National Semiconductor

74LVX240
Low Voltage Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

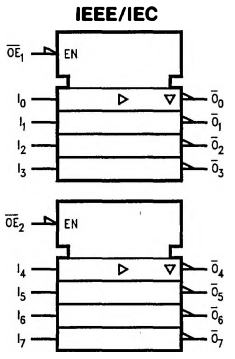
The LVX240 is an octal inverting buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density. The inputs tolerate up to 7V allowing interface of 5V systems to 3V systems.

Features

- Input voltage 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 Symbol



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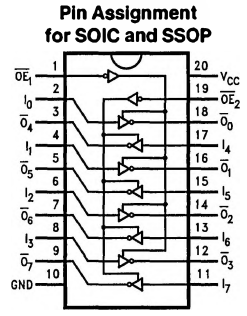
Connection Diagram



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Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	TRI-STATE Output Enable Inputs
I_0–I_7	Inputs
$\overline{O}_0$–$\overline{O}_7$	Outputs

Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
$\overline{OE}_1$	I_n	
L	L	H
L	H	L
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
$\overline{OE}_2$	I_n	
L	L	H
L	H	L
H	X	Z

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

	SOIC JEDEC	SOIC EIAJ	SSOP TYPE I
Order Number	74LVX240M 74LVX240MX	74LVX240SJ 74LVX240SJX	74LVX240MSCX
See NS Package Number	M20B	M20D	MSC20

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})	±75 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Power Dissipation (P_D)	180 mW

Note: *Absolute Maximum Ratings are those values beyond which the safety to 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 ($\Delta t/\Delta V$)	0 ns/V to 100 ns/V

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	74LVX240 T_A = +25°C			74LVX240 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_{IH} or V_{IL}	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_{IH} or V_{IL}	I_{OL} = 50 μA I_{OL} = 50 μA 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_{IN} = V_{CC} or GND	

Noise Characteristics: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX240 T_A = 25°C		Units	C_L (pF)
			Typ	Limit		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3	0.5	0.8	V	50
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3	−0.5	−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: See Section 2 for Test Methodology

Symbol	Parameter	V_{CC} (V)	74LVX240 T_A = +25°C			74LVX240 T_A = −40°C to +85°C		Units	Conditions
			Min	Typ	Max	Min	Max		
t_{PLH}, t_{PHL}	Propagation Delay Time	2.7		5.7	10.1	1.0	12.5	ns	C_L = 15 pF
				8.2	13.6	1.0	16.0		C_L = 50 pF
		3.3 ±0.3		4.3	6.2	1.0	7.5		C_L = 15 pF
				6.8	9.7	1.0	11.0		C_L = 50 pF
t_{PZL}, t_{PZH}	TRI-STATE Output Enable Time	2.7		7.1	13.8	1.0	16.5	ns	C_L = 15 pF, R_L = 1 kΩ
				9.6	17.3	1.0	20.0		C_L = 50 pF, R_L = 1 kΩ
		3.3 ±0.3		5.5	8.8	1.0	10.5		C_L = 15 pF, R_L = 1 kΩ
				8.0	12.3	1.0	14.0		C_L = 50 pF, R_L = 1 kΩ
t_{PLZ}, t_{PHZ}	TRI-STATE Output Disable Time	2.7		11.6	16.0	1.0	19.0	ns	C_L = 50 pF, R_L = 1 kΩ
		3.3 ±0.3		9.7	11.4	1.0	13.0		C_L = 50 pF, R_L = 1 kΩ
t_{OSLH} t_{OSHL}	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	74LVX240 T_A = +25°C			74LVX240 T_A = −40°C to +85°C		Units
		Min	Typ	Max	Min	Max	
C_{IN}	Input Capacitance		4	10		10	pF
C_{OUT}	Output Capacitance		6				pF
C_{PD}	Power Dissipation Capacitance (Note 1)		17	10			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: $I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{8 \text{ (per bit)}}$