

# Low Voltage Octal Buffer / Line Driver with 3-STATE Outputs

## 74LVX541



TSSOP20, 4.4x6.5  
CASE 948AQ

### General Description

The LVX541 is an octal non-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 5.5 V allowing interface of 5 V systems to 3 V systems.

### Features

- Input Voltage Translation from 5 V to 3 V
- Ideal for Low Power / Low Noise 3.3 V Applications
- Guaranteed Simultaneous Switching Noise Level and Dynamic Threshold Performance
- This is a Pb-Free Device

### Logic Symbol

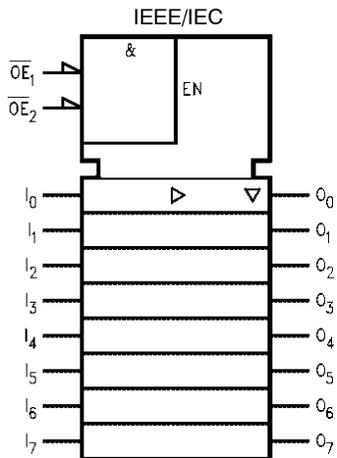


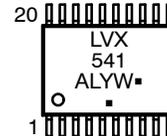
Figure 1. Logic Symbol

### TRUTH TABLE

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

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

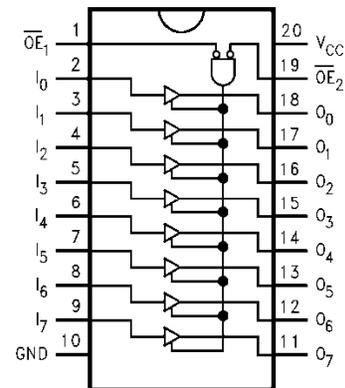
### MARKING DIAGRAM



- LVX541 = Specific Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

### CONNECTION DIAGRAM



### PIN DESCRIPTION

Pin Names	Description
$\overline{OE}_1 - \overline{OE}_2$	3-STATE Outputs Enable Inputs
$I_0 - I_7$	Inputs
$O_0 - O_7$	3-STATE Outputs

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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## MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5 to +6.5	V
V <sub>OUT</sub>	DC Output Voltage		-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IN</sub>	DC Input Current, per Pin		±20	mA
I <sub>OUT</sub>	DC Output Current, per Pin		±25	mA
I <sub>CC</sub>	DC Supply Current, V <sub>CC</sub> and GND Pins		±75	mA
I <sub>IK</sub>	Input Clamp Current		-20	mA
I <sub>OK</sub>	Output Clamp Current		±20	mA
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T <sub>J</sub>	Junction Temperature Under Bias		+150	°C
θ <sub>JA</sub>	Thermal Resistance (Note 2)	TSSOP-20	150	°C/W
P <sub>D</sub>	Power Dissipation in Still Air at 25 °C	TSSOP-20	833	mW
MSL	Moisture Sensitivity		Level 1	-
F <sub>R</sub>	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.573 in	-
V <sub>ESD</sub>	ESD Withstand Voltage (Note 3)	Human Body Model	2000	V
		Charged Device Model	N/A	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Applicable to devices with outputs that may be tri-stated.
2. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
3. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	DC Supply Voltage	2.0	3.6	V
V <sub>IN</sub>	DC Input Voltage (Note 4)	0	5.5	V
V <sub>OUT</sub>	DC Output Voltage (Note 4)	0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	-40	+85	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise or Fall Rate	0	100	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

4. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V<sub>CC</sub>). Unused outputs must be left open.

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## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub>	T <sub>A</sub> = 25 °C			T <sub>A</sub> = -40 °C to +85 °C		Unit	
				Min	Typ	Max	Min	Max		
V <sub>IH</sub>	HIGH Level Input Voltage		2.0	1.5	-	-	1.5	-	V	
			3.0	2.0	-	-	2.0	-		
			3.6	2.4	-	-	2.4	-		
V <sub>IL</sub>	LOW Level Input Voltage		2.0	-	-	0.5	-	0.5	V	
			3.0	-	-	0.8	-	0.8		
			3.6	-	-	0.8	-	0.8		
V <sub>OH</sub>	HIGH Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50 μA	2.0	1.9	2.0	-	1.9	-	V
			I <sub>OH</sub> = -50 μA	3.0	2.9	3.0	-	2.9	-	
			I <sub>OH</sub> = -4 mA	3.0	2.58	-	-	2.48	-	
V <sub>OL</sub>	LOW Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 μA	2.0	-	0.0	0.1	-	0.1	V
			I <sub>OL</sub> = 50 μA	3.0	-	0.0	0.1	-	0.1	
			I <sub>OL</sub> = 4 mA	3.0	-	-	0.36	-	0.44	
I <sub>OZ</sub>	3-STATE Output Off-State Current	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>OUT</sub> = V <sub>CC</sub> or GND	3.6	-	-	±0.25	-	±2.5	μA	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 5.5 V or GND	3.6	-	-	±0.1	-	±1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6	-	-	4.0	-	40.0	μA	

## NOISE CHARACTERISTICS (Note 5)

Symbol	Parameter	Conditions C <sub>L</sub> (pF)	V <sub>CC</sub> (V)	T <sub>A</sub> = 25 °C		Unit
				Typ	Limits	
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	50	3.3	0.5	0.8	V
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	50	3.3	-0.5	-0.8	V
V <sub>IHD</sub>	Minimum HIGH Level Dynamic Input Voltage	50	3.3	-	2.0	V
V <sub>ILD</sub>	Maximum LOW Level Dynamic Input Voltage	50	3.3	-	0.8	V

