

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 \bar{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.

MODE SELECT - TRUTH TABLE

| OPERATING MODE | INPUTS | | | OUTPUTS | |
|------------------|-------------|-------------|---|---------|-----------|
| | \bar{S}_D | \bar{C}_D | D | Q | \bar{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 \bar{S}_D and \bar{C}_D are LOW, but the output states are unpredictable if \bar{S}_D and \bar{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, l = 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.

GUARANTEED OPERATING RANGES

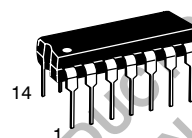
| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|-------------------------------------|------|-----|------|------|
| V_{CC} | Supply Voltage | 4.75 | 5.0 | 5.25 | V |
| T_A | Operating Ambient Temperature Range | 0 | 25 | 70 | °C |
| I_{OH} | Output Current - High | | | -0.4 | mA |
| I_{OL}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



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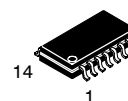
LOW
POWER
SCHOTTKY



PLASTIC
N SUFFIX
CASE 646



SOIC
D SUFFIX
CASE 751A



SOEIAJ
M SUFFIX
CASE 965

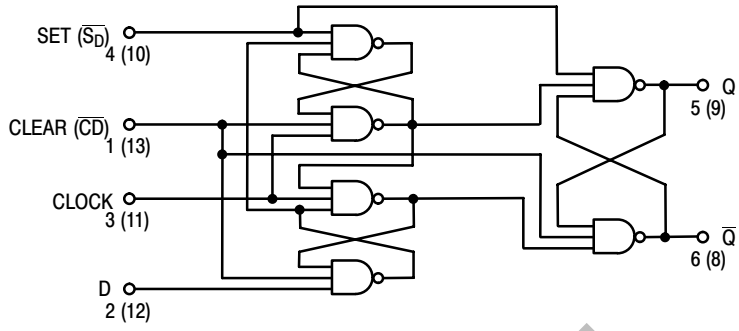
ORDERING INFORMATION

| Device | Package | Shipping |
|--------------|------------|------------------|
| SN74LS74AN | 14 Pin DIP | 2000 Units/Box |
| SN74LS74AD | SOIC-14 | 55 Units/Rail |
| SN74LS74ADR2 | SOIC-14 | 2500/Tape & Reel |
| SN74LS74AM | SOEIAJ-14 | See Note 1 |
| SN74LS74AMEL | SOEIAJ-14 | See Note 1 |

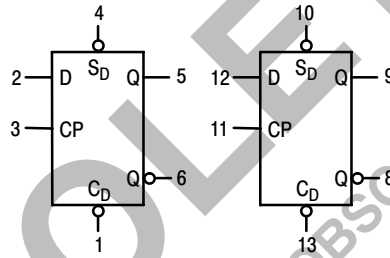
1. For ordering information on the EIAJ version of the SOIC package, please contact your local ON Semiconductor representative.

SN74LS74A

LOGIC DIAGRAM (Each Flip-Flop)



LOGIC SYMBOL



V_{CC} = PIN 14
GND = PIN 7

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SN74LS74A

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 |
| | | | 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 2) | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current | | | 8.0 | mA | V _{CC} = MAX |

2. 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)

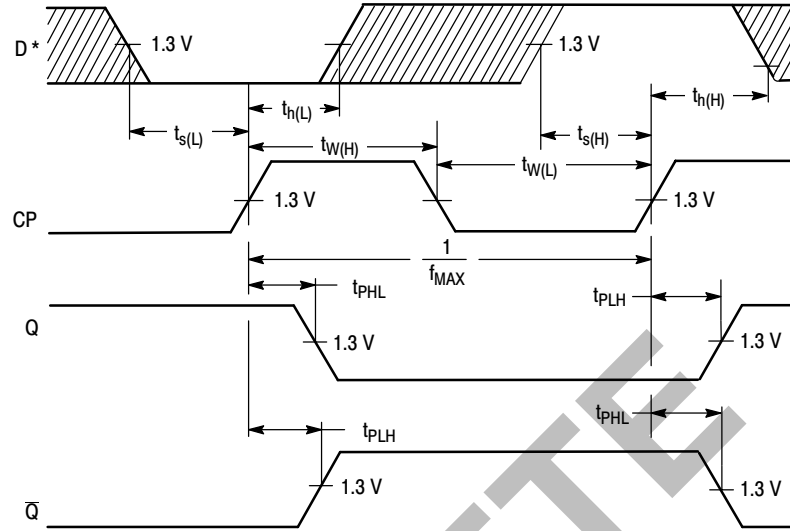
| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|--------------------------------------|-----------------------------|--------|----------|----------|------|---|
| | | Min | Typ | Max | | |
| f _{MAX} | Maximum Clock Frequency | 25 | 33 | | MHz | Figure 1 |
| t _{PLH} t _{PHL} | Clock, Clear, Set to Output | | 13 25 | 25 40 | ns | Figure 1 |
| | | | | | | V _{CC} = 5.0 V C _L = 15 pF |

AC SETUP REQUIREMENTS (T_A = 25°C)

| Symbol | Parameter | Limits | | | Unit | Test Conditions |
|-------------------|-------------------------------|--------|-----|-----|------|-------------------------|
| | | Min | Typ | Max | | |
| t _{W(H)} | Clock | 25 | | | ns | Figure 1 |
| t _{W(L)} | Clear, Set | 25 | | | ns | Figure 2 |
| t _s | Data Setup Time — HIGH LOW | 20 | | | ns | Figure 1 |
| | | 20 | | | ns | |
| t _h | Hold Time | 5.0 | | | ns | Figure 1 |
| | | | | | | V _{CC} = 5.0 V |

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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

