

September 1996

54AC/74AC00 • 54ACT/74ACT00

Quad 2-Input NAND Gate

General Description

The 'AC/'ACT00 contains four 2-input NAND gates.

Features

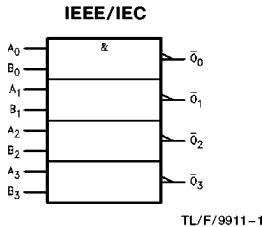
- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- 'ACT00 has TTL-compatible inputs
- Standard Military Drawing (SMD)
 - 'AC00: 5962-87549
 - 'ACT00: 5962-87699

Commercial	Military	Package Number	Package Description
74AC00PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54AC00DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74AC00SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74AC00SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
74AC00MTC (Note 1)		MTC14	14-Lead Molded Thin Shrink Small Outline, JEDEC
	74AC00FM (Note 2)	W14B	14-Lead Cerpak
	74AC00LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C
74ACT00PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54ACT00DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74ACT00SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74ACT00SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
74ACT00MTC (Note 1)		MTC14	14-Lead Molded Thin Shrink Small Outline, JEDEC
	74ACT00FM (Note 2)	W14B	14-Lead Cerpak
	74ACT00LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

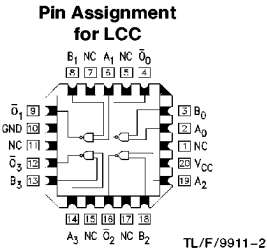
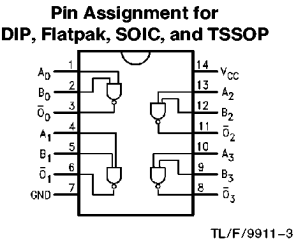
Note 1: Devices also available in 13" reel. Use suffix = SCX, SJX and MTCX.

Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMOB, FMOB and LMOB.

Logic Symbol



Connection Diagrams



Pin Names	Description
A_n, B_n	Inputs
O_n	Outputs

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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
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})	
'AC	2.0V to 6.0V
'ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
74AC/ACT	−40°C to +85°C
54AC/ACT	−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
Minimum Input Edge Rate ($\Delta V/\Delta t$)	
'ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 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°C		T _A = −55°C to +125°C	T _A = −40°C to +85°C		
			Typ	Guaranteed Limits				
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	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		
		5.5	2.75	3.85	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	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		
		5.5	2.75	1.65	1.65	1.65		
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	2.9	V	I _{OUT} = −50 μA
		4.5	4.49	4.4	4.4	4.4		
		5.5	5.49	5.4	5.4	5.4		
		3.0		2.56	2.4	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		
		5.5		4.86	4.7	4.76		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	0.1	V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1	0.1		
		5.5	0.001	0.1	0.1	0.1		
		3.0		0.36	0.5	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		
		5.5		0.36	0.5	0.44		
I _{IN}	Maximum Input Leakage Current	5.5		± 0.1	± 1.0	± 1.0	μA	V _I = V _{CC} , GND

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

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.

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.

DC Characteristics for 'ACT Family Devices

Symbol	Parameter	V _{CC} (V)	74ACT		54ACT		74ACT		Units	Conditions
			T _A = +25°C		T _A = −55°C to +125°C		T _A = −40°C to +85°C			
			Typ	Guaranteed Limits						
V _{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0		2.0 2.0		V	V _{OUT} = 0.1V or V _{CC} − 0.1V
V _{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8		0.8 0.8		V	V _{OUT} = 0.1V or V _{CC} − 0.1V
V _{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4		4.4 5.4		V	I _{OUT} = −50 μA
		4.5 5.5		3.86 4.86	3.70 4.70		3.76 4.76		V	*V _{IN} = V _{IL} or V _{IH} −24 mA −24 mA
V _{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1		0.1 0.1		V	I _{OUT} = 50 μA
		4.5 5.5		0.36 0.36	0.50 0.50		0.44 0.44		V	*V _{IN} = V _{IL} or V _{IH} 24 mA 24 mA
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0		±1.0		μA	V _I = V _{CC} , GND
I _{CC} T	Maximum I _{CC} /Input	5.5	0.6		1.6		1.5		mA	V _I = V _{CC} − 2.1V
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

