

HD74UH04

Inverter

HITACHI

ADE-205-016A(Z)
2nd Edition
August 1993

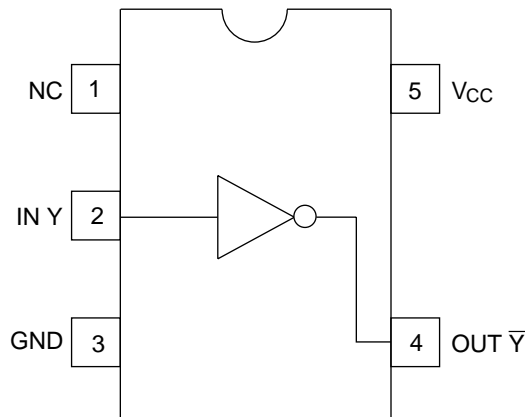
Description

The HD74UH04 is high speed CMOS inverter 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

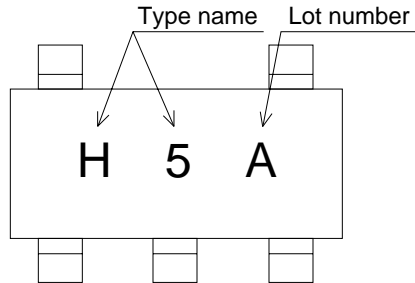
- Encapsulated in very small 5pins package of $2.9 \times 1.6 \times 1.1$ mm, the efficiency to mount on substrate is significantly improved.
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on embos taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74HC04
Supply voltage range: 2 to 6 V
Operating temperature range: -40 to $+85^{\circ}\text{C}$
- $|I_{OH}| = I_{OL} = 2$ mA (min)

Pin Arrangement



(Top view)

Article Indication



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	-0.5 to +7.0	V
Input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	V
Output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	V
Input diode current	I_{IK}	± 20	mA
Output diode current	I_{OK}	± 20	mA
Output current	I_{OUT}	± 25	mA
V_{CC} /GND current	I_{CC}, I_{GND}	± 25	mA
Power dissipation	P_T	200	mW
Storage temperature	T_{stg}	-65 to +150	°C

Recommended Operating Conditions

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to +85	°C
Input rise/fall time	t_r, t_f	0 to 1000 ($V_{CC} = 2.0$ V)	ns
		0 to 500 ($V_{CC} = 4.5$ V)	
		0 to 400 ($V_{CC} = 6.0$ V)	

Electrical Characteristics

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

Switching Characteristics

Item	Symbol	Ta = 25°C			Unit	Test Conditions
		Min	Typ	Max		
Output rise/fall time	t _{TLH}	—	5	10	ns	See Test circuit
	t _{THL}	—	5	10		
Propagation delay time	t _{PLH}	—	7	15	ns	See Test circuit
	t _{PHL}	—	7	15		

(C_L = 15 pF, t_r = t_f = 6 ns, V_{CC} = 5 V)

HD74UH04

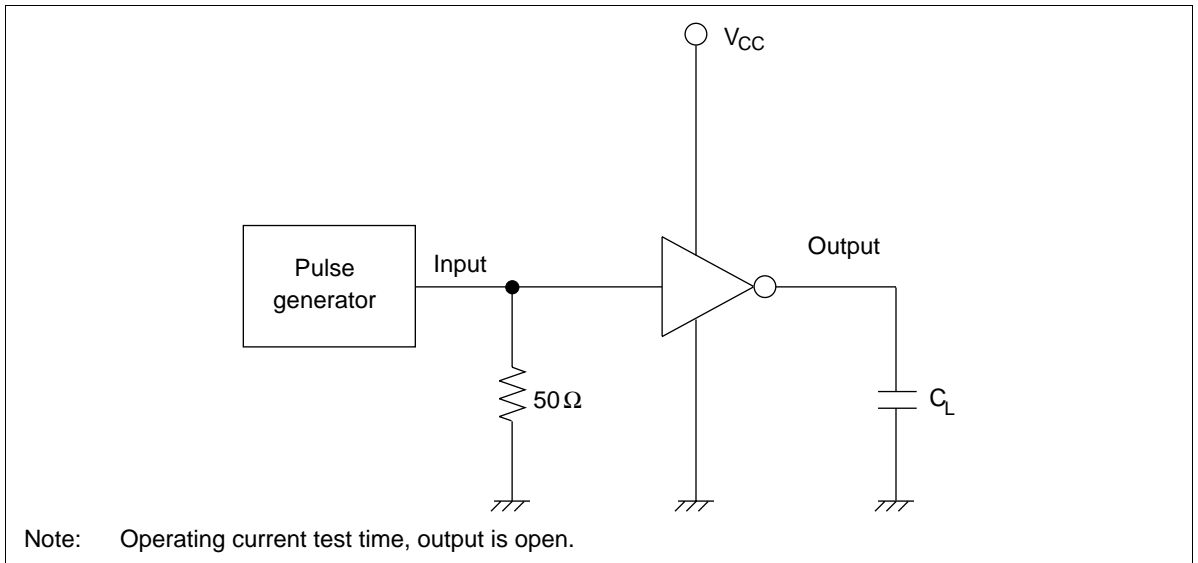
Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	
		Min	Typ	Max	Min	Max		V _{CC}	
Output rise/fall time	t _{TLH}	—	50	125	—	155	ns	2.0	See Test circuit
	t _{THL}	—	14	25	—	31		4.5	
		—	12	21	—	26		6.0	
Propagation delay time	t _{PLH}	—	48	100	—	125	ns	2.0	See Test circuit
	t _{PHL}	—	12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

