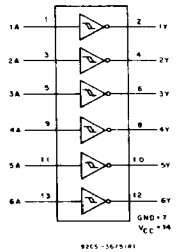
Advance Information

CD54/74AC14
CD54/74ACT14

Hex Inverting Schmitt Trigger



FUNCTIONAL DIAGRAM & TERMINAL ASSIGNMENT

Type Features:

- *Operates with much slower than standard input rise and fall slew rates*
- *Exceptionally high noise immunity*

The RCA CD54/74AC14 and CD54/74ACT14 each contain six inverting Schmitt Triggers in one package. These devices use the RCA ADVANCED CMOS technology.

The CD74AC14 and CD74ACT14 are supplied in 14-lead dual-in-line plastic packages (E suffix) and in 14-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to 70°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC14 and CD54ACT14, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

Family Features:

- *Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015*
- *SCR-Latchup-resistant CMOS process and circuit design*
- *Speed of bipolar FAST*/AS/S with significantly reduced power consumption*
- *Balanced propagation delays*
- *AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply*
- *± 24-mA output drive current*
  - *Fanout to 15 FAST* ICs*
  - *Drives 50-ohm transmission lines*
- *Greater noise immunity than standard inverters*

*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

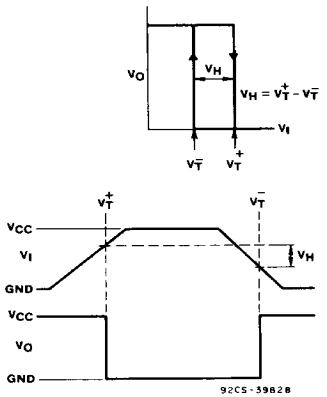


Fig. 1 - Hysteresis definition and characteristic.

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}) ..... -0.5 to 6 V
DC INPUT DIODE CURRENT, I_{IK} (for $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V) ..... ±20 mA
DC OUTPUT DIODE CURRENT, I_{OK} (for $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V) ..... ±50 mA
DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, I_O (for $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V) ..... ±50 mA
DC V_{CC} or GROUND CURRENT (I_{CC} or I_{GND}) ..... ±100 mA*
POWER DISSIPATION PER PACKAGE (P_D):
For T_A = -55 to +100°C (PACKAGE TYPE E) ..... 500 mW
For T_A = +100 to +125°C (PACKAGE TYPE E) ..... Derate Linearly at 8 mW/°C to 300 mW
For T_A = -55 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) ..... -55 to +125°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 maximum ..... +265°C
Unit inserted into PC board min. thickness 1/16 in. (1.59 mm) with solder contacting lead tips only ..... +300°C

*For up to 4 outputs per device; add ± 25 mA for each additional output.

RECOMMENDED OPERATING CONDITIONS:
For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range, V_{CC}*: (For T_A = Full Package-Temperature Range)			
AC Types	1.5	5.5	V
ACT Types	4.5	5.5	V
DC Input or Output Voltage, V_I, V_O	0	V_{CC}	V
Operating Temperature, T_A	-55	+125	°C
Input Rise and Fall Slew Rate, dt/dv†:			
at 1.5 V to 5.5 V (AC Types)	0	150	ms/V
at 4.5 V to 5.5 V (ACT Types)	0	20	ns/V

*Unless otherwise specified, all voltages are referenced to ground.
†5 Outputs switching
V_{CC} = 5 V
Load = 500Ω, 50 pF
T_A = Full temperature range
For AC14, V_I = 5.5 V sawtooth
For ACT14, V_I = 3 V sawtooth

CD54/74AC14
CD54/74ACT14

STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS		TEST CONDITIONS		V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS
					+25		-40 to +85		-55 to +125		
		V_I (V)	I_O (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Positive-Going Threshold Voltage	V_T^+			5	2.6	3.4	2.6	3.4	2.6	3.4	V
Negative-Going Threshold Voltage	V_T^-			5	1.6	2.4	1.6	2.4	1.6	2.4	V
Hysteresis Voltage	V_H			5	0.5	—	0.5	—	0.5	—	V
High-Level Output Voltage	V_{OH}	V_T^+ or V_T^-	-0.05	1.5	1.4	—	1.4	—	1.4	—	V
			-0.05	3	2.9	—	2.9	—	2.9	—	
			-0.05	4.5	4.4	—	4.4	—	4.4	—	
			-4	3	2.58	—	2.48	—	2.4	—	
			-24	4.5	3.94	—	3.8	—	3.7	—	
		#, *	-75	5.5	—	—	3.85	—	—	—	
			-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage	V_{OL}	V_T^+ or V_T^-	0.05	1.5	—	0.1	—	0.1	—	0.1	V
			0.05	3	—	0.1	—	0.1	—	0.1	
			0.05	4.5	—	0.1	—	0.1	—	0.1	
			12	3	—	0.36	—	0.44	—	0.5	
			24	4.5	—	0.36	—	0.44	—	0.5	
		#, *	75	5.5	—	—	—	1.65	—	—	
			50	5.5	—	—	—	—	—	1.65	
Input Leakage Current	I_I	V_{CC} or GND	—	5.5	—	±0.1	—	±1	—	±1	μA
Quiescent Supply Current,SSI	I_{CC}	V_{CC} or GND	0	5.5	—	4	—	40	—	80	μA

