National Semiconductor

January 1996

74LVX125
Low-Voltage Quad Buffer with TRI-STATE® Outputs

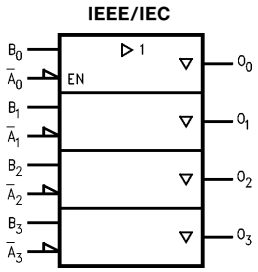
General Description

The LVX125 contains four independent non-inverting buffers with TRI-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
- Available in SOIC JEDEC, SOIC EIAJ and TSSOP packages
- Guaranteed simultaneous switching noise level and dynamic threshold performance

Logic Symbol



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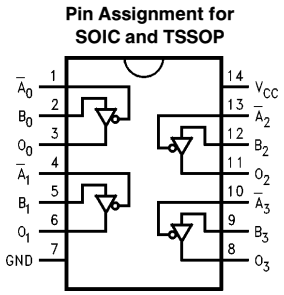
Connection Diagram



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Pin Names	Description
A_n, B_n	Inputs
O_n	Outputs

Truth Table

Inputs		Output
A_n	B_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

	SOIC JEDEC	SOIC EIAJ	TSSOP
Order Number	74LVX125M 74LVX125MX	74LVX125SJ 74LVX125SJX	74LVX125MTC 74LVX125MTCX
See NS Package Number	M14A	M14D	MTC14

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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 +7.0V
DC Output Diode Current (I_{OK})	
V_O = 0.5V	−20 mA
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)	±25 mA
DC V_{CC} or Ground Current (I_{CC} or I_{GND})	±50 mA
Storage Temp. Range (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 Operating 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 ($\Delta t/\Delta v$)	0 ns/V to 100 ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	74LVX125 T_A = 25°C			74LVX125 T_A = −40°C to +85°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 μA
		3.0	2.9	3.0		2.9				I_{OH} = −50 μA
		3.0	2.58			2.48				I_{OH} = −4 mA
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 μA
		3.0		0.0	0.1		0.1			I_{OL} = 50 μA
		3.0			0.36		0.44			I_{OL} = 4 mA
I_{OZ}	TRI-STATE Output Off-State Current	3.6			±0.25		±2.5	μA	V_{IN} = V_{IH} or V_{IL}; V_{OUT} = V_{CC} or GND	
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_{IH} = V_{CC} or GND	

Noise Characteristics

Symbol	Parameter	V_{CC} (V)	74LVX125 $T_A = 25°C$		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: Input $t_r = t_f = 3$ ns.

AC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	74LVX125 $T_A = +25°C$			74LVX125 $T_A = -40°C$ to $+85°C$		Units	Conditions
			Min	Typ	Max	Min	Max		
t_{PLH}, t_{PHL}	Propagation Delay Time Data to Output	2.7		5.8	10.1	1.0	13.5	ns	$C_L = 15$ pF
				8.3	13.6	1.0	17.0		$C_L = 50$ pF
		3.3 ±0.3		4.4	6.2	1.0	8.5		$C_L = 15$ pF
				6.9	9.7	1.0	12.0		$C_L = 50$ pF
t_{PZH}, t_{PZL}	Output Enable Time	2.7		5.3	9.3	1.0	12.5	ns	$C_L = 15$ pF, $R_L = 1$ kΩ
				7.8	12.8	1.0	16.0		$C_L = 50$ pF, $R_L = 1$ kΩ
		3.3 ±0.3		4.0	5.6	1.0	7.5		$C_L = 15$ pF, $R_L = 1$ kΩ
				6.5	9.1	1.0	11.0		$C_L = 50$ pF, $R_L = 1$ kΩ
t_{PHZ}, t_{PLZ}	Output Disable Time	2.7		10.0	15.7	1.0	19.0	ns	$C_L = 50$ pF, $R_L = 1$ kΩ
		3.3 ±0.3		8.3	11.2	1.0	13.0		$C_L = 50$ pF, $R_L = 1$ kΩ
t_{OSHL}, t_{OSLH}	Output to Output Skew (Note 1)	2.7			1.5		1.5	ns	$C_L = 50$ pF

