FAIRCHILD SEMICONDUCTOR™

November 1988
Revised December 1999

74AC14 • 74ACT14
Hex Inverter with Schmitt Trigger Input

General Description

The 74AC14 and 74ACT14 contain six inverter gates each with a Schmitt trigger input. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

The 74AC14 and 74ACT14 have hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Features

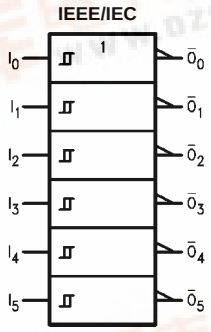
- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- 74ACT14 has TTL-compatible inputs

Ordering Code:

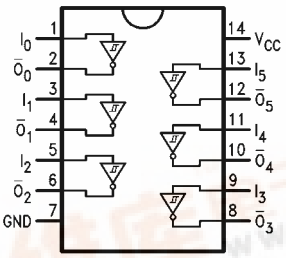
Order Number	Package Number	Package Description
74AC14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74AC14SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MS-153, 4.4mm Wide
74AC14PC	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
74ACT14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MS-153, 4.4mm Wide
74ACT14PC	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Device 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
I_n	Inputs
$\overline{O}_n$	Outputs

Function Table

Input	Output
A	$\overline{O}$
L	H
H	L

FACT™ is a trademark of Fairchild Semiconductor Corporation.

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source	
or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current	
per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Junction Temperature (T_J)	
PDIP	140°C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
AC	2.0V to 6.0V
ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. 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 of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for AC

Symbol	Parameter	V_{CC}	T_A = +25°C	T_A = −40°C to +85°C		Units	Conditions
		(V)	Typ	Guaranteed Limits			
V_{OH}	Minimum HIGH Level	3.0	2.99	2.9	2.9		
	Output Voltage	4.5	4.49	4.4	4.4	V	I_{OUT} = −50 µA
		5.5	5.49	5.4	5.4		
		3.0		2.56	2.46		I_{OH} = 12
		4.5		3.86	3.76	V	I_{OH} = 24 mA
		5.5		4.86	4.76		I_{OH} = 24 mA (Note 2)
V_{OL}	Maximum LOW Level	3.0	0.002	0.1	0.1		
	Output Voltage	4.5	0.001	0.1	0.1	V	I_{OUT} = 50 µA
		5.5	0.001	0.1	0.1		
		3.0		0.36	0.44		I_{OL} = 12
		4.5		0.36	0.44	V	I_{OL} 24 mA
		5.5		0.36	0.44		I_{OL} = 24 mA (Note 2)
I_{IN} (Note 4)	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	V_I = V_{CC}, GND
V_{t+}	Maximum Positive	3.0		2.2	2.2		
	Threshold	4.5		3.2	3.2	V	T_A = Worst Case
		5.5		3.9	3.9		
V_{t-}	Minimum Negative	3.0		0.5	0.5		
	Threshold	4.5		0.9	0.9	V	T_A = Worst Case
		5.5		1.1	1.1		
$V_{H(MAX)}$	Maximum Hysteresis	3.0		1.2	1.2		
		4.5		1.4	1.4	V	T_A = Worst Case
		5.5		1.6	1.6		
$V_{H(MIN)}$	Minimum Hysteresis	3.0		0.3	0.3		
		4.5		0.4	0.4	V	T_A = Worst Case
		5.5		0.5	0.5		
I_{OLD}	Minimum Dynamic	5.5			75	mA	V_{OLD} = 1.65V Max
I_{OHD}	Output Current (Note 3)	5.5			−75	mA	V_{OHD} = 3.85V Min
I_{CC}	Maximum Quiescent	5.5		2.0	20.0	µA	V_{IN} = V_{CC}
(Note 4)	Supply Current						or GND

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

Note 4: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

AC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V) (Note 5)	$T_A = +25°C$, $C_L = 50$ pF			$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay	3.3	1.5	9.5	13.5	1.5	15.0	ns
		5.0	1.5	7.0	10.0	1.5	11.0	
t_{PHL}	Propagation Delay	3.3	1.5	7.5	11.5	1.5	13.0	ns
		5.0	1.5	6.0	8.5	1.5	9.5	

