



February 1994  
Revised March 1999

# 74LVX125

## Low Voltage Quad Buffer with 3-STATE Outputs

### General Description

The LVX125 contains four independent non-inverting buffers with 3-STATE outputs. The inputs tolerate voltages up to 7V allowing the interface of 5V systems to 3V systems.

### Features

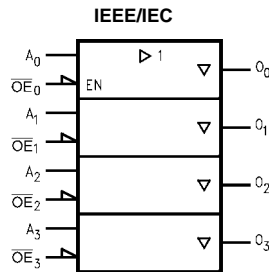
- Input voltage level translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

### Ordering Code:

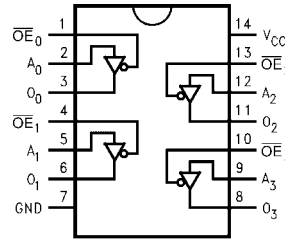
Order Number	Package Number	Package Description
74LVX125M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow
74LVX125SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVX125MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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

### Logic Symbol



### Connection Diagram



### Pin Descriptions

Pin Names	Description
$A_n$	Inputs
$\overline{OE}_n$	Output Enable Inputs
$O_n$	Outputs

### Truth Table

Inputs		Output
$\overline{OE}_n$	$A_n$	$O_n$
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level  
L = LOW Voltage Level  
Z = High Impedance  
X = Immaterial

74LVX125 Low Voltage Quad Buffer with 3-STATE Outputs

74LVX125

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 ( $I_{IK}$ ) $V_I = -0.5V$	-20 mA	Input Voltage ( $V_I$ )	0V to 5.5V
DC Input Voltage ( $V_I$ )	-0.5V to +7.0V	Output Voltage ( $V_O$ )	0V to $V_{CC}$
DC Output Diode Current ( $I_{OK}$ )		Operating Temperature ( $T_A$ )	-40°C to +85°C
$V_O = 0.5V$	-20 mA	Input Rise and Fall Time ( $\Delta t/\Delta V$ )	0 ns/V to 100 ns/V
$V_O = V_{CC} + 0.5V$	+20 mA		
Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$		
DC Output Source/Sink Current ( $I_O$ )	$\pm 25$ mA		
DC $V_{CC}$ or Ground Current ( $I_{CC}$ or $I_{GND}$ )	$\pm 50$ mA		
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C		
Power Dissipation	180 mW		

**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	$V_{CC}$ (V)	$T_A = 25^\circ C$			$T_A = -40^\circ C$ 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 $V_{IH}$ $I_{OH} = -50 \mu A$ $I_{OH} = -4 mA$
		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		
$I_{OZ}$	3-STATE Output Off-State Current	3.6			$\pm 0.25$		$\pm 2.5$	$\mu A$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND
$I_{IN}$	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	0.8	V	50
$V_{OLV}$	Quiet Output Minimum Dynamic $V_{OL}$	3.3	-0.3	-0.8	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  $t_r = t_f = 3$  ns

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	Conditions
			Min	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Time Data to Output	2.7	5.8	10.1	1.0	13.5	ns	C <sub>L</sub> = 15 pF	
t <sub>PHL</sub>		3.3 ± 0.3	8.3	13.6	1.0	17.0		C <sub>L</sub> = 50 pF	
			4.4	6.2	1.0	8.5		C <sub>L</sub> = 15 pF	
			6.9	9.7	1.0	12.0		C <sub>L</sub> = 50 pF	
t <sub>PZH</sub>	Output Enable Time	2.7	5.3	9.3	1.0	12.5	ns	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PZL</sub>		3.3 ± 0.3	7.8	12.8	1.0	16.0		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
			4.0	5.6	1.0	7.5		C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ	
			6.5	9.1	1.0	11.0		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PHZ</sub>	Output Disable Time	2.7	10.0	15.7	1.0	19.0	ns	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>PLZ</sub>		3.3 ± 0.3	8.3	11.2	1.0	13.0		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ	
t <sub>OSSL</sub>	Output to Output	2.7		1.5		1.5	ns	C <sub>L</sub> = 50 pF	
t <sub>OSLH</sub>	Skew (Note 4)	3.3		1.5		1.5			

**Note 4:** Parameter guaranteed by design. t<sub>OSSL</sub> = |t<sub>PLHm</sub> - t<sub>PLHnl</sub>|. t<sub>OSLH</sub> = |t<sub>PHLm</sub> - t<sub>PHLnl</sub>|

### Capacitance

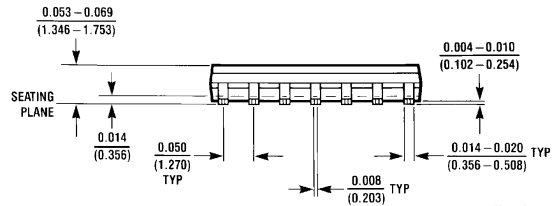
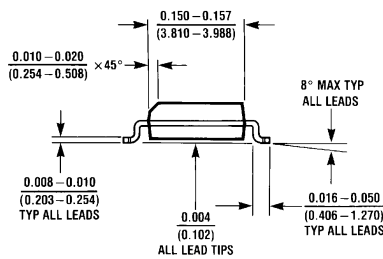
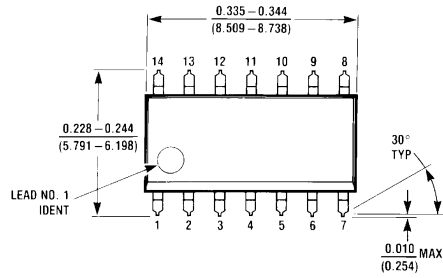
Symbol	Parameter	T <sub>A</sub> = 25°C			T <sub>A</sub> = -40°C to +85°C		Units
		Min	Typ	Max	Min	Max	
C <sub>IN</sub>	Input Capacitance		4.0	10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5)		14				pF

