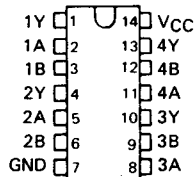


SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

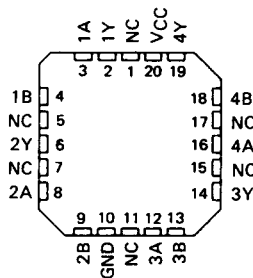
DECEMBER 1983—REVISED MARCH 1988

- 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.

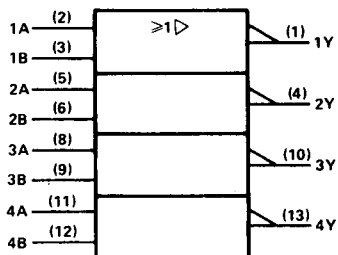
FUNCTION TABLE (each gate)

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

positive logic

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

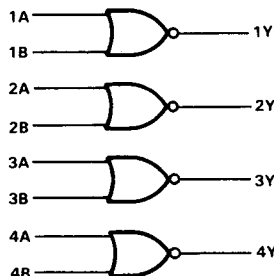
logic symbol†



† 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

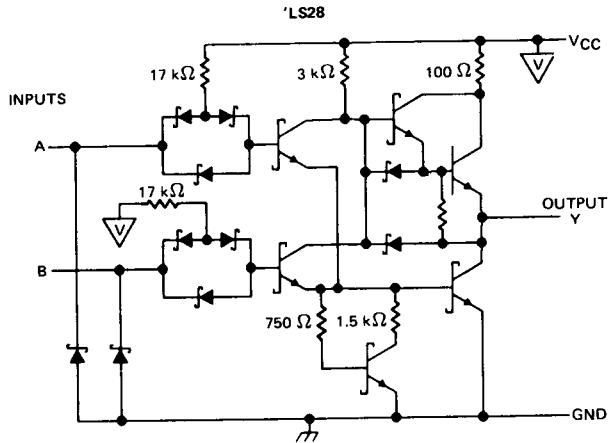
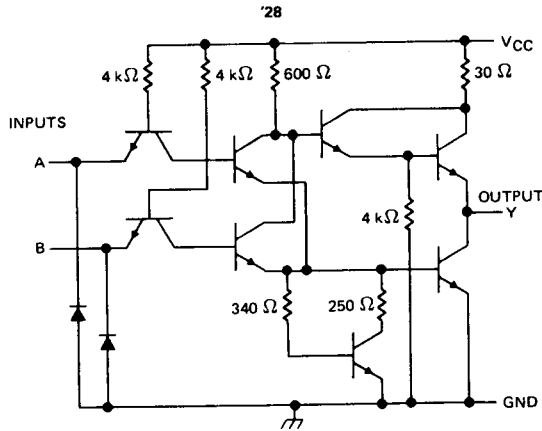


SN5428, SN54LS28, SN7428, SN74LS28 QUADRUPLE 2-INPUT POSITIVE-NOR BUFFERS

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 |
| t _{PHL} | | | | | | | 12 | 24 | ns |

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

2

TTL Devices