

December 1994

# 54F/74F02 Quad 2-Input NOR Gate

## General Description

This device contains four independent gates, each of which performs the logic NOR function.

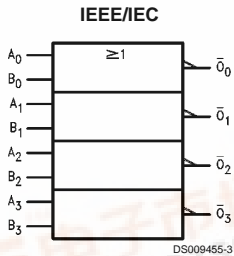
**Ordering Code:** See Section 0

Commercial	Military	Package Number	Package Description
74F02PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54F02DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F02SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F02SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F02FM (Note 2)	W14B	14-Lead Cerpack
	54F02LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

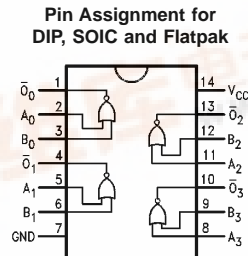
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

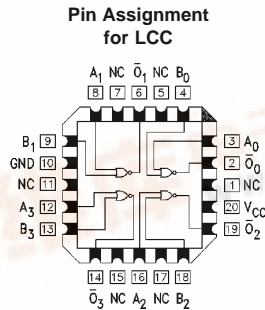
## Logic Symbol



## Connection Diagrams



DS009455-2



DS009455-1

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## Unit Loading/Fan Out

See Section 0 for U.L. definitions

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_n, B_n$	Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\bar{O}_n$	Outputs	50/33.3	-1 mA/20 mA

DSXXX

## Absolute Maximum Ratings (Note 3)

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 4)	-0.5V to +7.0V
Input Current (Note 4)	-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)

## 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

**Note 3:** 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 4:** Either voltage limit or current limit is sufficient to protect inputs.

## 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				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>	2.5		V	Min	I <sub>OH</sub> = -1 mA
		74F 10% V <sub>CC</sub>	2.5				
		74F 5% V <sub>CC</sub>	2.7				
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>	0.5		V	Min	I <sub>OL</sub> = 20 mA
		74F 10% V <sub>CC</sub>	0.5				
I <sub>IH</sub>	Input HIGH Current	54F	20.0		µA	Max	V <sub>IN</sub> = 2.7V
		74F	5.0				
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	54F	100		µA	Max	V <sub>IN</sub> = 7.0V
		74F	7.0				
I <sub>CEX</sub>	Output HIGH Leakage Current	54F	250		µA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
		74F	50				
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				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	3.7 5.6			mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current	8.7 13.0			mA	Max	V <sub>O</sub> = LOW

## AC Electrical Characteristics

See Section 0 for Waveforms and Load Configurations

Symbol	Parameter	74F			54F		74F		Units	Fig. No.
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF			
		Min	Typ	Max	Min	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay	2.5	4.4	5.5	2.5	7.5	2.5	6.5	ns	◆◆◆◆
t <sub>PHL</sub>	A <sub>n</sub> , B <sub>n</sub> to $\bar{O}_n$	1.5	3.2	4.3	1.5	6.5	1.5	5.3		

