IN74HCT14A

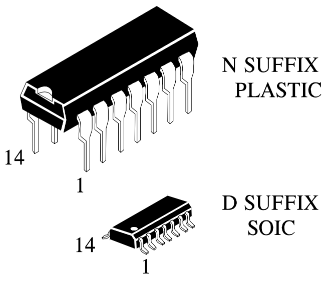
Hex Schmitt-Trigger Inverter
High-Performance Silicon-Gate CMOS

The IN74HCT14A may be used as a level converter for interfacing TTL or NMOS outputs to high-speed CMOS inputs.

The IN74HCT14A is identical in pinout to the LS/ALS14.

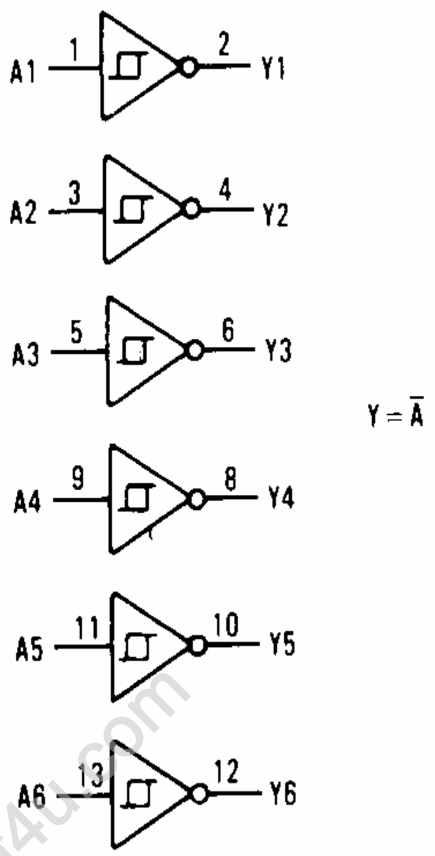
The IN74HCT14A is useful to "square up" slow input rise and fall times. Due to the hysteresis voltage of the Schmitt trigger, the IN74HCT14A finds applications in noisy environments.

- TTL/NMOS-Compatible Input Levels.
- Outputs Directly Inferface to CMOS, NMOS and TTL.
- Operating Voltage Range: 4.5 to 5.5 V
- Low Input Current: 1.0 μA



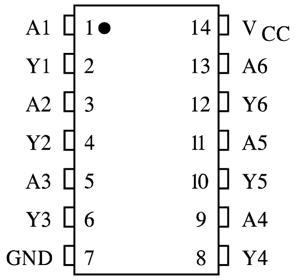
ORDERING INFORMATION
IN74HCT14AN Plastic
IN74HCT14AD SOIC
T_A = -55° to 125° C for all packages

LOGIC DIAGRAM



PIN 14 =V_{CC}
PIN 7 = GND

PIN ASSIGNMENT



FUNCTION TABLE

Inputs	Output
A	Y
L	H
H	L

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
Tstg	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
	DC Supply Voltage (Referenced to GND)	4.5	5.5	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)	0	No Limit*	ns

* When $V_{IN} \approx 50\%\ V_{CC}$,I_{CC}>1.0 mA.

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_T+max	Maximum Positive-Going Input Threshold Voltage	V_{OUT}=0.1 V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	1.9 2.1	1.9 2.1	1.9 2.1	V
V_T+min	Minimum Positive-Going Input Threshold Voltage	V_{OUT}=0.1 V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	1.2 1.4	1.2 1.4	1.2 1.4	V
V_T-max	Maximum Negative-Going Input Threshold Voltage	$V_{OUT}=V_{CC}$ -0.1 V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	1.2 1.4	1.2 1.4	1.2 1.4	V
V_T-min	Minimum Negative-Going Input Threshold Voltage	$V_{OUT}=V_{CC}$-0.1 V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	0.5 0.6	0.5 0.6	0.5 0.6	V
$V_H$max Note 1	Maximum Hysteresis Voltage	V_{OUT}=0.1 V or V_{CC}-0.1V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	1.4 1.5	1.4 1.5	1.4 1.5	V
$V_H$min Note 1	Minimum Hysteresis Voltage	V_{OUT}=0.1 V or V_{CC}-0.1V $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	0.4 0.4	0.4 0.4	0.4 0.4	V
V_{OH}	Minimum High-Level Output Voltage	$V_{IN} \le V_T$ -min $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	4.4 5.4	4.4 5.4	4.4 5.4	V
		$V_{IN} \le V_T$ -min $\lvert I_{OUT}\rvert \le$4mA	4.5	3.98	3.84	3.7	
V_{OL}	Maximum Low-Level Output Voltage	$V_{IN} \ge V_T$ +max $\lvert I_{OUT}\rvert \le 20$ μA	4.5 5.5	0.1 0.1	0.1 0.1	0.1 0.1	V
		$V_{IN} \ge V_T$ +max $\lvert I_{OUT}\rvert \le$ 4mA	4.5	0.26	0.33	0.4	
I_{IN}	Maximum Input Leakage Current	$V_{IN}=V_{CC}$ or GND	5.5	±0.1	±1.0	±1.0	μA
I_{CC}	Maximum Quiescent Supply Current (per Package)	$V_{IN}=V_{CC}$ or GND I_{OUT}=0μA	5.5	1.0	10	40	μA
ΔI_{CC}	Additional Quiescent Supply Current	V_{IN}=2.4 V, Any One Input		≥-55° C		25°C to 125 °C	mA
		$V_{IN}=V_{CC}$ or GND, Other Inputs I_{OUT}=0 μA	5.5	2.9		2.4	

