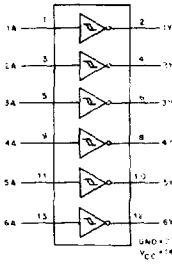


# CD54/74HC14 CD54/74HCT14

## High-Speed CMOS Logic



### Hex Inverting Schmitt Trigger

**Type Features:**

- Unlimited input rise and fall times
- Exceptionally high noise immunity

**FUNCTIONAL DIAGRAM AND  
TERMINAL ASSIGNMENT**

The RCA-CD54/74HC14 and CD54/74HCT14 each contain 6 inverting Schmitt Triggers in one package.

The CD54HC14 and CD54HCT14 are supplied in 14-lead ceramic dual-in-line packages (F suffix). The CD74HC14 and CD74HCT14 are supplied in 14-lead dual-in-line plastic packages (E suffix) and in 14-lead dual-in-line surface mount plastic packages (M suffix). Both devices are also available in chip form (H suffix).



LOGIC DIAGRAM

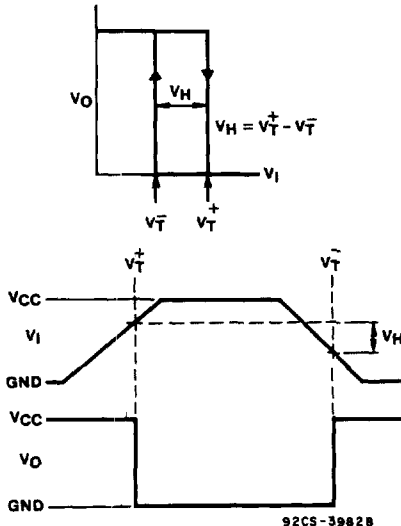


Fig. 1 - Hysteresis definition, characteristic, and test setup.

**Family Features:**

- Fanout (Over Temperature Range):  
Standard Outputs - 10 LSTTL Loads  
Bus Driver Outputs - 15 LSTTL Loads
- Wide Operating Temperature Range:  
CD74HC/HCT: -40 to +85°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- Alternate Source is Philips/Signetics
- CD54HC/CD74HC Types:  
2 to 6 V Operation  
High Noise Immunity:  
 $N_{IL} = 37\%$ ,  $N_{IH} = 51\%$  of  $V_{CC}$  @  $V_{CC} = 5V$
- CD54HCT/CD74HCT Types:  
4.5 to 5.5 V Operation  
Direct LSTTL Input Logic Compatibility  
 $N_{IL} = 18\%$ ,  $N_{IH} = 67\%$  of  $V_{CC}$  @  $V_{CC} = 4.5V$   
CMOS Input Compatibility  
 $I_i \leq 1 \mu A$  @  $V_{OL}$ ,  $V_{OH}$

**TRUTH TABLE**

INPUT		OUTPUT	
A	Y	A	Y
L	H	L	H
H	L	H	L

H = High Level  
L = Low Level

# CD54/74HC14 CD54/74HCT14

**MAXIMUM RATINGS, Absolute-Maximum Values:**

DC SUPPLY-VOLTAGE, (V <sub>CC</sub> ):	
(Voltages referenced to ground)	-0.5 to +7 V
DC INPUT DIODE CURRENT, I <sub>IK</sub> (FOR V <sub>i</sub> < -0.5 V OR V <sub>i</sub> > V <sub>CC</sub> + 0.5V)	±20mA
DC OUTPUT DIODE CURRENT, I <sub>OK</sub> (FOR V <sub>o</sub> < -0.5 V OR V <sub>o</sub> > V <sub>CC</sub> + 0.5V)	±20mA
DC DRAIN CURRENT, PER OUTPUT (I <sub>o</sub> ) (FOR -0.5 V < V <sub>o</sub> < V <sub>CC</sub> + 0.5V)	±25mA
DC V <sub>CC</sub> OR GROUND CURRENT (I <sub>CC</sub> )	±50mA
POWER DISSIPATION PER PACKAGE (P <sub>D</sub> )	
For T <sub>A</sub> = -40 to +60°C (PACKAGE TYPE E)	500 mW
For T <sub>A</sub> = +60 to +85°C (PACKAGE TYPE E)	Derate Linearly at 8 mW/°C to 300 mW
For T <sub>A</sub> = -55 to +100°C (PACKAGE TYPE F, H)	500 mW
For T <sub>A</sub> = +100 to +125°C (PACKAGE TYPE F, H)	Derate Linearly at 8 mW/°C to 300 mW
For T <sub>A</sub> = -40 to +70°C (PACKAGE TYPE M)	400 mW
For T <sub>A</sub> = +70 to +125°C (PACKAGE TYPE M)	Derate Linearly at 6 mW/°C to 70 mW
OPERATING-TEMPERATURE RANGE (T <sub>A</sub> )	
PACKAGE TYPE F, H	-55 to +125°C
PACKAGE TYPE E, M	-40 to +85°C
STORAGE TEMPERATURE (T <sub>stg</sub> )	-65 to +150°C
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 ± 1/32 in. (1.59 ± 0.79 mm) from case for 10 s max.	+265°C
Unit inserted into a PC Board (min. thickness 1/16 in., 1.59 mm)	
with solder contacting lead tips only	+300°C

