National Semiconductor

December 1994

54F/74F38
Quad Two-Input NAND Buffer (Open Collector)

General Description

This device contains four independent gates, each of which performs the logic NAND function. The open-collector outputs require external pull-up resistors for proper logical operation.

Commercial	Military	Package Number	Package Description
74F38PC		N14E	14-Lead (0.300″ Wide) Molded Dual-In-Line
	54F38DM (Note 2)	J14A	14-Lead Ceramic Dual-In-Line
74F38SC (Note 1)		M14A	14-Lead (0.150″ Wide) Molded Small Outline, JEDEC
74F38SJ (Note 1)		M14D	14-Lead (0.300″ Wide) Molded Small Outline, EIAJ
	54F38FM (Note 2)	W14B	14-Lead Cerpack
	54F38LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

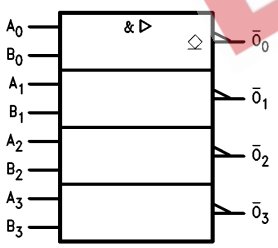
Note 1: Devices also available in 13″ reel. Use suffix = SCX and SJX.

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

Logic Symbol

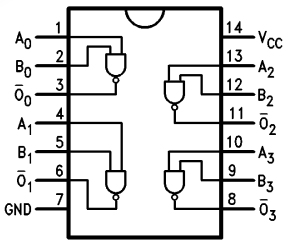
Connection Diagrams

IEEE/IEC



TL/F/9465–3

Pin Assignment for DIP, SOIC and Flatpak



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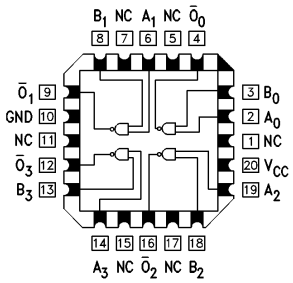
Pin Assignment for LCC



TL/F/9465–2

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

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, B_n	Inputs	1.0/2.0	20 μA/ −1.2 mA
$\overline{O}_n$	Outputs	OC*/106.6 (80)	OC*/64 mA (48 mA)

*OC = Open Collector

Function Table

Inputs		Output
A	B	$\overline{O}$
L	L	H
L	H	H
H	L	H
H	H	L

H = HIGH Voltage Level

L = LOW Voltage Level

Absolute Maximum Ratings (Note 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)

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			Units	V_{CC}	Conditions
			Min	Typ	Max			
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_{OL}	Output LOW Voltage	54F 10% V_{CC}			0.55	V	Min	I_{OL} = 48 mA
		74F 10% V_{CC}			0.55			I_{OL} = 64 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			
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				−1.2	mA	Max	V_{IN} = 0.5V
I_{OHC}	Open Collector, Output OFF Leakage Test				250	μA	Min	V_{OUT} = V_{CC}
I_{CCH}	Power Supply Current			2.1	7.0	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current			26.0	30.0	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}	Propagation Delay	6.5	9.7	12.5	6.5	14.5	6.5	13.0	ns
t_{PHL}	A_n, B_n to $\overline{O}_n$	1.5	2.1	5.0	1.0	5.5	1.5	5.5	

