



May 1993  
Revised March 1999

## 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

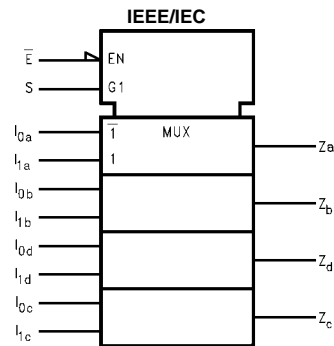
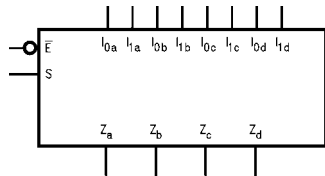
- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

### Ordering Code:

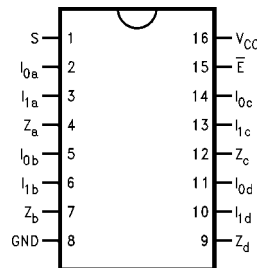
Order Number	Package Number	Package Description
74LVX157M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LVX157SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVX157MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 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 <sub>0a</sub> -I <sub>0d</sub>	Source 0 Data Inputs
I <sub>1a</sub> -I <sub>1d</sub>	Source 1 Data Inputs
$\bar{E}$	Enable Input
S	Select Input
Z <sub>a</sub> -Z <sub>d</sub>	Outputs

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**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:

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

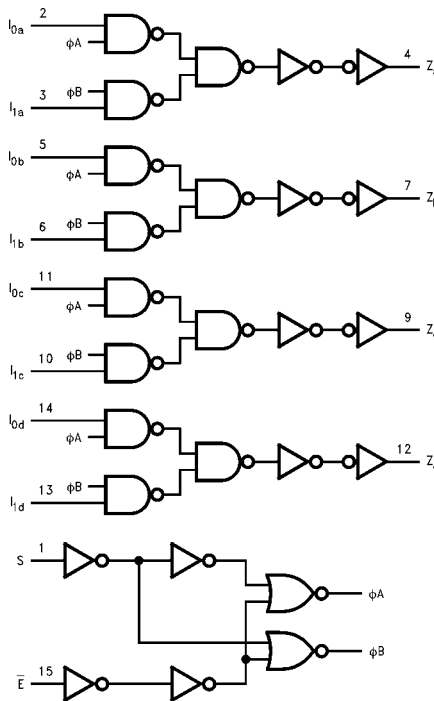
$$Z_b = \bar{E} \cdot (I_{1b} \cdot S + I_{0b} \cdot \bar{S})$$

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

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

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)			Recommended Operating Conditions (Note 2)						
Supply Voltage ( $V_{CC}$ )		-0.5V to +7.0V	Supply Voltage ( $V_{CC}$ )				2.0V to 3.6V		
DC Input Diode Current ( $I_{IK}$ )		-20 mA	Input Voltage ( $V_I$ )				0V to 5.5V		
$V_I = -0.5V$			Output Voltage ( $V_O$ )				0V to $V_{CC}$		
DC Input Voltage ( $V_I$ )		-0.5V to 7V	Operating Temperature ( $T_A$ )				-40°C to +85°C		
DC Output Diode Current ( $I_{OK}$ )		-20 mA	Input Rise and Fall Time ( $\Delta t/\Delta V$ )				0 ns/V to 100 ns/V		
$V_O = -0.5V$									
$V_O = V_{CC} + 0.5V$		+20 mA							
DC Output Voltage ( $V_O$ )		-0.5V to $V_{CC} + 0.5V$	<b>Note 1:</b> 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.						
DC Output Source or Sink Current ( $I_O$ )		$\pm 25$ mA	<b>Note 2:</b> Unused inputs must be held HIGH or LOW. They may not float.						
DC $V_{CC}$ or Ground Current ( $I_{CC}$ or $I_{GND}$ )		$\pm 50$ mA							
Storage Temperature ( $T_{STG}$ )		-65°C to +150°C							
Power Dissipation		180 mW							
DC Electrical Characteristics									
Symbol	Parameter	$V_{CC}$	$T_A = +25^\circ C$			$T_A = -40^\circ C$ to $+85^\circ C$		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 $V_{IH}$ $I_{OH} = -50 \mu A$ $I_{OH} = -50 \mu A$ $I_{OH} = -4 mA$
		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 $V_{IH}$ $I_{OL} = 50 \mu A$ $I_{OL} = 50 \mu A$ $I_{OL} = 4 mA$
		3.0		0.0	0.1		0.1		
		3.0			0.36		0.44		
$I_{IN}$	Input Leakage Current	3.6			$\pm 0.1$		$\pm 1.0$	$\mu A$	$V_{IN} = 5.5V$ or GND
$I_{CC}$	Quiescent Supply Current	3.6			4.0		40.0	$\mu A$	$V_{IN} = V_{CC}$ or GND
Noise Characteristics (Note 3)									
Symbol	Parameter	$V_{CC}$ (V)	$T_A = 25^\circ C$		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			
<b>Note 3:</b> Input $t_r = t_f = 3ns$									

