

74LVX157 Low Voltage Quad 2-Input Multiplexer

General Description

The LVX157 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 outputs present the selected data in the true (noninverted) form. The LVX157 can also be used as a function generator.

Features

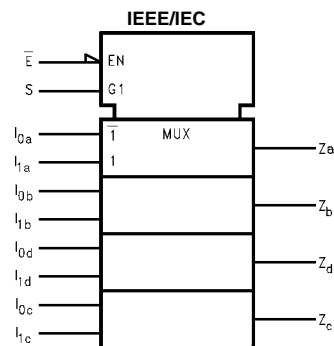
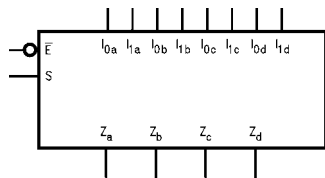
- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

Ordering Code:

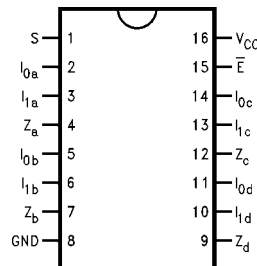
| Order Number | Package Number | Package Description |
|--------------|----------------|------------------------------------------------------------------------------|
| 74LVX157M | M16A | 16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow |
| 74LVX157SJ | M16D | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74LVX157MTC | MTC16 | 16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Devices are also available in Tape and Reel. Specify by appending letter suffix "X" to the ordering code.

Logic Symbols



Connection Diagram



Pin Descriptions

| Pin Names | Description |
|----------------------------------|----------------------|
| I _{0a} -I _{0d} | Source 0 Data Inputs |
| I _{1a} -I _{1d} | Source 1 Data Inputs |
| \bar{E} | Enable Input |
| S | Select Input |
| Z _a -Z _d | Outputs |

Truth Table

| Inputs | | | | Outputs |
|-----------|---|----------------|----------------|---------|
| \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 = Immaterial

Functional Description

The LVX157 is a quad 2-input multiplexer. 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 LVX157 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 shown below:

$$Z_a = \bar{E} \cdot (I_{1a} \cdot S + I_{0a} \cdot \bar{S})$$

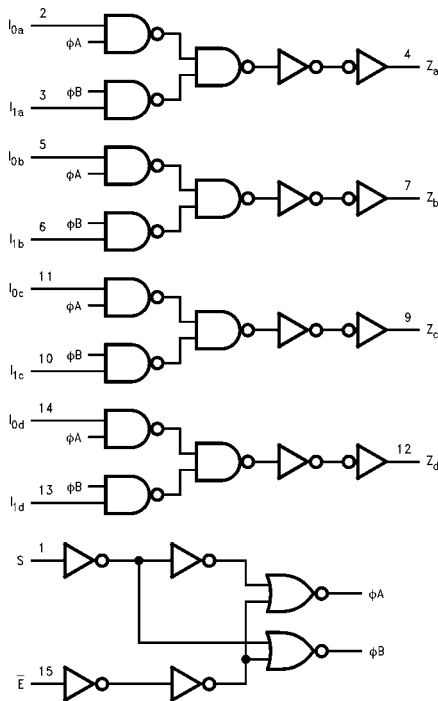
$$Z_b = \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

$$Z_c = \bar{E} \cdot (I_{1c} \cdot S + I_{0c} \cdot \bar{S})$$

$$Z_d = \bar{E} \cdot (I_{1d} \cdot S + I_{0d} \cdot \bar{S})$$

A common use of the LVX157 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 LVX157 can generate any four of the sixteen different functions of two variables with one variable common. This is useful for implementing gating functions.

