

November 1994

## 54F/74F132 Quad 2-Input NAND Schmitt Trigger

### General Description

The 'F132 contains four 2-input NAND gates 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 NAND gates.

Each circuit contains a 2-input Schmitt trigger followed by level shifting circuitry and a standard FAST® output structure. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input

threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input threshold (typically 800 mV) is determined by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

### Features

- Guaranteed 4000V minimum ESD protection
- Standard Military Drawing (SMD)
- 5962-89487

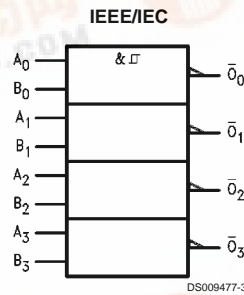
**Ordering Code:** See Section 0

Commercial	Military	Package Number	Package Description
74F132PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54F132DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F132SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F132SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F132FM (Note 2)	W14B	14-Lead Cerpack
	54F132LM (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

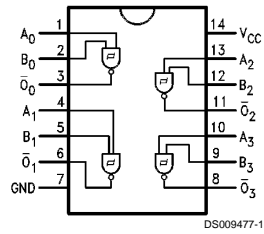


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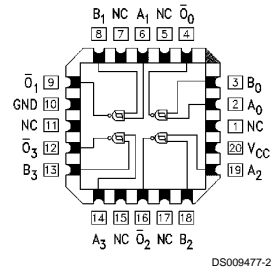


## Connection Diagrams

Pin Assignment for  
DIP, SOIC and Flatpak



Pin Assignment  
for LCC



## Unit Loading/Fan Out See Section 0 for U.L. definitions

Pin Names	Description	54F74F	
		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

## Function Table

Inputs		Outputs
A	B	$\bar{O}$
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH Voltage Level  
L = LOW Voltage Level

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

## 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>T+</sub>	Positive-going Threshold	1.5	2.0		V	5.0	
V <sub>T-</sub>	Negative-going Threshold	0.7	1.1		V	5.0	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	0.4			V	5.0	
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				I <sub>OH</sub> = -1 mA
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -1 mA
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>OL</sub> = 20 mA
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			17.0	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current			18.0	mA	Max	V <sub>O</sub> = LOW

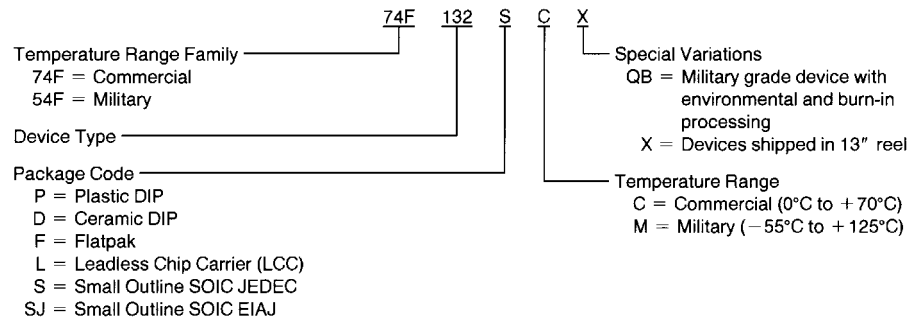
## AC Electrical Characteristics

See Section 0 for Waveforms and Load Configurations

Symbol	Parameter	74F			54F		74F		Units	Fig. No.
		$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A, V_{CC} = \text{Mil}$ $C_L = 50\text{ pF}$		$T_A, V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$			
		Min	Typ	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay	4.0		10.5	2.0	13.0	3.5	12.0	ns	◆◆◆◆
$t_{PHL}$	$A_n, B_n$ to $\bar{O}_n$	5.0		12.5	4.5	16.0	5.0	13.0		