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.
*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

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CD54/74AC14
CD54/74ACT14

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS		V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS
				+25		-40 to +85		-55 to +125		
	V_I (V)	I_O (mA)		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Positive-Going Threshold Voltage V_T^+			5	1.4	2	1.4	2	1.4	2	V
Negative-Going Threshold Voltage V_T^-			5	0.9	1.3	0.9	1.3	0.9	1.3	V
Hysteresis Voltage V_H			5	0.4	—	0.4	—	0.4	—	V
High-Level Output Voltage V_{OH}	V_T^+ or V_T^-	-0.05	4.5	4.4	—	4.4	—	4.4	—	V
		-24	4.5	3.94	—	3.8	—	3.7	—	
	#, *	-75	5.5	—	—	3.85	—	—	—	
		-50	5.5	—	—	—	—	3.85	—	
Low-Level Output Voltage V_{OL}	V_T^+ or V_T^-	0.05	4.5	—	0.1	—	0.1	—	0.1	V
		24	4.5	—	0.36	—	0.44	—	0.5	
	#, *	75	5.5	—	—	—	1.65	—	—	
		50	5.5	—	—	—	—	—	1.65	
Input Leakage Current I_I	V_{CC} or GND	—	5.5	—	±0.1	—	±1	—	±1	μA
Quiescent Supply Current,SSI I_{CC}	V_{CC} or GND	0	5.5	—	4	—	40	—	80	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load ΔI_{CC}	V_{CC}-2.1	—	4.5 to 5.5	—	2.4	—	2.8	—	3	mA

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

ACT INPUT LOADING TABLE

INPUT	UNIT LOAD*
ALL	0.21

*Unit load is ΔI_{CC} limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

SWITCHING CHARACTERISTICS: AC Series; t_r, t_f = 3 ns, C_L = 50 pF

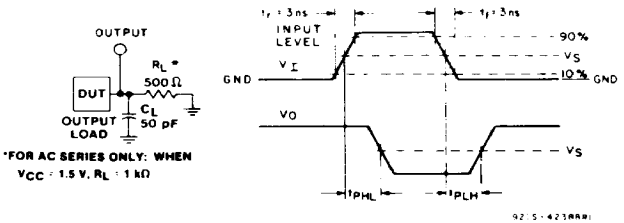
CHARACTERISTICS	SYMBOL	V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Input to Output	t_{PLH} t_{PHL}	5†	2.7	9.5	2.6	10.5	ns
Power Dissipation Capacitance	C_{PD}§	—	45 Typ.		45 Typ.		pF
Input Capacitance	C_I	—	—	10	—	10	pF

SWITCHING CHARACTERISTICS: ACT Series; t_r, t_f = 3 ns, C_L = 50 pF

CHARACTERISTICS	SYMBOL	V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Propagation Delays: Input to Output	t_{PLH}	5†	3.7	13.2	3.6	14.5	ns
	t_{PHL}		2.4	8.6	2.4	9.5	
Power Dissipation Capacitance	C_{PD}§	—	45 Typ.		45 Typ.		pF
Input Capacitance	C_I	—	—	10	—	10	pF

†5 V: min. is @ 5.5 V
max. is @ 4.5 V

§C_{PD} is used to determine the dynamic power consumption, per gate.
For AC series: $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$
For ACT series: $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$ where f_i = input frequency
C_L = output load capacitance
V_{CC} = supply voltage.



	CD54/74AC	CD54/74ACT
Input Level	V_{CC}	3 V
Input Switching Voltage, V_S	0.5 V_{CC}	1.5 V
Output Switching Voltage, V_S	0.5 V_{CC}	0.5 V_{CC}

Fig. 1 - Propagation delay times and test circuit.