Logic Diagram



Absolute Maximum Ratings (Note 1)

| | |
|--------------------------------------|--------------------------|
| Supply Voltage (V_{CC}) | -0.5V to +7.0V |
| DC Input Diode Current (I_{IK}) | |
| $V_I = -0.5V$ | -20 mA |
| DC Input Voltage (V_I) | -0.5V to 7V |
| DC Output Diode Current (I_{OK}) | |
| $V_O = -0.5V$ | -20 mA |
| $V_O = V_{CC} + 0.5V$ | +20 mA |
| DC Output Voltage (V_O) | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source | |
| or Sink Current (I_O) | ± 25 mA |
| DC V_{CC} or Ground Current | |
| (I_{CC} or I_{GND}) | ± 50 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Power Dissipation | 180 mW |

Recommended Operating Conditions (Note 2)

| | |
|--------------------------------------------------|--------------------|
| Supply Voltage (V_{CC}) | 2.0V to 3.6V |
| Input Voltage (V_I) | 0V to 5.5V |
| Output Voltage (V_O) | 0V to V_{CC} |
| Operating Temperature (T_A) | -40°C to +85°C |
| Input Rise and Fall Time ($\Delta t/\Delta V$) | 0 ns/V to 100 ns/V |

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

| Symbol | Parameter | V_{CC} | $T_A = +25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units | Conditions |
|----------|------------------------------|----------|---------------------------|-----|-----------|-------------------------------------------------|-----------|---------------|----------------------------------------------------------------------------------------------------------------------|
| | | | Min | Typ | Max | Min | Max | | |
| V_{IH} | HIGH Level Input Voltage | 2.0 | 1.5 | | | 1.5 | | V | |
| | | 3.0 | 2.0 | | | 2.0 | | | |
| | | 3.6 | 2.4 | | | 2.4 | | | |
| V_{IL} | LOW Level Input Voltage | 2.0 | | | 0.5 | | 0.5 | V | |
| | | 3.0 | | | 0.8 | | 0.8 | | |
| | | 3.6 | | | 0.8 | | 0.8 | | |
| V_{OH} | HIGH Level Output Voltage | 2.0 | 1.9 | 2.0 | | 1.9 | | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -50 \mu\text{A}$ $I_{OH} = -4 \text{mA}$ |
| | | 3.0 | 2.9 | 3.0 | | 2.9 | | | |
| | | 3.0 | 2.58 | | | 2.48 | | | |
| V_{OL} | LOW Level Output Voltage | 2.0 | | 0.0 | 0.1 | | 0.1 | V | $V_{IN} = V_{IL}$ or V_{IH} $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 50 \mu\text{A}$ $I_{OL} = 4 \text{mA}$ |
| | | 3.0 | | 0.0 | 0.1 | | 0.1 | | |
| | | 3.0 | | | 0.36 | | 0.44 | | |
| I_{IN} | Input Leakage Current | 3.6 | | | ± 0.1 | | ± 1.0 | μA | $V_{IN} = 5.5V$ or GND |
| I_{CC} | Quiescent Supply Current | 3.6 | | | 4.0 | | 40.0 | μA | $V_{IN} = V_{CC}$ or GND |

Noise Characteristics (Note 3)

| Symbol | Parameter | V_{CC} (V) | $T_A = 25^\circ\text{C}$ | | Units | C_L (pF) |
|-----------|------------------------------------------|-----------------|--------------------------|-------|-------|------------|
| | | | Typ | Limit | | |
| V_{OLP} | Quiet Output Maximum Dynamic V_{OL} | 3.3 | 0.3 | 0.5 | V | 50 |
| V_{OLV} | Quiet Output Minimum Dynamic V_{OL} | 3.3 | -0.3 | -0.5 | V | 50 |
| V_{IHD} | Minimum HIGH Level Dynamic Input Voltage | 3.3 | | 2.0 | V | 50 |
| V_{ILD} | Maximum LOW Level Dynamic Input Voltage | 3.3 | | 0.8 | V | 50 |

