FAIRCHILD SEMICONDUCTOR®

October 1998
Revised February 2005

74LVTH125
Low Voltage Quad Buffer with 3-STATE Outputs

General Description

The LVTH125 contains four independent non-inverting buffers with 3-STATE outputs.

These buffers are designed for low-voltage (3.3V) V_{CC} applications, but with the capability to provide a TTL interface to a 5V environment. The LVTH125 is 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
- 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 125
- 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
74LVTH125M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74LVTH125SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74LVTH125MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74LVTH125MTCX_NL (Note 1)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering code.
Pb-Free package per JEDEC J-STD-020B.

Note 1: "_NL" indicates Pb-Free package (per JEDED J-STD-020B). Device available in Tape and Reel only.

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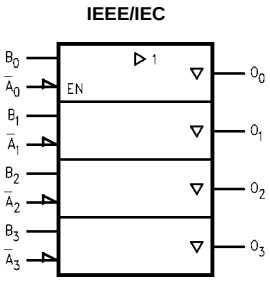
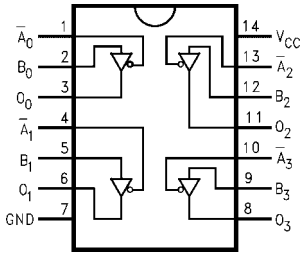
Logic Symbol



Connection Diagram



Pin Descriptions

Pin Names	Description
$\overline{A}_n$, B_n	Inputs
O_n	3-STATE Outputs

Truth Table

Inputs		Output
$\overline{A}_n$	B_n	O_n
L	L	L
L	H	H
H	X	Z

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

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Absolute Maximum Ratings(Note 2)

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 +7.0	Output in HIGH or LOW State (Note 3)	
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 2: 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 3: I_O Absolute Maximum Rating must be observed.

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DC Electrical Characteristics

Symbol	Parameter		V_{CC} (V)	$T_A = -40°C$ to $+85°C$			Units	Conditions
				Min	Typ (Note 4)	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	$I_{OH} = -100\ \mu A$
			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	$I_{OL} = 100\ \mu A$
			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
$I_{I(HOLD)}$	Bushold Input Minimum Drive		3.0	75			μA	$V_I = 0.8V$
				−75				$V_I = 2.0V$
$I_{I(OD)}$	Bushold Input Over-Drive		3.0	500			μA	(Note 5)
	Current to Change State			−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	$V_O = 3.0V$
I_{OZH+}	3-STATE Output Leakage Current		3.6			10	μA	$V_{CC} < V_O \le 5.5V$
I_{CCH}	Power Supply Current		3.6			0.19	mA	Outputs HIGH
I_{CCL}	Power Supply Current		3.6			5	mA	Outputs LOW
I_{CCZ}	Power Supply Current		3.6			0.19	mA	Outputs Disabled
I_{CCZ+}	Power Supply Current		3.6			0.19	mA	$V_{CC} \le V_O \le 5.5V$ 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 4: All typical values are at $V_{CC} = 3.3V$, $T_A = 25°C$.

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
			Min	Typ	Max		$C_L = 50$ pF, $R_L = 500\Omega$
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 SOIC 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 under test held LOW.

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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	4.5	ns
t_{PHL}		1.0		3.9	1.0	4.9	
t_{PZH}	Output Enable Time	1.0		4.0	1.0	5.5	ns
t_{PZL}		1.1		4.0	1.1	5.4	
t_{PHZ}	Output Disable Time	1.5		4.5	1.5	5.7	ns
t_{PLZ}		1.3		4.5	1.3	4.0	
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-883B, Method 3012.

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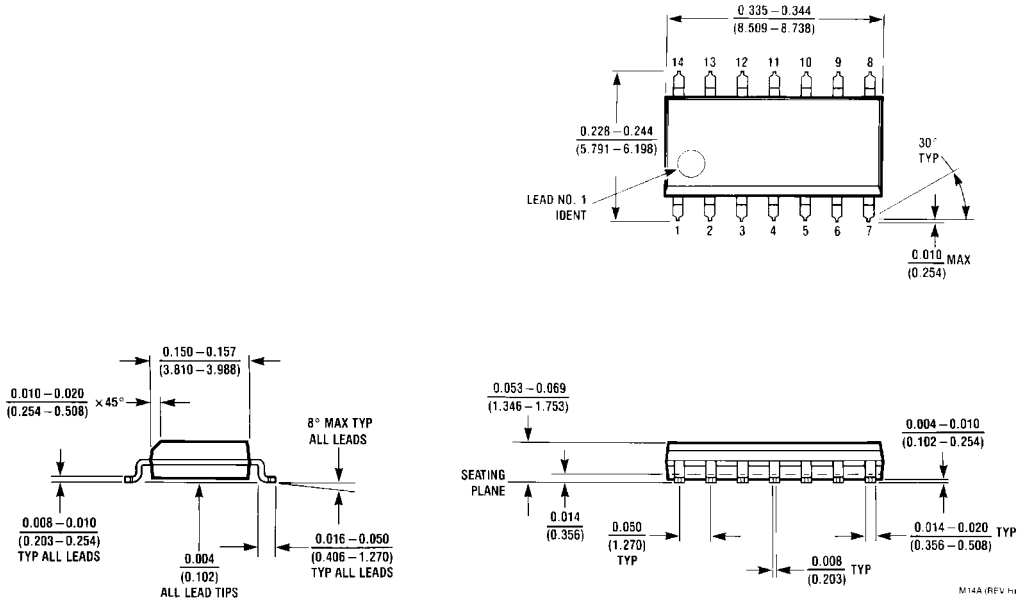
Physical Dimensions inches (millimeters) unless otherwise noted



