

## 54AC14 Hex Inverter with Schmitt Trigger Input

### General Description

The 'AC14 contains six inverter gates each with a Schmitt trigger input. The 'AC14 contains six logic inverters which accept standard CMOS input signals and provide standard CMOS output levels. 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.

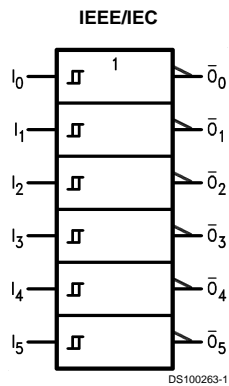
The 'AC14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is de-

termined 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
- Standard Military Drawing (SMD)  
— 'AC14: 5962-87624

### Logic Symbol

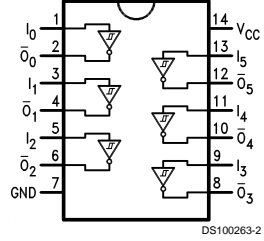


### Function Table

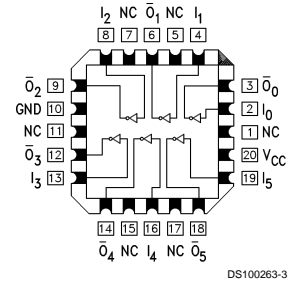
Input	Output
A	$\bar{O}$
L	H
H	L

## Connection Diagrams

**Pin Assignment for  
DIP and Flatpack**



**Pin Assignment for LCC**



Pin Names	Description
$I_n$	Inputs
$\bar{O}_n$	Outputs

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

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 ( $T_J$ )	
CDIP	175°C

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ )	'AC	2.0V to 6.0V
Input Voltage ( $V_I$ )		0V to $V_{CC}$
Output Voltage ( $V_O$ )		0V to $V_{CC}$
Operating Temperature ( $T_A$ )	54AC	-55°C to +125°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. National does not recommend operation of FACT™ circuits outside databook specifications.

## DC Characteristics for 'AC Family Devices

Symbol	Parameter	$V_{CC}$ (V)	54AC	Units	Conditions		
			$T_A = -55^\circ\text{C to } +125^\circ\text{C}$				
			Guaranteed Limits				
$V_{OH}$	Minimum High Level Output Voltage	3.0	2.9	V	$I_{OUT} = -50 \mu\text{A}$		
		4.5	4.4				
		5.5	5.4				
				3.0	2.4	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ -12 mA $I_{OH} -24 \text{ mA}$ -24 mA
				4.5	3.7		
				5.5	4.7		
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.1	V	$I_{OUT} = 50 \mu\text{A}$		
		4.5	0.1				
		5.5	0.1				
				3.0	0.5	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ 12 mA $I_{OL} 24 \text{ mA}$ 24 mA
				4.5	0.5		
				5.5	0.5		
$I_{IN}$	Maximum Input Leakage Current	5.5	±1.0	μA	$V_I = V_{CC}, \text{GND}$		
$V_{t+}$	Maximum Positive Threshold	3.0	2.2	V	$T_A = \text{Worst Case}$		
		4.5	3.2				
		5.5	3.9				
$V_{t-}$	Minimum Negative Threshold	3.0	0.5	V	$T_A = \text{Worst Case}$		
		4.5	0.9				
		5.5	1.1				
$V_{h(max)}$	Maximum Hysteresis	3.0	1.2	V	$T_A = \text{Worst Case}$		
		4.5	1.4				
		5.5	1.6				
$V_{h(min)}$	Minimum Hysteresis	3.0	0.3	V	$T_A = \text{Worst Case}$		
		4.5	0.4				
		5.5	0.5				

## DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	54AC		Units	Conditions
			T <sub>A</sub> = -55°C to +125°C			
			Guaranteed Limits			
I <sub>OLD</sub>	(Note 3) Minimum Dynamic Output Current	5.5	50		mA	V <sub>OLD</sub> = 1.65V Max
I <sub>OHD</sub>		5.5	-50		mA	V <sub>OHD</sub> = 3.85V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	40.0		μA	V <sub>IN</sub> = V <sub>CC</sub> 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<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

I<sub>CC</sub> for 54AC @ 25°C is identical to 74AC @ 25°C.

## AC Electrical Characteristics

Symbol	Parameter	V <sub>CC</sub> (V) (Note 5)	54AC		Units	Fig. No.
			T <sub>A</sub> = -55°C to +125°C			
			C <sub>L</sub> = 50 pF			
			Min	Max		
t <sub>PLH</sub>	Propagation Delay	3.3	1.0	16.0	ns	
		5.0	1.0	12.0		
t <sub>PHL</sub>	Propagation Delay	3.3	1.0	14.0	ns	
		5.0	1.5	10.0		

