- **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 NOR buffer gates with open-collector outputs. Open-collector outputs require resistive pull-up to perform logically but can deliver higher V_{OH} levels and are commonly used in wired-AND applications.

The SN5433 and SN54LS33 are characterized for operation over the full military temperature range of −55 °C to 125 °C. The SN7433, and SN74LS33 are characterized for operation from 0 °C to 70 °C.
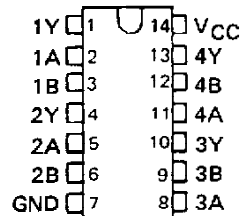
FUNCTION TABLE (each gate)

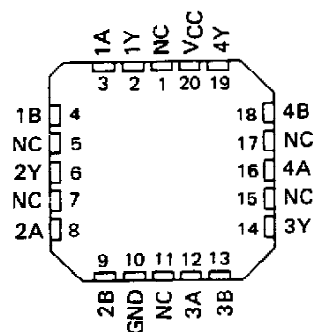| INPUTS		OUTPUT
A	B	Y
H	X	L
X	H	L
L	L	H

logic symbol†
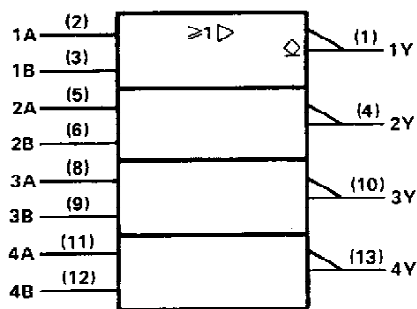
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for D, J, N, and W packages.

SN5433, SN54LS33 . . . J OR W PACKAGE
SN7433 . . . N PACKAGE
SN74LS33 . . . D OR N PACKAGE
(TOP VIEW)
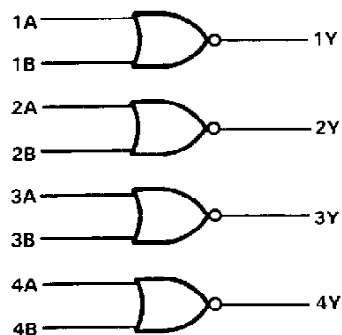

SN54LS33 . . . FK PACKAGE
(TOP VIEW)

NC – No internal connection

logic diagram

positive logic

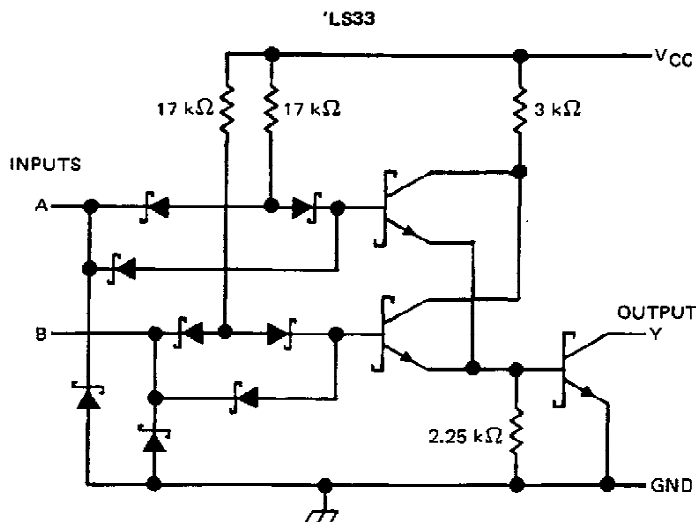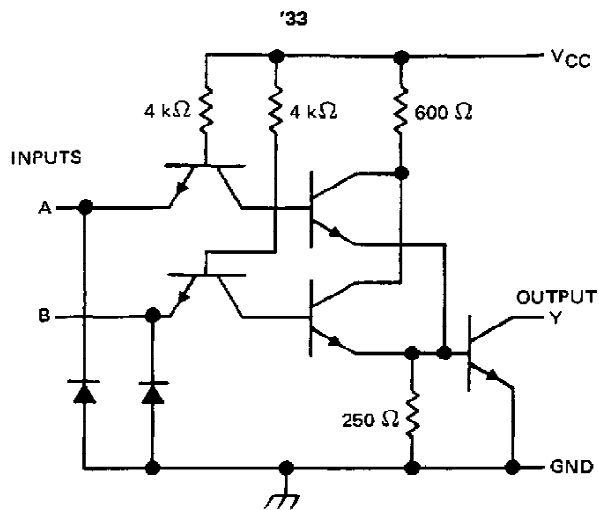$$Y = \overline{A + B} \text{ or } Y = \overline{A} \cdot \overline{B}$$

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schematics (each gate)

'33

'LS33

Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1) . . . . 7 V

Input voltage: '33 . . . . 5.5 V

               'LS33 . . . . 7 V

Off-state output voltage . . . . 7 V

Operating free-air temperature: 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.

recommended operating conditions

		SN5433			SN7433			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[†]	SN5433			SN7433			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		0.2	0.4		0.2	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		3	6		3	6	mA
I_{CCL}	V_{CC} = MAX, See Note 2		9	16.5		9	16.5	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.
NOTE 2: One input at 4.5 V, all others at 0 V.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	R_L = 133 kΩ, C_L = 50 pF		10	15	ns
t_{PHL}					12	18	ns
t_{PLH}			R_L = 133 kΩ, C_L = 150 pF		15	22	ns
t_{PHL}					16	24	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

recommended operating conditions

		SN54LS33			SN74LS33			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			0.7			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†			SN54LS33			SN74LS33			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_{IH} = 2 V,	V_{IL} = MAX, V_{OH} = 5.5 V			0.25			0.25	mA
V_{OL}	V_{CC} = MIN,	V_{IH} = 2 V,	V_{IL} = MAX, I_{OL} = 12 mA	0.25	0.4		0.25	0.4		V
	V_{CC} = MIN,	V_{IL} = MAX,	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			1.8	3.6		1.8	3.6	mA
I_{CCL}	V_{CC} = MAX,	See Note 2			6.9	13.8		6.9	13.8	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.
NOTE 2: One input at 4.5 V, all others at 0 V.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 3)

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
t_{PHL}						18	28	ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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