National Semiconductor

November 1994

54F/74F04
Hex Inverter

General Description

This device contains six independent gates, each of which performs the logic INVERT function.

Features

- Guaranteed 4000V minimum ESD protection

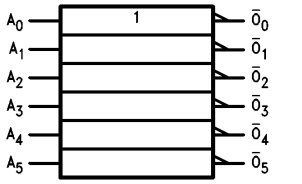
Commercial	Military	Package Number	Package Description
74F04PC		N14A	14-Lead (0.300″ Wide) Molded Dual-In-Line
	54F04DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F04SC (Note 1)		M14A	14-Lead (0.150″ Wide) Molded Small Outline, JEDEC
74F04SJ (Note 1)		M14D	14-Lead (0.300″ Wide) Molded Small Outline, EIAJ
	54F04FM (Note 2)	W14B	14-Lead Cerpack
	54F04LM (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

IEEE/IEC



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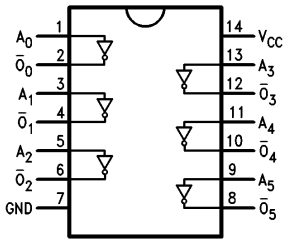
Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



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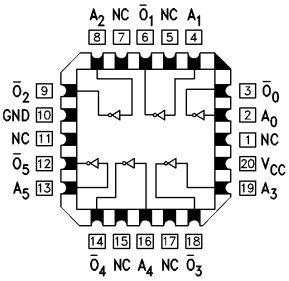
Pin Assignment for LCC



TL/F/9456–1

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	Inputs	1.0/1.0	20 μA/−0.6 mA
$\overline{O}_n$	Outputs	50/33.3	−1 mA/20 mA

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RRD-B30M75/Printed in U. S. A.

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_{CC} 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_{CC} = 0V)	
Standard Output	−0.5V to V_{CC}
TRI-STATE® Output	−0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated I_{OL} (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 Min	54F/74F Typ	54F/74F Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized as a LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54F 10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA
		74F 10% V_{CC}	2.5					I_{OH} = −1 mA
		74F 5% V_{CC}	2.7					I_{OH} = −1 mA
V_{OL}	Output LOW Voltage	54F 10% V_{CC}			0.5	V	Min	I_{OL} = 20 mA
		74F 10% V_{CC}			0.5			I_{OL} = 20 mA
I_{IH}	Input HIGH Current	54F			20.0	μA	Max	V_{IN} = 2.7V
		74F			5.0			
I_{BVI}	Input HIGH Current Breakdown Test	54F			100	μA	Max	V_{IN} = 7.0V
		74F			7.0			
I_{CEX}	Output HIGH Leakage Current	54F			250	μA	Max	V_{OUT} = V_{CC}
		74F			50			
V_{ID}	Input Leakage Test	74F	4.75			V	0.0	I_{ID} = 1.9 μA All other pins grounded
I_{OD}	Output Leakage Circuit Current	74F			3.75	μA	0.0	V_{IOD} = 150 mV All other pins grounded
I_{IL}	Input LOW Current				−0.6	mA	Max	V_{IN} = 0.5V
I_{OS}	Output Short-Circuit Current		−60		−150	mA	Max	V_{OUT} = 0V
I_{CCH}	Power Supply Current			2.8	4.2	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			10.2	15.3	mA	Max	V_O = LOW

AC Electrical Characteristics

Symbol	Parameter	74F			54F		74F		Units
		$T_A = +25°C$ $V_{CC} = +5.0V$ $C_L = 50$ pF			$T_A, V_{CC} =$ Mil $C_L = 50$ pF		$T_A, V_{CC} =$ Com $C_L = 50$ pF		
		Min	Typ	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay A_n to $\overline{O}_n$	2.4 1.5	3.7 3.2	5.0 4.3	2.0 1.5	7.0 6.5	2.4 1.5	6.0 5.3	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:

