

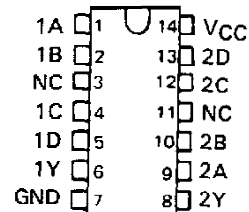
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chlp Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

SN5422, SN54LS22, SN54S22 . . . J OR W PACKAGE

SN7422 . . . N PACKAGE

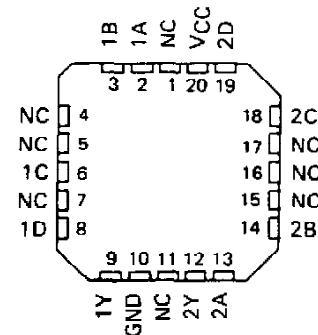
SN74LS22, SN74S22 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS22, SN54S22 . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

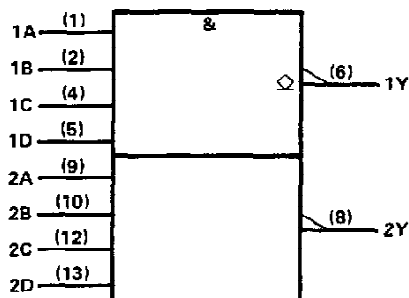
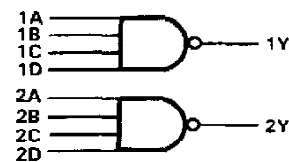
description

These devices contain two independent 4-input NAND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN5422, SN54LS22 and SN54S22 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7422, SN74LS22, and SN74S22 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

logic symbol†**logic diagram****positive logic**

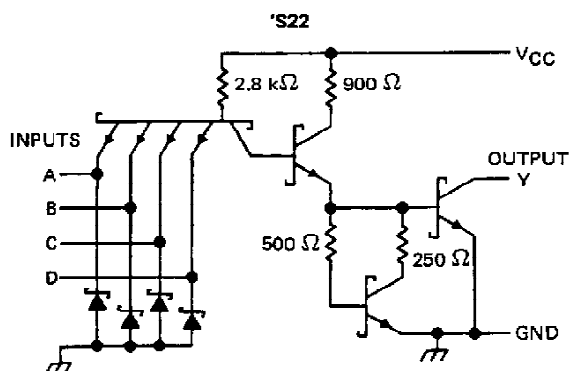
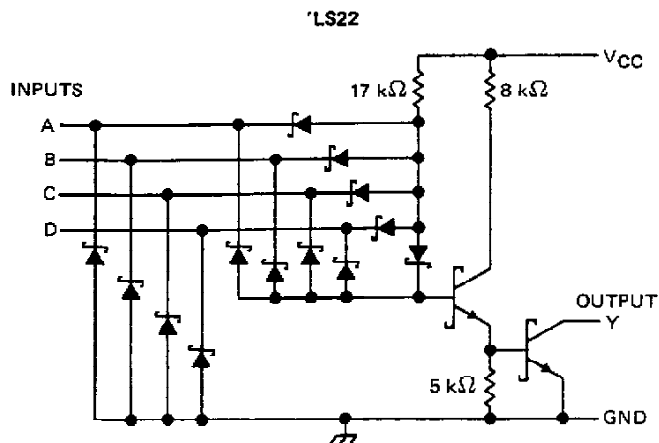
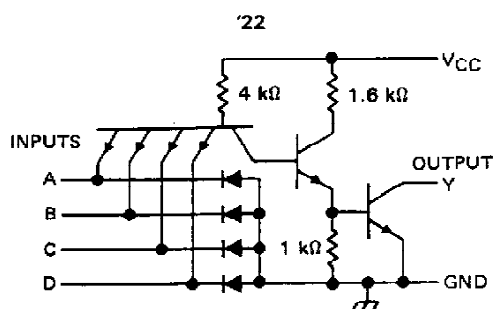
$$Y = \overline{A \cdot B \cdot C \cdot D} \text{ or } Y = \overline{A} + \overline{B} + \overline{C} + \overline{D}$$

† 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.

**SN5422, SN54LS22, SN54S22,
SN7422, SN74LS22, SN74S22
DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS**

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) | 7 V |
| Input voltage: '22, 'S22 | 5.5 V |
| 'LS22 | 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.

