

HD74HC1GU04

Unbuffered Inverter

HITACHI

ADE-205-298B (Z)
3rd. Edition
April 2001

Description

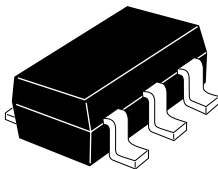
The HD74HC1GU04 is high speed CMOS unbuffered inverter using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equivalent to LS-TTL series.

Features

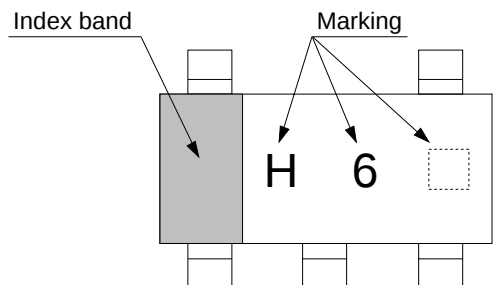
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Supply voltage range : 2 to 6 V
Operating temperature range : -40 to +85°C
- $|I_{OH}| = I_{OL} = 2 \text{ mA (min)}$

Outline and Article Indication

- HD74HC1GU04



CMPAK-5



□ = Control code
(— or blank)

HD74HC1GU04

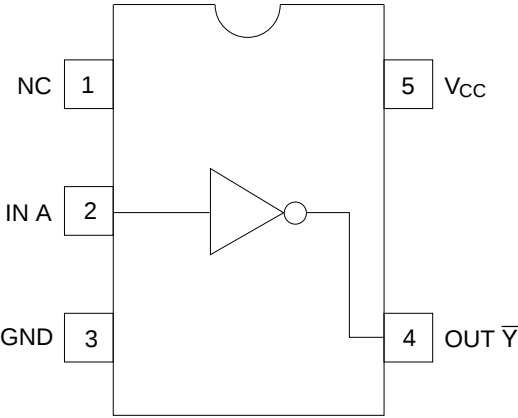
Function Table

Input A	Output $\bar{Y}$
H	L
L	H

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 ^{*1}	V_I	-0.5 to $V_{CC} + 0.5$	V	
Output voltage range ^{*1, 2}	V_O	-0.5 to $V_{CC} + 0.5$	V	Output : H or L
Input clamp current	I_{IK}	± 20	mA	$V_I < 0$ or $V_I > V_{CC}$
Output clamp current	I_{OK}	± 20	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	± 25	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	± 25	mA	
Maximum power dissipation P_T at $T_a = 25^\circ\text{C}$ (in still air) ^{*3}		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°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		$V_{CC} = 6.0\text{ V}$
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 _{CC} (V)	T _a = 25°C			T _a = -40 to 85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Input voltage	V _{IH}	2.0	1.7	—	—	1.7	—	V	
		4.5	3.6	—	—	3.6	—		
		6.0	4.8	—	—	4.8	—		
	V _{IL}	2.0	—	—	0.3	—	0.3		
		4.5	—	—	0.9	—	0.9		
		6.0	—	—	1.2	—	1.2		
Output voltage	V _{OH}	2.0	1.8	2.0	—	1.8	—	V	V _{IN} = V _{IL} I _{OH} = -20 μA
		4.5	4.0	4.5	—	4.0	—		
		6.0	5.5	6.0	—	5.5	—		
		4.5	4.18	4.31	—	4.13	—		V _{IN} = GND I _{OH} = -2 mA
		6.0	5.68	5.80	—	5.63	—		
	V _{OL}	2.0	—	0.0	0.2	—	0.2	V	V _{IN} = V _{IH} I _{OL} = 20 μA
		4.5	—	0.01	0.5	—	0.5		
		6.0	—	0.04	0.5	—	0.5		
		4.5	—	0.17	0.26	—	0.33		V _{IN} = V _{CC} I _{OL} = 2 mA
		6.0	—	0.18	0.26	—	0.33		
Input current	I _{IN}	6.0	—	—	±0.1	—	±1.0	μA	V _{IN} = V _{CC} or GND
Operating current	I _{CC}	6.0	—	—	1.0	—	10.0	μA	V _{IN} = V _{CC} or GND

Switching Characteristics

Item	Symbol	T _a = 25°C			Unit	Test Conditions
		Min	Typ	Max		
Output rise / fall time	t _{TLH} t _{THL}	—	4	10	ns	Test circuit
Propagation delay time	t _{PLH} t _{PHL}	—	3	15	ns	Test circuit

