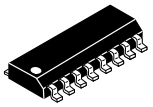
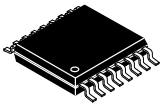
Low Voltage 1-of-8 Decoder/Demultiplexer

74LVX138



SOIC-16, 150 mils
CASE 751BG



TSSOP 16
CASE 948AH

General Description

The LVX138 is a high-speed 1-of-8 decoder/demultiplexer. This device is ideally suited for high-speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three LVX138 devices or a 1-of-32 decoder using four LVX138 devices and one inverter.

Features

- Input Voltage Level 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
- These Devices are Pb-Free and are RoHS Compliant

Logic Symbols

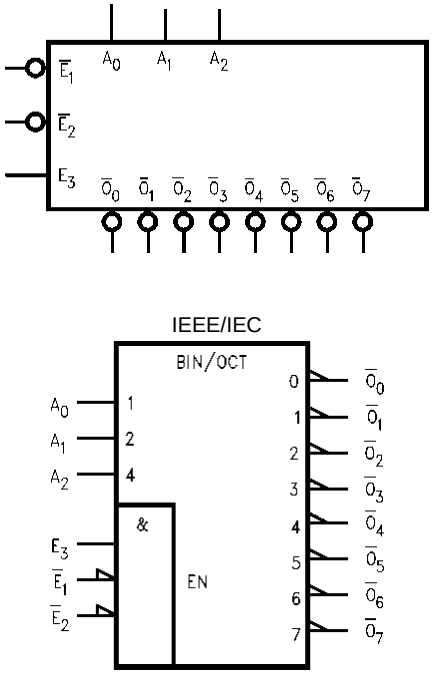
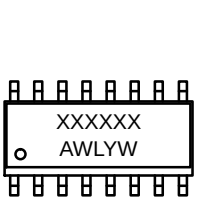
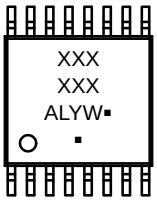


Figure 1. Logic Symbols

MARKING DIAGRAMS



SOIC-16

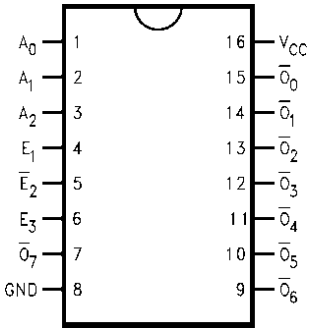


TSSOP 16

XXXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week
G or ▪ = Pb-Free Package

(Note: Microdot may be in either location)

CONNECTION DIAGRAM



PIN DESCRIPTIONS

Pins	Function
A_0–A_2	Address Inputs
$\overline{E}_1$–$\overline{E}_2$	Enable Inputs
E_3	Enable Input
$\overline{O}_0$–$\overline{O}_7$	Outputs

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

Functional Description

The LVX138 high-speed 1-of-8 decoder/demultiplexer accepts three binary weighted inputs (A_0, A_1, A_2) and, when enabled, provides eight mutually exclusive active-LOW outputs ($\overline{O}_0$–$\overline{O}_7$). The LVX138 features three Enable inputs, two active-LOW ($\overline{E}_1$, $\overline{E}_2$) and one active-HIGH (E_3).

All outputs will be HIGH unless $\overline{E}_1$ and $\overline{E}_2$ are LOW and E_3 is HIGH.

