FAIRCHILD

SEMICONDUCTOR®

August 1993
Revised February 2005

74VHC125
Quad Buffer with 3-STATE Outputs

General Description

The VHC125 contains four independent non-inverting buffers with 3-STATE outputs. It is an advanced high-speed CMOS device fabricated with silicon gate CMOS technology and achieves the high-speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

An input protection circuit insures that 0V to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery backup. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

■ High Speed: t_{PD} = 3.8 ns (typ) at V_{CC} = 5V

■ Lower power dissipation: I_{CC} = 4 μA (max) at T_A = 25°C

■ High noise immunity: V_{NIH} = V_{NIL} = 28% V_{CC} (min)

■ Power down protection is provided on all inputs

■ Low noise: V_{OLP} = 0.8V (max)
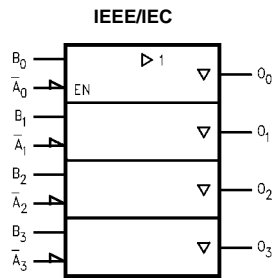
■ Pin and function compatible with 74HC125

Ordering Code:

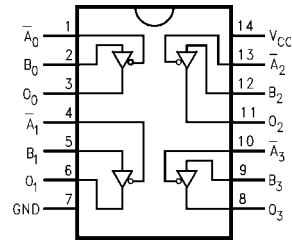| Order Number	Package Number	Package Description
74VHC125M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC125MX_NL (Note 1)	M14A	Pb-Free 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74VHC125SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74VHC125MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC125MTCX_NL (Note 1)	MTC14	Pb-Free 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74VHC125N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.
Pb-Free package per JEDED J-STD-020B.

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

Logic Symbol

IEEE/IEC

B_0
$\overline{A}_0$ — EN
O_0

B_1
$\overline{A}_1$
O_1

B_2
$\overline{A}_2$
O_2

B_3
$\overline{A}_3$
O_3

Connection Diagram

Pin	Signal
1	$\overline{A}_0$
2	B_0
3	O_0
4	$\overline{A}_1$
5	B_1
6	O_1
7	GND
14	V_{CC}
13	$\overline{A}_2$
12	B_2
11	O_2
10	$\overline{A}_3$
9	B_3
8	O_3

Pin Descriptions

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

Function 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
Z = HIGH Impedance
X = Immaterial

Absolute Maximum Ratings(Note 2)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Voltage (V_{IN})	−0.5V to +7.0V
DC Output Voltage (V_{OUT})	−0.5V to V_{CC} + 0.5V
Input Diode Current (I_{IK})	−20 mA
Output Diode Current (I_{OK})	±20 mA
DC Output Current (I_{OUT})	±25 mA
DC V_{CC}/GND Current (I_{CC})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Lead Temperature (T_L)	
(Soldering, 10 seconds)	260°C

Recommended Operating Conditions (Note 3)

Supply Voltage (V_{CC})	2.0V to +5.5V
Input Voltage (V_{IN})	0V to +5.5V
Output Voltage (V_{OUT})	0V to V_{CC}
Operating Temperature (T_{OPR})	−40°C to +85°C
Input Rise and Fall Time (t_r, t_f)	
V_{CC} = 3.3V ± 0.3V	0 ~ 100 ns/V
V_{CC} = 5.0V ± 0.5V	0 ~ 20 ns/V

Note 2: Absolute Maximum Ratings are values beyond which the device may be damaged or have its useful life impaired. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside databook specifications.

