FAIRCHILD SEMICONDUCTOR™

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74LVT16240 • 74LVTH16240
Low Voltage 16-Bit Inverting Buffer/Line Driver with 3-STATE Outputs

General Description

The LVT16240 and LVTH16240 contain sixteen inverting buffers with 3-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus-oriented transmitter/receiver. The device is nibble controlled.

Individual 3-STATE control inputs can be shorted together for 8-bit or 16-bit operation.

The LVTH16240 data inputs include bushold, eliminating the need for external pull-up resistors to hold unused inputs.

These buffers and line drivers are designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVT16240 and LVTH16240 are fabricated with an advanced BiCMOS technology to achieve high speed operation similar to 5V ABT while maintaining a low power dissipation.

Features

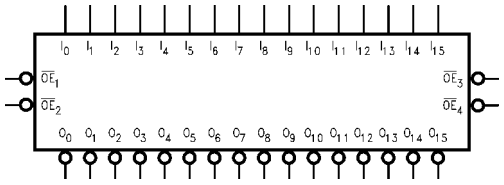
- Input and output interface capability to systems at 5V V_{CC}
- Bushold data inputs eliminate the need for external pull-up resistors to hold unused inputs (74LVTH16240), also available without bushold feature (74LVT16240)
- Live insertion/extraction permitted
- Power Up/Down high impedance provides glitch-free bus loading
- Outputs source/sink −32 mA/+64 mA
- Functionally compatible with the 74 series 16240
- Latch-up performance exceeds 500 mA
- ESD performance:
  - Human-body model > 2000V
  - Machine model > 200V
  - Charged-device model > 1000V

Ordering Code:

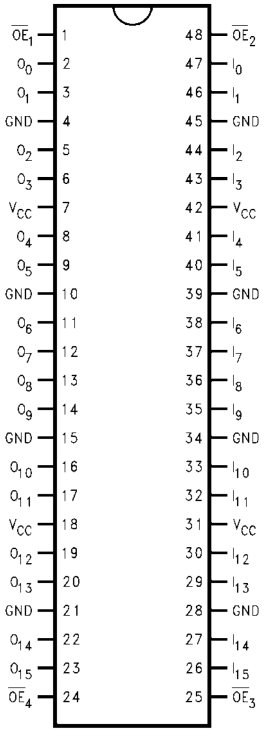
Order Number	Package Number	Package Description
74LVT16240MEA	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74LVT16240MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
74LVTH16240MEA	MS48A	48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
74LVTH16240MTD	MTD48	48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide

Devices also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.

Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
$\overline{OE}_n$	Output Enable Inputs (Active LOW)
I_0–I_{15}	Inputs
$\overline{O}_0$–$\overline{O}_{15}$	3-STATE Outputs

Truth Table

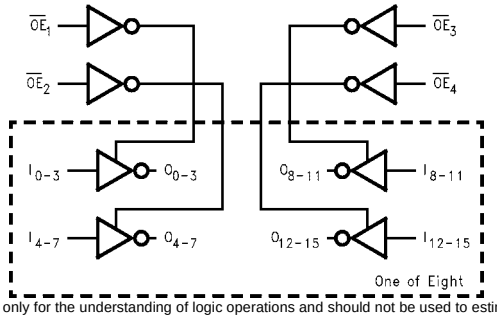
Inputs		Outputs
$\overline{OE}_1$	I_0–I_3	$\overline{O}_0$–$\overline{O}_3$
L	L	H
L	H	L
H	X	Z
Inputs		**Outputs**
$\overline{OE}_2$	I_4–I_7	$\overline{O}_4$–$\overline{O}_7$
L	L	H
L	H	L
H	X	Z
Inputs		**Outputs**
$\overline{OE}_3$	I_8–I_{11}	$\overline{O}_8$–$\overline{O}_{11}$
L	L	H
L	H	L
H	X	Z
Inputs		**Outputs**
$\overline{OE}_4$	I_{12}–I_{15}	$\overline{O}_{12}$–$\overline{O}_{15}$
L	L	H
L	H	L
H	X	Z

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

Functional Description

The LVT16240 and LVTH16240 contain sixteen inverting buffers with 3-STATE standard outputs. The device is nibble (4-bits) controlled with each nibble functioning identically, but independent of the other. The control pins may be shorted together to obtain full 16-bit operation. The 3-STATE outputs are controlled by an Output Enable ($\overline{OE}_n$) input for each nibble. When $\overline{OE}_n$ is LOW, the outputs are in 2-state mode. When $\overline{OE}_n$ is HIGH, the outputs are in the high impedance mode, but this does not interfere with entering new data into the inputs.

