



November 1994

# 54F/74F20 Dual 4-Input NAND Gate

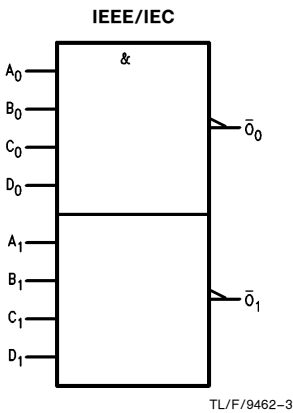
## General Description

This device contains two independent gates, each of which performs the logic NAND function.

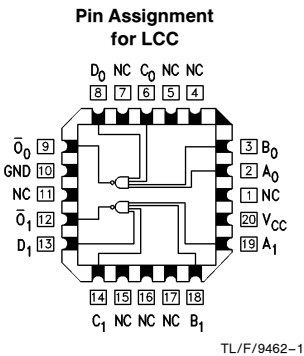
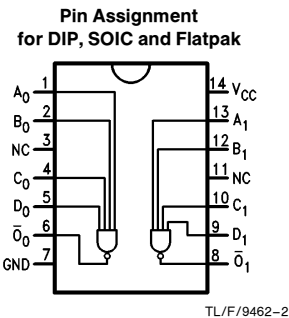
Commercial	Military	Package Number	Package Description
74F20PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54F20DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F20SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F20SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F20FM (Note 2)	W14B	14-Lead Cerpack
	54F20LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.  
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

## Logic Symbol



## Connection Diagrams



## Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I <sub>IH</sub> /I <sub>IL</sub> Output I <sub>OH</sub> /I <sub>OL</sub>
A <sub>n</sub> , B <sub>n</sub> , C <sub>n</sub> , D <sub>n</sub> O <sub>n</sub>	Inputs Outputs	1.0/1.0 50/33.3	20 $\mu$ A/ -0.6 mA - 1 mA/20 mA

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54F/74F20 Dual 4-Input NAND Gate

## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−55°C to +175°C
Plastic	−55°C to +150°C
V <sub>CC</sub> Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V)	
Standard Output	−0.5V to V <sub>CC</sub>
TRI-STATE® Output	−0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I<sub>OL</sub> (mA)

**Note 1:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

## Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

## DC Electrical Characteristics

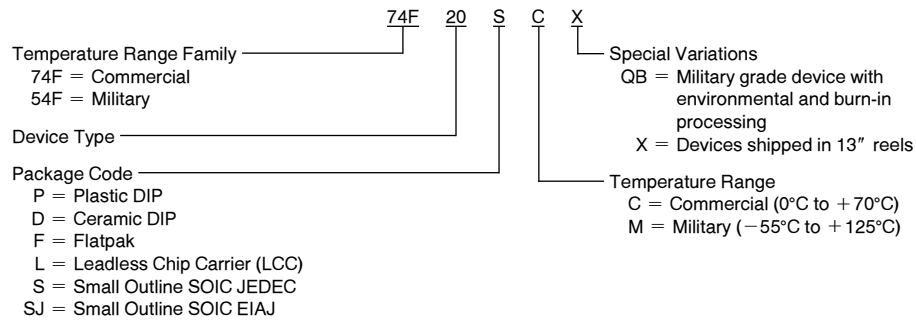
Symbol	Parameter		54F/74F			Units	V <sub>CC</sub>	Conditions
			Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage				0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage				−1.2	V	Min	I <sub>IN</sub> = −18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub> 74F 5% V <sub>CC</sub>	2.5 2.5 2.7			V	Min	I <sub>OH</sub> = −1 mA I <sub>OH</sub> = −1 mA I <sub>OH</sub> = −1 mA
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub> 74F 10% V <sub>CC</sub>		0.5 0.5		V	Min	I <sub>OL</sub> = 20 mA I <sub>OL</sub> = 20 mA
I <sub>IH</sub>	Input HIGH Current	54F 74F		20.0 5.0		μA	Max	V <sub>IN</sub> = 2.7V
I <sub>BVI</sub>	Input HIGH Breakdown Current	54F 74F		100 7.0		μA	Max	V <sub>IN</sub> = 7.0V
I <sub>CEX</sub>	Output HIGH Leakage Current	54F 74F		250 50		μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
V <sub>ID</sub>	Input Leakage Test	74F	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All other pins grounded
I <sub>OD</sub>	Output Leakage Circuit Current	74F		3.75		μA	0.0	V <sub>IOD</sub> = 150 mV All other pins grounded
I <sub>IL</sub>	Input LOW Current			−0.6		mA	Max	V <sub>IN</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current		−60	−150		mA	Max	V <sub>OUT</sub> = 0V
I <sub>CCH</sub>	Power Supply Current			0.9	1.4	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current			3.4	5.1	mA	Max	V <sub>O</sub> = LOW

