# SN74LS157

# Quad 2-Input Multiplexer

The LSTTL/MSI SN74LS157 is a high speed Quad 2-Input Multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four buffered outputs present the selected data in the true (non-inverted) form. The LS157 can also be used to generate any four of the 16 different functions of two variables. The LS157 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all ON Semiconductor TTL families.

- Schottky Process for High Speed
- Multifunction Capability
- Non-Inverting Outputs
- Input Clamp Diodes Limit High Speed Termination Effects
- Special Circuitry Ensures Glitch Free Multiplexing
- ESD > 3500 Volts

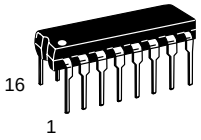
**GUARANTEED OPERATING RANGES**

| 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 |

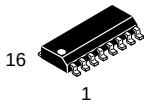
ON Semiconductor™

http://onsemi.com

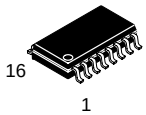
**LOW POWER SCHOTTKY**




**PLASTIC**
**N SUFFIX**
**CASE 648**




**SOIC**
**D SUFFIX**
**CASE 751B**

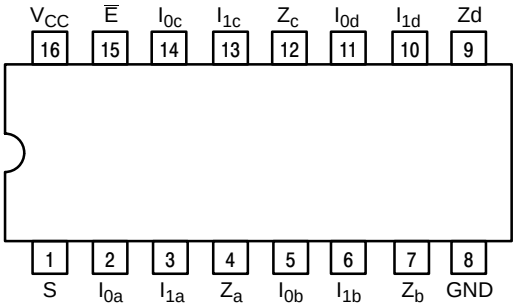



**SOEIAJ**
**M SUFFIX**
**CASE 966**

**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| SN74LS157N | 16 Pin DIP | 2000 Units/Box |
| SN74LS157D | SOIC–16 | 38 Units/Rail |
| SN74LS157DR2 | SOIC–16 | 2500/Tape & Reel |
| SN74LS157M | SOEIAJ–16 | See Note 1 |
| SN74LS157MEL | SOEIAJ–16 | See Note 1 |

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

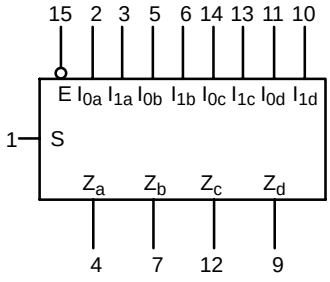



NOTE: The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

| PIN NAMES | | LOADING (Note a) HIGH | LOW |
|---|---|---|---|
| S | Common Select Input | 1.0 U.L. | 0.5 U.L. |
| $\overline{E}$ | Enable (Active LOW) Input | 1.0 U.L. | 0.5 U.L. |
| $I_{0a} – I_{0d}$ | Data Inputs from Source 0 | 0.5 U.L. | 0.25 U.L. |
| $I_{1a} – I_{1d}$ | Data Inputs from Source 1 | 0.5 U.L. | 0.25 U.L. |
| $Z_a – Z_d$ | Multiplexer Outputs | 10 U.L. | 5 U.L. |

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

**Figure 1. Connection Diagram DIP** (TOP VIEW)




$V_{CC}$ = PIN 16
GND = PIN 8

**Figure 2. Logic Symbol**

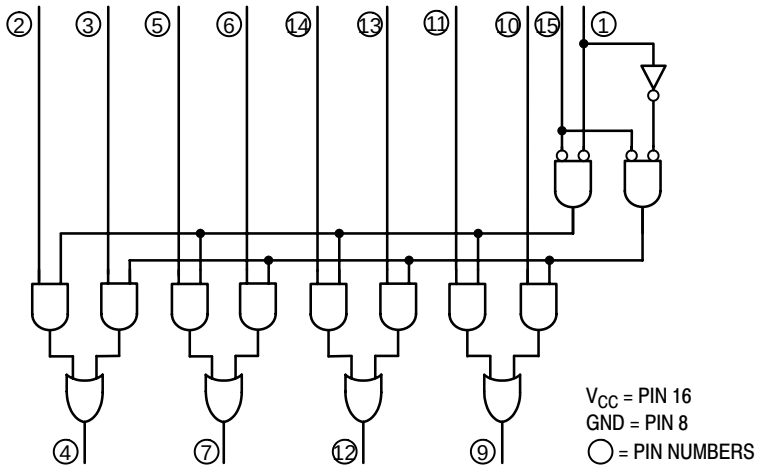



**Figure 3. Logic Diagram**

## FUNCTIONAL DESCRIPTION

The LS157 is a Quad 2-Input Multiplexer fabricated with the Schottky barrier diode process for high speed. It selects four bits of data from two sources under the control of a common Select Input (S). The Enable Input ($\overline{E}$) is active LOW. When $\overline{E}$ is HIGH, all of the outputs (Z) are forced LOW regardless of all other inputs.

