December 1994

National Semiconductor

54F/74F00
Quad 2-Input NAND Gate

General Description

This device contains four independent gates, each of which performs the logic NAND function.

Features

- Guaranteed 4000V minimum ESD protection

Ordering Code: See Section 0

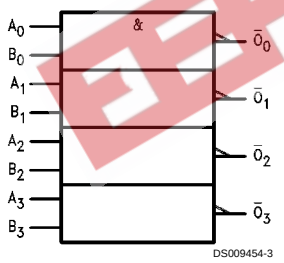
Commercial	Military	Package Number	Package Description
74F00PC		N14A	14-Lead (0.300" Wide) Molded Dual-In-Line
	54F00DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F00SC (Note 1)		M14A	14-Lead (0.150" Wide) Molded Small Outline, JEDEC
74F00SJ (Note 1)		M14D	14-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F00FM (Note 2)	W14B	14-Lead Cerpack
	54F00LM (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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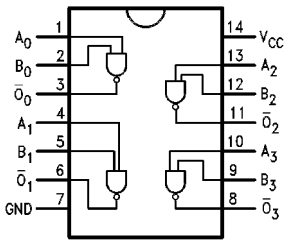
Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



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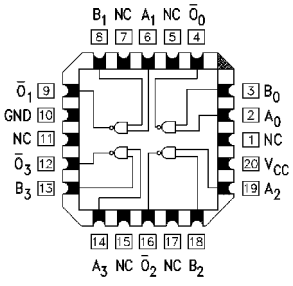
Pin Assignment for LCC



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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, B_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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Absolute Maximum Ratings (Note 3)

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 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_{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

Recommended Operating Conditions

Free Air Ambient Temperature	
Commercial	0˚C to +70˚C
Supply Voltage	
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 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			1.9	2.8	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			6.8	10.2	mA	Max	V_O = LOW

AC Electrical Characteristics

See Section 0 for Waveforms and Load Configurations

Symbol	Parameter	74F T_A = +25˚C, V_{CC} = +5.0V, C_L = 50 pF Min	Typ	Max	54F T_A, V_{CC} = Mil, C_L = 50 pF Min	Max	74F T_A, V_{CC} = Com, C_L = 50 pF Min	Max	Units	Fig. No.
t_{PLH}	Propagation Delay	2.4	3.7	5.0	2.0	7.0	2.4	6.0	ns	⧫⧫-⧫⧫
t_{PHL}	A_n, B_n to $\overline{O}_n$	1.5	3.2	4.3	1.5	6.5	1.5	5.3		

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Book Extract End

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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 00 S C X

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

Device Type

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

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

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

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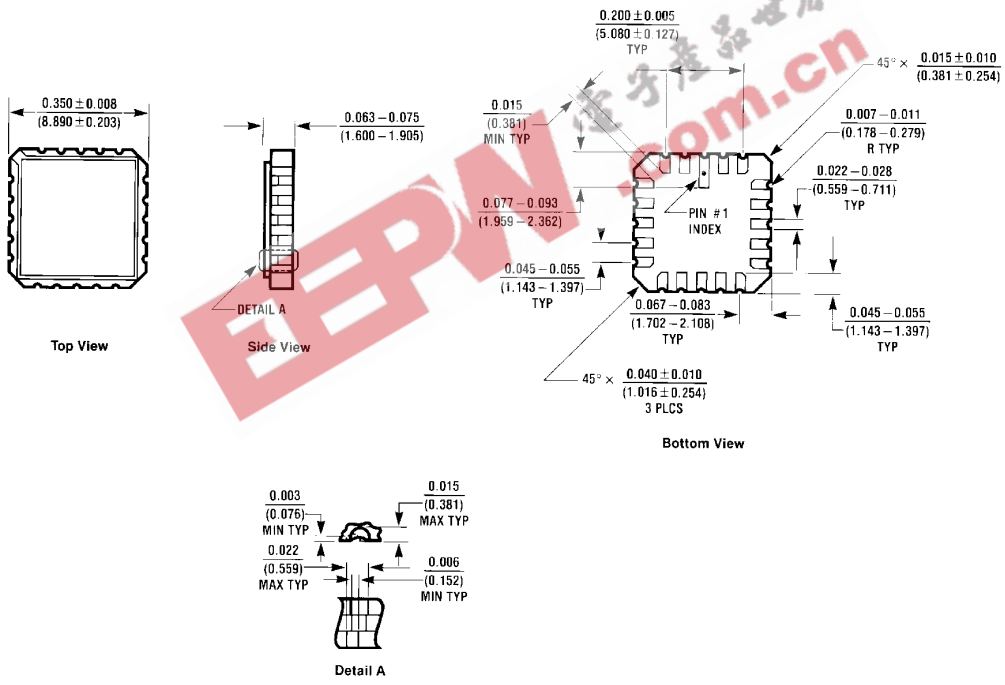
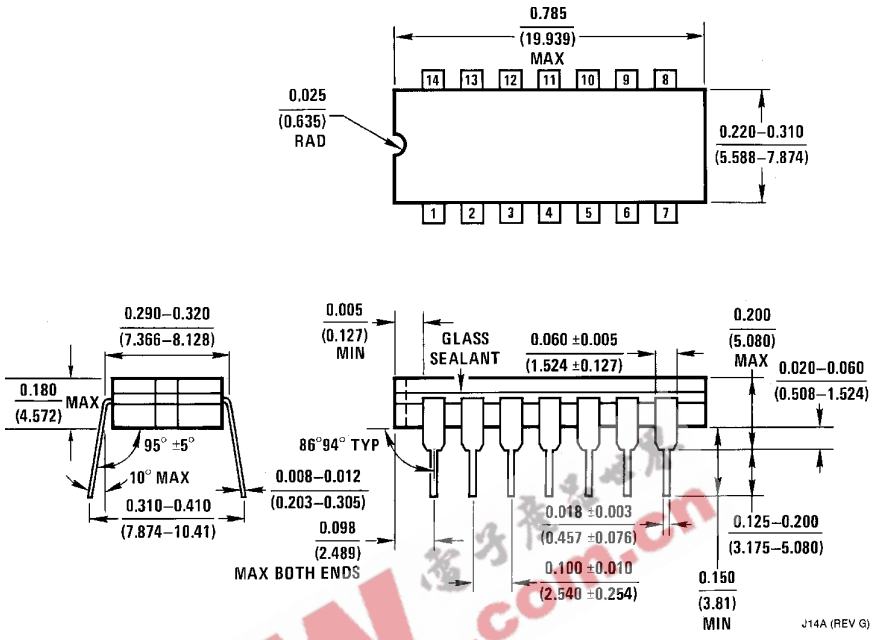
Physical Dimensions inches (millimeters) unless otherwise noted



