# 74AHC1G32; 74AHCT1G32

2-input OR gate
Rev. 07 — 14 May 2009

**Product data sheet** 

#### **General description** 1.

74AHC1G32 and 74AHCT1G32 are high-speed Si-gate CMOS devices. They provide a 2-input OR function.

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**

- 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
- SOT353-1 and SOT753 package options
- Specified from -40 °C to +125 °C

#### **Ordering information** 3.

Table 1. **Ordering information** 

Type number	Package								
	Temperature range	Name	Description	Version					
74AHC1G32GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads;	SOT353-1					
74AHCT1G32GW			body width 1.25 mm						
74AHC1G32GV	$-40~^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$	SC-74A	plastic surface-mounted package; 5 leads	SOT753					
74AHCT1G32GV									



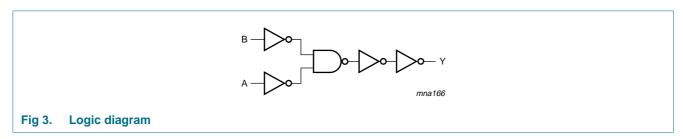
## 4. Marking

#### Table 2. Marking codes

Type number	Marking code
74AHC1G32GW	AG
74AHCT1G32GW	CG
74AHC1G32GV	A32
74AHCT1G32GV	C32

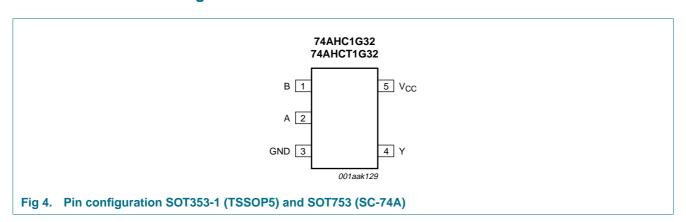
## 5. Functional diagram





## 6. Pinning information

### 6.1 Pinning



## 6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
В	1	data input
A	2	data input
GND	3	ground (0 V)
Υ	4	data output
$V_{CC}$	5	supply voltage

## 7. Functional description

#### Table 4. Function table

H = HIGH voltage level; L = LOW voltage level

Inputs		Output
Α	В	Υ
L	L	L
L	Н	Н
Н	L	Н
Н	Н	Н

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7.0	V
VI	input voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	$V_{I} < -0.5 \text{ V}$	-20	-	mA
I <sub>OK</sub>	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±20	mA
Io	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		<b>–75</b>	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	$T_{amb} = -40  ^{\circ}\text{C} \text{ to } +125  ^{\circ}\text{C}$	<u>[2]</u> _	250	mW

<sup>[1]</sup> The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

<sup>[2]</sup> For both TSSOP5 and SC-74A packages: above 87.5  $^{\circ}$ C the value of P<sub>tot</sub> derates linearly with 4.0 mW/K.

## 9. Recommended operating conditions

Table 6. Recommended operating conditions

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

Symbol	Parameter		74AHC	74AHC1G32			74AHCT1G32		
			Min	Тур	Max	Min	Тур	Max	
$V_{CC}$	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
$V_{I}$	input voltage		0	-	5.5	0	-	5.5	V
Vo	output voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC}$ = 3.3 V $\pm$ 0.3 V	-	-	100	-	-	-	ns/V
		$V_{CC}$ = 5.0 V $\pm$ 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	
For type	74AHC1G32		1	•						
V <sub>IH</sub>	HIGH-level	$V_{CC} = 2.0 \text{ V}$	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	$V_{CC} = 2.0 \text{ V}$	-	-	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
$V_{OH}$	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$								
output	output voltage	$I_{O} = -50 \ \mu A; \ V_{CC} = 2.0 \ V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -50 \ \mu A; \ V_{CC} = 3.0 \ V$	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 mA; $V_{CC}$ = 3.0 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
l <sub>l</sub>	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	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
C <sub>I</sub>	input capacitance		-	1.5	10	-	10	-	10	pF