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 38 S C X

Temperature Range Family
74F = Commercial
54F = Military

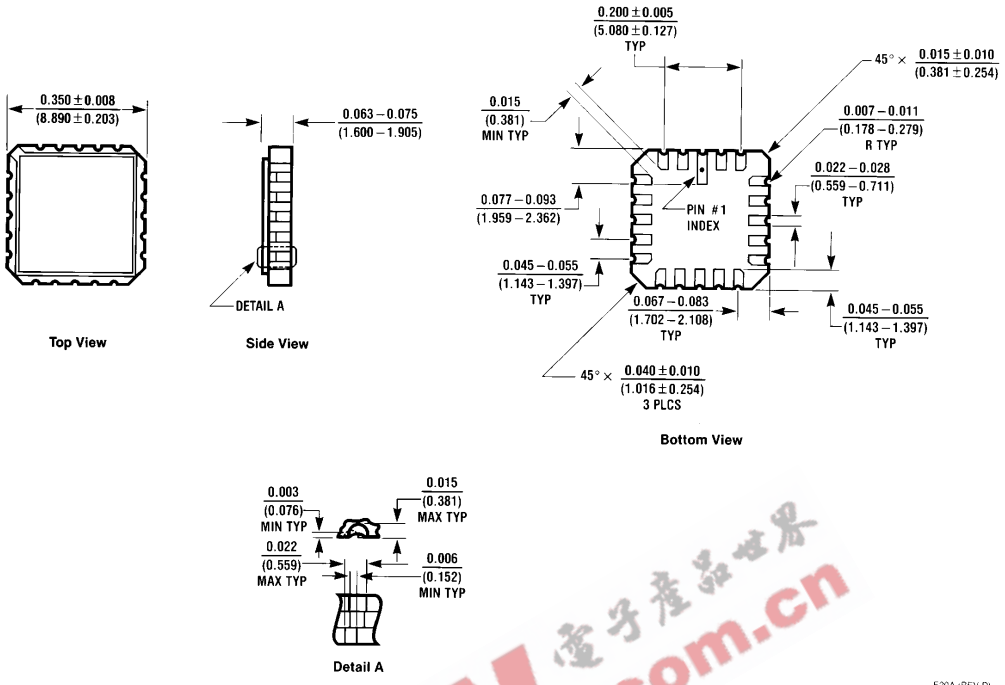
Device Type

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

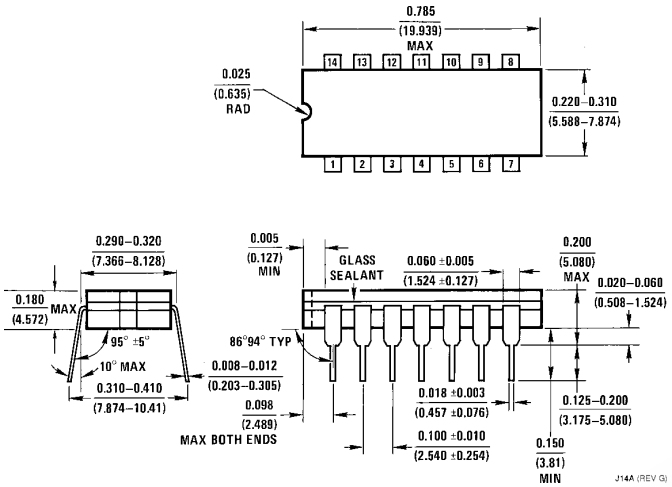
Physical Dimensions inches (millimeters)



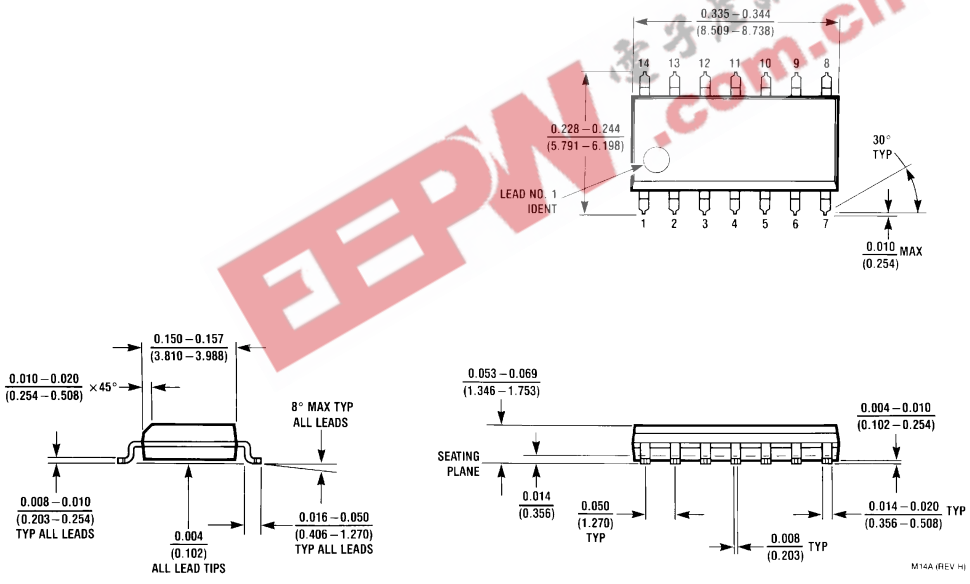
E20A (REV D)

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

Physical Dimensions inches (millimeters) (Continued)

