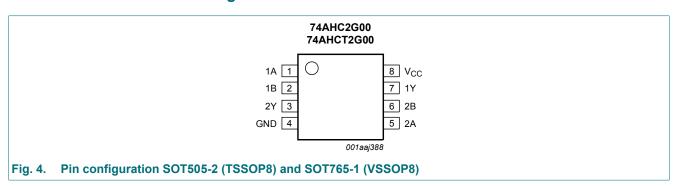
5. Functional diagram





6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A, 2A	1, 5	data input
1B, 2B	2, 6	data input
GND	4	ground (0 V)
1Y, 2Y	7, 3	data output
V _{CC}	8	supply voltage

7. Functional description

Table 4. Function table

 $H = HIGH \ voltage \ level; \ L = LOW \ voltage \ level.$

Input	Output	
nA	nB	nY
L	L	Н
L	Н	Н
Н	L	Н
Н	Н	L

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

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	[1]	-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 °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 Conditions		74	74AHC2G00			74AHCT2G00		
			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
Δt/ΔV	input transition rise and	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
	fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	-	20	-	-	20	ns/V

^[2] For TSSOP8 package: above 55 °C the value of P_{tot} derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P_{tot} derates linearly with 8 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	
74AHC2	G00									
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	-	٧
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	٧
		V _{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	٧
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = -50 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	٧
		I _O = -50 μA; V _{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	٧
		I _O = -50 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	٧
		I _O = -4.0 mA; V _{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I _O = -8.0 mA; V _{CC} = 4.5 V	3.94	-	-	3.8	-	3.70	-	٧
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	I _O = 50 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	٧
		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	٧
		I_O = 8.0 mA; V_{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	٧
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; $V_{CC} = 5.5 \text{ V}$	-	-	10	-	10	-	40	μΑ
Cı	input capacitance		-	1.5	10	-	10	-	10	pF
74AHCT	2G00									
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 _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
	output voltage	Ι _Ο = -50 μΑ	4.4	4.5	-	4.4	-	4.4	-	٧
		I _O = -8.0 mA	3.94	-	-	3.8	-	3.70	-	٧
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 V$								
	output voltage	Ι _Ο = 50 μΑ	-	0	0.1	-	0.1	-	0.1	V
		I _O = 8.0 mA	-	-	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	μA
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

Symbol	Parameter	Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
Δl _{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. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see 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	1
74AHC2	G00	1				'					
t _{pd}	propagation	nA, nB to nY; see Fig. 5	[1]								
	delay	V _{CC} = 3.0 V to 3.6 V;	[2]								
		C _L = 15 pF		-	4.5	7.9	1.0	9.5	1.0	10.5	ns
		C _L = 50 pF		-	6.5	11.4	1.0	13.0	1.0	14.5	ns
		V _{CC} = 4.5 V to 5.5 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; $C_L = 50 \text{ pF}$; $f_i = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	[4]	-	17	-	-	-	-	-	pF
74AHCT	2G00						'	1	'		
t _{pd}	propagation	nA, nB to nY; see Fig. 5	[1]								
	delay	V _{CC} = 4.5 V to 5.5 V;	[3]								
		C _L = 15 pF		1.0	3.6	6.2	1.0	7.1	1.0	8.0	ns
		C _L = 50 pF		1.0	5.0	7.9	1.0	9.0	1.0	10.0	ns
C _{PD}	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$; $f_i = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	[4]	-	18	-	-	-	-	-	pF

- 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.
 C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 P_D = C_{PD} x V_{CC}² x f_i x N + Σ(C_L x V_{CC}² x f_o) where:

 f_i = input frequency in MHz;

 f_o = output frequency in MHz;

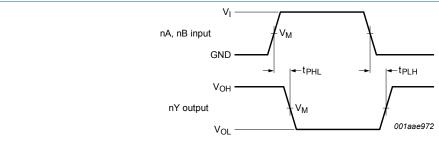
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

11.1. Waveforms and test circuit



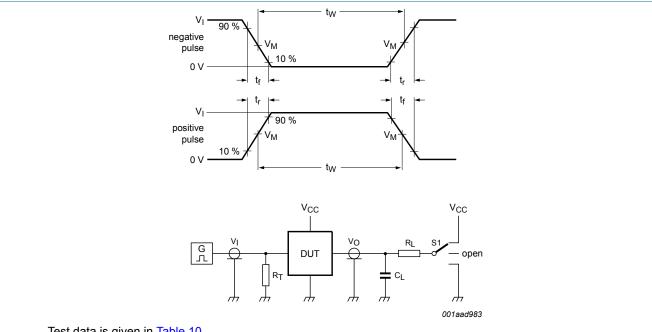
Measurement points are given in Table 9.

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

The input (nA and nB) to output (nY) propagation delays Fig. 5.

Table 9. Measurement points

Туре	Input	Output
	V_{M}	V _M
74AHC2G00	0.5V _{CC}	0.5V _{CC}
74AHCT2G00	1.5 V	0.5V _{CC}



Test data is given in Table 10.

Definitions test circuit:

 R_T = Termination resistance should be equal to output impedance Z_0 of the pulse generator;

C_L = Load capacitance including jig and probe capacitance;

R_L = Load resistance; S1 = Test selection switch.