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

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

Note: I_{CC} for 54ACT @ 25°C is identical to 74ACT @ 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 5.0	2.0 1.5	7.0 6.0	9.5 8.0	1.0 1.5	11.0 8.5	2.0 1.5	10.0 8.5	ns
t _{PHL}	Propagation Delay	3.3 5.0	1.5 1.5	5.5 4.5	8.0 6.5	1.0 1.5	9.0 7.0	1.0 1.0	8.5 7.0	ns

*Voltage Range 3.3 is 3.3V ±0.3V
Voltage Range 5.0 is 5.0V ±0.5V

AC Electrical Characteristics

Symbol	Parameter	V _{CC} * (V)	74ACT			54ACT		74ACT		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	5.0	1.5	5.5	9.0	1.5	9.5	1.0	9.5	ns
t _{PHL}	Propagation Delay	5.0	1.5	4.0	7.0	1.5	8.0	1.0	8.0	ns

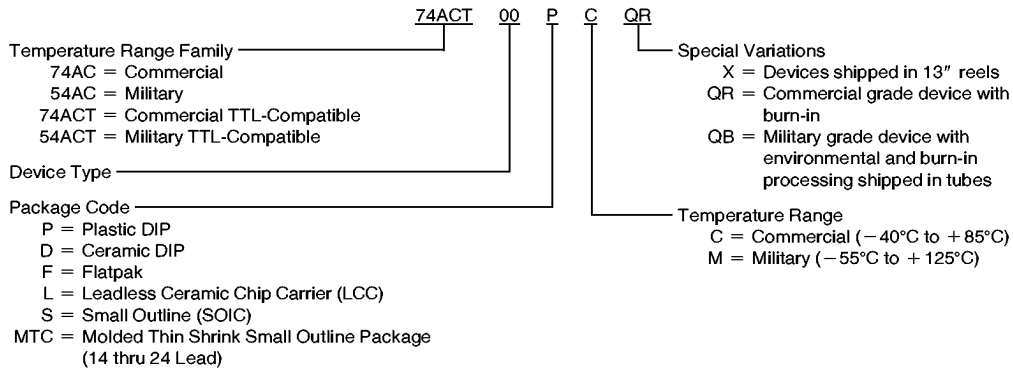
Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

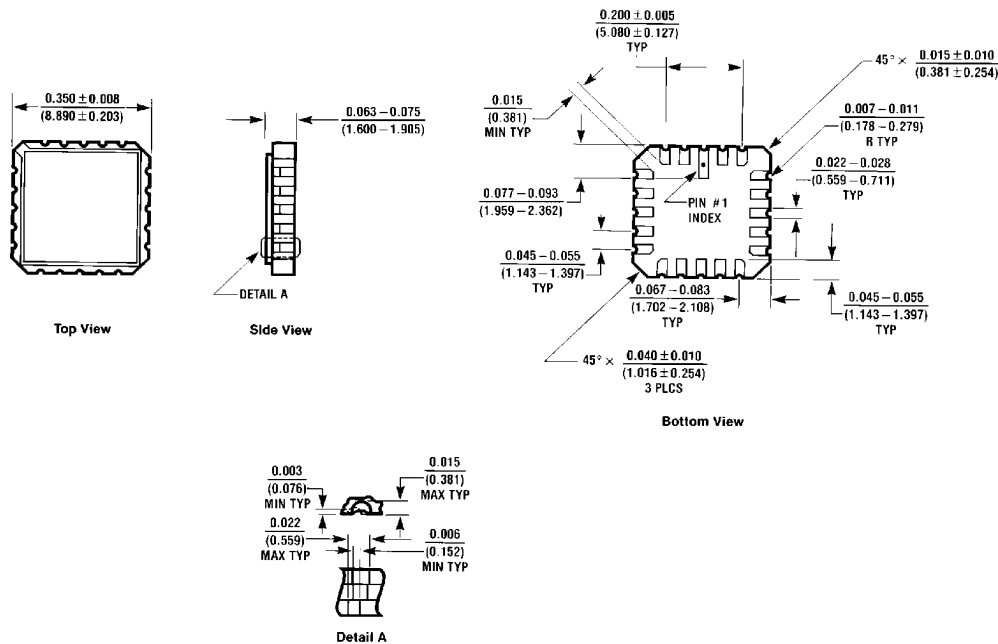
Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = Open
C _{PD}	Power Dissipation Capacitance	30.0	pF	V _{CC} = 5.0V

