

## 54F/74F86 2-Input Exclusive-OR Gate

### General Description

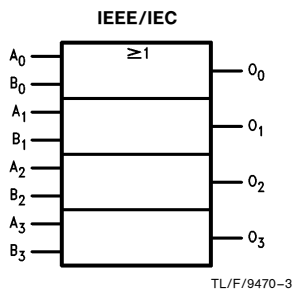
This device contains four independent gates, each of which performs the logic exclusive-OR function.

Commercial	Military	Package Number	Package Description
74F86PC		N14A	14-Lead (0.300" Wide) Molded Dual-in-Line
	54F86DM (Note 2)	J14A	14-Lead Ceramic Dual-in-Line
74F86SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F86SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F86FM (Note 2)	W14B	14-Lead Cerpack
	54F86LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

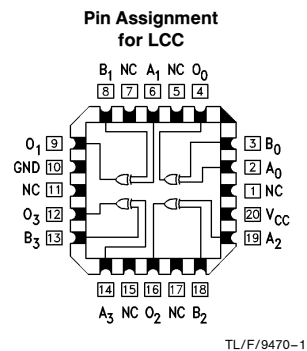
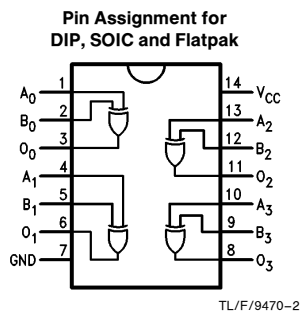
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

**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 $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_n, B_n$	Inputs	1.0/1.0	20 $\mu$ A/ -0.6 mA
$O_n$	Outputs	50/33.3	-1 mA/20 mA

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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.

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

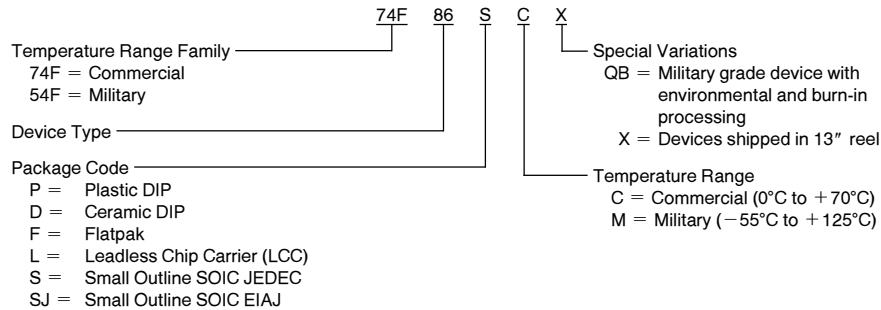
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage						Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage				-1.2	V	Min I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA I <sub>OH</sub> = -1 mA 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 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				-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	12			18	mA	Max V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current	18			28	mA	Max V <sub>O</sub> = LOW

## AC Electrical Characteristics

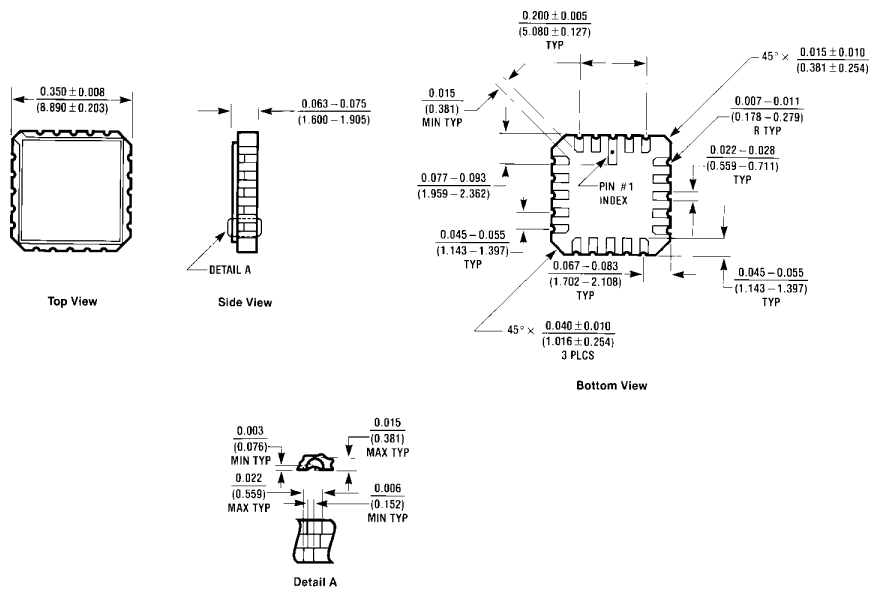
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> , B <sub>n</sub> to O <sub>n</sub> (Other Input LOW)	3.0	4.0	5.5	2.5	7.0	3.0	6.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> , B <sub>n</sub> to O <sub>n</sub> (Other Input HIGH)	3.5	5.3	7.0	3.5	8.5	3.5	8.0	
		3.0	4.7	6.5	3.0	8.0	3.0	7.5	ns