5. Input t<sub>r</sub> = t<sub>f</sub> = 3 ns

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## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25 °C			T <sub>A</sub> = -40 °C to +85 °C		Unit
				Min	Typ	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Time	C <sub>L</sub> = 15 pF	2.7	-	6.1	11.3	1.0	13.5	ns
		C <sub>L</sub> = 50 pF		-	8.6	14.9	1.0	17.0	
		C <sub>L</sub> = 15 pF	3.3 ±0.3	-	4.7	7.0	1.0	8.5	ns
		C <sub>L</sub> = 50 pF		-	7.2	10.5	1.0	12.0	
t <sub>PZL</sub> , t <sub>PZH</sub>	3-STATE Output Enable Time	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ	2.7	-	7.1	13.8	1.0	16.5	ns
		C <sub>L</sub> = 50 pF R <sub>L</sub> = 1 kΩ		-	9.6	17.3	1.0	20.0	
		C <sub>L</sub> = 15 pF R <sub>L</sub> = 1 kΩ	3.3 ±0.3	-	6.8	10.5	1.0	12.5	ns
		C <sub>L</sub> = 50 pF R <sub>L</sub> = 1 kΩ		-	9.3	14.0	1.0	16.0	
t <sub>PLZ</sub> , t <sub>PHZ</sub>	3-STATE Output Disable Time	C <sub>L</sub> = 50 pF R <sub>L</sub> = 1 kΩ	2.7	-	11.6	17.9	1.0	20.0	ns
		C <sub>L</sub> = 50 pF R <sub>L</sub> = 1 kΩ	3.3 ±0.3	-	10.7	15.4	1.0	17.5	
t <sub>OSLH</sub> , t <sub>OSHL</sub>	Output to Output Skew (Note 6)	C <sub>L</sub> = 50 pF	2.7	-	-	1.5	-	1.5	ns
			3.3	-	-	1.5	-	1.5	

6. Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHm</sub> - t<sub>PLHn</sub>|; t<sub>OSHL</sub> = |t<sub>PHLm</sub> - t<sub>PHLn</sub>|

## CAPACITANCE

Symbol	Parameter	T <sub>A</sub> = 25 °C			T <sub>A</sub> = -40 °C to +85 °C		Unit
		Min	Typ	Max	Min	Max	
C <sub>IN</sub>	Input Capacitance	-	4	10	-	10	pF
C <sub>OUT</sub>	Output Capacitance	-	6	-	-	-	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 7)	-	19	-	-	-	pF

7. 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<sub>CC</sub> (opr.) = (C<sub>PD</sub> · V<sub>CC</sub> · f<sub>IN</sub> + I<sub>CC</sub>) / 8 (per Latch).

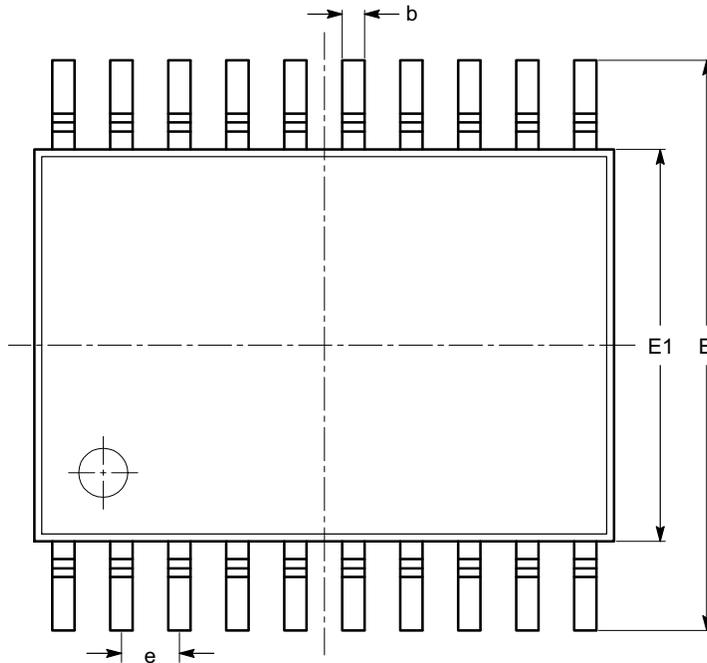
## ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
74LVX541MTCX	LVX 541	TSSOP-20	2500 Units / Tape & Reel

<sup>†</sup> For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

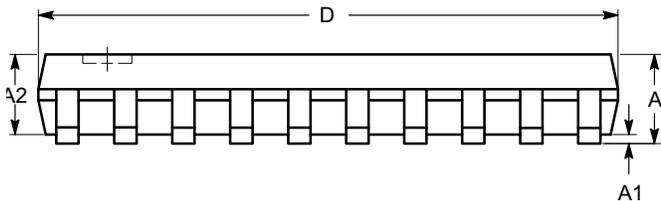
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**CASE 948AQ**  
**ISSUE A**

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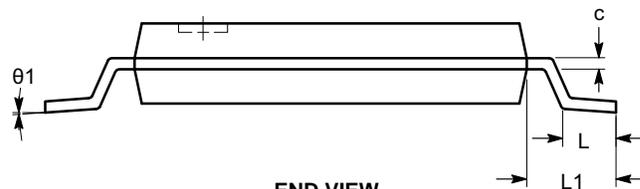


**TOP VIEW**

SYMBOL	MIN	NOM	MAX
A			1.20
A1	0.05		0.15
A2	0.80		1.05
b	0.19		0.30
c	0.09		0.20
D	6.40	6.50	6.60
E	6.30	6.40	6.50
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
$\theta$	0°		8°



**SIDE VIEW**



**END VIEW**

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

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