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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD74HCT1G04

Inverter



ADE-205-303C (Z)

4th. Edition
Feb. 2003

Description

The HD74HCT1G04 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.

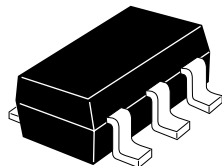
Features

- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- TTL compatible input level.
Supply voltage range : 4.5 to 5.5 V
Operating temperature range : -40 to +85°C
- $|I_{OH}| = I_{OL} = 2 \text{ mA (min)}$
- Ordering Information

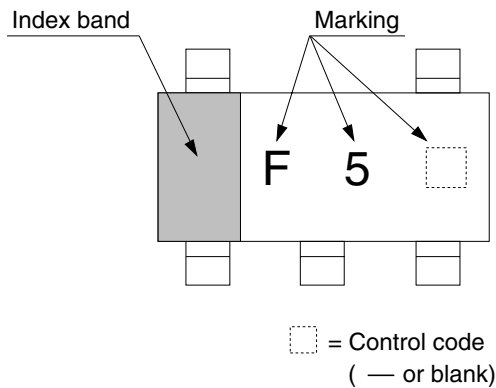
Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HCT1G04CME	CMPAK-5 pin	CMPAK-5V	CM	E (3,000 pcs/reel)

Outline and Article Indication

• HD74HCT1G04



CMPAK-5



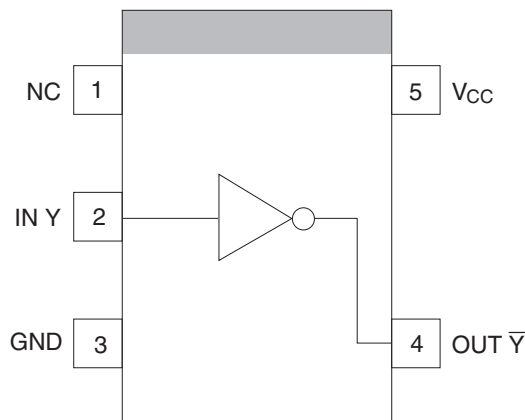
Function Table

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	°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}	4.5	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	V_O	0	V_{CC}	V	
Output current	I_{OL}	—	2	mA	$V_{CC} = 4.5$ to 5.5 V
	I_{OH}	—	-2		$V_{CC} = 4.5$ to 5.5 V
Input rise / fall time (0.3 V to 2.7 V)	t_r, t_f	0	500	ns	$V_{CC} = 4.5$ to 5.5 V
Operating temperature	T_a	-40	85	°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}	4.5 to 5.5	2.0	—	—	2.0	—	V		
	V _{IL}	4.5 to 5.5	—	—	0.8	—	0.8			
Output voltage	V _{OH}	4.5	4.4	4.5	—	4.4	—	V	V _{IN} = V _{IL}	I _{OH} = -20 µA
		4.5	4.18	4.31	—	4.13	—			I _{OH} = -2 mA
	V _{OL}	4.5	—	0.0	0.1	—	0.1		V _{IN} = V _{IH}	I _{OL} = 20 µA
		4.5	—	0.17	0.26	—	0.33			I _{OL} = 2 mA
Input current	I _{IN}	5.5	—	—	±0.1	—	±1.0	µA	V _{IN} = V _{CC} or GND	
Operating current	I _{CC}	5.5	—	—	1.0	—	10.0	µA	V _{IN} = V _{CC} or GND	
Quiescent supply current	I _{CCT}	5.5	—	—	2.0	—	2.9	mA	One input V _{IN} = 2.4 V, other input V _{CC} or GND	

Switching Characteristics

Item	Symbol	Ta = 25°C			Unit	Test Conditions
		Min	Typ	Max		
Output rise / fall time	t _{TLH}	—	6	10	ns	Test circuit
	t _{THL}	—	6	10		
Propagation delay time	t _{PLH}	—	7.5	12	ns	Test circuit
	t _{PHL}	—	10	17		