The LS157 is the logic implementation of a 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the Select Input. The logic equations for the outputs are:

$Z_a = \overline{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \overline{S})$ $\quad Z_b = \overline{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \overline{S})$

$Z_c = \overline{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \overline{S})$ $\quad Z_d = \overline{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \overline{S})$

A common use of the LS157 is the moving of data from two groups of registers to four common output busses. The particular register from which the data comes is determined by the state of the Select Input. A less obvious use is as a function generator. The LS157 can generate any four of the 16 different functions of two variables with one variable common. This is useful for implementing highly irregular logic.

### TRUTH TABLE

| ENABLE | SELECT INPUT | INPUTS | | OUTPUT |
|---|---|---|---|---|
| $\overline{E}$ | S | $I_0$ | $I_1$ | Z |
| H | X | X | X | L |
| L | H | X | L | L |
| L | H | X | H | H |
| L | L | L | X | L |
| L | L | H | X | H |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

**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 | $V_{CC}$ = $V_{CC}$ MIN, $V_{IN}$ = $V_{IL}$ or $V_{IH}$ per Truth Table |
| | | | 0.35 | 0.5 | V | $I_{OL}$ = 8.0 mA | |
| $I_{IH}$ | Input HIGH Current<br>$I_0$, $I_1$<br>$\overline{E}$, S | | | 20<br>40 | μA | $V_{CC}$ = MAX, $V_{IN}$ = 2.7 V | |
| | $I_0$, $I_1$<br>$\overline{E}$, S | | | 0.1<br>0.2 | mA | $V_{CC}$ = MAX, $V_{IN}$ = 7.0 V | |
| $I_{IL}$ | Input LOW Current<br>$I_0$, $I_1$<br>$\overline{E}$, S | | | –0.4<br>–0.8 | mA | $V_{CC}$ = MAX, $V_{IN}$ = 0.4 V | |
| $I_{OS}$ | Short Circuit Current (Note 2) | –20 | | –100 | mA | $V_{CC}$ = MAX | |
| $I_{CC}$ | Power Supply Current | | | 16 | 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)

| Symbol | Parameter | Limits | | | Unit | Test Conditions | |
|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Data to Output | | 9.0<br>9.0 | 14<br>14 | ns | Figure 2 | $V_{CC}$ = 5.0 V<br>$C_L$ = 15 pF |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Enable to Output | | 13<br>14 | 20<br>21 | ns | Figure 1 | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>Select to Output | | 15<br>18 | 23<br>27 | ns | Figure 2 | |

**AC WAVEFORMS**

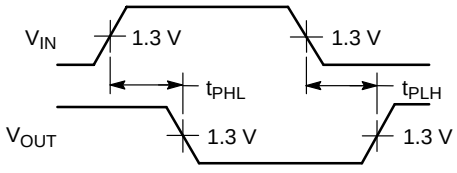



**Figure 1.**

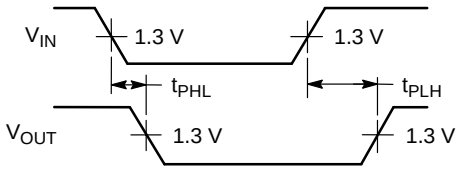
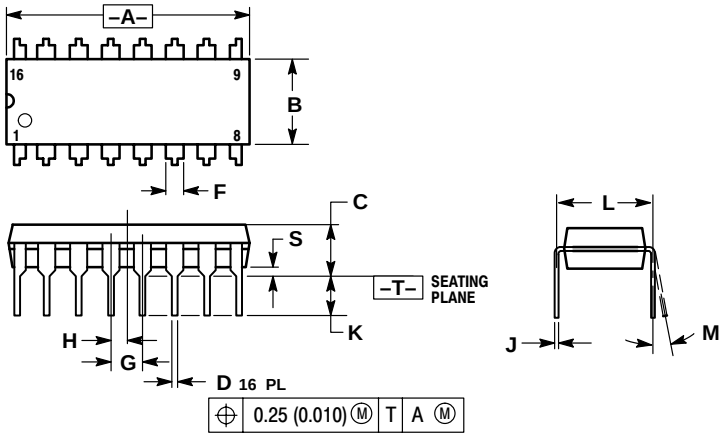