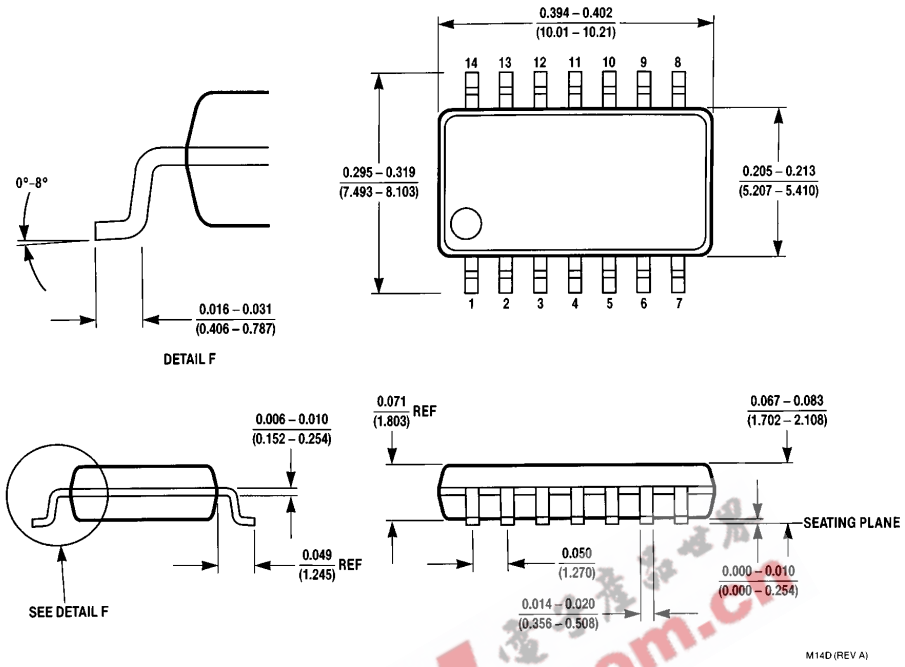


14-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J14A

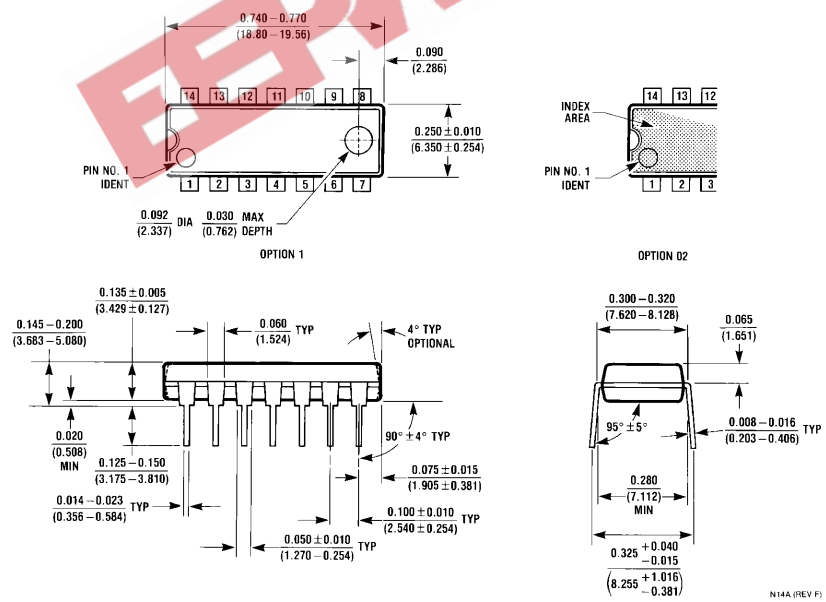


14-Lead (0.150″ Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M14A

Physical Dimensions inches (millimeters) (Continued)

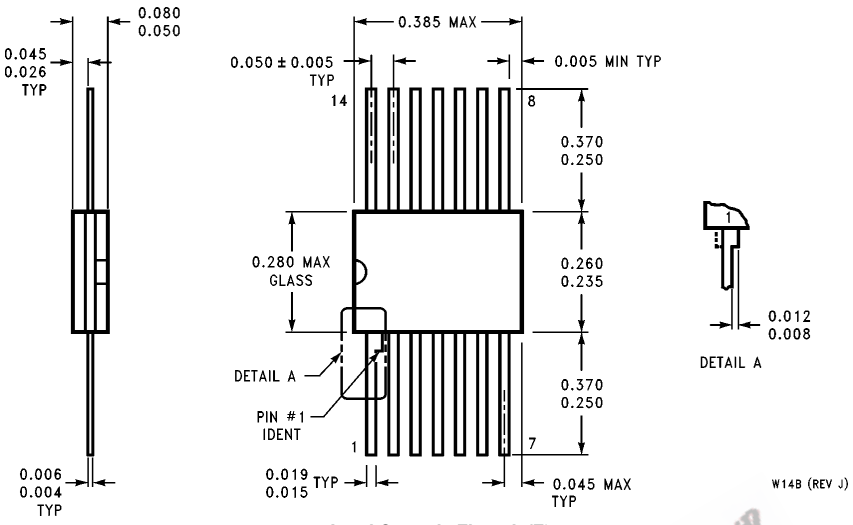


14-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M14D



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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