National Semiconductor

74LVX157
Low Voltage Quad 2-Input Multiplexer

General Description

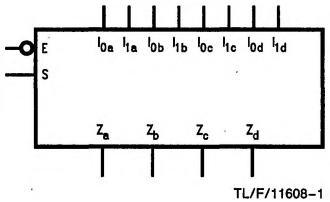
The LVX157 is a high-speed quad 2-input multiplexer. Four bits of data from two sources can be selected using the common Select and Enable inputs. The four outputs present the selected data in the true (noninverted) form. The LVX157 can also be used as a function generator.

Features

- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Available in SOIC JEDEC, SOIC EIAJ and SSOP packages
- Guaranteed simultaneous switching noise level and dynamic threshold performance

Ordering Code: See Section 11

Logic Symbols



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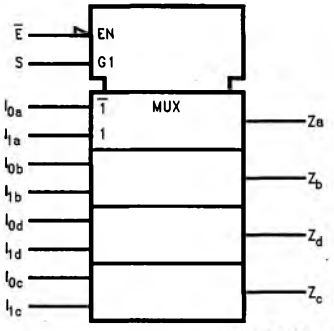
IEEE/IEC



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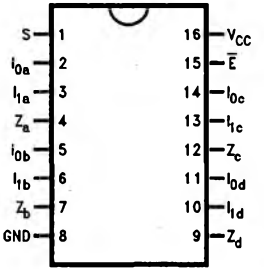
Connection Diagram

Pin Assignment for SOIC and SSOP



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Pin Names	Description
I_{0a}–I_{0d}	Source 0 Data Inputs
I_{1a}–I_{1d}	Source 1 Data Inputs
$\overline{E}$	Enable Input
S	Select Input
Z_a–Z_d	Outputs

	SOIC JEDEC	SOIC EIAJ	SSOP TYPE I
Order Number	74LVX157M 74LVX157MX	74LVX157SJ 74LVX157SJX	74LVX157MSCX
See NS Package Number	M16A	M16D	MSC16

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 ($\overline{E}$) is active-LOW. When $\overline{E}$ 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:

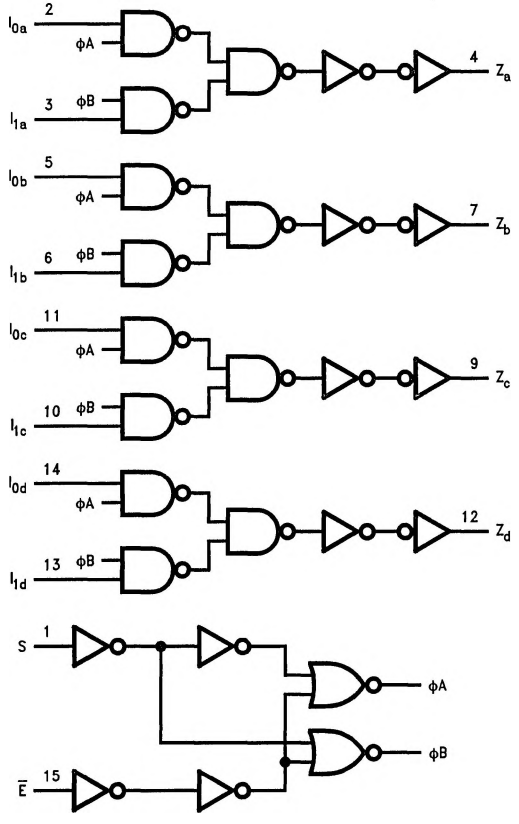
$$Z_a = \overline{E} \bullet (I_{1a} \bullet S + I_{0a} \bullet \overline{S})$$
$$Z_b = \overline{E} \bullet (I_{1b} \bullet S + I_{0b} \bullet \overline{S})$$
$$Z_c = \overline{E} \bullet (I_{1c} \bullet S + I_{0c} \bullet \overline{S})$$
$$Z_d = \overline{E} \bullet (I_{1d} \bullet S + I_{0d} \bullet \overline{S})$$

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.

Truth Table

Inputs				Outputs
$\overline{E}$	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 = Immaterial



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Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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

Note: *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" table are not guaranteed at the absolute maximum ratings. The "Recommended Operarting Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

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 (Δ_t/Δ_v)	0 ns/V to 100 ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	74LVX157 T_A = +25°C			74LVX157 T_A = −40°C to +85°C		Units	Conditions	
			Min	Typ	Max	Min	Max			
V_{IH}	High Level Input Voltage	2.0 3.0 3.6	1.5 2.0 2.4			1.5 2.0 2.4		V		
V_{IL}	Low Level Input Voltage	2.0 3.0 3.6			0.5 0.8 0.8		0.5 0.8 0.8	V		
V_{OH}	High Level Output Voltage	2.0 3.0 3.0	1.9 2.9 2.58	2.0 3.0		1.9 2.9 2.48		V	V_{IN} = V_{IL} or V_{IH}	I_{OH} = −50 μA I_{OH} = −50 μA I_{OH} = −4 mA
V_{OL}	Low Level Output Voltage	2.0 3.0 3.0		0.0 0.0	0.1 0.1 0.36		0.1 0.1 0.44	V	V_{IN} = V_{IL} or V_{IH}	I_{OL} = 50 μA I_{OL} = 50 μA I_{OL} = 4 mA
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: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX157 $T_A = 25°C$ Typ	74LVX157 $T_A = 25°C$ Limit	Units	C_L (pF)
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: (Input $t_r = t_f = 3$ ns)

AC Electrical Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX157 $T_A = +25°C$ Min	Typ	Max	74LVX157 $T_A = -40°C$ to $+85°C$ Min	Max	Units	C_L (pF)
t_{PLH}, t_{PHL}	Propagation Delay Time I_n to Z_n	2.7		6.6	12.5	1.0	15.5	ns	15
				9.1	16.0	1.0	19.0		50
		3.3 ±0.3		5.1	7.9	1.0	9.5		15
				7.6	11.4	1.0	13.0		50
t_{PLH}, t_{PHL}	Propagation Delay Time S to Z_n	2.7		8.9	16.9	1.0	20.5	ns	15
				11.4	20.4	1.0	24.0		50
		3.3 ±0.3		7.0	11.0	1.0	13.0		15
				9.5	14.5	1.0	16.5		50
t_{PLH}, t_{PHL}	Propagation Delay Time $\overline{E}$ to Z_n	2.7		9.1	17.6	1.0	20.5	ns	15
				11.6	21.1	1.0	24.0		50
		3.3 ±0.3		7.2	11.5	1.0	13.5		15
				9.7	15.0	1.0	17.0		50
t_{OSHL}, t_{OSLH}	Output to Output Skew (Note 1)	2.7			1.5		1.5	ns	50

Note 1: Parameter guaranteed by design. $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$, $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$.

Capacitance

Symbol	Parameter	74LVX157 $T_A = +25°C$ Min	Typ	Max	74LVX157 $T_A = -40°C$ to $+85°C$ Min	Max	Units
C_{IN}	Input Capacitance		4	10		10	pF
C_{PD}	Power Dissipation Capacitance (Note 1)		20				pF

Note 1: 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: $I_{CC(opr.)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$