

# Hex Inverter with Schmitt Trigger Input

## 74AC14, 74ACT14

### 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 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

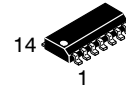
### Features

- $I_{CC}$  Reduced by 50%
- Outputs Source/Sink 24 mA
- 74ACT14 has TTL-Compatible Inputs
- These are Pb-Free Devices

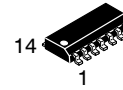
### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Supply Voltage	$V_{CC}$	-0.5 to +6.5	V
DC Input Diode Current $V_I = -0.5$ V $V_I = V_{CC} + 1.5$ V	$I_{IK}$	-20 +20	mA
DC Input Voltage	$V_I$	-0.5 to $V_{CC} + 1.5$	V
DC Output Diode Current $V_O = -0.5$ V $V_O = V_{CC} + 0.5$ V	$I_{OK}$	-20 +20	mA
DC Output Voltage	$V_O$	-0.5 to $V_{CC} + 0.5$	V
DC Output Source or Sink Current	$I_O$	$\pm 50$	mA
DC $V_{CC}$ or Ground Current per Output Pin	$I_{CC}$ or $I_{GND}$	$\pm 50$	mA
Storage Temperature Range	$T_{STG}$	-65 to +150	$^{\circ}C$
Junction Temperature	$T_J$	140	$^{\circ}C$

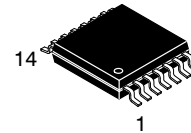
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



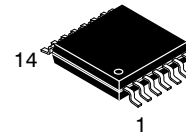
SOIC-14 NB  
CASE 751A-03



SOIC14  
CASE 751EF

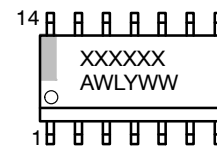


TSSOP-14 WB  
CASE 948G



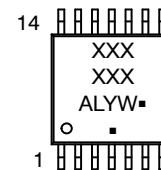
TSSOP-14 WB  
CASE 948G-01

### MARKING DIAGRAM



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week

### MARKING DIAGRAM



- XXXXXX = Specific Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# 74AC14, 74ACT14

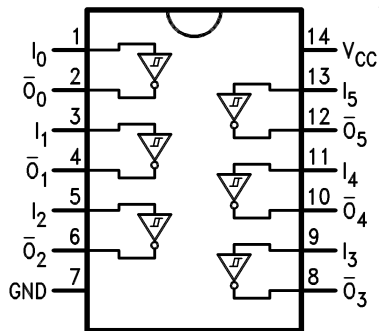


Figure 1. Connection Diagram

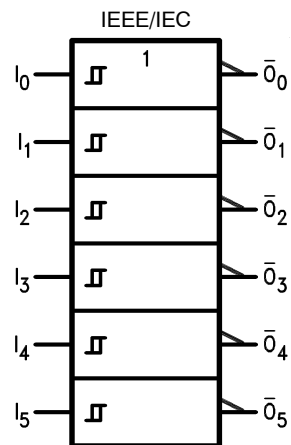


Figure 2. Logic Symbol

## PIN DESCRIPTION

Pin	Description
$A_n$	Inputs
$\bar{O}_n$	Outputs

## FUNCTION TABLE

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

# 74AC14, 74ACT14

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
$V_{CC}$	Supply Voltage AC ACT	2.0	6.0	V
		4.5	5.5	
$V_I$	Input Voltage	0	$V_{CC}$	V
$V_O$	Output Voltage	0	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+85	°C

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.