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

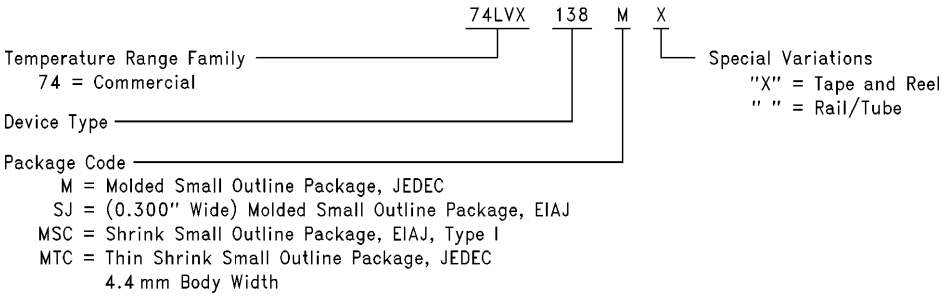
Capacitance

Symbol	Parameter	74LVX125 $T_A = 25°C$			74LVX125 $T_A = -40°C$ to $+85°C$		Units
		Min	Typ	Max	Min	Max	
C_{IN}	Input Capacitance		4.0	10		10	pF
C_{PD}	Power Dissipation Capacitance (Note 1)		14				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: $I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{4 \text{ (per bit)}}$

74LVX138 Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



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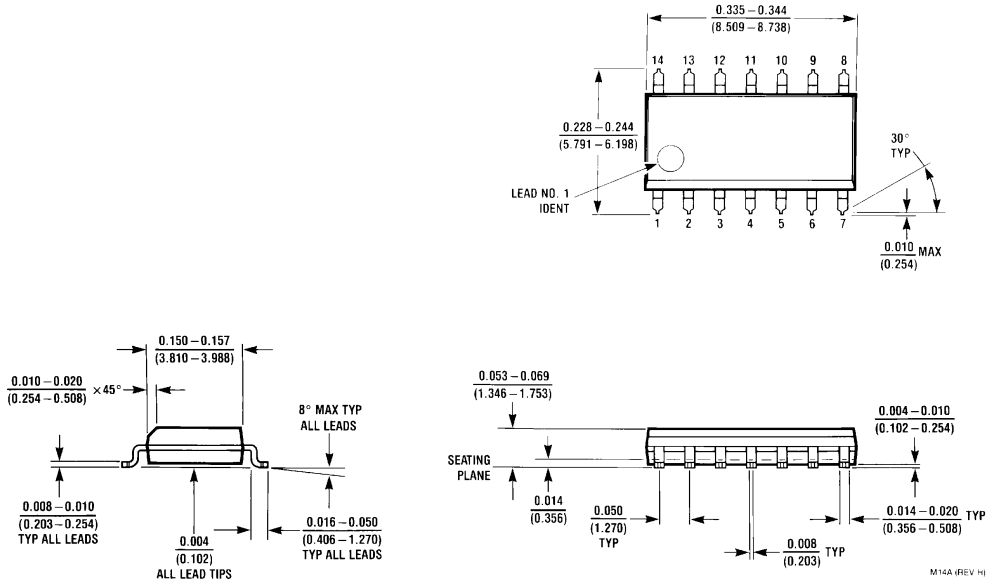
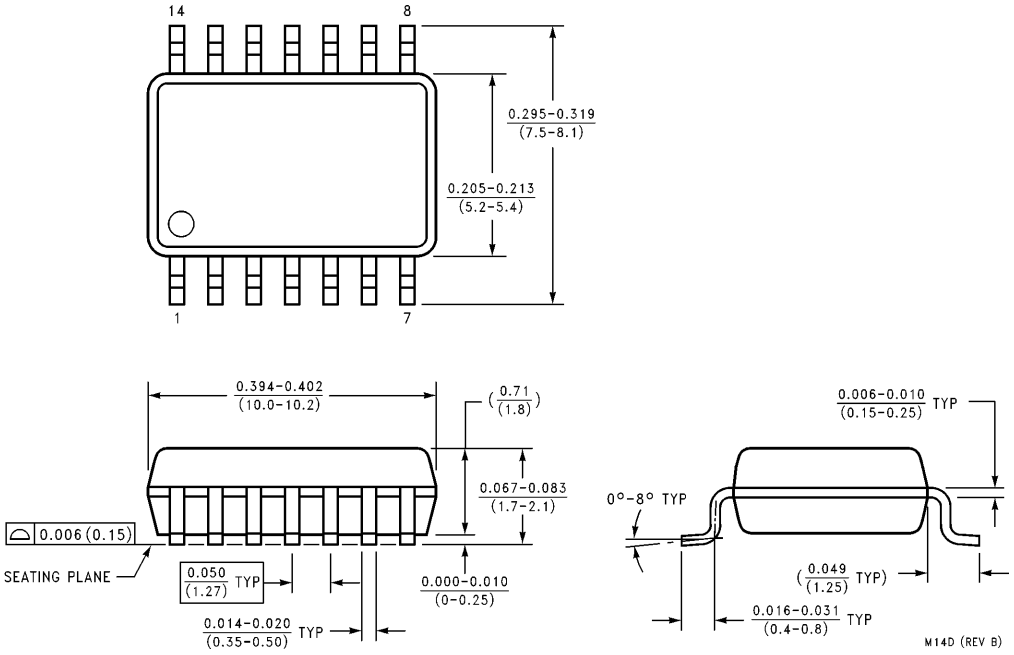
Physical Dimensions inches (millimeters) unless otherwise noted