Note 5: Voltage Range 3.3 is 3.3V ± 0.3V
Voltage Range 5.0 is 5.0V ± 0.5V

DC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$	$T_A = -40°C$ to $+85°C$		Units	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum HIGH Level	4.5	1.5	2.0	2.0	V	$V_{OUT} = 0.1V$
	Input Voltage	5.5	1.5	2.0	2.0		or $V_{CC} - 0.1V$
V_{IL}	Maximum LOW Level	4.5	1.5	0.8	0.8	V	$V_{OUT} = 0.1V$
	Output Voltage	5.5	1.5	0.8	0.8		or $V_{CC} - 0.1V$
V_{OH}	Minimum HIGH Level	4.5	4.49	434	4.4	V	$I_{OUT} = -50\mu A$
	Output Voltage	5.5	5.49	5.4	5.4		
							$V_{IN} = V_{IL}$ or V_{IH}
		4.5		3.86	3.76	V	$I_{OH} = -24$ mA
		5.5		4.86	4.76		$I_{OH} = -24$ mA (Note 6)
V_{OL}	Maximum LOW Level	4.5	0.001	0.1	0.1	V	$I_{OUT} = 50\ \mu A$
	Output Voltage	5.5	0.001	0.1	0.1		
							$V_{IN} = V_{IL}$ or V_{IH}
		4.5		0.36	0.44	V	$I_{OL} = 24$ mA
		5.5		0.36	0.44		$I_{OL} = 24$ mA (Note 6)
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	$V_I = V_{CC}$, GND
$V_{H(MAX)}$	Maximum Hysteresis	4.5		1.4	1.4	V	T_A = Worst Case
		5.5		1.6	1.6		
$V_{H(MIN)}$	Minimum Hysteresis	4.5		0.4	0.4	V	T_A = Worst Case
		5.5		0.5	0.5		
V_{t+}	Maximum Positive	4.5		2.0	2.0	V	T_A = Worst Case
	Threshold	5.5		2.0	2.0		
V_{t-}	Minimum Negative	4.5		0.8	0.8	V	T_A = Worst Case
	Threshold	5.5		0.8	0.8		
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.5	mA	$V_I = V_{CC} - 2.1V$
I_{OLD}	Minimum Dynamic	5.5			75	mA	$V_{OLD} = 1.65V$ Max
I_{OHD}	Output Current (Note 7)	5.5			−75	mA	$V_{OHD} = 3.85V$ Min
I_{CC}	Maximum Quiescent	5.5		2.0	20.0	µA	$V_{IN} = V_{CC}$
	Supply Current						or GND

Note 6: All outputs loaded; thresholds on input associated with output under test.

Note 7: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics for ACT

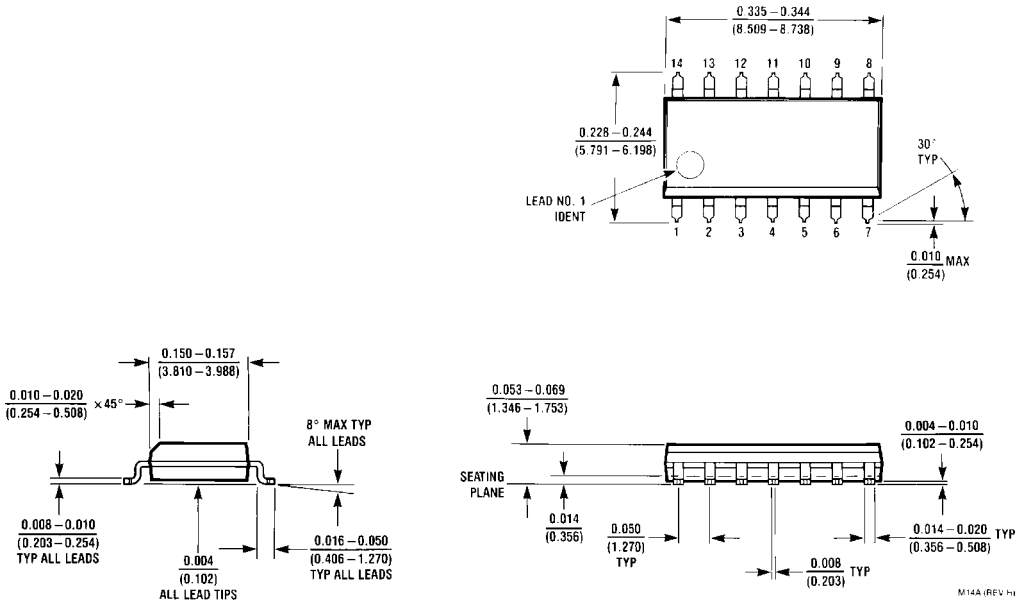
Symbol	Parameter	V_{CC} (V) (Note 8)	$T_A = +25°C$, $C_L = 50$ pF			$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay Data to Output	5.0	3.0	8.0	10.0	3.0	11.0	ns
t_{PHL}	Propagation Delay Data to Output	5.0	3.0	8.0	10.0	3.0	11.0	ns