(C_L = 50 pF, t_r = t_f = 6 ns)

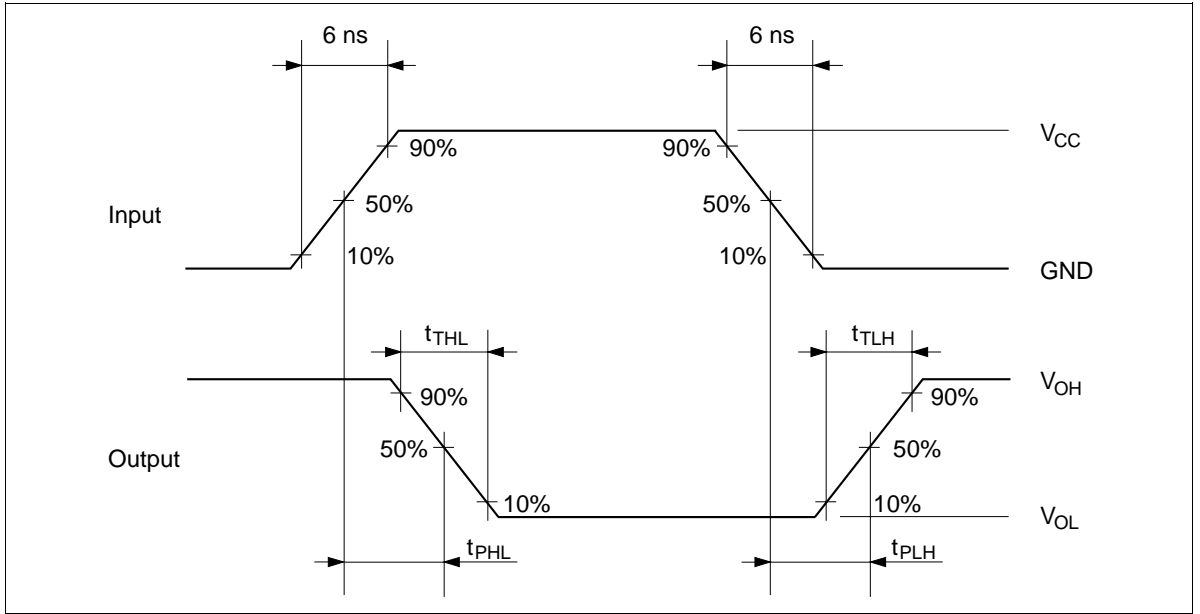
Note: C_{PD} is equivalent capacitance inside of the IC calculated from the operating current without load (see test circuit). The average operating current without load is calculated according to the expression below.

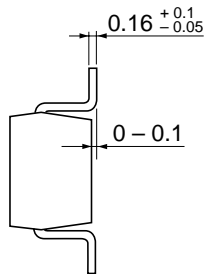
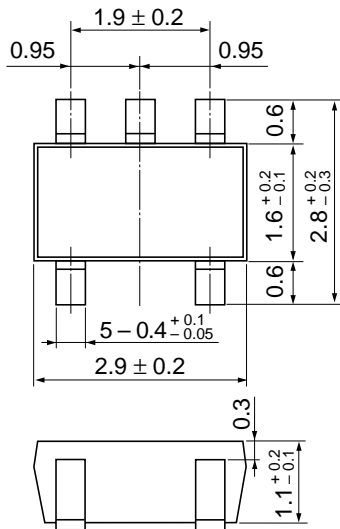
$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit



Waveforms





Hitachi Code	MPAK-5
JEDEC	—
EIAJ	—
Weight (reference value)	0.015 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

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 North America : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
 Asia (Singapore) : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>
 Asia (Taiwan) : http://www.hitachi.com.tw/E/Product/SICD_Frame.htm
 Asia (HongKong) : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>
 Japan : <http://www.hitachi.co.jp/Sicd/indx.htm>

For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

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 Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

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
Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1999. All rights reserved. Printed in Japan.

HITACHI