**RECOMMENDED OPERATING CONDITIONS:**

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range (For T <sub>A</sub> = Full Package-Temperature Range) V <sub>CC</sub> *:			
CD54/74HC Types	2	6	V
CD54/74HCT Types	4.5	5.5	V
DC Input or Output Voltage V <sub>I</sub> , V <sub>O</sub>	0	V <sub>CC</sub>	V
Operating Temperature T <sub>A</sub> :			
CD74 Types	-40	+85	°C
CD54 Types	-55	+125	°C
Input Rise and Fall Times t <sub>r</sub> , t <sub>f</sub>			
at 2 V	0	Unlimited	ns
at 4.5 V	0	Unlimited	ns
at 6 V	0	Unlimited	ns

\*Unless otherwise specified, all voltages are referenced to Ground.

# CD54/74HC14

# CD54/74HCT14

## STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CD74HC14/CD54HC14									CD74HCT14/CD54HCT14									UNITS		
	TEST CONDITIONS			74HC/54HC TYPES		74HC TYPE		54HC TYPE		TEST CONDITIONS	74HCT/54HCT TYPES			74HCT TYPE		54HCT TYPE					
	V <sub>i</sub> V	I <sub>o</sub> mA	V <sub>cc</sub> V	+25° C		-40/ +85° C		-55/ +125° C			V <sub>i</sub> V	V <sub>cc</sub> V	+25° C		-40/ +85° C		-55/ +125° C				
				Min	Max	Min	Max	Min	Max	Min			Max	Min	Max	Min	Max				
Input Switch Points	V <sub>i+</sub>			2	0.7	1.5	0.7	1.5	0.7	1.5			—	—	—	—	—	—	V		
				4.5	1.7	3.15	1.7	3.15	1.7	3.15			4.5	1.2	1.9	1.2	1.9	1.2	1.9	V	
				6	2.1	4.2	2.1	4.2	2.1	4.2			5.5	1.4	2.1	1.4	2.1	1.4	2.1	V	
	V <sub>i-</sub>			2	0.3	1	0.3	1	0.3	1			—	—	—	—	—	—	—	V	
				4.5	0.9	2.2	0.9	2.2	0.9	2.2			4.5	0.5	1.2	0.5	1.2	0.5	1.2	V	
				6	1.2	3	1.2	3	1.2	3			5.5	0.6	1.4	0.6	1.4	0.6	1.4	V	
	V <sub>o</sub>			2	0.2	1	0.2	1	0.2	1			—	—	—	—	—	—	—	V	
				4.5	0.4	1.4	0.4	1.4	0.4	1.4			4.5	0.4	1.4	0.4	1.4	0.4	1.4	V	
				6	0.6	1.6	0.6	1.6	0.6	1.6			5.5	0.4	1.5	0.4	1.5	0.4	1.5	V	
High-Level Output Voltage	V <sub>OH</sub>			2	1.9	—	1.9	—	1.9	—	V <sub>i-</sub>		—	—	—	—	—	—	—	V	
		or	-0.02	4.5	4.4	—	4.4	—	4.4	—	or		4.5	4.4	—	4.4	—	4.4	—	V	
CMOS Loads	V <sub>i+</sub>			6	5.9	—	5.9	—	5.9	—	V <sub>i+</sub>		—	—	—	—	—	—	—	V	
TTL Loads	V <sub>i-</sub>			—	—	—	—	—	—	—	V <sub>i-</sub>		—	—	—	—	—	—	—	V	
	or		-4	4.5	3.98	—	3.84	—	3.7	—	or		4.5	3.98	—	3.84	—	3.7	—	V	
	V <sub>i+</sub>			-5.2	6	5.48	—	5.34	—	5.2	—		—	—	—	—	—	—	—	V	
Low-Level Output Voltage	V <sub>OL</sub>			2	—	0.1	—	0.1	—	0.1	V <sub>i-</sub>		—	—	—	—	—	—	—	V	
		or	0.02	4.5	—	0.1	—	0.1	—	0.1	or		4.5	—	0.1	—	0.1	—	0.1	V	
CMOS Loads	V <sub>i+</sub>			6	—	0.1	—	0.1	—	0.1	V <sub>i+</sub>		—	—	—	—	—	—	—	V	
TTL Loads	V <sub>i-</sub>			—	—	—	—	—	—	—	V <sub>i-</sub>		—	—	—	—	—	—	—	V	
	or		4	4.5	—	0.26	—	0.33	—	0.4	or		4.5	—	0.26	—	0.33	—	0.4	V	
	V <sub>i+</sub>			5.2	6	—	0.26	—	0.33	—	5.2		—	—	—	—	—	—	—	V	
Input Leakage Current	I <sub>i</sub>			6	—	±0.1	—	±1	—	±1	Any Voltage Between V <sub>cc</sub> and Gnd		5.5	—	±0.1	—	±1	—	±1	μA	
Quiescent Device Current	I <sub>cc</sub>			6	—	2	—	20	—	40	V <sub>cc</sub>		5.5	—	2	—	20	—	40	μA	
		or	0								or									μA	
		Gnd									Gnd									μA	
Additional Quiescent Device Current per input pin: 1 unit load ΔI <sub>cc</sub> *											V <sub>cc</sub> -2	1	4.5	Min	Typ	Max				μA	
											10	—	—	100	360	—	—	450	—	490	μA
											5.5										μA

