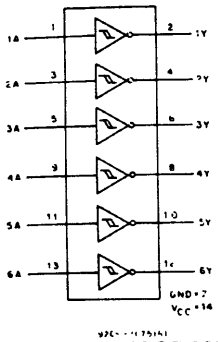
CD54/74HC14
CD54/74HCT14

File Number **1781**

High-Speed CMOS Logic



FUNCTIONAL DIAGRAM AND TERMINAL ASSIGNMENT

Hex Inverting Schmitt Trigger

Type Features:
- *Unlimited input rise and fall times*
- *Exceptionally high noise immunity*

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

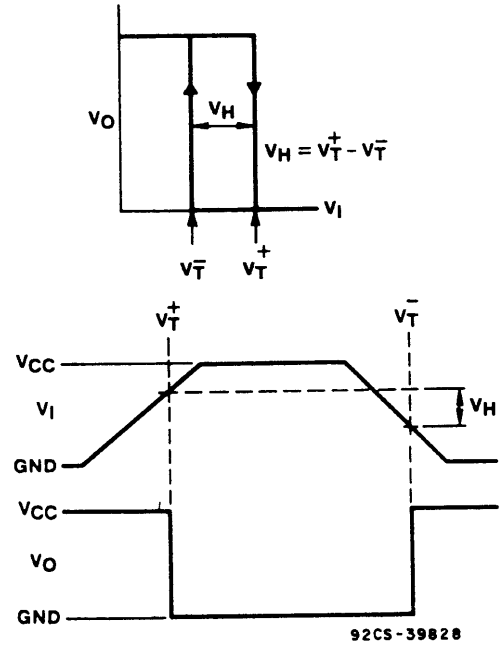


Fig 1 - Hysteresis definition, characteristic, and test setup.

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
L	H
H	L

H = High Level
L = Low Level

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MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE, (V_{CC}):
(Voltages referenced to ground) ..... -0.5 to + 7 V
DC INPUT DIODE CURRENT, I_{IK} (FOR $V_I < -0.5$ V OR $V_I > V_{CC}$ +0.5V) ..... ±20mA
DC OUTPUT DIODE CURRENT, I_{OK} (FOR $V_O < -0.5$ V OR $V_O > V_{CC}$ +0.5V) ..... ±20mA
DC DRAIN CURRENT, PER OUTPUT (I_O) (FOR -0.5 V $< V_O < V_{CC} + 0.5$V) ..... ±25mA
DC V_{CC} OR GROUND CURRENT (I_{CC}) ..... ±50mA
POWER DISSIPATION PER PACKAGE (P_D)
For T_A = -40 to +60°C (PACKAGE TYPE E) ..... 500 mW
For T_A = +60 to +85°C (PACKAGE TYPE E) ..... Derate Linearly at 8 mW/°C to 300 mW
For T_A = -55 to +100°C (PACKAGE TYPE F, H) ..... 500 mW
For T_A = +100 to +125°C (PACKAGE TYPE F, H) ..... Derate Linearly at 8 mW/°C to 300 mW
For T_A = -40 to +70°C (PACKAGE TYPE M) ..... 400 mW
For T_A = +70 to +125°C (PACKAGE TYPE M) ..... Derate Linearly at 6 mW/°C to 70 mW
OPERATING-TEMPERATURE RANGE (T_A):
PACKAGE TYPE F, H ..... -55 to +125°C
PACKAGE TYPE E, M ..... -40 to +85°C
STORAGE TEMPERATURE (T_{stg}) ..... -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_A = Full Package-Temperature Range) V_{CC}.*			
CD54/74HC Types	2	6	V
CD54/74HCT Types	4.5	5.5	V
DC Input or Output Voltage V_I, V_O	0	V_{CC}	V
Operating Temperature T_A			
CD74 Types	-40	+85	°C
CD54 Types	-55	+125	°C
Input Rise and Fall Times t_r, t_f			
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

