74AHC2G08-Q100; 74AHCT2G08-Q100

Dual 2-input AND gate

Rev. 3 — 20 November 2015

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
 - \bullet 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								
74AHC2G08GD-Q100	−40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no	SOT996-2							
74AHCT2G08GD-Q100			leads; 8 terminals; body 3 × 2 × 0.5 mm								



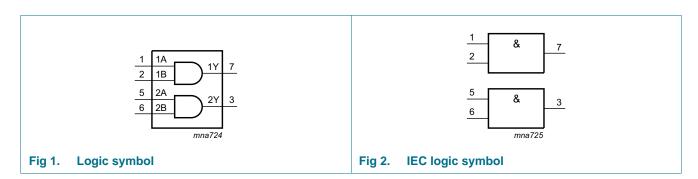
4. Marking

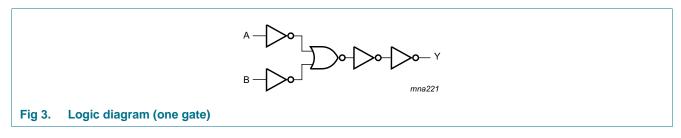
Table 2. Marking

Type number	Marking code ^[1]
74AHC2G08DP-Q100	A08
74AHCT2G08DP-Q100	C08
74AHC2G08DC-Q100	A08
74AHCT2G08DC-Q100	C08
74AHC2G08GD-Q100	A08
74AHCT2G08GD-Q100	C08

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

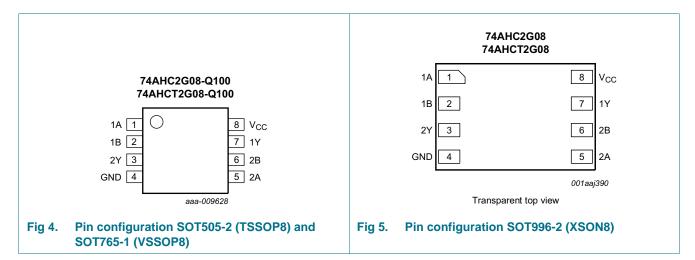
5. Functional diagram





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[1]

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

[1] H = HIGH voltage level; L = LOW voltage level.

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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[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	74AH	1C2G08-	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	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
	and fall rate	$V_{CC} = 5.0 \text{ V} \pm 0.5 \text{ V}$	-	-	20	-	-	20	ns/V

10. Static characteristics

Table 7. Static characteristics

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

Symbol	bol Parameter Conditions			25 °C			o +85 °C	-40 °C t	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G08-Q100									
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

^[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. For XSON8 package: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

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 t	Unit	
			Min	Тур	Max	Min	Max	Min	Max	
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	$I_O = -50 \mu A$; $V_{CC} = 2.0 \text{ V}$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -50 \mu A$; $V_{CC} = 3.0 \text{ V}$	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	$I_O = 50 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 3.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 50 \mu A; V_{CC} = 4.5 V$	-	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
		$I_O = 8.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	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	μА
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	2G08-Q100					I				
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} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -50 μA	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	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
Δl _{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
Cı	input capacitance		-	1.5	10	-	10	-	10	pF

11. Dynamic characteristics

Table 8. Dynamic characteristics

GND = 0 V; for test circuit see Figure 7.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	–40 °C t	Unit	
				Min	Тур	Max	Min	Max	Min	Max	
74AHC2	G08-Q100							1			
t _{pd}	propagation	nA, nB to nY; see Figure 6	<u>[1]</u>								
	delay	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; $C_L = 50 \text{ pF}$; $f_i = 1 \text{ MHz}$; $V_I = \text{GND to V}_{CC}$	[4]	-	17	-	-	-	-	-	pF
74AHCT	2G08-Q100	1									-
t _{pd}	propagation	nA, nB to nY; see Figure 6	<u>[1]</u>								
	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}	$ \begin{array}{ll} \text{power} & \text{per buffer;} \\ \text{dissipation} & \text{C}_L = 50 \text{ pF; } f_i = 1 \text{ MHz;} \\ \text{capacitance} & \text{V}_I = \text{GND to V}_{CC} \\ \end{array} $		[4]	-	19	-	-	-	-	-	pF

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [2] Typical values are measured at $V_{CC} = 3.3 \text{ V}$.
- [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 in $\mu W).$

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

 f_i = input frequency in MHz;

f_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.

12. Waveforms

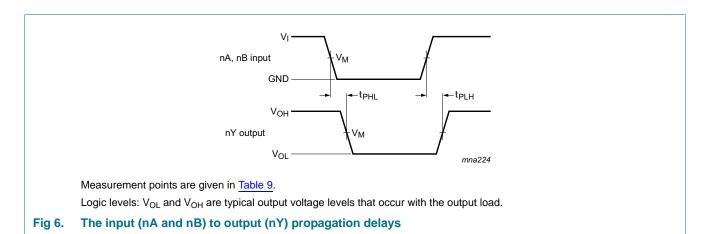
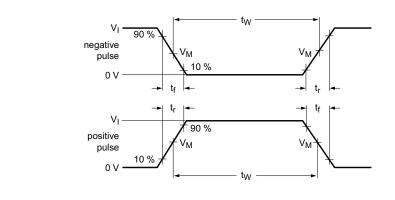
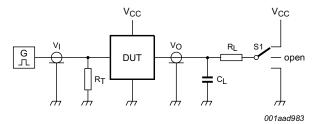


Table 9. Measurement points

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





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 7. Test circuit for measuring switching times