Note 3: Unused inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	T_A = −40°C to +85°C Min	T_A = −40°C to +85°C Max	Units	Conditions	
V_{IH}	HIGH Level Input Voltage	2.0	1.50			1.50		V		
		3.0 – 5.5	0.7 V_{CC}			0.7 V_{CC}				
V_{IL}	LOW Level Input Voltage	2.0			0.50		0.50	V		
		3.0 – 5.5			0.3 V_{CC}		0.3 V_{CC}			
V_{OH}	HIGH Level Output Voltage	2.0	1.9	2.0		1.9		V	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50 μA
		3.0	2.9	3.0		2.9				
		4.5	4.4	4.5		4.4				
		3.0	2.58			2.48		V		I_{OH} = −4 mA
		4.5	3.94			3.80				I_{OH} = −8 mA
V_{OL}	LOW Level Output Voltage	2.0		0.0	0.1		0.1	V	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA
		3.0		0.0	0.1		0.1			
		4.5		0.0	0.1		0.1			
		3.0			0.36		0.44	V		I_{OL} = 4 mA
		4.5			0.36		0.44			I_{OL} = 8 mA
I_{OZ}	3-STATE Output Off-State Current	5.5			±0.25		±2.5	μA	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND	
I_{IN}	Input Leakage Current	0 – 5.5			±0.1		±1.0	μA	V_{IN} = 5.5V or GND	
I_{CC}	Quiescent Supply Current	5.5			4.0		40.0	μA	V_{IN} = V_{CC} or GND	

Noise Characteristics

Symbol	Parameter	V_{CC} (V)	T_A = 25°C Typ	T_A = 25°C Limits	Units	Conditions
V_{OLP} (Note 4)	Quiet Output Maximum Dynamic V_{OL}	5.0	0.5	0.8	V	C_L = 50 pF
V_{OLV} (Note 4)	Quiet Output Minimum Dynamic V_{OL}	5.0	−0.5	−0.8	V	C_L = 50 pF
V_{IHD} (Note 4)	Minimum HIGH Level Dynamic Input Voltage	5.0		3.5	V	C_L = 50 pF
V_{ILD} (Note 4)	Maximum HIGH Level Dynamic Input Voltage	5.0		1.5	V	C_L = 50 pF

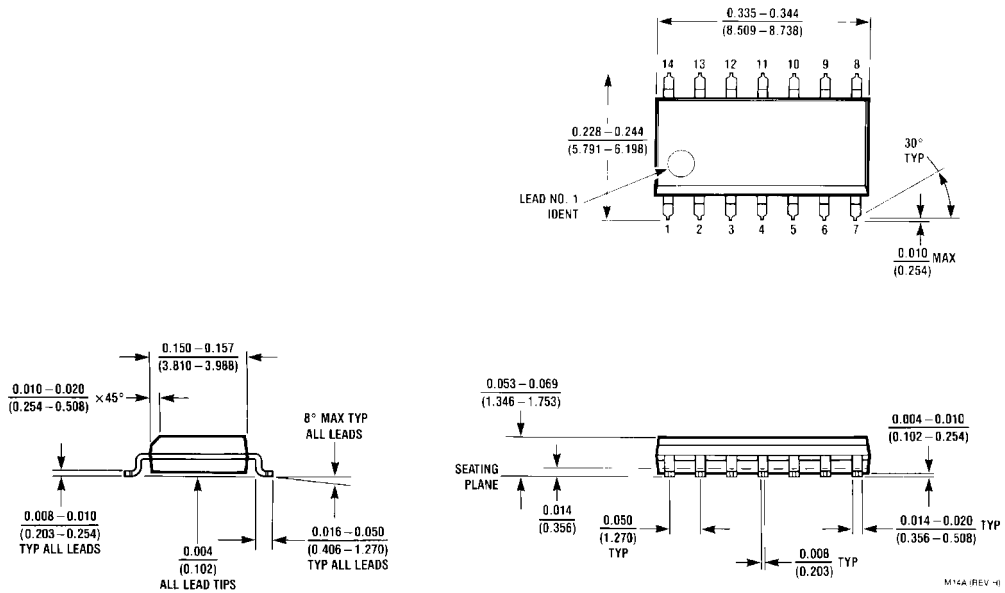**Note 4:** Parameter guaranteed by design.

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AC Electrical Characteristics

