

## DM74LS38 Quad 2-Input NAND Buffers with Open-Collector Outputs

### 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.

### Features

- Alternate Military/Aerospace device (54LS38) is available. Contact a Fairchild Semiconductor Sales Office/Distributor for specifications.

### Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC} (Min) - V_{OH}}{N_1 (I_{OH}) + N_2 (I_{IH})}$$

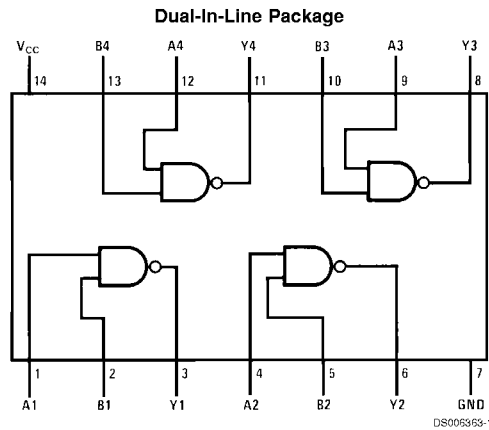
$$R_{MIN} = \frac{V_{CC} (Max) - V_{OL}}{I_{OL} - N_3 (I_{IL})}$$

Where:  $N_1 (I_{OH})$  = total maximum output high current for all outputs tied to pull-up resistor

$N_2 (I_{IH})$  = total maximum input high current for all inputs tied to pull-up resistor

$N_3 (I_{IL})$  = total maximum input low current for all inputs tied to pull-up resistor

### Connection Diagram



Order Number 54LS38DMQB, 54LS38FMQB, 54LS38LMQB,  
DM54LS38J, DM74LS38M or DM74LS38N  
See Package Number E20A, J14A, M14A, N14A or W14B

### Function Table

$$Y = \overline{AB}$$

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

H = High Logic Level  
L = Low Logic Level

### Absolute Maximum Ratings (Note 1)

Supply Voltage	7V	Operating Free Air Temperature Range	DM54LS and 54LS	-55°C to +125°C
Input Voltage	7V		DM74LS	0°C to +70°C
Output Voltage	7V	Storage Temperature Range		-65°C to +150°C

### Recommended Operating Conditions

Symbol	Parameter	DM54LS38			DM74LS38			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7			0.8	V
V <sub>OH</sub>	High Level Output Voltage			5.5			5.5	V
I <sub>OL</sub>	Low Level Output Current			12			24	mA
T <sub>A</sub>	Free Air Operating Temperature	-55		125	0		70	°C

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

### Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA			-1.5	V
I <sub>CEX</sub>	High Level Output Current	V <sub>CC</sub> = Min, V <sub>O</sub> = 5.5V V <sub>IL</sub> = Max			250	μA
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max	DM54	0.25	0.4	V
		V <sub>IH</sub> = Min	DM74	0.35	0.5	
		I <sub>OL</sub> = 12 mA, V <sub>CC</sub> = Min	DM74	0.25	0.4	
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 7V			0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-0.36	mA
I <sub>CCH</sub>	Supply Current with Outputs High	V <sub>CC</sub> = Max		0.9	2	mA
I <sub>CCL</sub>	Supply Current with Outputs Low	V <sub>CC</sub> = Max		6	12	mA

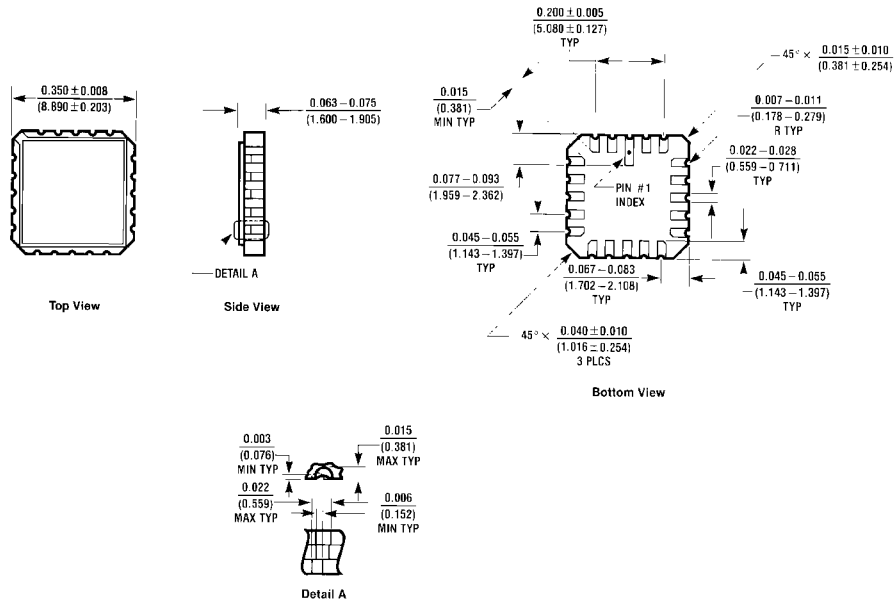
### Switching Characteristics

at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	R <sub>L</sub> = 667Ω				Units
		C <sub>L</sub> = 45 pF		C <sub>L</sub> = 150 pF		
		Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output		22		48	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output		22		29	ns