\*For dual-supply systems theoretical worst case (V<sub>i</sub> = 2.4 V, V<sub>cc</sub> = 5.5 V) specification is 1.8 mA.

### HCT INPUT LOADING TABLE

INPUT	UNIT LOADS*
nA	0.6

\*Unit load is ΔI<sub>cc</sub> limit specified in Static Characteristic Chart, e.g., 360 μA max. @ 25° C.

# CD54/74HC14 CD54/74HCT14

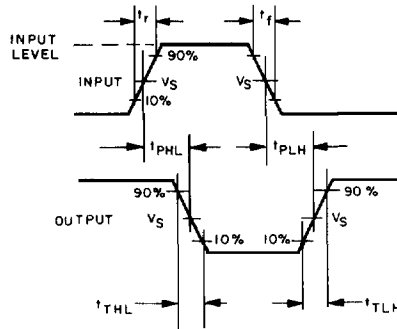
**SWITCHING CHARACTERISTICS (V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C, Input t<sub>r</sub>, t<sub>f</sub> = 6 ns)**

CHARACTERISTIC	CL (pF)	TYPICAL		UNITS	
		HC	HCT		
Propagation Delay, A to Y $t_{PHL}, t_{PLH}$	15	11	16	ns	
Power Dissipation Capacitance*	C <sub>PD</sub>	—	20	20	pF

\*C<sub>PD</sub> is used to determine the dynamic power consumption, per inverter.  
 $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where: f<sub>i</sub> = input frequency  
 C<sub>L</sub> = output load capacitance  
 V<sub>CC</sub> = supply voltage

**SWITCHING CHARACTERISTICS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub>, t<sub>f</sub> = 6 ns)**

CHARACTERISTIC	V <sub>CC</sub>	25°C				-40°C to +85°C				-55°C to +125°C				UNITS
		HC		HCT		74HC		74HCT		54HC		54HCT		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Propagation Delay, A to Y $t_{PLH}, t_{PHL}$	2	—	135	—	—	—	170	—	—	—	205	—	—	ns
	4.5	—	27	—	38	—	34	—	48	—	41	—	57	
	6	—	23	—	—	—	29	—	—	—	35	—	—	
Output Transition Time $t_{TLH}, t_{THL}$	2	—	75	—	—	—	95	—	—	—	110	—	—	ns
	4.5	—	15	—	15	—	19	—	19	—	22	—	22	
	6	—	13	—	—	—	16	—	—	—	19	—	—	
Input Capacitance C <sub>i</sub>	—	—	10	—	10	—	10	—	10	—	10	—	10	pF



	54/74HC	54/74HCT
INPUT LEVEL	V <sub>CC</sub>	3V
V <sub>S</sub>	50% V <sub>CC</sub>	1.3V

92CS-36948RI

Fig. 2 - Transition times and propagation delay times.