14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M14A

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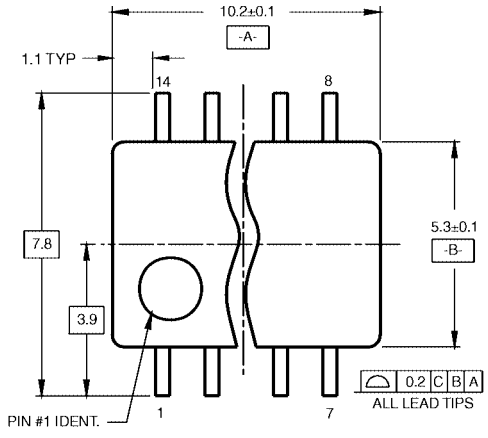
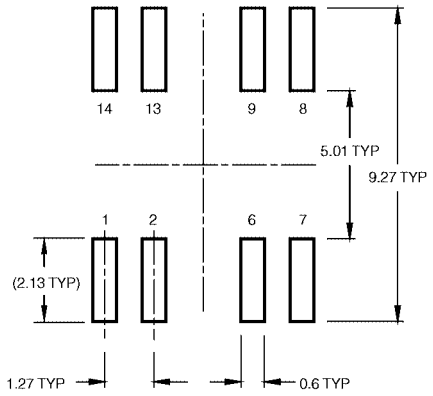
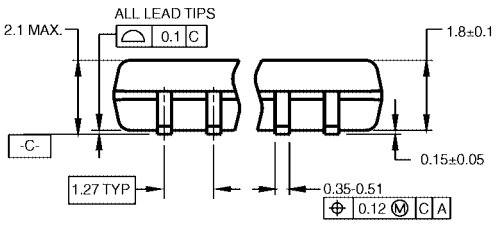
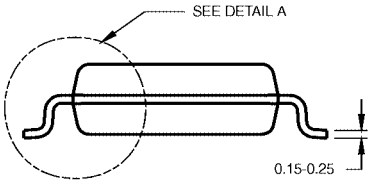
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



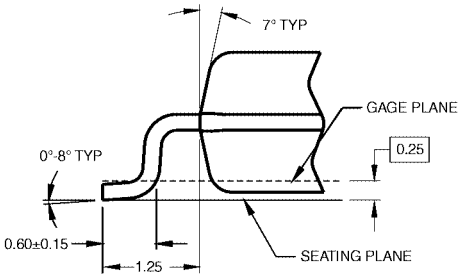


LAND PATTERN RECOMMENDATION





DIMENSIONS ARE IN MILLIMETERS



DETAIL A

NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D

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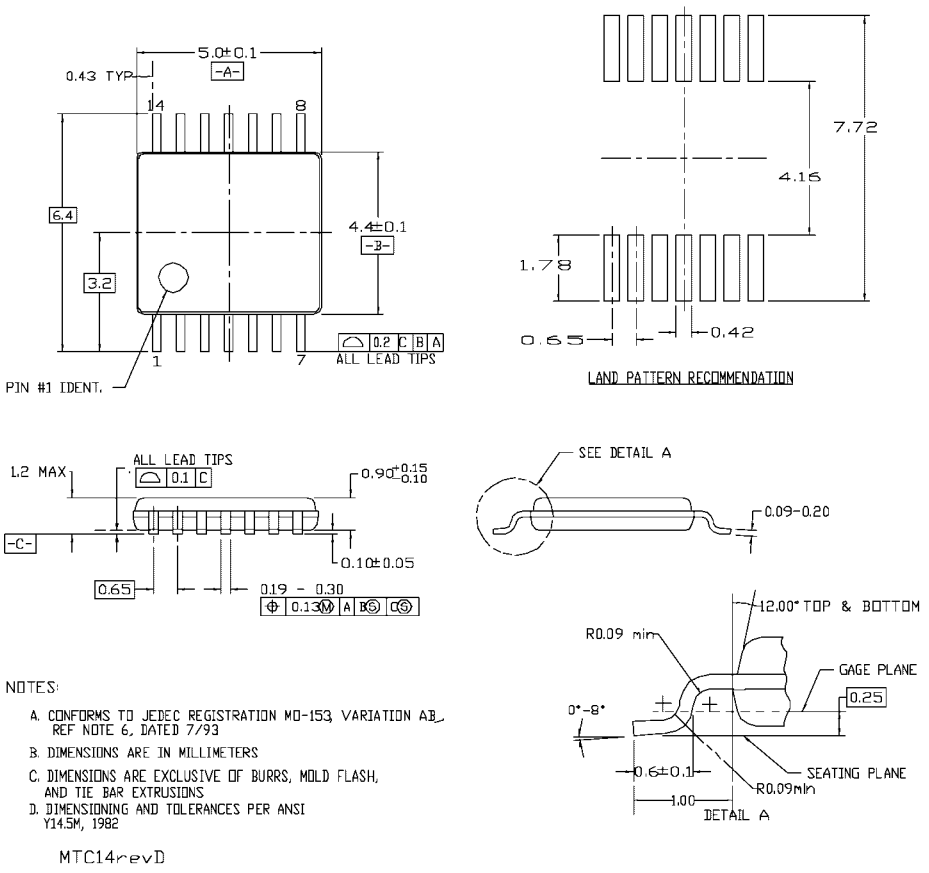
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC14

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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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