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AC Electrical Characteristics									
Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units	C <sub>L</sub> (pF)
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Time	2.7	6.6	12.5	1.0	15.5	ns	15	
t <sub>PHL</sub>	I <sub>n</sub> to Z <sub>n</sub>	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 <sub>PLH</sub>	Propagation Delay Time	2.7	8.9	16.9	1.0	20.5	ns	15	
t <sub>PHL</sub>	S to Z <sub>n</sub>	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 <sub>PLH</sub>	Propagation Delay Time	2.7	9.1	17.6	1.0	20.5	ns	15	
t <sub>PHL</sub>	$\bar{E}$ to Z <sub>n</sub>	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 <sub>OSHL</sub>	Output to Output Skew (Note 4)	2.7		1.5		1.5	ns	50	
		3.3		1.5		1.5			

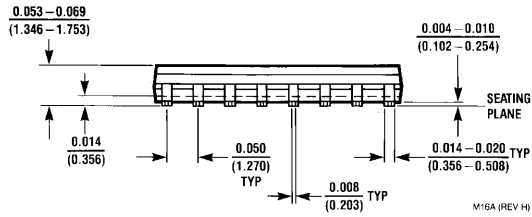
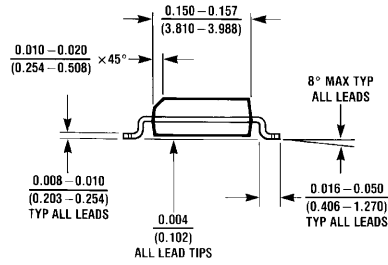
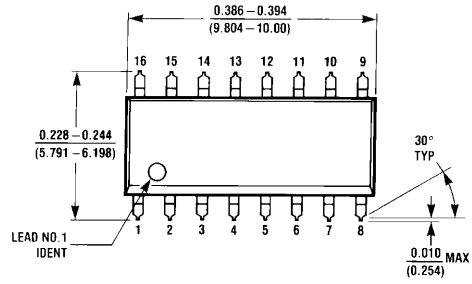
**Note 4:** Parameter guaranteed by design.  
 $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$   
 $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$

### Capacitance

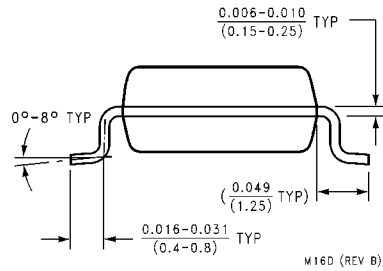
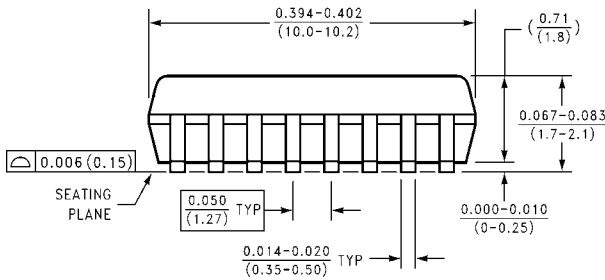
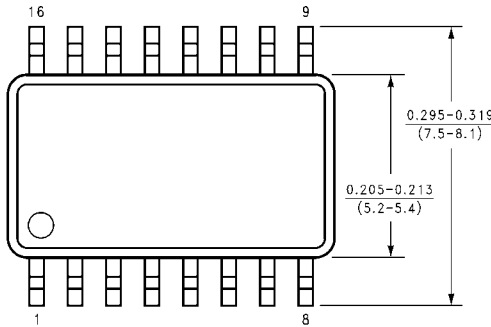
Symbol	Parameter	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40°C to +85°C		Units
		Min	Typ	Max	Min	Max	
C <sub>IN</sub>	Input Capacitance		4	10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)		20				pF

