SN74LS74A

Dual D-Type Positive Edge-Triggered Flip-Flop

The SN74LS74A dual edge-triggered flip-flop utilizes Schottky TTL circuitry to produce high speed D-type flip-flops. Each flip-flop has individual clear and set inputs, and also complementary Q and $\overline{Q}$ outputs.

Information at input D is transferred to the Q output on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the HIGH or the LOW level, the D input signal has no effect.

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LOW POWER SCHOTTKY

MODE SELECT – TRUTH TABLE

OPERATING MODE	INPUTS			OUTPUTS	
	$\overline{S}_D$	$\overline{S}_D$	D	Q	$\overline{Q}$
Set	L	H	X	H	L
Reset (Clear)	H	L	X	L	H
*Undetermined	L	L	X	H	H
Load “1” (Set)	H	H	h	H	L
Load “0” (Reset)	H	H	l	L	H

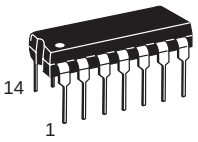
* Both outputs will be HIGH while both $\overline{S}_D$ and $\overline{C}_D$ are LOW, but the output states are unpredictable if $\overline{S}_D$ and $\overline{C}_D$ go HIGH simultaneously. If the levels at the set and clear are near V_{IL} maximum then we cannot guarantee to meet the minimum level for V_{OH}.

H, h = HIGH Voltage Level

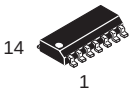
L, I = LOW Voltage Level

X = Don’t Care

l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the HIGH to LOW clock transition.



PLASTIC
N SUFFIX
CASE 646



SOIC
D SUFFIX
CASE 751A

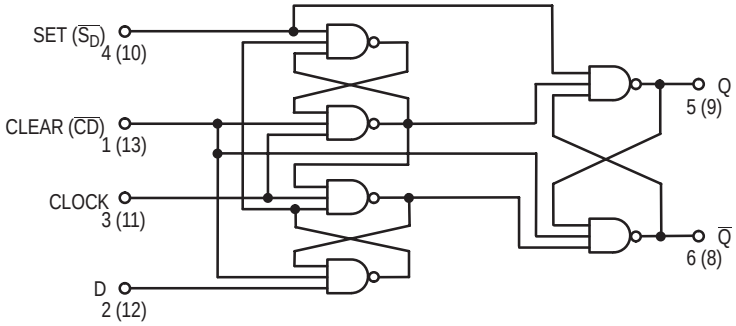
GUARANTEED OPERATING RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.75	5.0	5.25	V
T_A	Operating Ambient Temperature Range	0	25	70	°C
I_{OH}	Output Current – High			–0.4	mA
I_{OL}	Output Current – Low			8.0	mA

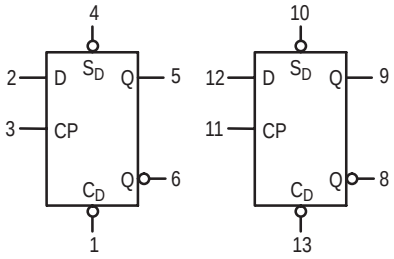
ORDERING INFORMATION

Device	Package	Shipping
SN74LS74AN	14 Pin DIP	2000 Units/Box
SN74LS74AD	14 Pin	2500/Tape & Reel

LOGIC DIAGRAM (Each Flip-Flop)



LOGIC SYMBOL



V_{CC} = PIN 14
GND = PIN 7

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Symbol	Parameter	Limits			Unit	Test Conditions	
		Min	Typ	Max			
V_{IH}	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage for All Inputs	
V_{IL}	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage for All Inputs	
V_{IK}	Input Clamp Diode Voltage		−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA	
V_{OH}	Output HIGH Voltage	2.7	3.5		V	V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH} or V_{IL} per Truth Table	
V_{OL}	Output LOW Voltage		0.25	0.4	V	I_{OL} = 4.0 mA	V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
			0.35	0.5	V	I_{OL} = 8.0 mA	
I_{IH}	Input High Current Data, Clock Set, Clear			 20 40	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
	Data, Clock Set, Clear			0.1 0.2	mA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current Data, Clock Set, Clear			 −0.4 −0.8	mA	V_{CC} = MAX, V_{IN} = 0.4 V	
I_{OS}	Output Short Circuit Current (Note 1)	−20		−100	mA	V_{CC} = MAX	
I_{CC}	Power Supply Current			8.0	mA	V_{CC} = MAX	

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

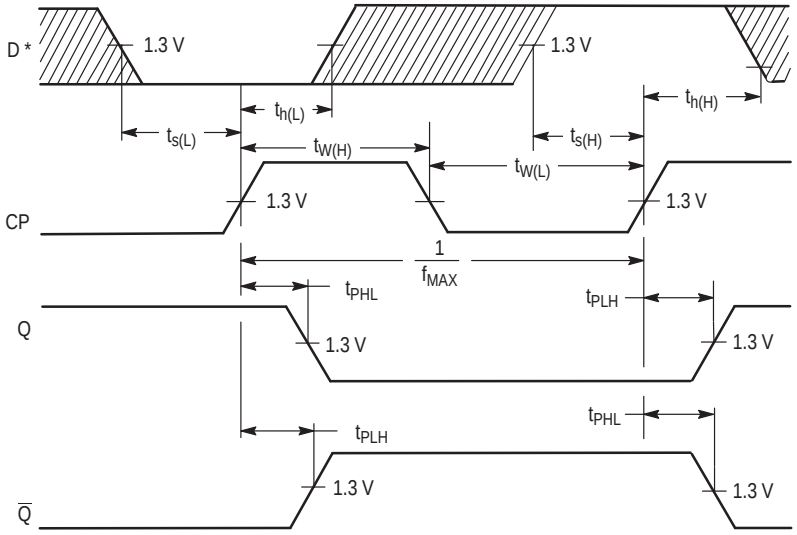
AC CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 V)

