



THE DATASHEET OF SN74LS33DR



SN5433, SN54LS33, SN7433, SN74LS33 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS WITH OPEN-COLLECTOR OUTPUTS

SDLS101

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

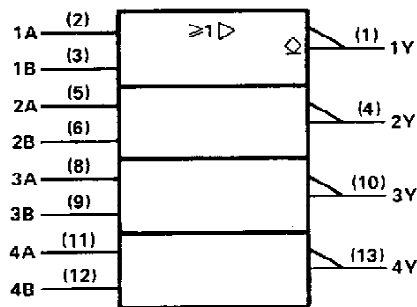
These devices contain four independent 2-input NOR buffer gates with open-collector outputs. Open-collector outputs require resistive pull-up to perform logically but can deliver higher V_{OH} levels and are commonly used in wired-AND applications.

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

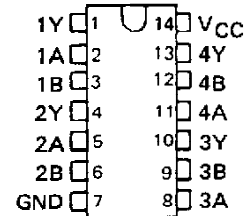
logic symbol†



† 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.

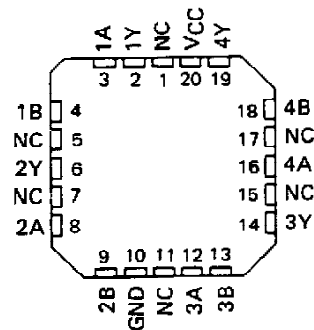
SN5433, SN54LS33 . . . J OR W PACKAGE
SN7433 . . . N PACKAGE
SN74LS33 . . . D OR N PACKAGE

(TOP VIEW)



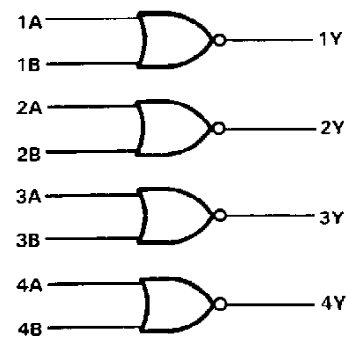
SN54LS33 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

logic diagram



positive logic

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

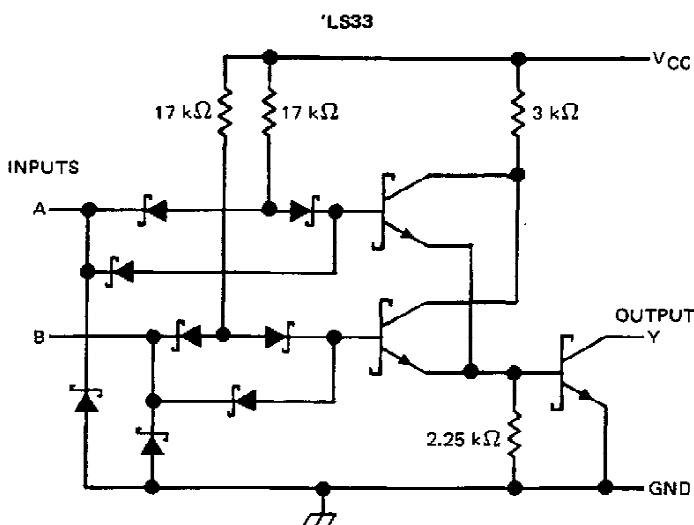
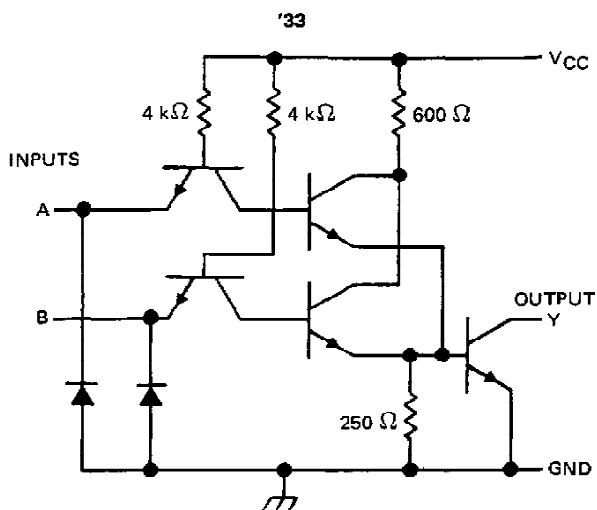
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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SN5433, SN54LS33, SN7433, SN74LS33 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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: '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.