**Note 5:** Voltage Range 3.3 is 3.3V ±0.3V

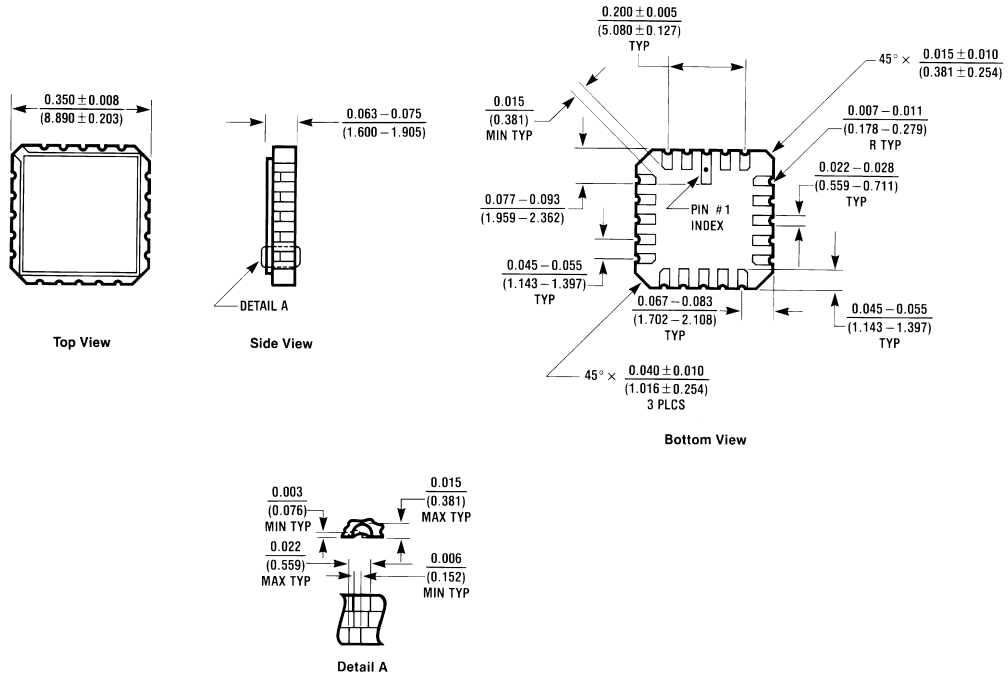
Voltage Range 5.0 is 5.0V ±0.5V

## Capacitance

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



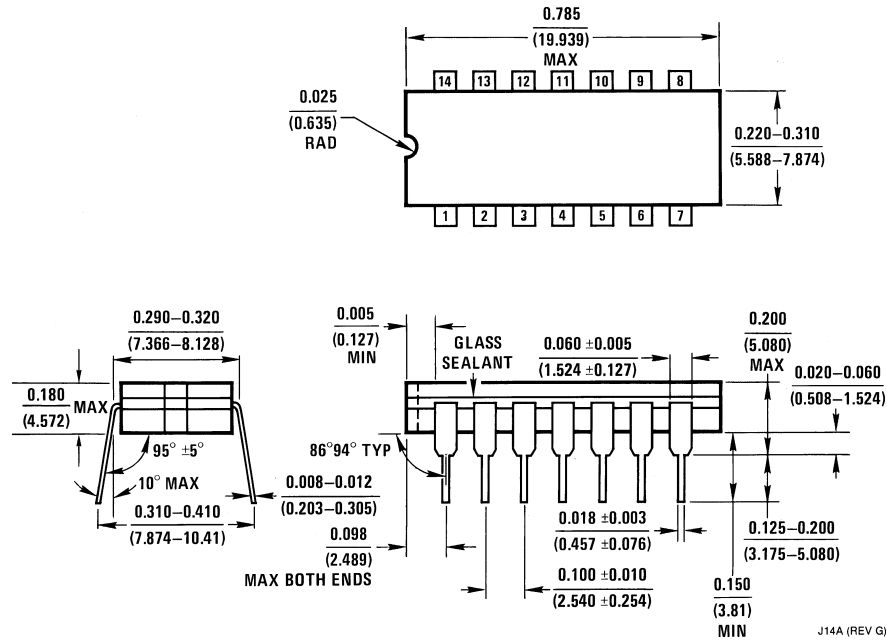
**Physical Dimensions** inches (millimeters) unless otherwise noted



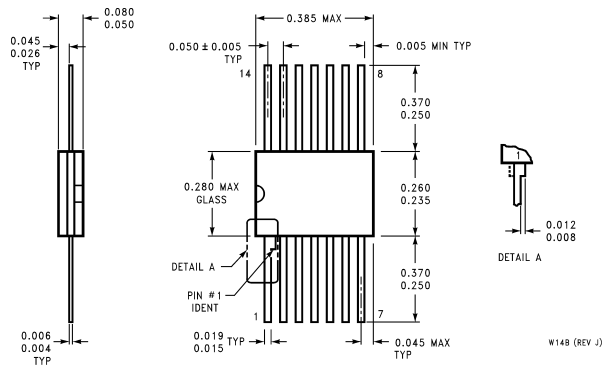
E20A (REV D)

**20 Terminal Ceramic Leadless Chip Carrier (L)**  
**NS Package Number E20A**

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



**14-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J14A



**14-Lead Ceramic Flatpak (F)**  
NS Package Number W14B

**LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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.



**National Semiconductor Corporation**  
Americas  
Tel: 1-800-272-9959  
Fax: 1-800-737-7018  
Email: support@nsc.com

[www.national.com](http://www.national.com)

**National Semiconductor Europe**  
Fax: +49 (0) 1 80-530 85 86  
Email: europe.support@nsc.com  
Deutsch Tel: +49 (0) 1 80-530 85 85  
English Tel: +49 (0) 1 80-532 78 32  
Français Tel: +49 (0) 1 80-532 93 58  
Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
Tel: 65-2544466  
Fax: 65-2504466  
Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
Tel: 81-3-5620-6175  
Fax: 81-3-5620-6179