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.

Absolute Maximum Ratings(Note 1)

Symbol	Parameter	Value	Conditions	Units
V_{CC}	Supply Voltage	−0.5 to +4.6		V
V_I	DC Input Voltage	−0.5 to +7.0		V
V_O	DC Output Voltage	−0.5 to +7.0	Output in 3-STATE	V
		−0.5 to V_{CC} + 0.5	Output in HIGH or LOW State (Note 2)	
I_{IK}	DC Input Diode Current	−50	V_I < GND	mA
I_{OK}	DC Output Diode Current	−50	V_O < GND	mA
I_O	DC Output Current	64	$V_O > V_{CC}$ Output at HIGH State	mA
		128	$V_O > V_{CC}$ Output at LOW State	
I_{CC}	DC Supply Current per Supply Pin	±64		mA
I_{GND}	DC Ground Current per Ground Pin	±128		mA
T_{STG}	Storage Temperature	−65 to +150		°C

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units
V_{CC}	Supply Voltage	2.7	3.6	V
V_I	Input Voltage	0	5.5	V
I_{OH}	HIGH Level Output Current		−32	mA
I_{OL}	LOW Level Output Current		64	mA
T_A	Free-Air Operating Temperature	−40	85	°C
$\Delta t/\Delta V$	Input Edge Rate, V_{IN} = 0.8V–2.0V, V_{CC} = 3.0V	0	10	ns/V

Note 1: 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.

Note 2: I_O Absolute Maximum Rating must be observed.

DC Electrical Characteristics

Symbol	Parameter		V_{CC} (V)	T_A = −40°C to +85°C			Units	Conditions
				Min	Typ (Note 10)	Max		
V_{IK}	Input Clamp Diode Voltage		2.7			−1.2	V	I_I = −18 mA
V_{IH}	Input HIGH Voltage		2.7–3.6	2.0			V	$V_O \le 0.1V$ or
V_{IL}	Input LOW Voltage		2.7–3.6			0.8	V	$V_O \ge V_{CC} - 0.1V$
V_{OH}	Output HIGH Voltage		2.7–3.6	V_{CC} − 0.2			V	I_{OH} = −100 μA
			2.7	2.4				I_{OH} = −8 mA
			3.0	2.0				I_{OH} = −32 mA
V_{OL}	Output LOW Voltage		2.7			0.2	V	I_{OL} = 100 μA
			2.7			0.5		I_{OL} = 24 mA
			3.0			0.4		I_{OL} = 16 mA
			3.0			0.5		I_{OL} = 32 mA
			3.0			0.55		I_{OL} = 64 mA
$I_{I(HOLD)}$ (Note 4)	Bushold Input Minimum Drive		3.0	75			μA	V_I = 0.8V
				−75				V_I = 2.0V
$I_{I(OD)}$ (Note 4)	Bushold Input Over-Drive Current to Change State		3.0	500			μA	(Note 5)
				−500				(Note 6)
I_I	Input Current		3.6			10	μA	V_I = 5.5V
		Control Pins	3.6			±1		V_I = 0V or V_{CC}
		Data Pins	3.6			−5		V_I = 0V
						1		V_I = V_{CC}
I_{OFF}	Power Off Leakage Current		0			±100	μA	$0V \le V_I$ or $V_O \le 5.5V$
$I_{PU/PD}$	Power Up/Down 3-STATE Output Current		0–1.5V			±100	μA	V_O = 0.5V to 3.0V V_I = GND or V_{CC}
I_{OZL}	3-STATE Output Leakage Current		3.6			−5	μA	V_O = 0.5V
I_{OZH}	3-STATE Output Leakage Current		3.6			5	μA	V_O = 3.0V

