SN54F38, SN74F38
QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

SDFS013A – MARCH 1987 – REVISED OCTOBER 1993

- **Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**

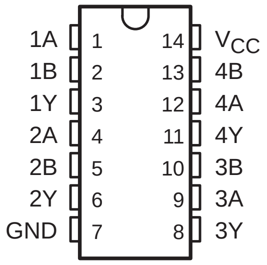
description

These devices contain four independent 2-input NAND buffer gates with open-collector outputs. They perform the Boolean functions $Y = \overline{A \bullet B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

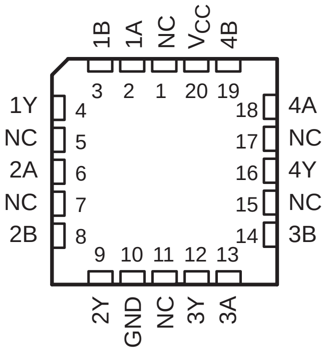
The open-collector outputs require pullup resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN54F38 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74F38 is characterized for operation from 0°C to 70°C.

SN54F38 . . . J PACKAGE
SN74F38 . . . D OR N PACKAGE
(TOP VIEW)



SN54F38 . . . FK PACKAGE
(TOP VIEW)

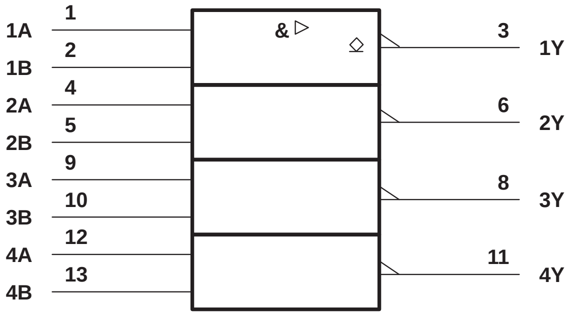


NC – No internal connection

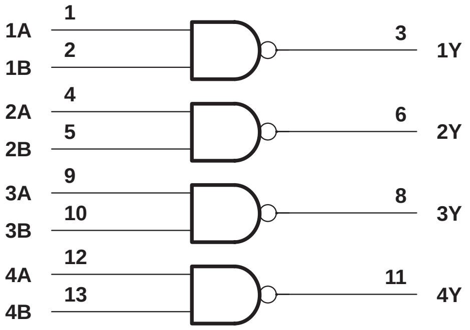
FUNCTION TABLE
(each gate)

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

logic symbol†



logic diagram (positive logic)



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

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

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

Supply voltage range, V_{CC}		–0.5 V to 7 V
Input voltage range, V_I (see Note 1)		–0.5 V to 7 V
Input current range		–30 mA to 5 mA
Voltage range applied to any output in the high state		–0.5 V to V_{CC}
Current into any output in the low state		128 mA
Operating free-air temperature range:	SN54F38	–55°C to 125°C
	SN74F38	0°C to 70°C
Storage temperature range		–65°C to 150°C

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

recommended operating conditions

		SN54F38			SN74F38			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			0.8			0.8	V
I_{IK}	Input clamp current			–18			–18	mA
V_{OH}	High-level output voltage			4.5			4.5	V
I_{OL}	Low-level output current			48			64	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		SN54F38			SN74F38			UNIT
			MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}	V_{CC} = 4.5 V,	I_I = –18 mA		–0.73	–1.2			–1.2	V
V_{OL}	V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.3	0.5		0.3	0.5	V
	V_{CC} = 4.5 V,	I_{OL} = 64 mA		0.3	0.5		0.3	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 = 0.5 V			– 0.6			– 0.6	mA
I_{OH}	V_{CC} = 4.5 V				250			250	µA
I_{CCH}	V_{CC} = 5.5 V,	V_I = 0		4	7		4	7	mA
I_{CCL}	V_{CC} = 5.5 V,	V_I = 4.5 V		22	30		22	30	mA

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

switching characteristics (see Note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 5 V, C_L = 50 pF, R_L = 500 Ω, T_A = 25°C			V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX†				UNIT
			′F38			SN54F38		SN74F38		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	Y	6.7	9.6	12.5	6.2	14	6.7	13	ns
t_{PHL}			1	2.6	5	1	6.5	1	5.5	

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

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

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