

Technical Data

CD54/74AC74
CD54/74ACT74

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 $+100^\circ\text{C}$ (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 $+120^\circ\text{C}$

STORAGE TEMPERATURE (T_{stg}) -65 to $+150^\circ\text{C}$

LEAD TEMPERATURE (DURING SOLDERING):

At distance $1/16 \pm 1/32$ in. (1.59 ± 0.79 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 ± 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 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	$^\circ\text{C}$
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.

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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 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	—	—		
			-50	5.5	—	—	—	—	3.85		
Low-Level Output Voltage V _{OL}	V _{IH} or V _{IL} #,*		0.05	1.5	—	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, FF 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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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.		
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	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	—	±1	—	±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, FF	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*
D	0.53
\bar{R}, \bar{S}	0.58
CP	1

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

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PREREQUISITE FOR SWITCHING: AC Series

CHARACTERISTICS	SYMBOL	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Data to CP Setup Time	t _{SU}	1.5 3.3* 5†	39 4.3 3.1	— — —	44 4.9 3.5	— — —	ns
Hold Time	t _H	1.5 3.3 5	0 0 0	— — —	0 0 0	— — —	ns
Removal Time R̄, S̄ to CP	t _{REM}	1.5 3.3 5	30 4.1 2.4	— — —	34 4.7 2.7	— — —	ns
Pulse Width R̄, S̄	t _W	1.5 3.3 5	44 4.9 3.5	— — —	50 5.6 4	— — —	ns
Pulse Width CP	t _W	1.5 3.3 5	49 5.5 3.9	— — —	56 6.3 4.5	— — —	ns
CP Frequency	f _{MAX}	1.5 3.3 5	10 90 125	— — —	9 79 110	— — —	MHz

*3.3 V: min. is @ 3 V

†5 V: min. is @ 4.5 V

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: CP to Q, Q̄	t _{PLH} t _{PHL}	1.5 3.3* 5†	— 3.6 2.6	114 12.7 9.1	— 3.5 2.5	125 14 10	ns
R̄, S̄ to Q, Q̄	t _{PLH}	1.5 3.3 5	— 3.8 2.7	120 13.4 9.5	— 3.7 2.6	132 14.7 10.5	ns
	t _{PHL}	1.5 3.3 5	— 4.1 3	131 14.6 10.4	— 4 2.9	144 16.1 11.5	ns
Power Dissipation Capacitance	C _{PD} §	—	55 Typ.		55 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 flip-flop.

$$P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o) \text{ where } f_i = \text{input frequency}$$

$$f_o = \text{output frequency}$$

$$C_L = \text{output load capacitance}$$

$$V_{CC} = \text{supply voltage.}$$

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PREREQUISITE FOR SWITCHING: ACT Series

CHARACTERISTICS	SYMBOL	V _{CC} (V)	AMBIENT TEMPERATURE (T _A) - °C				UNITS
			-40 to +85		-55 to +125		
			MIN.	MAX.	MIN.	MAX.	
Data to CP Setup Time	t _{SU}	5*	3.5	—	4	—	ns
Hold Time	t _H	5	0	—	0	—	ns
Removal Time R̄, S̄ to CP	t _{REM}	5	2.4	—	2.7	—	ns
Pulse Width R̄, S̄	t _w	5	4.4	—	5	—	ns
Pulse Width CP	t _w	5	5	—	5.7	—	ns
CP Frequency	f _{MAX}	5	97	—	85	—	MHz

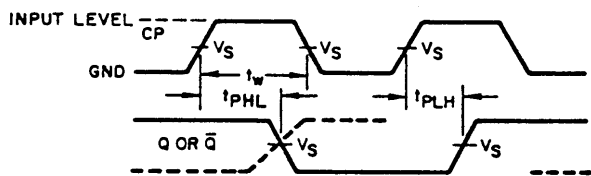
*Min. is @ 4.5 V

SWITCHING CHARACTERISTICS: ACT Series, t_r = 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: CP to Q, Q̄	t _{PLH} t _{PHL}	5*	2.5	8.6	2.4	9.5	ns
R̄, S̄ to Q, Q̄	t _{PLH}	5	3	10.5	2.9	11.5	ns
	t _{PHL}	5	3.2	11.4	3.1	12.5	
Power Dissipation Capacitance	C _{PD} †	—	55 Typ.		55 Typ.		pF
Input Capacitance	C _I	—	—	10	10	—	pF

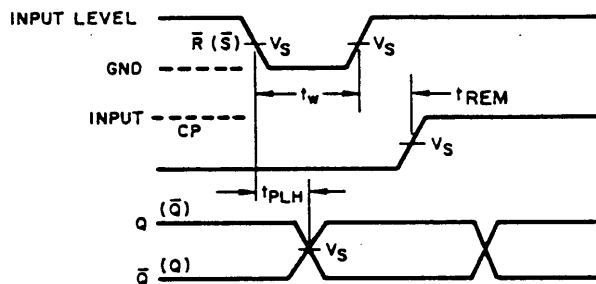
*Min. is @ 5.5 V
Max. is @ 4.5 V.

†C_{PD} is used to determine the dynamic power consumption, per flip-flop.
 $P_D = C_{PD}V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$ where
 f_i = input frequency
 f_o = output frequency
 C_L = output load capacitance
 V_{CC} = supply voltage.



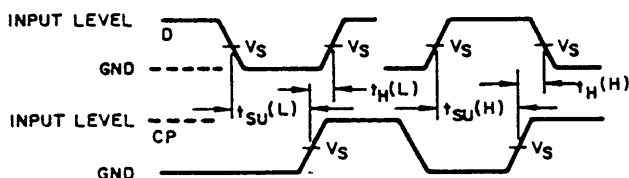
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Fig. 1 - Clock prerequisite and propagation delays.



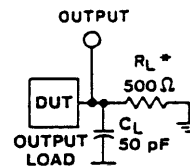
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Fig. 2 - Reset or Set prerequisite and propagation delays.



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Fig. 3 - Data prerequisite times.



*FOR AC SERIES ONLY: WHEN
V_{CC} = 1.5 V, R_L = 1 kΩ

92CS-42389

	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}