DC Electrical Characteristics (Continued)

Symbol	Parameter	V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions
			Min	Typ (Note 10)	Max		
I_{OZH+}	3-STATE Output Leakage Current	3.6			10	μA	$V_{CC} < V_O \leq 5.5V$
I_{CCH}	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, Outputs HIGH
I_{CCL}	Power Supply Current	3.6			5	mA	V_I = GND or V_{CC}, Outputs LOW
I_{CCZ}	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, Outputs Disabled
I_{CCZH+}	Power Supply Current	3.6			0.19	mA	V_I = GND or V_{CC}, $V_{CC} \leq V_O \leq 5.5V$, Outputs Disabled
ΔI_{CC}	Increase in Power Supply Current (Note 7)	3.6			0.2	mA	One Input at $V_{CC} - 0.6V$ Other Inputs at V_{CC} or GND

Note 3: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

Note 4: Applies to bushold versions only (LVTH16240).

Note 5: An external driver must source at least the specified current to switch from LOW-to-HIGH.

Note 6: An external driver must sink at least the specified current to switch from HIGH-to-LOW.

Note 7: This is the increase in supply current for each input that is at the specified voltage level rather than V_{CC} or GND.

Dynamic Switching Characteristics (Note 8)

Symbol	Parameter	V_{CC} (V)	$T_A = 25°C$			Units	Conditions $C_L = 50$ pF, $R_L = 500\Omega$
			Min	Typ	Max		
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	3.3		0.8		V	(Note 9)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	3.3		−0.8		V	(Note 9)

Note 8: Characterized in SSOP package. Guaranteed parameter, but not tested.

Note 9: Max number of outputs defined as (n). n–1 data inputs are driven 0V to 3V. Output at LOW.

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF, $R_L = 500\Omega$					Units
		$V_{CC} = 3.3V \pm 0.3V$			$V_{CC} = 2.7V$		
		Min	Typ (Note 10)	Max	Min	Max	
t_{PLH}	Propagation Delay Data to Output	1.0		3.5	1.0	4.2	ns
t_{PHL}		1.0		3.5	1.0	4.0	
t_{PZH}	Output Enable Time	1.0		4.0	1.0	4.9	ns
t_{PZL}		1.2		4.8	1.2	6.1	
t_{PHZ}	Output Disable Time	1.7		4.7	1.7	5.2	ns
t_{PLZ}		1.7		4.2	1.7	4.4	
t_{OSHL}	Output to Output Skew			1.0		1.0	ns
t_{OSLH}	(Note 11)						

Note 10: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

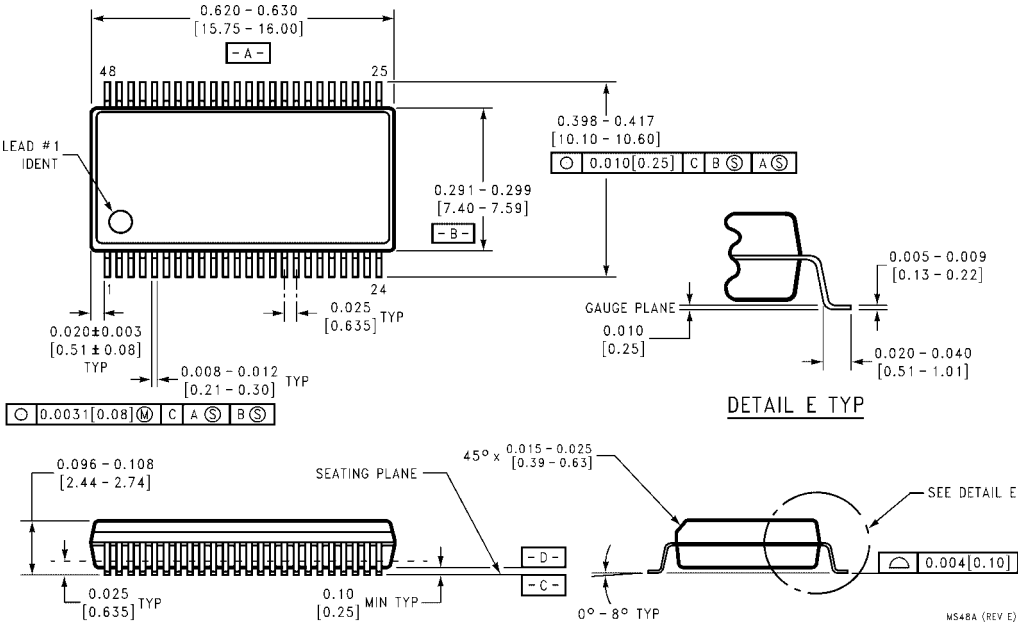
Note 11: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}).

