# 74AHC2G32-Q100; 74AHCT2G32-Q100

Dual 2-input OR gate

Rev. 3 — 18 December 2018

Product data sheet

### 1. General description

The 74AHC2G32; 74AHCT2G32 are high-speed Si-gate CMOS devices. They provide two 2-input OR 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
- 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**

Table 1. Oracining informat	1011			
Type number	Package			
	Temperature range	Name	Description	Version
74AHC2G32DP-Q100	-40 °C to +125 °C	TSSOP8	plastic thin shrink small outline package; 8	SOT505-2
74AHCT2G32DP-Q100			leads; body width 3 mm; lead length 0.5 mm	
74AHC2G32DC-Q100	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package;	SOT765-1
74AHCT2G32DC-Q100			8 leads; body width 2.3 mm	

### 4. Marking

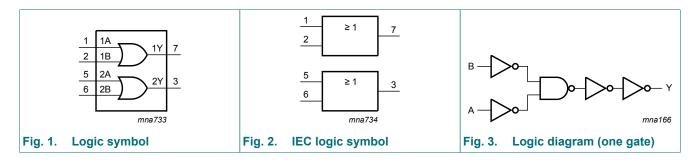
### Table 2. Marking

Table 2. Marking	
Type number	Marking code[1]
74AHC2G32DP-Q100	A32
74AHCT2G32DP-Q100	C32
74AHC2G32DC-Q100	A32
74AHCT2G32DC-Q100	C32

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

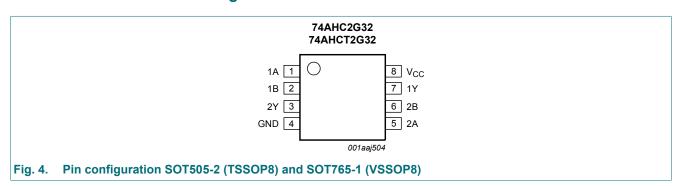


# 5. Functional diagram



# 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 <sub>CC</sub>	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	Н
Н	L	Н
Н	Н	Н

2/11

# 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
$I_{GND}$	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		74AH	1C2G32-	Q100	74AH	Unit		
			Min	Тур	Max	Min	Тур	Max	
V <sub>CC</sub>	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 <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 and	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	-	-	100	-	-	-	ns/V
	fall rate	V <sub>CC</sub> = 5.0 V ± 0.5 V	-	-	20	-	-	20	ns/V

### 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	G32-Q100									
V <sub>IH</sub>	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

<sup>[2]</sup> For TSSOP8 package: above 55 °C the value of P<sub>tot</sub> derates linearly with 2.5 mW/K. For VSSOP8 package: above 110 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.

Symbol	Parameter	Conditions		25 °C		-40 °C	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
V <sub>OH</sub>	HIGH-level	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
	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	-	٧
		$I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.58	-	-	2.48	-	2.40	-	٧
		$I_{O}$ = -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 <sub>O</sub> = 50 μA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	٧
		I <sub>O</sub> = 50 μA; V <sub>CC</sub> = 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	٧
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.36	-	0.44	-	0.55	V
		$I_O$ = 8.0 mA; $V_{CC}$ = 4.5 V	-	-	0.36	-	0.44	-	0.55	٧
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	μA
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
74AHCT	2G32-Q100									
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 voltage	I <sub>O</sub> = -50 μA	4.4	4.5	-	4.4	-	4.4	-	V
		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 $V_{IL}$ ; $V_{CC} = 4.5 V$								
	output voltage	I <sub>O</sub> = 50 μA	-	0	0.1	-	0.1	-	0.1	٧
		I <sub>O</sub> = 8.0 mA	-	-	0.36	-	0.44	-	0.55	٧
I <sub>I</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	μA
Δl <sub>CC</sub>	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 Fig. 6.

