

# 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   |

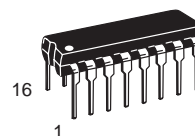


**ON Semiconductor**

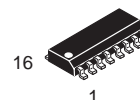
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<http://onsemi.com>

**LOW  
POWER  
SCHOTTKY**



**PLASTIC  
N SUFFIX  
CASE 648**



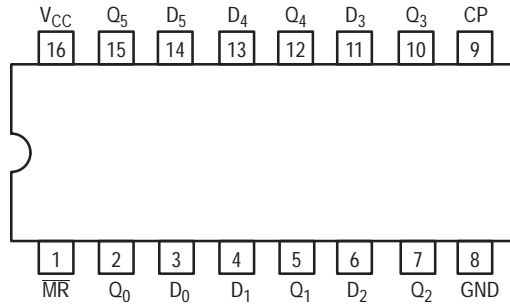
**SOIC  
D SUFFIX  
CASE 751B**

### 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 <sub>0</sub> – D <sub>5</sub> | Data Inputs                          |
| CP                              | Clock (Active HIGH Going Edge) Input |
| MR                              | Master Reset (Active LOW) Input      |
| Q <sub>0</sub> – Q <sub>5</sub> | Outputs                              |

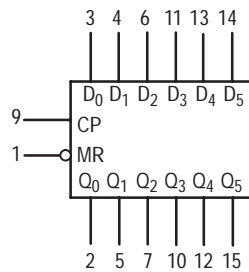
### LOADING (Note a)

| HIGH     | LOW       |
|----------|-----------|
| 0.5 U.L. | 0.25 U.L. |
| 0.5 U.L. | 0.25 U.L. |
| 0.5 U.L. | 0.25 U.L. |
| 10 U.L.  | 5 U.L.    |

### NOTES:

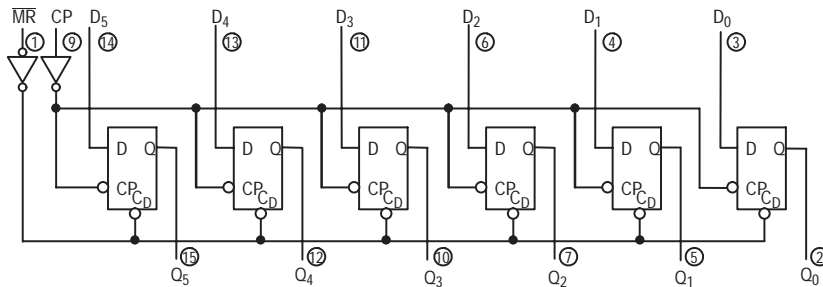
a) 1 TTL Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW.

## LOGIC SYMBOL



V<sub>CC</sub> = PIN 16  
GND = PIN 8

## LOGIC DIAGRAM



V<sub>CC</sub> = 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             | $V_{CC} = \text{MIN}$ , $I_{IN} = -18 \text{ mA}$   |
| $V_{OH}$ | Output HIGH Voltage            | 2.7    | 3.5   |      | V             | $V_{CC} = \text{MIN}$ , $I_{OH} = \text{MAX}$ , $V_{IN} = V_{IH}$ or $V_{IL}$ per Truth Table           |
| $V_{OL}$ | Output LOW Voltage             |        | 0.25  | 0.4  | V             | $I_{OL} = 4.0 \text{ mA}$ $V_{CC} = V_{CC} \text{ MIN}$ , $V_{IN} = V_{IL}$ or $V_{IH}$ per Truth Table |
|          |                                |        | 0.35  | 0.5  | V             | $I_{OL} = 8.0 \text{ mA}$   |
| $I_{IH}$ | Input HIGH Current             |        |       | 20   | $\mu\text{A}$ | $V_{CC} = \text{MAX}$ , $V_{IN} = 2.7 \text{ V}$  |
|          |                                |        |       | 0.1  | mA            | $V_{CC} = \text{MAX}$ , $V_{IN} = 7.0 \text{ V}$  |
| $I_{IL}$ | Input LOW Current              |        |       | -0.4 | mA            | $V_{CC} = \text{MAX}$ , $V_{IN} = 0.4 \text{ V}$  |
| $I_{OS}$ | Short Circuit Current (Note 1) | -20    |       | -100 | mA            | $V_{CC} = \text{MAX}$   |
| $I_{CC}$ | Power Supply Current           |        |       | 26   | mA            | $V_{CC} = \text{MAX}$   |