Capacitance (Note 12)

Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = 0V$, $V_I = 0V$ or V_{CC}	4	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.0V$, $V_O = 0V$ or V_{CC}	8	pF

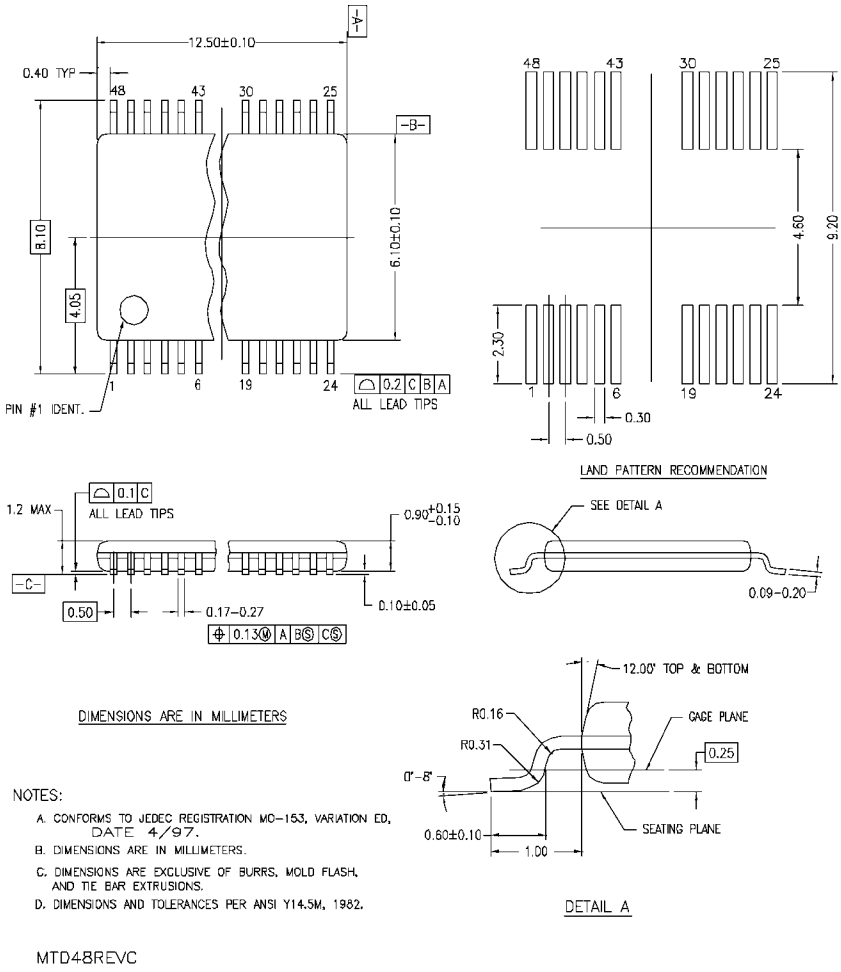
Note 12: Capacitance is measured at frequency f = 1 MHz, per MIL-STD-883, Method 3012.

Physical Dimensions inches (millimeters) unless otherwise noted



48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300" Wide
Package Number MS48A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



48-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 6.1mm Wide
Package Number MTD48

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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