## 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:



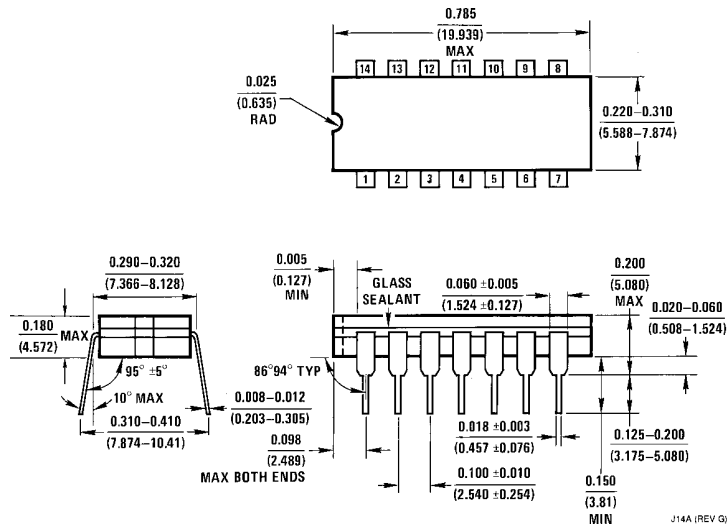
## Physical Dimensions inches (millimeters)



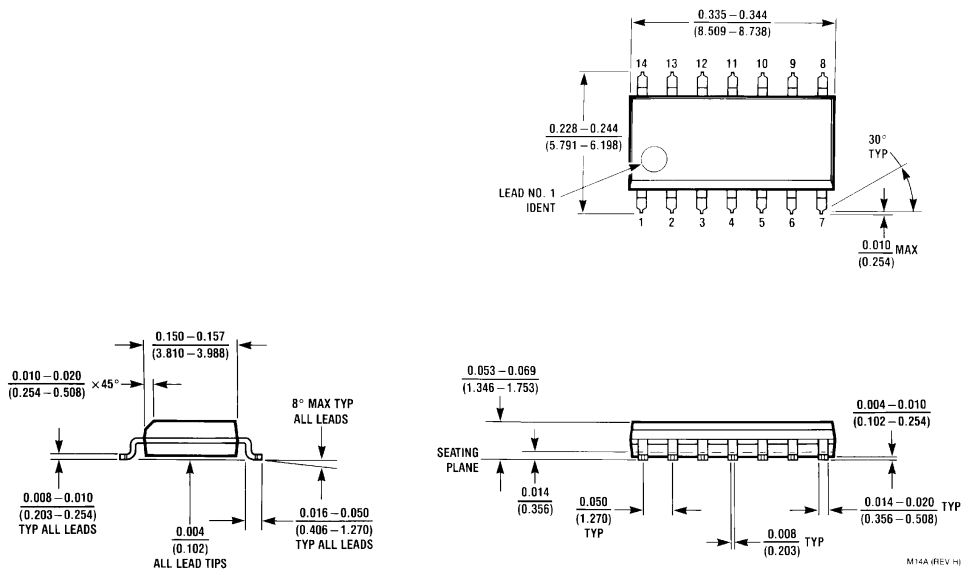
20-Terminal Ceramic Leadless Chip Carrier (L)  
 NS Package Number E20A

E20A (REV. D)

