



December 1994

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

### General Description

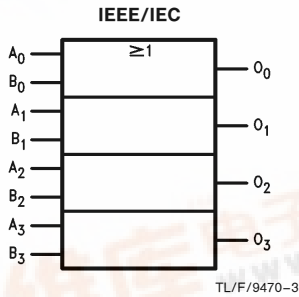
This device contains four independent gates, each of which performs the logic exclusive-OR function.

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

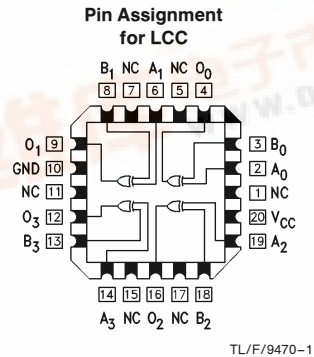
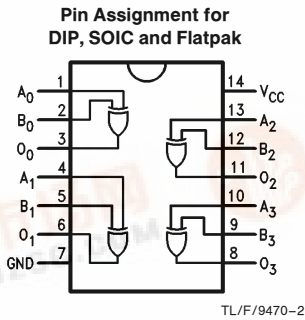
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

**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	$20 \mu A / -0.6 \text{ mA}$
$O_n$	Outputs	50/33.3	$-1 \text{ mA} / 20 \text{ mA}$

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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

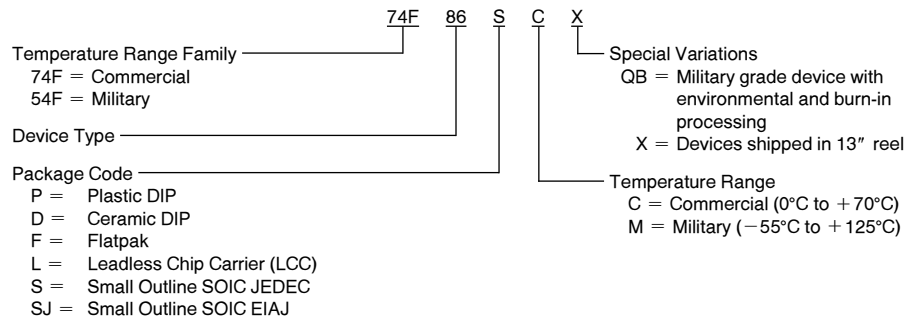
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			–1.2	V	Min	I <sub>IN</sub> = –18 mA
V <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		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

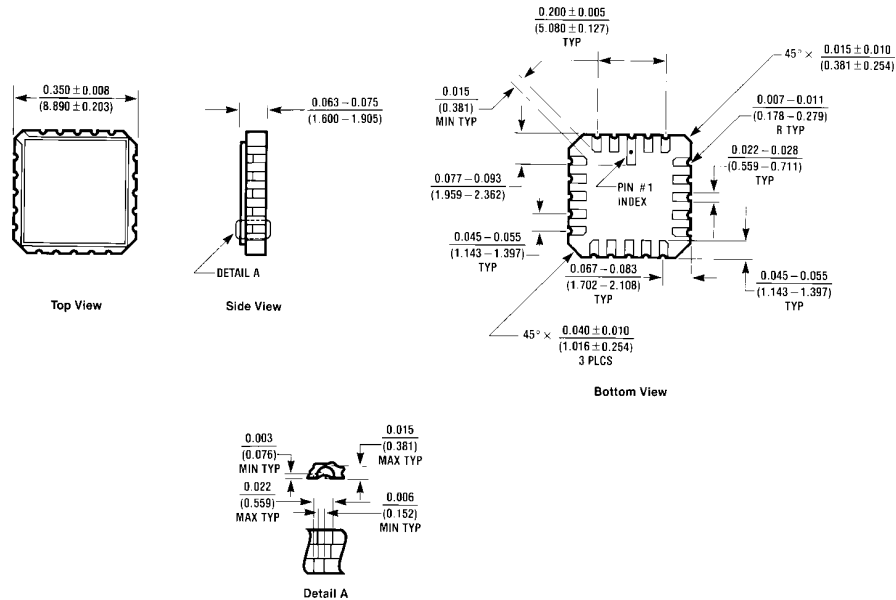
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay A <sub>n</sub> , B <sub>n</sub> to O <sub>n</sub> (Other Input LOW)	3.0 3.0	4.0 4.2	5.5 5.5	2.5 3.0	7.0 7.0	3.0 3.0	6.5 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 3.0	5.3 4.7	7.0 6.5	3.5 3.0	8.5 8.0	3.5 3.0	8.0 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:



