

## 54AC04 Hex Inverter

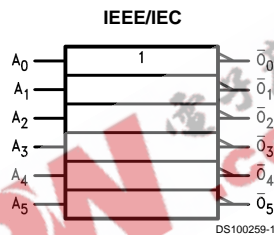
### General Description

The AC04 contains six inverters.

### Features

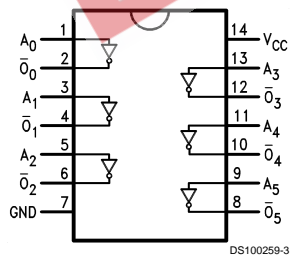
- $I_{CC}$  reduced by 50% on 54AC only
- Outputs source/sink 24 mA
- 'ACT04 has TTL-compatible inputs
- Standard Military Drawing (SMD)
  - 'AC04: 5962-87609
- For Military 54ACT04 device see 54ACTQ04

### Logic Symbol

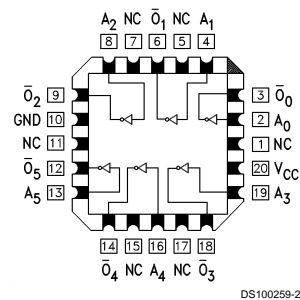


### Connection Diagrams

Pin Assignment  
for DIP and Flatpak



Pin Assignment  
for LCC



Pin Names	Description
$A_n$	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 to $V_{CC} + 0.5V$
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 ( $T_{STG}$ )	-65°C to +150°C
Junction Temperature ( $T_J$ )	
CDIP	175°C

## Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ )		2.0V to 6.0V
'AC		
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	$V_{OUT} = 0.1V$ 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	$V_{OUT} = 0.1V$ 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	V	$I_{OUT} = -50 \mu A$
		4.5	4.4			
		5.5	5.4			
		3.0	2.4	V	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ -12 mA $I_{OH} -24$ mA -24 mA
		4.5	3.7			
	5.5	4.7				
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.1	V	V	$I_{OUT} = 50 \mu A$
		4.5	0.1			
		5.5	0.1			
		3.0	0.5	V	V	(Note 2) $V_{IN} = V_{IL}$ or $V_{IH}$ 12 mA $I_{OL} 24$ mA 24 mA
		4.5	0.5			
	5.5	0.5				
$I_{IN}$	Maximum Input Leakage Current	5.5	$\pm 1.0$	$\mu A$		$V_I = V_{CC}, GND$
$I_{OLD}$	(Note 3) Minimum Dynamic Output Current	5.5	50	mA		$V_{OLD} = 1.65V$ Max
$I_{OHD}$		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

**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.

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

**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	1.5	8.5		
$t_{PHL}$	Propagation Delay	3.3	1.0	10.0	ns	
		5.0	1.5	7.5		

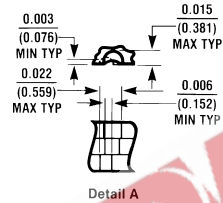
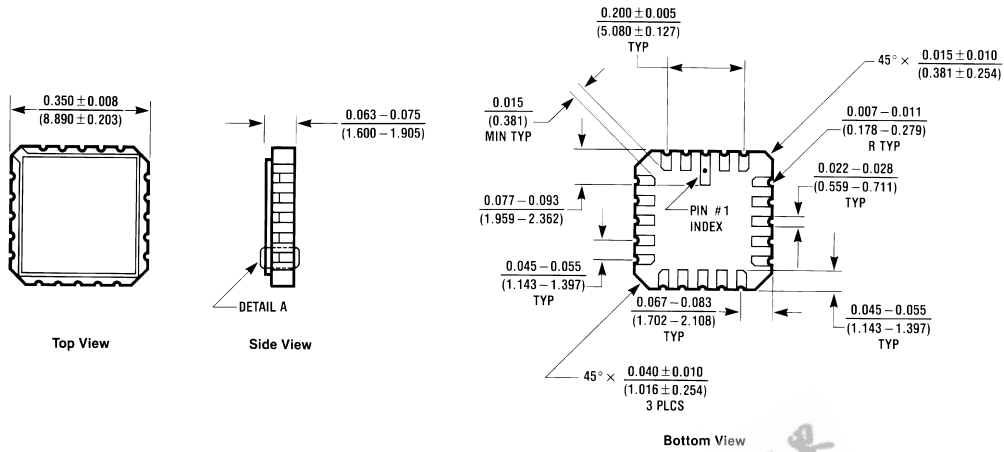
**Note 5:** Voltage Range 3.3 is 3.3V  $\pm 0.3V$   
Voltage Range 5.0 is 5.0V  $\pm 0.5V$

## 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	$V_{CC} = 5.0V$

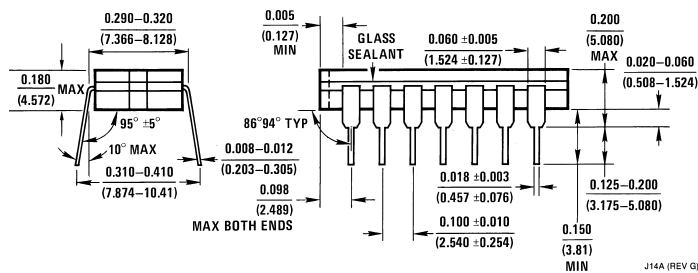
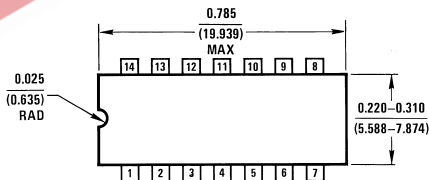
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**Physical Dimensions** inches (millimeters) unless otherwise noted



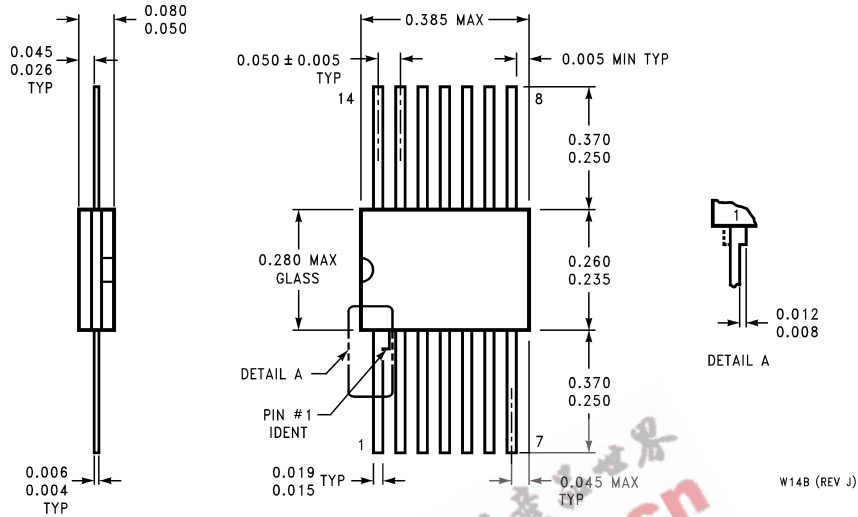
**20 Terminal Ceramic Leadless Chip Carrier (L)**  
 NS Package Number E20A

E20A (REV. D)



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

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



14 Lead Ceramic Flatpak (F)  
NS Package Number W14B

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