**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:  $I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{4}$  (per bit)

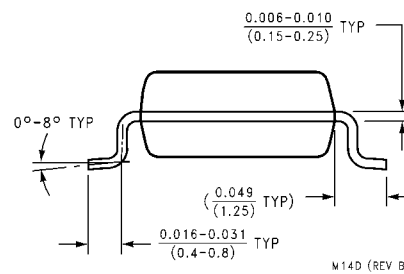
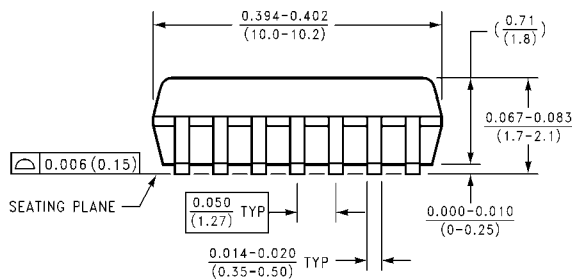
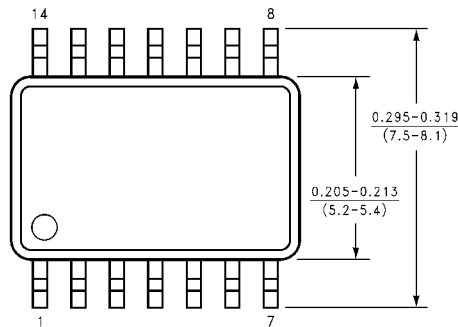
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**Physical Dimensions** inches (millimeters) unless otherwise noted



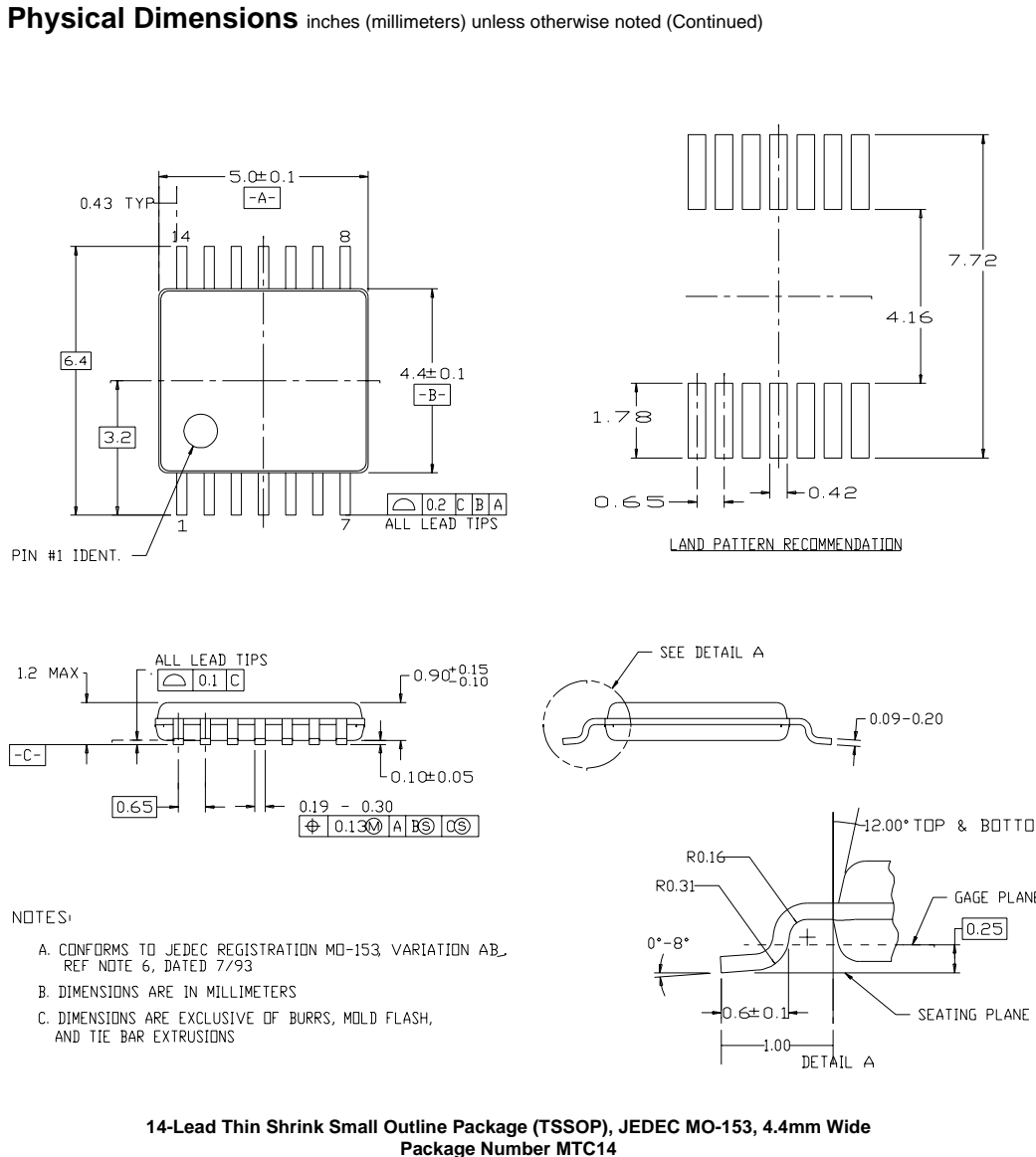
M14A (REV H)

**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150" Narrow  
Package Number M14A**



M14D (REV B)

**14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M14D**



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