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:



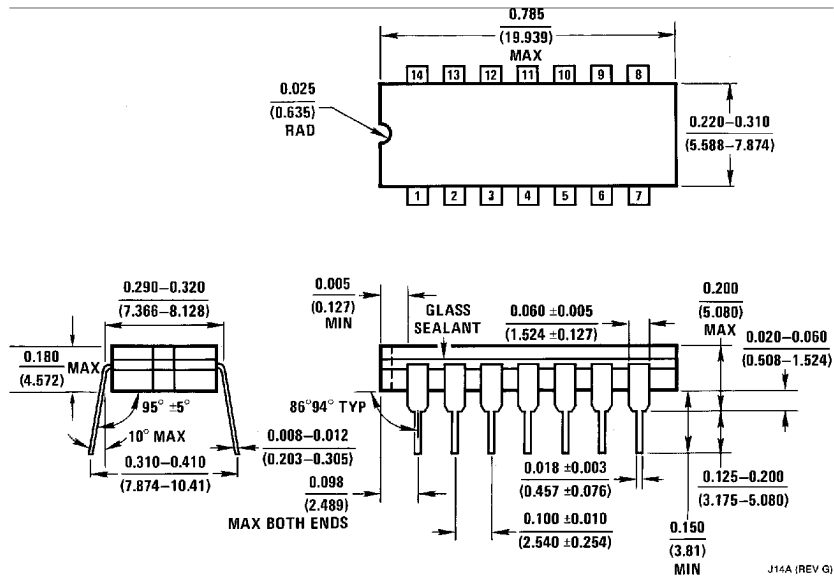
Physical Dimensions inches (millimeters) unless otherwise noted



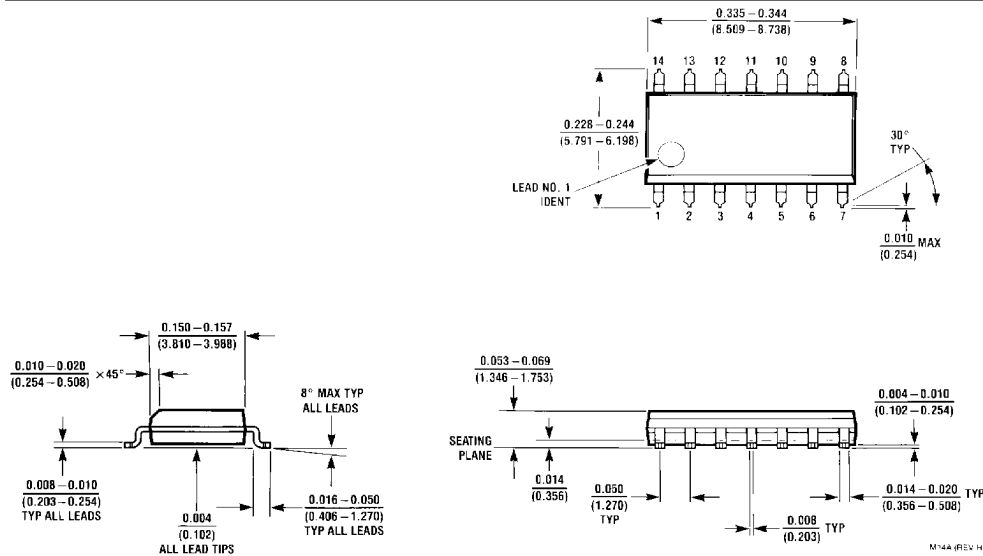
20 Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

E20A (REV D)