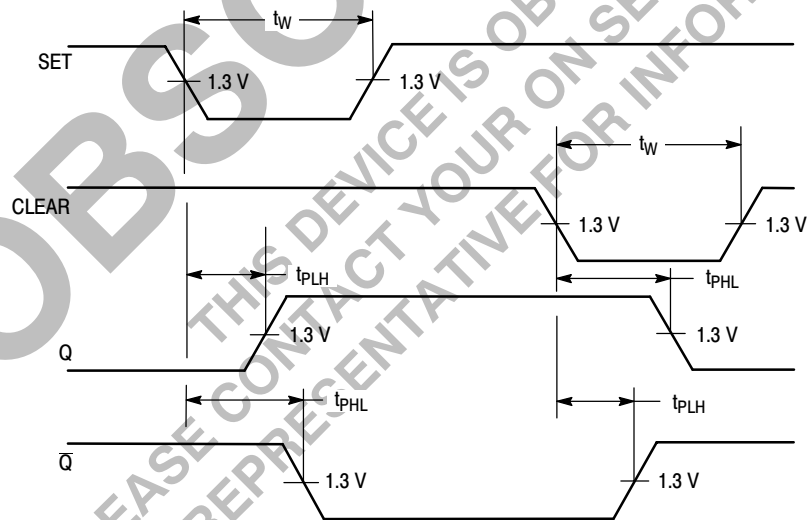
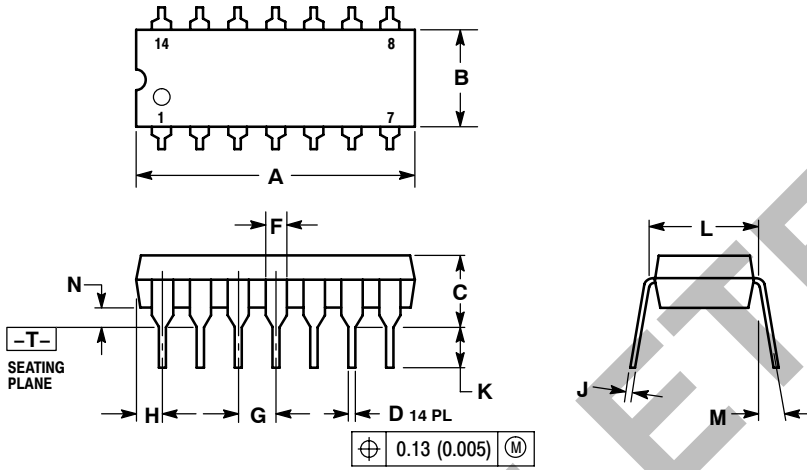


Figure 2. Set and Clear to Output Delays, Set and Clear Pulse Widths

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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.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | 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 |

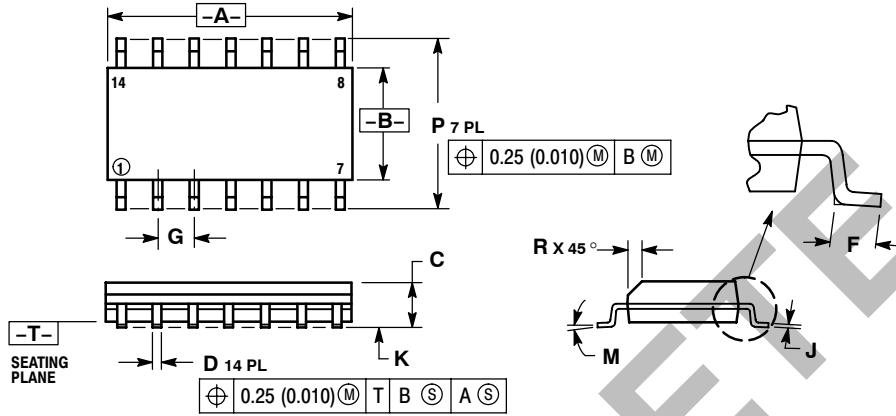
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PACKAGE DIMENSIONS

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.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|--------|-------|
| | 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 |

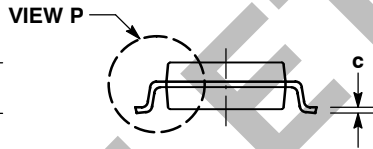
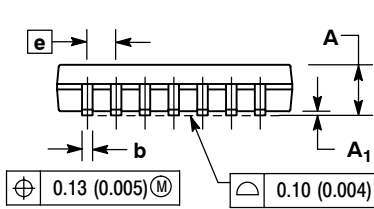
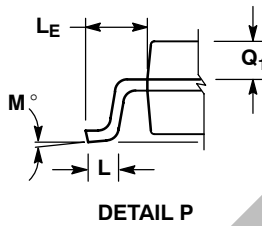
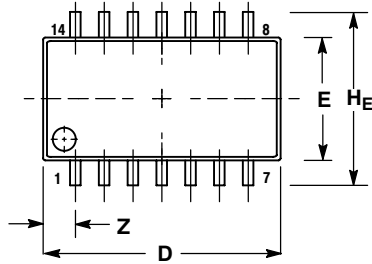
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SN74LS74A

PACKAGE DIMENSIONS

M SUFFIX
SOEIAJ PACKAGE
CASE 965-01
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 ₁ | 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 | |
| H _E | 7.40 | 8.20 | 0.291 | 0.323 |
| 0.50 | 0.50 | 0.85 | 0.020 | 0.033 |
| L _E | 1.10 | 1.50 | 0.043 | 0.059 |
| M | 0° | 10° | 0° | 10° |
| Q ₁ | 0.70 | 0.90 | 0.028 | 0.035 |
| Z | --- | 1.42 | --- | 0.056 |

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