# 74AHC2G08; 74AHCT2G08 Dual 2-input AND gate Rev. 6 — 21 March 2018 Proc

**Product data sheet** 

#### 1 **General description**

The 74AHC2G08; 74AHCT2G08 is a high-speed Si-gate CMOS device.

The 74AHC2G08; 74AHCT2G08 provides two 2-input AND gates.

#### **Features and benefits**

- Symmetrical output impedance
- High noise immunity
- ESD protection:
- HBM JESD22-A114E exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101C exceeds 1000 V
- Low power dissipation
- · Balanced propagation delays
- Multiple package options
- Specified from -40 °C to +80 °C and from -40 °C to +125 °C

## **Ordering information**

Table 1. Ordering information

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



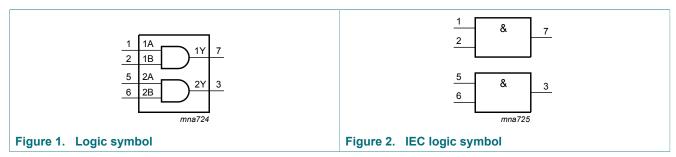
# 4 Marking

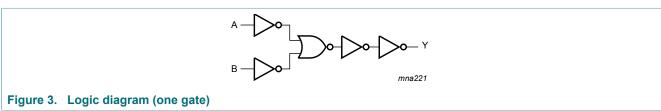
#### Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AHC2G08DP	A08
74AHCT2G08DP	C08
74AHC2G08DC	A08
74AHCT2G08DC	C08

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

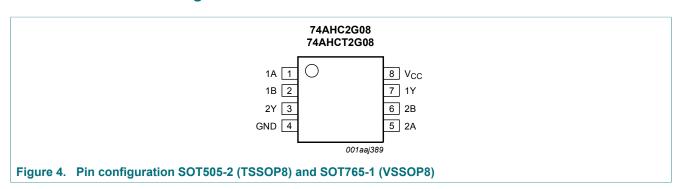
# 5 Functional diagram





# 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 <sub>CC</sub>	8	supply voltage

# 7 Functional description

#### Table 4. Function table

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

Input	nput				
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 <sub>CC</sub>	supply voltage			-0.5	+7.0	V
VI	input voltage			-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V	[1]	-20	-	mA
I <sub>OK</sub>	output clamping current	$V_{O}$ < -0.5 V or $V_{O}$ > $V_{CC}$ + 0.5 V	[1]	-	±20	mA
I <sub>O</sub>	output current	$-0.5 \text{ V} < \text{V}_{\text{O}} < \text{V}_{\text{CC}} + 0.5 \text{ V}$		-	±25	mA
I <sub>CC</sub>	supply current			-	75	mA
I <sub>GND</sub>	ground current			-75	-	mA
T <sub>stg</sub>	storage temperature			-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C	[2]	-	250	mW

<sup>[1]</sup> 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	AHC2G	08	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
VI	input voltage		0	-	5.5	0	-	5.5	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	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

<sup>[2]</sup> For SOT505-2 package: above 96 °C the value of P<sub>tot</sub> derates linearly with 4.6 mW/K. For SOT765-1 package: above 99 °C the value of P<sub>tot</sub> 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			1	1				1	
$V_{IH}$	HIGH-level	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
	input voltage	V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
$V_{IL}$	LOW-level	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
	output voltage	I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I <sub>O</sub> = -50 μA; V <sub>CC</sub> = 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 <sub>OL</sub>	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 <sub>O</sub> = 50 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 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 <sub>Ι</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>CC</sub>	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 1	to +85 °C	-40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74AHCT	2G08		<del>'</del>		-			-		
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
output volta	output voltage	Ι <sub>Ο</sub> = -50 μΑ	4.4	4.5	-	4.4	-	4.4	-	٧
		I <sub>O</sub> = -8.0 mA	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub>	LOW-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	Ι <sub>Ο</sub> = 50 μΑ	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 8.0 mA	-	-	0.36	-	0.44	-	0.55	V
l <sub>l</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	μΑ
I <sub>CC</sub>	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
ΔI <sub>CC</sub>	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 <sub>I</sub>	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					1	ı				
t <sub>pd</sub>	t <sub>pd</sub> propagation delay	nA, nB to nY; see Figure 5	[1]								
		V <sub>CC</sub> = 3.0 V to 3.6 V	[2]								
		C <sub>L</sub> = 15 pF		-	4.6	8.8	1.0	10.5	1.0	12.0	ns
		C <sub>L</sub> = 50 pF		-	6.5	12.3	1.0	14.0	1.0	16.0	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	[3]								
		C <sub>L</sub> = 15 pF		-	3.2	5.9	1.0	7.0	1.0	8.0	ns
		C <sub>L</sub> = 50 pF		-	4.6	7.9	1.0	9.0	1.0	10.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L$ = 50 pF; $f_i$ = 1 MHz; $V_I$ = GND to $V_{CC}$	[4]	-	17	-	-	-	-	-	pF