## DC ELECTRICAL CHARACTERISTICS FOR AC

Symbol	Parameter	$V_{CC}(V)$	Conditions	$T_A = +25^\circ C$		$T_A = -40^\circ C \text{ to } +85^\circ C$		Unit	
				Typ	Guaranteed Limits				
$V_{OH}$	Minimum HIGH Level Output Voltage	3.0	$I_{OUT} = -50 \mu A$	2.99	2.9	2.9	V		
				4.49	4.4	4.4			
				5.49	5.4	5.4			
		3.0	$I_{OH} = 12 \text{ mA}$	-	2.56	2.46			
				4.5	$I_{OH} = 24 \text{ mA}$	-		3.86	3.76
						5.5		$I_{OH} = 24 \text{ mA (Note 1)}$	-
$V_{OL}$	Maximum LOW Level Output Voltage	3.0	$I_{OUT} = 50 \mu A$	0.002	0.1		0.1		V
				4.5	0.001	0.1	0.1		
				5.5	0.001	0.1	0.1		
		3.0	$I_{OL} = 12 \text{ mA}$	-	0.36	0.44			
				4.5	$I_{OL} = 24 \text{ mA}$	-	0.36	0.44	
						5.5	$I_{OL} = 24 \text{ mA (Note 1)}$	-	
$I_{IN}$ (Note 3)	Maximum Input Leakage Current	5.5	$V_I = V_{CC}, GND$	-	$\pm 0.1$			$\pm 1.0$	$\mu A$
$V_{t+}$	Maximum Positive Threshold	3.0	$T_A = \text{Worst Case}$	-	2.2	2.2	V		
				4.5	-	3.2		3.2	
				5.5	-	3.9		3.9	
$V_{t-}$	Minimum Negative Threshold	3.0	$T_A = \text{Worst Case}$	-	0.5	0.5	V		
				4.5	-	0.9		0.9	
				5.5	-	1.1		1.1	
$V_{H(MAX)}$	Maximum Hysteresis	3.0	$T_A = \text{Worst Case}$	-	1.2	1.2	V		
				4.5	-	1.4		1.4	
				5.5	-	1.6		1.6	
$V_{H(MIN)}$	Minimum Hysteresis	3.0	$T_A = \text{Worst Case}$	-	0.3	0.3	V		
				4.5	-	0.4		0.4	
				5.5	-	0.5		0.5	
$I_{OLD}$	Minimum Dynamic	5.5	$V_{OLD} = 1.65 \text{ V Max.}$	-	-	75	$\text{mA}$		
$I_{OHD}$	Output Current (Note 2)	5.5	$V_{OHD} = 3.85 \text{ V Min.}$	-	-	-75	$\text{mA}$		
$I_{CC}$ (Note 3)	Maximum Quiescent Supply Current	5.5	$V_{IN} = V_{CC} \text{ or } GND$	-	2.0	20.0	$\mu A$		

1. All outputs loaded; thresholds on input associated with output under test.

2. Maximum test duration 2.0 ms, one output loaded at a time.

3.  $I_{IN}$  and  $I_{CC}$  at 3.0 V are guaranteed to be less than or equal to the respective limit at 5.5 V  $V_{CC}$ .

