74AHC1G86; 74AHCT1G86

2-input EXCLUSIVE-OR gate Rev. 05 — 4 July 2007

Product data sheet

General description 1.

74AHC1G86 and 74AHCT1G86 are high-speed Si-gate CMOS devices. They provide a 2-input EXCLUSIVE-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	Package												
4AHC1G86GW - 4AHCT1G86GW	Temperature range	Name	Description	Version										
74AHC1G86GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads;	SOT353-1										
74AHCT1G86GW			body width 1.25 mm											
74AHC1G86GV	–40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads	SOT753										
74AHCT1G86GV														



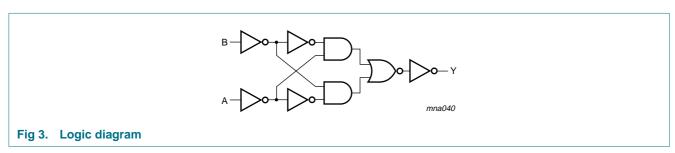
4. Marking

Table 2. Marking codes

Type number	Marking code
74AHC1G86GW	AH
74AHCT1G86GW	СН
74AHC1G86GV	A86
74AHCT1G86GV	C86

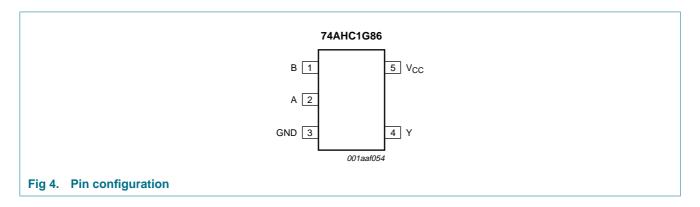
5. Functional diagram





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	L

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
V_{I}	input voltage		-0.5	+7.0	V
I _{IK}	input clamping current	$V_1 < -0.5 \text{ V}$	-20	-	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or } V_O > V_{CC} + 0.5 \text{ V}$	<u>[1]</u> _	±20	mA
I _O	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.

^[2] For both TSSOP5 and SC-74A packages: above 87.5 $^{\circ}$ C the value of P_{tot} 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	Conditions	74	AHC1G	86	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
V_{I}	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
$\Delta t/\Delta V$	input transition rise	V_{CC} = 3.3 V \pm 0.3 V	-	-	100	-	-	-	ns/V
а	and fall rate	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).

For type 7	Parameter	Conditions		25 °C		-40 °C t	to +85 °C	-40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	
For type	74AHC1G86							'		
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}	HIGH-level input voltage LOW-level input voltage HIGH-level output voltage LOW-level output voltage input leakage current supply current	$V_{CC} = 2.0 \text{ V}$	-	-	0.5	-	0.5	-	0.5	V
	input voltage	V _{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
	\	$V_{CC} = 5.5 \text{ V}$	-	-	1.65	-	1.65	-	1.65	V
V_{OH}		$V_I = V_{IH}$ or V_{IL}								
Ol	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}		$V_I = V_{IH}$ 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
	input voltage LOW-level input voltage HIGH-level output voltage LOW-level output voltage input leakage current supply current	$I_O = 50 \mu A; V_{CC} = 4.5 V$	-	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 ₁		$V_I = 5.5 \text{ V or GND};$ $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$	-	-	0.1	-	1.0	-	2.0	μΑ
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	10	-	40	μΑ
C _I	•		-	1.5	10	-	10	-	10	pF

Table 7. Static characteristics ...continued Voltages are referenced to GND (ground = 0 V).

	Parameter	Conditions		25 °C		-40 °C	to +85 °C	–40 °C t	o +125 °C	Unit
			Min	Тур	Max	Min	Max	Min	Max	1
For type	74AHCT1G86	'							•	
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} ; $V_{CC} = 4.5 \text{ V}$								
ou	output voltage	$I_{O} = -50 \mu A$	4.4	4.5	-	4.4	-	4.4	-	V
	output voltage LOW-level output voltage	$I_{O} = -8.0 \text{ mA}$	3.94	-	-	3.8	-	3.70	-	V
V_{OL}		$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage input leakage	I _O = 50 μA	-	0	0.1	-	0.1	-	0.1	V
		$I_0 = 8.0 \text{ mA}$	-	-	0.36	-	0.44	-	0.55	V
I _I	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 _{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; $V_I = 3.4 \text{ V}$; 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 _I	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 t	o +85 °C	–40 °C to	+125 °C	Unit
				Min	Тур	Max	Min	Max	Min	Max	
For type	delay V _C										
For type 74Al t _{pd} prop dela		A and B to Y	<u>[1]</u>								
	delay	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	[2]								
		C _L = 15 pF		-	4.0	11.0	1.0	13.0	1.0	14.0	ns
		C _L = 50 pF		-	5.8	14.5	1.0	16.5	1.0	18.5	ns
		$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]								
		C _L = 15 pF		-	3.4	6.8	1.0	8.0	1.0	8.5	ns
		$C_L = 50 pF$		-	4.9	8.8	1.0	10.0	1.0	11.5	ns
C_{PD}	delay CPD power power dissipation	per buffer; $C_L = 50 \text{ pF}$; $f = 1 \text{ MHz}$; $V_I = \text{GND to } V_{CC}$	<u>[4]</u>	-	9	-	-	-	-	-	pF

 Table 8.
 Dynamic characteristics ...continued

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

Symbol	Parameter	Conditions			25 °C		-40 °C	to +85 °C	–40 °C t	o +125 °C	Unit	
			Min	Тур	Max	Min	Max	Min	Max			
For type	74AHCT1G8	6										
pu i	propagation	A and B to Y	<u>[1]</u>									
	delay	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	[3]									
		C _L = 15 pF		-	3.5	6.9	1.0	8.0	1.0	9.0	ns	
		$C_L = 50 pF$		-	5.0	7.9	1.0	9.0	1.0	10.5	ns	
C _{PD}	power dissipation	dissipation $C_L = 50 \text{ pF}$; $f = 1 \text{ MHz}$;		[4]	-	11	-	-	-	-	-	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 (μW).

