74AHC2G08-Q100; 74AHCT2G08-Q100

Dual 2-input AND gate

Rev. 4 — 21 March 2018

Product data sheet

1 General description

The 74AHC2G08-Q100 and 74AHCT2G08-Q100 are high-speed Si-gate CMOS devices.

They provide two 2-input AND 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.

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
- · Low power dissipation
- Balanced propagation delays
- Multiple package options
- 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)

3 Ordering information

Table 1. Ordering information

Type number	Package								
	Temperature range	Name	Description	Version					
74AHC2G08DP-Q100	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8 leads;	SOT505-2					
74AHCT2G08DP-Q100			body width 3 mm; lead length 0.5 mm						
74AHC2G08DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package;	SOT765-1					
74AHCT2G08DC-Q100			8 leads; body width 2.3 mm						



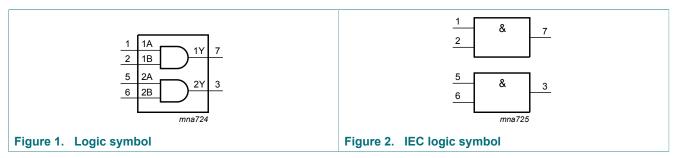
4 Marking

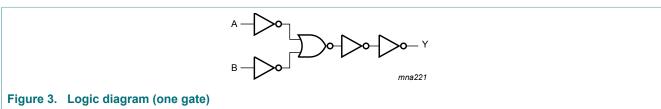
Table 2. Marking

Type number	Marking code ^[1]
74AHC2G08DP-Q100	A08
74AHCT2G08DP-Q100	C08
74AHC2G08DC-Q100	A08
74AHCT2G08DC-Q100	C08

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

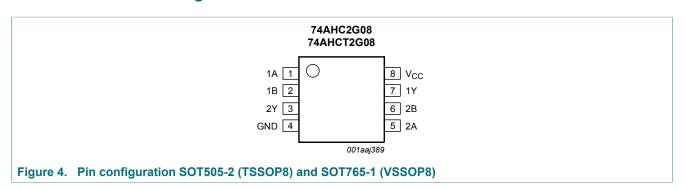
5 Functional diagram





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	L
L	Н	L
Н	L	L
Н	Н	Н

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	$V_{\rm O}$ < -0.5 V or $V_{\rm O}$ > $V_{\rm CC}$ + 0.5 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	74Al	HC2G08-	Q100	74AH	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
Δt/ΔV	input transition rise and fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
		$V_{CC} = 5.0 V \pm 0.5 V$	-	-	20	-	-	20	ns/V

^[2] For SOT505-2 package: above 96 °C the value of Ptot derates linearly with 4.6 mW/K. For SOT765-1 package: above 99 °C the value of Ptot derates linearly with 4.9 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	G08-Q100			1	1					
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 output voltage	V _I = V _{IH} or V _{IL}								
		I_{O} = -50 μ A; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_{O} = -50 μ 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 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	-	V
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	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
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		I _O = 8.0 mA; V _{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
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
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

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHCT	2G08-Q100		'		-			-		
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 output voltage	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
		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	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	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
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
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
C _I	input capacitance		-	1.5	10	-	10	-	10	pF

11 Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see Figure 6.

Symbol	Parameter	Conditions		25 °C		-40 °C 1	to +85 °C	-40 °C to +125 °C		Unit	
				Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G08-Q100				'	·	·			-	
t _{pd}	propagation delay	nA, nB to nY; see Figure 5	[1]								
de		V _{CC} = 3.0 V to 3.6 V	[2]								
		C _L = 15 pF		-	4.6	8.8	1.0	10.5	1.0	12.0	ns
		C _L = 50 pF		-	6.5	12.3	1.0	14.0	1.0	16.0	ns
		V _{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.2	5.9	1.0	7.0	1.0	8.0	ns
		C _L = 50 pF		-	4.6	7.9	1.0	9.0	1.0	10.5	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f_i = 1 MHz; V_I = GND to V_{CC}	[4]	-	17	-	-	-	-	-	pF