Note 8: Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance

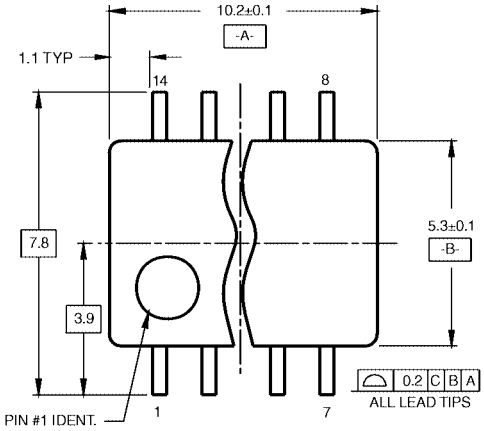
Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance for AC for ACT	25.0 80	pF	V_{CC} = 5.0V

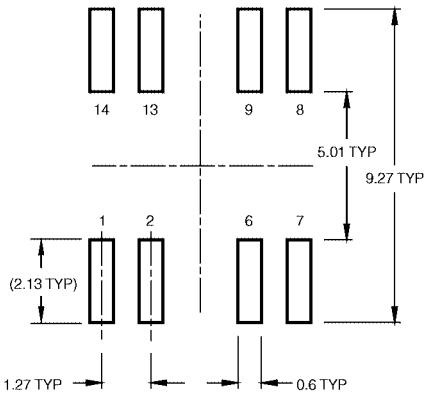
Physical Dimensions inches (millimeters) unless otherwise noted



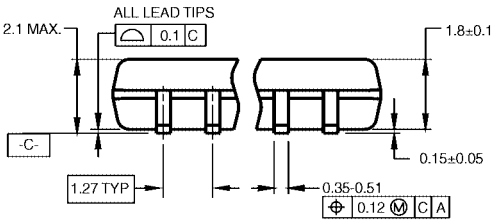
14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
Package Number M14A

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

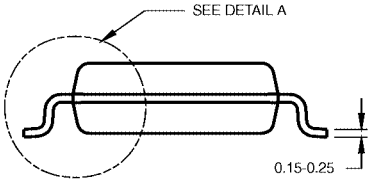


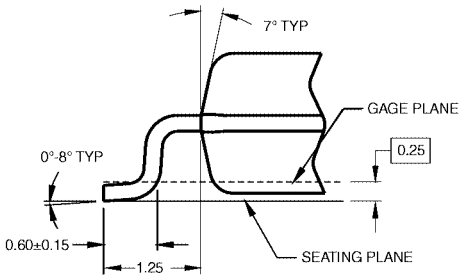


LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS





DETAIL A

NOTES:

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

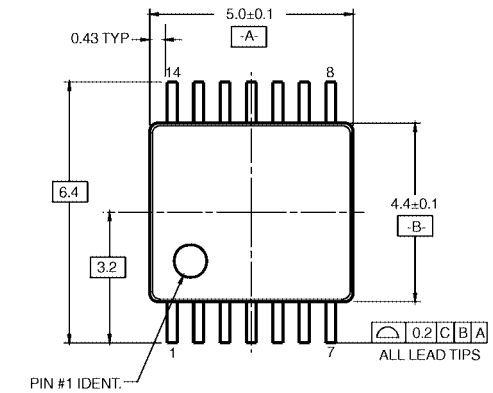
B. DIMENSIONS ARE IN MILLIMETERS.