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

 f_i = input frequency in MHz;

fo = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts.

12. Waveforms

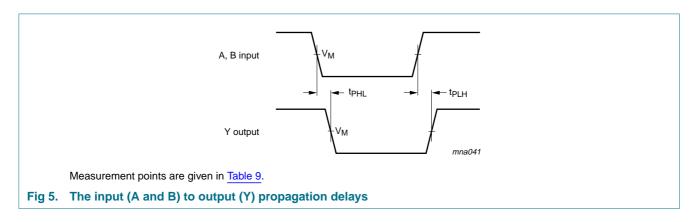
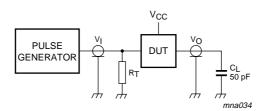


Table 9. Measurement points

Туре	Input	Output	
	VI	V _M	V _M
74AHC1G86	GND to V _{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74AHCT1G86	GND to 3.0 V	1.5 V	$0.5 \times V_{CC}$



Test data is given in Table 8. Definitions for test circuit:

 C_L = load capacitance including jig and probe capacitance.

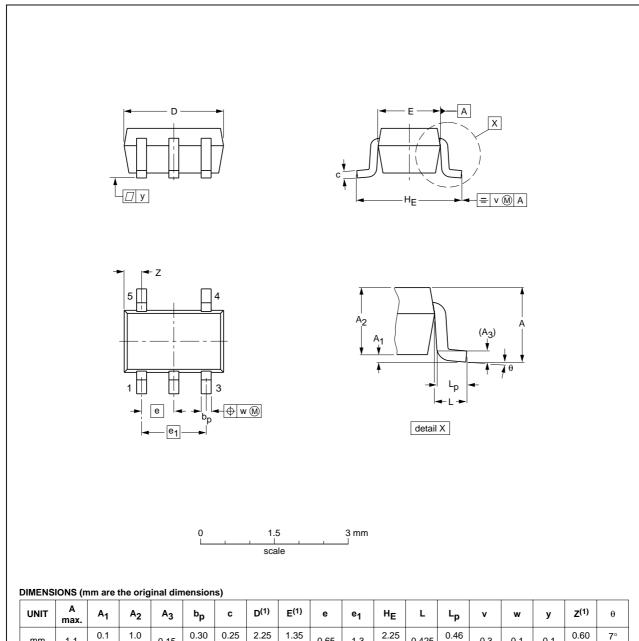
 R_T = termination resistance should be equal to the output impedance Z_0 of the pulse generator.

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



ι	JNIT	A max.	A ₁	A ₂	А3	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	e ₁	HE	L	Lp	v	w	у	Z ⁽¹⁾	θ	
	mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°	

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

REFERENCES				EUROPEAN	ISSUE DATE
IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
	MO-203	SC-88A			-00-09-01 03-02-19
_	IEC				IEC JEHA

Fig 7. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

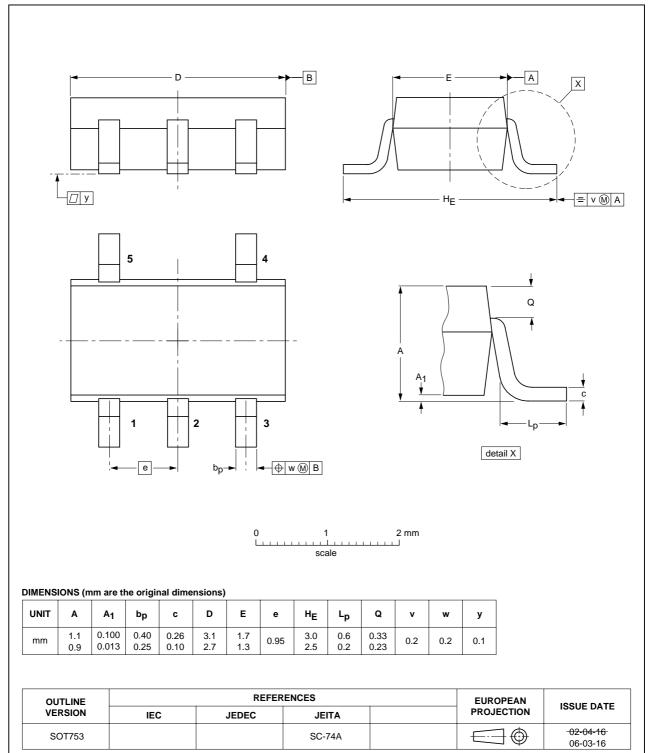


Fig 8. Package outline SOT753 (SC-74A)

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_AHCT1G86_5	20070704	Product data sheet	-	74AHC_AHCT1G86_4
Modifications:		f this data sheet has been redeNXP Semiconductors.	esigned to comply w	ith the new identity
	 Legal texts h 	ave been adapted to the new o	company name wher	e appropriate.
	 Package SO 	T353 changed to SOT353-1 in	Section 3 and Section	on 13.
	 Quick referer 	nce data and Soldering section	s removed.	
74AHC_AHCT1G86_4	20020606	Product specification	-	74AHC_AHCT1G86_3
74AHC_AHCT1G86_3	20020218	Product specification	-	74AHC_AHCT1G86_2
74AHC_AHCT1G86_2	20010406	Product specification	-	74AHC1G_AHCT1G86_1
74AHC1G_AHCT1G86_1	19990920	Product specification	-	-

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

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