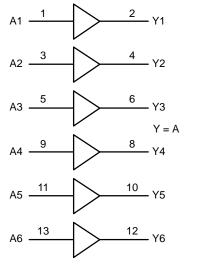
# **Hex Buffer**

The MC74LVX50 is an advanced high speed CMOS buffer fabricated with silicon gate CMOS technology.

The internal circuit is composed of three stages, including a buffered output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

# Features

- High Speed:  $t_{PD} = 4.1$  ns (Typ) at  $V_{CC} = 3.3$  V
- Low Power Dissipation:  $I_{CC} = 2 \mu A$  (Max) at  $T_A = 25^{\circ}C$
- High Noise Immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2.0 V to 3.6 V Operating Range
- Low Noise:  $V_{OLP} = 0.5 V (Max)$
- These Devices are Pb-Free and are RoHS Compliant



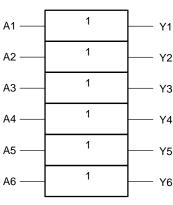


Figure 2. Logic Symbol

Figure 1. Logic Diagram



A Input	Y Output
L	L
Н	Н



# **ON Semiconductor®**

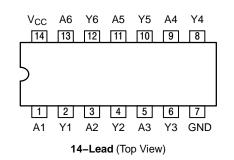
http://onsemi.com



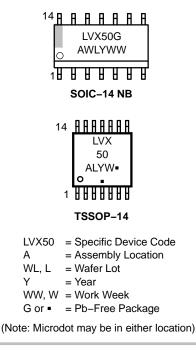
SOIC-14 NB D SUFFIX CASE 751A

TSSOP-14 DT SUFFIX CASE 948G

**PIN ASSIGNMENT** 



MARKING DIAGRAMS



# **ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

# MAXIMUM RATINGS

Symbol		Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage		-0.5 to +7.0	V
V <sub>IN</sub>	DC Input Voltage		-0.5 to $+7.0$	V
V <sub>OUT</sub>	DC Output Voltage		$-0.5$ to $V_{\mbox{CC}}$ $+0.5$	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>I</sub> < GND	-20	mA
Ι <sub>ΟΚ</sub>	DC Output Diode Current	V <sub>O</sub> < GND	±20	mA
I <sub>OUT</sub>	DC Output Sink Current		±25	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin		±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65 to +150	°C
ΤL	Lead Temperature, 1 mm from Cas	se for 10 Seconds	260	°C
TJ	Junction Temperature under Bias		+150	°C
$\theta_{JA}$	Thermal Resistance	(Note 1) SOIC TSSOP	125 170	°C/W
MSL	Moisture Sensitivity		Level 1	
F <sub>R</sub>	Flammability Rating	Oxygen Index: 30% – 35%	UL 94–V0 @ 0.125 in	
V <sub>ESD</sub>	ESD Withstand Voltage	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 2000	V
I <sub>Latchup</sub>	Latchup Performance	Above V <sub>CC</sub> and Below GND at 85°C (Note 5)	±300	mA

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. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.

2. Tested to EIA/JESD22-A114-A.

3. Tested to EIA/JESD22-A115-A.

4. Tested to JESD22-C101-A.

5. Tested to EIA/JESD78.

#### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage	2.0	3.6	V
VI	Input Voltage	(Note 6) 0	5.5	V
Vo	Output Voltage (HIGH or	LOW State) 0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Free–Air Temperature	-40	+ 85	°C
$\Delta t / \Delta V$	Input Transition Rise or Fall Rate $V_{CC} = 3$	3.0 V ±0.3 V 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.

6. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

NOTE: The 0<sub>JA</sub> of the package is equal to 1/Derating. Higher junction temperatures may affect the expected lifetime of the device per the table and figure below.

