HD74UH04

Inverter

HITACHI

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

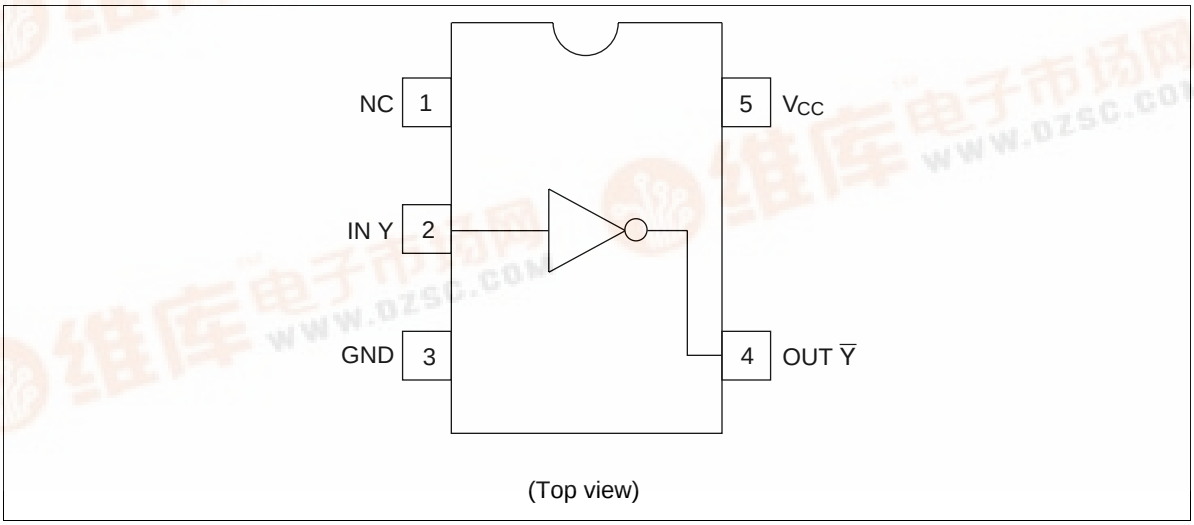
Description

The HD74UH04 is high speed CMOS inverter using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equiralent 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 × 1.6 × 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°C
- $| I_{OH} | = I_{OL} = 2$ mA (min)

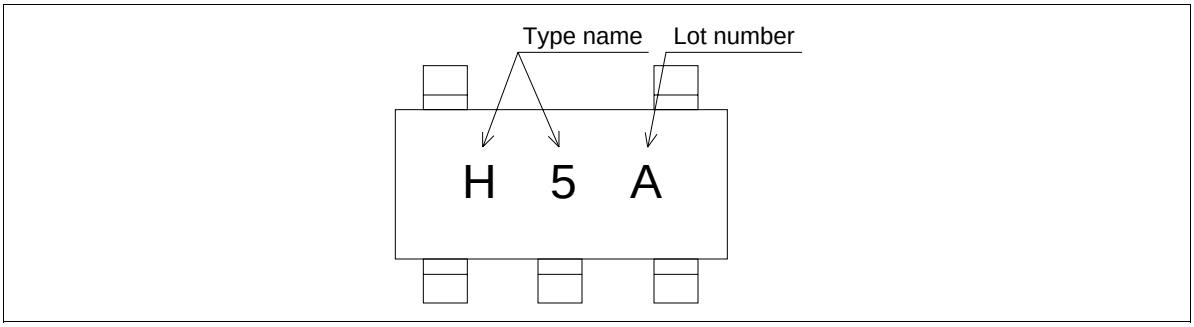
Pin Arrangement



(Top view)

Hitachi semiconductor

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
Strage temperature	Tstg	–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	Topr	–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 Min	Typ	Max	Ta = –40 to 85°C Min	Max	Unit	Test Conditions 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
Input current	I_{IN}	—	—	±0.1	—	±1.0	µA	6.0	$V_{IN} = V_{CC}$ or GND	
Operating current	I_{CC}	—	—	1.0	—	10.0		6.0	$V_{IN} = V_{CC}$ or GND	

Switching Characteristics

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

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

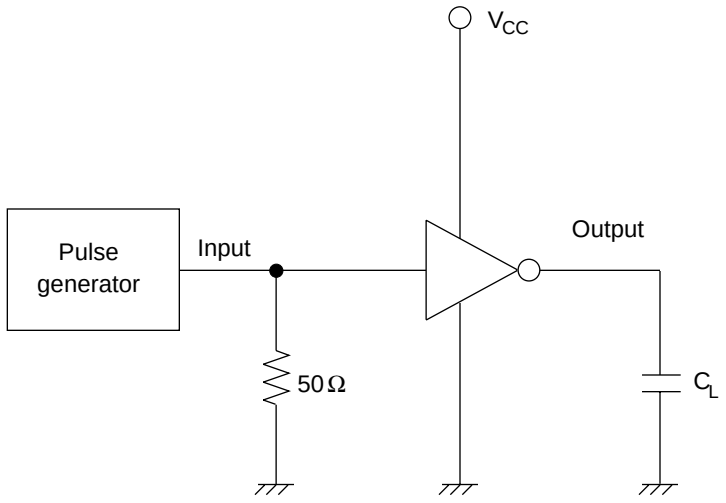
Item	Symbol	Ta = 25°C Min	Typ	Max	Ta = –40 to 85°C Min	Max	Unit	Test Conditions V_{cc}	
Output rise/fall time	t_{TLH}	—	50	125	—	155	ns	2.0	See Test circuit
	t_{THL}	—	14	25	—	31		4.5	
		—	12	21	—	26		6.0	
Propagation delay time	t_{PLH}	—	48	100	—	125	ns	2.0	See Test circuit
	t_{PHL}	—	12	20	—	25		4.5	
		—	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.

