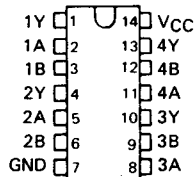


SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

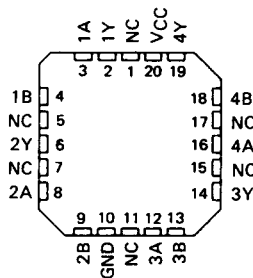
DECEMBER 1983—REVISED MARCH 1988

- 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.

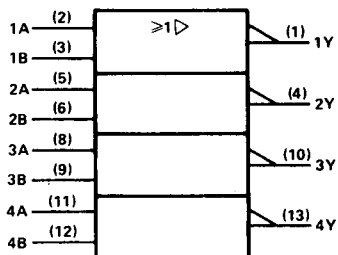
FUNCTION TABLE (each gate)

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

positive logic

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

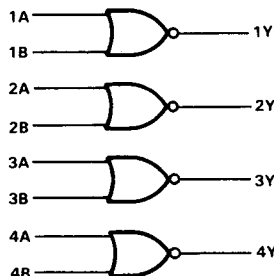
logic symbol†



† 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

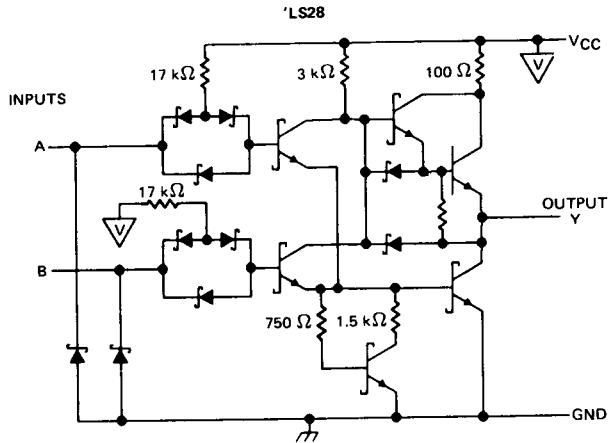
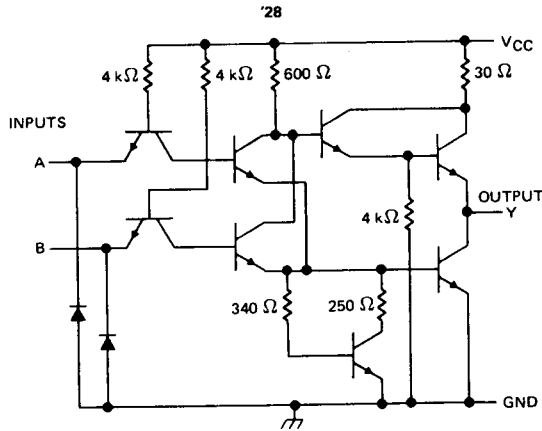


SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

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 ‡	MAX		
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			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 _{OS} §	V _{CC} = MAX	-30		-130	-30		-130	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0 V	1.8			1.8			3.6	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
							12	24	ns
t _{PHL}									

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

2

TTL Devices