

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 |

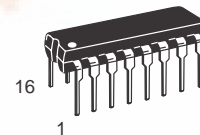


ON Semiconductor

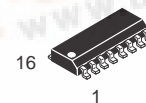
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<http://onsemi.com>

**LOW
POWER
SCHOTTKY**



**PLASTIC
N SUFFIX
CASE 648**



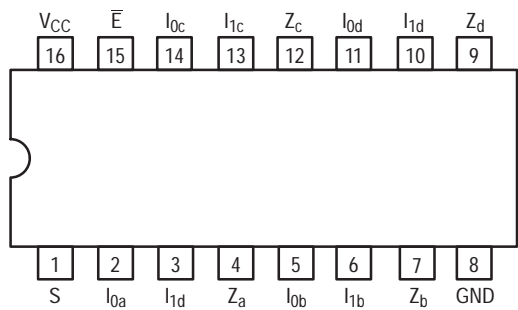
**SOIC
D SUFFIX
CASE 751B**

ORDERING INFORMATION

| Device | Package | Shipping |
|------------|------------|------------------|
| SN74LS157N | 16 Pin DIP | 2000 Units/Box |
| SN74LS157D | 16 Pin | 2500/Tape & Reel |

SN74LS157

CONNECTION DIAGRAM DIP (TOP VIEW)

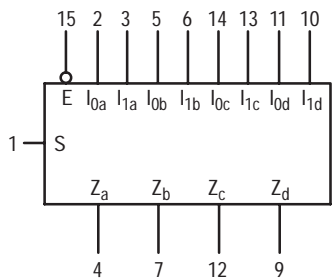


NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

| PIN NAMES | | LOADING (Note a) | |
|-------------------|---------------------------|------------------|-----------|
| | | HIGH | LOW |
| S | Common Select Input | 1.0 U.L. | 0.5 U.L. |
| \bar{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 μ A HIGH/1.6 mA LOW.

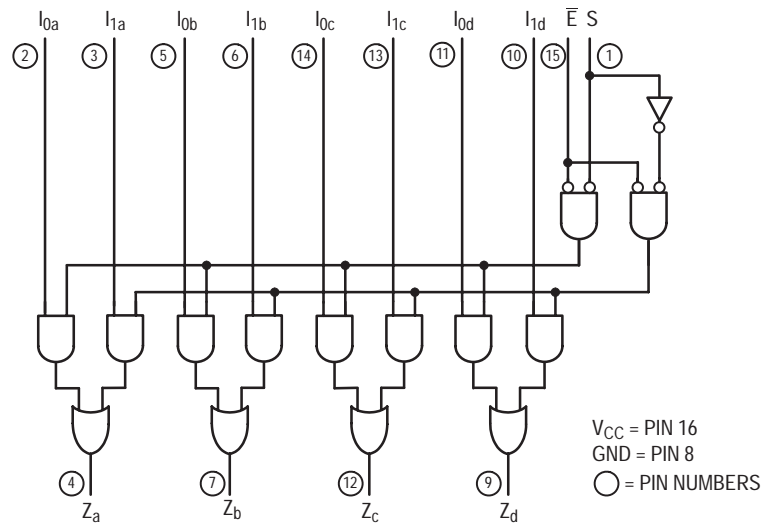
LOGIC SYMBOL



V_{CC} = PIN 16
GND = PIN 8

SN74LS157

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 (\bar{E}) is active LOW. When \bar{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:

$$\begin{aligned}
 Z_a &= \bar{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S}) & Z_b &= \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S}) \\
 Z_c &= \bar{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S}) & Z_d &= \bar{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})
 \end{aligned}$$

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 |
|-----------|--------------|--------|-------|--------|
| \bar{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

SN74LS157

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 | $I_{OL} = 4.0 \text{ mA}$ |
| | | | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current I_0, I_1 \bar{E}, S | | | 20 40 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | I_0, I_1 \bar{E}, S | | | 0.1 0.2 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current I_0, I_1 \bar{E}, S | | | -0.4 -0.8 | 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 | | | 16 | 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 | | |
| t_{PLH} t_{PHL} | Propagation Delay Data to Output | | 9.0 9.0 | 14 14 | ns | Figure 2 |
| t_{PLH} t_{PHL} | Propagation Delay Enable to Output | | 13 14 | 20 21 | ns | Figure 1 |
| t_{PLH} t_{PHL} | Propagation Delay Select to Output | | 15 18 | 23 27 | ns | Figure 2 |

AC WAVEFORMS

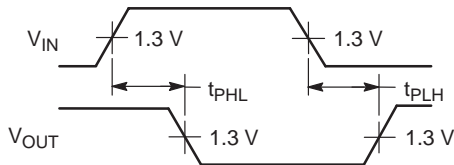


Figure 1.

