TC74HC02AP/AF/AFN

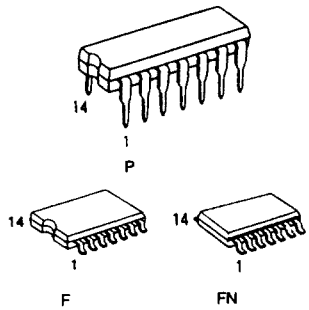
Quad 2-Input NOR Gate

The TC74HC02A is a high speed CMOS 2-INPUT NOR GATE fabricated with silicon gate C^2MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

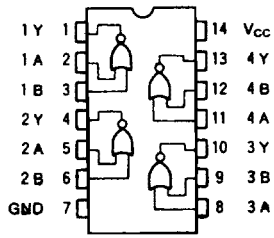
The internal circuit is composed of 3 stages, including buffer output, which provide high noise immunity and stable output.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.



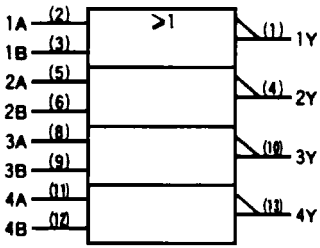
Features

- High Speed: t_{pd} = 6ns(Typ.) at V_{CC} = 5V
- Low Power Dissipation: I_{CC} = 1μA(Max.) at Ta = 25°C
- High Noise Immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC}(Min.)
- Output Drive Capability: 10 LSTTL Loads
- Symmetrical Output Impedance: $|I_{OH}| = I_{OL}$ = 4mA(Min.)
- Balanced Propagation Delays: $t_{pLH} = t_{pHL}$
- Wide Operating Voltage Range: V_{CC}(opr) = 2V ~ 6V
- Pin and Function Compatible with 74LS02



(TOP VIEW)

Pin Assignment



IEC Logic Symbol

Truth Table

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Supply Voltage Range	V_{CC}	-0.5 ~ 7	V
DC Input Voltage	V_{IN}	-0.5 ~ V_{CC} + 0.5	V
DC Output Voltage	V_{OUT}	-0.5 ~ V_{CC} + 0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±25	mA
DC V_{CC}/Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	500(DIP)*/180(MFP)	mW
Storage Temperature	T_{stg}	-65 ~ 150	°C
Lead Temperature 10sec	T_L	300	°C

*500mW in the range of Ta = -40°C ~ 65°C. From Ta = 65°C to 85°C a derating factor of -10mW/°C shall be applied until 300mW.

Recommended Operating Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	2 ~ 6	V
Input Voltage	V_{IN}	0 ~ V_{CC}	V
Output Voltage	V_{OUT}	0 ~ V_{CC}	V
Operating Temperature	T_{opr}	-40 ~ 85	°C
Input Rise and Fall Time	t_r, t_f	0 ~ 1000(V_{CC} = 2.0V) 0 ~ 500(V_{CC} = 4.5V) 0 ~ 400(V_{CC} = 6.0V)	ns

DC Electrical Characteristics

Parameter	Symbol	Test Condition		V_{CC}	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max.	Ta = -40 ~ 85°C Min.	Ta = -40 ~ 85°C Max.	Unit
High-Level Input Voltage	V_{IH}	–		2.0	1.5	–	–	1.5	–	V
				4.5	3.15	–	–	3.15	–	
				6.0	4.2	–	–	4.2	–	
Low-Level Input Voltage	V_{IL}	–		2.0	–	–	0.5	–	0.5	V
				4.5	–	–	1.35	–	1.35	
				6.0	–	–	1.8	–	1.8	
High-Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -20μA	2.0	1.9	2.0	–	1.9	–	V
				4.5	4.4	4.5	–	4.4	–	
				6.0	5.9	6.0	–	5.9	–	
			I_{OH} = -4 mA	4.5	4.18	4.31	–	4.13	–	
			I_{OH} = -5.2mA	6.0	5.68	5.80	–	5.63	–	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20μA	2.0	–	0.0	0.1	–	0.1	V
				4.5	–	0.0	0.1	–	0.1	
				6.0	–	0.0	0.1	–	0.1	
			I_{OL} = 4 mA	4.5	–	0.17	0.26	–	0.33	
			I_{OL} = 5.2mA	6.0	–	0.18	0.26	–	0.33	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	–	–	±0.1	–	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	–	–	1.0	–	10.0	

AC Electrical Characteristics (C_L = 15pF, V_{CC} = 5V, Ta = 25°C, Input t_r = t_f = 6ns)

Parameter	Symbol	Test Conditon	Min.	Typ.	Max.	Unit
Output Transition Time	t_{TLH} t_{THL}	–	–	4	8	ns
Propagation Delay Time	t_{pLH} t_{pHL}	–	–	6	12	

AC Electrical Characteristics (C_L = 50pF, Input t_r = t_f = 6ns)

Parameter	Symbol	Test Condition		Ta = 25°C			Ta = -40 ~ 85°C		Unit
			V_{CC}	Min	Typ.	Max.	Min.	Max.	
Output Transition Time	t_{TLH} t_{THL}	–	2.0	–	25	75	–	95	ns
			4.5	–	7	15	–	19	
			6.0	–	6	13	–	16	
Propagation Delay Time	t_{pLH} t_{pHL}	–	2.0	–	27	75	–	95	
			4.5	–	9	15	–	19	
			6.0	–	8	13	–	16	
Input Capacitance	C_{IN}	–		–	5	10	–	10	pF
Power Dissipation Capacitance	C_{PD}(1)	–		–	21	–	–	–	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation:
$I_{CC(opr)} = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/4$(per Gate)

Notes