

54AC/74AC20 Dual 4-Input NAND Gate

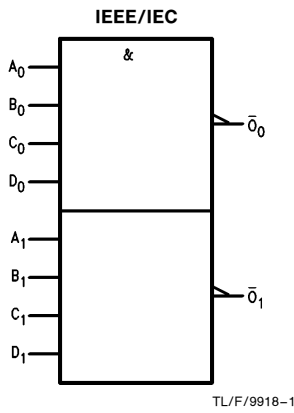
General Description

The 'AC20 contains four 4-input NAND gates.

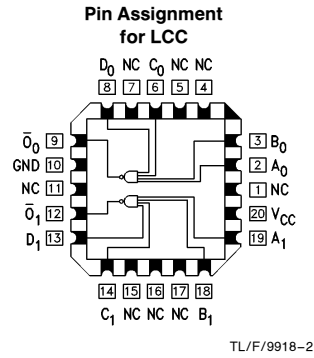
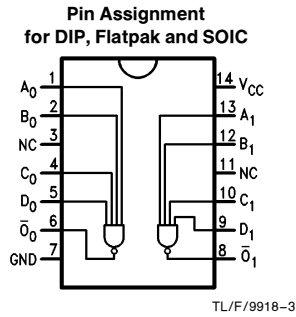
Features

- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
— 'AC20: 5962-87613

Logic Symbol



Connection Diagrams



Pin Names	Description
A_n, B_n, C_n, D_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})	-20 mA
$V_I = -0.5V$	-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})	-20 mA
$V_O = -0.5V$	-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
PDIP	140°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.

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)	
74AC	-40°C to +85°C
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

DC Characteristics for 'AC Family Devices

Symbol	Parameter	V_{CC} (V)	74AC		54AC	74AC		Units	Conditions
			$T_A = +25^\circ\text{C}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			
			Typ	Guaranteed Limits					
V_{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	2.1	2.1	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	2.25	3.15	3.15	3.15	3.15		
		5.5	2.75	3.85	3.85	3.85	3.85		
V_{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	0.9	0.9	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		4.5	2.25	1.35	1.35	1.35	1.35		
		5.5	2.75	1.65	1.65	1.65	1.65		
V_{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	2.9	2.9	V	$I_{OUT} = -50 \mu\text{A}$
		4.5	4.49	4.4	4.4	4.4	4.4		
		5.5	5.49	5.4	5.4	5.4	5.4		
		3.0		2.56	2.4	2.46	2.46	V	* $V_{IN} = V_{IL}$ or V_{IH} -12 mA $I_{OH} = -24$ mA -24 mA
		4.5		3.86	3.7	3.76	3.76		
5.5		4.86	4.7	4.76	4.76				
V_{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	0.1	0.1	V	$I_{OUT} = 50 \mu\text{A}$
		4.5	0.001	0.1	0.1	0.1	0.1		
		5.5	0.001	0.1	0.1	0.1	0.1		
		3.0		0.36	0.5	0.44	0.44	V	* $V_{IN} = V_{IL}$ or V_{IH} 12 mA $I_{OL} = 24$ mA 24 mA
		4.5		0.36	0.5	0.44	0.44		
5.5		0.36	0.5	0.44	0.44				
I_{IN}	Maximum Input Leakage Current	5.5		± 0.1	± 1.0	± 1.0	μA	$V_I = V_{CC}, \text{GND}$	

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

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	74AC		54AC	74AC		Units	Conditions
			T _A = +25°C		T _A = -55°C to +125°C	T _A = -40°C to +85°C			
			Typ	Guaranteed Limits					
I _{OLD}	†Minimum Dynamic Output Current	5.5			50		75	mA	V _{OLD} = 1.65V Max
I _{OHD}		5.5			-50		-75	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		2.0	40.0		20.0	μA	V _{IN} = V _{CC} or GND

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

Note :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)	74AC			54AC		74AC		Units
			T _A = +25°C C _L = 50 pF			T _A = -55°C to +125°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF		
			Min	Typ	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay	3.3	2.0	6.0	8.5	1.0	11.0	1.5	10.0	ns
		5.0	1.5	5.0	7.0	1.0	8.5	1.0	8.0	
t _{PHL}	Propagation Delay	3.3	1.5	5.0	7.0	1.0	10.5	1.0	9.0	ns
		5.0	1.5	4.0	6.0	1.0	7.0	1.0	7.0	

