

# 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

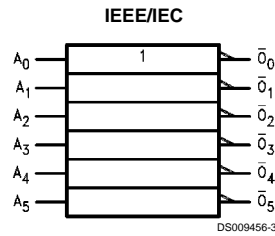
**Ordering Code:** See Section 0

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

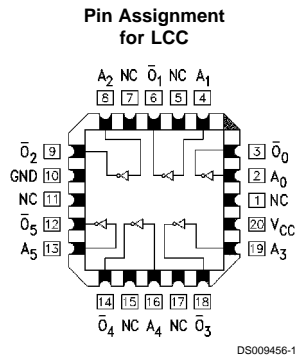
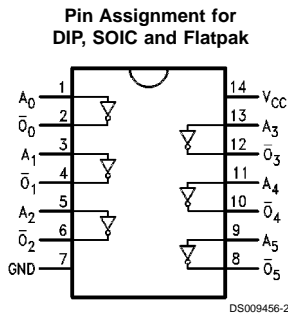
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

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

## Logic Symbol



## Connection Diagrams



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## Unit Loading/Fan Out

See Section 0 for U.L. definitions

DSXXX

Pin Names	Description	54F74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_n$	Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\bar{O}_n$	Outputs	50/33.3	-1 mA/20 mA

## 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.

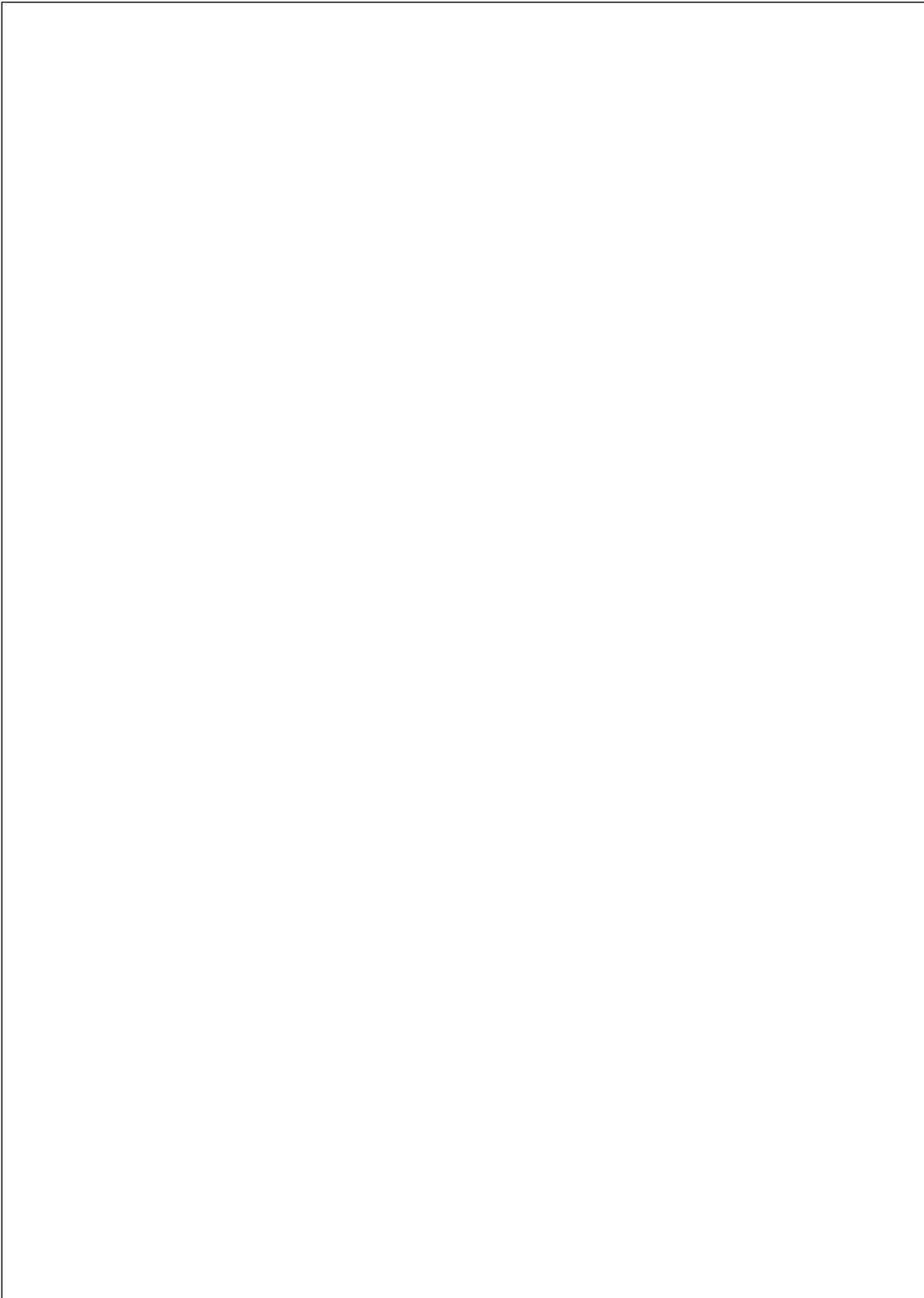
