

## 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

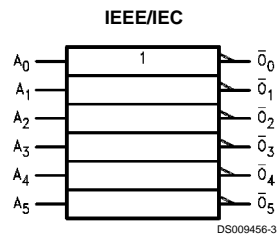
**Ordering Code:** See Section 0

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

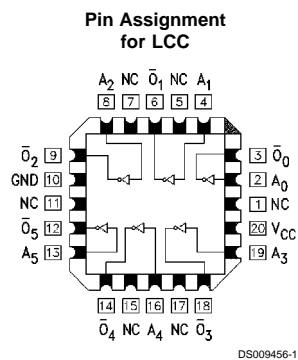
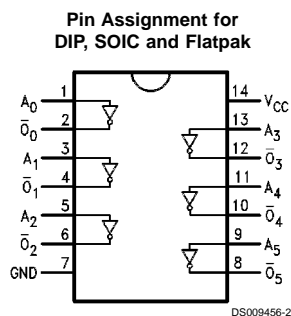
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

**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	54F/74F	
		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
$\overline{O}_n$	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			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>	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
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		2.8	4.2	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current		10.2	15.3	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 $\overline{O}_n$	1.5	3.2	4.3	1.5	6.5	1.5	5.3		

DSXXX

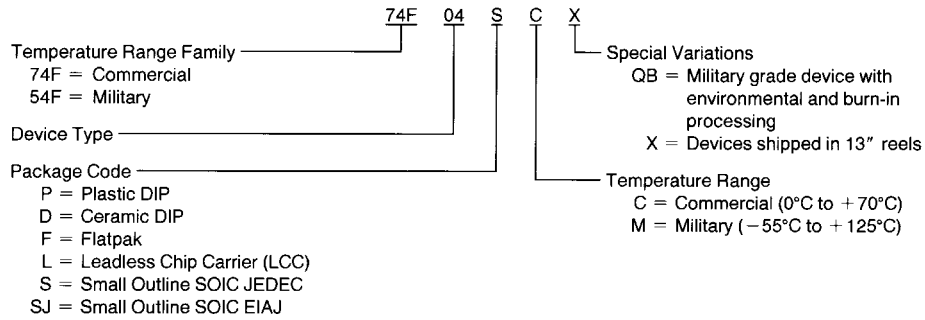
DSXXX

Book  
Extract  
End



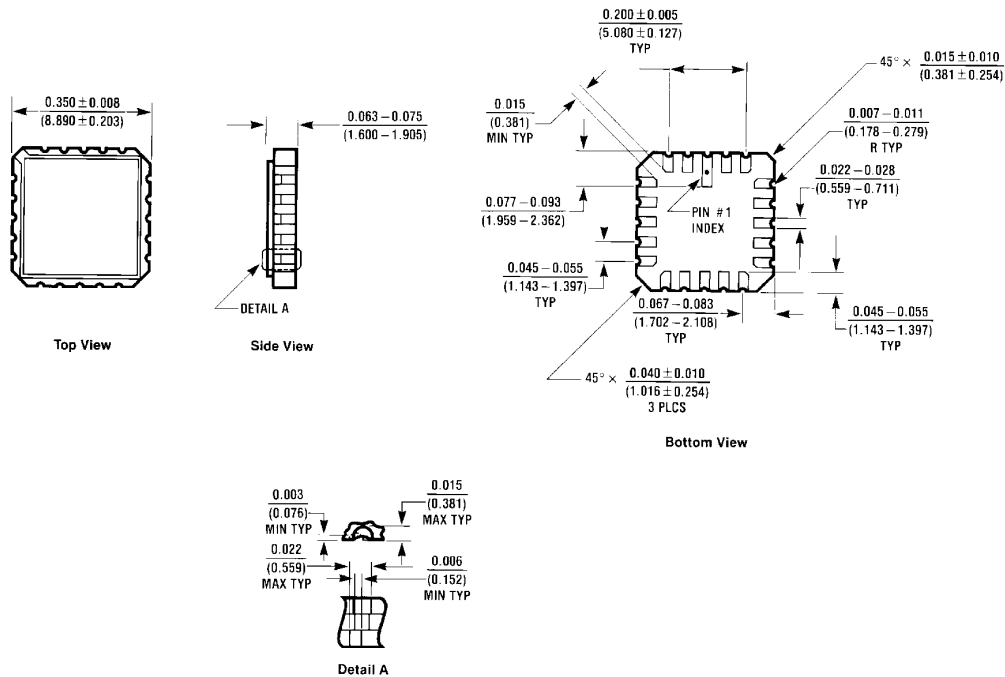
## Ordering Information

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

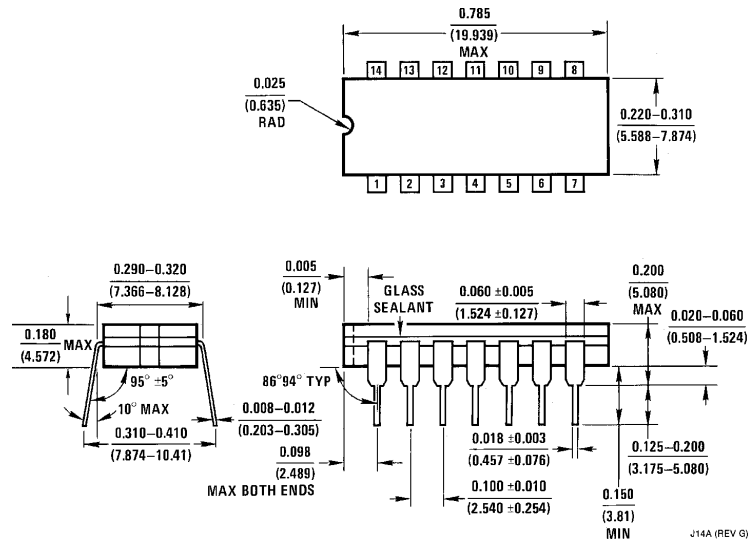
## Physical Dimensions inches (millimeters) unless otherwise noted



