Octal Bus Buffer
With 5V-Tolerant Inputs

The MC74LVX244 is an advanced high speed CMOS non–inverting 3–state octal bus buffer and has two active low output enables. It is also designed to work with 3–state memory address drivers, etc. The inputs tolerate voltages up to 7V, allowing the interface of 5V systems to 3V systems.

- High Speed: t_{PD} = 4.7ns (Typ) at V_{CC} = 3.3V
- Low Power Dissipation: I_{CC} = 4µA (Max) at T_A = 25°C
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Low Noise: V_{OLP} = 0.8V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300mA
- ESD Performance: HBM > 2000V; Machine Model > 200V

MC74LVX244

LVX

LOW–VOLTAGE CMOS

DW SUFFIX
20–LEAD SOIC PACKAGE
CASE 751D–04

DT SUFFIX
20–LEAD TSSOP PACKAGE
CASE 948E–02

M SUFFIX
20–LEAD SOIC EIAJ PACKAGE
CASE 967–01
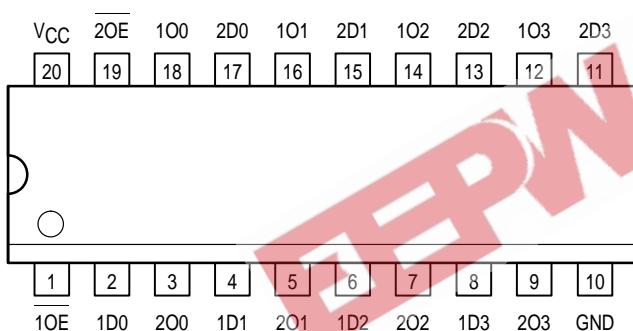
Figure 1. 20–Lead Pinout (Top View)

Figure 2. Logic Diagram

PIN NAMES

Pins	Function
nOE	Output Enable Inputs
1Dn, 2Dn	Data Inputs
1On, 2On	3–State Outputs

FUNCTION TABLE

INPUTS		OUTPUTS
1OE, 2OE	1Dn, 2Dn	1On, 2On
L	L	L
L	H	H
H	X	Z

MC74LVX244

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage	−0.5 to +7.0	V
V_{in}	DC Input Voltage	−0.5 to +7.0	V
V_{out}	DC Output Voltage	−0.5 to V_{CC} +0.5	V
I_{IK}	Input Diode Current	−20	mA
I_{OK}	Output Diode Current	±20	mA
I_{out}	DC Output Current, per Pin	±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins	±75	mA
P_D	Power Dissipation	180	mW
T_{stg}	Storage Temperature	−65 to +150	°C

* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage	2.0	3.6	V
V_{in}	DC Input Voltage	0	5.5	V
V_{out}	DC Output Voltage	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	−40	+85	°C
Δt/ΔV	Input Rise and Fall Time	0	100	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CC} V	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	T_A = −40 to 85°C Min	T_A = −40 to 85°C Max	Unit
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 (V_{in} = V_{IH} or V_{IL})	I_{OH} = −50μA I_{OH} = −50μA I_{OH} = −4mA	2.0 3.0 3.0	1.9 2.9 2.58	2.0 3.0		1.9 2.9 2.48		V
V_{OL}	Low–Level Output Voltage (V_{in} = V_{IH} or V_{IL})	I_{OL} = 50μA I_{OL} = 50μA I_{OL} = 4mA	2.0 3.0 3.0		0.0 0.0	0.1 0.1 0.36		0.1 0.1 0.44	V
I_{in}	Input Leakage Current	V_{in} = 5.5V or GND	3.6			±0.1		±1.0	μA
I_{OZ}	Maximum Three–State Leakage Current	V_{in} = V_{IL} or V_{IH} V_{out} = V_{CC} or GND	3.6			±0.25		±2.5	μA
I_{CC}	Quiescent Supply Current	V_{in} = V_{CC} or GND	3.6			4.0		40.0	μA

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f$ = 3.0ns)

Symbol	Parameter	Test Conditions		$T_A = 25°C$			$T_A = -40$ to $85°C$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay Input to Output	V_{CC} = 2.7V	C_L = 15pF C_L = 50pF		6.1 8.6	11.4 14.9	1.0 1.0	13.5 17.0	ns
		V_{CC} = 3.3 ± 0.3V	C_L = 15pF C_L = 50pF		4.7 7.2	7.1 10.6	1.0 1.0	8.5 12.0	
t_{PZL}, t_{PZH}	Output Enable Time to High and Low Level	V_{CC} = 2.7V R_L = 1kΩ	C_L = 15pF C_L = 50pF		7.1 9.6	13.8 17.3	1.0 1.0	16.5 20.0	ns
		V_{CC} = 3.3 ± 0.3V R_L = 1kΩ	C_L = 15pF C_L = 50pF		5.5 8.0	8.8 12.3	1.0 1.0	10.5 14.0	
t_{PLZ}, t_{PHZ}	Output Disable Time From High and Low Level	V_{CC} = 2.7V R_L = 1kΩ	C_L = 50pF		11.6	16.0	1.0	19.0	ns
		V_{CC} = 3.3 ± 0.3V R_L = 1kΩ	C_L = 50pF		9.7	11.4	1.0	13.0	
t_{OSHL} t_{OSLH}	Output–to–Output Skew (Note NO TAG)	V_{CC} = 2.7V V_{CC} = 3.3 ±0.3V	C_L = 50pF C_L = 50pF			1.5 1.5		1.5 1.5	ns

1. 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_{OSHL}) or LOW–to–HIGH (t_{OSLH}); parameter guaranteed by design.

