

# 54F/74F14 Hex Inverter Schmitt Trigger

## General Description

The 'F14 contains six logic inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem-pole output. The Schmitt trigger uses positive feed back to

effectively speed-up slow input transition, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

## Features

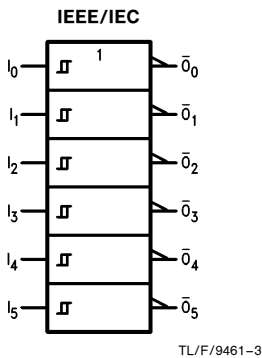
- Guaranteed 4000V minimum ESD protection
- Standard Military Drawing  
— 5962-88752

Commercial	Military	Package Number	Package Description
74F14PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54F14DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F14SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F14SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F14FM (Note 2)	W14B	14-Lead Cerpack
	54F14LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

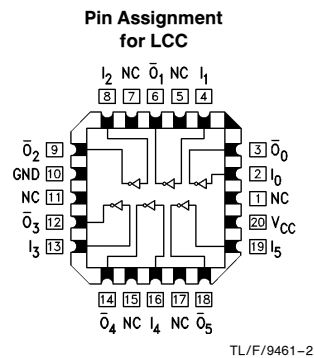
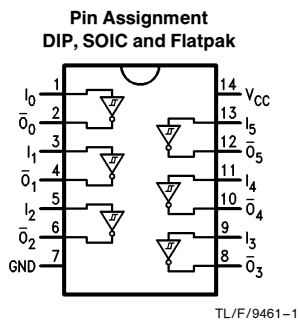
**Note 1:** Devices also available in 13" reel. Use Suffix = SCX and SJX.

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

## Logic Symbol



## Connection Diagrams



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## Unit Loading/Fan Out

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

Function Table

Input	Output
A	$\bar{O}$
L	H
H	L

H = HIGH Voltage Level  
L = LOW Voltage Level

## 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
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)
ESD Last Passing Voltage (Min)	4000V

**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

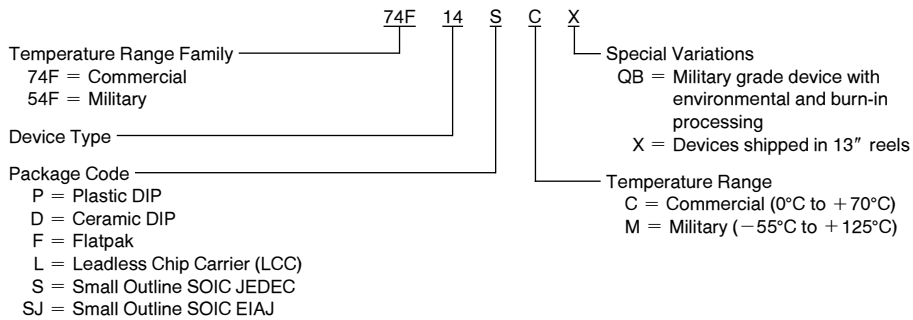
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>T+</sub>	Positive-Going Threshold	1.5	1.7	2.0	V	5.0V	
V <sub>T-</sub>	Negative-Going Threshold	0.7	0.9	1.1	V	5.0V	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	0.4	0.8		V	5.0V	
V <sub>CD</sub>	Input 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 Current Breakdown Test	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	Max	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			25	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current			25	mA	Max	V <sub>O</sub> = LOW

## AC Electrical Characteristics

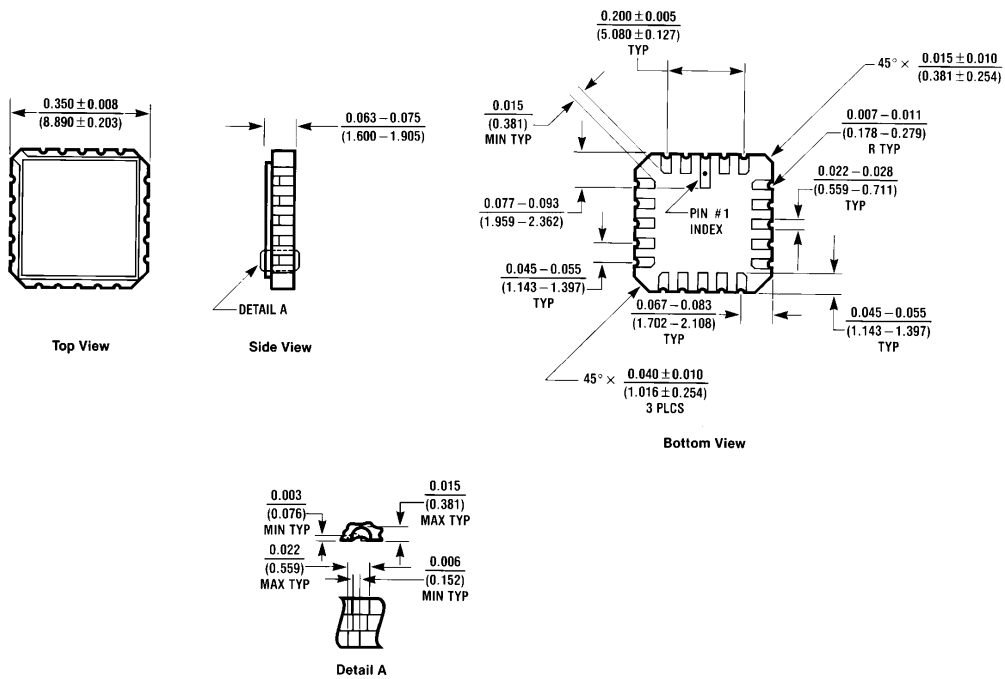
Symbol	Parameter	74F		54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	4.0	10.5	4.0	13.0	4.0	11.5	ns
t <sub>PHL</sub>	I <sub>n</sub> → $\bar{O}_n$	3.5	8.5	3.5	10.0	3.5	9.0	