## DC Electrical Characteristics

Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage				V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage				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>			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				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	2.8			mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current	10.2			mA	Max	V <sub>O</sub> = LOW

## AC Electrical Characteristics

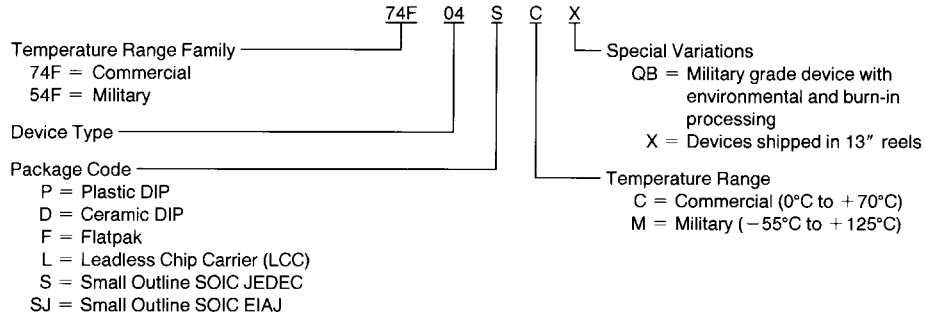
See Section 0 for Waveforms and Load Configurations

Symbol	Parameter	74F			54F		74F		Units	Fig. No.
		T <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>	Propagation Delay	2.4	3.7	5.0	2.0	7.0	2.4	6.0	ns	◆◆◆◆
t <sub>PHL</sub>	A <sub>n</sub> to $\bar{O}_n$	1.5	3.2	4.3	1.5	6.5	1.5	5.3		