*Voltage Range 3.3 is 3.3V ±0.3V

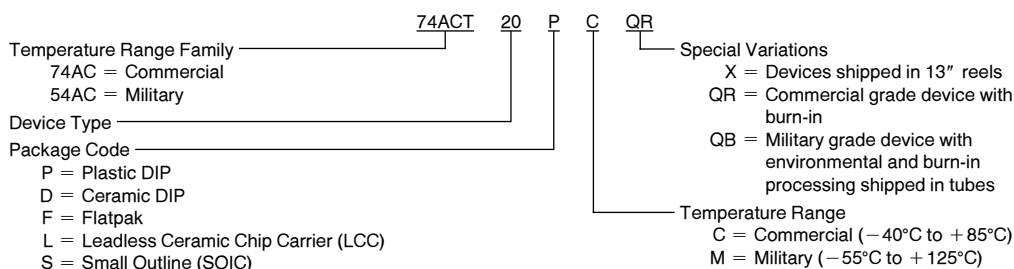
Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

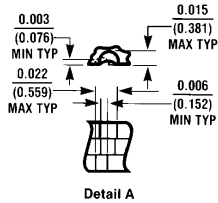
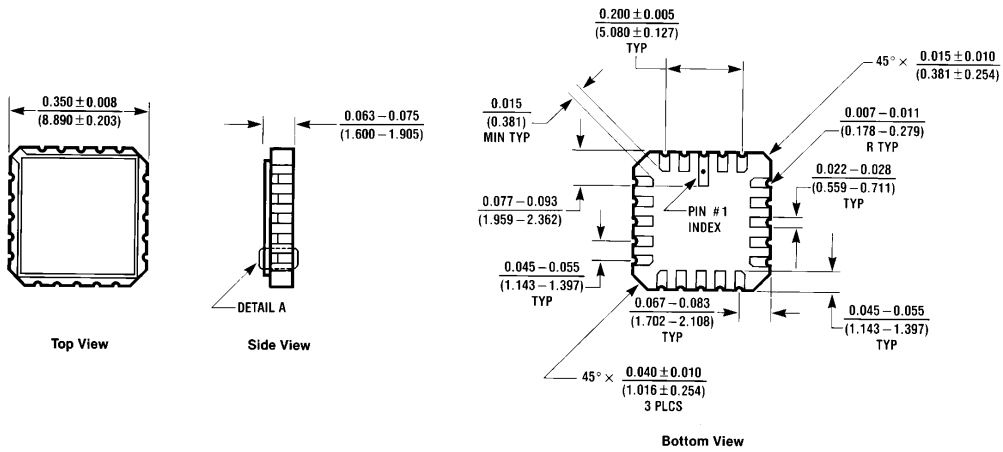
Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	40.0	pF	V _{CC} = 5.0V

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

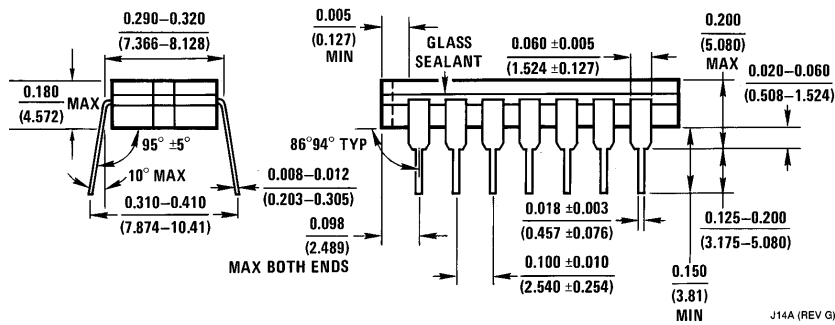
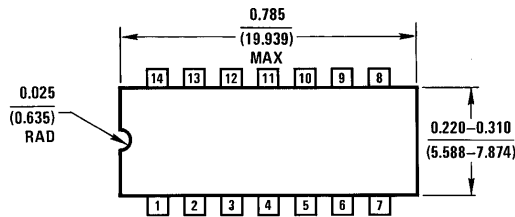


Physical Dimensions inches (millimeters)



