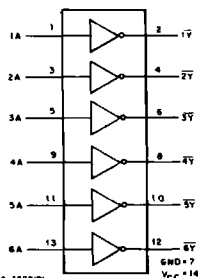


CD54/74AC04, CD54/74AC05 CD54/74ACT04, CD54/74ACT05



FUNCTIONAL DIAGRAM & TERMINAL ASSIGNMENT

Hex Inverters

CD54/74AC/ACT04 - Active Outputs
CD54/74AC/ACT05 - Open-Drain Outputs

Type Features:

- Buffered inputs
- Typical propagation delay (AC04/05):
3.5 ns @ $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$

The RCA-CD54/74AC04, -05 and CD54/74ACT04, -05 hex inverters use the RCA ADVANCED CMOS technology. The CD54/74AC/ACT04 have active outputs; the CD54/74AC/ACT05 have open-drain outputs.

The CD74AC04, -05 and CD74ACT04, -05 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 $+85^\circ\text{C}$); and Extended Industrial/Military (-55 to $+125^\circ\text{C}$).

The CD54AC04, -05 and CD54ACT04, -05, available in chip form (H suffix), are operable over the -55 to $+125^\circ\text{C}$ temperature.

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/IS 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
- $\pm 24\text{-mA}$ output drive current
 - Fanout to 15 FAST® ICs
 - Drives 50-ohm transmission lines

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TRUTH TABLES

CD54/74AC/ACT04

CD54/74AC/ACT05

INPUT	OUTPUT
A	Y
L	H
H	L

INPUT	OUTPUT
A	Y
L	Z
H	L

Z = High Impedance

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE (V_{CC})	-0.5 to 6 V
DC INPUT DIODE CURRENT, I_{IK} (for $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$)	$\pm 20\text{ mA}$
DC OUTPUT DIODE CURRENT, I_{OK} (for $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$)	$\pm 50\text{ mA}$
DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, I_O (for $V_O > -0.5\text{ V}$ or $V_O < V_{CC} + 0.5\text{ V}$)	$\pm 50\text{ mA}$
DC V_{CC} or GROUND CURRENT (I_{CC} or I_{GND})	$\pm 100\text{ mA}$ *
POWER DISSIPATION PER PACKAGE (P_D):	
For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E)	500 mW
For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E)	Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW
For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M)	400 mW
For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M)	Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW
OPERATING-TEMPERATURE RANGE (T_A):	-55 to $+125^\circ\text{C}$
STORAGE TEMPERATURE (T_{STG})	-65 to $+150^\circ\text{C}$
LEAD TEMPERATURE (DURING SOLDERING):	
At distance $1/16 \pm 1/32$ in. ($1.59 \pm 0.79\text{ mm}$) from case for 10 s maximum	$+265^\circ\text{C}$
Unit inserted into PC board min. thickness $1/16$ in. (1.59 mm) with solder contacting lead tips only	$+300^\circ\text{C}$

* For up to 4 outputs per device; add $\pm 25\text{ mA}$ for each additional output.

CD54/74AC04, CD54/74AC05 CD54/74ACT04, CD54/74ACT05

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 ACT Types	1.5 4.5	5.5 5.5	V 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 3 V (AC Types) at 3.6 V to 5.5 V (AC Types) at 4.5 V to 5.5 V (ACT Types)	0 0 0	50 20 10	ns/V ns/V ns/V

*Unless otherwise specified, all voltages are referenced to ground.

STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS	TEST CONDITIONS		V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS	
				+25		-40 to +85		-55 to +125			
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage V_{IH}			1.5	1.2	—	1.2	—	1.2	—	V	
			3	2.1	—	2.1	—	2.1	—		
			5.5	3.85	—	3.85	—	3.85	—		
Low-Level Input Voltage V_{IL}			1.5	—	0.3	—	0.3	—	0.3	V	
			3	—	0.9	—	0.9	—	0.9		
			5.5	—	1.65	—	1.65	—	1.65		
High-Level Output Voltage (04) V_{OH}	V_{IH} or V_{IL}	#, *	-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	—	—	—	
Low-Level Output Voltage V_{OL}	V_{IH} or V_{IL}	#, *	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	—	—	
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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CD54/74AC04, CD54/74AC05 CD54/74ACT04, CD54/74ACT05