Note 3: Input $t_r = t_f = 3\text{ns}$

AC Electrical Characteristics

| Symbol | Parameter | V _{CC} (V) | T _A = +25°C | | | T _A = -40°C to +85°C | | Units | C _L (pF) |
|-------------------|----------------------------------|---------------------|------------------------|------|------|---------------------------------|------|-------|---------------------|
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay Time | 2.7 | | 6.6 | 12.5 | 1.0 | 15.5 | ns | 15 |
| t _{PHL} | I _n to Z _n | 3.3 ± 0.3 | | 9.1 | 16.0 | 1.0 | 19.0 | | 50 |
| | | | | 5.1 | 7.9 | 1.0 | 9.5 | | 15 |
| | | | 7.6 | 11.4 | 1.0 | 13.0 | 50 | | |
| t _{PLH} | Propagation Delay Time | 2.7 | | 8.9 | 16.9 | 1.0 | 20.5 | ns | 15 |
| t _{PHL} | S to Z _n | 3.3 ± 0.3 | | 11.4 | 20.4 | 1.0 | 24.0 | | 50 |
| | | | | 7.0 | 11.0 | 1.0 | 13.0 | | 15 |
| | | | 9.5 | 14.5 | 1.0 | 16.5 | 50 | | |
| t _{PLH} | Propagation Delay Time | 2.7 | | 9.1 | 17.6 | 1.0 | 20.5 | ns | 15 |
| t _{PHL} | \bar{E} to Z _n | 3.3 ± 0.3 | | 11.6 | 21.1 | 1.0 | 24.0 | | 50 |
| | | | | 7.2 | 11.5 | 1.0 | 13.5 | | 15 |
| | | | 9.7 | 15.0 | 1.0 | 17.0 | 50 | | |
| t _{OSHL} | Output to Output Skew (Note 4) | 2.7 | | | 1.5 | | 1.5 | ns | 50 |
| t _{OSLH} | | 3.3 | | | 1.5 | | 1.5 | | |

Note 4: Parameter guaranteed by design.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|$$

$$t_{OSHL} = |t_{PHLm} - t_{PHLn}|$$

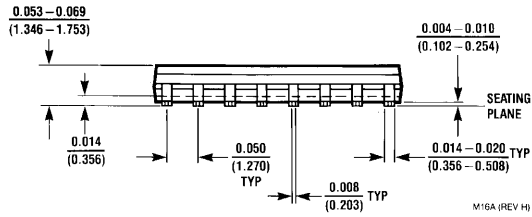
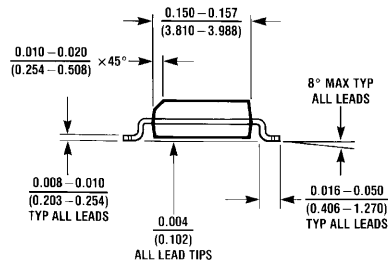
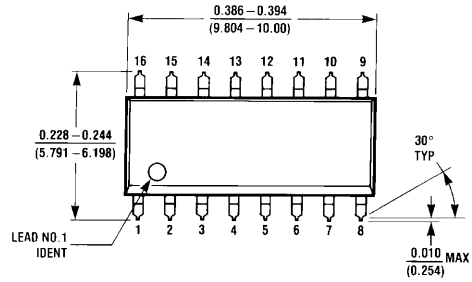
Capacitance

| Symbol | Parameter | T _A = +25°C | | | T _A = -40°C to +85°C | | Units |
|-----------------|----------------------------------------|------------------------|-----|-----|---------------------------------|-----|-------|
| | | Min | Typ | Max | Min | Max | |
| C _{IN} | Input Capacitance | | 4 | 10 | | 10 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 5) | | 20 | | | | pF |