**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	to +125 °C	Unit
				Тур	Max	Min	Max	Min	Max	
For type	74AHCT1G32	'	'				'			
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	-	-	2.0	-	2.0	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	-	8.0	-	0.8	-	0.8	V
$V_{OH}$	HIGH-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
outp	output voltage	$I_{O} = -50 \ \mu A$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -8.0 \text{ mA}$	3.94	-	-	3.8	-	3.70	-	V
V <sub>OL</sub> L	LOW-level	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	$I_O = 50 \mu A$	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
II	input leakage current	$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to 5.5 V}$	-	-	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
$\Delta I_{CC}$	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
C <sub>I</sub>	input capacitance		-	1.5	10	-	10	-	10	pF

## 11. Dynamic characteristics

Table 8. Dynamic characteristics

 $GND = 0 \ V; \ t_r = t_f = \le 3.0 \ \text{ns.}$  For waveform see Figure 5. For test circuit see Figure 6.

Symbol	Parameter	Conditions		25 °C		-40 °C	-40 °C to +85 °C		-40 °C to +125 °C		
				Min	Тур	Max	Min	Max	Min	Max	
For type	74AHC1G32										
t <sub>pd</sub>	propagation delay	A and B to Y	<u>[1]</u>								
C		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[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
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C <sub>L</sub> = 15 pF		-	3.2	5.5	1.0	6.5	1.0	7.0	ns
		$C_L = 50 pF$		-	4.6	7.5	1.0	8.5	1.0	9.5	ns
C <sub>PD</sub>	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$ ; $f = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	[4]	-	16	-	-	-	-	-	pF

 Table 8.
 Dynamic characteristics ...continued

 $GND = 0 \ V; t_f = t_f = \le 3.0 \ ns.$  For waveform see Figure 5. For test circuit see Figure 6.

Symbol	Parameter	Conditions		25 °C			-40 °C to +85 °C		-40 °C to +125 °C	
				Тур	Max	Min	Max	Min	Max	
For type	74AHCT1G3	2								
F	propagation delay	A and B to Y; [1] see Figure 5; [2] V <sub>CC</sub> = 4.5 V to 5.5 V								
		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	ns
$C_{PD}$	power dissipation capacitance	per buffer; $C_L = 50 \text{ pF}$ ; $f = 1 \text{ MHz}$ ; $V_I = \text{GND to } V_{CC}$	1] -	17	-	-	-	-	-	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 V.
- [4]  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu W$ ).

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

 $f_i$  = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

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

 $V_{CC}$  = supply voltage in Volts.

### 12. Waveforms

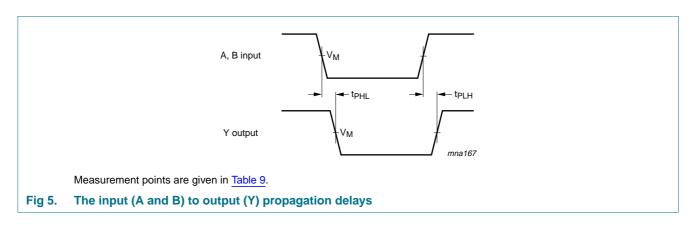
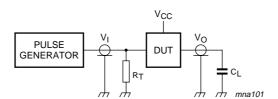


Table 9. Measurement points

Type number	Input	Output	
	V <sub>I</sub>	V <sub>M</sub>	V <sub>M</sub>
74AHC1G32	GND to V <sub>CC</sub>	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74AHCT1G32	GND to 3.0 V	1.5 V	$0.5 \times V_{CC}$

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Test data is given in Table 8.

Definitions for test circuit:

 $C_L$  = Load capacitance including jig and probe capacitance.

