

# HD74HC1G00

2-input NAND Gate

# HITACHI

ADE-205-309B (Z)

3rd. Edition

April 2001

## Description

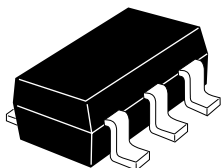
The HD74HC1G00 is high speed CMOS two input NAND gate using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equivalent to LS-TTL series. The internal circuit of three stages construction with buffer provides wide noise margin and stable output.

## Features

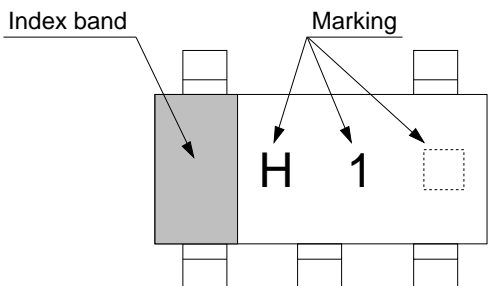
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74HC00
  - Supply voltage range : 2 to 6 V
  - Operating temperature range : -40 to +85°C
- $|I_{OH}| = I_{OL} = 2 \text{ mA (min)}$


## Outline and Article Indication

- HD74HC1G00



CMPAK-5



 = Control code  
( — or blank)

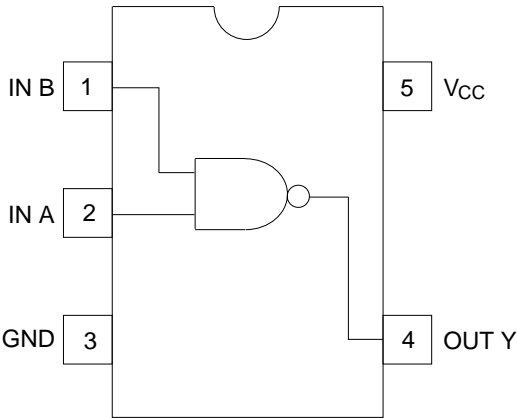
# HD74HC1G00

## Function Table

Inputs		Output Y
A	B	
L	L	H
L	H	H
H	L	H
H	H	L

H : High level  
L : Low level

## Pin Arrangement



(Top view)

## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to $V_{CC} + 0.5$	V	
Output voltage range <sup>*1, 2</sup>	$V_O$	-0.5 to $V_{CC} + 0.5$	V	Output : H or L
Input clamp current	$I_{IK}$	$\pm 20$	mA	$V_I < 0$ or $V_I > V_{CC}$
Output clamp current	$I_{OK}$	$\pm 20$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 25$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 25$	mA	
Maximum power dissipation $P_T$ at $T_a = 25^\circ\text{C}$ (in still air) <sup>*3</sup>		200	mW	
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$	

Notes: The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of  $150^\circ\text{C}$ .

## Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Test Conditions
Supply voltage range	$V_{CC}$	2	6	V	
Input voltage range	$V_I$	0	$V_{CC}$	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	
Output current	$I_{OL}$	—	2.0	mA	$V_{CC} = 4.5\text{ V}$
		—	2.6		$V_{CC} = 6.0\text{ V}$
	$I_{OH}$	—	-2.0	mA	$V_{CC} = 4.5\text{ V}$
		—	-2.6		$V_{CC} = 6.0\text{ V}$
Input rise / fall time (10% to 90%)	$t_r, t_f$	0	1000	ns	$V_{CC} = 2.0\text{ V}$
		0	500		$V_{CC} = 4.5\text{ V}$
		0	400		$V_{CC} = 6.0\text{ V}$
Operating temperature	$T_a$	-40	85	$^\circ\text{C}$	

Note: Unused or floating inputs must be held high or low.