**Physical Dimensions** inches (millimeters) (Continued)

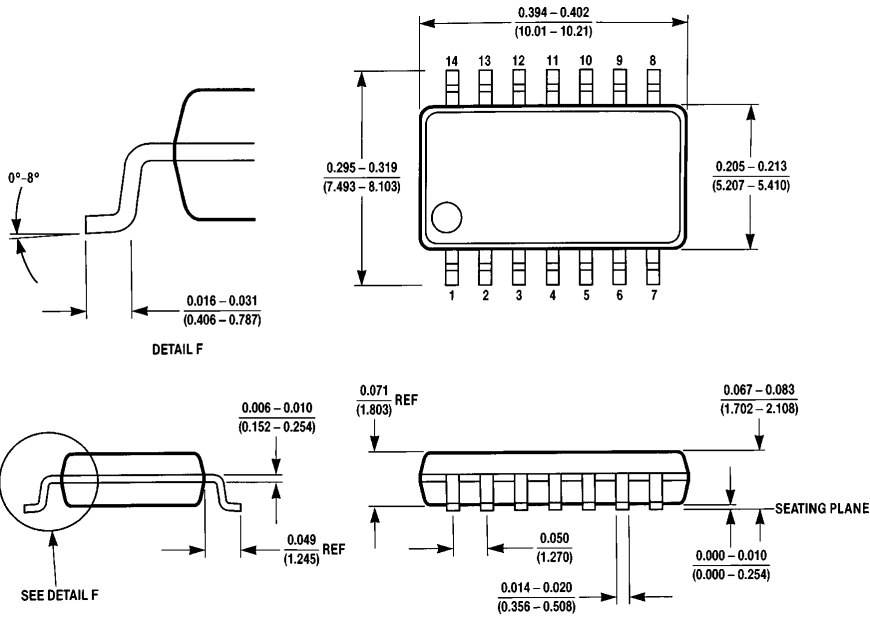


**14-Lead Ceramic Dual-In-Line Package (D)**  
**NS Package Number J14A**



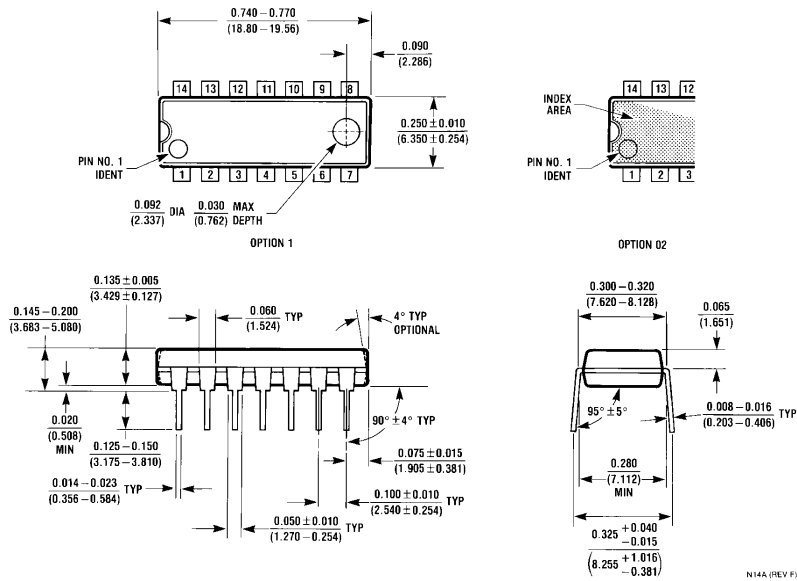
**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)**  
**NS Package Number M14A**

**Physical Dimensions** inches (millimeters) (Continued)



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

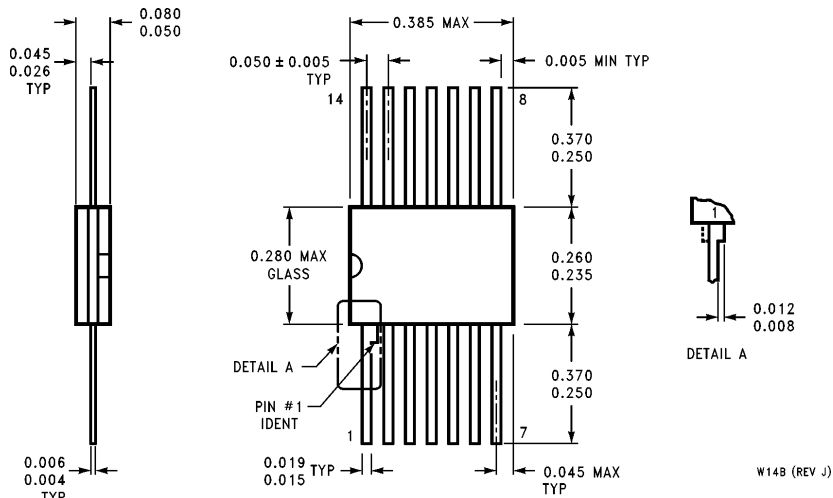
M14D (REV A)



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

N14A (REV F)

**Physical Dimensions** inches (millimeters) (Continued)



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

W14B (REV J)

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**National Semiconductor Corporation**  
2900 Semiconductor Drive  
P.O. Box 58090  
Santa Clara, CA 95052-8090  
Tel: 1(800) 272-9959  
TWX: (910) 339-9240

**National Semiconductor GmbH**  
Livry-Gargan-Str. 10  
D-82256 Fürstentfeldbruck  
Germany  
Tel: (61-41) 35-0  
Telex: 527649  
Fax: (61-41) 35-1

**National Semiconductor Japan Ltd.**  
Sumitomo Chemical  
Engineering Center  
Bldg. 7F  
1-7-1, Nakase, Mihama-Ku  
Chiba-City,  
Ciba Prefecture 261  
Tel: (043) 299-2300  
Fax: (043) 299-2500

**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 Semiconductores Do Brazil Ltda.**  
Rue Deputado Lacerda Franco  
120-3A  
Sao Paulo-SP  
Brazil 05418-000  
Tel: (55-11) 212-5066  
Telex: 391-1131931 NSBR BR  
Fax: (55-11) 212-1181

**National Semiconductor (Australia) Pty. Ltd.**  
Building 16  
Business Park Drive  
Monash Business Park  
Nottingham, Melbourne  
Victoria 3168 Australia  
Tel: (3) 558-9999  
Fax: (3) 558-9998

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