## AC Electrical Characteristics

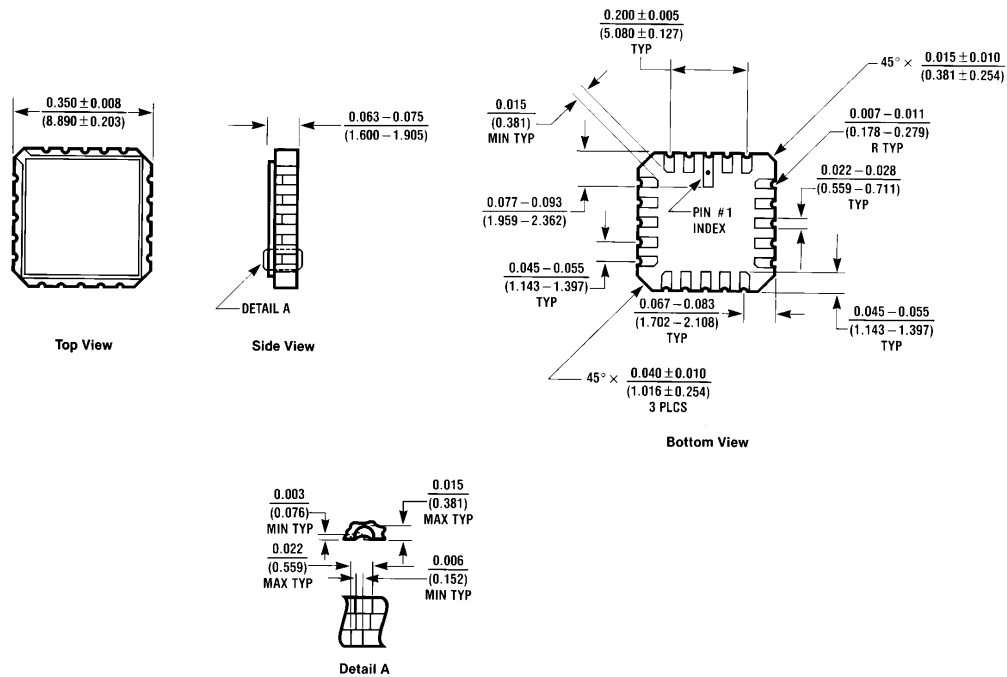
Symbol	Parameter	74F			54F		74F		Units
		$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A, V_{CC} = \text{Mil}$ $C_L = 50\text{ pF}$		$T_A, V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$		
		Min	Typ	Max	Min	Max	Min	Max	
$t_{PLH}$	Propagation Delay	2.4	3.7	5.0	2.0	7.0	2.4	6.0	ns
$t_{PHL}$	$A_n, B_n, C_n, D_n$ to $\overline{O}_n$	1.5	3.2	4.3	1.5	6.5	1.5	5.3	

## 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:



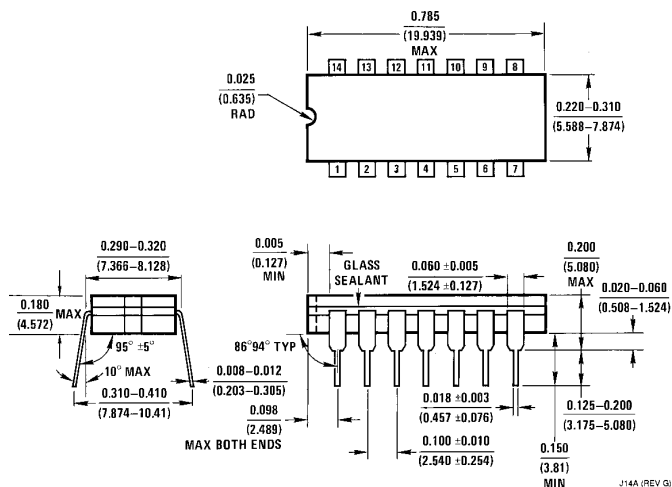
## Physical Dimensions inches (millimeters)