# 74AC14, 74ACT14

## DC ELECTRICAL CHARACTERISTICS FOR ACT

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Unit
				Typ	Guaranteed Limits			
V <sub>IH</sub>	Minimum HIGH Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	1.5	2.0	2.0		V
		5.5		1.5	2.0	2.0		
V <sub>IL</sub>	Maximum LOW Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	1.5	0.8	0.8		V
		5.5		1.5	0.8	0.8		
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	4.5	I <sub>OUT</sub> = -50 μA	4.49	4.34	4.4		V
		5.5		5.49	5.4	5.4		
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24 mA	-	3.86	3.76		
		5.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24 mA (Note 4)	-	4.86	4.76		
V <sub>OL</sub>	Maximum LOW Level Output Voltage	4.5	I <sub>OUT</sub> = 50 μA	0.001	0.1	0.1		V
		5.5		0.001	0.1	0.1		
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA	-	0.36	0.44		
		5.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24 mA (Note 4)	-	0.36	0.44		
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND	-	±0.1	±1.0		μA
V <sub>H(MAX)</sub>	Maximum Hysteresis	4.5	T <sub>A</sub> = Worst Case	-	1.4	1.4		V
		5.5		-	1.6	1.6		
V <sub>H(MIN)</sub>	Minimum Hysteresis	4.5	T <sub>A</sub> = Worst Case	-	0.4	0.4		V
		5.5		-	0.5	0.5		
V <sub>t+</sub>	Maximum Positive Threshold	4.5	T <sub>A</sub> = Worst Case	-	2.0	2.0		V
		5.5		-	2.0	2.0		
V <sub>t-</sub>	Minimum Negative Threshold	4.5	T <sub>A</sub> = Worst Case	-	0.8	0.8		V
		5.5		-	0.8	0.8		
I <sub>CCT</sub>	Maximum I <sub>CC</sub> /Input	5.5	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V	0.6	-	1.5		mA
I <sub>OLD</sub>	Minimum Dynamic Output Current (Note 5)	5.5	V <sub>OLD</sub> = 1.65 V Max.	-	-	75		mA
I <sub>OHD</sub>		5.5	V <sub>OHD</sub> = 3.85 V Min.	-	-	-75		mA
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND	-	2.0	20.0		μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. All outputs loaded; thresholds on input associated with output under test.
5. Maximum test duration 2.0 ms, one output loaded at a time.

# 74AC14, 74ACT14

## AC ELECTRICAL CHARACTERISTICS FOR AC

Symbol	Parameter	V <sub>CC</sub> (V) (Note 6)	T <sub>A</sub> = +25°C, C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C, C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
t <sub>PLH</sub>	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 <sub>PHL</sub>	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	

6. Voltage range 3.3 is 3.3 V + 0.3 V. Voltage range 5.0 is 5.0 V + 0.5 V.

## AC ELECTRICAL CHARACTERISTICS FOR ACT

Symbol	Parameter	V <sub>CC</sub> (V) (Note 7)	T <sub>A</sub> = +25°C, C <sub>L</sub> = 50 pF			T <sub>A</sub> = -40°C to +85°C, C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns
t <sub>PLH</sub>	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns

7. Voltage range 5.0 is 5.0 V + 0.5 V.

## CAPACITANCE

Symbol	Parameter	Conditions	Typ	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = OPEN	4.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance AC ACT	V <sub>CC</sub> = 5.0 V	25.0 80	pF

## ORDERING INFORMATION

Order Number	Marking	Package	Shipping <sup>†</sup>
74AC14SC	AC14	SOIC-14	55 Units / Rail
74AC14SCX	AC14	SOIC-14	2500 / Tape & Reel
74AC14MTCX	AC 14	TSSOP-14	2500 / Tape & Reel
74ACT14MTC	ACT 14	TSSOP-14	96 Units / Rail
74ACT14MTCX	ACT 14	TSSOP-14	2500 / Tape & Reel
74ACT14SCX	ACT14	SOIC-14	2500 / Tape & Reel

<sup>†</sup>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.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-14 NB  
CASE 751A-03  
ISSUE L

DATE 03 FEB 2016



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM\*



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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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**SOIC-14**  
**CASE 751A-03**  
**ISSUE L**

DATE 03 FEB 2016

STYLE 1:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. NO CONNECTION  
 5. ANODE/CATHODE  
 6. NO CONNECTION  
 7. ANODE/CATHODE  
 8. ANODE/CATHODE  
 9. ANODE/CATHODE  
 10. NO CONNECTION  
 11. ANODE/CATHODE  
 12. ANODE/CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 2:  
 CANCELLED

STYLE 3:  
 PIN 1. NO CONNECTION  
 2. ANODE  
 3. ANODE  
 4. NO CONNECTION  
 5. ANODE  
 6. NO CONNECTION  
 7. ANODE  
 8. ANODE  
 9. ANODE  
 10. NO CONNECTION  
 11. ANODE  
 12. ANODE  
 13. NO CONNECTION  
 14. COMMON CATHODE