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SN5433, SN7433
QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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			V
V _{OH}	High-level output voltage				5.5			V
I _{OL}	Low-level output current				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.

SN54LS33, SN74LS33

QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS WITH OPEN-COLLECTOR OUTPUTS

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}	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$		-1.5			-1.5		V
I_{OH}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = \text{MAX}$, $V_{OH} = 5.5 \text{ V}$		0.25			0.25		mA
V_{OL}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = \text{MAX}$, $I_{OL} = 12 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $I_{OL} = 24 \text{ mA}$					0.35	0.5	
I_I	$V_{CC} = \text{MAX}$, $V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$			20			20	μA
I_{IL}	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-0.4			-0.4	mA
I_{CCH}	$V_{CC} = \text{MAX}$, $V_I = 0$		1.8	3.6		1.8	3.6	mA
I_{CCL}	$V_{CC} = \text{MAX}$, 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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

NOTE 2: One input at 4.5 V, all others at 0 V.

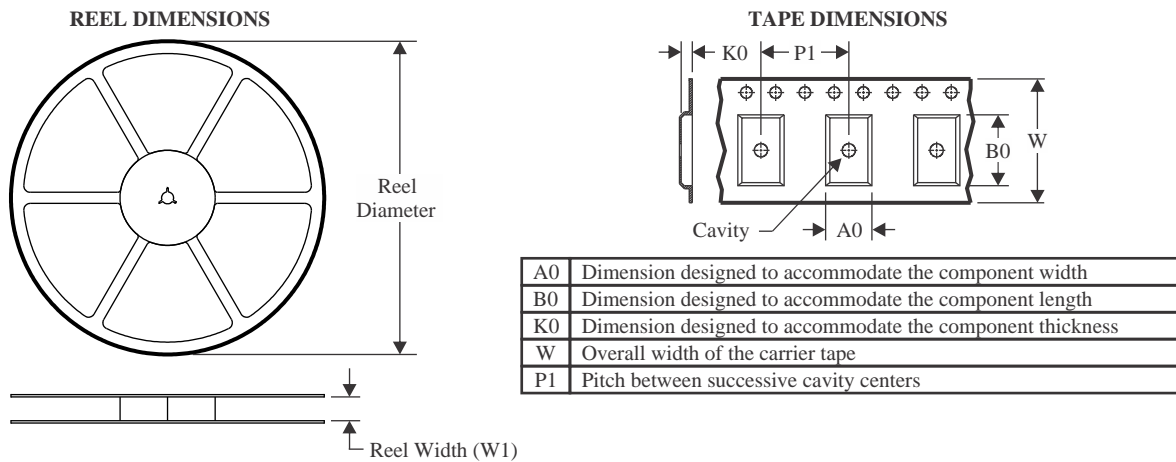
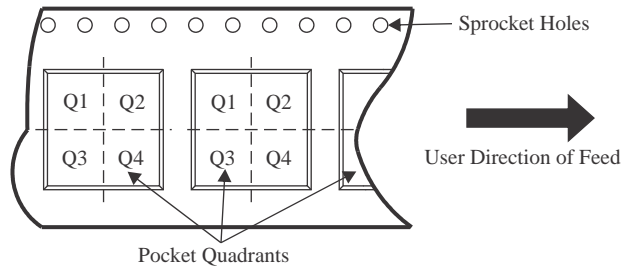
switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y	$R_L = 667 \Omega$, $C_L = 45 \text{ pF}$		20	32	ns
t_{PHL}					18	28	