Symbol	Parameter	V_CC (V)	T_A = 25°C Min	T_A = 25°C Typ	T_A = 25°C Max	T_A = −40°C to +85°C Min	T_A = −40°C to +85°C Max	Units	Conditions	
t_{PLH}	Propagation Delay	3.3 ± 0.3		5.6	8.0	1.0	9.5	ns		C_L = 15 pF
t_{PHL}	Time			8.1	11.5	1.0	13.0			C_L = 50 pF
		5.0 ± 0.5		3.8	5.5	1.0	6.5	ns		C_L = 15 pF
				5.3	7.5	1.0	8.5			C_L = 50 pF
t_{PZL}	3-STATE Output	3.3 ± 0.3		5.4	8.0	1.0	9.5	ns	R_L = 1 kΩ	C_L = 15 pF
t_{PZH}	Enable Time			7.9	11.5	1.0	13.0			C_L = 50 pF
		5.0 ± 0.5		3.6	5.1	1.0	6.0	ns		C_L = 15 pF
				5.1	7.1	1.0	8.0			C_L = 50 pF
t_{PLZ}	3-STATE Output	3.3 ± 0.3		9.5	13.2	1.0	15.0	ns	R_L = 1 kΩ	C_L = 50 pF
t_{PHZ}	Disable Time	5.0 ± 0.5		6.1	8.8	1.0	10.0			C_L = 50 pF
t_{OSLH}	Output to Output Skew	3.3 ± 0.3			1.5		1.5	ns	(Note 5)	C_L = 50 pF
t_{OSHL}		5.0 ± 0.5			1.0		1.0			C_L = 50 pF
C_{IN}	Input Capacitance			4	10		10	pF	V_{CC} = Open	
C_{OUT}	Output Capacitance			6				pF	V_{CC} = 5.0V	
C_{PD}	Power Dissipation Capacitance			14				pF	(Note 6)	

Note 5: Parameter guaranteed by design. $t_{OSLH} = |t_{PLHmax} - t_{PLHmin}|$; $t_{OSHL} = |t_{PHLmax} - t_{PHLmin}|$.
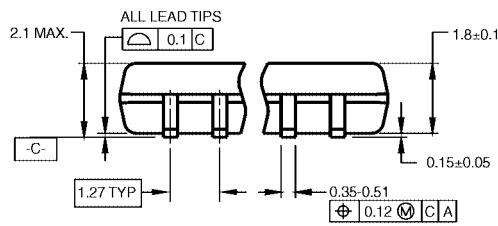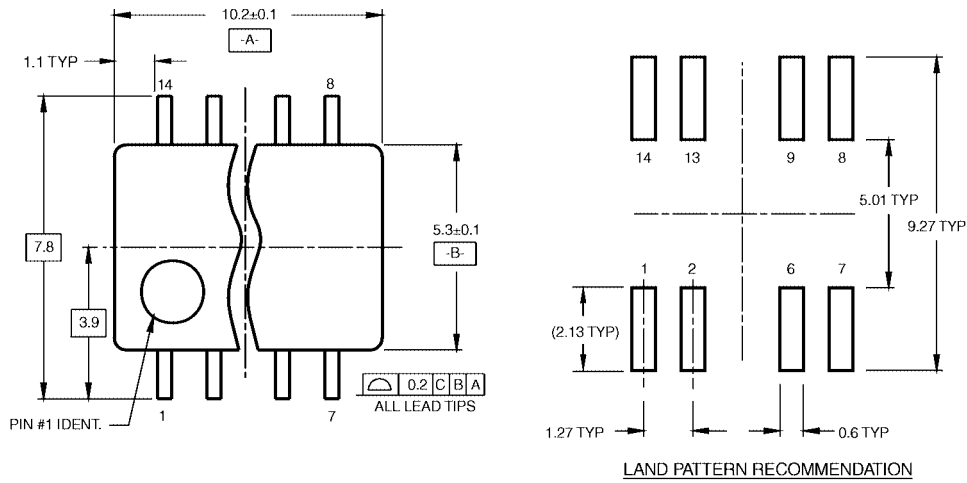
Note 6: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC} (OPR.) = $C_{PD} * V_{CC} * f_{IN} + I_{CC}/4$ (per bit).

