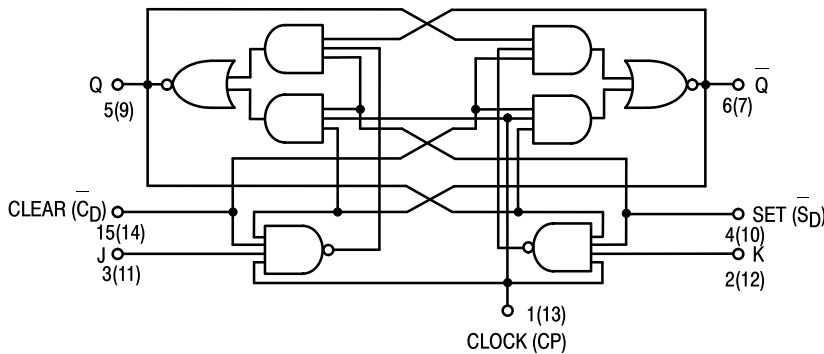




# DUAL JK NEGATIVE EDGE-TRIGGERED FLIP-FLOP

The SN54/74LS112A dual JK flip-flop features individual J, K, clock, and asynchronous set and clear inputs to each flip-flop. When the clock goes HIGH, the inputs are enabled and data will be accepted. The logic level of the J and K inputs may be allowed to change when the clock pulse is HIGH and the bistable will perform according to the truth table as long as minimum set-up and hold time are observed. Input data is transferred to the outputs on the negative-going edge of the clock pulse.

LOGIC DIAGRAM (Each Flip-Flop)



MODE SELECT — TRUTH TABLE

| OPERATING MODE   | INPUTS         |                |   |   | OUTPUTS |    |
|------------------|----------------|----------------|---|---|---------|----|
|                  | S <sub>D</sub> | C <sub>D</sub> | J | K | Q       | Q̄ |
| Set              | L              | H              | X | X | H       | L  |
| Reset (Clear)    | H              | L              | X | X | L       | H  |
| *Undetermined    | L              | L              | X | X | H       | H  |
| Toggle           | H              | H              | h | h | q       | q̄ |
| Load "0" (Reset) | H              | H              | l | h | L       | H  |
| Load "1" (Set)   | H              | H              | h | l | H       | L  |
| Hold             | H              | H              | l | l | q       | q̄ |

\* Both outputs will be HIGH while both S<sub>D</sub> and C<sub>D</sub> are LOW, but the output states are unpredictable if S<sub>D</sub> and C<sub>D</sub> go HIGH simultaneously.

H, h = HIGH Voltage Level

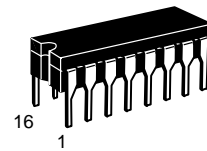
L, l = LOW Voltage Level

X = Don't Care

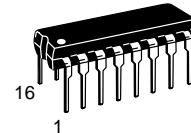
l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the HIGH to LOW clock transition.

## SN54/74LS112A

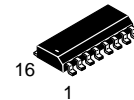
DUAL JK NEGATIVE  
EDGE-TRIGGERED FLIP-FLOP  
LOW POWER SCHOTTKY



J SUFFIX  
CERAMIC  
CASE 620-09



N SUFFIX  
PLASTIC  
CASE 648-08

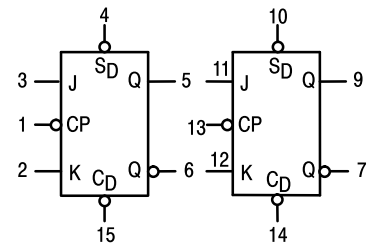


D SUFFIX  
SOIC  
CASE 751B-03

ORDERING INFORMATION

- SN54LSXXXJ Ceramic
- SN74LSXXXN Plastic
- SN74LSXXXD SOIC

LOGIC SYMBOL



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

# SN54/74LS112A

## GUARANTEED OPERATING RANGES

| Symbol          | Parameter                           |          | Min         | Typ        | Max         | Unit |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54<br>74 | 4.5<br>4.75 | 5.0<br>5.0 | 5.5<br>5.25 | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54<br>74 | -55<br>0    | 25<br>25   | 125<br>70   | °C   |
| I <sub>OH</sub> | Output Current — High               | 54, 74   |             |            | -0.4        | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54<br>74 |             |            | 4.0<br>8.0  | mA   |