Symbol	Parameter	Limits			Unit	Test Conditions	
		Min	Typ	Max			
f_{MAX}	Maximum Clock Frequency	25	33		MHz	Figure 1	V_{CC} = 5.0 V C_L = 15 pF
t_{PLH} t_{PHL}	Clock, Clear, Set to Output		13	25	ns	Figure 1	
			25	40	ns		

AC SETUP REQUIREMENTS (T_A = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions	
		Min	Typ	Max			
$t_{W(H)}$	Clock	25			ns	Figure 1	V_{CC} = 5.0 V
$t_{W(L)}$	Clear, Set	25			ns	Figure 2	
t_s	Data Setup Time — HIGH	20			ns	Figure 1	
	LOW	20			ns		
t_h	Hold Time	5.0			ns	Figure 1	

AC WAVEFORMS



*The shaded areas indicate when the input is permitted to change for predictable output performance.

Figure 1. Clock to Output Delays, Data Set-Up and Hold Times, Clock Pulse Width

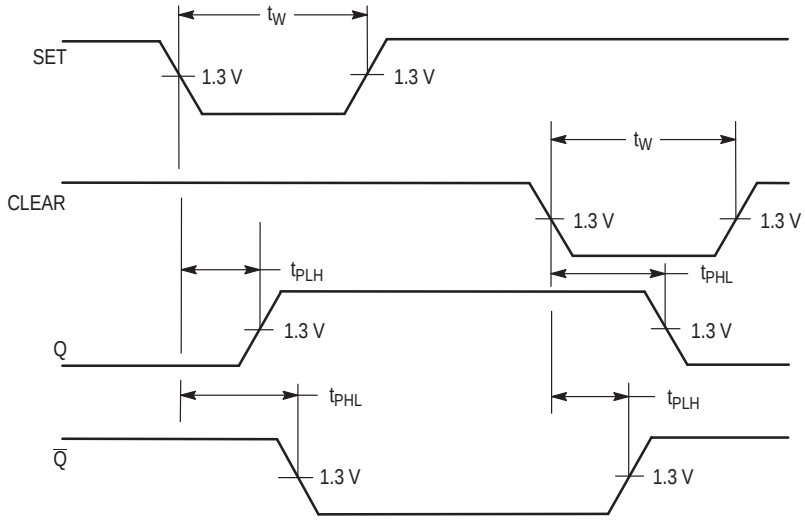
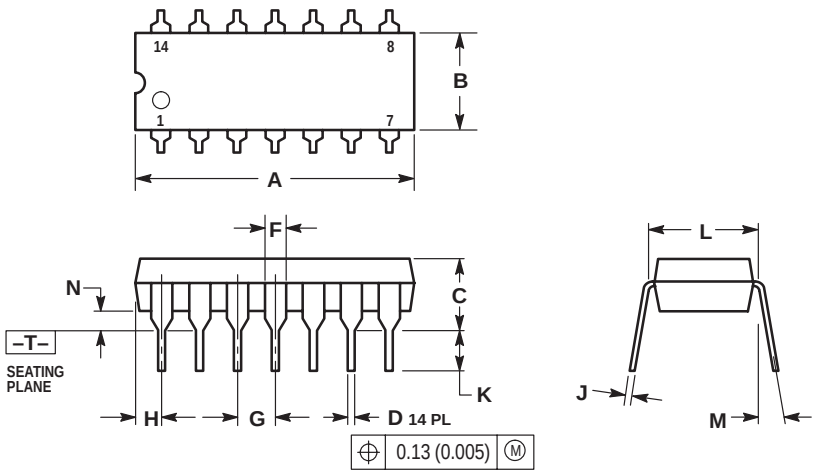


Figure 2. Set and Clear to Output Delays, Set and Clear Pulse Widths

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 646–06
ISSUE M

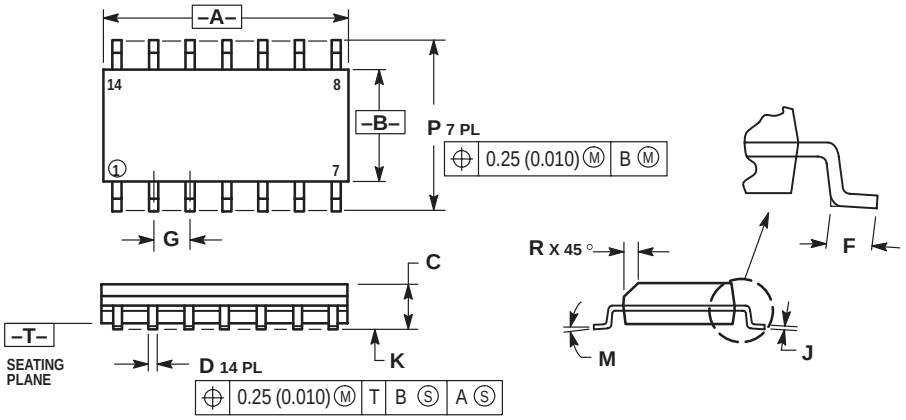


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	18.80
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	—	10°	—	10°
N	0.015	0.039	0.38	1.01

PACKAGE DIMENSIONS

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751A–03
ISSUE F



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

Notes

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