National Semiconductor

July 2003

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.

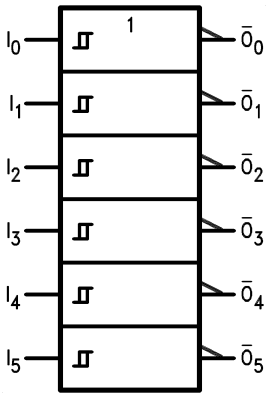
The ’AC14 has hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Features

- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
  — 54AC14: 5962-87624
- 54AC14 now qualified to 300Krad RHA designation, refer to the SMD for more information

Logic Symbol

IEEE/IEC



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Function Table

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

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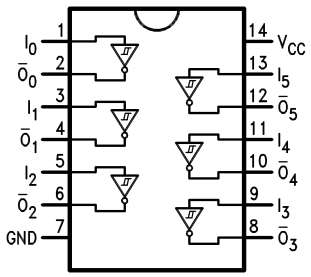
Connection Diagrams

Pin Assignment for DIP and Flatpack



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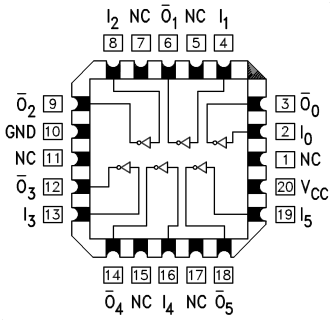
Pin Assignment for LCC



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

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V_{CC} (V)	54AC T_A = –55˚C to +125˚C Guaranteed Limits	Units	Conditions
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	µA	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.

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

See for waveforms

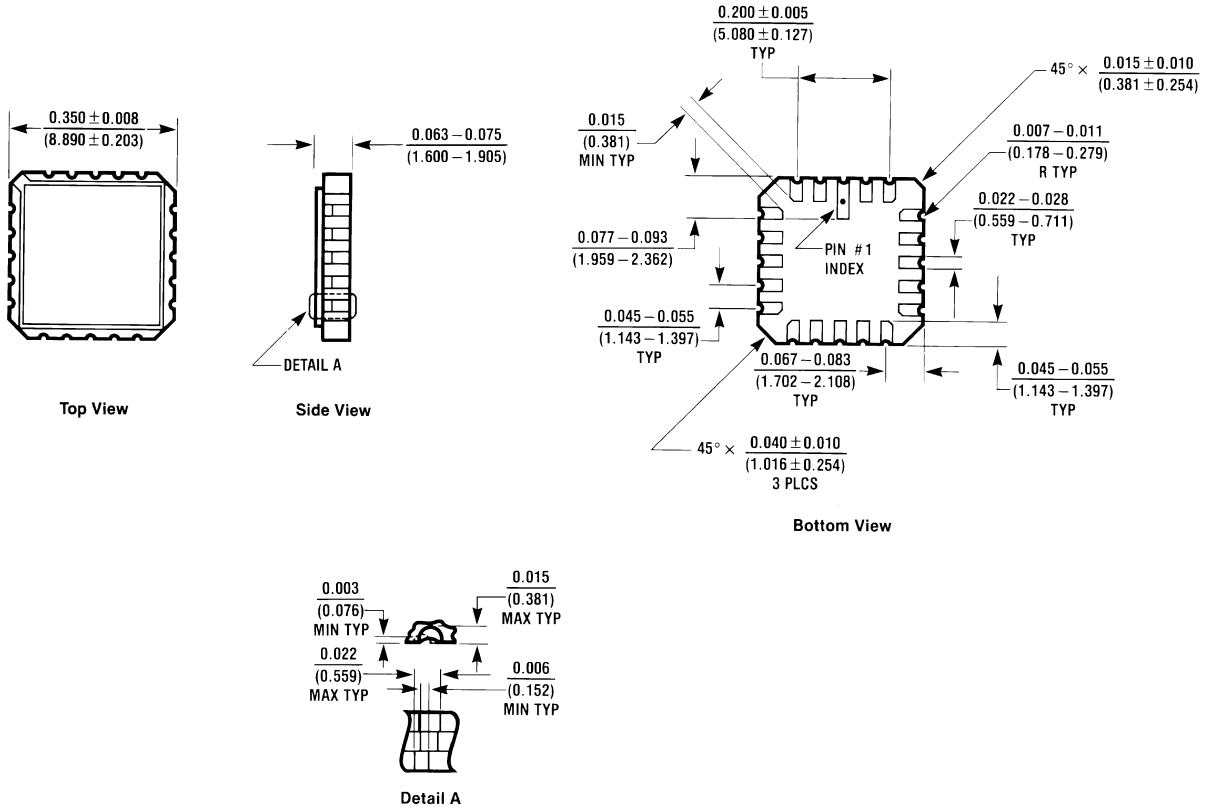
Symbol	Parameter	V_{CC} (V) (Note 5)	54AC T_A = –55˚C to +125˚C C_L = 50 pF Min	54AC T_A = –55˚C to +125˚C C_L = 50 pF Max	Units	Fig. No.
t_{PLH}	Propagation Delay	3.3	1.0	16.0	ns	
		5.0	1.0	12.0		
t_{PHL}	Propagation Delay	3.3	1.0	14.0	ns	
		5.0	1.5	10.0		

