

**IN74LS05**

## Hex Inverters with Open-Drain Outputs

This device contains six independent inverters. It performs the Boolean function  $Y=A$ . The open collector outputs require pull-up resistor to perform correctly. Open-collector devices are often used to generate higher  $V_{OH}$  levels.

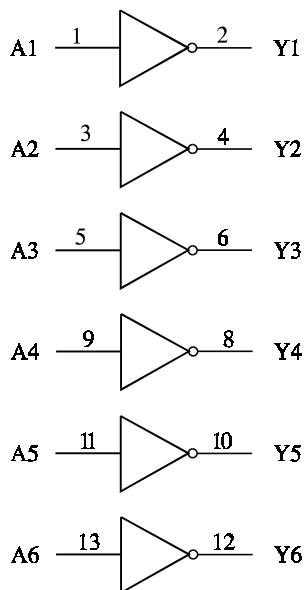
### Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC(Min)} - V_{OH}}{N_1(I_{OH}) + N_2(I_{IH})}$$

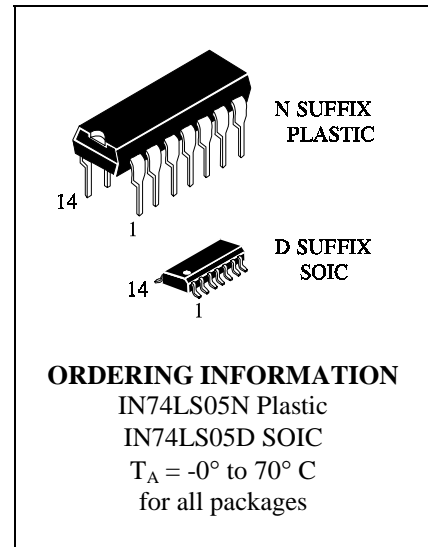
$$R_{MIN} = \frac{V_{CC(Max)} - V_{OL}}{(I_{OL} + N_3(I_{IL}))}$$

Where:  $N_1(I_{OH})$ =total maximum output high current for all outputs tied to pull-up resistor  
 $N_2(I_{IH})$ =total input high current for all inputs tied to pull-up resistor  
 $N_3(I_{IL})$ =total input low current for all inputs tied to pull-up resistor

### LOGIC DIAGRAM



PIN 14 =  $V_{CC}$   
 PIN 7 = GND



### PIN ASSIGNMENT

A1	1	14	$V_{CC}$
Y1	2	13	A6
A2	3	12	Y6
Y2	4	11	A5
A3	5	10	Y5
Y3	6	9	A4
GND	7	8	Y4

### FUNCTION TABLE

Inputs	Output
A	Y
L	H
H	L

**MAXIMUM RATINGS\***

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	7.0	V
V <sub>IN</sub>	Input Voltage	7.0	V
V <sub>OUT</sub>	Output Voltage	7.0	V
T <sub>stg</sub>	Storage Temperature Range	-65 to +150	°C

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

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage	4.75	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2.0		V
V <sub>IL</sub>	Low Level Input Voltage		0.8	V
V <sub>OH</sub>	High Level Output Voltage		5.5	V
I <sub>OL</sub>	Low Level Output Current		8.0	mA
T <sub>A</sub>	Ambient Temperature Range	0	+70	°C

**DC ELECTRICAL CHARACTERISTICS** over full operating conditions

Symbol	Parameter	Test Conditions	Guaranteed Limit		Unit	
			Min	Max		
V <sub>IK</sub>	Input Clamp Voltage	V <sub>CC</sub> = min, I <sub>IN</sub> = -18 mA		-1.5	V	
I <sub>OH</sub>	High Level Output Current	V <sub>CC</sub> = min, V <sub>OH</sub> = max		0.1	mA	
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = min, I <sub>OL</sub> = 4 mA		0.4	V	
		V <sub>CC</sub> = min, I <sub>OL</sub> = 8 mA		0.5		
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = max, V <sub>IN</sub> = 2.7 V		20	μA	
		V <sub>CC</sub> = max, V <sub>IN</sub> = 7.0 V		0.1	mA	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = max, V <sub>IN</sub> = 0.4 V		-0.4	mA	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = max	Total with outputs high		2.4	mA
			Total with outputs low		6.6	

**AC ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $C_L = 15\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 2\text{ k}\Omega$ ,  $t_r = 15\text{ ns}$ ,  $t_f = 6.0\text{ ns}$ )

Symbol	Parameter	Min	Max	Unit
$t_{PLH}$	Propagation Delay Time		32	ns
$t_{PHL}$	Propagation Delay Time		28	ns

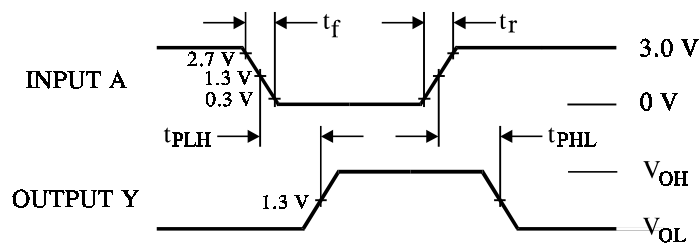
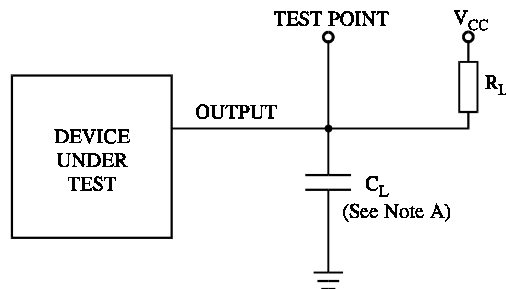


Figure 1. Switching Waveforms



NOTE A.  $C_L$  includes probe and jig capacitance.

Figure 2. Test Circuit