CAPACITIVE CHARACTERISTICS

Symbol	Parameter		$T_A = 25°C$		$T_A = -40$ to $85°C$		Unit
		Min	Typ	Max	Min	Max	
C_{in}	Input Capacitance		4	10		10	pF
C_{out}	Maximum Three–State Output Capacitance		6				pF
C_{PD}	Power Dissipation Capacitance (Note NO TAG)		19				pF

2. 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: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC} / 8$ (per bit). C_{PD} is used to determine the no–load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

NOISE CHARACTERISTICS (Input $t_r = t_f$ = 3.0ns, C_L = 50pF, V_{CC} = 3.3V, Measured in SOIC Package)

Symbol	Characteristic	$T_A = 25°C$		Unit
		Typ	Max	
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	0.5	0.8	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	−0.5	−0.8	V
V_{IHD}	Minimum High Level Dynamic Input Voltage		2.0	V
V_{ILD}	Maximum Low Level Dynamic Input Voltage		0.8	V

MC74LVX244

SWITCHING WAVEFORMS
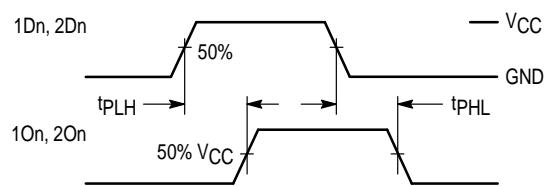
Figure 3.
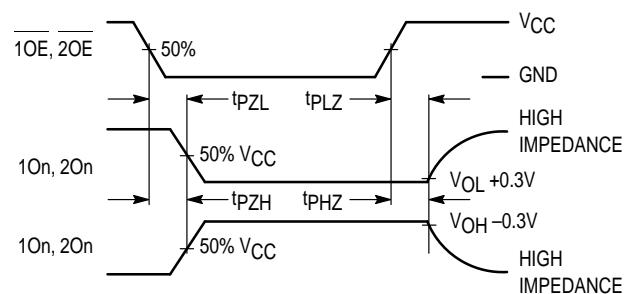
Figure 4.

TEST CIRCUITS
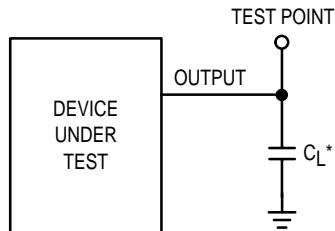
* Includes all probe and jig capacitance

Figure 5. Propagation Delay Test Circuit

CONNECT TO V_{CC} WHEN TESTING t_{PLZ} AND t_{PZL}.
CONNECT TO GND WHEN TESTING t_{PHZ} AND t_{PZH}.
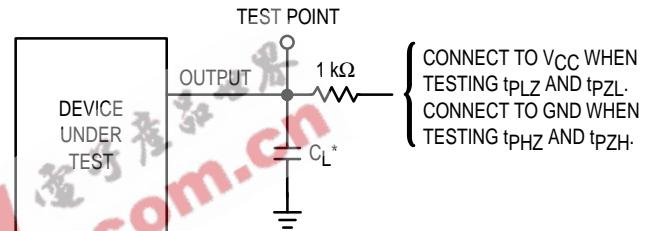
* Includes all probe and jig capacitance