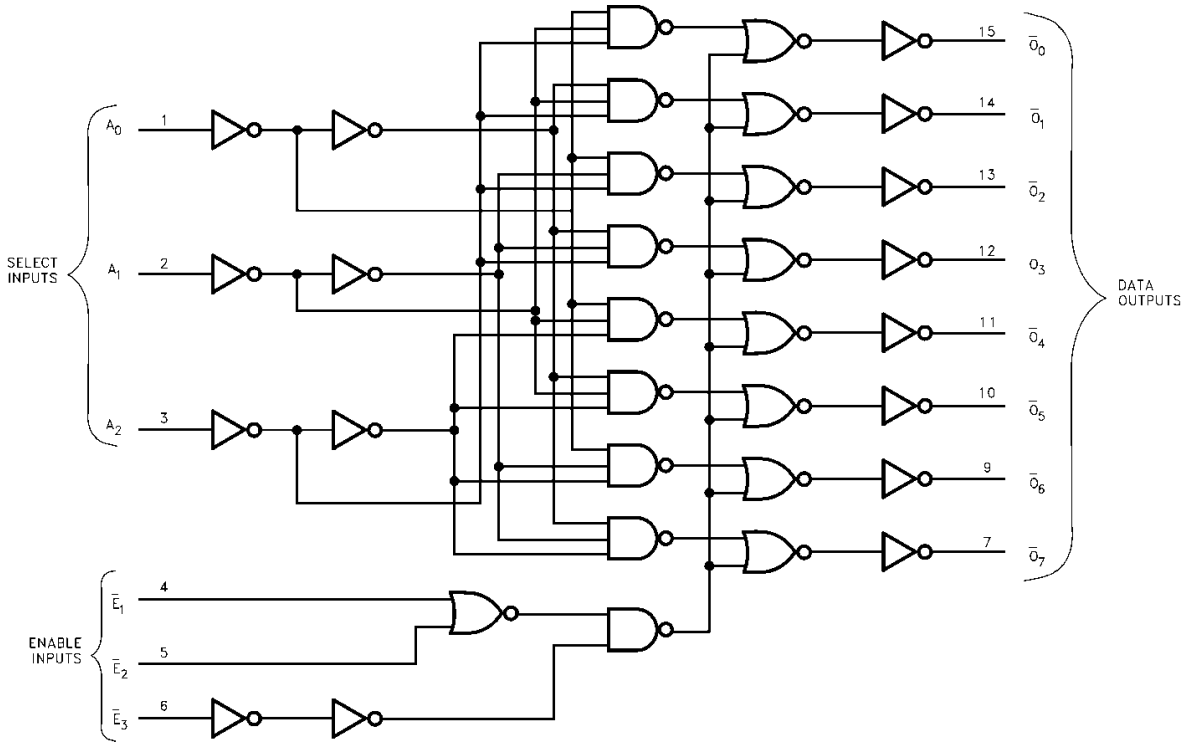
The LVX138 can be used as an 8-output demultiplexer by using one of the active LOW Enable inputs as the data input and the other Enable inputs as strobes. The Enable inputs which are not used must be permanently tied to their appropriate active-HIGH or active-LOW state.

TRUTH TABLE

Inputs						Outputs							
$\overline{E}_1$	$\overline{E}_2$	E_3	A_0	A_1	A_2	$\overline{O}_0$	$\overline{O}_1$	$\overline{O}_2$	$\overline{O}_3$	$\overline{O}_4$	$\overline{O}_5$	$\overline{O}_6$	$\overline{O}_7$
H	X	X	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
X	X	L	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	H	L	L	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	H	H	L	H	H	H	L	H	H	H	H
L	L	H	L	L	H	H	H	H	H	L	H	H	H
L	L	H	H	L	H	H	H	H	H	H	L	H	H
L	L	H	L	H	H	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Figure 2. Logic Diagram

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +6.5	V
V_{IN}	DC Input Voltage		−0.5 to +6.5	V
V_{OUT}	DC Output Voltage		−0.5 to V_{CC} + 0.5	V
I_{IN}	DC Input Current, per Pin		±20	mA
I_{OUT}	DC Output Current, per Pin		±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins		±75	mA
I_{IK}	Input Clamp Current		−20	mA
I_{OK}	Output Clamp Current		±20	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 1)	SOIC-16 TSSOP 16	126 159	°C/W
P_D	Power Dissipation in Still Air at 25 °C	SOIC-16 TSSOP 16	995 787	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage (Note 2)	Human Body Model Charged Device Model	2000 N/A	V

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 76mm-by-114mm, 2-ounce copper trace no air flow per JESD51-7.
2. 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_{CC}	DC Supply Voltage	2.0	3.6	V
V_{in}	DC Input Voltage (Note 3)	0	5.5	V
V_{out}	DC Output Voltage (Note 3)	0	V_{CC}	V
T_A	Operating Temperature	−40	+85	°C
t_r, t_f	Input Rise and Fall Time	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.

3. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions		V_{CC} (V)	T_A = 25 °C			T_A = −40 to 85 °C		Unit
					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	V_{IN} = V_{IL} or V_{IH}	I_{OH} = –50 μA I_{OH} = –50 μA I_{OH} = –4 mA	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_{IL} or V_{IH}	I_{OL} = 50 μA I_{OL} = 50 μA I_{OL} = 4 mA	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} = 5.5 V or GND		3.6	–	–	±0.1	–	±1.0	μA
I_{CC}	Quiescent Supply Current	V_{IN} = V_{CC} or GND		3.6	–	–	4.0	–	40.0	μA

NOISE CHARACTERISTICS (Note 4)

Symbol	Characteristic	C_L (pF)	V_{CC} (V)	T_A = 25°C		Unit
				Typ	Limit	
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	50	3.3	0.3	0.5	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	50	3.3	−0.33	−0.5	V
V_{IHD}	Minimum HIGH Level Dynamic Input Voltage	50	3.3	–	2.0	V
V_{ILD}	Maximum LOW Level Dynamic Input Voltage	50	3.3	–	0.8	V