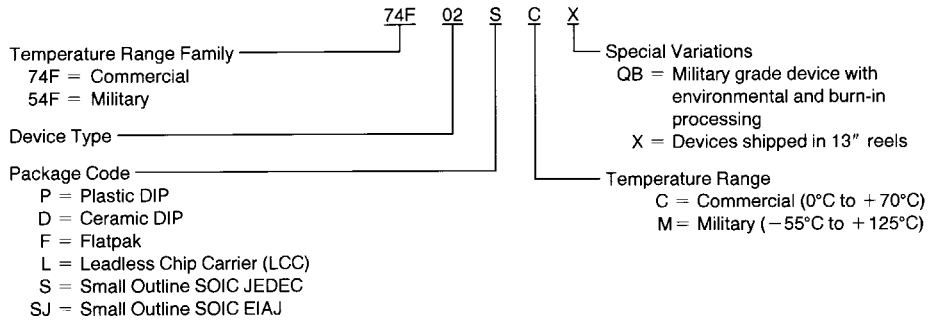
DSXXX

DSXXX

Book  
Extract  
End

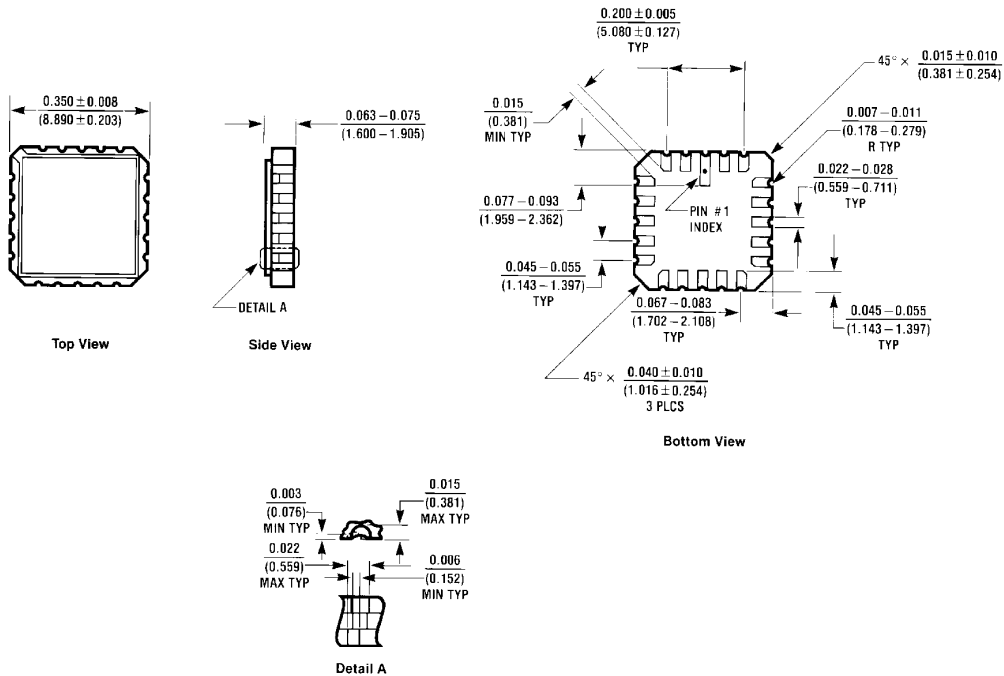
## Ordering Information

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



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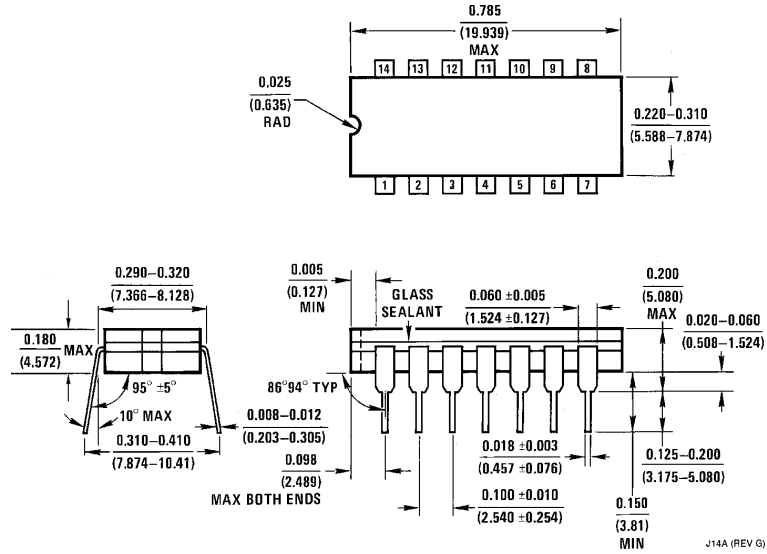
## Physical Dimensions inches (millimeters) unless otherwise noted



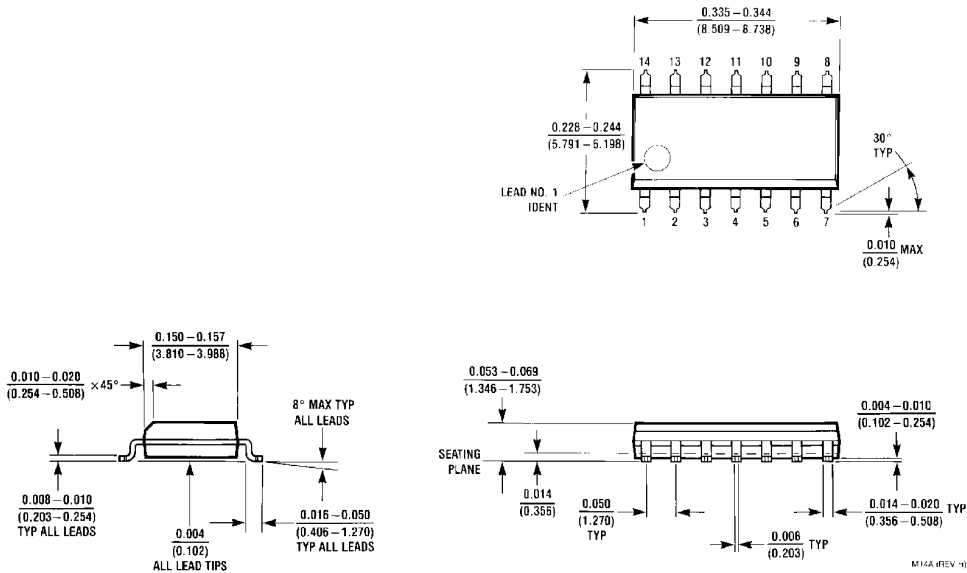
E20A (REV. 01)