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_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	25.0	pF	V_{CC} = 5.0V

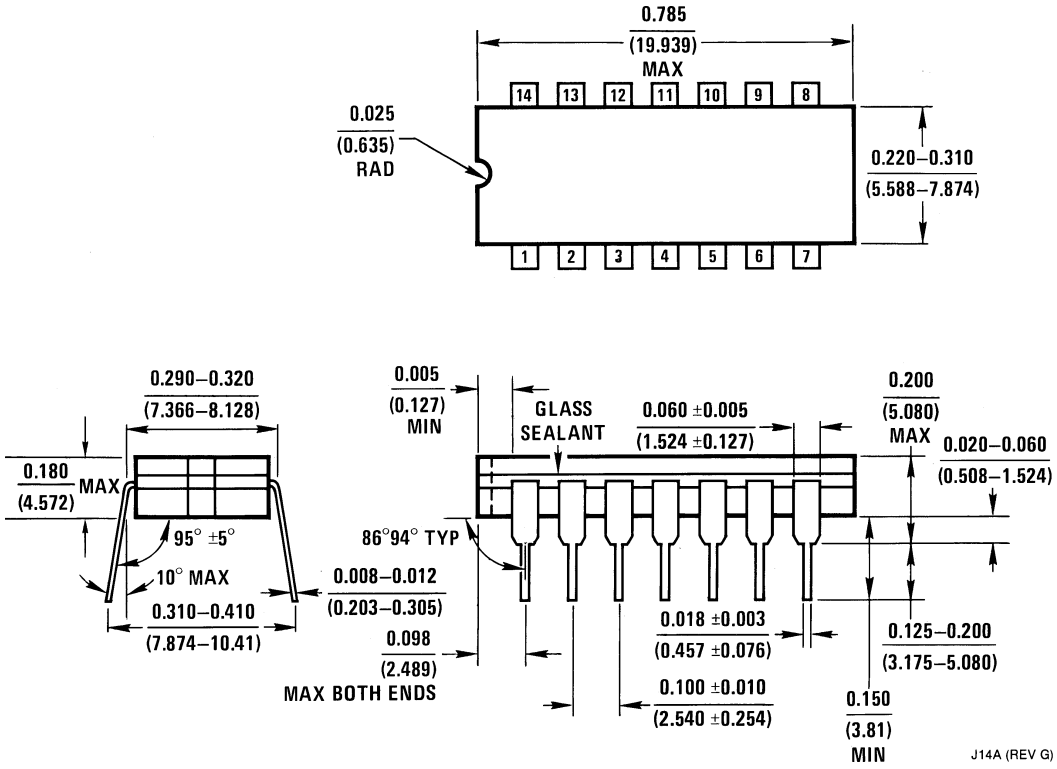
Physical Dimensions inches (millimeters) unless otherwise noted



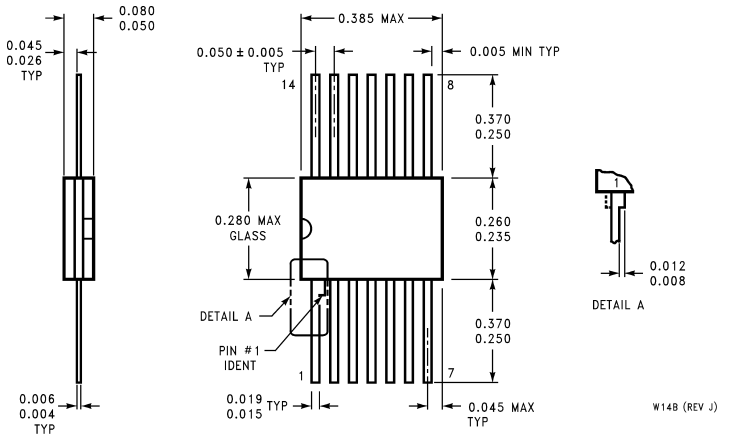
E20A (REV D)

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

Notes

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