

# SN74ALS38A, SN54ALS38A QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

D2661, APRIL 1982 - REVISED MAY 1986

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

## description

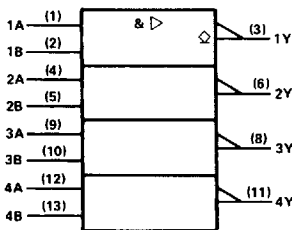
These devices contain four independent 2-input NAND buffer gates with open-collector outputs. These NAND buffers perform the Boolean functions  $Y = \overline{A \cdot B}$  or  $Y = \overline{A + B}$  in positive logic. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher  $V_{OH}$  levels.

The SN54ALS38A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS38A is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

**FUNCTION TABLE** (each gate)

INPUTS		OUTPUT
A	B	Y
H	H	L
L	X	H
X	L	H

## logic symbol†

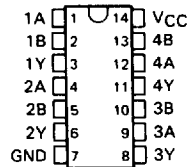


† This symbol is in accordance with ANSI/IEEE Std 91 1984 and IEC Publication 617-12

Pin numbers shown are for D, J, and N packages

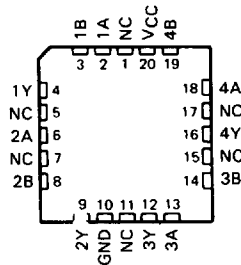
SN54ALS38A . . . J PACKAGE  
SN74ALS38A . . . D OR N PACKAGE

(TOP VIEW)



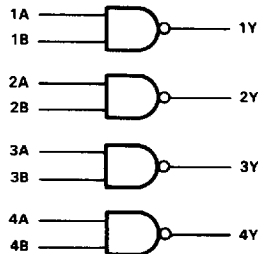
SN54ALS38A . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

## logic diagram (positive logic)



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**TEXAS  
INSTRUMENTS**

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, $V_{CC}$ .....	7 V
Input voltage .....	7 V
Operating free-air temperature range: SN54ALS38A .....	-55°C to 125°C
SN74ALS38A .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

recommended operating conditions

		SN54ALS38A			SN74ALS38A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.7			0.8	V
$V_{OH}$	High-level output voltage			5.5			5.5	V
$I_{OL}$	Low-level output current			12			24	mA
$T_A$	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54ALS38A		SN74ALS38A		UNIT
		MIN	TYP <sup>†</sup> MAX	MIN	TYP <sup>†</sup> MAX	
$V_{IK}$	$V_{CC} = 4.5$ V, $I_I = -18$ mA		-1.5		-1.5	V
$I_{OH}$	$V_{CC} = 4.5$ V, $V_{OH} = 5.5$ V		0.1		0.1	mA
$V_{OL}$	$V_{CC} = 4.5$ V, $I_{OL} = 12$ mA		0.25 0.4		0.25 0.4	V
	$V_{CC} = 4.5$ V, $I_{OL} = 24$ mA				0.35 0.5	
$I_I$	$V_{CC} = 5.5$ V, $V_I = 7$ V		0.1		0.1	mA
$I_{IH}$	$V_{CC} = 5.5$ V, $V_I = 2.7$ V		20		20	μA
$I_{IL}$	$V_{CC} = 5.5$ V, $V_I = 0.4$ V		-0.1		-0.1	mA
$I_{CCH}$	$V_{CC} = 5.5$ V, $V_I = 0$ V		0.86 1.6		0.86 1.6	mA
$I_{CCL}$	$V_{CC} = 5.5$ V, $V_I = 4.5$ V		4.8 7.8		4.8 7.8	mA

<sup>†</sup> All typical values are at  $V_{CC} = 5$  V,  $T_A = 25$ °C

switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $C_L = 50$ pF, $R_L = 680$ Ω, $T_A = 25$ °C		$V_{CC} = 4.5$ V to 5.5 V, $C_L = 50$ pF, $R_L = 680$ Ω, $T_A = \text{MIN to MAX}$		UNIT	
			'ALS38A		SN54ALS38A			
			TYP	MIN	MAX	MIN		MAX
$t_{PLH}$	A or B	Y	18	10	59	10	33	ns
$t_{PHL}$	A or B	Y	7	2	18	2	12	

NOTE 1 Load circuit and voltage waveforms are shown in Section 1.