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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_I V	I_O mA	V_{CC} V	+25°C		-40/ +85°C		-55/ +125°C		V_I V	V_{CC} 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_{T+}			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	
			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_{T-}			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	
			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_H			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	
			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	
High-Level Output Voltage V_{OH} CMOS Loads	V_{T-} or V_{T+}	-0 02	2	1 9	—	1 9	—	1 9	—	V_{T-} or V_{T+}		—	—	—	—	—	—	V
			4 5	4 4	—	4 4	—	4 4	—		4.5	4 4	—	4 4	—	4 4	—	
			6	5 9	—	5 9	—	5 9	—			—	—	—	—	—	—	
TTL Loads	V_{T-} or V_{T+}		—	—	—	—	—	—	—	V_{T-} or V_{T+}		—	—	—	—	—	—	V
		-4	4 5	3.98	—	3 84	—	3 7	—		4.5	3 98	—	3 84	—	3 7	—	
		-5 2	6	5 48	—	5 34	—	5 2	—			—	—	—	—	—	—	
Low-Level Output Voltage V_{OL} CMOS Loads	V_{T-} or V_{T+}	0 02	2	—	0 1	—	0 1	—	0 1	V_{T-} or V_{T+}		—	—	—	—	—	—	V
			4 5	—	0 1	—	0 1	—	0 1		4 5	—	0 1	—	0 1	—	0 1	
			6	—	0 1	—	0 1	—	0 1			—	—	—	—	—	—	
TTL Loads	V_{T-} or V_{T+}			—	—	—	—	—	—	V_{T-} or V_{T+}		—	—	—	—	—	—	V
		4	4 5	—	0 26	—	0 33	—	0 4		4 5	—	0 26	—	0 33	—	0 4	
		5 2	6	—	0 26	—	0 33	—	0 4			—	—	—	—	—	—	
Input Leakage Current I_I	V_{CC} or Gnd		6	—	±0 1	—	±1	—	±1	Any Voltage Between V_{CC} and Gnd	5 5	—	±0 1	—	±1	—	±1	µA
Quiescent Device Current I_{CC}	V_{CC} or Gnd	0	6	—	2	—	20	—	40	V_{CC} or Gnd	5 5	--	2	—	20	—	40	µA
Additional Quiescent Device Current per input pin 1 unit load ΔI_{CC}*										V_{CC}-2 1	4 5 to 5.5	Min —	Typ 100	Max 360	—	450	—	490	µA

*For dual-supply systems theoretical worst case (V_I = 2 4 V, V_{CC} = 5 5 V) specification is 1 8 mA

HCT INPUT LOADING TABLE

INPUT	UNIT LOADS*
nA	0.6

*Unit load is ΔI_{CC} limit specified in Static Characteristic Chart, e g., 360 µA max @ 25°C.

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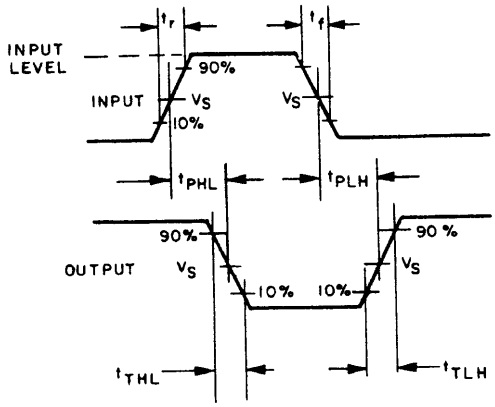
SWITCHING CHARACTERISTICS (V_{CC} = 5 V, T_A = 25°C, Input t_r, t_f = 6 ns)

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

*C_{PD} is used to determine the dynamic power consumption, per inverter.
$P_D = V_{CC}^2 f_i (C_{PD} + C_L)$ where: f_i = input frequency
C_L = output load capacitance
V_{CC} = supply voltage

SWITCHING CHARACTERISTICS (C_L = 50 pF, Input t_r, t_f = 6 ns)

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



	54/74HC	54/74HCT
INPUT LEVEL	V_{CC}	3V
V_S	50% V_{CC}	1.3V

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Fig. 2 - Transition times and propagation delay times.