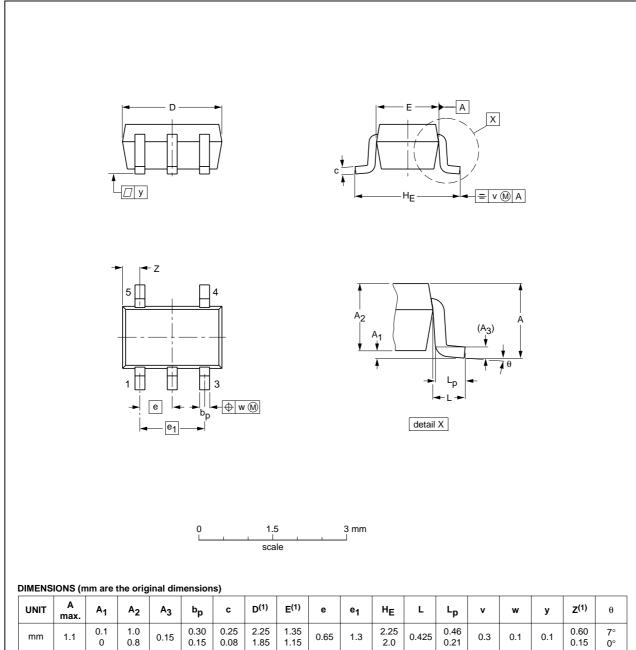
 $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

Fig 6. Load circuitry for switching times

## 13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1



#### . . .

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

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA	PROJECTION	1550E DATE	
SOT353-1		MO-203	SC-88A		<del>-00-09-01</del> 03-02-19	

Fig 7. Package outline SOT353-1 (TSSOP5)



**SOT753** 

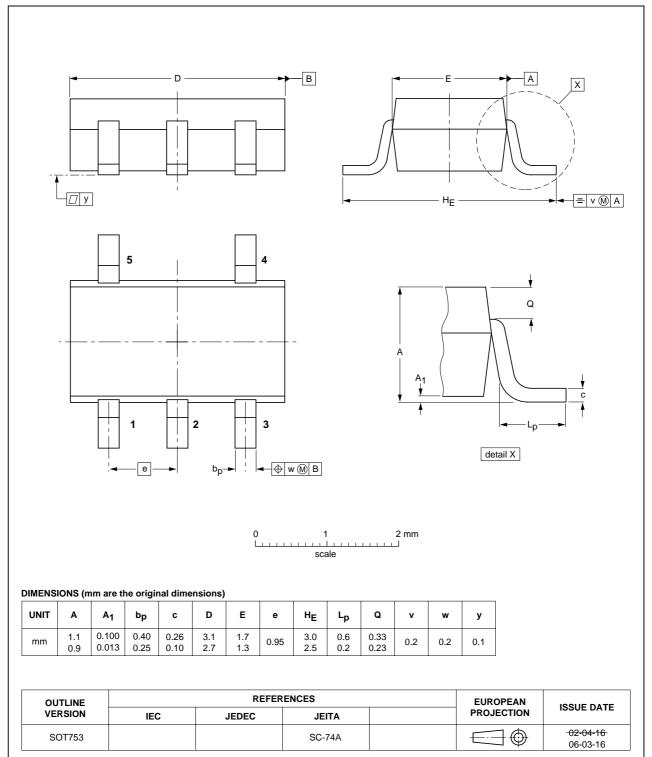


Fig 8. Package outline SOT753 (SC-74A)

## 14. Abbreviations

#### Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

## 15. Revision history

### Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT1G32_7	20090514	Product data sheet	-	74AHC_AHCT1G32_6
Modifications:	<ul> <li>Pin configura</li> </ul>	tion SOT353-1 (TSSOP5) and	SOT753 (SC-74A)	drawing corrected.
74AHC_AHCT1G32_6	20070702	Product data sheet	-	74AHC_AHCT1G32_5
74AHC_AHCT1G32_5	20020605	Product specification	-	74AHC_AHCT1G32_4
74AHC_AHCT1G32_4	20020326	Product specification	-	74AHC_AHCT1G32_3
74AHC_AHCT1G32_3	20010222	Product specification	-	74AHC_AHCT1G32_2
74AHC_AHCT1G32_2	19990127	Product specification	-	74AHC_AHCT1G32_N_1
74AHC_AHCT1G32_N_1	19981125	Product specification	-	-

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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.
Product [short] data sheet	Production	This document contains the product specification.

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