Note: 1 $V_H$min>(V_T+min)-(V_T-max); $V_H$max=(V_T+max)-(V_T-min)

AC ELECTRICAL CHARACTERISTICS (V_{CC}=5.0 V ± 10%, C_L=50pF,Input t_r=t_f=6.0 ns)

Symbol	Parameter	Temperature Limits			Unit
		25 °C to -55°C	≤85°C	≤125°C	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input A or B to Output Y (L to H) (Figures 1 and 2)	32	40	48	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 2)	15	19	22	ns
C_{IN}	Maximum Input Capacitance	10	10	10	pF

C_{PD}	Power Dissipation Capacitance (Per Inverter)	Typical @25°C,V_{CC}=5.0 V	pF
	Used to determine the no-load dynamic power consumption: $P_D=C_{PD}V_{CC}^2f+I_{CC}V_{CC}$	32	

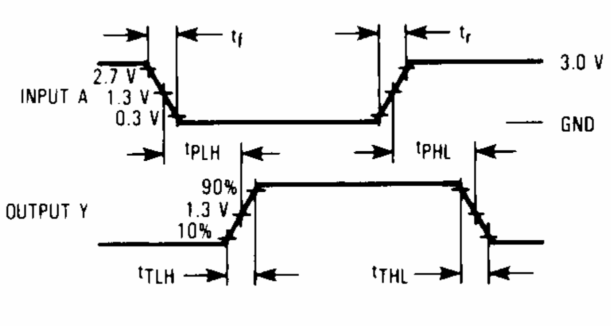
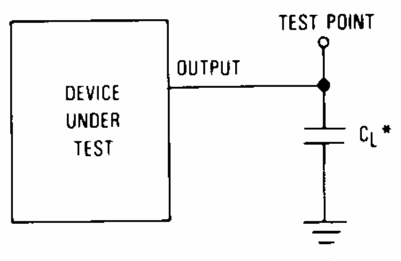


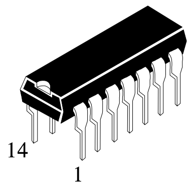
Figure 1. Switching Waveforms



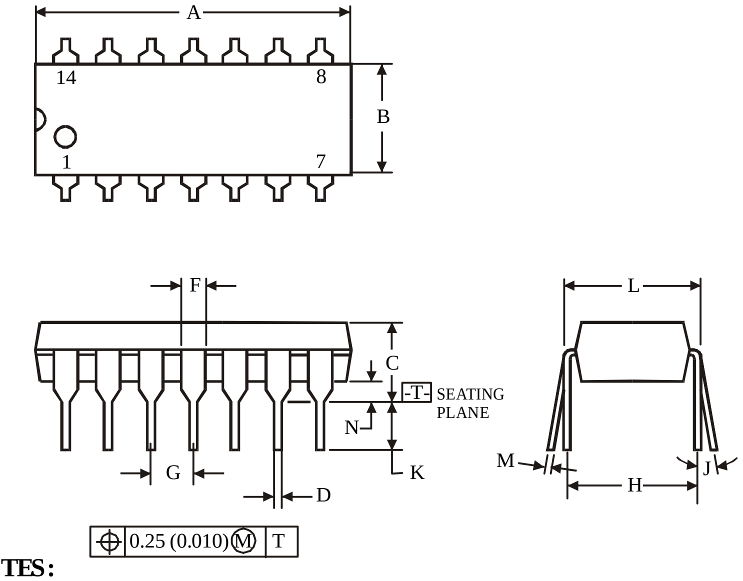
*Includes all probe and jig capacitance.

Figure 2. Test Circuit

N SUFFIX PLASTIC DIP
(MS - 001AA)



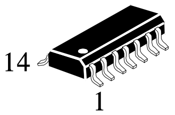
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	



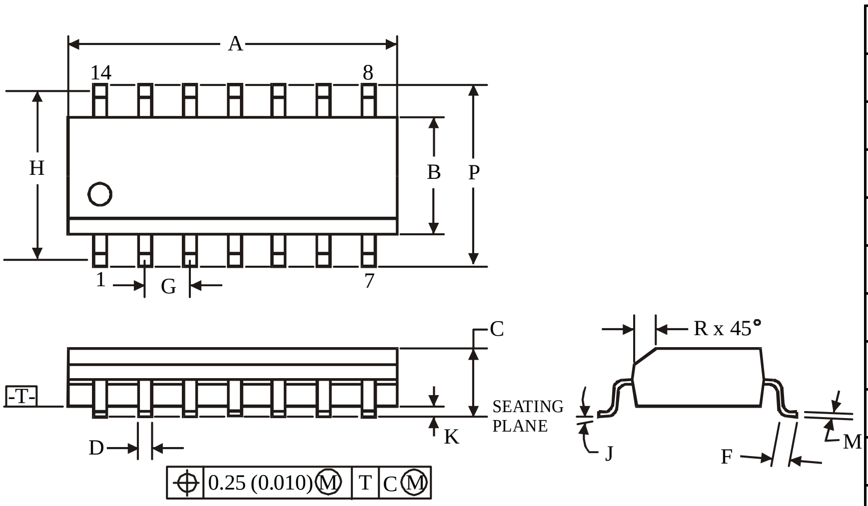
NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions. Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC
(MS - 012AB)



	Dimension, mm	
Symbol	**MIN**	**MAX**
A	8.55	8.75
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.27	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5



NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B ‑ 0.25 mm (0.010) per side.