Physical Dimensions inches (millimeters) unless otherwise noted

0.335 − 0.344
(8.509 − 8.738)

14 13 12 11 10 9 8

0.228 − 0.244
(5.791 − 6.198)

30°
TYP

LEAD NO. 1
IDENT

1 2 3 4 5 6 7

0.010 MAX
(0.254)

0.150 − 0.157
(3.810 − 3.988)

0.010 − 0.020
(0.254 − 0.508) ×45°

8° MAX TYP
ALL LEADS

0.008 − 0.010
(0.203 − 0.254)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 − 0.050
(0.406 − 1.270)
TYP ALL LEADS

0.053 − 0.069
(1.346 − 1.753)

0.004 − 0.010
(0.102 − 0.254)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008
(0.203) TYP

0.014 − 0.020 TYP
(0.356 − 0.508)

M14A (REV H)

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

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

10.2±0.1
-A-

1.1 TYP

14   8

7.8

3.9

5.3±0.1
-B-

⌒ 0.2 C B A
ALL LEAD TIPS

PIN #1 IDENT.   1   7

14   13   9   8

5.01 TYP

9.27 TYP

(2.13 TYP)   1   2   6   7

1.27 TYP   0.6 TYP

LAND PATTERN RECOMMENDATION

ALL LEAD TIPS

2.1 MAX.   ⌒ 0.1 C

1.8±0.1

-C-

0.15±0.05

1.27 TYP   0.35-0.51

⊕ 0.12 Ⓜ C A
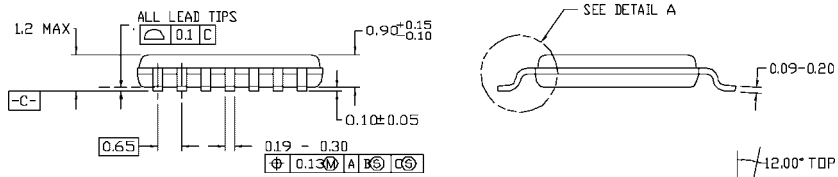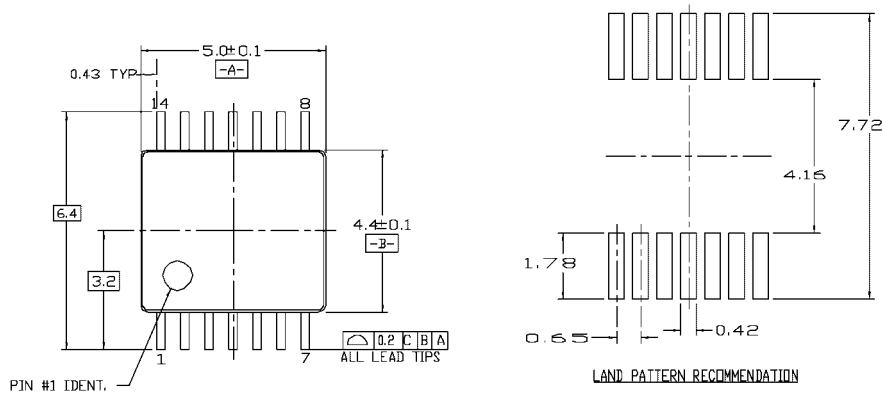
DIMENSIONS ARE IN MILLIMETERS

SEE DETAIL A

0.15-0.25

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

7° TYP

GAGE PLANE

0°-8° TYP

0.25

0.60±0.15

1.25

SEATING PLANE

DETAIL A

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

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

5.0±0.1
-A-

0.43 TYP

14

8

6.4

3.2

4.4±0.1
-B-

⟋ 0.2 C B A
ALL LEAD TIPS

1

7

PIN #1 IDENT.

7.72

4.16

1.78

0.65

0.42

LAND PATTERN RECOMMENDATION

1.2 MAX

ALL LEAD TIPS
⟋ 0.1 C

0.90 +0.15 -0.10

-C-

0.65

0.19 - 0.30

0.10±0.05

⊕ 0.13 Ⓜ A BⓈ CⓈ

SEE DETAIL A

0.09-0.20

R0.09 min

12.00° TOP & BOTTOM

GAGE PLANE

0.25

0°-8°

0.6±0.1

R0.09 min

SEATING PLANE

1.00

DETAIL A

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6, DATED 7/93

B. DIMENSIONS ARE IN MILLIMETERS

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

D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

MTC14revD
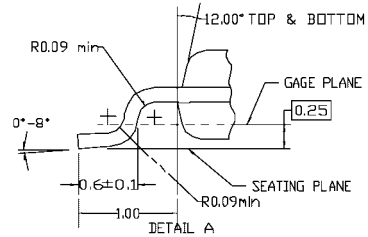
**14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC14**

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

OPTION 1

OPTION 02

14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N14A

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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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