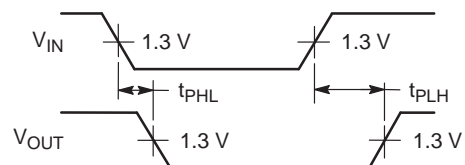
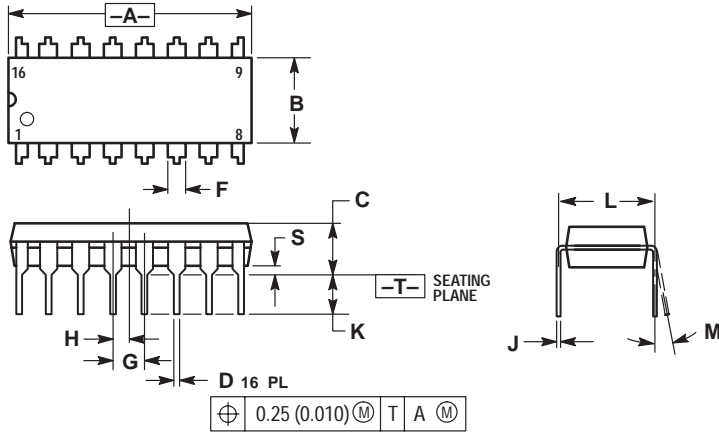


Figure 2.

SN74LS157

PACKAGE DIMENSIONS

N SUFFIX
PLASTIC PACKAGE
CASE 648-08
ISSUE R



NOTES:

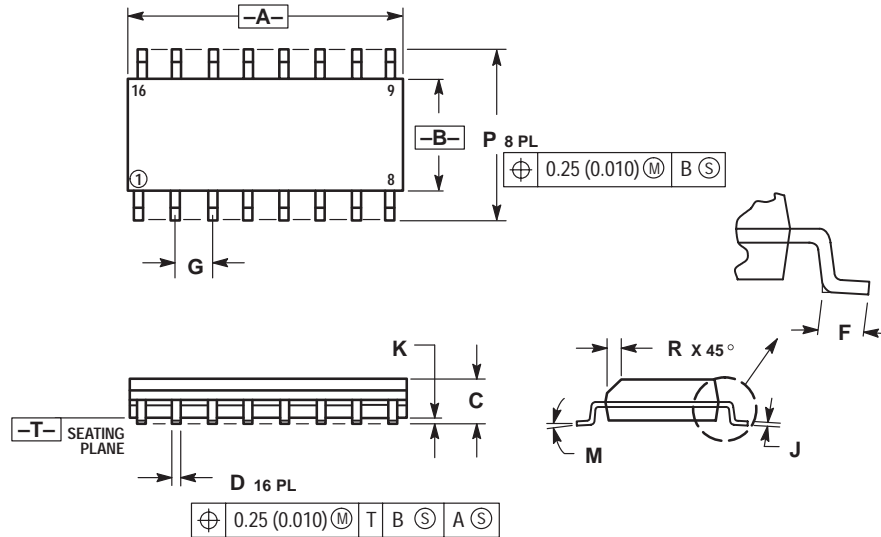
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| 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 |

SN74LS157

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 |
| E | 0.40 | 1.25 | 0.016 | 0.049 |
| F | 1.27 BSC | | 0.050 BSC | |
| G | 0.19 | 0.25 | 0.008 | 0.009 |
| H | 0.10 | 0.25 | 0.004 | 0.009 |
| J | 0° | 7° | 0° | 7° |
| K | 5.80 | 6.20 | 0.229 | 0.244 |
| M | 0.25 | 0.50 | 0.010 | 0.019 |

SN74LS157

Notes

SN74LS157

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