## 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              | 54                          |       | 0.7  | V                 | Guaranteed Input LOW Voltage for All Inputs                                                                        |                                                                                                                                         |
|                 |                                | 74                          |       | 0.8  |                   |                                                                                                                    |                                                                                                                                         |
| 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            | 54                          | 2.5   | 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 |                                                                                                                                         |
|                 |                                | 74                          | 2.7   | 3.5  | V                 |                                                                                                                    |                                                                                                                                         |
| V <sub>OL</sub> | Output LOW Voltage             | 54, 74                      |       | 0.25 | 0.4               | V                                                                                                                  | I <sub>OL</sub> = 4.0 mA<br>V <sub>CC</sub> = V <sub>CC</sub> MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table |
|                 |                                | 74                          |       | 0.35 | 0.5               | V                                                                                                                  |                                                                                                                                         |
| I <sub>IH</sub> | Input HIGH Current             | J, K<br>Set, Clear<br>Clock |       |      | 20<br>60<br>80    | μA                                                                                                                 | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V                                                                                          |
|                 |                                | J, K<br>Set, Clear<br>Clock |       |      | 0.1<br>0.3<br>0.4 | mA                                                                                                                 | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V                                                                                          |
| I <sub>IL</sub> | Input LOW Current              | J, K<br>Clear, Set, Clk     |       |      | -0.4<br>-0.8      | mA                                                                                                                 | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4 V                                                                                          |
| I <sub>OS</sub> | Short Circuit Current (Note 1) |                             | -20   |      | -100              | mA                                                                                                                 | V <sub>CC</sub> = MAX                                                                                                                   |
| I <sub>CC</sub> | Power Supply Current           |                             |       |      | 6.0               | mA                                                                                                                 | V <sub>CC</sub> = MAX                                                                                                                   |

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

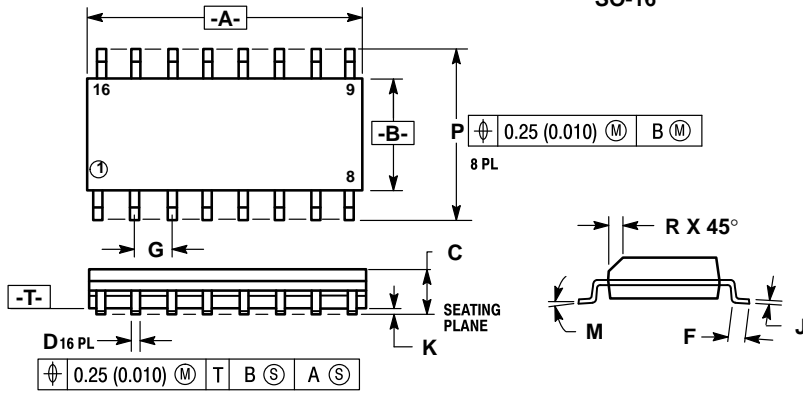
## AC CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0 V)

| Symbol           | Parameter                                        | Limits |     |     | Unit | Test Conditions                                   |
|------------------|--------------------------------------------------|--------|-----|-----|------|---------------------------------------------------|
|                  |                                                  | Min    | Typ | Max |      |                                                   |
| f <sub>MAX</sub> | Maximum Clock Frequency                          | 30     | 45  |     | MHz  | V <sub>CC</sub> = 5.0 V<br>C <sub>L</sub> = 15 pF |
| t <sub>PLH</sub> | Propagation Delay, Clock<br>Clear, Set to Output |        | 15  | 20  | ns   |                                                   |
| t <sub>PHL</sub> |                                                  |        | 15  | 20  | ns   |                                                   |

## AC SETUP REQUIREMENTS (T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0 V)

| Symbol         | Parameter              | Limits |     |     | Unit | Test Conditions         |
|----------------|------------------------|--------|-----|-----|------|-------------------------|
|                |                        | Min    | Typ | Max |      |                         |
| t <sub>W</sub> | Clock Pulse Width High | 20     |     |     | ns   | V <sub>CC</sub> = 5.0 V |
| t <sub>W</sub> | Clear, Set Pulse Width | 25     |     |     | ns   |                         |
| t <sub>S</sub> | Setup Time             | 20     |     |     | ns   |                         |
| t <sub>H</sub> | Hold Time              | 0      |     |     | ns   |                         |

