

SN5402, SN54LS02, SN54S02, SN7402, SN74LS02, SN74S02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

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 gates.

The SN5402, SN54LS02, and SN54S02 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7402, SN74LS02, and SN74S02 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, and N packages.

logic diagram (positive logic)



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.

SN5402 . . . J PACKAGE
SN54LS02, SN54S02 . . . J OR W PACKAGE
SN7402 . . . N PACKAGE
SN74LS02, SN74S02 . . . D OR N PACKAGE

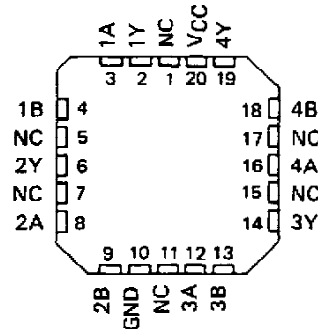
(TOP VIEW)



SN5402 . . . W PACKAGE
(TOP VIEW)



SN54LS02, SN54S02 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

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SN5402, SN7402 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

recommended operating conditions

| | SN5402 | | | SN7402 | | | 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 | | | -0.4 | | | -0.4 | mA |
| I _{OL} Low-level output current | | | 16 | | | 16 | 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 † | SN5402 | | | SN7402 | | | UNIT |
|-------------------|---|--------|-------|------|--------|-------|------|------|
| | | MIN | TYP ‡ | MAX | MIN | TYP ‡ | MAX | |
| V _{IK} | V _{CC} = MIN, I _I = -12 mA | | | -1.5 | | | -1.5 | V |
| V _{OH} | V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.4 mA | 2.4 | 3.4 | | 2.4 | 3.4 | | V |
| 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 _{OS} § | V _{CC} = MAX | -20 | | -55 | -18 | | -55 | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 0 V | | 8 | 16 | | 8 | 16 | mA |
| I _{CCL} | V _{CC} = MAX, See Note 2 | | 14 | 27 | | 14 | 27 | 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.

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 = 400 Ω, C _L = 15 pF | | 12 | 22 | ns |
| t _{PHL} | | | | | 8 | 15 | ns |

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


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SN54LS02, SN74LS02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

recommended operating conditions

| | SN54LS02 | | | SN74LS02 | | | 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 | | | -0.4 | | | -0.4 | mA |
| I _{OL} Low-level output current | | | 4 | | | 8 | 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 † | SN54LS02 | | | SN74LS02 | | | 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} = -0.4 mA | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 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 | -20 | | -100 | -20 | | -100 | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 0 V | | 1.6 | 3.2 | | 1.6 | 3.2 | mA |
| I _{CCL} | V _{CC} = MAX, See Note 2 | | 2.8 | 5.4 | | 2.8 | 5.4 | 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 = 2 kΩ, C _L = 15 pF | | 10 | 15 | ns |
| t _{PHL} | | | | | 10 | 15 | |

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

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SN54S02, SN74S02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

recommended operating conditions

| | SN54S02 | | | SN74S02 | | | 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 | | | -1 | | | -1 | mA |
| I _{OL} Low-level output current | | | 20 | | | 20 | 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 † | SN54S02 | | | SN74S02 | | | UNIT |
|-------------------|---|---------|------|------|---------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | | | -1.2 | | | -1.2 | V |
| V _{OH} | V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -1 mA | 2.5 | 3.4 | | 2.7 | 3.4 | | V |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA | | | 0.5 | | | 0.5 | V |
| I _I | V _{CC} = MAX, V _I = 5.5 V | | | 1 | | | 1 | mA |
| I _{IH} | V _{CC} = MAX, V _I = 2.7 V | | | 50 | | | 50 | μA |
| I _{IL} | V _{CC} = MAX, V _I = 0.5 V | | | -2 | | | -2 | mA |
| I _{OS} § | V _{CC} = MAX | -40 | | -100 | -40 | | -100 | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 0 V | | 17 | 29 | | 17 | 29 | mA |
| I _{CCL} | V _{CC} = MAX, See Note 2 | | 26 | 45 | | 26 | 45 | 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 = 280 Ω, C _L = 15 pF | 3.5 | 5.5 | | ns |
| t _{PHL} | | | | 3.5 | 5.5 | | ns |
| t _{PLH} | | | R _L = 280 Ω, C _L = 50 pF | 5 | | | ns |
| t _{PHL} | | | | 5 | | | ns |

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


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