

# HD74UH02

2-input NOR Gate

# HITACHI

ADE-205-015A(Z)  
2nd Edition  
August 1993

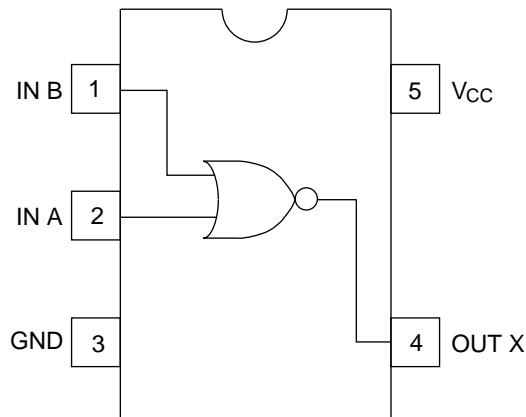
## Description

The HD74UH02 is high speed CMOS two input NOR 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

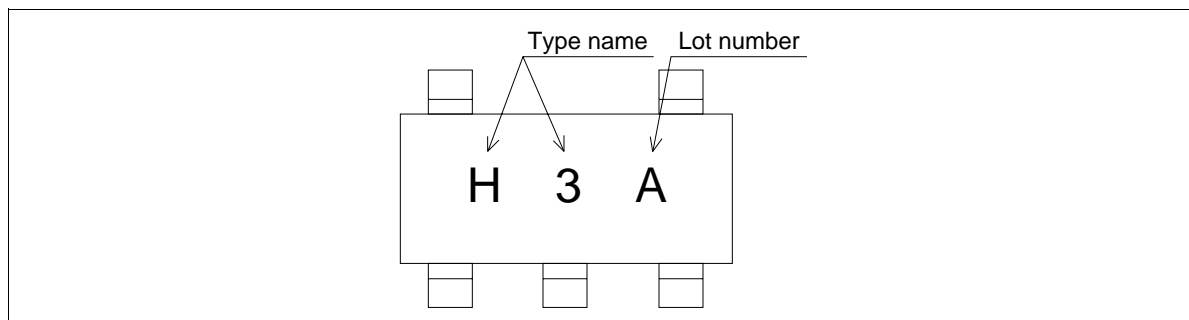
- Encapsulated in very small 5pins package of  $2.9 \times 1.6 \times 1.1$  mm, the efficiency to mount on substrate is significantly improved.
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on embos taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74HC02  
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	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
Output current	$I_{OUT}$	$\pm 25$	mA
$V_{CC}$ /GND current	$I_{CC}, I_{GND}$	$\pm 25$	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 <sub>CC</sub>			
Input voltage	V <sub>IH</sub>	1.5	—	—	1.5	—	V	2.0			
		3.15	—	—	3.15	—		4.5			
		4.2	—	—	4.2	—		6.0			
	V <sub>IL</sub>	—	—	0.5	—	0.5	V	2.0			
		—	—	1.35	—	1.35		4.5			
		—	—	1.8	—	1.8		6.0			
Output voltage	V <sub>OH</sub>	1.9	2.0	—	1.9	—	V	2.0	V <sub>IN</sub> = V <sub>IL</sub>	I <sub>OH</sub> = -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 <sub>OH</sub> = -2 mA
		5.68	5.80	—	5.63	—		6.0			I <sub>OH</sub> = -2.6 mA
	V <sub>OL</sub>	—	0.0	0.1	—	0.1	V	2.0	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 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 <sub>OL</sub> = 2 mA
		—	0.18	0.26	—	0.33		6.0			I <sub>OL</sub> = 2.6 mA
		—	—	—	—	—		—			—
Input current	I <sub>IN</sub>	—	—	±0.1	—	±1.0	μA	6.0	V <sub>IN</sub> = V <sub>CC</sub> or GND		
Operating current	I <sub>CC</sub>	—	—	1.0	—	10.0		6.0	V <sub>IN</sub> = V <sub>CC</sub> or GND		

