

TYPES SN7402, SN74LS02, SN74S02
SN5402, SN54LS02, SN54S02
QUADRUPLE 2-INPUT POSITIVE-NOR GATES
 REVISED DECEMBER 1983

- Package Options include Standard Plastic (N) and Ceramic (J) 300-mil Dual-In-Line Packages, Plastic Small Outline (D) and Ceramic Chip Carrier (FK) Package
- 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 |

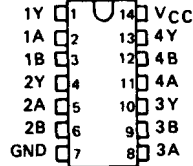
logic diagram (each gate)



positive logic

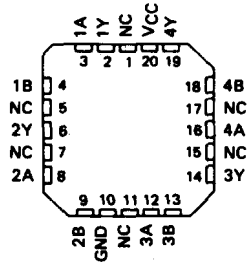
$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A + B}$$

SN5402, SN54LS02, SN54S02 ... J PACKAGE
SN7402 ... N PACKAGE
SN74LS02, SN74S02 ... D OR N PACKAGE
 (TOP VIEW)



SN54LS02, SN54S02 ... FK PACKAGE

(TOP VIEW)



NC - No internal connection

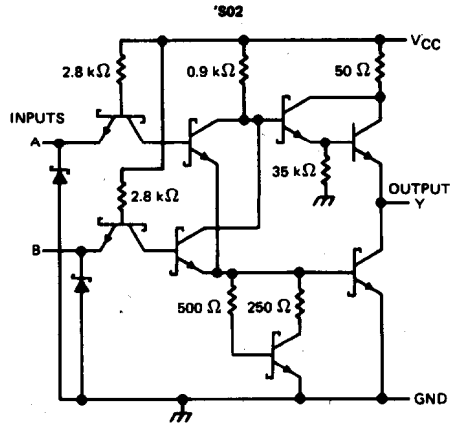
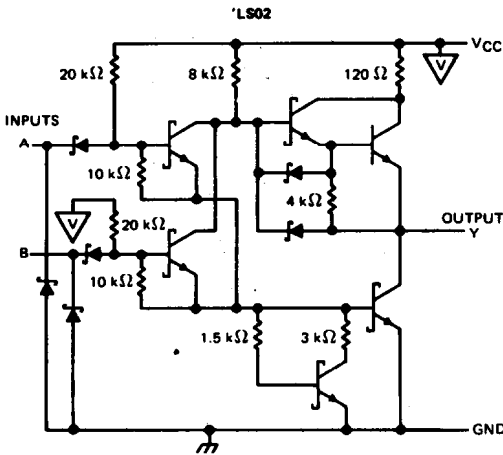
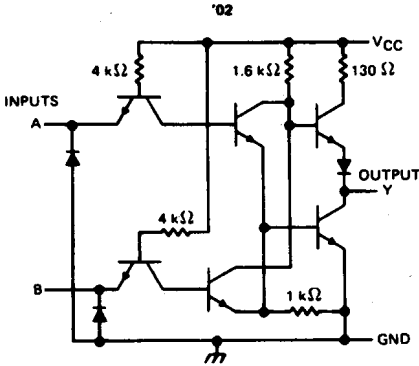
PRODUCTION DATA

This document contains 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.



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

schematics (each gate)



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1): '02, 'LS02, 'S02 | 7 V |
| Input voltage: '02, 'S02 | 5.5 V |
| 'LS02 | 7 V |
| Off-state output voltage | 7 V |
| Operating free-air temperature range: 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.

TYPES SN7402, SN5402
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} | $V_{CC} = \text{MIN.}$, $I_I = -12 \text{ mA}$ | | | -1.5 | | | -1.5 | V |
| V_{OH} | $V_{CC} = \text{MIN.}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -0.4 \text{ mA}$ | 2.4 | 3.4 | | 2.4 | 3.4 | | V |
| V_{OL} | $V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 16 \text{ mA}$ | | 0.2 | 0.4 | | 0.2 | 0.4 | V |
| I_I | $V_{CC} = \text{MAX.}$, $V_I = 5.5 \text{ V}$ | | | 1 | | | 1 | mA |
| I_{IH} | $V_{CC} = \text{MAX.}$, $V_I = 2.4 \text{ V}$ | | | 40 | | | 40 | µA |
| I_{IL} | $V_{CC} = \text{MAX.}$, $V_I = 0.4 \text{ V}$ | | | -1.6 | | | -1.6 | mA |
| $I_{OS}§$ | $V_{CC} = \text{MAX.}$ | -20 | | -55 | -18 | | -55 | mA |
| I_{CCH} | $V_{CC} = \text{MAX.}$, $V_I = 0 \text{ V}$ | | 8 | 16 | | 8 | 16 | mA |
| I_{CCL} | $V_{CC} = \text{MAX.}$, 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 $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|-----------|--------------|-------------|----------------------|-----------------------|-----|-----|-----|------|
| t_{PLH} | A or B | Y | $R_L = 400 \Omega$, | $C_L = 15 \text{ pF}$ | | 12 | 22 | ns |
| t_{PHL} | | | | | 8 | 15 | ns | |

NOTE 3: See General Information Section for load circuits and voltage waveforms.

TYPES SN74LS02, SN54LS02 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 | | -100 | mA | |
| I _{CCH} | V _{CC} = MAX, V _I = 0 V | | | 1.8 | 3.2 | 1.8 | 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 | ns |

NOTE 3: See General Information Section for load circuits and voltage waveforms.

TYPES SN74S02, SN54S02
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: See General Information Section for load circuits and voltage waveforms.