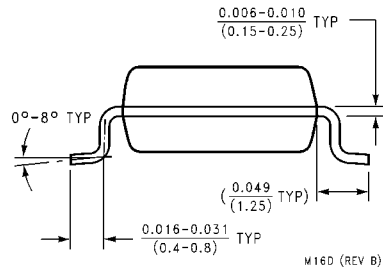
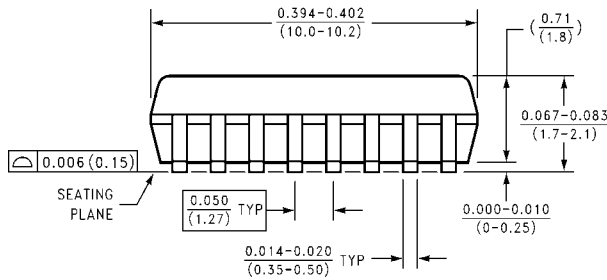
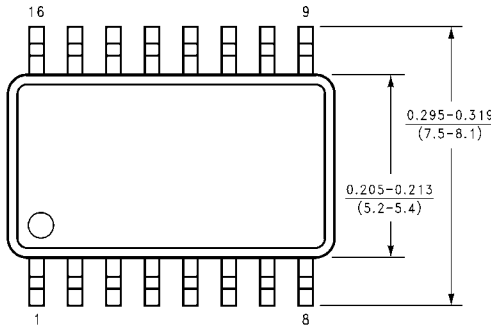
Note 5: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation: $I_{CC(opr.)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

Physical Dimensions inches (millimeters) unless otherwise noted

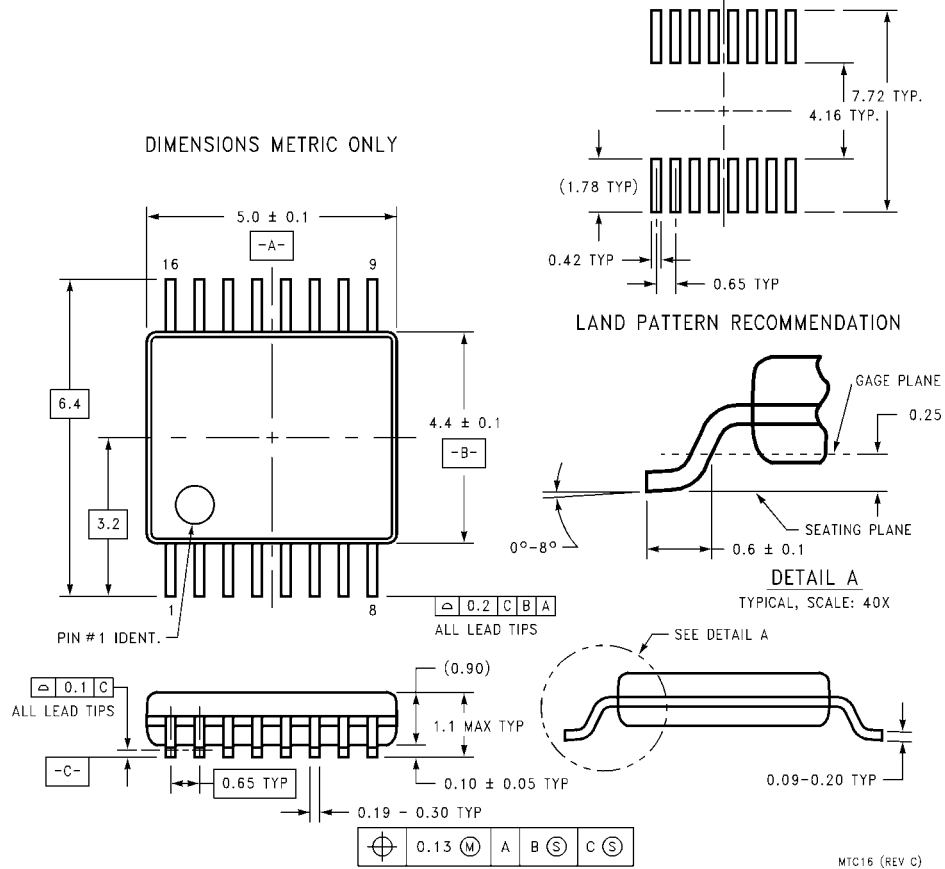


**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M16A**



**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D**

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



**16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC16**

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