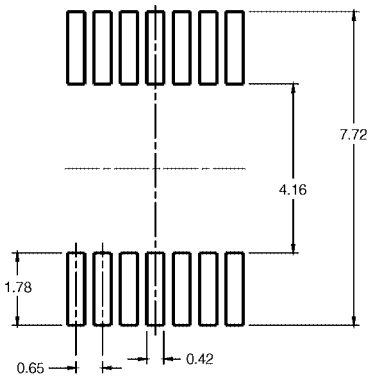
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1

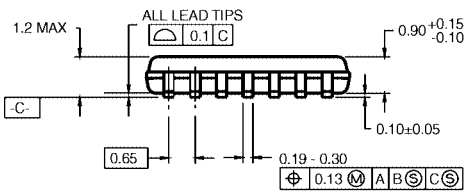
14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M14D

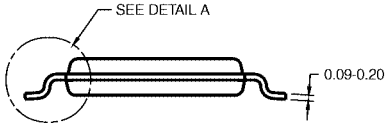
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

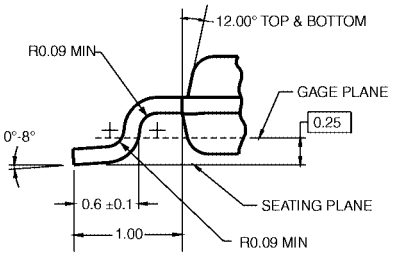




LAND PATTERN RECOMMENDATION







DETAIL A

NOTES:

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

B. DIMENSIONS ARE IN MILLIMETERS.

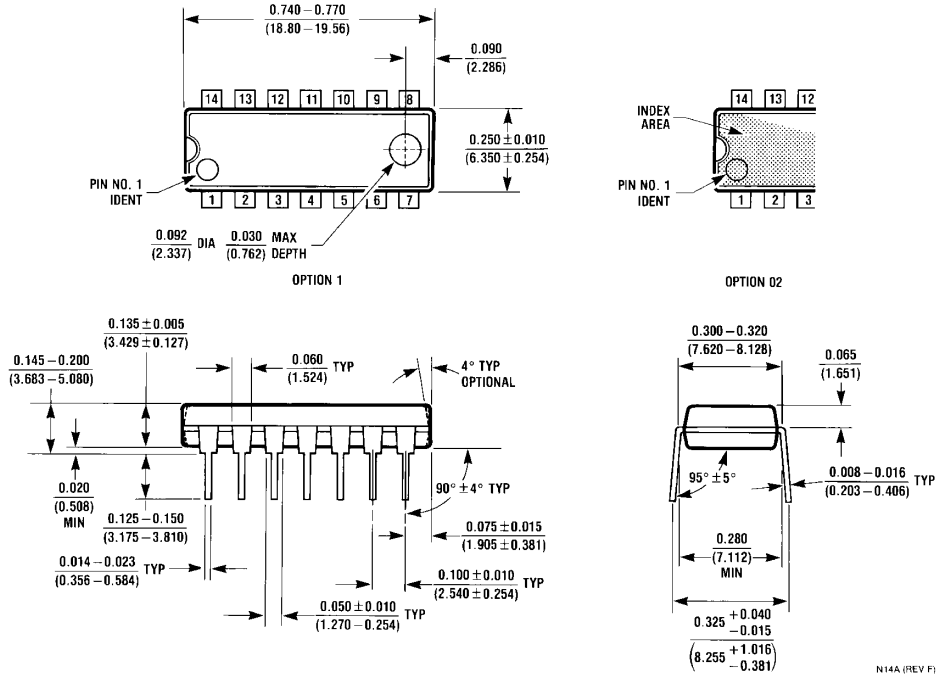
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

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

MTC14RevC3

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)



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