

SN74LS174

Hex D Flip-Flop

The LSTTL/MSI SN74LS174 is a high speed Hex D Flip-Flop. The device is used primarily as a 6-bit edge-triggered storage register. The information on the D inputs is transferred to storage during the LOW to HIGH clock transition. The device has a Master Reset to simultaneously clear all flip-flops. The LS174 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all ON Semiconductor TTL families.

- Edge-Triggered D-Type Inputs
- Buffered-Positive Edge-Triggered Clock
- Asynchronous Common Reset
- Input Clamp Diodes Limit High Speed Termination Effects

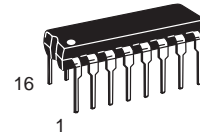
GUARANTEED OPERATING RANGES

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

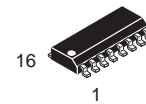


ON Semiconductor
Formerly a Division of Motorola
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**LOW
POWER
SCHOTTKY**



**PLASTIC
N SUFFIX
CASE 648**



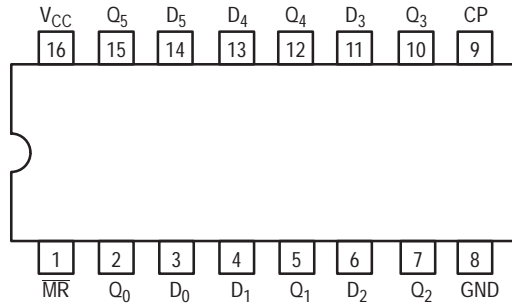
**SOIC
D SUFFIX
CASE 751B**

ORDERING INFORMATION

Device	Package	Shipping
SN74LS174N	16 Pin DIP	2000 Units/Box
SN74LS174D	16 Pin	2500/Tape & Reel

SN74LS174

CONNECTION DIAGRAM DIP (TOP VIEW)



NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

PIN NAMES

D ₀ - D ₅	Data Inputs
CP	Clock (Active HIGH Going Edge) Input
MR	Master Reset (Active LOW) Input
Q ₀ - Q ₅	Outputs

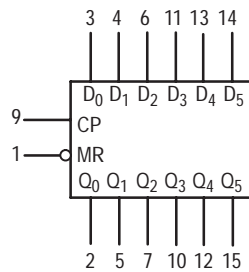
LOADING (Note a)

	HIGH	LOW
D ₀ - D ₅	0.5 U.L.	0.25 U.L.
CP	0.5 U.L.	0.25 U.L.
MR	0.5 U.L.	0.25 U.L.
Q ₀ - Q ₅	10 U.L.	5 U.L.

NOTES:

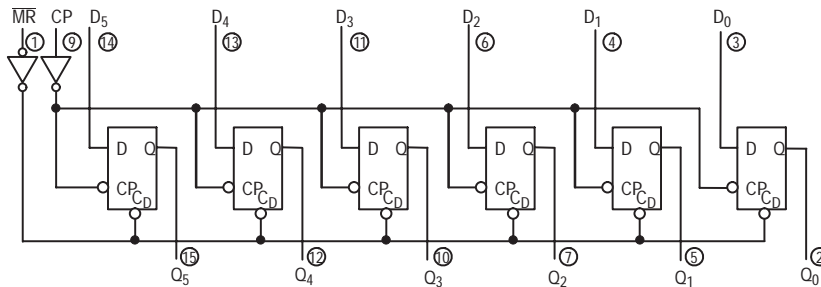
a) 1 TTL Unit Load (U.L.) = 40 μA HIGH/1.6 mA LOW.

LOGIC SYMBOL



V_{CC} = PIN 16
GND = PIN 8

LOGIC DIAGRAM



V_{CC} = PIN 16
GND = PIN 8
○ = PIN NUMBERS

SN74LS174

FUNCTIONAL DESCRIPTION

The LS174 consists of six edge-triggered D flip-flops with individual D inputs and Q outputs. The Clock (CP) and Master Reset (\overline{MR}) are common to all flip-flops.

Each D input's state is transferred to the corresponding flip-flop's output following the LOW to HIGH Clock (CP) transition.

A LOW input to the Master Reset (\overline{MR}) will force all outputs LOW independent of Clock or Data inputs. The LS174 is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

TRUTH TABLE

Inputs (t = n, $\overline{MR} = H$)	Outputs (t = n+1) Note 1
D	Q
H	H
L	L

Note 1: t = n + 1 indicates conditions after next clock.