Figure 6. Three–State Test Circuit

OUTLINE DIMENSIONS

DW SUFFIX
PLASTIC SOIC PACKAGE
CASE 751D–04
ISSUE E
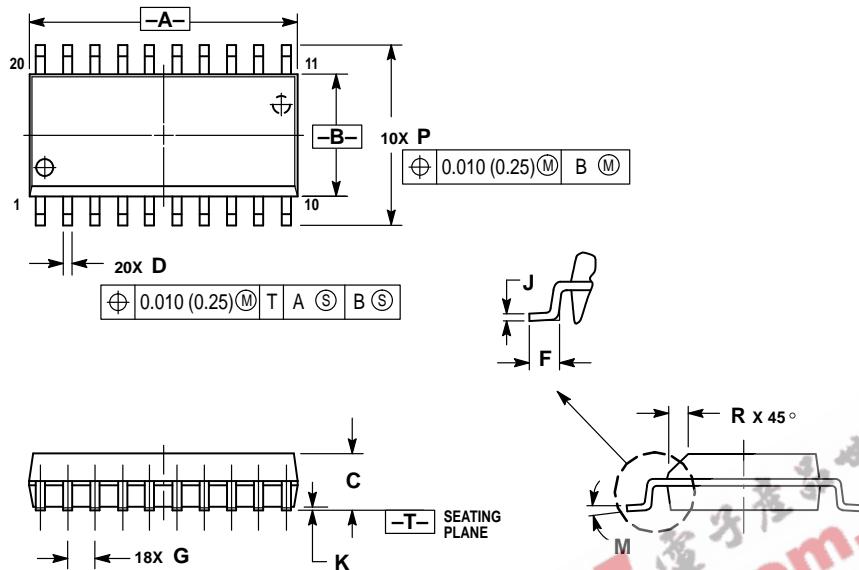
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.150 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.65	12.95	0.499	0.510
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948E–02
ISSUE A
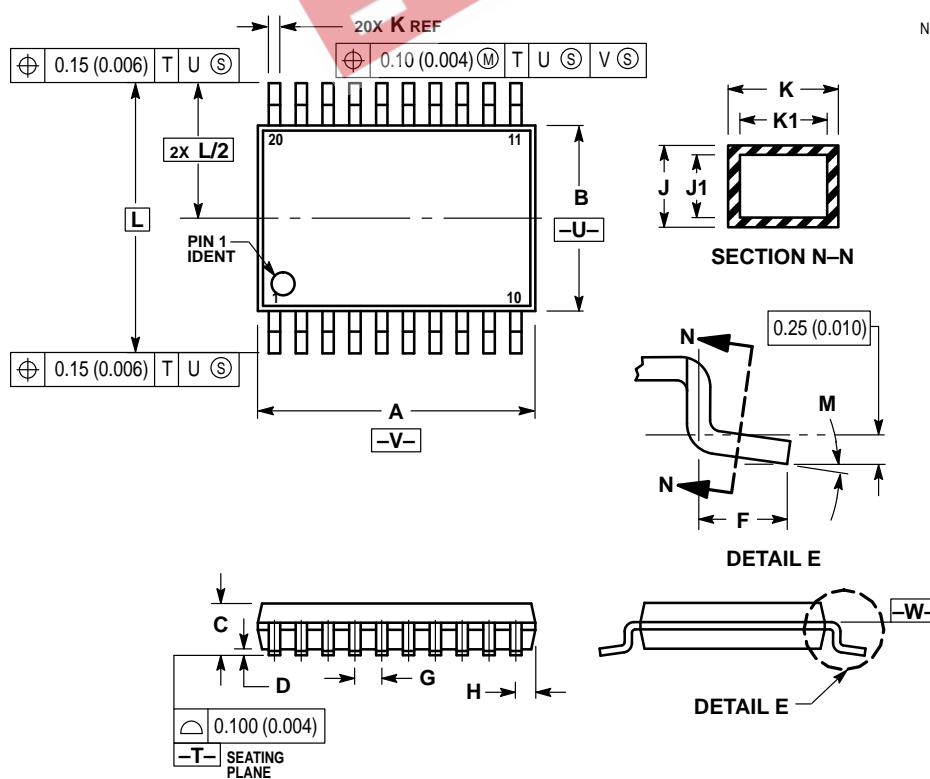
SECTION N–N

DETAIL E

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	—	1.20	—	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

DETAIL E

SEATING PLANE

OUTLINE DIMENSIONS

M SUFFIX
PLASTIC SOIC EIAJ PACKAGE
CASE 967–01
ISSUE O
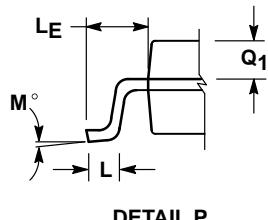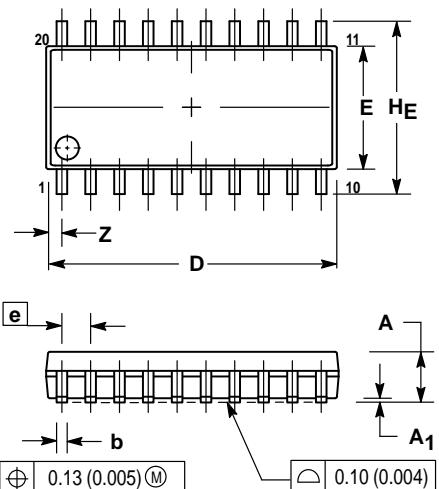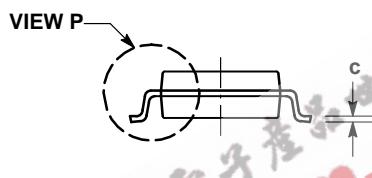
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DETAIL P

VIEW P

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	2.05	—	0.081
A1	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	12.35	12.80	0.486	0.504
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q1	0.70	0.90	0.028	0.035
Z	—	0.81	—	0.032

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