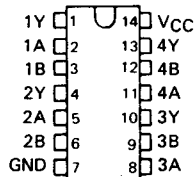


SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

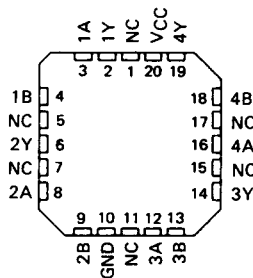
DECEMBER 1983—REVISED MARCH 1988

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

SN5428, SN54LS28 . . . J OR W PACKAGE
SN7428 . . . N PACKAGE
SN74LS28 . . . D OR N PACKAGE
(TOP VIEW)



SN54LS28 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

2

TTL Devices

description

These devices contain four independent 2-input NOR buffer gates.

The SN5428, and SN54LS28 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7428, and SN74LS28 are characterized for operation from 0°C to 70°C.

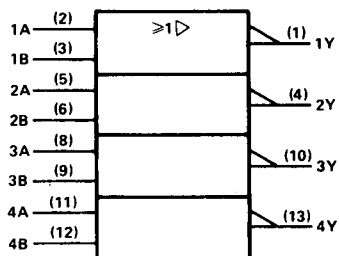
FUNCTION TABLE (each gate)

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

positive logic

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

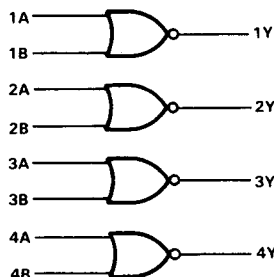
logic symbol†



† 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.

logic diagram



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.

TEXAS
INSTRUMENTS

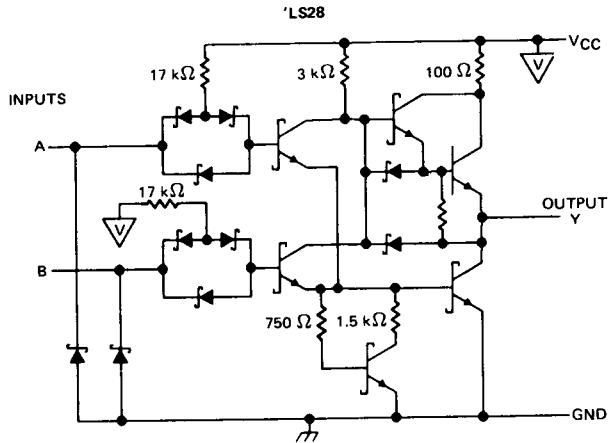
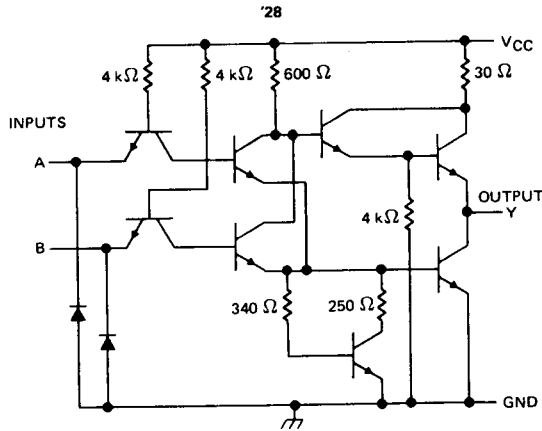
POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

schematics (each gate)

2

TTL Devices



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: '28	5.5 V
'LS28	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.

SN5428, SN7428 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

recommended operating conditions

	SN5428			SN7428			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
I _{OH} High-level output current	-2.4			-2.4			mA
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 †	MIN	TYP ‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = -12mA			-1.5	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -2.4 mA	2.4	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 48 mA		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-1.6	mA
I _{OS} §	V _{CC} = MAX	-70		-180	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		12	21	mA
I _{CCL}	V _{CC} = MAX, See Note 2		33	57	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.

§ Not more than one output should be shorted at a time and the duration of the short circuit should not exceed one second.

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

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 = 133 Ω, C _L = 50 pF	6	9		ns
t _{PHL}				8	12		ns
t _{PLH}			R _L = 133 Ω, C _L = 150 pF	10	15		ns
t _{PHL}				12	18		ns

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

2

TTL Devices

SN54LS28, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

recommended operating conditions

	SN54LS28			SN74LS28			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	
I _{OH} High-level output current	-1.2			-1.2			mA	
I _{OL} Low-level output current	12			24			mA	
T _A Operating free-air temperature	-55			0			70	°C

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

PARAMETER	TEST CONDITIONS †	SN54LS28		SN74LS28		UNIT	
		MIN	TYP ‡	MAX	MIN		TYP ‡
V _{IK}	V _{CC} = MIN, I _I = -18 mA	-1.5		-1.5		V	
V _{OH}	V _{CC} = MIN, V _{IL} = MAX, I _{OH} = -1.2 mA	2.5	3.4	2.7	3.4	V	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 12 mA	0.25		0.24		V	
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 24 mA			0.35			
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 _{OS} §	V _{CC} = MAX	-30	-130	-30	-130	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0 V	1.8		1.8		mA	
I _{CCL}	V _{CC} = MAX, See Note 2	6.9		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.

§ Not more than one output should be shorted at a time and the duration of the short circuit should not exceed one second.

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

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			12	24	ns
t _{PHL}							12	24	ns

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

2

TTL Devices