## 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:



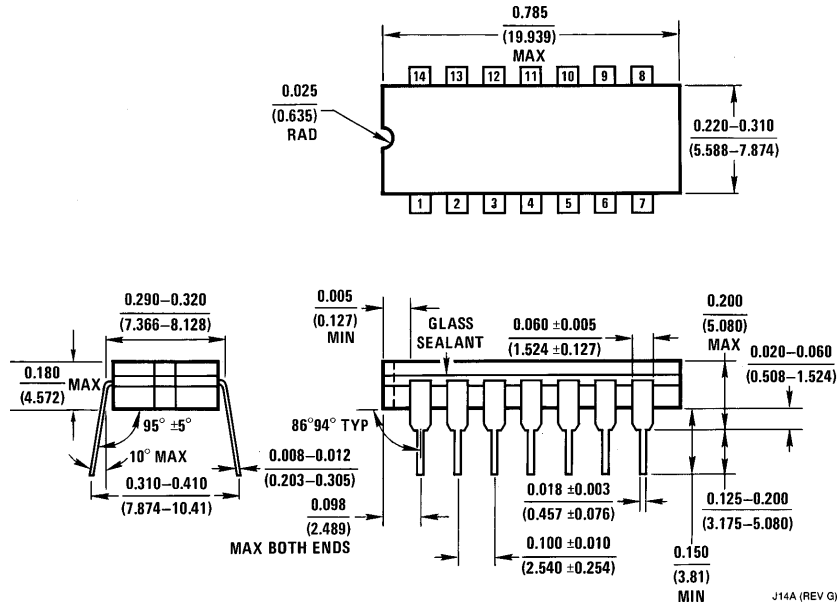
**Physical Dimensions** inches (millimeters)



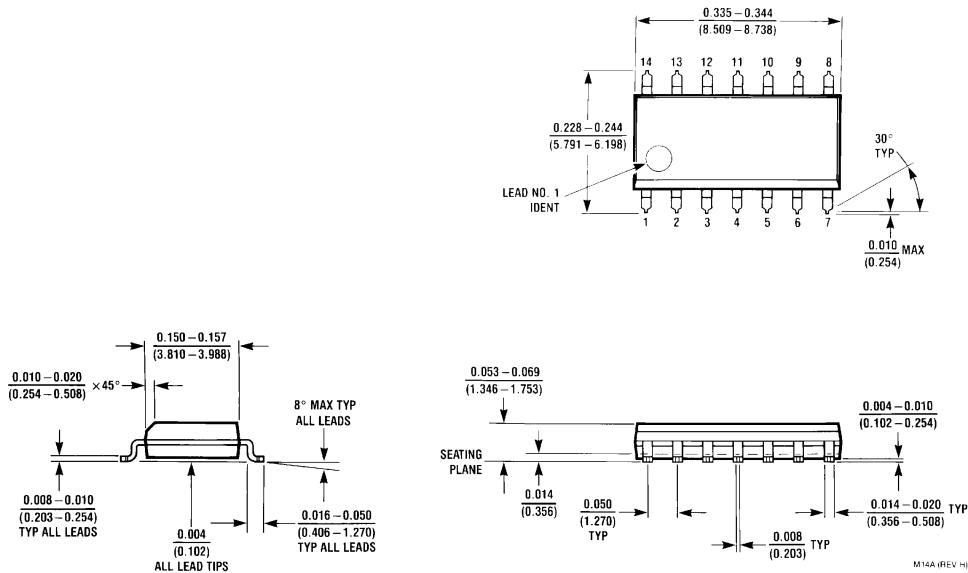
**20-Terminal Ceramic Leadless Chip Carrier (L)  
NS Package Number E20A**

E20A (REV D)