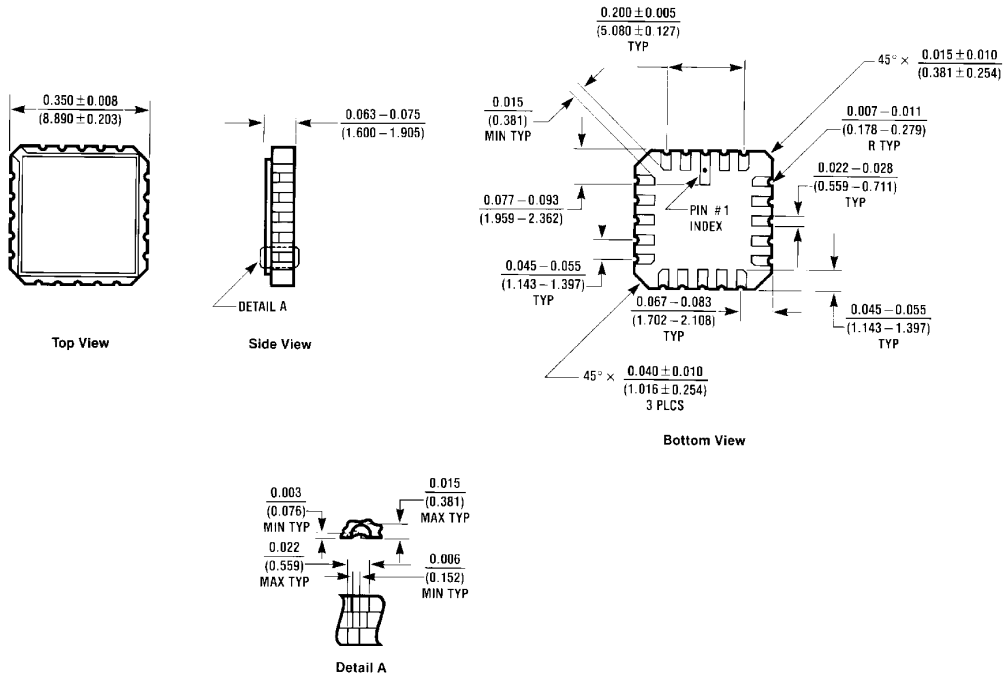
## Ordering Information

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



DS009456-4

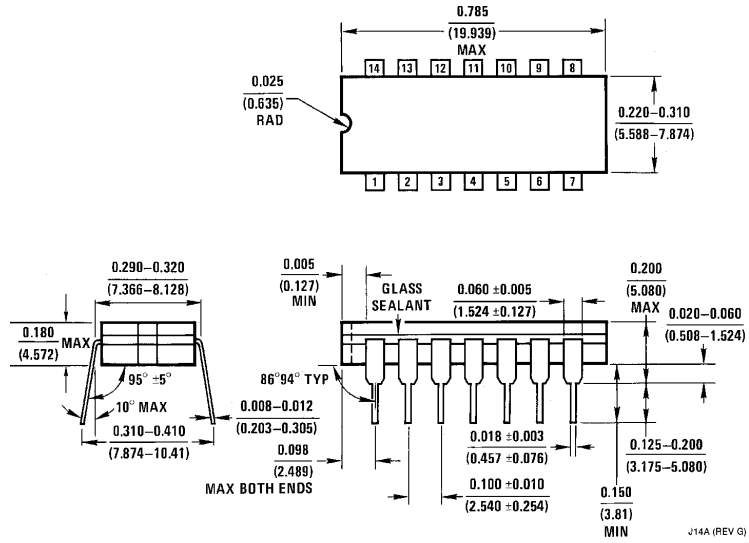
## Physical Dimensions inches (millimeters) unless otherwise noted



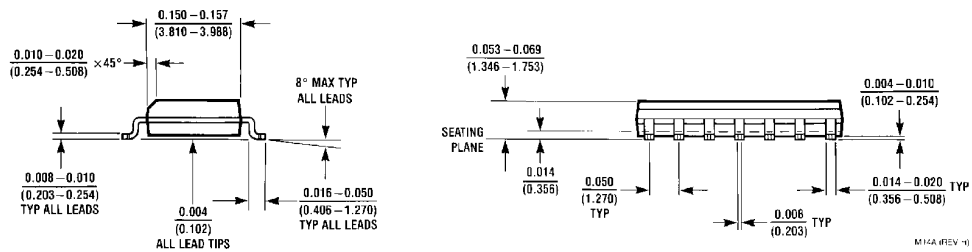
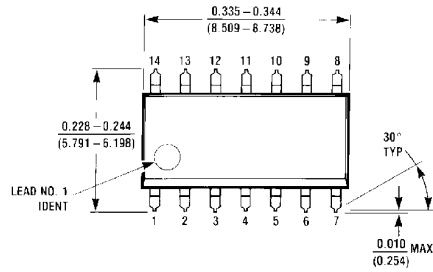
E20A (REV D)

