

# 54AC04 Hex Inverter

## General Description

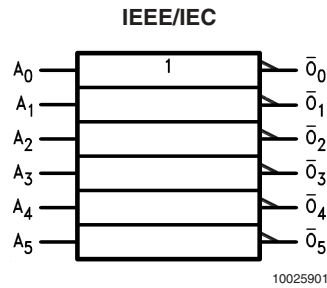
The AC04 contains six inverters.

## Features

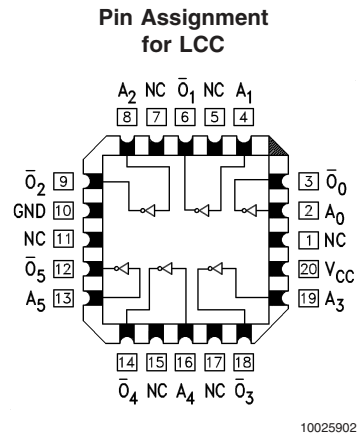
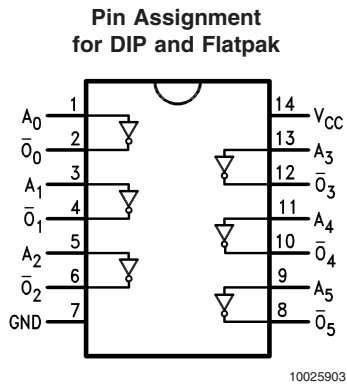
- $I_{CC}$  reduced by 50% on 54AC only
- Outputs source/sink 24 mA
- 'ACT04 has TTL-compatible inputs

- Standard Military Drawing (SMD)  
— 'AC04: 5962-87609
- 54AC04 now qualified to 300Krad RHA designation, refer to the SMD for more information
- For Military 54ACT04 device see 54ACTQ04

## Logic Symbol



## Connection Diagrams



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

**Absolute Maximum Ratings** (Note 1)

CDIP

175°C

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 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 ( $T_J$ )	

**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
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
'AC Devices	
$V_{IN}$ from 30% to 70% of $V_{CC}$	
$V_{CC}$ @ 3.3V, 4.5V, 5.5V	125 mV/ns

**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		
$V_{IH}$	Minimum High Level Input Voltage	3.0	2.1	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	3.15		
		5.5	3.85		
$V_{IL}$	Maximum Low Level Input Voltage	3.0	0.9	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	1.35		
		5.5	1.65		
$V_{OH}$	Minimum High Level Output Voltage	3.0	2.9	V	$I_{OUT} = -50 \mu A$
		4.5	4.4		
		5.5	5.4		
		3.0	2.4	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ -12 mA $I_{OH} -24$ mA -24 mA
		4.5	3.7		
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.1	V	$I_{OUT} = 50 \mu A$
		4.5	0.1		
		5.5	0.1		
		3.0	0.5	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ 12 mA $I_{OL} 24$ mA 24 mA
		4.5	0.5		
$I_{IN}$	Maximum Input Leakage Current	5.5	±1.0	$\mu A$	$V_I = V_{CC}, GND$
$I_{OLD}$	(Note 3) Minimum Dynamic	5.5	50	mA	$V_{OLD} = 1.65V$ Max
$I_{OHD}$	Output Current	5.5	-50	mA	$V_{OHD} = 3.85V$ Min
$I_{CC}$	Maximum Quiescent Supply Current	5.5	40.0	$\mu A$	$V_{IN} = V_{CC}$ or GND

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

**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  $V_{CC}$ .

$I_{CC}$  for 54AC @ 25°C is identical to 74AC @ 25°C.

## AC Electrical Characteristics

Symbol	Parameter	$V_{CC}$ (V) (Note 5)	54AC		Units	Fig. No.
			$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ $C_L = 50\text{ pF}$			
			Min	Max		
$t_{PLH}$	Propagation Delay	3.3	1.0	11.0	ns	
			5.0	8.5		
$t_{PHL}$	Propagation Delay	3.3	1.0	10.0	ns	
			5.0	7.5		

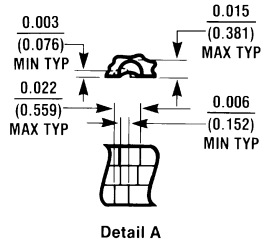
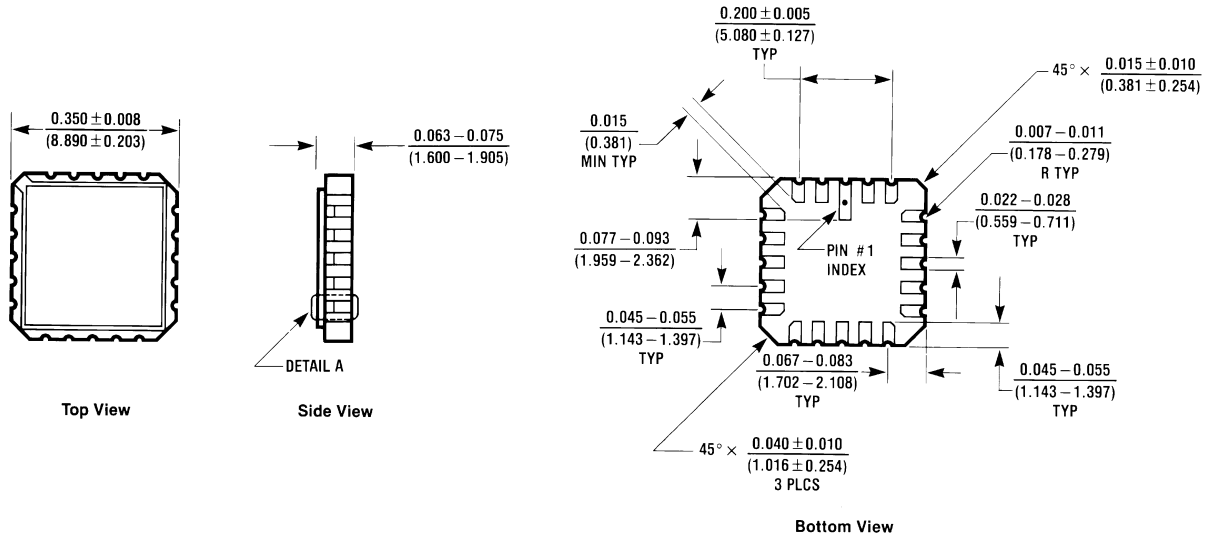
**Note 5:** Voltage Range 3.3 is 3.3V  $\pm 0.3V$