**Figure 2.**

## PACKAGE DIMENSIONS

**N SUFFIX**
PLASTIC PACKAGE
CASE 648–08
ISSUE R

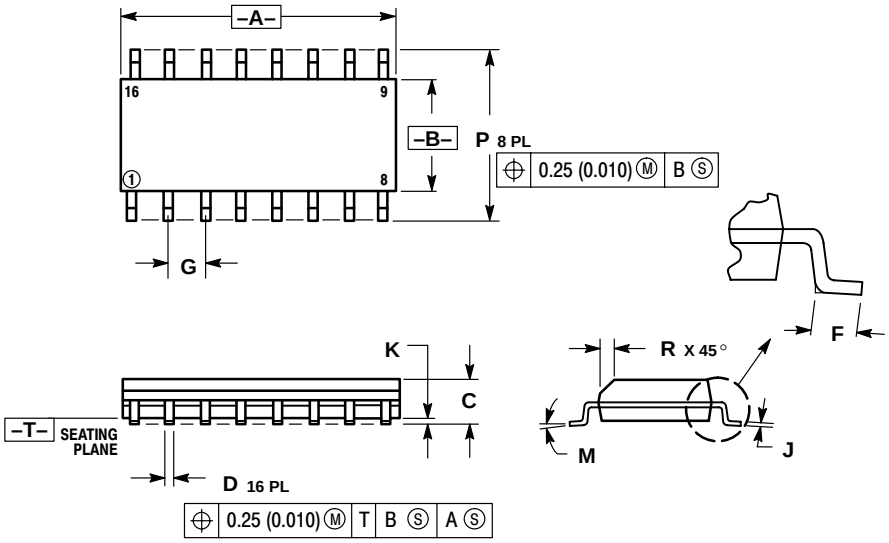



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

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

## PACKAGE DIMENSIONS

**D SUFFIX**
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J

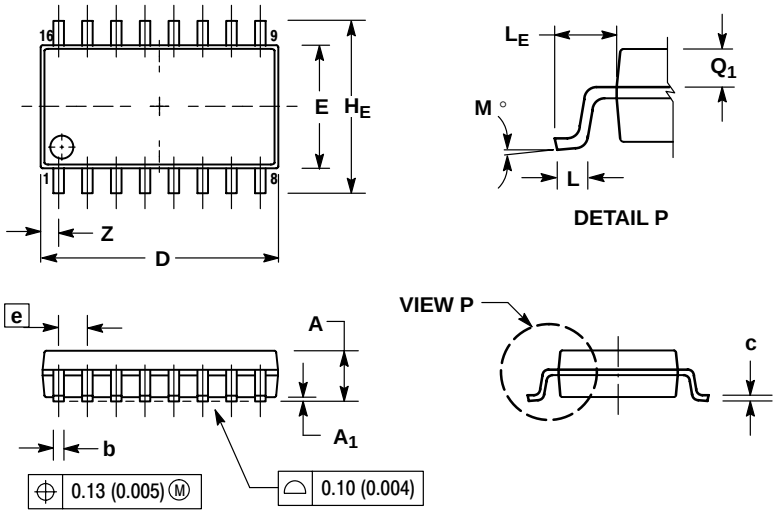



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

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

## 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).

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | 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 |
| L | 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 | --- | 0.78 | --- | 0.031 |

## PUBLICATION ORDERING INFORMATION

**Literature Fulfillment**:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
**Phone**: 303–675–2175 or 800–344–3860 Toll Free USA/Canada
**Fax**: 303–675–2176 or 800–344–3867 Toll Free USA/Canada
**Email**: ONlit@hibbertco.com

**N. American Technical Support**: 800–282–9855 Toll Free USA/Canada

**JAPAN**: ON Semiconductor, Japan Customer Focus Center
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031
**Phone**: 81–3–5740–2700
**Email**: r14525@onsemi.com

**ON Semiconductor Website**: http://onsemi.com

For additional information, please contact your local
Sales Representative.