# DC ELECTRICAL CHARACTERISTICS

			V <sub>cc</sub>	٦	Γ <sub>A</sub> = 25°0	2	<b>T</b> <sub>A</sub> ≤	85°C	
Symbol	Parameter	Test Conditions	(V)	Min	Тур	Max	Min	Max	Unit
V <sub>IH</sub>	High-Level Input Voltage		2.0 3.0 3.6	1.5 2.0 2.4			1.5 2.0 2.4		V
V <sub>IL</sub>	Low-Level Input Voltage		2.0 3.0 3.6			0.5 0.8 0.8		0.5 0.8 0.8	V
V <sub>OH</sub>	High–Level Output Voltage $(V_{IN}=V_{IH} \text{ or } V_{IL})$	$I_{OH} = -50 \ \mu A$ $I_{OH} = -50 \ \mu A$ $I_{OH} = -4 \ m A$	2.0 3.0 3.0	1.9 2.9 2.58	2.0 3.0		1.9 2.9 2.48		V
V <sub>OL</sub>	Low–Level Output Voltage $(V_{IN}=V_{IH} \text{ or } V_{IL})$	$I_{OL} = 50 \ \mu A$ $I_{OL} = 50 \ \mu A$ $I_{OL} = 4 \ m A$	2.0 3.0 3.0		0.0 0.0	0.1 0.1 0.36		0.1 0.1 0.44	V
I <sub>IN</sub>	Input Leakage Current	$V_{IN} = 5.5 V \text{ or GND}$	0 to 3.6			±0.1		±1.0	μΑ
I <sub>CC</sub>	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	3.6			2.0		20.0	μΑ

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

### AC ELECTRICAL CHARACTERISTICS Input tr = tf = 3.0 ns

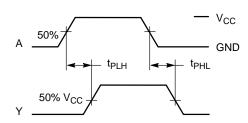
					T <sub>A</sub> = 25°C			$T_A \le 85^\circ C$	
Symbol	Parameter	Test Cond	ditions	Min	Тур	Max	Min	Max	Unit
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, Input A to Y	V <sub>CC</sub> = 2.7 V	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		5.4 7.9	10.1 13.6	1.0 1.0	12.5 16.0	ns
		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		4.1 6.6	6.2 9.7	1.0 1.0	7.5 11.5	
tOSHL	Output-to-Output Skew	V <sub>CC</sub> = 2.7 V	C <sub>L</sub> = 50 pF			1.5		1.5	ns
toslh	(Note 7)	V <sub>CC</sub> = 3.3 V ±0.3V	C <sub>L</sub> = 50 pF			1.5		1.5	
C <sub>IN</sub>	Input Capacitance				4	10		10	pF
				Ту	/pical @	25°C, V	<sub>CC</sub> = 3.3	V	
C <sub>PD</sub>	Power Dissipation Capacitance (Note 8)					15			pF

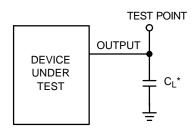
 Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSHL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>); parameter guaranteed by design.
C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

 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(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no–load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

### **NOISE CHARACTERISTICS** Input $t_r = t_f = 3.0$ ns, $C_L = 50$ pF, $V_{CC} = 3.3$ V

		T <sub>A</sub> = 25°C		
Symbol	Characteristic	Тур	Мах	Unit
V <sub>OLP</sub>	Quiet Output Maximum Dynamic V <sub>OL</sub>	0.3	0.5	V
V <sub>OLV</sub>	Quiet Output Minimum Dynamic V <sub>OL</sub>	-0.3	-0.5	V
V <sub>IHD</sub>	Minimum High Level Dynamic Input Voltage		2.0	V
V <sub>ILD</sub>	Maximum Low Level Dynamic Input Voltage		0.8	V





\*Includes all probe and jig capacitance

Figure 4. Test Circuit

Figure 3. Switching Waveforms

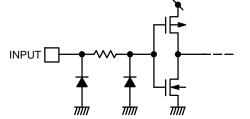
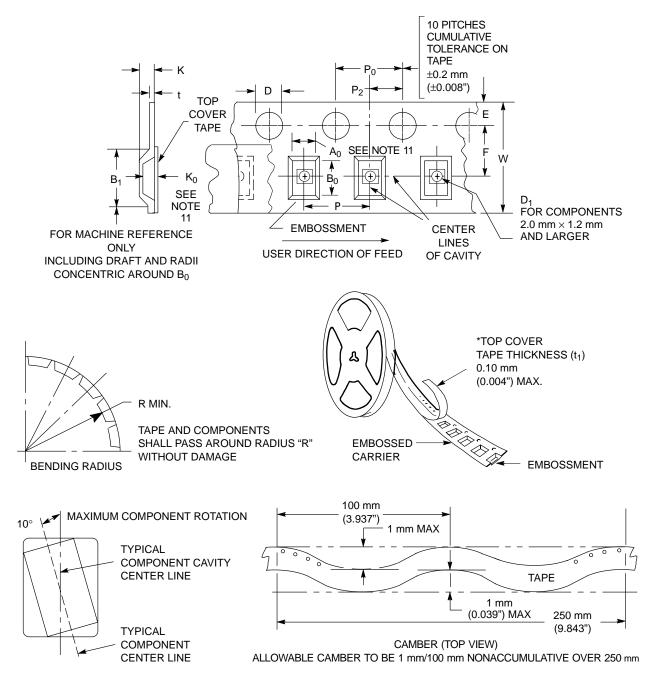


