

# 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

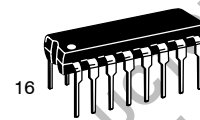
Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	4.75	5.0	5.25	V
T <sub>A</sub>	Operating Ambient Temperature Range	0	25	70	°C
I <sub>OH</sub>	Output Current - High			-0.4	mA
I <sub>OL</sub>	Output Current - Low			8.0	mA



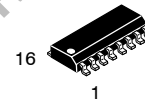
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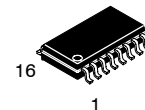
LOW  
POWER  
SCHOTTKY



PLASTIC  
N SUFFIX  
CASE 648



SOIC  
D SUFFIX  
CASE 751B



SOEIAJ  
M SUFFIX  
CASE 966

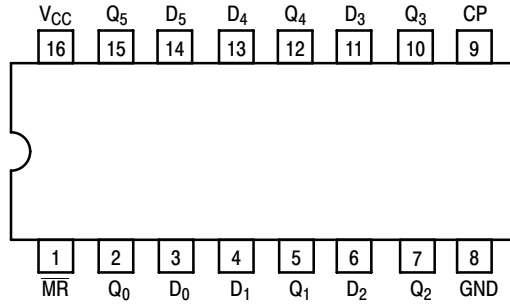
### ORDERING INFORMATION

Device	Package	Shipping
SN74LS174N	16 Pin DIP	2000 Units/Box
SN74LS174D	SOIC-16	38 Units/Rail
SN74LS174DR2	SOIC-16	2500/Tape & Reel
SN74LS174M	SOEIAJ-16	See Note 1
SN74LS174MEL	SOEIAJ-16	See Note 1

1. For ordering information on the EIAJ version of the SOIC package, please contact your local ON Semiconductor representative.

# 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

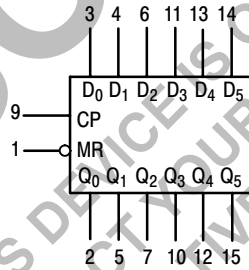
### LOADING (Note a)

	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:

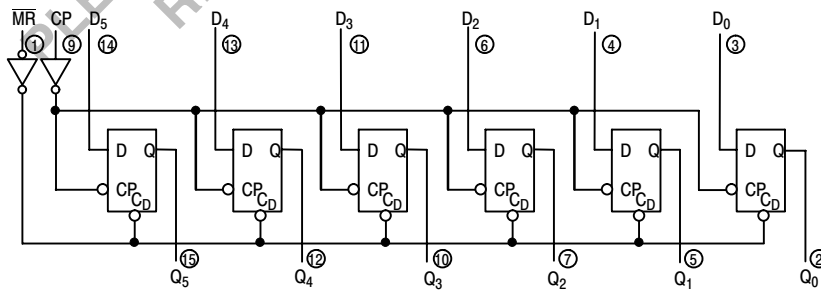
a) 1 TTL Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW.

### 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 <sub>IH</sub>	Input HIGH Voltage	2.0			V	Guaranteed Input HIGH Voltage for All Inputs
V <sub>IL</sub>	Input LOW Voltage			0.8	V	Guaranteed Input LOW Voltage for All Inputs
V <sub>IK</sub>	Input Clamp Diode Voltage		-0.65	-1.5	V	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	2.7	3.5		V	V <sub>CC</sub> = MIN, I <sub>OH</sub> = MAX, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table
V <sub>OL</sub>	Output LOW Voltage		0.25	0.4	V	I <sub>OL</sub> = 4.0 mA
			0.35	0.5	V	I <sub>OL</sub> = 8.0 mA
I <sub>IH</sub>	Input HIGH Current			20	μA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V
				0.1	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V
I <sub>IL</sub>	Input LOW Current			-0.4	mA	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V
I <sub>OS</sub>	Short Circuit Current (Note 2)	-20		-100	mA	V <sub>CC</sub> = MAX
I <sub>CC</sub>	Power Supply Current			26	mA	V <sub>CC</sub> = MAX

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

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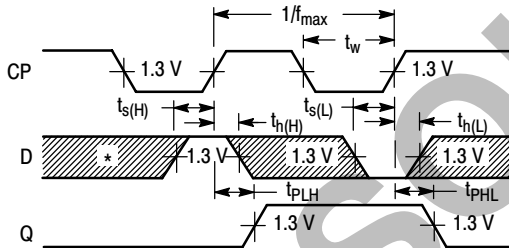
## AC CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
$f_{\text{MAX}}$	Maximum Input Clock Frequency	30	40		MHz	$V_{\text{CC}} = 5.0\text{ V}$ $C_L = 15\text{ pF}$
$t_{\text{PHL}}$	Propagation Delay, $\overline{\text{MR}}$ to Output		23	35	ns	
$t_{\text{PLH}}$ $t_{\text{PHL}}$	Propagation Delay, Clock to Output		20 21	30 30	ns	