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

CHARACTERISTICS	TEST CONDITIONS	V_{CC} (V)	AMBIENT TEMPERATURE (T_A) - °C						UNITS		
			+25		-40 to +85		-55 to +125				
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.			
High-Level Input Voltage	V_{IH}		4.5 to 5.5	2	—	2	—	2	—	V	
Low-Level Input Voltage	V_{IL}		4.5 to 5.5	—	0.8	—	0.8	—	0.8	V	
High-Level Output Voltage (O4)	V_{OH}	V_{IH} or V_{IL} #, *	-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_{IH} or V_{IL} #, *	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*
nA	0.18

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

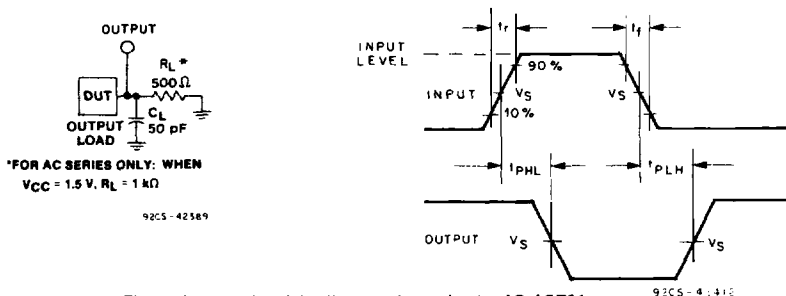


Fig. 1 - Propagation delay times and test circuit - AC/ACT04.

	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}

CD54/74AC04, CD54/74AC05 CD54/74ACT04, CD54/74ACT05

SWITCHING CHARACTERISTICS: AC Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

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 (04)	t_{PLH} t_{PHL}	1.5	—	74	—	81	ns
		3.3*	2.3	10.4	2.3	9.1	
		5†	1.7	5.9	1.6	6.5	
High Z to Output Low (05)	t_{PZL}	1.5	—	74	—	81	ns
		3.3	2.3	10.4	2.3	9.1	
		5	1.7	5.9	1.6	6.5	
Output Low to High Z (05)	t_{PLZ}	1.5	—	94	—	103	ns
		3.3	3	10.4	2.9	11.5	
		5	2.2	7.5	2.1	8.2	
Power Dissipation Capacitance	$C_{PD}§$	—	105 Typ.		105 Typ.		pF
Input Capacitance	C_i	—	—	10	—	10	pF

SWITCHING CHARACTERISTICS: ACT Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

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 (04)	t_{PLH} t_{PHL}	5†	2.4	8.5	2.3	9.3	ns
			—	—	—	—	
Output Low to High Z	t_{PLZ}	5	2.8	9.8	2.7	10.8	ns
High Z to Output Low (05)	t_{PZL}	5	2.4	8.5	2.3	9.3	ns
Power Dissipation Capacitance	$C_{PD}§$	—	105 Typ.		105 Typ.		pF
Input Capacitance	C_i	—	—	10	—	10	pF

*3.3 V: min. is @ 3.6 V
max. is @ 3 V
†5 V: min. is @ 5.5 V
max. is @ 4.5 V

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

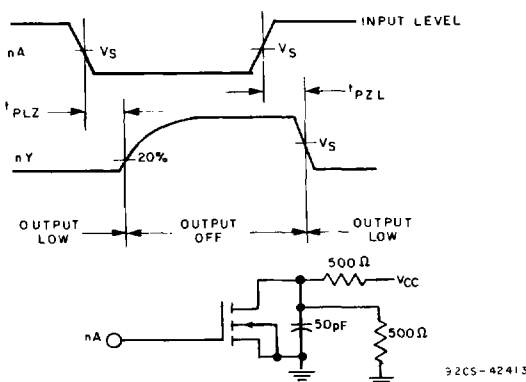


Fig. 2 - Propagation delay times and test circuit - AC/ACT05

	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}