Figure 5. Input Equivalent Circuit

### EMBOSSED CARRIER DIMENSIONS (See Notes 9 and 10)

Tape Size	B <sub>1</sub> Max	D	D <sub>1</sub>	E	F	к	Р	P <sub>0</sub>	P <sub>2</sub>	R	т	w
8 mm	4.35 mm (0.179")	1.5 mm + 0.1 -0.0 (0.059"	1.0 mm Min (0.179")	1.75 mm ±0.1 (0.069 ±0.004")	3.5 mm ±0.5 (1.38 ±0.002")	2.4 mm Max (0.094")	4.0 mm ±0.10 (0.157 ±0.004")	4.0 mm ±0.1 (0.157 ±0.004")	2.0 mm ±0.1 (0.079 ±0.004")	25 mm (0.98")	0.6 mm (0.024)	8.3 mm (0.327)
12 mm	8.2 mm (0.323")	+0.004 -0.0)	1.5 mm Min (0.060)		5.5 mm ±0.5 (0.217 ±0.002")	6.4 mm Max (0.252")	4.0 mm ±0.10 (0.157 ±0.004") 8.0 mm ±0.10 (0.315 ±0.004")			30 mm (1.18")		12.0 mm ±0.3 (0.470 ±0.012")
16 mm	12.1 mm (0.476")	1			7.5 mm ±0.10 (0.295 ±0.004")	7.9 mm Max (0.311")	4.0 mm ±0.10 (0.157 ±0.004") 8.0 mm ±0.10 (0.315 ±0.004") 12.0 mm ±0.10 (0.472 ±0.004")	1				16.3 mm (0.642)
24 mm	20.1 mm (0.791")				11.5 mm ±0.10 (0.453 ±0.004")	11.9 mm Max (0.468")	16.0 mm ±0.10 (0.63 ±0.004")					24.3 mm (0.957)

 Metric Dimensions Govern–English are in parentheses for reference only.
A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> are determined by component size. The clearance between the components and the cavity must be within 0.05 mm min to 0.50 mm max. The component cannot rotate more than 10° within the determined cavity



11. A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> are determined by component size. The clearance between the components and the cavity must be within 0.05 mm min to 0.50 mm max. The component cannot rotate more than 10° within the determined cavity

Figure 6. Carrier Tape Specifications

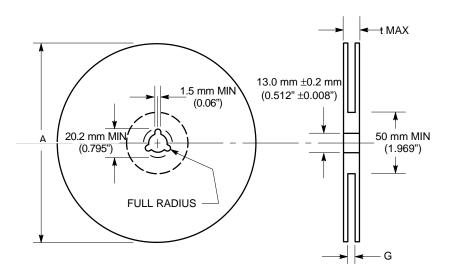


Figure 7. Reel Dimensions

Tape Size	T&R Suffix	A Max	G	t Max
8 mm	T1, T2	178 mm (7")	8.4 mm, +1.5 mm, −0.0 (0.33" + 0.059", −0.00)	14.4 mm (0.56")
8 mm	T3, T4	330 mm (13")	8.4 mm, +1.5 mm, −0.0 (0.33" + 0.059", −0.00)	14.4 mm (0.56")
12 mm	R2	330 mm (13")	12.4 mm, +2.0 mm, -0.0 (0.49" + 0.079", -0.00)	18.4 mm (0.72")
16 mm	R2	360 mm (14.173")	16.4 mm, +2.0 mm, -0.0 (0.646" + 0.078", -0.00)	22.4 mm (0.882")
24 mm	R2	360 mm (14.173")	24.4 mm, +2.0 mm, -0.0 (0.961" + 0.078", -0.00)	30.4 mm (1.197")

