

38A



T-43-15-00

## DM54ALS38A/DM74ALS38A Quadruple 2-Input NAND Buffer 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.

### Pull-Up Resistor Equations

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

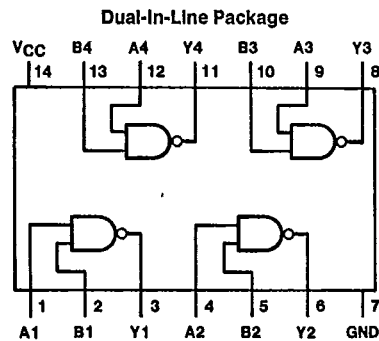
$$R_{MIN} = \frac{V_{CC} (Max) - V_{OL}}{I_{OL} - N_3 (I_{IL})}$$

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

### Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and  $V_{CC}$  range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin for pin compatible with LS TTL counterpart
- Improved AC performance over LS38
- Improved line receiving characteristics

### Connection Diagram



TL/F/6193-1

Order Number DM54ALS38AJ, DM74ALS38AM or DM74ALS38AN  
 See NS Package Number J14A, M14A or N14A

### 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

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If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Note: 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.

Supply Voltage	7V
Input Voltage	7V
High Level Output Voltage	7V
Operating Free Air Temperature Range	
DM54ALS	-55°C to +125°C
DM74ALS	0°C to +70°C
Storage Temperature Range	-65°C to +150°C
Typical $\theta_{JA}$	
N Package	83.0°C/W
M Package	114.0°C/W

### Recommended Operating Conditions

Symbol	Parameter	DM54ALS38A			DM74ALS38A			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.5	5	5.5	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

### Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>IK</sub>	Input Clamp Voltage	V <sub>CC</sub> = 4.5V, I <sub>I</sub> = -18 mA			-1.5	V
I <sub>OH</sub>	High Level Output Current	V <sub>CC</sub> = 4.5V, V <sub>OH</sub> = 5.5V			100	μA
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = 4.5V V <sub>IH</sub> = 2V	54/74ALS I <sub>OL</sub> = 12 mA	0.25	0.4	V
			74ALS I <sub>OL</sub> = 24 mA	0.35	0.5	V
I <sub>I</sub>	Input Current at Max Input Voltage	V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 7V			0.1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IH</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = 5.5V, V <sub>IL</sub> = 0.4V			-0.1	mA
I <sub>CCH</sub>	Supply Current with Outputs High	V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 0V		0.86	1.6	mA
I <sub>CCL</sub>	Supply Current with Outputs Low	V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 4.5V		4.0	7.8	mA

### Switching Characteristics over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	DM54ALS38A		DM74ALS38A		Units
			Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output	V <sub>CC</sub> = 4.5V to 5.5V R <sub>L</sub> = 500Ω C <sub>L</sub> = 50 pF	10	55	10	33	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output		2	20	2	12	ns

Note 1: See Section 1 for test waveforms and output load.