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

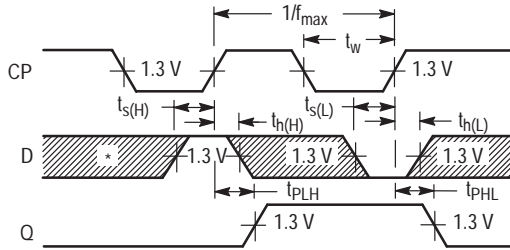
AC CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

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

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

| Symbol           | Parameter               | Limits |     |     | Unit | Test Conditions                |
|------------------|-------------------------|--------|-----|-----|------|--------------------------------|
|                  |                         | Min    | Typ | Max |      |                                |
| $t_W$            | Clock or 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

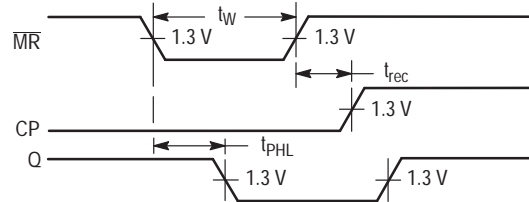


Figure 2. Master Reset to Output Delay, Master Reset Pulse Width, and Master Reset Recovery Time

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

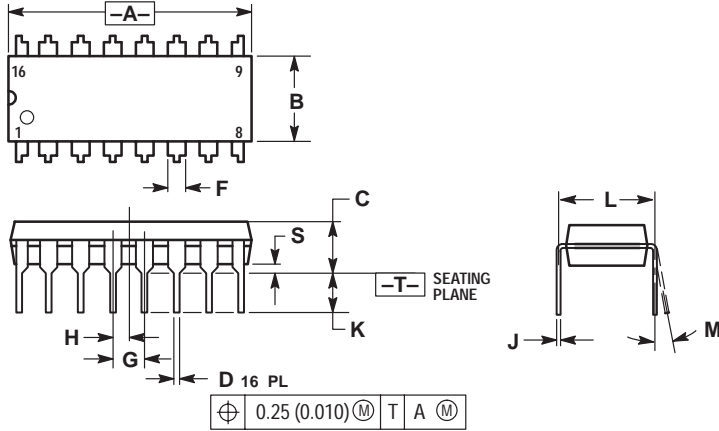
continued recognition. A negative HOLD TIME indicates that the correct logic level may be released prior to the clock transition from LOW to HIGH and still be recognized.

**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:

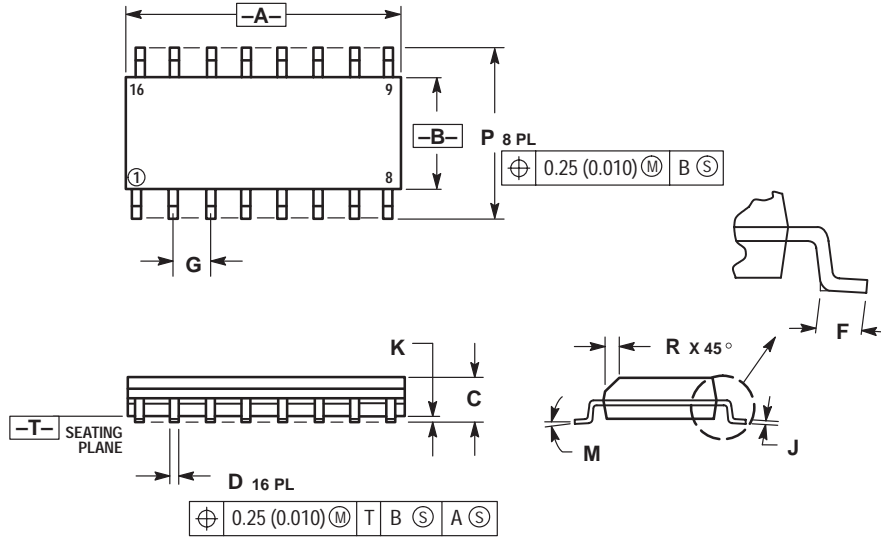
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| 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  |

# 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°    | 0°        | 7°    |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

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