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

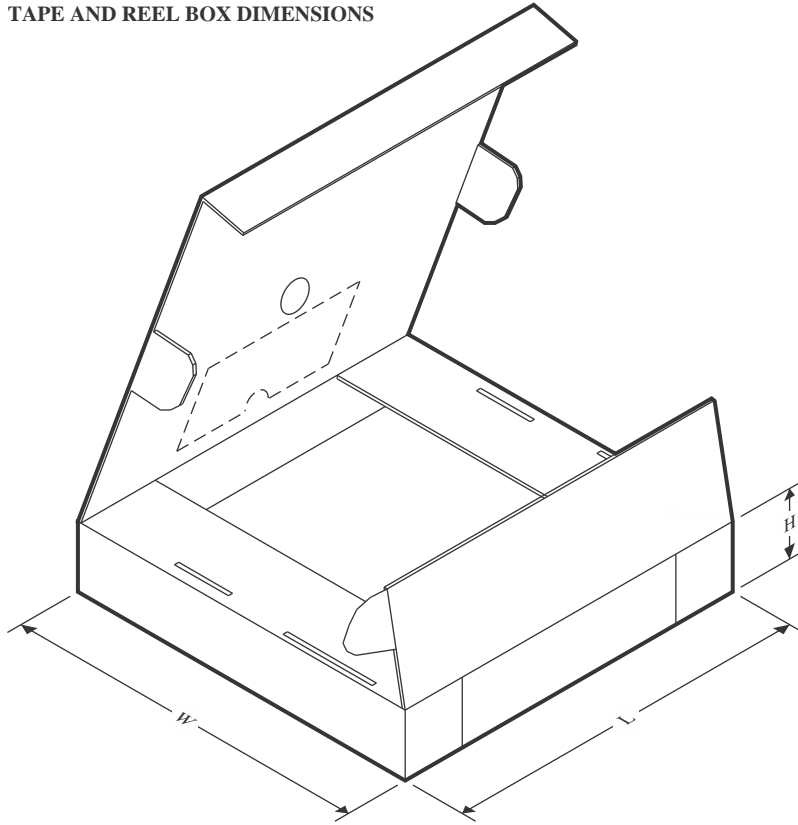
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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


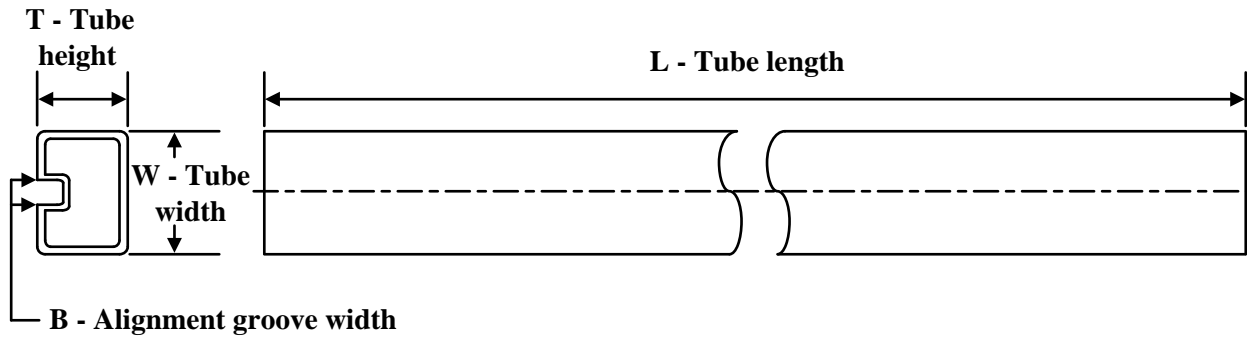
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS33DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS33NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS33DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74LS33NSR	SO	NS	14	2000	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
8512601DA	W	CFP	14	25	506.98	26.16	6220	NA
SN74LS33N	N	PDIP	14	25	506	13.97	11230	4.32
SN74LS33N	N	PDIP	14	25	506	13.97	11230	4.32
SNJ54LS33W	W	CFP	14	25	506.98	26.16	6220	NA

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