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	V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table
			0.35	0.5	V	
I _{IH}	Input HIGH Current			20	μA	V _{CC} = MAX, V _{IN} = 2.7 V
				0.1	mA	V _{CC} = MAX, V _{IN} = 7.0 V
I _{IL}	Input LOW Current			-0.4	mA	V _{CC} = MAX, V _{IN} = 0.4 V
I _{OS}	Short Circuit Current (Note 1)	-20		-100	mA	V _{CC} = MAX
I _{CC}	Power Supply Current			26	mA	V _{CC} = MAX

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

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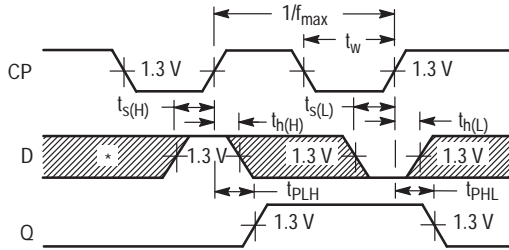
AC CHARACTERISTICS (T_A = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
f _{MAX}	Maximum Input Clock Frequency	30	40		MHz	V _{CC} = 5.0 V C _L = 15 pF
t _{PHL}	Propagation Delay, \overline{MR} to Output		23	35	ns	
t _{PLH} t _{PHL}	Propagation Delay, Clock to Output		20 21	30 30	ns	

AC SETUP REQUIREMENTS (T_A = 25°C)

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
t _W	Clock or MR Pulse Width	20			ns	V _{CC} = 5.0 V
t _S	Data Setup Time	20			ns	
t _H	Data Hold Time	5.0			ns	
t _{rec}	Recovery Time	25			ns	

AC WAVEFORMS



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

Figure 1. Clock to Output Delays, Clock Pulse Width, Frequency, Setup and Hold Times Data to Clock

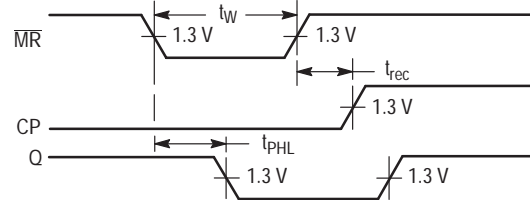


Figure 2. Master Reset to Output Delay, Master Reset Pulse Width, and Master Reset Recovery Time

DEFINITIONS OF TERMS

SETUP TIME (t_S) — is defined as the minimum time required for the correct logic level to be present at the logic input prior to the clock transition from LOW to HIGH in order to be recognized and transferred to the outputs.

HOLD TIME (t_H) — is defined as the minimum time following the clock transition from LOW to HIGH that the logic level must be maintained at the input in order to ensure

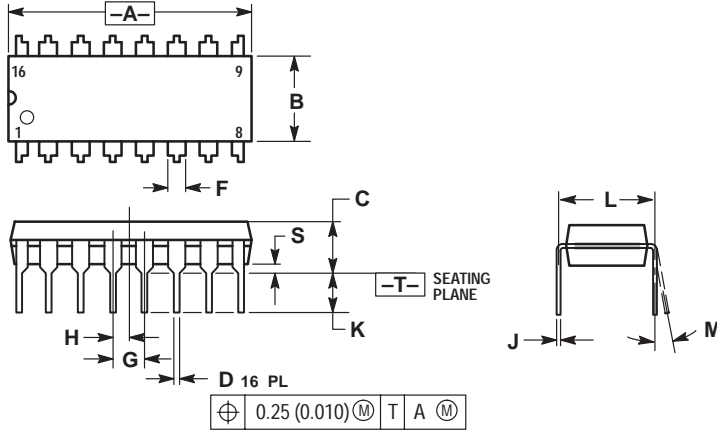
continued recognition. A negative HOLD TIME indicates that the correct logic level may be released prior to the clock transition from LOW to HIGH and still be recognized.

RECOVERY TIME (t_{rec}) — is defined as the minimum time required between the end of the reset pulse and the clock transition from LOW to HIGH in order to recognize and transfer HIGH Data to the Q outputs.

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PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 648-08
ISSUE R



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.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0° 10°		0° 10°	
S	0.020	0.040	0.51	1.01

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PACKAGE DIMENSIONS

D SUFFIX PLASTIC SOIC PACKAGE CASE 751B-05 ISSUE J



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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
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	0.229	0.244
R	0.25	0.50	0.010	0.019

Notes

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