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

t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
 Typical values are measured at V<sub>CC</sub> = 3.3 V.
 Typical values are measured at V<sub>CC</sub> = 5.0 V.
 C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

 $f_i$  = input frequency in MHz;

 $f_0$  = output frequency in MHz;

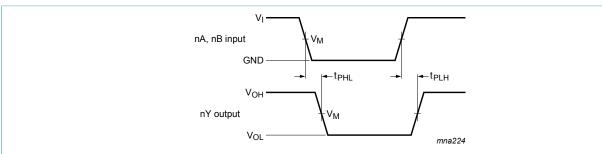
C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = 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.

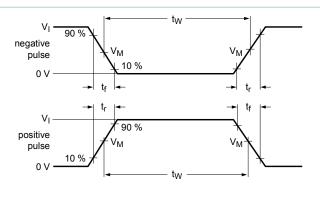
Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

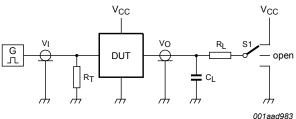
Figure 5. The input (nA and nB) to output (nY) propagation delays

Table 9. Measurement points

Туре	Input	Output
	$V_{M}$	$V_{M}$
74AHC2G08	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>
74AHCT2G08	1.5 V	0.5V <sub>CC</sub>

74AHC\_AHCT2G08





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<sub>L</sub> = Load resistance.

S1 = Test selection switch.

Figure 6. Test circuit for measuring switching times

Table 10. Test data

Туре	Input		Load		S1 position		
	VI	t <sub>r</sub> , t <sub>f</sub>	CL	R <sub>L</sub>	t <sub>PHL</sub> , t <sub>PLH</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>
74AHC2G08	V <sub>CC</sub>	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>
74AHCT2G08	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>

