

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

SDLS105 – DECEMBER 1983 – REVISED MARCH 1988

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

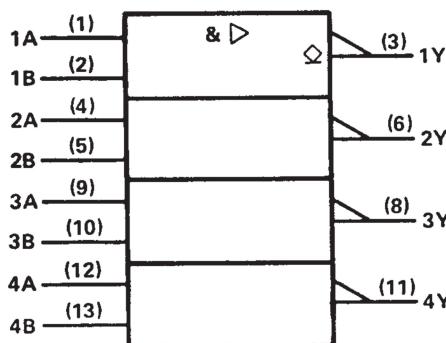
description

These devices contain four independent 2-input NAND buffer gates with open-collector outputs. 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 high V_{OH} levels.

The SN5438, SN54LS38, and SN54S38 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7438, SN74LS38, and SN74S38 are characterized for operation from 0°C to 70°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.

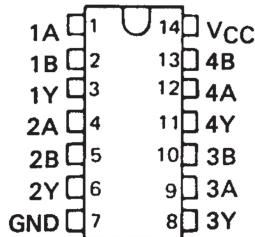
Pin numbers shown are for D, J, N, and W packages.

SN5438, SN54LS38, SN54S38 . . . J OR W PACKAGE

SN7438 . . . N PACKAGE

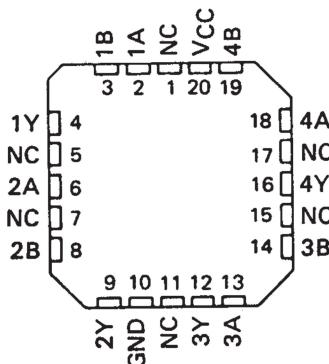
SN74LS38, SN74S38 . . . D OR N PACKAGE

(TOP VIEW)

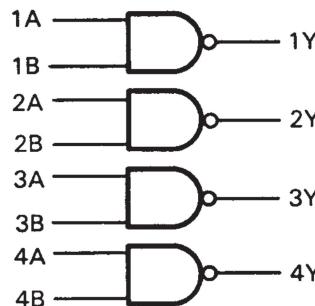


SN54LS38, SN54S38 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

logic diagram**positive logic**

$$Y = \overline{A} \cdot \overline{B} \text{ or } Y = \overline{A} + \overline{B}$$