STYLE 4:  
 PIN 1. NO CONNECTION  
 2. CATHODE  
 3. CATHODE  
 4. NO CONNECTION  
 5. CATHODE  
 6. NO CONNECTION  
 7. CATHODE  
 8. CATHODE  
 9. CATHODE  
 10. NO CONNECTION  
 11. CATHODE  
 12. CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 5:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. ANODE/CATHODE  
 5. ANODE/CATHODE  
 6. NO CONNECTION  
 7. COMMON ANODE  
 8. COMMON CATHODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. ANODE/CATHODE  
 12. ANODE/CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 6:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. CATHODE  
 4. CATHODE  
 5. CATHODE  
 6. CATHODE  
 7. CATHODE  
 8. ANODE  
 9. ANODE  
 10. ANODE  
 11. ANODE  
 12. ANODE  
 13. ANODE  
 14. ANODE

STYLE 7:  
 PIN 1. ANODE/CATHODE  
 2. COMMON ANODE  
 3. COMMON CATHODE  
 4. ANODE/CATHODE  
 5. ANODE/CATHODE  
 6. ANODE/CATHODE  
 7. ANODE/CATHODE  
 8. ANODE/CATHODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. COMMON CATHODE  
 12. COMMON ANODE  
 13. ANODE/CATHODE  
 14. ANODE/CATHODE

STYLE 8:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. NO CONNECTION  
 5. ANODE/CATHODE  
 6. ANODE/CATHODE  
 7. COMMON ANODE  
 8. COMMON ANODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. NO CONNECTION  
 12. ANODE/CATHODE  
 13. ANODE/CATHODE  
 14. COMMON CATHODE

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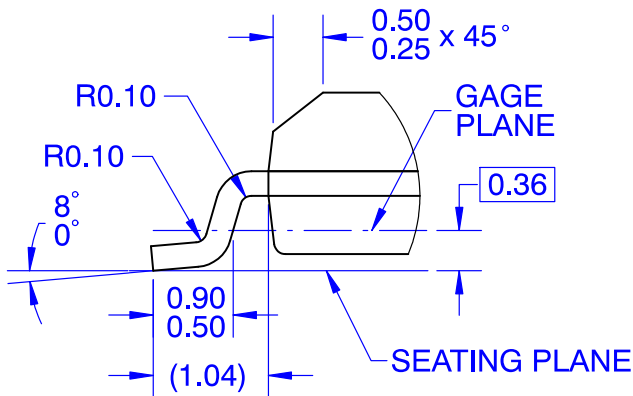
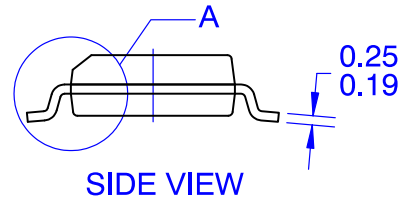
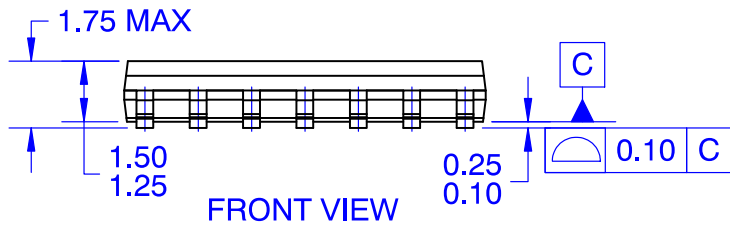
**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



**SOIC14**  
**CASE 751EF**  
**ISSUE O**

DATE 30 SEP 2016



**DETAIL A**  
**SCALE 16 : 1**

**NOTES:**

- A. CONFORMS TO JEDEC MS-012, VARIATION AB, ISSUE C
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS
- D. LAND PATTERN STANDARD: SOIC127P600X145-14M
- E. CONFORMS TO ASME Y14.5M, 2009

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



**TSSOP-14 WB**  
CASE 948G  
ISSUE C

DATE 17 FEB 2016

SCALE 2:1



**NOTES:**

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
- DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
- DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

**GENERIC MARKING DIAGRAM\***



- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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