Fig. 6. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load	S1 position	
	Vi	t _r , t _f	CL	R _L	t _{PHL} , t _{PLH}
74AHC2G00	V _{CC}	≤ 3 ns	15 pF, 50 pF	1 kΩ	open
74AHCT2G00	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open

Product data sheet

12. Package outline

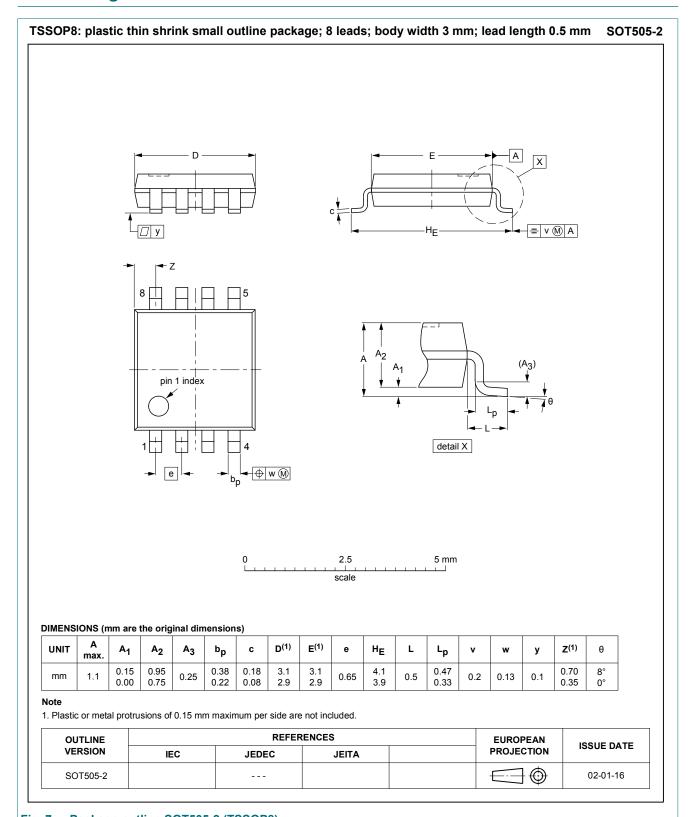


Fig. 7. Package outline SOT505-2 (TSSOP8)

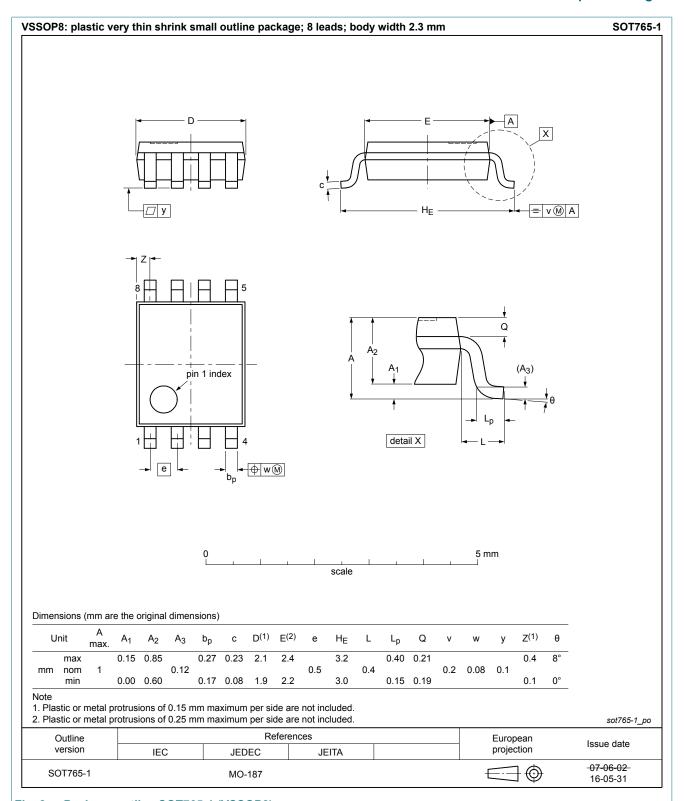


Fig. 8. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 12. Revision history

Table 12. Nevision history				
Release date	Data sheet status	Change notice	Supersedes	
20190307	Product data sheet	-	74AHC_AHCT2G00 v.4	
Type number 74AHCT2G00DP (SOT505-2/TSSOP8) removed.				
20181115	Product data sheet	-	74AHC_AHCT2G00 v.3	
 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type numbers 74AHC2G00GD and 74AHCT2G00GD (SOT996-2/XSON8) removed. 				
20130327	Product data sheet	-	74AHC_AHCT2G00 v.2	
For type numbers 74AHC2G00GD and 74AHCT2G00GD XSON8U has changed to XSON8.				
20090112	Product data sheet	-	74AHC_AHCT2G00 v.1	
20040101	Product specification	-	-	
	20190307 Type number 7 20181115 The format of t Nexperia. Legal texts have Type numbers 20130327 For type number XSON8.	20190307 Product data sheet Type number 74AHCT2G00DP (SOT505-2/T) 20181115 Product data sheet The format of this data sheet has been redes Nexperia. Legal texts have been adapted to the new co Type numbers 74AHC2G00GD and 74AHCT2 20130327 Product data sheet For type numbers 74AHC2G00GD and 74AH XSON8.	20190307 Product data sheet - Type number 74AHCT2G00DP (SOT505-2/TSSOP8) removed. 20181115 Product data sheet - The format of this data sheet has been redesigned to comply wit Nexperia. Legal texts have been adapted to the new company name where Type numbers 74AHC2G00GD and 74AHCT2G00GD (SOT996-20130327 Product data sheet - For type numbers 74AHC2G00GD and 74AHCT2G00GD XSON XSON8.	

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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.
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