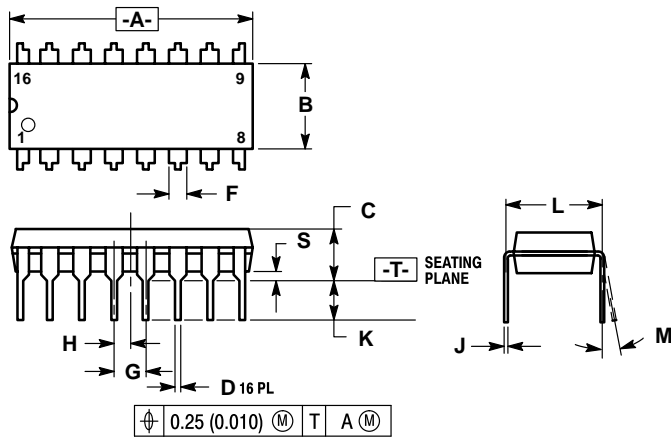
**Case 751B-03 D Suffix  
16-Pin Plastic  
SO-16**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03.

| 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 |

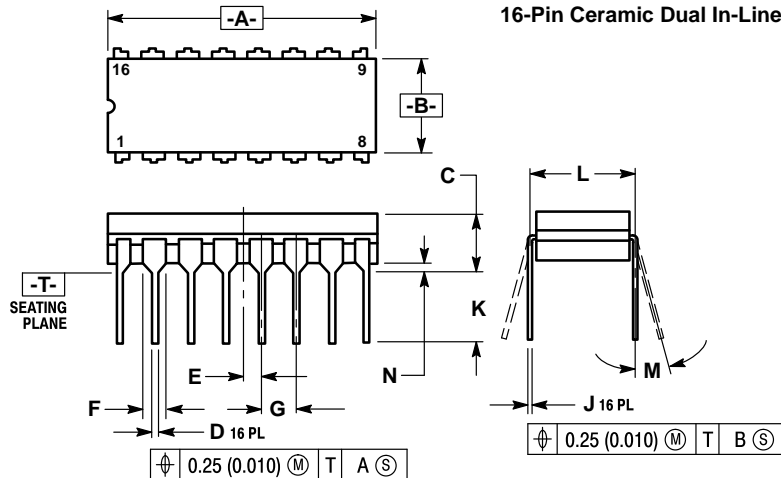
**Case 648-08 N Suffix  
16-Pin Plastic**



- 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.
  6. 648-01 THRU -07 OBSOLETE, NEW STANDARD 648-08.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 18.80       | 19.55 | 0.740     | 0.770 |
| B   | 6.35        | 6.85  | 0.250     | 0.270 |
| C   | 3.69        | 4.44  | 0.145     | 0.175 |
| D   | 0.39        | 0.53  | 0.015     | 0.021 |
| F   | 1.02        | 1.77  | 0.040     | 0.070 |
| G   | 2.54 BSC    |       | 0.100 BSC |       |
| H   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.21        | 0.38  | 0.008     | 0.015 |
| K   | 2.80        | 3.30  | 0.110     | 0.130 |
| L   | 7.50        | 7.74  | 0.295     | 0.305 |
| M   | 0°          | 10°   | 0°        | 10°   |
| S   | 0.51        | 1.01  | 0.020     | 0.040 |

**Case 620-09 J Suffix  
16-Pin Ceramic Dual In-Line**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
  4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
  5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-09.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 19.05       | 19.55 | 0.750     | 0.770 |
| B   | 6.10        | 7.36  | 0.240     | 0.290 |
| C   | —           | 4.19  | —         | 0.165 |
| D   | 0.39        | 0.53  | 0.015     | 0.021 |
| E   | 1.27 BSC    |       | 0.050 BSC |       |
| F   | 1.40        | 1.77  | 0.055     | 0.070 |
| G   | 2.54 BSC    |       | 0.100 BSC |       |
| J   | 0.23        | 0.27  | 0.009     | 0.011 |
| K   | —           | 5.08  | —         | 0.200 |
| L   | 7.62 BSC    |       | 0.300 BSC |       |
| M   | 0°          | 15°   | 0°        | 15°   |
| N   | 0.39        | 0.88  | 0.015     | 0.035 |

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