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Symbol	Parameter	meter Conditions		25 °C		-40 °C to +85 °C		-40 °C to +125 °C		Unit	
				Min	Тур	Max	Min	Max	Min	Max	
74AHCT2G08-Q100									'		
P 1	propagation	nA, nB to nY; see Figure 5	[1]								
	delay	V _{CC} = 4.5 V to 5.5 V	[3]								
		C _L = 15 pF		-	3.6	6.2	1.0	7.1	1.0	8.0	ns
		C _L = 50 pF		-	5.1	7.9	1.0	9.0	1.0	10.5	ns
C _{PD}	power dissipation capacitance	per buffer; C_L = 50 pF; f_i = 1 MHz; V_I = GND to V_{CC}	[4]	-	19	-	-	-	-	-	pF

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} . [2] 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).

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

 f_i = input frequency in MHz;

 f_0 = output frequency in MHz;

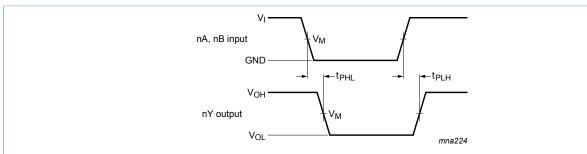
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_0)$ = sum of the outputs.

11.1 Waveform and test circuit



Measurement points are given in Table 9.

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

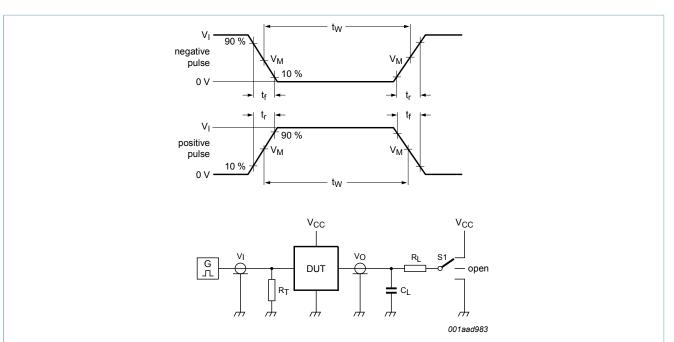
Figure 5. The input (nA and nB) to output (nY) propagation delays

Table 9. Measurement points

Туре	Input	Output		
	V _M	V _M		
74AHC2G08-Q100	0.5V _{CC}	0.5V _{CC}		
74AHCT2G08-Q100	1.5 V	0.5V _{CC}		

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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.

Figure 6. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position			
	V _I	t _r , t _f	CL	R _L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}	
74AHC2G08-Q100	V _{CC}	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	
74AHCT2G08-Q100	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V _{CC}	