Table 10. Test data

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

13. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm SOT505-2

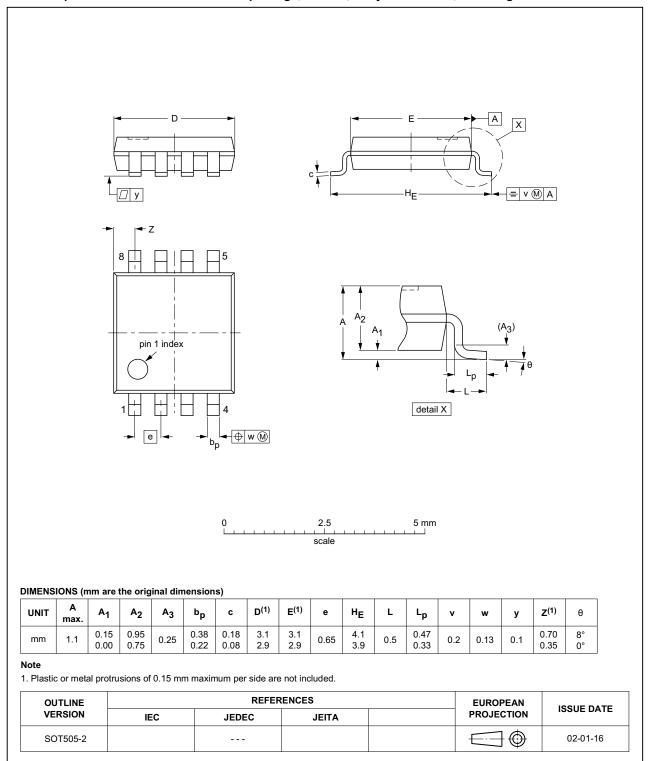


Fig 8. Package outline SOT505-2 (TSSOP8)

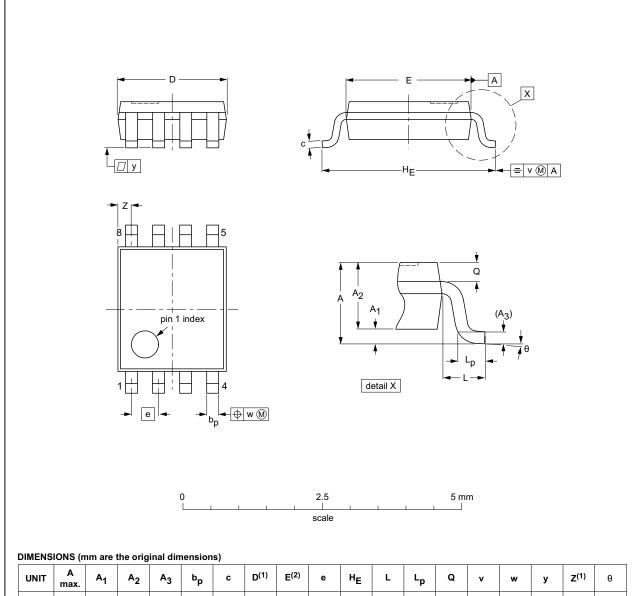
74AHC_AHCT2G08_Q100

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VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	С	D ⁽¹⁾	E ⁽²⁾	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1	0.15 0.00	0.85 0.60	0.12	0.27 0.17	0.23 0.08	2.1 1.9	2.4 2.2	0.5	3.2 3.0	0.4	0.40 0.15	0.21 0.19	0.2	0.13	0.1	0.4 0.1	8° 0°

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE	REFERENCES				EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT765-1		MO-187				02-06-07

Fig 9. Package outline SOT765-1 (VSSOP8)

74AHC_AHCT2G08_Q100

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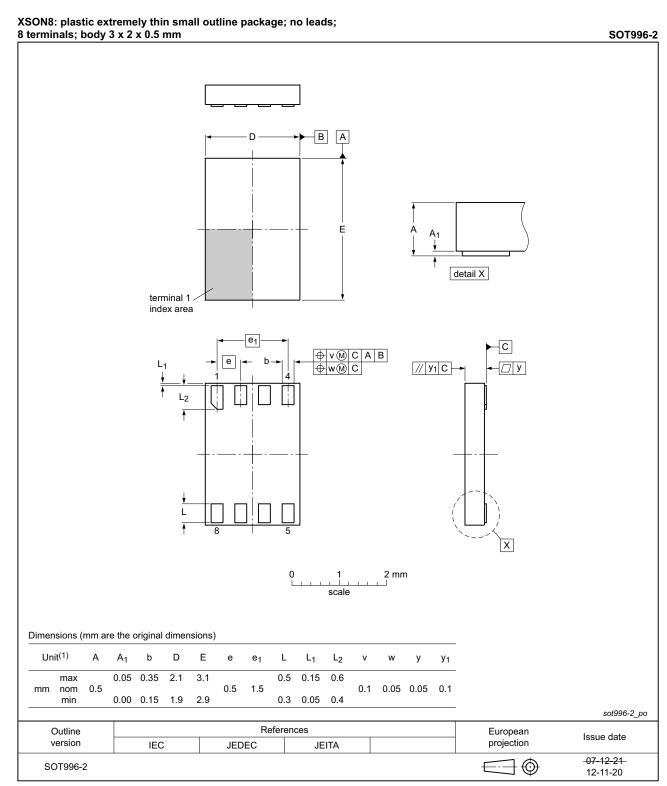


Fig 10. Package outline SOT996-2 (XSON8)

74AHC_AHCT2G08_Q100

14. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
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

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
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	-	-

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.
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Dual 2-input AND gate

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Dual 2-input AND gate

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