# 12 Package outline

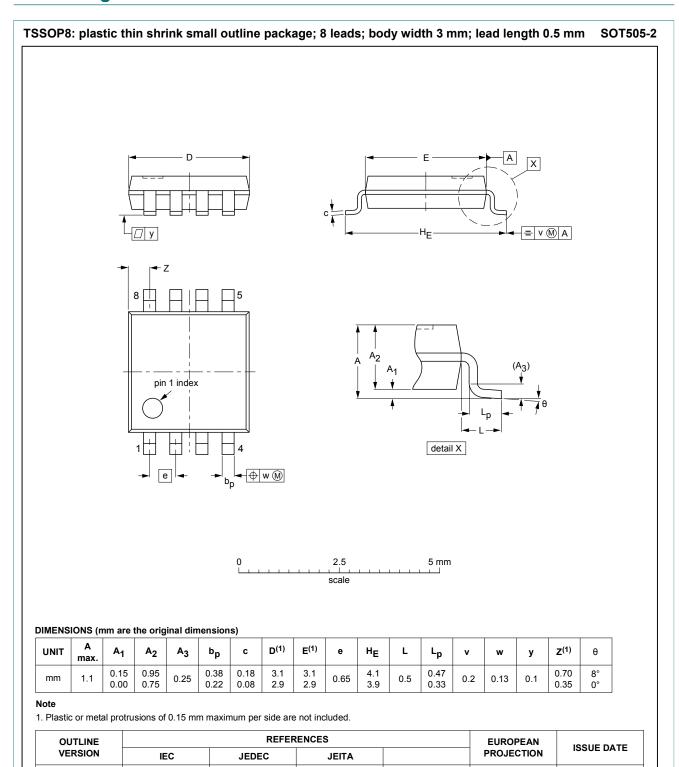
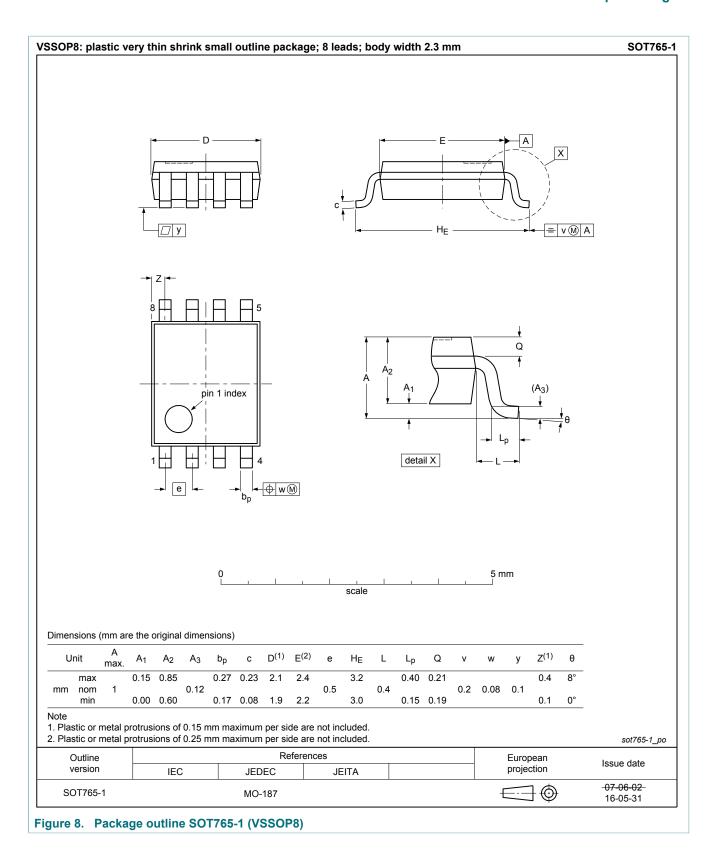


Figure 7. Package outline SOT505-2 (TSSOP8)

02-01-16

 $\bigcirc$ 

SOT505-2



74AHC\_AHCT2G08

## 13 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
MM	Machine Model

# 14 Revision history

## Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AHC_AHCT2G08 v.6	20180321	Product data sheet	-	74AHC_AHCT2G08 v.5		
Modifications:	<ul> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li>Table 5: total power dissipation derating factors have changed.</li> <li>Type number 74AHC2G08GD and 74AHCT2G08GD (SOT996-2/XSON8) removed .</li> </ul>					
74AHC_AHCT2G08 v.5	20131127	Product data sheet	-	74AHC_AHCT2G08 v.4		
Modifications:	General description updated (errata).					
74AHC_AHCT2G08 v.4	20130513	Product data sheet	-	74AHC_AHCT2G08 v.3		
Modifications:	• For type number 74AHC2G08GD and 74AHCT2G08GD XSON8U has changed to XSON8.					
74AHC_AHCT2G08 v.3	20090112	Product data sheet	-	74AHC_AHCT2G08 v.2		
74AHC_AHCT2G08 v.2	20041018	Product data sheet	-	74AHC_AHCT2G08 v.1		
74AHC_AHCT2G08 v.1	20040206	Product specification	-	-		

# 15 Legal information

#### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.

- Please consult the most recently issued document before initiating or completing a design.
- The term 'short data sheet' is explained in section "Definitions". [2] [3]
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