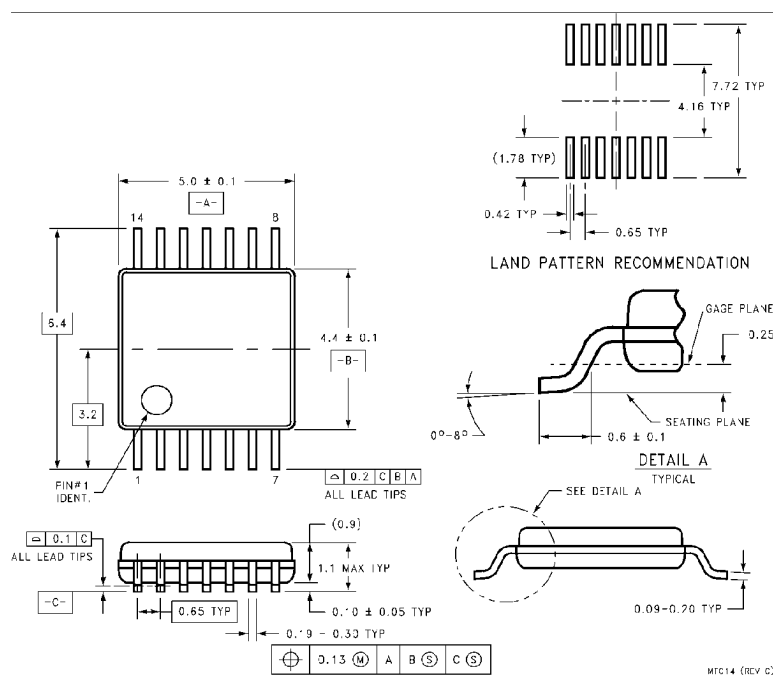
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



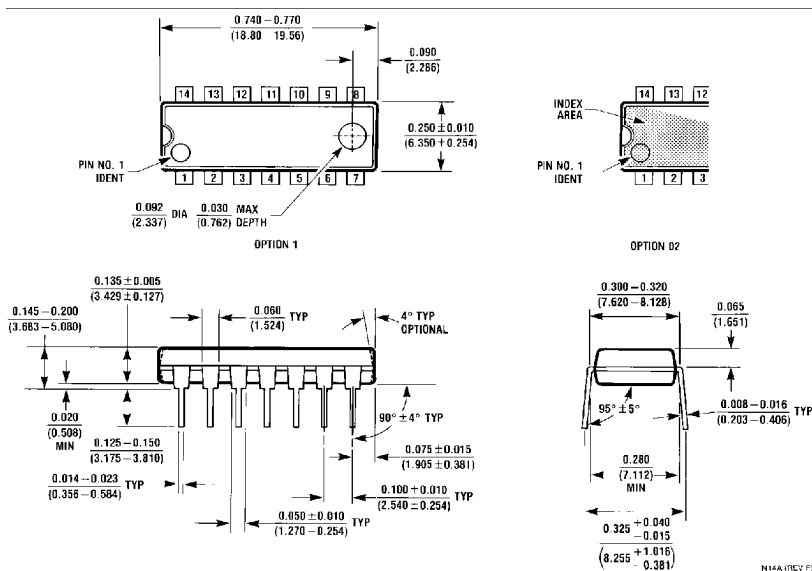
14 Lead Ceramic Dual-In-Line Package (D)
NS Package Number J14A



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

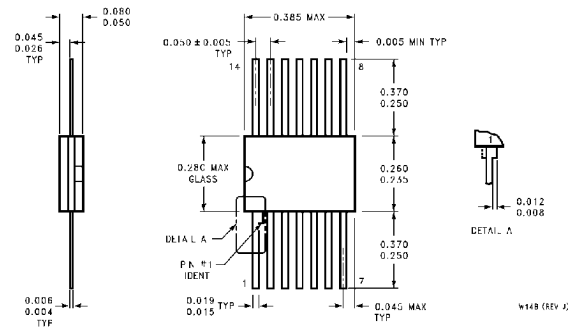
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

**14 Lead Molded Thin Shrink Small Outline Package, JEDEC
NS Package Number MTC14**



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

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



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

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National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

<http://www.national.com>

National Semiconductor Europe

Fax: +49 (0) 180-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 180-530 85 85
English Tel: +49 (0) 180-532 78 32
Français Tel: +49 (0) 180-532 93 58
Italiano Tel: +49 (0) 180-534 16 80

National Semiconductor Hong Kong Ltd.

13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.

Tel: 81-043-299-2308
Fax: 81-043-299-2408

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