74F 04 S C X

Temperature Range Family
- 74F = Commercial
- 54F = Military

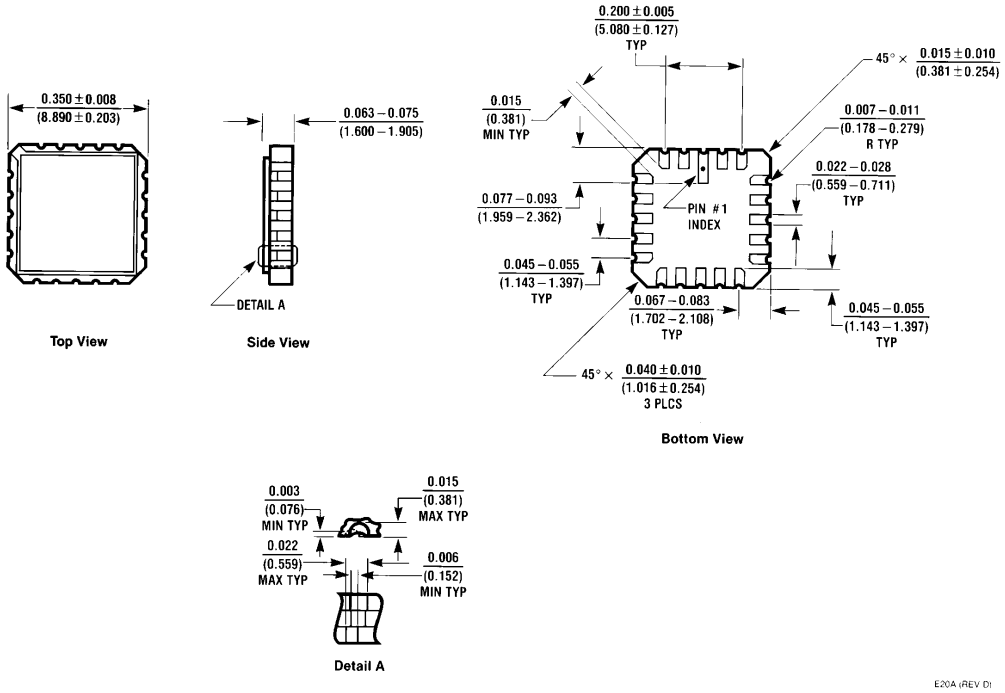
Device Type

Package Code
- P = Plastic DIP
- D = Ceramic DIP
- F = Flatpak
- L = Leadless Chip Carrier (LCC)
- S = Small Outline SOIC JEDEC
- SJ = Small Outline SOIC EIAJ

Temperature Range
- C = Commercial (0°C to +70°C)
- M = Military (−55°C to +125°C)

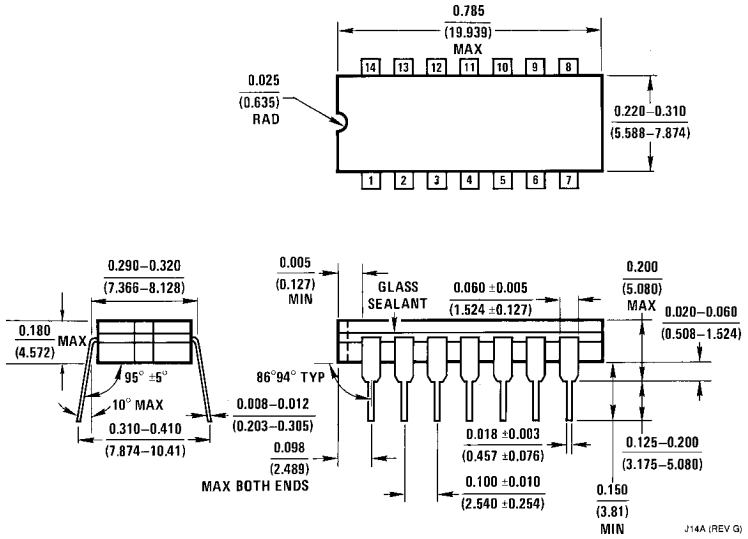
Special Variations
- QB = Military grade device with environmental and burn-in processing
- X = Devices shipped in 13″ reels

Physical Dimensions inches (millimeters)

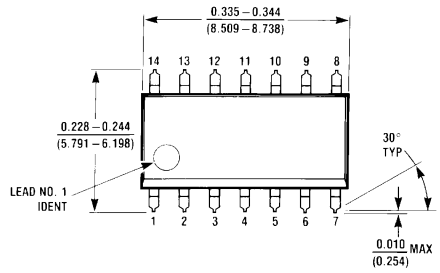


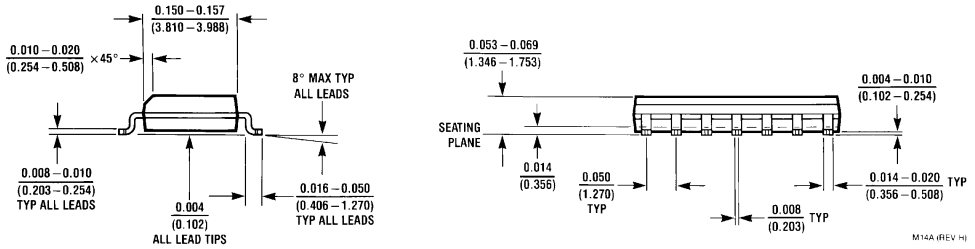
20-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

Physical Dimensions inches (millimeters) (Continued)