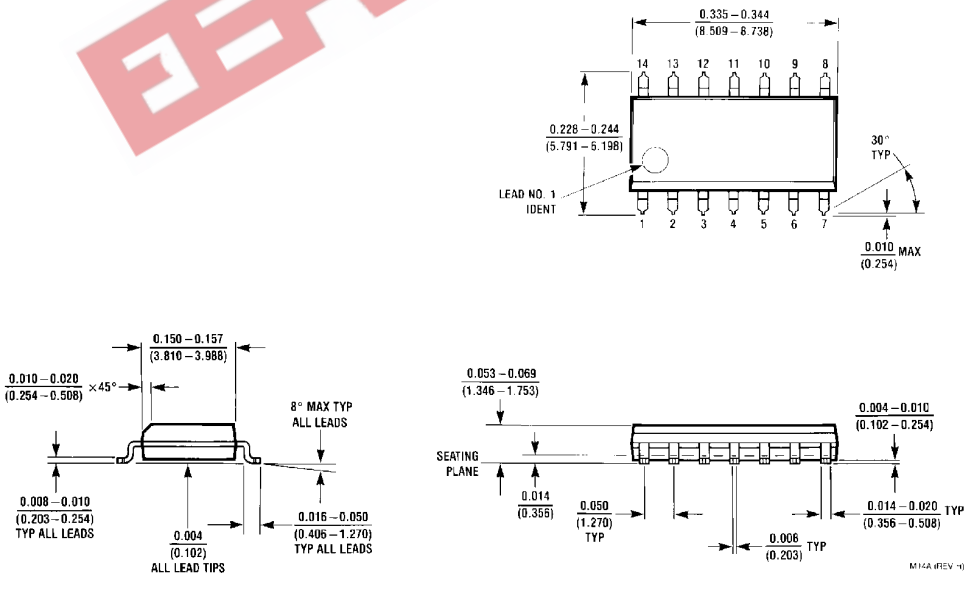
E20A (REV O)