12 Package outline

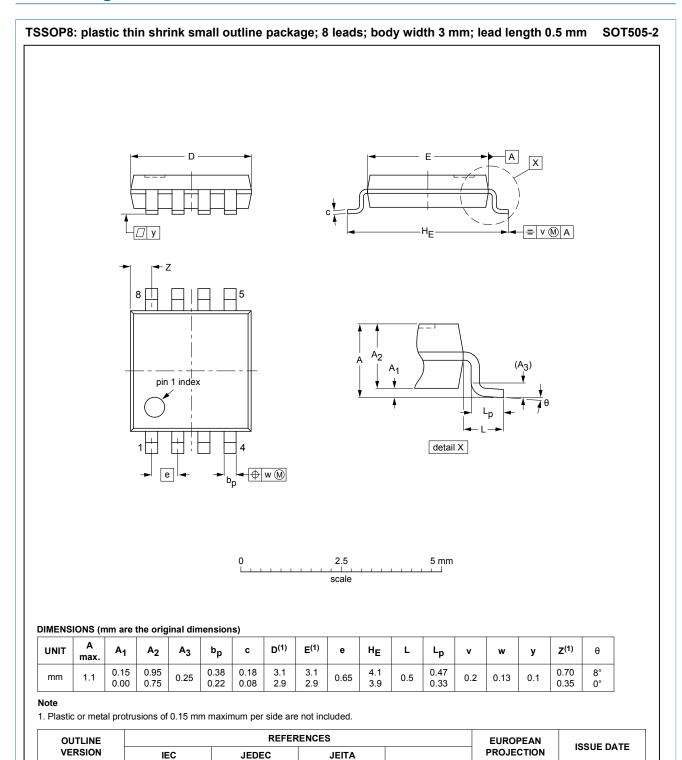


Figure 7. Package outline SOT505-2 (TSSOP8)

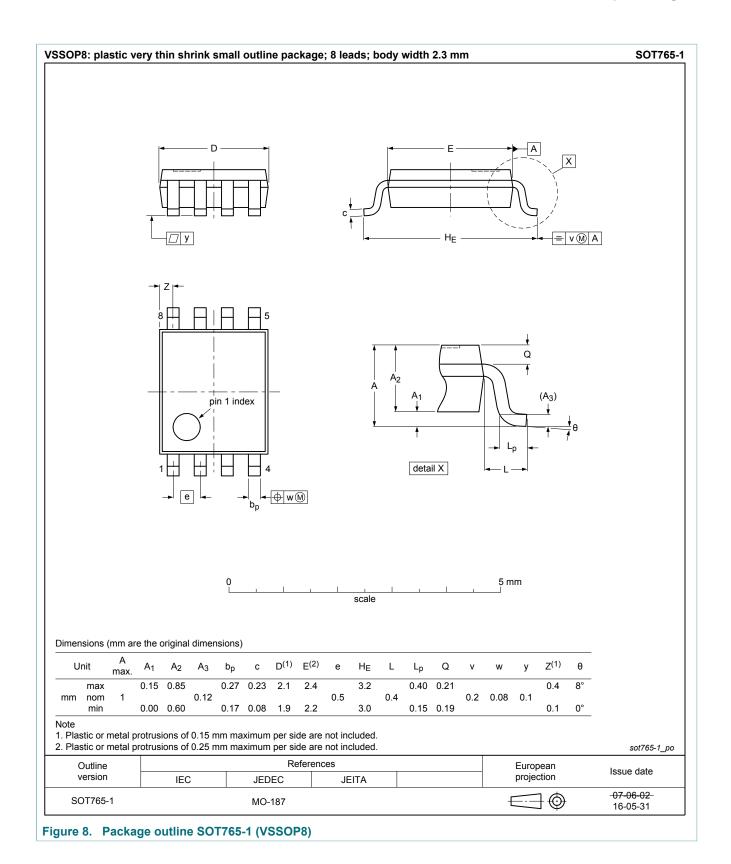
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SOT505-2



74AHC_AHCT2G08_Q100

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13 Abbreviations

Table 11. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MIL	Military
MM	Machine Model
TTL	Transistor-Transistor Logic

14 Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AHC_AHCT2G08_Q100 v.4	20180321	Product data sheet	-	74AHC_AHCT2G08_Q100 v.3		
Modifications:	 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. Table 5: total power dissipation derating factors have changed. Type number 74AHC2G08GD-Q100 and 74AHCT2G08GD-Q100 (SOT996-2/XSON8) removed . 					
74AHC_AHCT2G08_Q100 v.3	20151120	Product data sheet	-	74AHC_AHCT2G08_Q100 v.2		
Modifications:	Added type number 74AHC2G08GD-Q100 and 74AHCT2G08GD-Q100 (SOT996-2/XSON8).					
74AHC_AHCT2G08_Q100 v.2	20140121	Product data sheet	-	74AHC_AHCT2G08_Q100 v.1		
74AHC_AHCT2G08_Q100 v.1	20131113	Product data sheet	-	-		

15 Legal information

15.1 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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