#### **REEL DIMENSIONS**

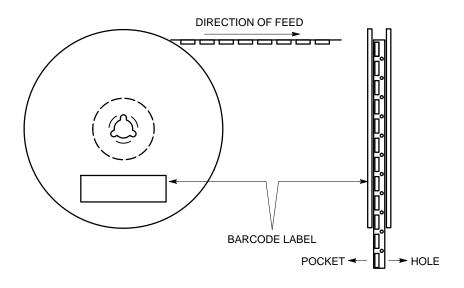


Figure 8. Reel Winding Direction

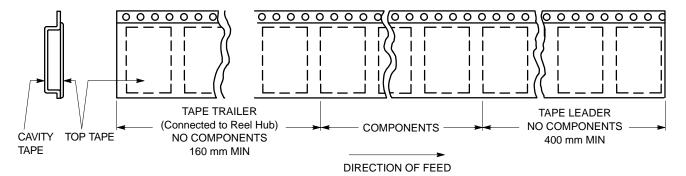
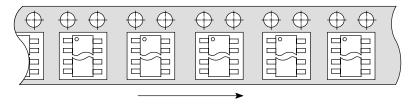


Figure 9. Tape Ends for Finished Goods



User Direction of Feed



# TAPE UTILIZATION BY PACKAGE

Tape Size	SOIC	TSSOP	QFN	SC88A / SOT-353 SC88/SOT-363
8 mm				5–, 6–Lead
12 mm	8-Lead	8–, 14–, 16–Lead	8–, 14–, 16–Lead	
16 mm	14–, 16–Lead	20–, 24–Lead	20–, 24–Lead	
24 mm	18–, 20–, 24–, 28–Lead	48–, 56–Lead	48–, 56–Lead	

# **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
MC74LVX50DG	SOIC-14 NB (Pb-Free)	55 Units / Rail
MC74LVX50DR2G	SOIC-14 NB (Pb-Free)	2500 Tape & Reel
MC74LVX50DTG	TSSOP-14 (Pb-Free)	96 Units / Rail
MC74LVX50DTR2G	TSSOP-14 (Pb-Free)	2500 Tape & Reel

†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.

# DUSEM

0.068

0.019

0.344

0.244



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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#### SOIC-14 CASE 751A-03 ISSUE L

# DATE 03 FEB 2016

STYLE 1: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. NO CONNECTION 7. ANODE/CATHODE 8. ANODE/CATHODE 9. ANODE/CATHODE 10. NO CONNECTION 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 2: CANCELLED	STYLE 3: PIN 1. NO CONNECTION 2. ANODE 3. ANODE 4. NO CONNECTION 5. ANODE 6. NO CONNECTION 7. ANODE 8. ANODE 9. ANODE 10. NO CONNECTION 11. ANODE 12. ANODE 13. NO CONNECTION 14. COMMON CATHODE	STYLE 4: PIN 1. NO CONNECTION 2. CATHODE 3. CATHODE 4. NO CONNECTION 5. CATHODE 6. NO CONNECTION 7. CATHODE 9. CATHODE 10. NO CONNECTION 11. CATHODE 12. CATHODE 13. NO CONNECTION 14. COMMON ANODE
STYLE 5: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 6. NO CONNECTION 7. COMMON ANODE 8. COMMON CATHODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. ANODE/CATHODE 12. ANODE/CATHODE 13. NO CONNECTION 14. COMMON ANODE	STYLE 6: PIN 1. CATHODE 2. CATHODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE 7. CATHODE 8. ANODE 9. ANODE 10. ANODE 11. ANODE 12. ANODE 13. ANODE 14. ANODE	STYLE 7: PIN 1. ANODE/CATHODE 2. COMMON ANODE 3. COMMON CATHODE 4. ANODE/CATHODE 5. ANODE/CATHODE 7. ANODE/CATHODE 8. ANODE/CATHODE 10. ANODE/CATHODE 11. COMMON CATHODE 12. COMMON ANODE 13. ANODE/CATHODE 14. ANODE/CATHODE	STYLE 8: PIN 1. COMMON CATHODE 2. ANODE/CATHODE 3. ANODE/CATHODE 4. NO CONNECTION 5. ANODE/CATHODE 6. ANODE/CATHODE 7. COMMON ANODE 8. COMMON ANODE 9. ANODE/CATHODE 10. ANODE/CATHODE 11. NO CONNECTION 12. ANODE/CATHODE 13. ANODE/CATHODE 14. COMMON CATHODE

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