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	-40 °C t	°C to +125 °C	
				Min	Тур	Max	Min	Max	Min	Max	1
74AHC2	G32-Q100								1		
t <sub>pd</sub>	propagation	nA, nB to nY; see Fig. 5	[1]								
	delay	V <sub>CC</sub> = 3.0 V to 3.6 V	[2]								
		C <sub>L</sub> = 15 pF		-	4.4	7.9	1.0	9.5	1.0	10.0	ns
		C <sub>L</sub> = 50 pF		-	6.3	11.4	1.0	13.0	1.0	14.5	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	[3]								
		C <sub>L</sub> = 15 pF		-	3.2	5.5	1.0	6.5	1.0	7.0	ns
		C <sub>L</sub> = 50 pF		-	4.6	7.5	1.0	8.5	1.0	9.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$ ; $f_i = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	[4]	-	16	-	-	-	-	-	pF
74AHCT	2G32-Q100	1									
t <sub>pd</sub>	propagation	nA, nB to nY; see Fig. 5	[1]								
	delay	V <sub>CC</sub> = 4.5 V to 5.5 V	[3]								
		C <sub>L</sub> = 15 pF		-	3.3	6.9	1.0	8.0	1.0	9.0	ns
		C <sub>L</sub> = 50 pF		-	4.8	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]	-	17	-	-	-	-	-	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  $V_{CC} = 5.3 \text{ V}$ .

  Typical values are measured at  $V_{CC} = 5.0 \text{ V}$ .  $C_{PD}$  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;

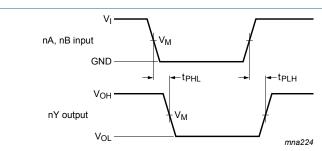
fo = output frequency in MHz;

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

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;  $\Sigma(C_L \ x \ V_{CC}^2 \ x \ f_o) = sum \ of \ the \ outputs.$ 

### 11.1. Waveforms and test circuit



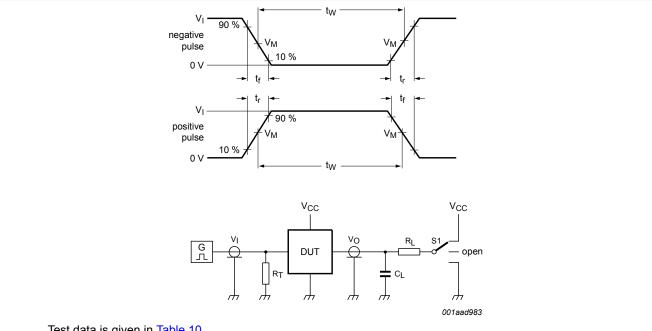
Measurement points are given in Table 9.

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

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

**Table 9. Measurement points** 

Туре	Input	Output						
	V <sub>M</sub>	V <sub>M</sub>						
74AHC2G32-Q100	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>						
74AHCT2G32-Q100	1.5 V	0.5V <sub>CC</sub>						



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 <sub>r</sub> , t <sub>f</sub>	CL	$R_L$	t <sub>PHL</sub> , t <sub>PLH</sub>	t <sub>PZH</sub> , t <sub>PHZ</sub>	t <sub>PZL</sub> , t <sub>PLZ</sub>
74AHC2G32-Q100	V <sub>CC</sub>	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	$V_{CC}$
74AHCT2G32-Q100	3 V	≤ 3 ns	15 pF, 50 pF	1 kΩ	open	GND	V <sub>CC</sub>

