

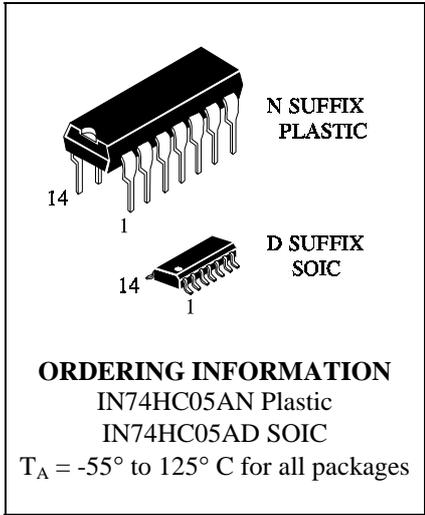
IN74HC05A

Hex Inverter with Open-Drain Outputs High-Performance Silicon-Gate CMOS

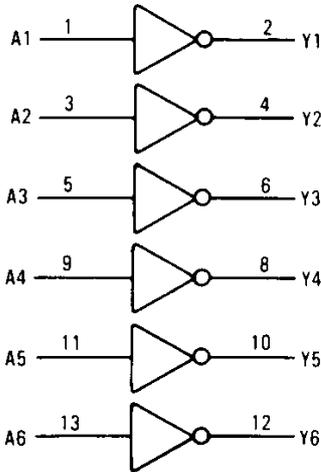
The IN74HC05A is identical in pinout to the LS/ALS05. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with LS/ALSTTL outputs.

This device contains six independent gates, each of which performs the logic INVERT function. The open-drain outputs require external pull-up resistors for proper logical operation. They may be connected to other open-drain outputs to implement active-high wired-AND functions.

- Outputs Directly Interface to CMOS, NMOS, and TTL
• Operating Voltage Range: 2.0 to 6.0 V
• Low Input Current: 1.0 µA
• High Noise Immunity Characteristic of CMOS Devices



LOGIC DIAGRAM



PIN 14 = VCC
PIN 7 = GND

PIN ASSIGNMENT

Table mapping pins 1-14 to inputs A1-A6, outputs Y1-Y6, VCC, and GND.

FUNCTION TABLE

Function table with columns Inputs (A) and Output (Y), showing L and H input states and Z output state.

Z = High Impedance

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +7.0	V
V _{IN}	DC Input Voltage (Referenced to GND)	-1.5 to V _{CC} +1.5	V
V _{OUT}	DC Output Voltage (Referenced to GND)	-0.5 to V _{CC} +0.5	V
I _{IN}	DC Input Current, per Pin	±20	mA
I _{OUT}	DC Output Current, per Pin	±25	mA
I _{CC}	DC Supply Current, V _{CC} and GND Pins	±50	mA
P _D	Power Dissipation in Still Air, Plastic DIP+ SOIC Package+	750 500	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°C

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

+Derating - Plastic DIP: - 10 mW/°C from 65° to 125°C
SOIC Package: : - 7 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	V
V _{IN} , V _{OUT}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V _{CC}	V
T _A	Operating Temperature, All Package Types	-55	+125	°C
t _r , t _f	Input Rise and Fall Time (Figure 1)			
	V _{CC} =2.0 V	0	1000	ns
	V _{CC} =4.5 V	0	500	
	V _{CC} =6.0 V	0	400	

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{IN} and V_{OUT} should be constrained to the range GND ≤ (V_{IN} or V_{OUT}) ≤ V_{CC}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS(Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				25 °C to -55°C	≤85 °C	≤125 °C	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} =0.1 V I _{OUT} ≤ 20 μA	2.0	1.5	1.5	1.5	V
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V _{IL}	Maximum Low - Level Input Voltage	V _{OUT} = V _{CC} -0.1 V or 0.1 V I _{OUT} ≤ 20 μA	2.0	0.5	0.5	0.5	V
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
V _{OL}	Maximum Low-Level Output Voltage	V _{IN} =V _{IH} I _{OUT} ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
		6.0	0.1	0.1	0.1		
		V _{IN} =V _{IH} I _{OUT} ≤ 4.0 mA I _{OUT} ≤ 5.2 mA	4.5	0.26	0.33	0.4	
6.0	0.26		0.33	0.4			
I _{IN}	Maximum Input Leakage Current	V _{IN} =V _{CC} or GND	6.0	±0.1	±1.0	±1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{IN} =V _{CC} or GND I _{OUT} =0μA	6.0	1.0	10	40	μA
I _{OZ}	Maximum Three- State Leakage Current	Output in High-Impedance State V _{IN} = V _{IL} or V _{IH} I _{OUT} = V _{CC} or GND	6.0	±0.5	±5.0	±10	μA

AC ELECTRICAL CHARACTERISTICS($C_L=50\text{pF}$, Input $t_r=t_f=6.0\text{ ns}$)

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			25 °C to -55°C	≤85°C	≤125°C	
t_{PLZ}, t_{PZL}	Maximum Propagation Delay, Input A to Output Y (Figures 1 and 2)	2.0	125	150	180	ns
		4.5	24	30	36	
		6.0	20	26	31	
t_{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 2)	2.0	75	95	110	ns
		4.5	15	19	22	
		6.0	13	16	19	
C_{IN}	Maximum Input Capacitance	-	10	10	10	pF
C_{OUT}	Maximum Three-State Output Capacitance (Output in High-Impedance State)	-	10	10	10	pF

C_{PD}	Power Dissipation Capacitance (Per Gate)	Typical @25°C, $V_{CC}=5.0\text{ V}$		pF
	Used to determine the no-load dynamic power consumption: $P_D=C_{PD}V_{CC}^2f+I_{CC}V_{CC}$	8.0		

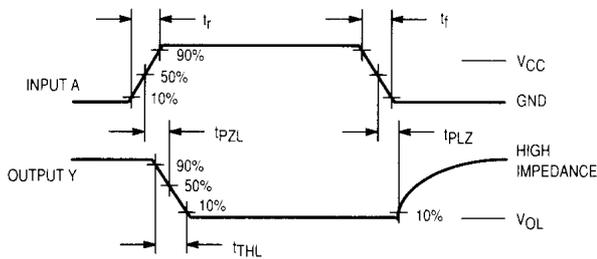


Figure 1. Switching Waveforms

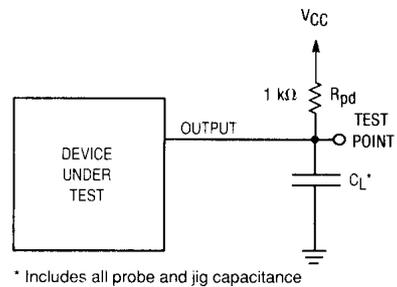
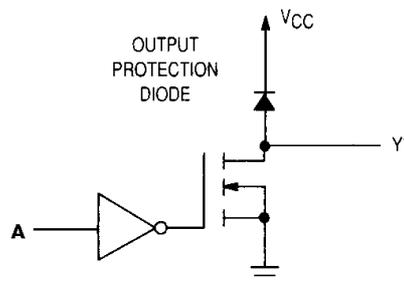


Figure 2. Test Circuit

**EXPANDED LOGIC DIAGRAM
(1/6 of the Device)**



* Denotes open-drain outputs