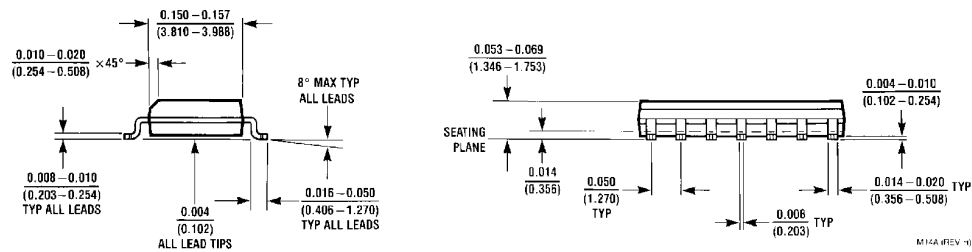
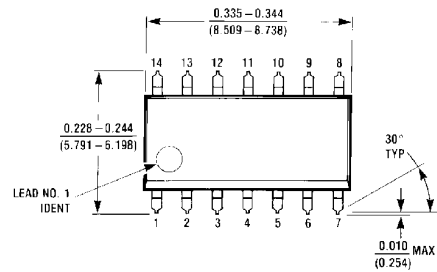
E20A (REV D)

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

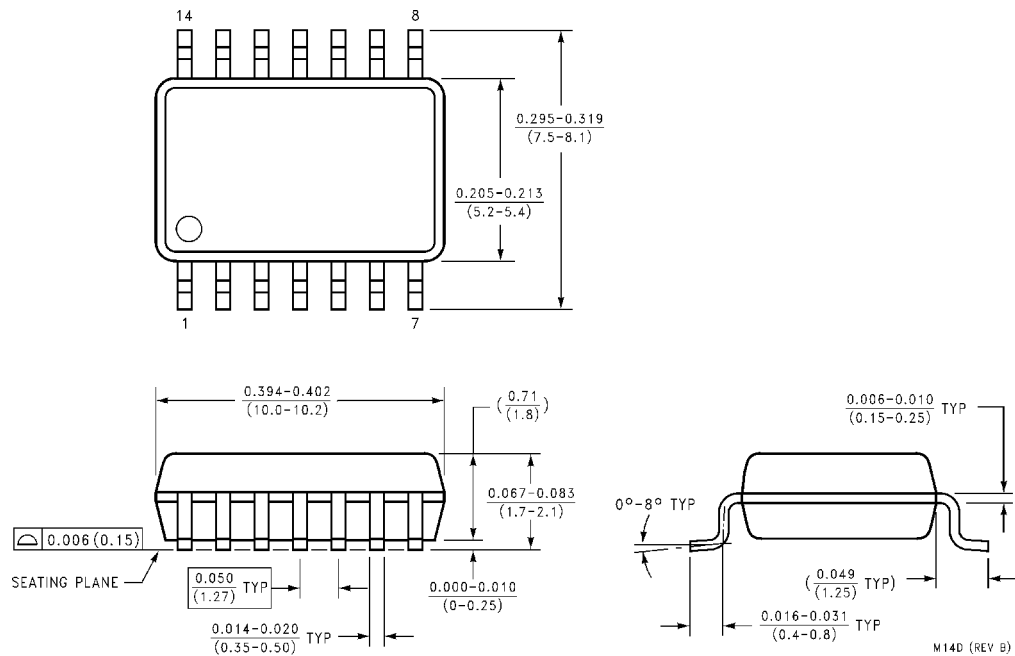
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



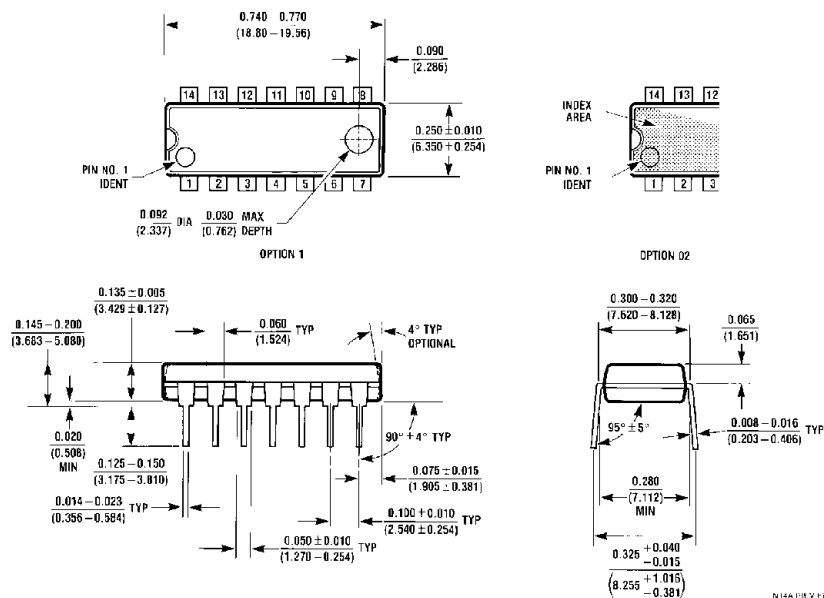
**14-Lead Ceramic Dual-In-Line Package (D)**  
**NS Package Number J14A**



**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**



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