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

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

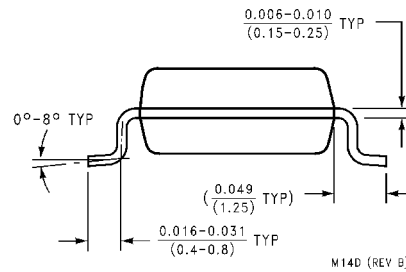
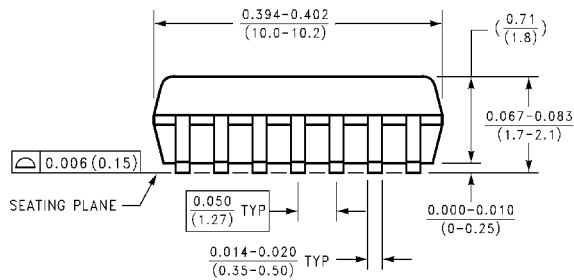
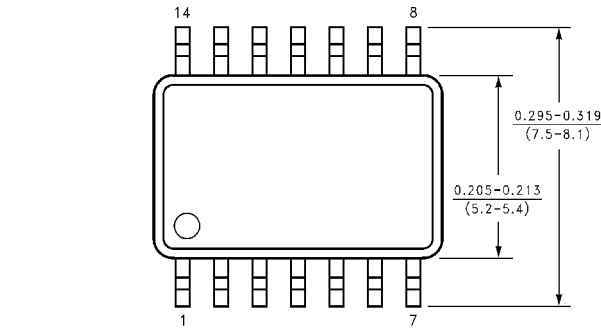


**14-Lead Ceramic Dual In-Line Package (D)  
NS Package Number J14A**

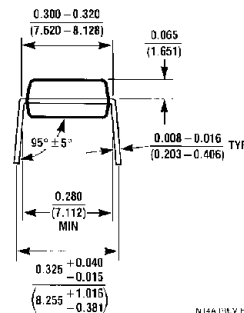
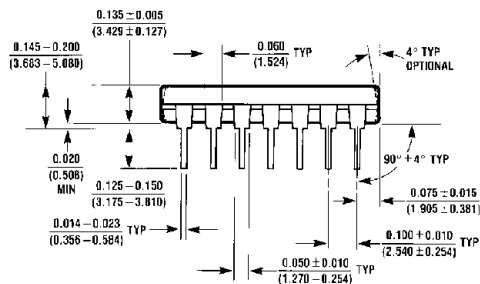
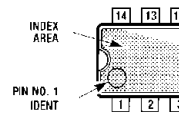
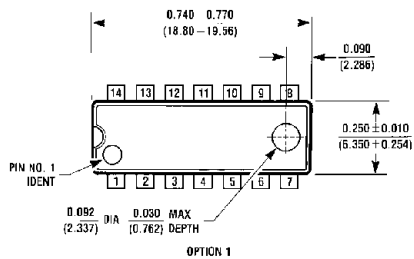


**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M14A**

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

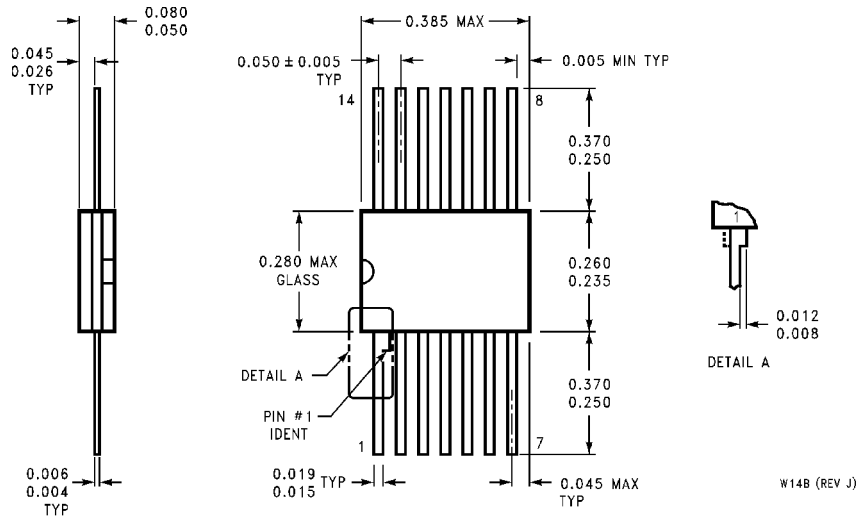


**14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M14D**



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

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



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

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