4. Input tr = tf = 3 ns

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	C_L (pF)	V_{CC} (V)	T_A = 25 °C			T_A = −40 to 85 °C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay Time A_n to $\overline{O}_n$	15	2.7	–	7.1	13.8	1.0	16.5	ns
		50		–	9.6	17.3	1.0	20.0	
		15	3.3 ±0.3	–	5.5	8.8	1.0	10.5	
		50		–	8.0	12.3	1.0	14.0	
t_{PLH}, t_{PHL}	Propagation Delay Time $\overline{E}_1$ or $\overline{E}_2$ to $\overline{O}_n$	15	2.7	–	8.8	16.0	1.0	18.5	ns
		50		–	11.3	19.5	1.0	22.0	
		15	3.3 ±0.3	–	6.9	10.4	1.0	11.5	
		50		–	9.4	13.9	1.0	15.0	
t_{PLH}, t_{PHL}	Propagation Delay Time E_3 to $\overline{O}_n$	15	2.7	–	8.7	16.3	1.0	19.5	ns
		50		–	11.2	19.8	1.0	23.0	
		15	3.3 ±0.3	–	6.8	10.6	1.0	12.5	
		50		–	9.3	14.1	1.0	16.0	
t_{OSHL}, t_{OSLH}	Output to Output Skew (Note 5)	50	2.7	–	–	1.5	–	1.5	ns
			3.3	–	–	1.5	–	1.5	

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

CAPACITANCE

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_{PD}	Power Dissipation Capacitance (Note 6)	−	34	−	−	−	pF

6. CPD 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: $C_{PD} \times V_{CC} \times I_{IN} + I_{CC}$

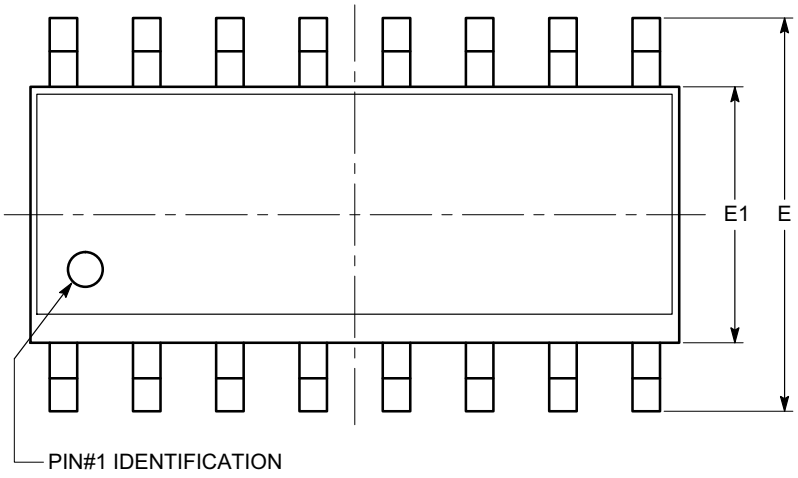
ORDERING INFORMATION

Device	Marking	Package	Shipping†
74LVX138MX	LVX138G	SOIC-16 (Pb-Free)	2500 Tape & Reel
74LVX138MTCX	LVX 138	TSSOP 16 (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.

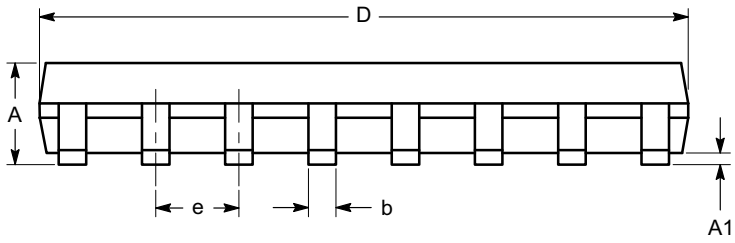
SOIC−16, 150 mils
CASE 751BG
ISSUE O

DATE 19 DEC 2008

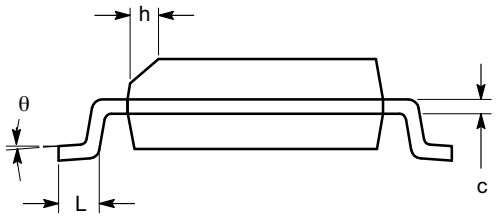


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	1.35		1.75
A1	0.10		0.25
b	0.33		0.51
c	0.19		0.25
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
h	0.25		0.50
L	0.40		1.27
θ	0º		8º



SIDE VIEW



END VIEW

Notes:
(1) All dimensions are in millimeters. Angles in degrees.
(2) Complies with JEDEC MS-012.