## AC SETUP REQUIREMENTS ( $T_A = 25^\circ\text{C}$ )

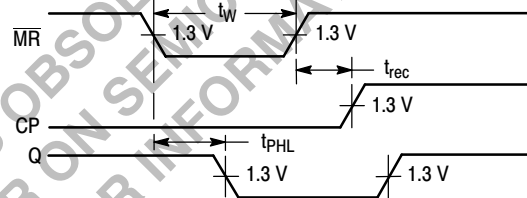
Symbol	Parameter	Limits			Unit	Test Conditions
		Min	Typ	Max		
$t_w$	Clock or $\overline{\text{MR}}$ Pulse Width	20			ns	$V_{\text{CC}} = 5.0\text{ V}$
$t_s$	Data Setup Time	20			ns	
$t_h$	Data Hold Time	5.0			ns	
$t_{\text{rec}}$	Recovery Time	25			ns	

## 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

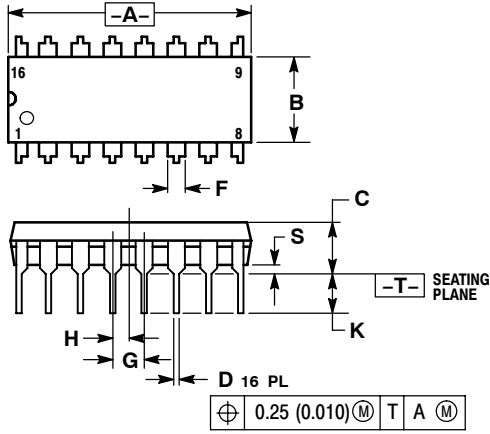
continued recognition. A negative HOLD TIME indicates that the correct logic level may be released prior to the clock transition from LOW to HIGH and still be recognized.

**RECOVERY TIME ( $t_{\text{rec}}$ )** — 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.

# SN74LS174

## 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

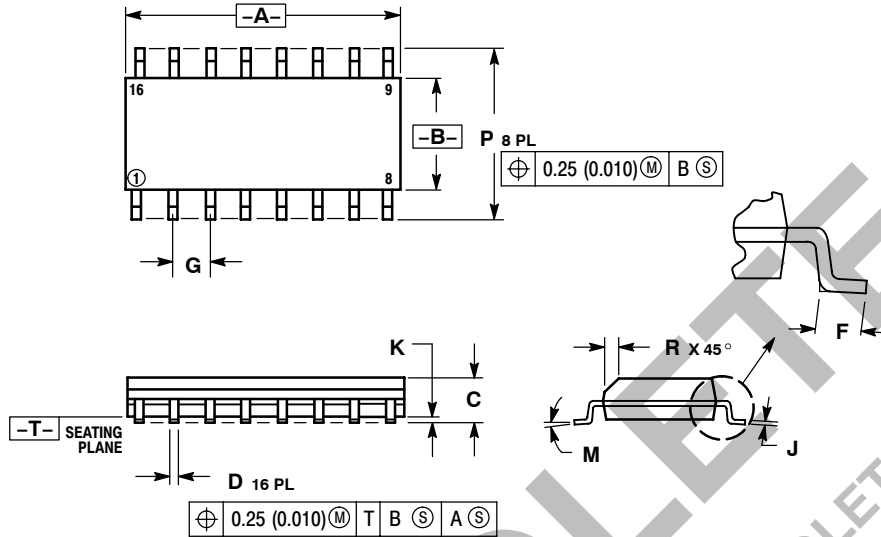
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 REPRESENTATIVE FOR INFORMATION

# SN74LS174

## 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°	
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

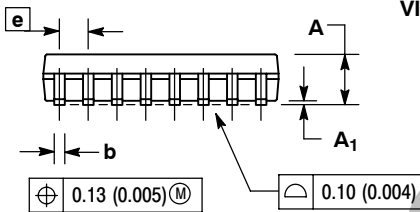
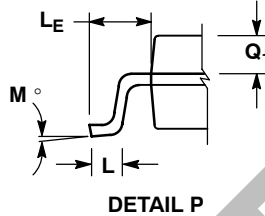
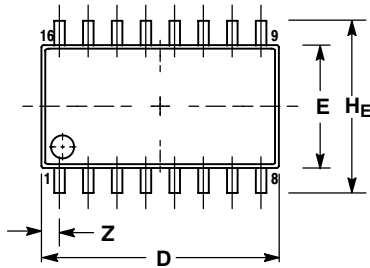
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# SN74LS174

## PACKAGE DIMENSIONS

**M SUFFIX**  
**SOEIAJ PACKAGE**  
**CASE 966-01**  
**ISSUE O**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A <sub>1</sub>	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0° 10°		0° 10°	
Q <sub>1</sub>	0.70	0.90	0.028	0.035
Z	---	0.78	---	0.031

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