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

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

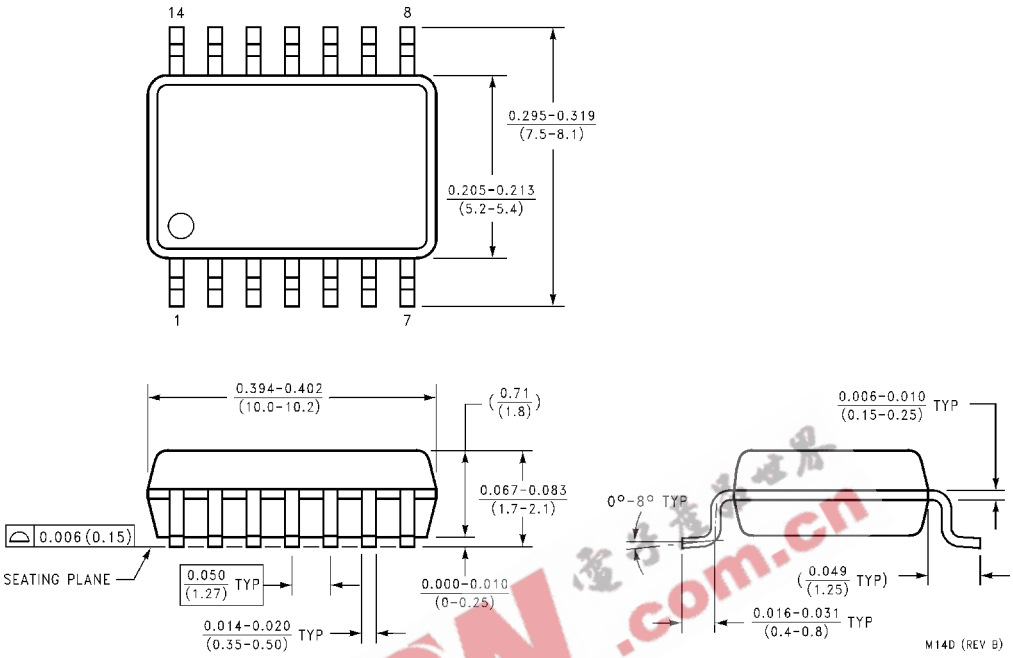


14-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J14A

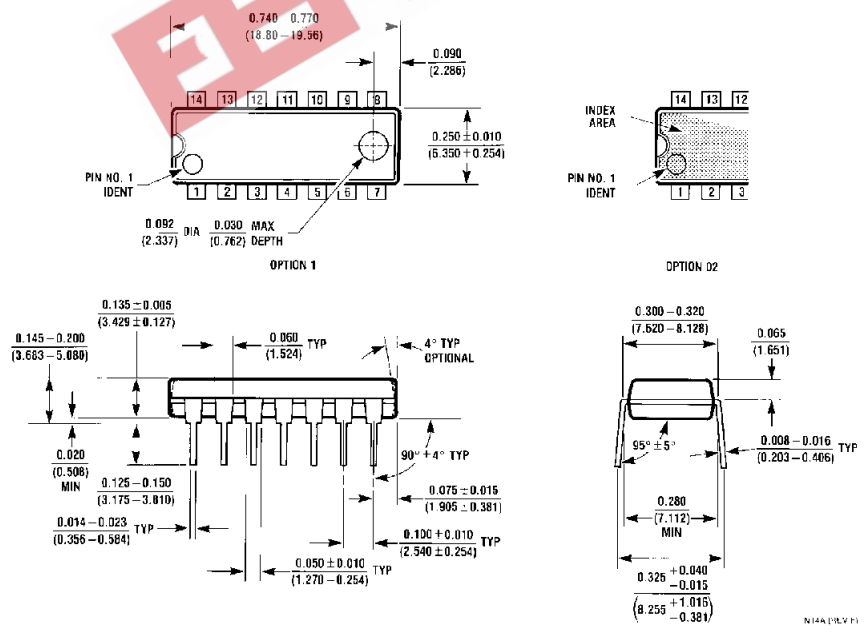


14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M14A

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

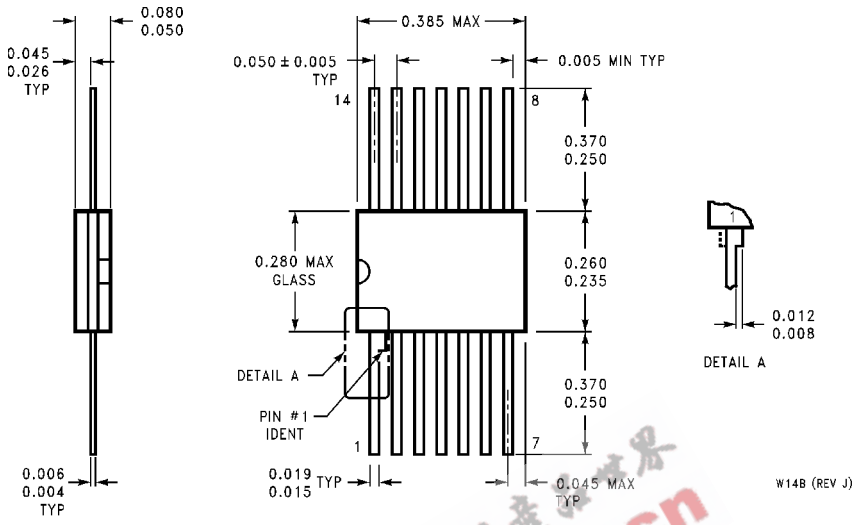


14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M14D



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

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



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

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