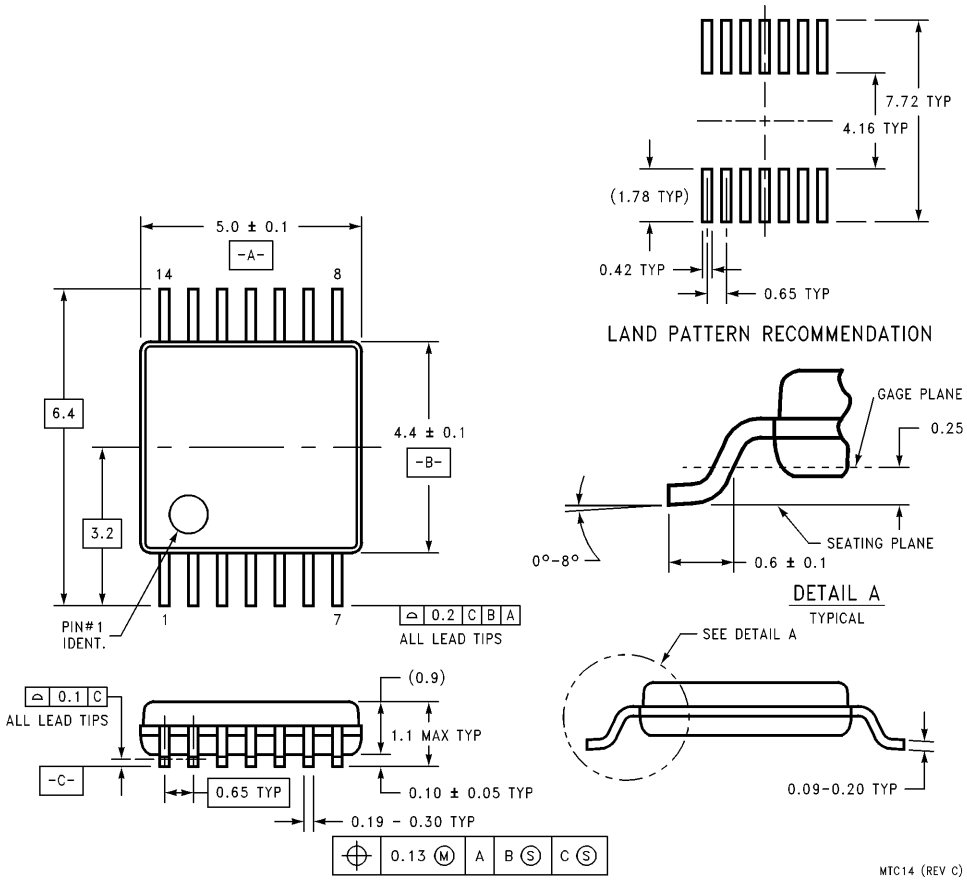
14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC
Order Number 74LVX125M or 74LVX125MX
NS Package Number M14A

Physical Dimensions inches (millimeters) unless otherwise noted



14-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ
Order Number 74LVX125SJ or 74LVX125SJX
NS Package Number M14D

Physical Dimensions millimeters (Continued)



14-Lead Thin Shrink Small Outline Package, JEDEC
Order Number 74LVX125MTC or 74LVX125MTCX
NS Package Number MTC14

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