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

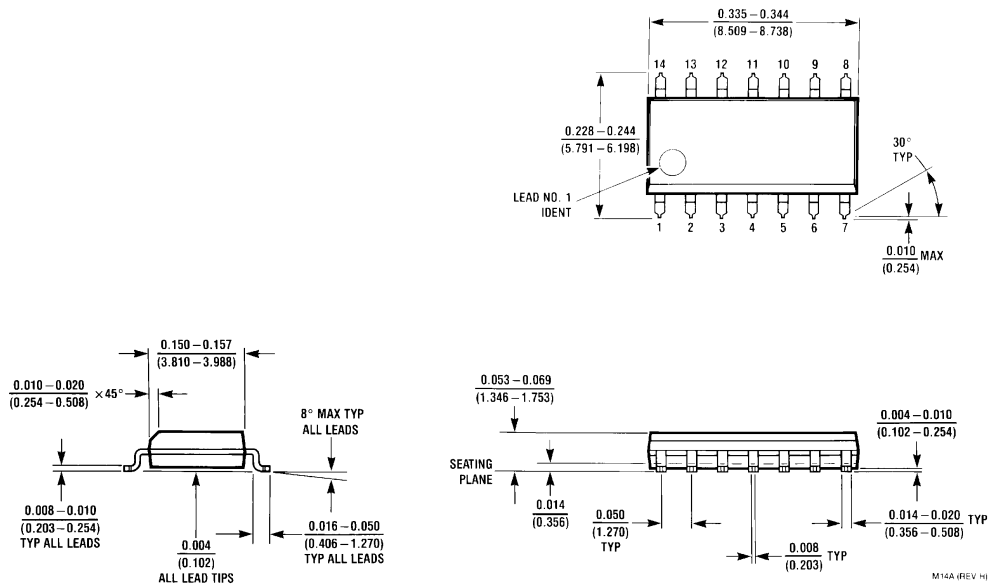
E20A (REV D)



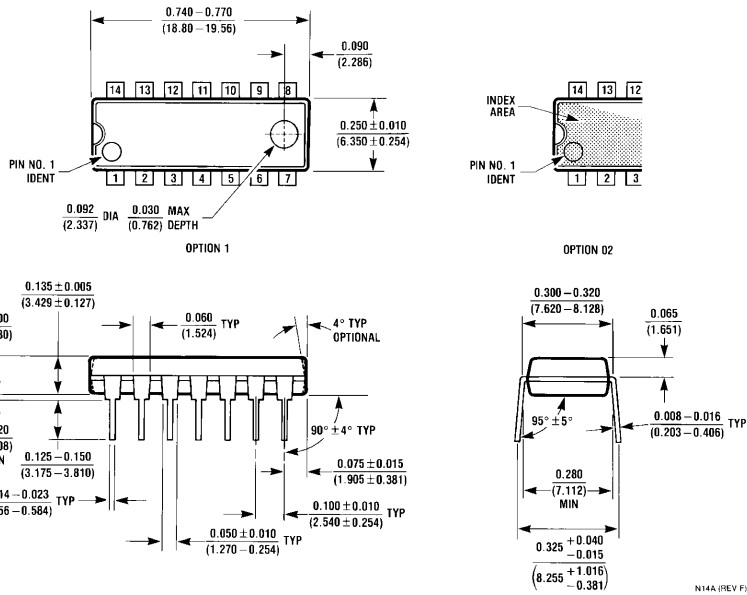
**14 Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J14A**

J14A (REV G)

Physical Dimensions inches (millimeters) (Continued)

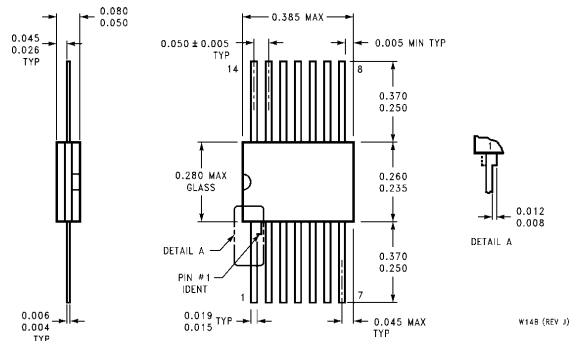


**14 Lead Small Outline Integrated Circuit (S)
NS Package Number M14A**



**14 Lead Plastic Dual-In-Line Package (P)
NS Package Number N14A**

Physical Dimensions inches (millimeters) (Continued)



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

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