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

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Keep safety first in your circuit designs!

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HD74UH02

2-input NOR Gate



ADE-205-015C (Z)

4th. Edition
Feb. 2003

Description

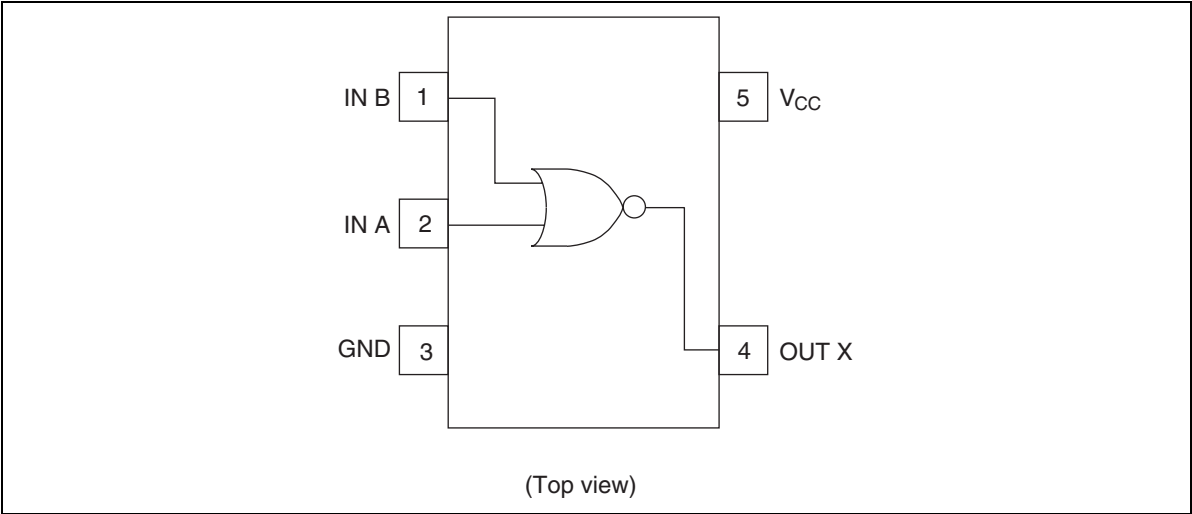
The HD74UH02 is high speed CMOS two input NOR gate using silicon gate CMOS process. With CMOS low power dissipation, it provides high speed equivalent to LS-TTL series. The internal circuit of three stages construction with buffer provides wide noise margin and stable output.

Features

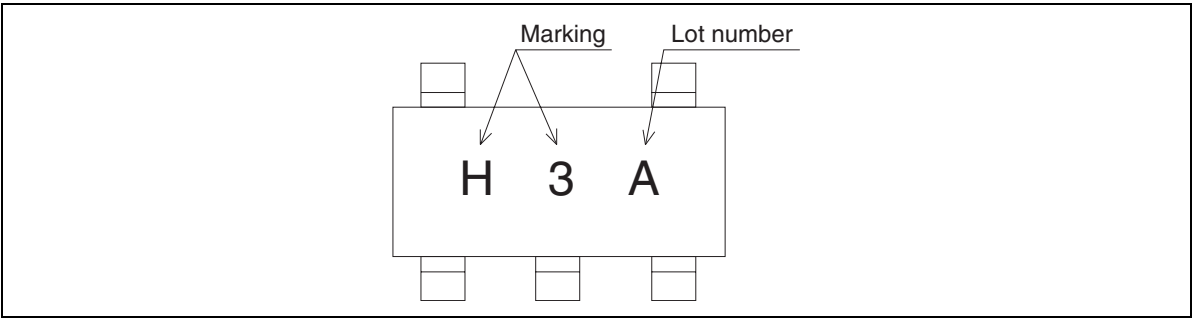
- Encapsulated in very small 5pins package of $2.9 \times 1.6 \times 1.1$ mm, the efficiency to mount on substrate is significantly improved.
- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Electrical characteristics equivalent to the HD74HC02
Supply voltage range: 2 to 6 V
Operating temperature range: -40 to $+85^{\circ}\text{C}$
- $|I_{\text{OH}}| = I_{\text{OL}} = 2$ mA (min)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74UH02EL	MPAK-5 pin	MPAK-5V	—	EL (3,000 pcs/reel)

Pin Arrangement



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	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	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	V _{CC}	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	V _{IN} = V _{IL}	I _{OH} = -20 μA
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	4.31	—	4.13	—			I _{OH} = -2 mA
		6.0	5.68	5.80	—	5.63	—			I _{OH} = -2.6 mA
		6.0	—	—	—	—	—			
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	0.17	0.26	—	0.33			I _{OL} = 2 mA
		6.0	—	0.18	0.26	—	0.33			I _{OL} = 2.6 mA
		6.0	—	—	—	—	—			
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		V _{IN} = V _{CC} or GND	

Switching Characteristics

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

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}					
Propagation delay time	t _{PLH}	—	7	15	ns	See Test circuit
	t _{PHL}					