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

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

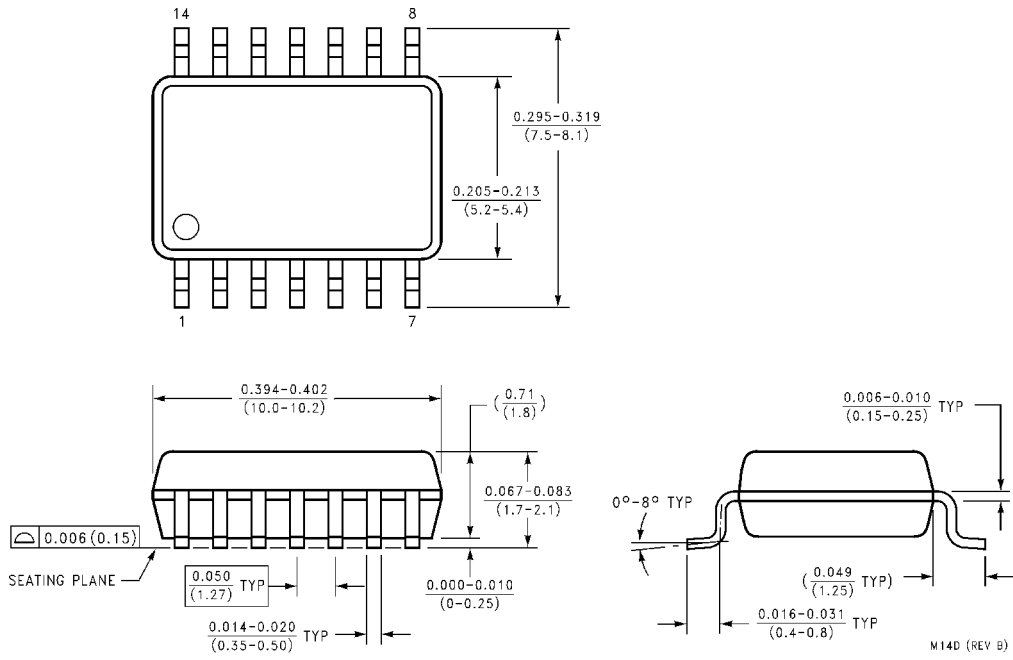


**14-Lead Ceramic Dual-In-Line Package (D)  
NS Package Number J14A**

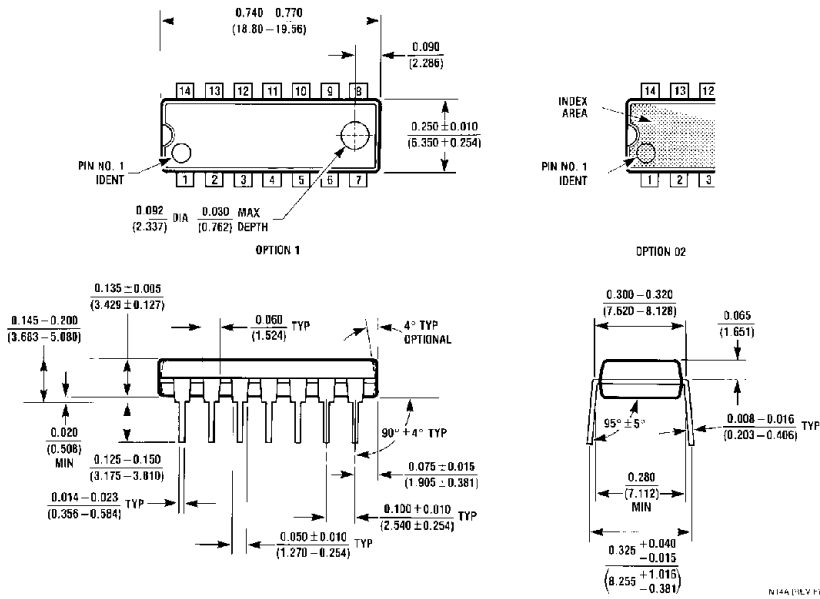


**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M14A**

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

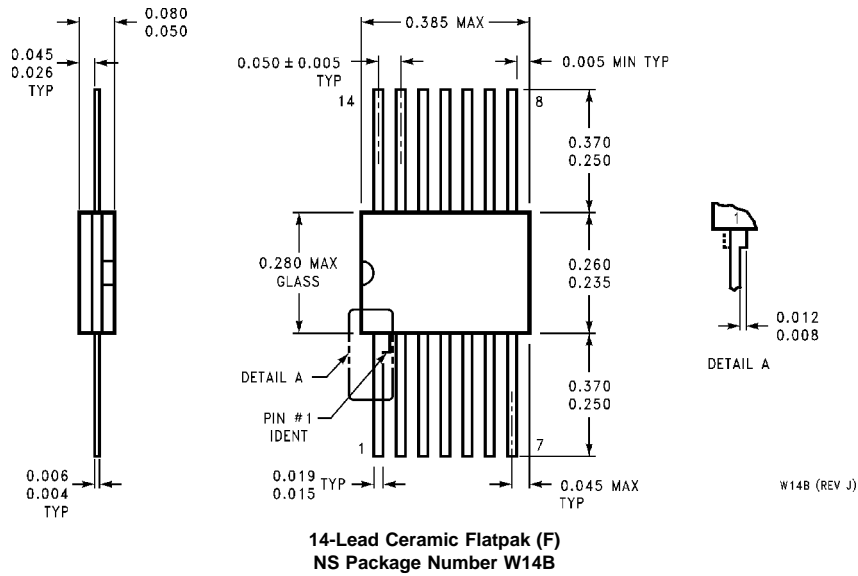


**14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M14D**



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


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



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