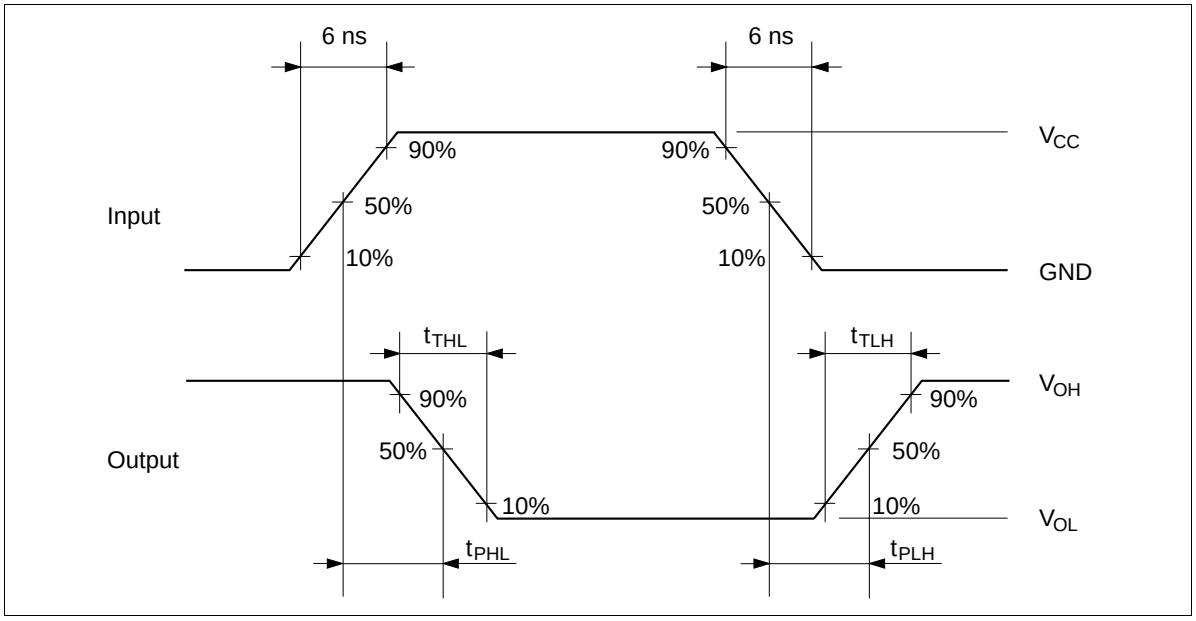
$I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}$

Test Circuit

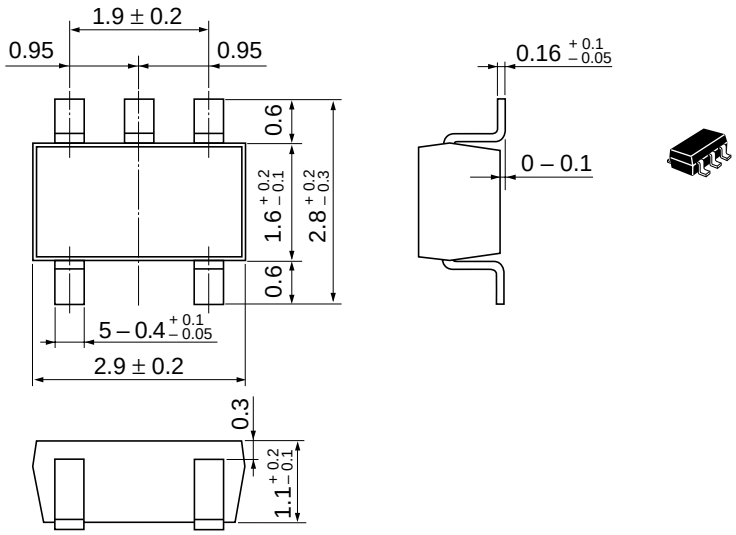


Note: Operating current test time, output is open.

Waveforms


6 ns
6 ns
90%
90%
50%
50%
10%
10%
Input
V_{CC}
GND
t_{THL}
t_{TLH}
90%
90%
50%
50%
10%
10%
Output
V_{OH}
V_{OL}
t_{PHL}
t_{PLH}

Unit: mm


1.9 ± 0.2
0.95
0.95
0.6
1.6 +0.2 −0.1
2.8 +0.2 −0.3
0.6
5 – 0.4 +0.1 −0.05
2.9 ± 0.2
0.3
1.1 +0.2 −0.1
0.16 +0.1 −0.05
0 – 0.1

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