**Note 2:** All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

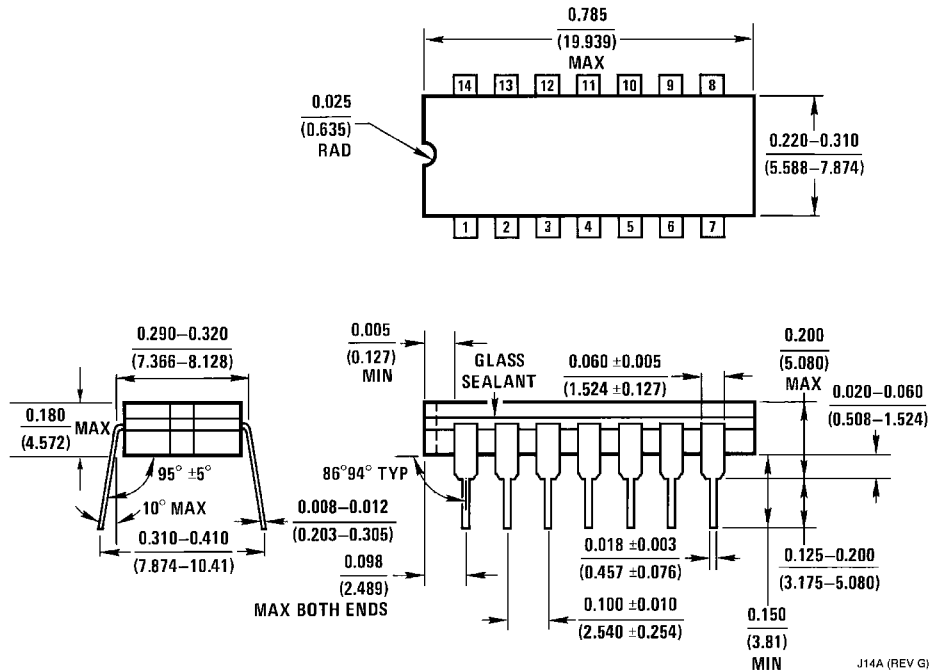
**Physical Dimensions** inches (millimeters) unless otherwise noted



220A REV 11/11

**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS38LMQB**  
**Package Number E20A**

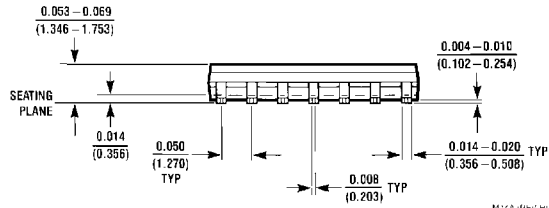
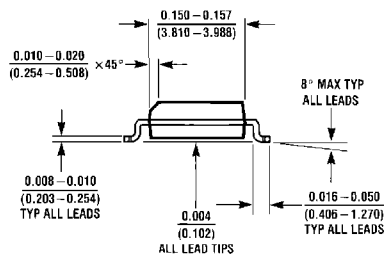
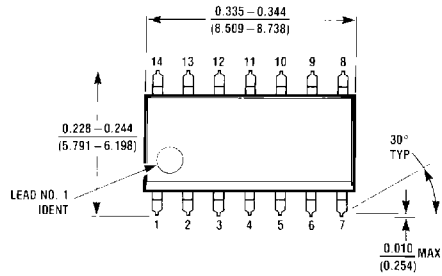
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



14-Lead Ceramic Dual-In-Line Package (J)  
Order Number 54LS538DMQB or DM54LS38J  
Package Number J14A

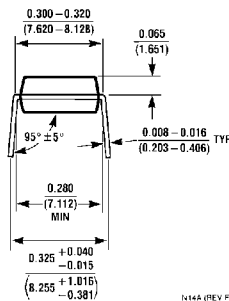
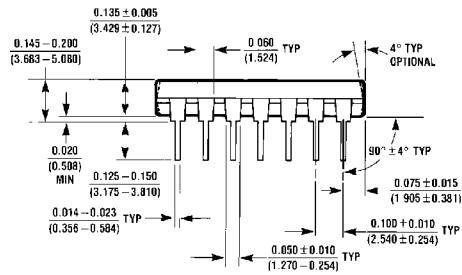
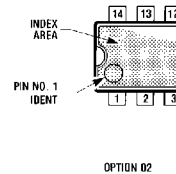
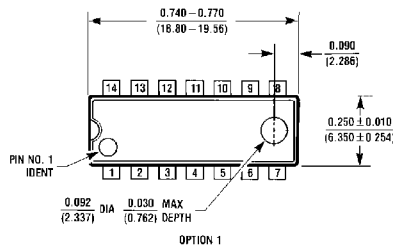
J14A (REV G)

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



M14A (REV HI)

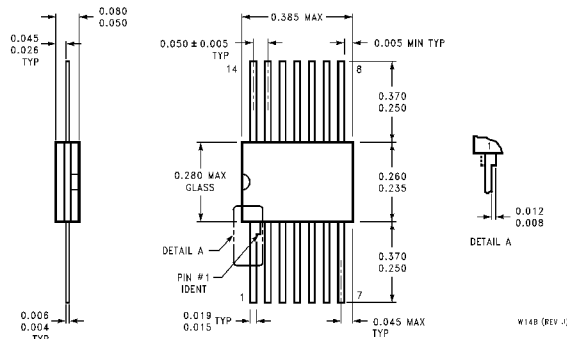
**14-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS38M**  
**Package Number M14A**



N14A (REV P)

**14-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS38N**  
**Package Number N14A**

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



**14-Lead Ceramic Flat Package (N)**  
**Order Number 54LS538DMQB or DM54LS38W**  
**Package Number W14B**

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