Voltage Range 5.0 is 5.0V  $\pm 0.5V$

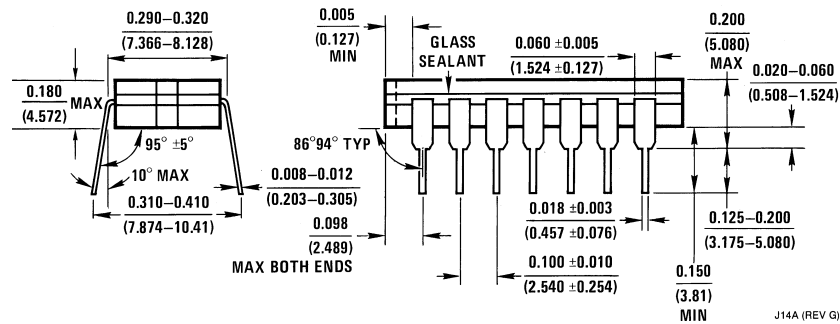
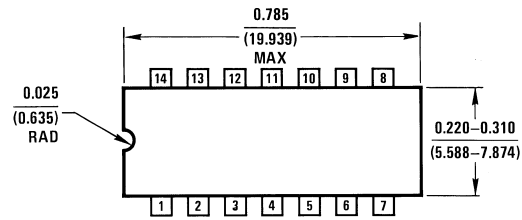
## Capacitance

Symbol	Parameter	Typ	Units	Conditions
$C_{IN}$	Input Capacitance	4.5	pF	$V_{CC} = \text{Open}$
$C_{PD}$	Power Dissipation Capacitance	30.0	pF	$V_{CC} = 5.0V$

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



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

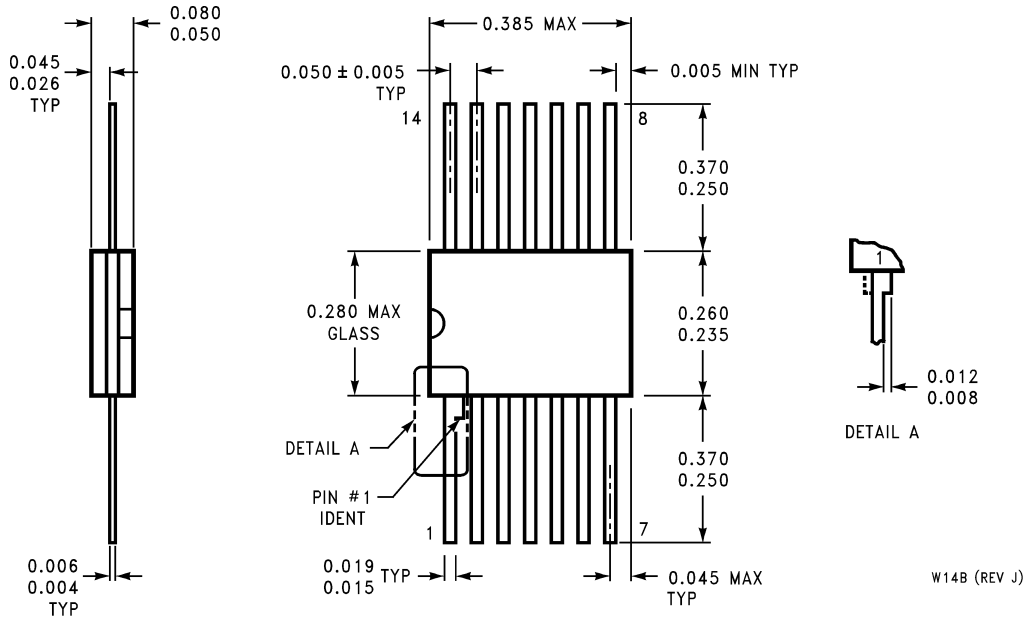


**14 Lead Ceramic Dual-In-Line Package (D)  
 NS Package Number J14A**

E20A (REV D)

J14A (REV G)

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



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

W14B (REV J)

**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 AND GENERAL COUNSEL 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 is 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**  
Americas Customer  
Support Center  
Email: new.feedback@nsc.com  
Tel: 1-800-272-9959

**National Semiconductor**  
Europe Customer Support Center  
Fax: +49 (0) 180-530 85 86  
Email: europe.support@nsc.com  
Deutsch Tel: +49 (0) 69 9508 6208  
English Tel: +44 (0) 870 24 0 2171  
Français Tel: +33 (0) 1 41 91 8790

**National Semiconductor**  
Asia Pacific Customer  
Support Center  
Email: ap.support@nsc.com

**National Semiconductor**  
Japan Customer Support Center  
Fax: 81-3-5639-7507  
Email: jpn.feedback@nsc.com  
Tel: 81-3-5639-7560

www.national.com