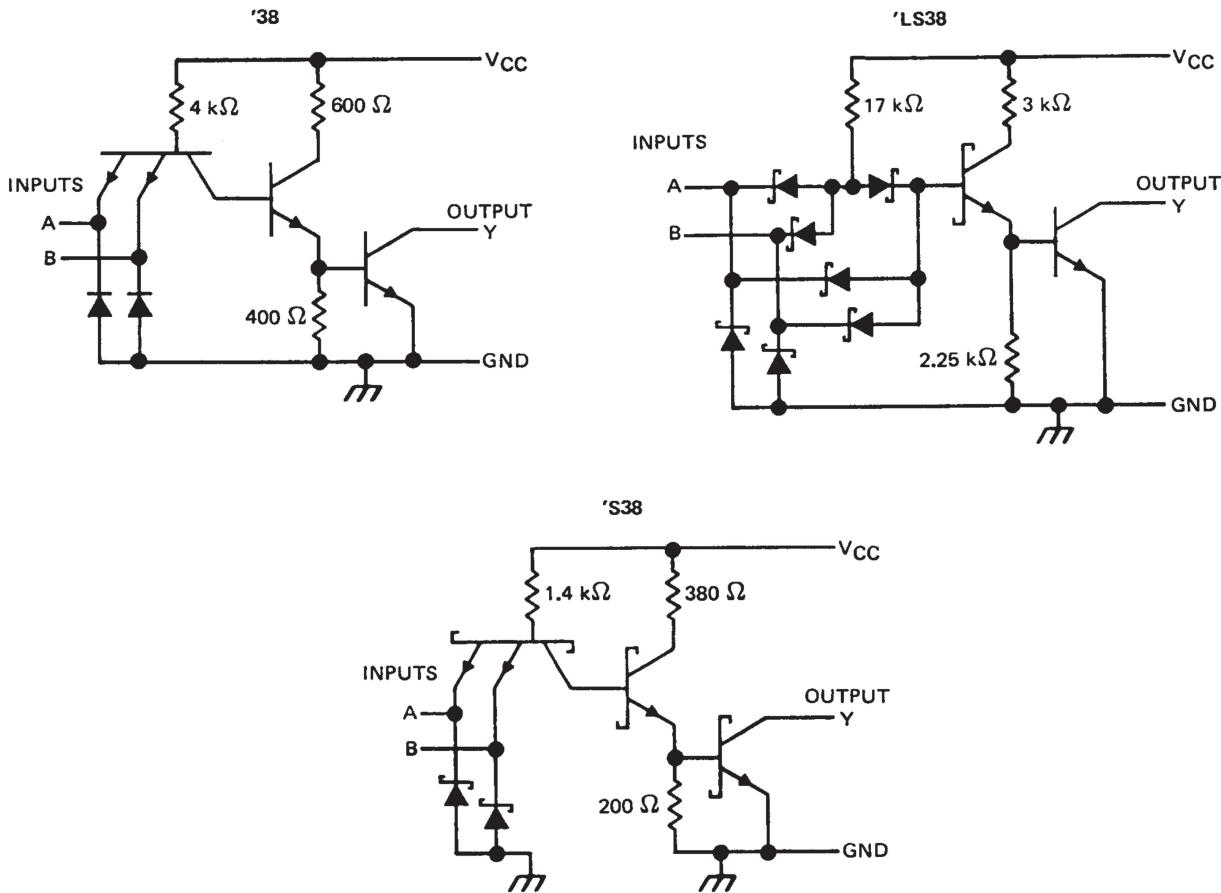
SN5438, SN54LS38, SN54S38

SN7438, SN74LS38, SN74S38

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schematics (each gate)



Resistor values shown are nominal.

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

Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage: '38	5.5 V
LS38	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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recommended operating conditions

		SN5438			SN7438			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High-level input voltage	2			2			V
V _{IL}	Low-level input voltage			0.8			0.8	V
V _{OH}	High-level output voltage			5.5			5.5	V
I _{OL}	Low-level output current			48			48	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 [†]	SN5438			SN7438			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V _{IK}	V _{CC} = MIN, I _I = -12 mA			-1.5			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V						0.25	mA
	V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V			0.25				
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA			0.4			0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-1.6			-1.6	mA
I _{CCH}	V _{CC} = MAX, V _I = 0			5 8.5			5 8.5	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V			34 54			34 54	mA

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 133 Ω, C _L = 45 pF	14	22	ns	
				11	18	ns	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

SN5438, SN54LS38, SN54S38

SN7438, SN74LS38, SN74S38

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recommended operating conditions

	SN54LS38	SN74LS38			UNIT	
		MIN	NOM	MAX		
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25
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 †	SN54LS38			SN74LS38			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = MAX, V _{OH} = 5.5 V			0.25			0.25	mA
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 12 mA		0.25	0.4	0.25	0.4		V
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 24 mA				0.35	0.5		
I _I	V _{CC} = MAX, V _I = 7 V			0.1			0.1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			20			20	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-0.4			-0.4	mA
I _{CCH}	V _{CC} = MAX, V _I = 0		0.9	2	0.9	2	mA	
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		6	12	6	12	mA	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 667 Ω, C _L = 45 pF	20	32	ns	
				18	28	ns	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



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recommended operating conditions

		SN54S38			SN74S38			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High-level input voltage	2			2			V
V _{IL}	Low-level input voltage			0.8			0.8	V
V _{OH}	High-level output voltage			5.5			5.5	V
I _{OL}	Low-level output current			60			60	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 [†]	SN54S38			SN74S38			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V _{IK}	V _{CC} = MIN, I _I = –18 mA			–1.2			–1.2	V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V						0.25	mA
	V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V			0.25				
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 60 mA			0.5			0.5	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			0.1			0.1	mA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			–4			–4	mA
I _{CCH}	V _{CC} = MAX, V _I = 0	20	36		20	36		mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	46	80		46	80		mA

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.[‡]All typical values are at V_{CC} = 5 V, T_A = 25°C.switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A or B	Y	R _L = 93 Ω, C _L = 50 pF	6.5	10		ns
t _{PHL}				6.5	10		ns
t _{PLH}		Y	R _L = 93 Ω, C _L = 150 pF	9			ns
t _{PHL}				8.5			ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.