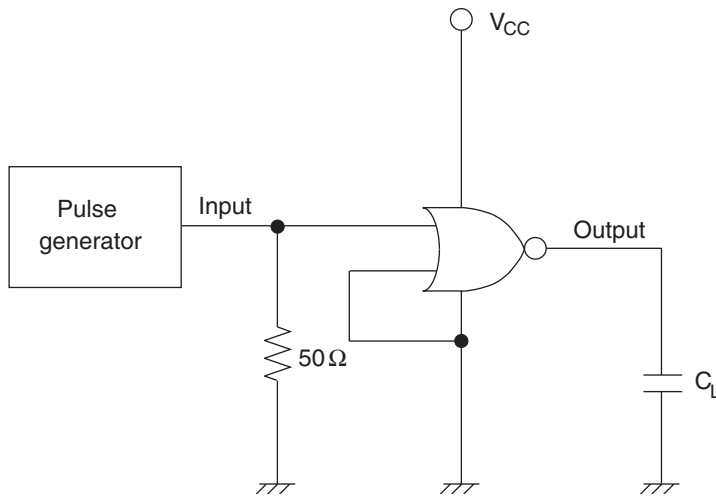
(C_L = 50 pF, t_r = t_f = 6 ns)

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}	2.0	—	50	125	—	155	ns	See Test circuit
	t _{THL}	4.5	—	14	25	—	31		
		6.0	—	12	21	—	26		
Propagation delay time	t _{PLH}	2.0	—	48	100	—	125	ns	See Test circuit
	t _{PHL}	4.5	—	12	20	—	25		
		6.0	—	9	17	—	21		
Input capacitance	C _{IN}	—	—	5	10	—	10	pF	
Equivalent capacitance	C _{PD}	—	—	10	—	—	—		

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.

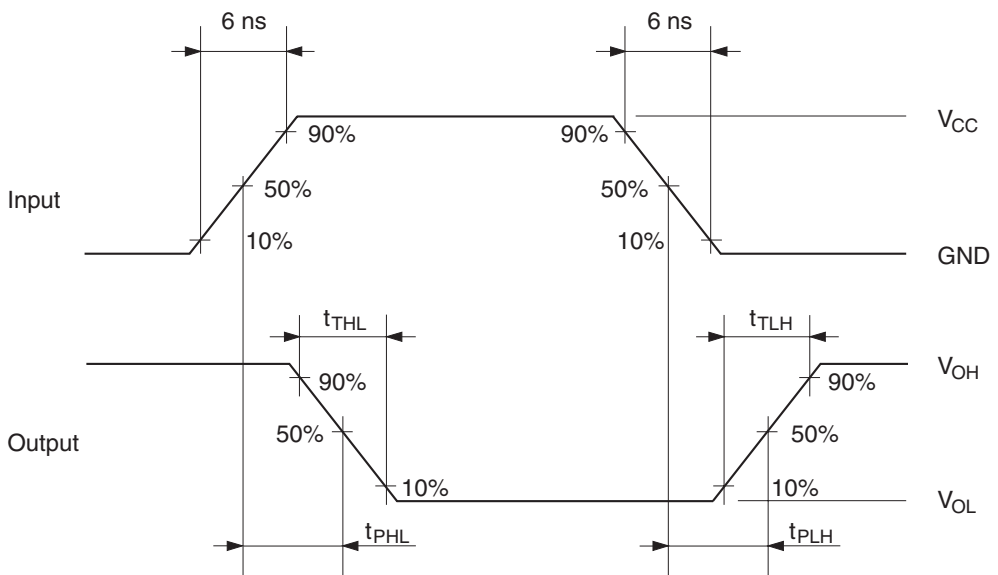
$I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

Test Circuit



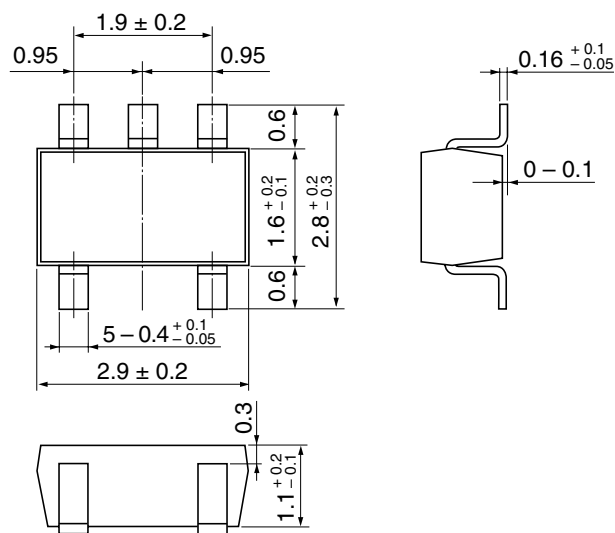
Note: Operating current test time, output is open.

Waveforms



Package Dimensions

Unit: mm



*Sn-Bi plating

Hitachi Code	MPAK-5V
JEDEC	—
JEITA	—
Mass (reference value)	0.015 g

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