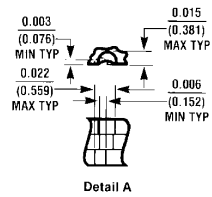
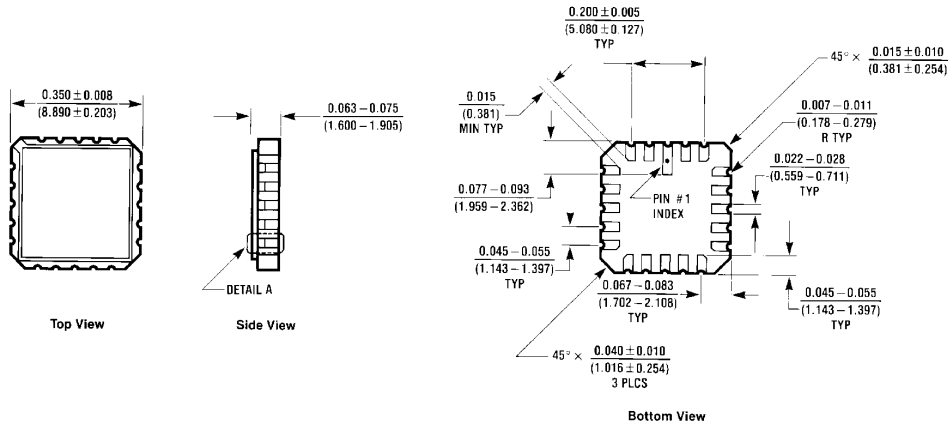
## Ordering Information

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

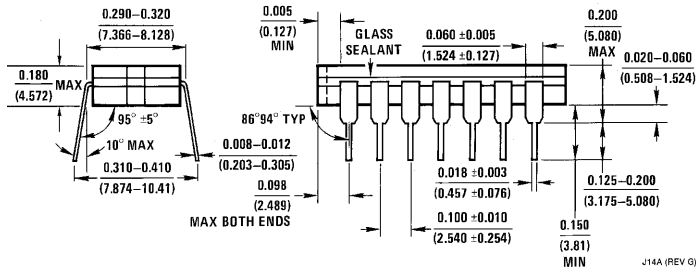
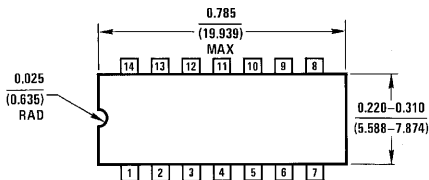


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**Physical Dimensions** inches (millimeters) unless otherwise noted

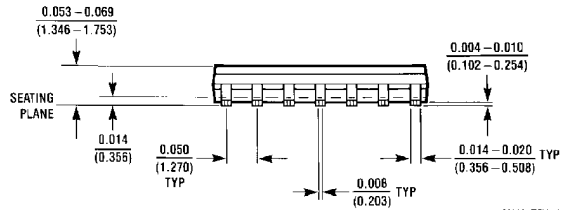
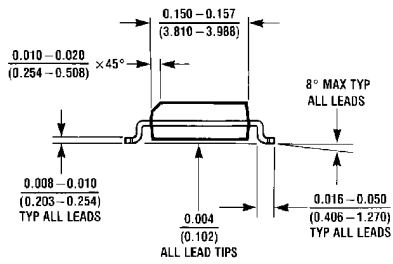
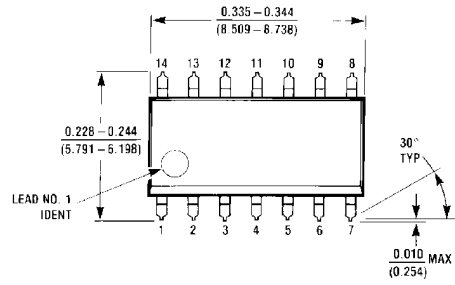