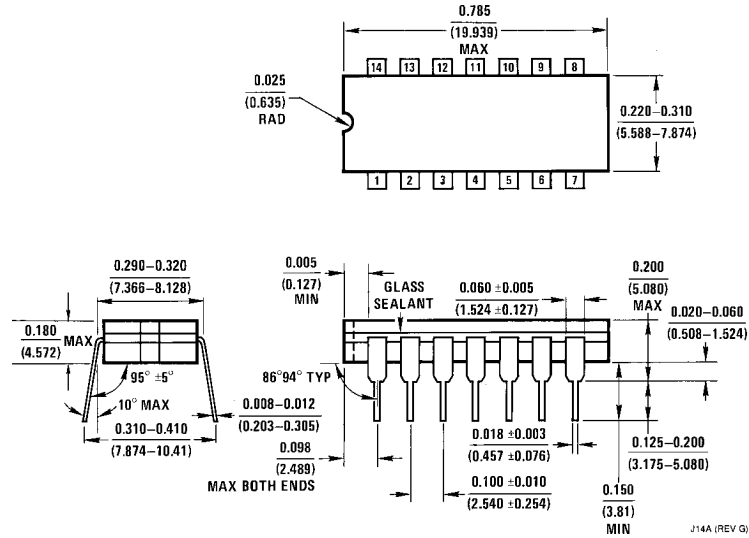
## Physical Dimensions inches (millimeters)



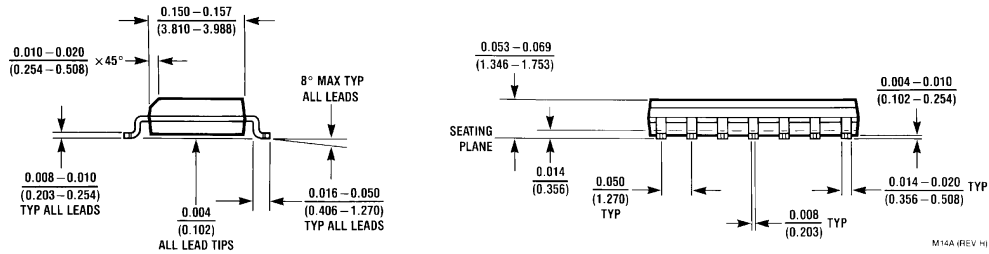
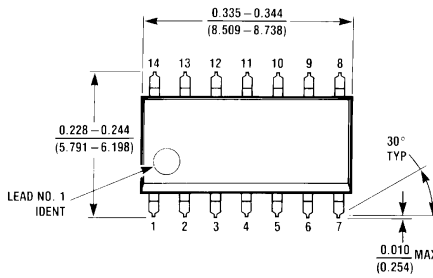
20-Terminal Ceramic Leadless Chip Carrier (L)  
NS Package Number E20A

E7A (REV. 0)

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



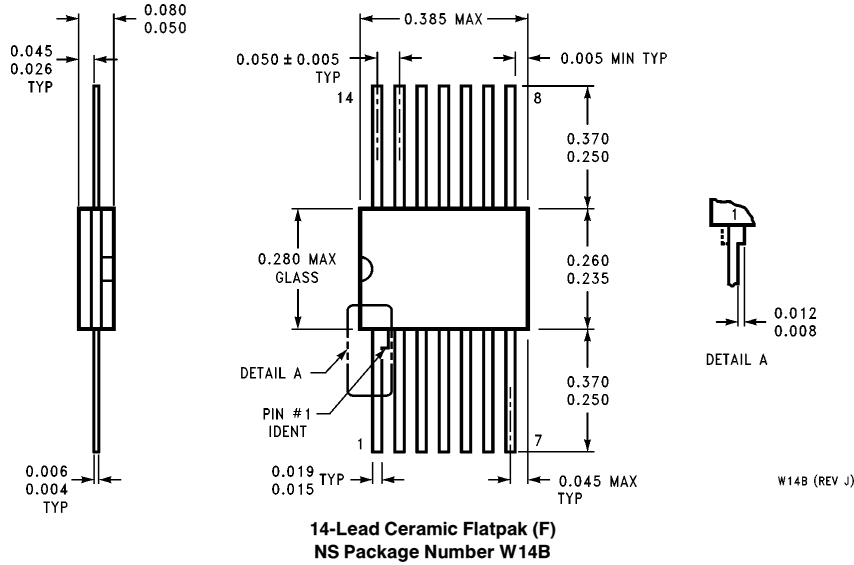
**14-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J14A



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



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



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