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

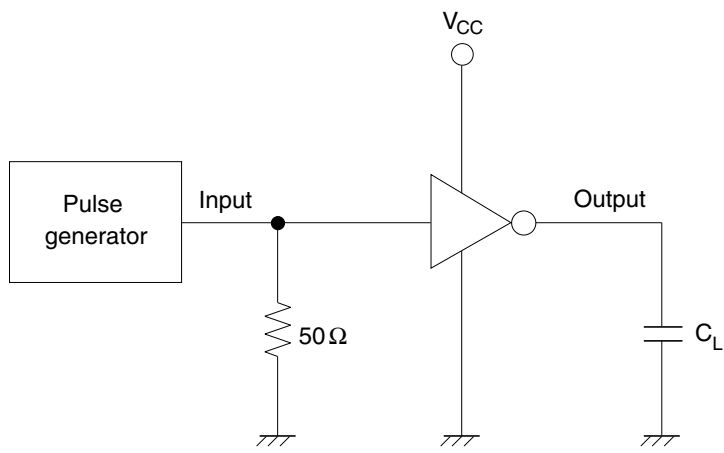
Item	Symbol	V _{CC}	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Output rise / fall time	t _{TLH}	4.5	—	14	25	—	31	ns	Test circuit
	t _{THL}	4.5	—	14	25	—	31		
Propagation delay time	t _{PLH}	4.5	—	11.2	16	—	20	ns	Test circuit
	t _{PHL}	4.5	—	16.4	27	—	31		
Input capacitance	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.

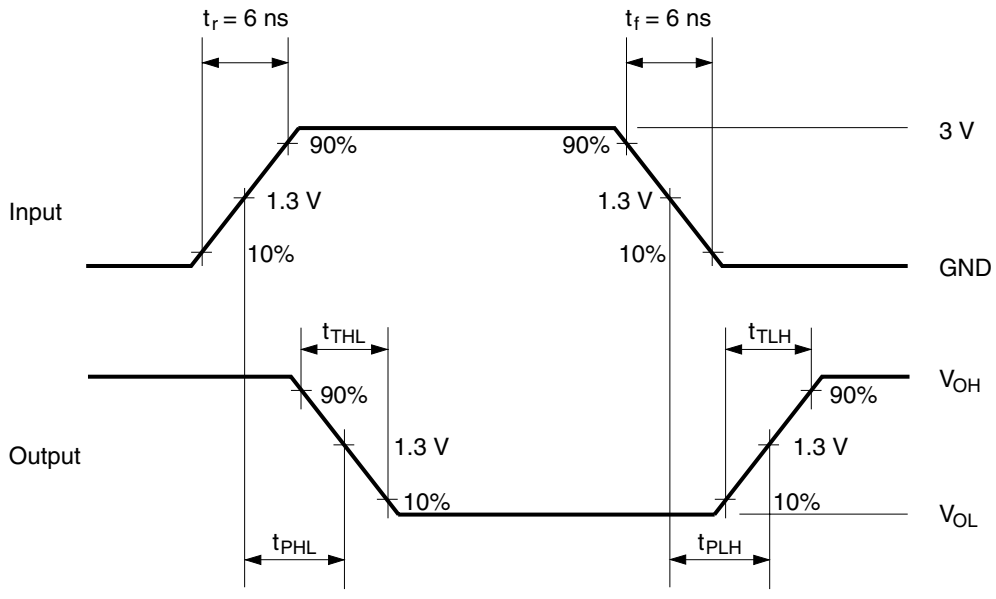
$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Test Circuit



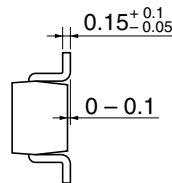
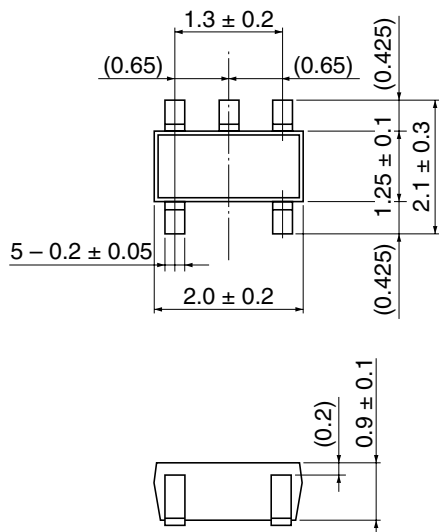
Note: 1. C_L includes probe and jig capacitance.

• Waveforms



Package Dimensions

Unit: mm



*Sn-Bi plating

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

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Sales Offices

HITACHI

Hitachi, Ltd.

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

URL <http://www.hitachisemiconductor.com/>

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) 778322

Hitachi Europe GmbH
 Electronic Components Group
 Dornacher Str 3
 D-85622 Feldkirchen
 Postfach 201, D-85619 Feldkirchen
 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>-6538-6533/6538-8577
 Fax: <65>-6538-6933/6538-3877
 URL: <http://semiconductor.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://semiconductor.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>-2735-9218
 Fax: <852>-2730-0281
 URL: <http://semiconductor.hitachi.com.hk>

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