Electrical Characteristics

Item	Symbol	V <sub>CC</sub> (V)	T <sub>a</sub> = 25°C			T <sub>a</sub> = -40 to 85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5			
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	4.31	—	4.13	—			I <sub>OH</sub> = -2 mA
		6.0	5.68	5.80	—	5.63	—			I <sub>OH</sub> = -2.6 mA
		6.0	—	—	—	—	—			I <sub>OH</sub> = -20 μA
	V <sub>OL</sub>	2.0	—	0.0	0.1	—	0.1			I <sub>OL</sub> = 20 μA
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	0.17	0.26	—	0.33			I <sub>OL</sub> = 2 mA
		6.0	—	0.18	0.26	—	0.33			I <sub>OL</sub> = 2.6 mA
		6.0	—	—	—	—	—			
Input current	I <sub>IN</sub>	6.0	—	—	±0.1	—	±1.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	
Operating current	I <sub>CC</sub>	6.0	—	—	1.0	—	10.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	

## Switching Characteristics

Item	Symbol	T <sub>a</sub> = 25°C			Unit	Test Conditions
		Min	Typ	Max		
Output rise / fall time	t <sub>TLH</sub> t <sub>THL</sub>	—	5	10	ns	Test circuit
Propagation delay time	t <sub>PLH</sub> t <sub>PHL</sub>	—	7	15	ns	Test circuit

(C<sub>L</sub> = 15 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns, V<sub>CC</sub> = 5 V)

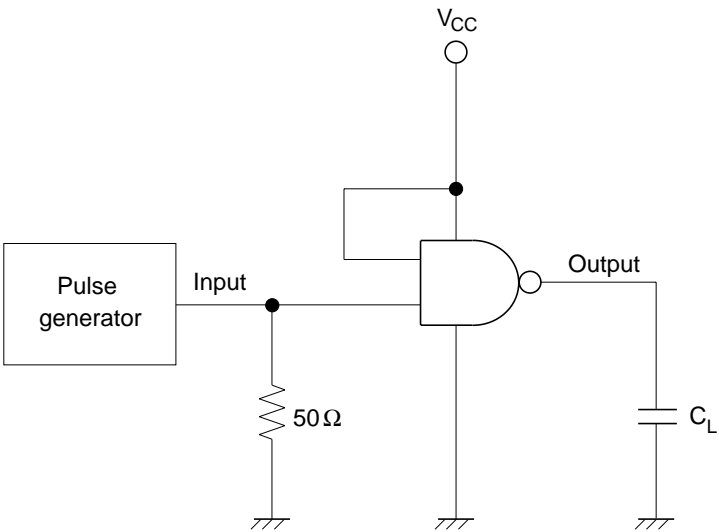
Item	Symbol	V <sub>CC</sub>	T <sub>a</sub> = 25°C			T <sub>a</sub> = -40 to 85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Output rise / fall time	t <sub>TLH</sub>	2.0	—	50	125	—	155	ns	Test circuit
	t <sub>THL</sub>	4.5	—	14	25	—	31		
		6.0	—	12	21	—	26		
Propagation delay time	t <sub>PLH</sub>	2.0	—	48	100	—	125	ns	Test circuit
	t <sub>PHL</sub>	4.5	—	12	20	—	25		
		6.0	—	9	17	—	21		
Input capacitance	C <sub>IN</sub>	—	—	2.5	5	—	5	pF	
Equivalent capacitance	C <sub>PD</sub>	—	—	10	—	—	—	pF	

(C<sub>L</sub> = 50 pF, t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Note: C<sub>PD</sub> is equivalent capacitance inside of the IC calculated from the operating current without load (see test circuit). The average operating current without load is calculated according to the expression below.