**Switching Characteristics**

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

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

# HD74UH02

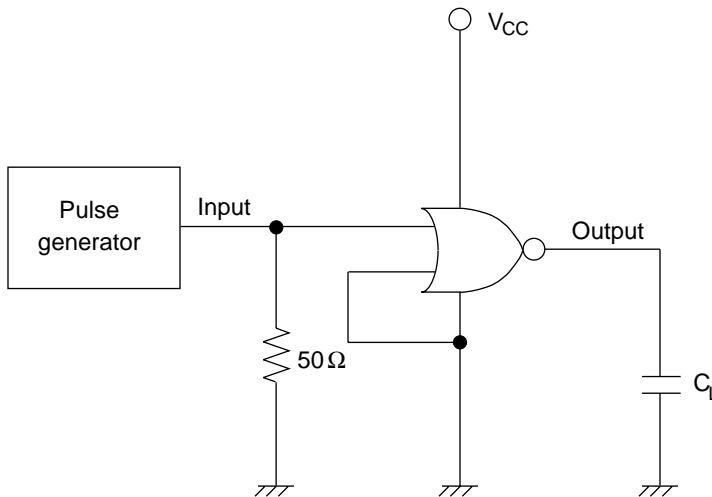
Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	
		Min	Typ	Max	Min	Max		V <sub>CC</sub>	
Output rise/fall time	t <sub>TLH</sub>	—	50	125	—	155	ns	2.0	See Test circuit
	t <sub>THL</sub>	—	14	25	—	31		4.5	
		—	12	21	—	26		6.0	
Propagation delay time	t <sub>PLH</sub>	—	48	100	—	125	ns	2.0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

(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.

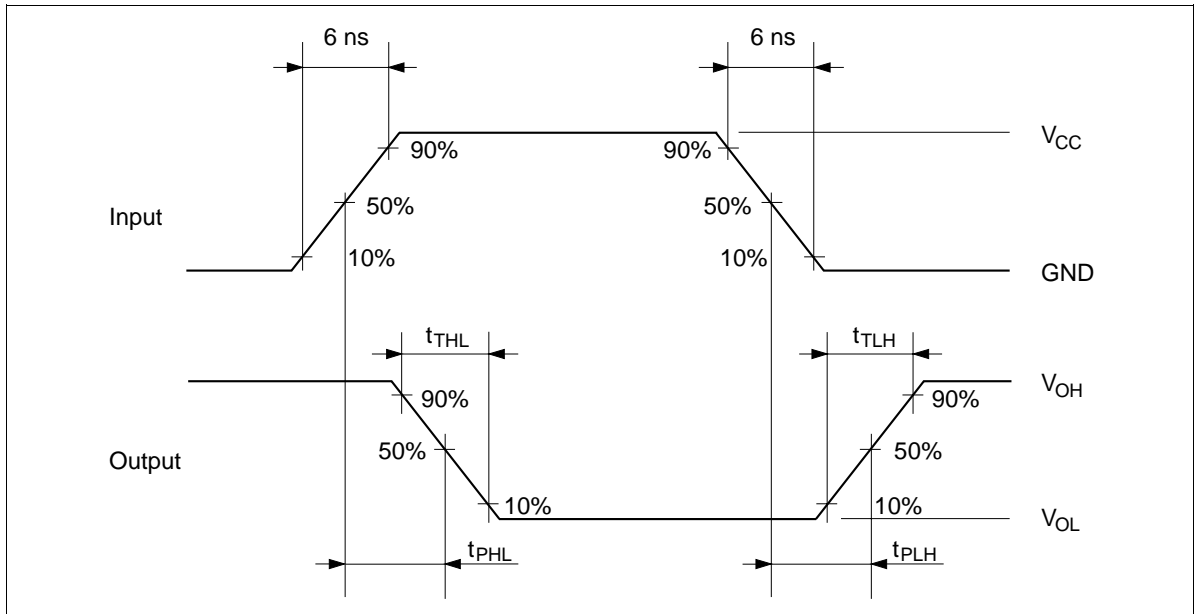
$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

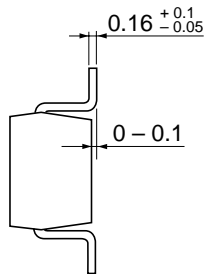
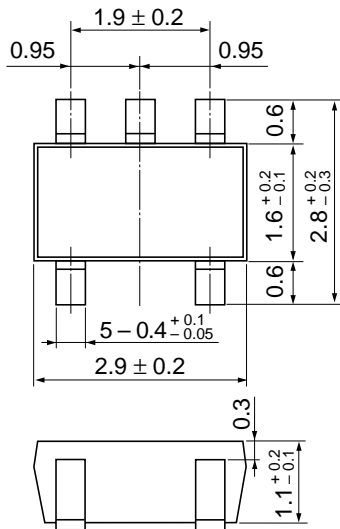
## Test Circuit



Note: Operating current test time, output is open.

Waveforms





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

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