**TEXAS
INSTRUMENTS**

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SN5422, SN7422

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| | SN5422 | | | SN7422 | | | 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 |
| V_{OH} High-level output voltage | | | 5.5 | | | 5.5 | V |
| 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† | SN5422 | | | SN7422 | | | UNIT |
|-----------|---|--------|------|------|--------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V_{IK} | $V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$ | | | -1.5 | | | -1.5 | V |
| I_{OH} | $V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$ | | | | | | 0.25 | mA |
| | $V_{CC} = \text{MIN}, V_{IL} = 0.7 \text{ V}, V_{OH} = 5.5 \text{ V}$ | | | 0.25 | | | | |
| 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_{CCH} | $V_{CC} = \text{MAX}, V_I = 0$ | 2 | 4 | | 2 | 4 | | mA |
| I_{CCL} | $V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$ | 6 | 11 | | 6 | 11 | | mA |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|-----------|-----------------|----------------|-----------------------------|-----------------------|-----|-----|-----|------|
| t_{PLH} | Any | Y | $R_L = 4 \text{ k}\Omega$, | $C_L = 15 \text{ pF}$ | 35 | 45 | | ns |
| t_{PHL} | | | $R_L = 400 \Omega$, | $C_L = 15 \text{ pF}$ | 8 | 15 | | ns |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



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SN54LS22, SN74LS22 **DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS**

recommended operating conditions

| | SN54LS22 | | | SN74LS22 | | | 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 |
| V_{OH} High-level output voltage | | | 5.5 | | | 5.5 | V |
| 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† | SN54LS22 | | | SN74LS22 | | | UNIT |
|-----------|--|----------|------|------|----------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V_{IK} | $V_{CC} = \text{MIN.}$, $I_I = -18 \text{ mA}$ | | | -1.5 | | | -1.5 | V |
| I_{OH} | $V_{CC} = \text{MIN.}$, $V_{IL} = \text{MAX.}$, $V_{OH} = 5.5 \text{ V}$ | | | 0.1 | | | 0.1 | mA |
| V_{OL} | $V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 4 \text{ mA}$ | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | $V_{CC} = \text{MIN.}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 8 \text{ mA}$ | | | | | 0.35 | 0.5 | |
| I_I | $V_{CC} = \text{MAX.}$, $V_I = 7 \text{ V}$ | | | 0.1 | | | 0.1 | mA |
| I_{IH} | $V_{CC} = \text{MAX.}$, $V_I = 2.7 \text{ V}$ | | | 20 | | | 20 | µA |
| I_{IL} | $V_{CC} = \text{MAX.}$, $V_I = 0.4 \text{ V}$ | | | -0.4 | | | -0.4 | mA |
| I_{CCH} | $V_{CC} = \text{MAX.}$, $V_I = 0$ | | 0.4 | 0.8 | | 0.4 | 0.8 | mA |
| I_{CCL} | $V_{CC} = \text{MAX.}$, $V_I = 4.5 \text{ V}$ | | 1.2 | 2.2 | | 1.2 | 2.2 | mA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|-----------------|----------------|---|-----|-----|-----|------|
| t_{PLH} | Any | Y | $R_L = 2 \text{ k}\Omega$, $C_L = 15 \text{ pF}$ | | 17 | 32 | ns |
| t_{PHL} | | | | | 15 | 28 | ns |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



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SN54S22, SN74S22

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| | SN54S22 | | | SN74S22 | | | 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 |
| V_{OH} High-level output voltage | | | 5.5 | | | 5.5 | V |
| 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† | SN54S22 | | | SN74S22 | | | UNIT |
|-----------|---|---------|------|------|---------|------|------|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V_{IK} | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$ | | | -1.2 | | | -1.2 | V |
| I_{OH} | $V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$ | | | | | | 0.25 | mA |
| | $V_{CC} = \text{MIN}, V_{IL} = 0.7 \text{ V}, V_{OH} = 5.5 \text{ V}$ | | | 0.25 | | | | |
| V_{OL} | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$ | | | 0.5 | | | 0.5 | V |
| I_I | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$ | | | 1 | | | 1 | mA |
| I_{IH} | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$ | | | 50 | | | 50 | µA |
| I_{IL} | $V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$ | | | -2 | | | -2 | mA |
| I_{CCH} | $V_{CC} = \text{MAX}, V_I = 0$ | | | 3 | | | 3 | mA |
| I_{CCL} | $V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$ | | | 10 | | | 10 | mA |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|--------------|-------------|---|-----|-----|-----|------|
| t_{PLH} | Any | Y | $R_L = 280 \Omega, C_L = 15 \text{ pF}$ | 2 | 5 | 7.5 | ns |
| t_{PHL} | | | | 2 | 4.5 | 7 | ns |
| t_{PLH} | | | $R_L = 280 \Omega, C_L = 50 \text{ pF}$ | | 7.5 | | ns |
| t_{PHL} | | | | | 7 | | ns |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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