**Note 5:** C<sub>PD</sub> 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:  $I_{CC(opr.)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

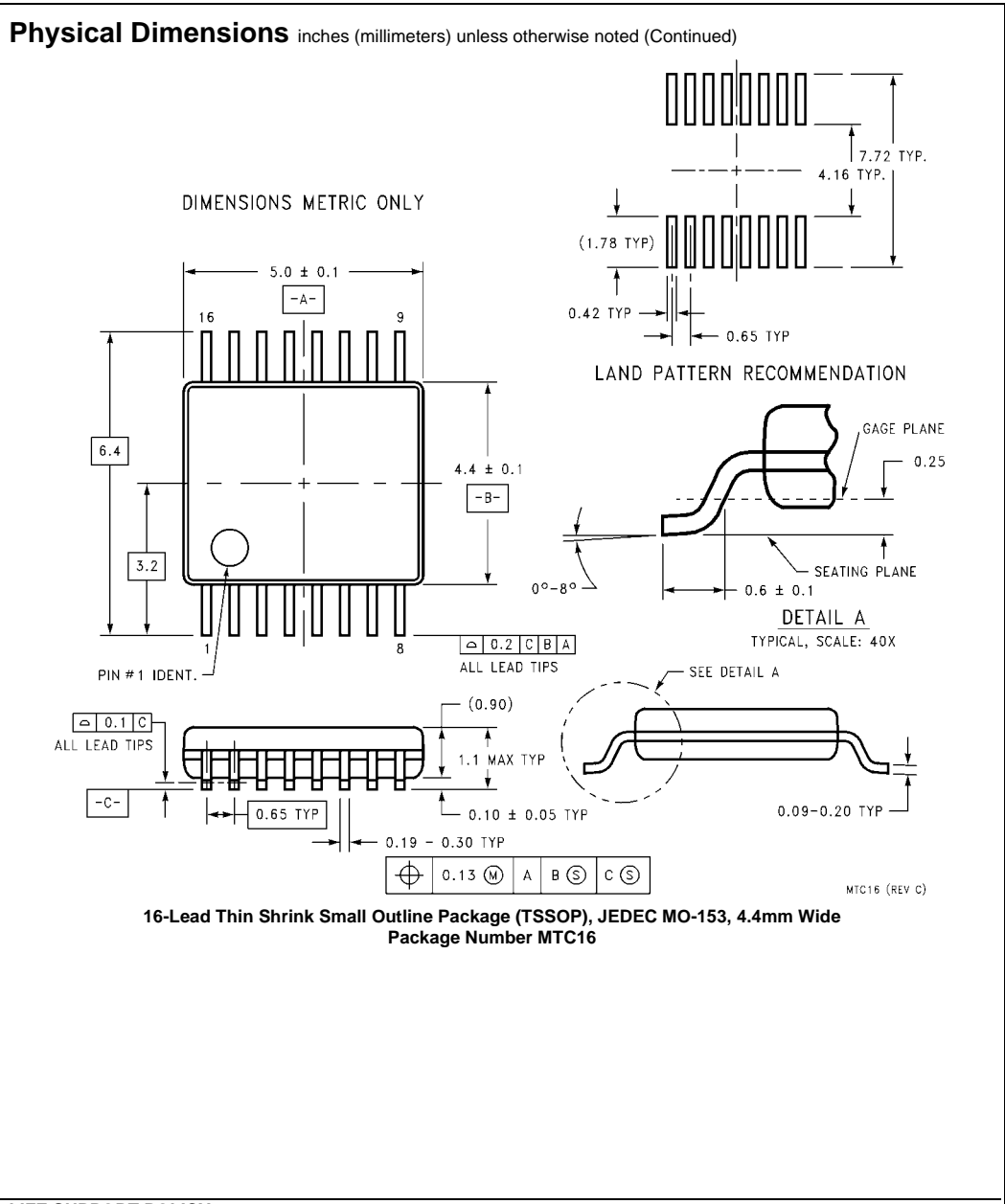
**Physical Dimensions** inches (millimeters) unless otherwise noted



**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**



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