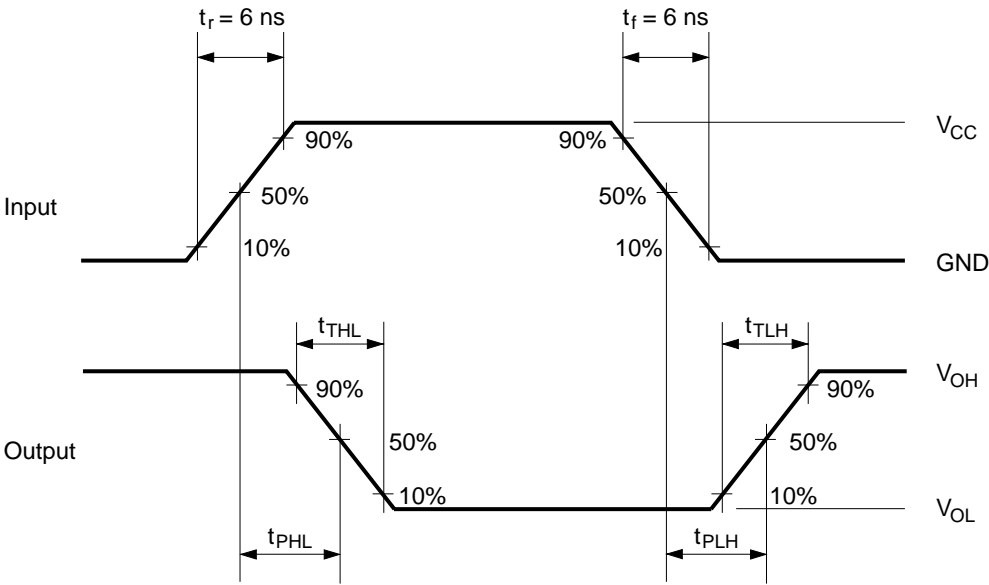
$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit



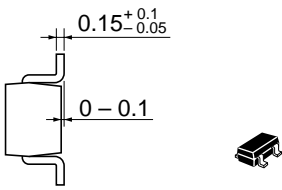
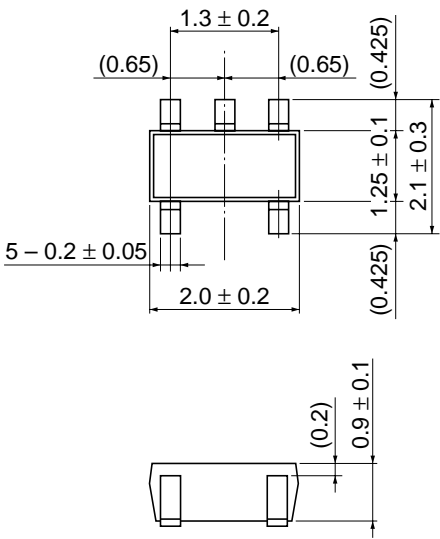
Note: 1.  $C_L$  includes probe and jig capacitance.

• Waveforms



Package Dimensions

As of January, 2001  
Unit: mm



Hitachi Code	CMPAK-5
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.006 g

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# HITACHI

**Hitachi, Ltd.**

Semiconductor & Integrated Circuits.  
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan  
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	NorthAmerica	:	<a href="http://semiconductor.hitachi.com/">http://semiconductor.hitachi.com/</a>
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**For further information write to:**

Hitachi Semiconductor (America) Inc.	Hitachi Europe Ltd.
179 East Tasman Drive,	Electronic Components Group.
San Jose, CA 95134	Whitebrook Park
Tel: <1> (408) 433-1990	Lower Cookham Road
Fax: <1> (408) 433-0223	Maidenhead
	Berkshire SL6 8YA, United Kingdom
	Tel: <44> (1628) 585000
	Fax: <44> (1628) 585200

Hitachi Europe GmbH  
Electronic Components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Asia Ltd.  
Hitachi Tower  
16 Collyer Quay #20-00,  
Singapore 049318  
Tel: <65>-538-6533/538-8577  
Fax: <65>-538-6933/538-3877  
URL: <http://www.hitachi.com.sg>

Hitachi Asia Ltd.  
(Taipei Branch Office)  
4/F, No. 167, Tun Hwa North Road,  
Hung-Kuo Building,  
Taipei (105), Taiwan  
Tel: <886>-(2)-2718-3666  
Fax: <886>-(2)-2718-8180  
Telex: 23222 HAS-TP  
URL: <http://www.hitachi.com.tw>

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower,  
World Finance Centre,  
Harbour City, Canton Road  
Tsim Sha Tsui, Kowloon,  
Hong Kong  
Tel: <852>-(2)-735-9218  
Fax: <852>-(2)-730-0281  
URL: <http://semiconductor.hitachi.com.hk>

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