**20-Lead Ceramic Leadless Chip Carrier (L)**  
 NS Package Number E20A



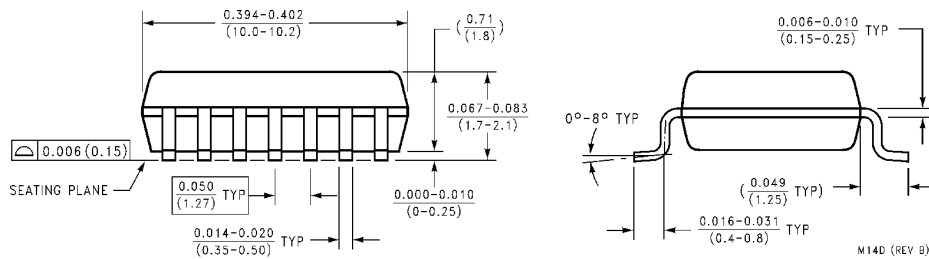
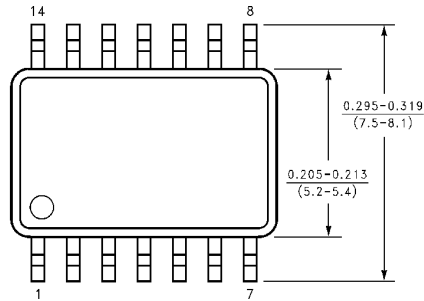
**14-Lead Ceramic Dual-In-Line Package (D)**  
 NS Package Number J14A

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



M14A (REV. H)

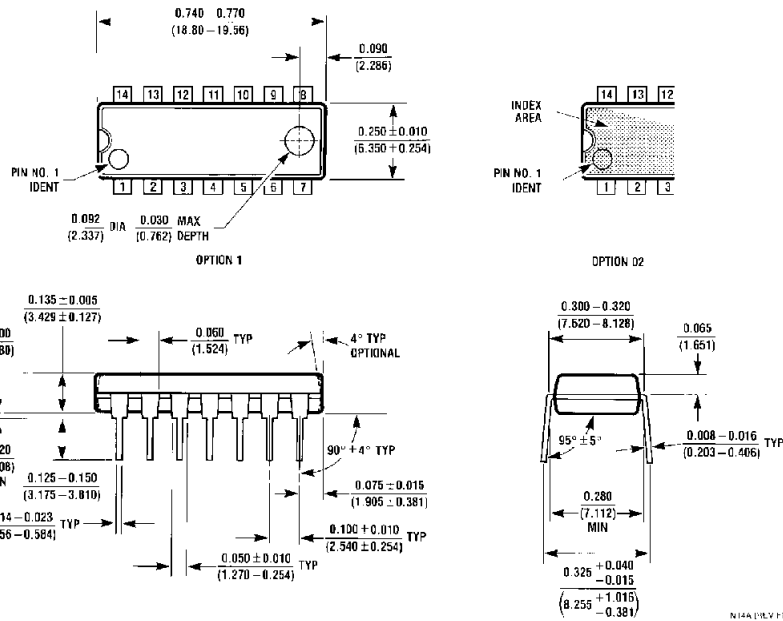
**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M14A**



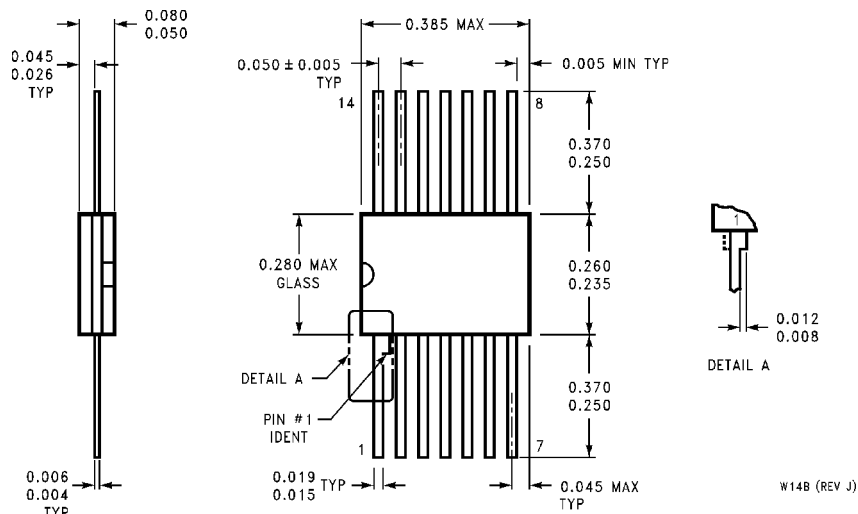
M14D (REV. B)

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

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



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



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

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