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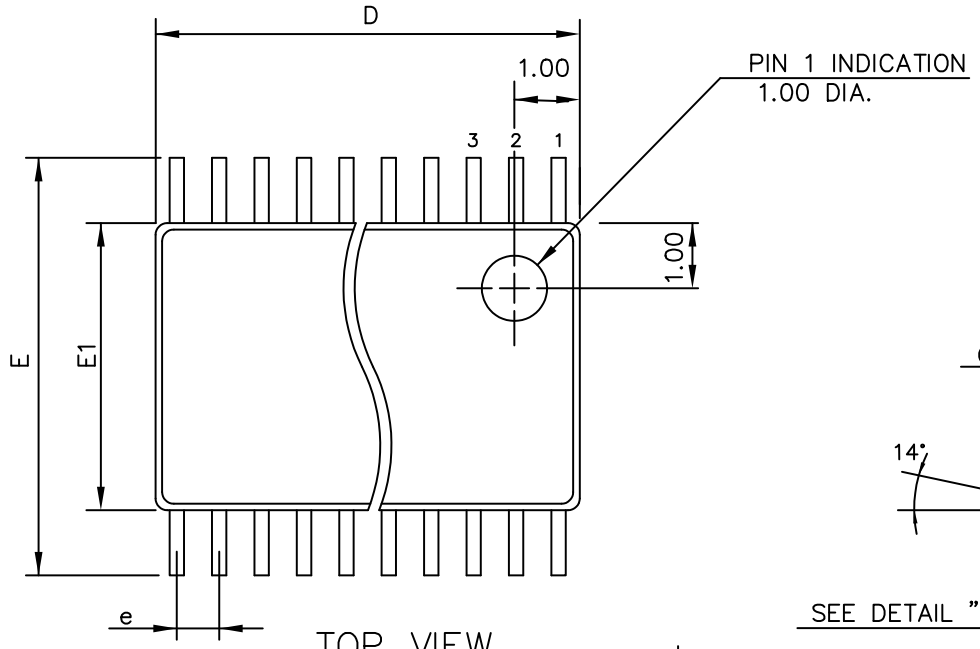
TSSOP 16
CASE 948AH
ISSUE O

DATE 19 SEP 2008



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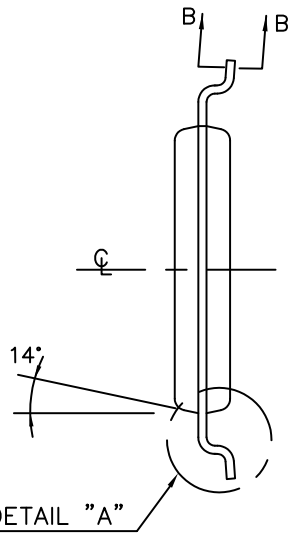

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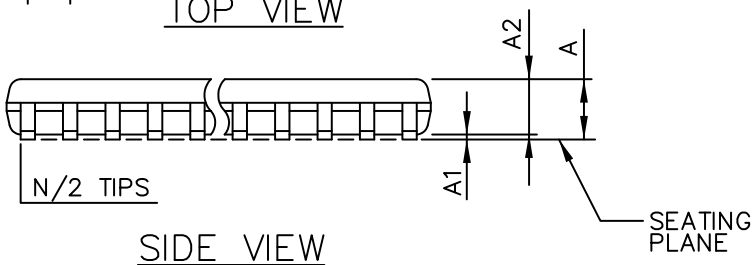
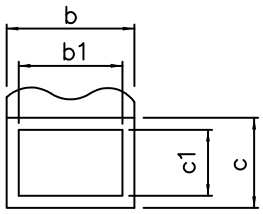


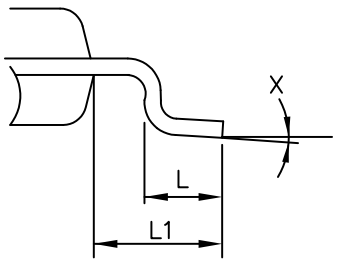
SIDE VIEW



SECTION "B–B"

THIS TABLE FOR 0.65mm PITCH

SYMBOL	COMMON DIMENSIONS			NOTE VARIATIONS	D	N
	MIN.	NOM.	MAX.			
A	——	——	1.10	AA/AAT	3.00 BSC	8
A_1	0.05	——	0.15	AB–1/ABT	5.00 BSC	14
A_2	0.85	0.90	0.95	AB/ABT	5.00 BSC	16
b	0.19	–	0.30	AD/ADT	7.80 BSC	24
b1	0.19	0.22	0.25			
c	0.09	–	0.20			
c1	0.09	0.127	0.16			
D	SEE VARIATIONS					
E1	4.30	4.40	4.50			
e	0.65 BSC					
E	6.40 BSC					
L	0.50	0.60	0.70			
L1	1.00 REF					
N	SEE VARIATIONS					
X	0°	——	8°			



DETAIL 'A'

ALL DIMENSIONS IN MILLIMETERS

MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15mm ON D PER SIDE

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