# 12. Package outline

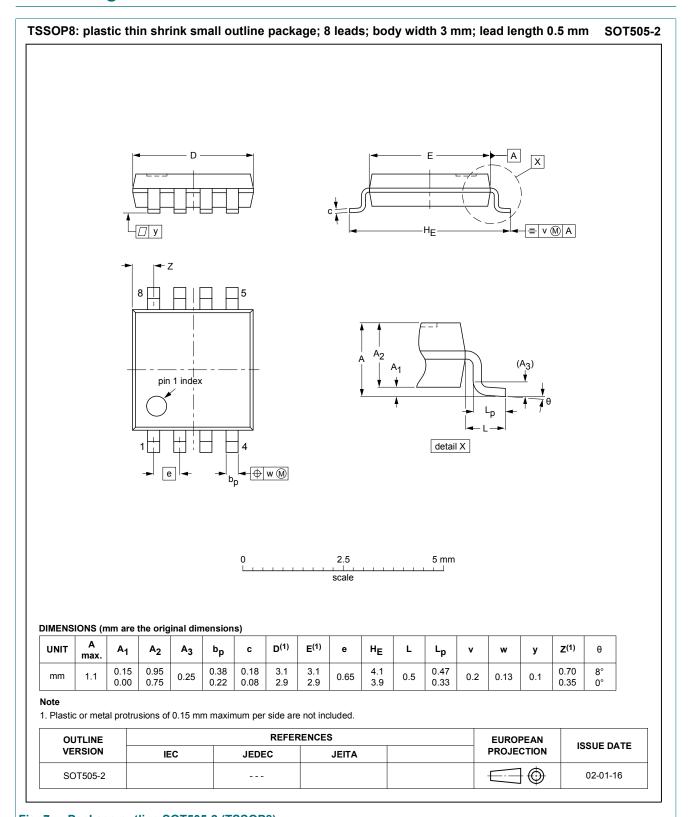


Fig. 7. Package outline SOT505-2 (TSSOP8)

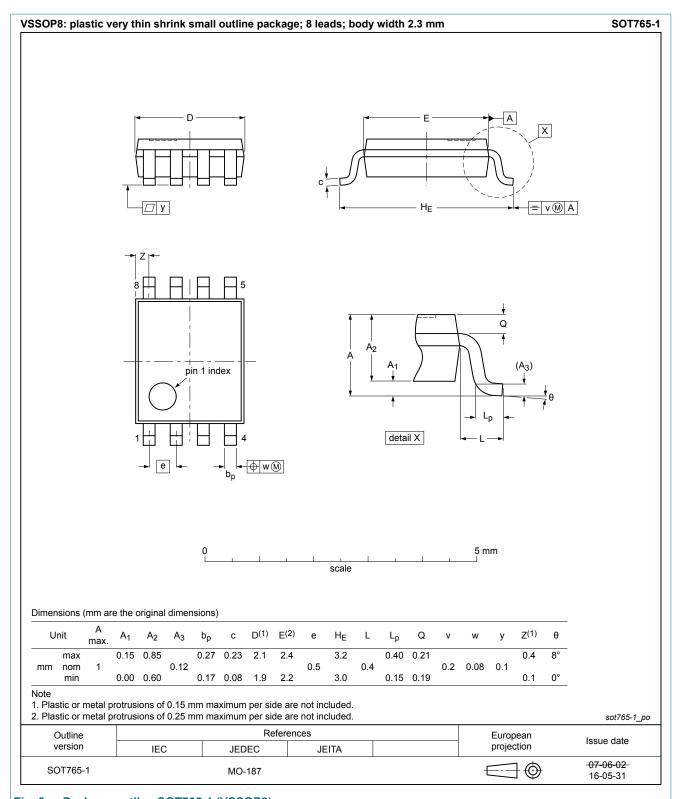


Fig. 8. Package outline SOT765-1 (VSSOP8)

# 13. Abbreviations

### **Table 11. Abbreviations**

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

# 14. Revision history

### **Table 12. Revision history**

Table 12. Revision history							
Document ID	Release date	Data sheet status	Change notice	Supersedes			
74AHC_AHCT2G32_Q100 v.3	20181218	Product data sheet	-	74AHC_AHCT2G32_Q100 v.2			
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>Type numbers 74AHC2G32GD-Q100 and 74AHCT2G32GD-Q100 removed.</li> </ul>						
74AHC_AHCT2G32_Q100 v.2	20151201	Product data sheet	-	74AHC_AHCT2G32_Q100 v.1			
Modifications:	<ul> <li>Added type number 74AHC2G32GD-Q100 and 74AHCT2G32GD-Q100 (SOT996-2/XSON8).</li> </ul>						
74AHC_AHCT2G32_Q100 v.1	20140312	Product data sheet	-	-			

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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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### **Contents**

1.	General description	. 1
2.	Features and benefits	. 1
3.	Ordering information	.1
4.	Marking	. 1
5.	Functional diagram	.2
6.	Pinning information	. 2
6.1	. Pinning	. 2
6.2	Pin description	. 2
7.	Functional description	. 2
8.	Limiting values	3
9.	Recommended operating conditions	.3
10.	Static characteristics	.3
11.	Dynamic characteristics	.5
11.	1. Waveforms and test circuit	6
12.	Package outline	. 7
13.	Abbreviations	. 9
14.	Revision history	.9
15.	Legal information	10

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