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

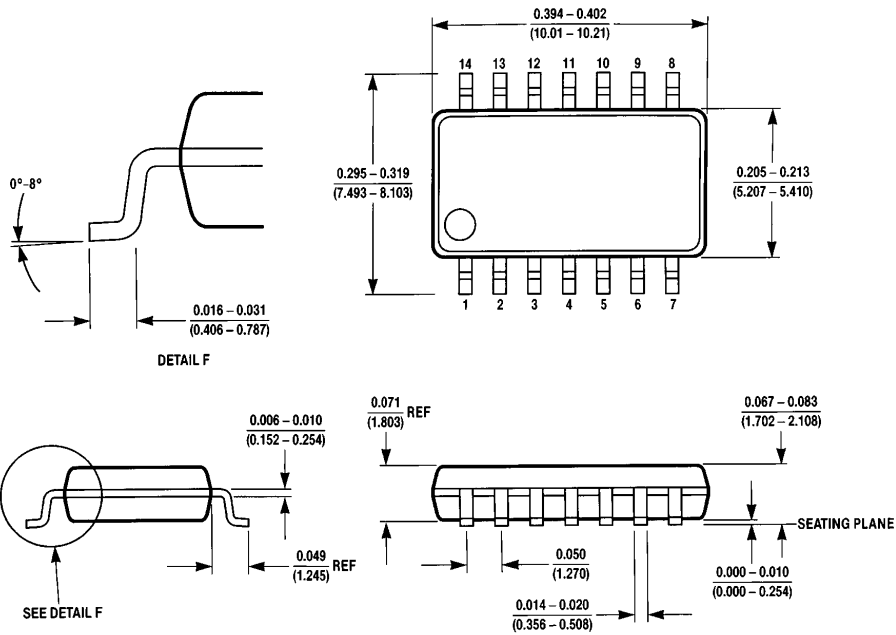


**14-Lead Ceramic Dual-In-Line Package (D)  
NS Package Number J14A**



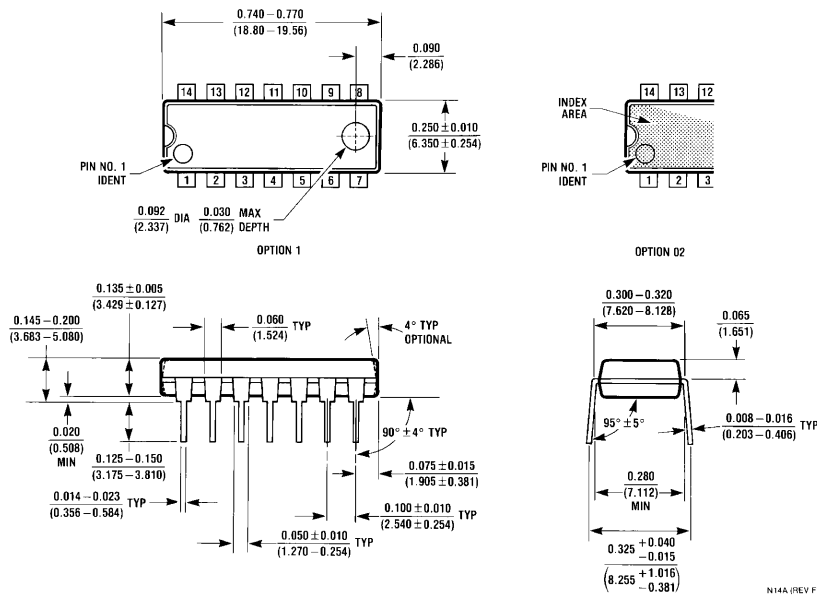
**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M14A**

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



M14D (REV A)

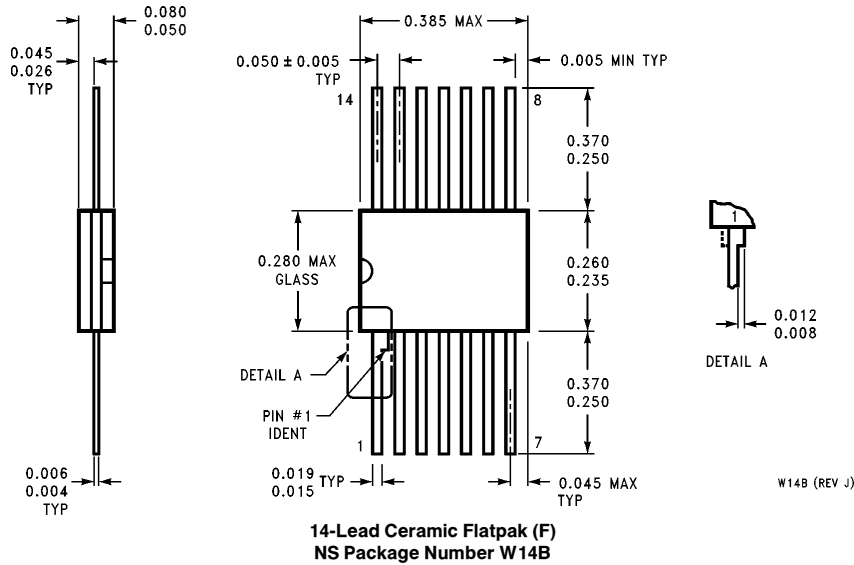
**14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M14D**



N14A (REV F)

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

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



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