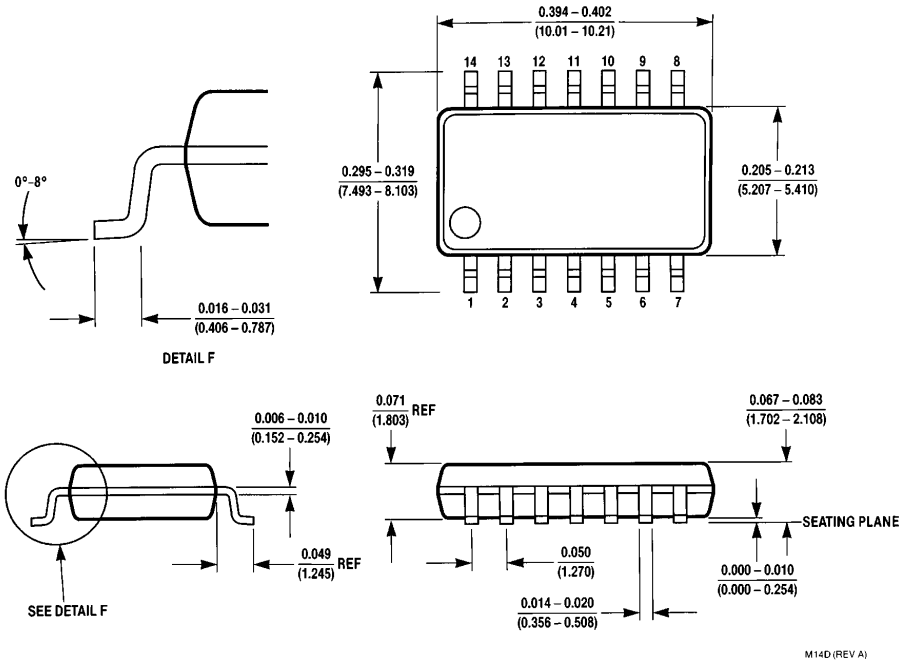
14-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J14A



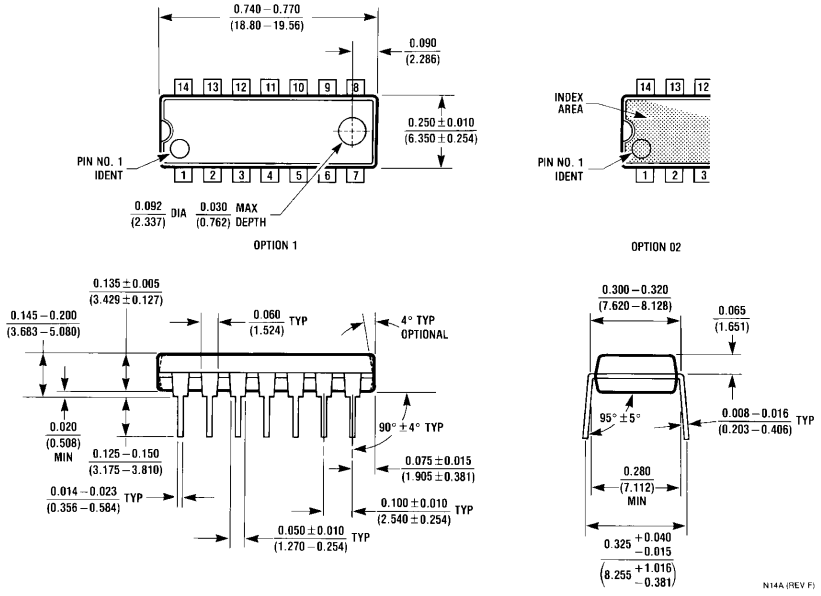


14-Lead (0.150″ Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M14A

Physical Dimensions inches (millimeters) (Continued)

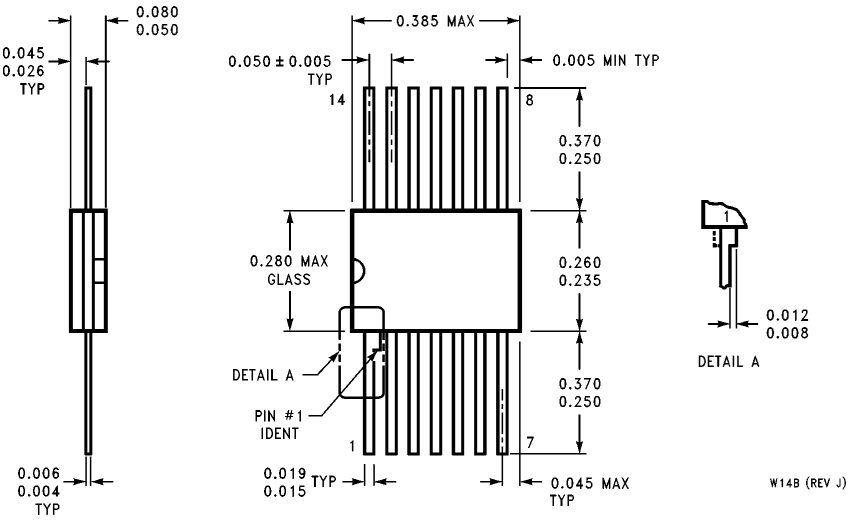


14-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M14D



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

Physical Dimensions inches (millimeters) (Continued)



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

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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