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

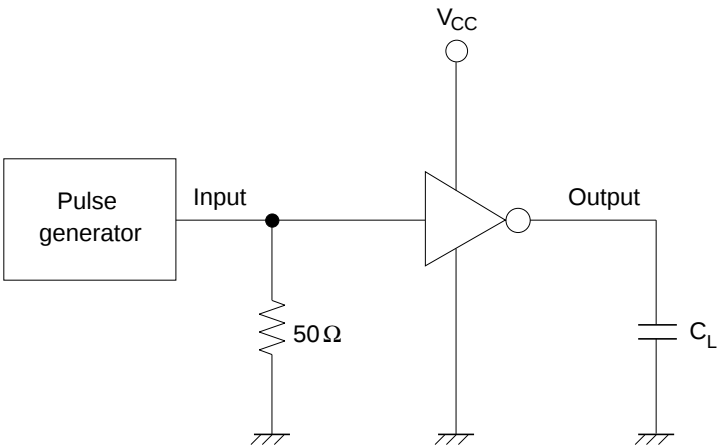
Item	Symbol	T _a = 25°C			T _a = -40 to 85°C		Unit	Test Conditions	
		V _{CC}	Min	Typ	Max	Min			Max
Output rise / fall time	t _{TLH}	2.0	—	25	125	—	155	ns	Test circuit
	t _{THL}	4.5	—	12	25	—	31		
		6.0	—	10	21	—	26		
Propagation delay time	t _{PLH}	2.0	—	17	100	—	125	ns	Test circuit
	t _{PHL}	4.5	—	7	20	—	25		
		6.0	—	6.5	17	—	21		
Input capacitance	C _{IN}	—	—	2.5	5	—	5	pF	
Equivalent capacitance	C _{PD}	—	—	10	—	—	—	pF	

(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.

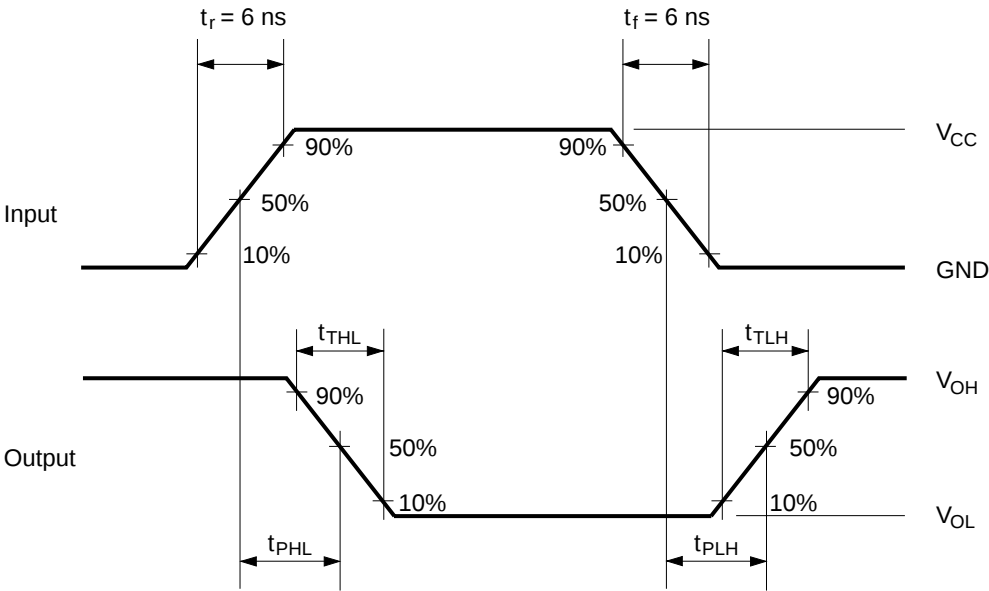
$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit



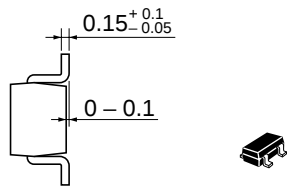
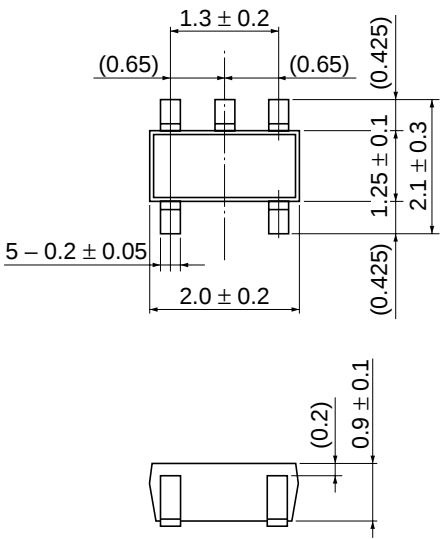
Note: 1. C_L includes probe and jig capacitance.

• Waveforms



Package Dimensions

As of January, 2001
Unit: mm



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

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	NorthAmerica	:	http://semiconductor.hitachi.com/
	Europe	:	http://www.hitachi-eu.com/hel/ecg
	Asia	:	http://sicapac.hitachi-asia.com
	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 Ltd. Electronic Components Group. Whitebrook Park Lower Cookham Road 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
--	---	---	---

Copyright © Hitachi, Ltd., 2001. All rights reserved. Printed in Japan.

Colophon 3.0