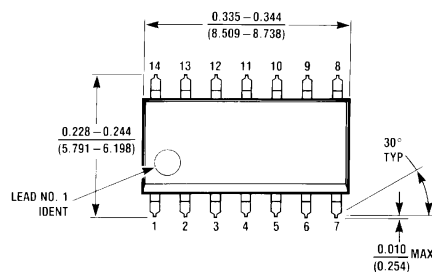
**20-Lead Ceramic Leadless Chip Carrier (L)  
NS Package Number E20A**

E20A (REV D)

# Physical Dimensions inches (millimeters) (Continued)

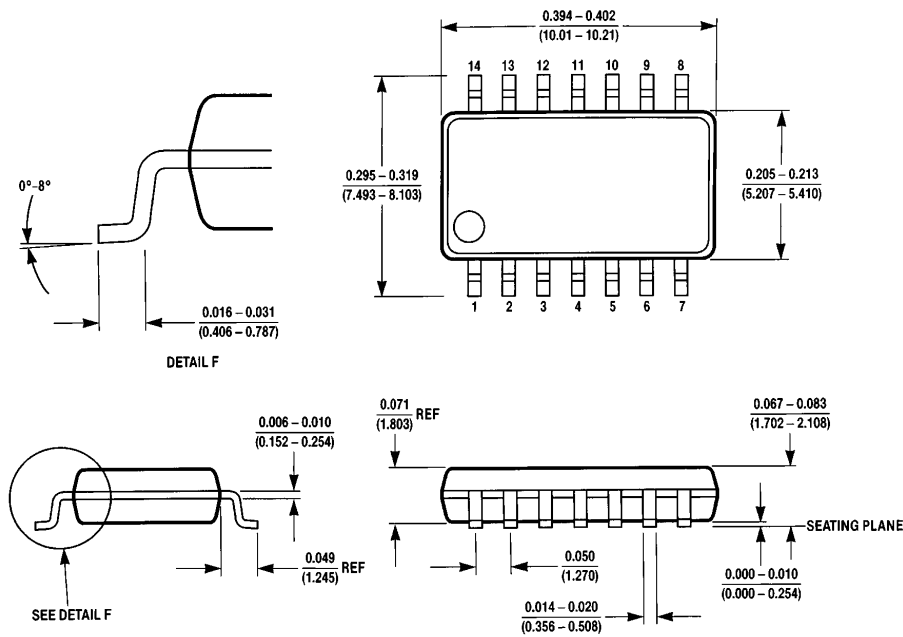


**14-Lead Ceramic Dual-In-Line Package (D)  
NS Package Number J14A**



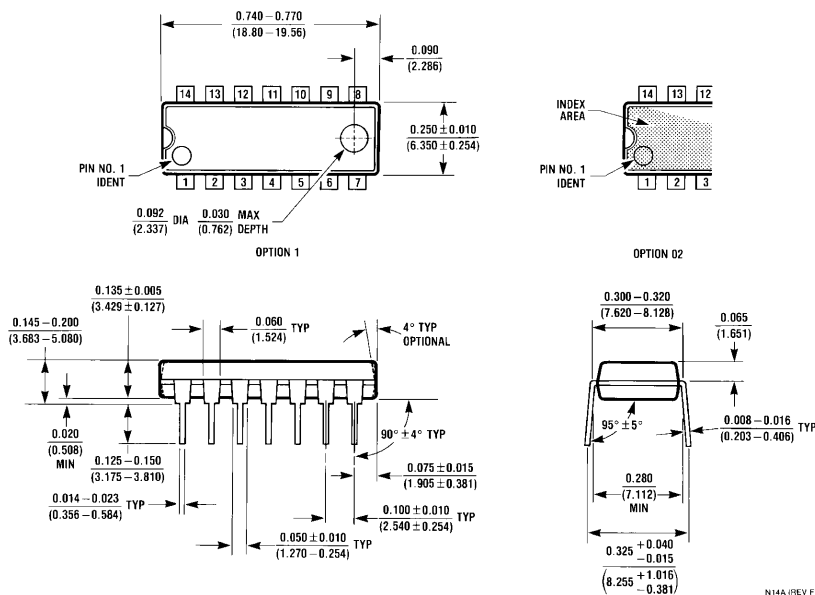
**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M14A**

# Physical Dimensions inches (millimeters) (Continued)



M14D (REV A)

**14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)**  
**NS Package Number M14D**



**14-Lead (0.300" Wide) Molded Dual-In-Line Package (P)**  
**NS Package Number N14A**



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.

