# SN5423, SN5425, SN7423, SN7425
# DUAL 4-INPUT NOR GATES WITH STROBE

SDLS082

DECEMBER 1983—REVISED MARCH 1988

- **Package Options Include Plastic and Ceramic DIPs and Ceramic Flat Packages**
- **Dependable Texas Instruments Quality and Reliability**

## description

These devices contain dual 4-input positive NOR gates with strobe. They perform the Boolean function:

$$Y = \overline{G(A+B+C+D)}$$

(with 1X and $1\overline{X}$ of '23 left open).

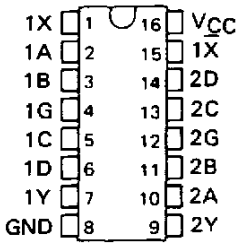
The SN5423 and the SN5425 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN7423 and the SN7425 are characterized for operation from 0°C to 70°C.

**FUNCTION TABLE**

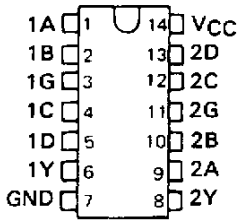
| INPUTS | | | | | OUTPUT |
|---|---|---|---|---|---|
| A | B | C | D | G | Y |
| H | X | X | X | H | L |
| X | H | X | X | H | L |
| X | X | H | X | H | L |
| X | X | X | H | H | L |
| L | L | L | L | X | H |
| X | X | X | X | L | H |

Expander inputs are open.
H = high level, L = low level, X = irrelevant

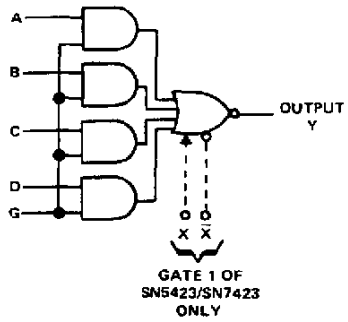
**SN5423 . . . J OR W PACKAGE**
**SN7423 . . . N PACKAGE**
**(TOP VIEW)**




**SN5425 . . . J OR W PACKAGE**
**SN7425 . . . N PACKAGE**
**(TOP VIEW)**

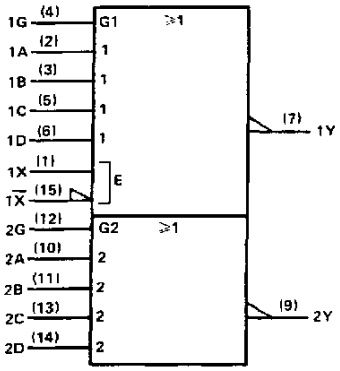



## logic diagram

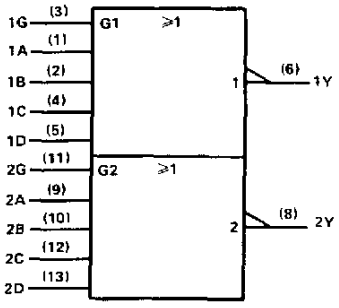



## logic symbols†

**SN5423/SN7423**

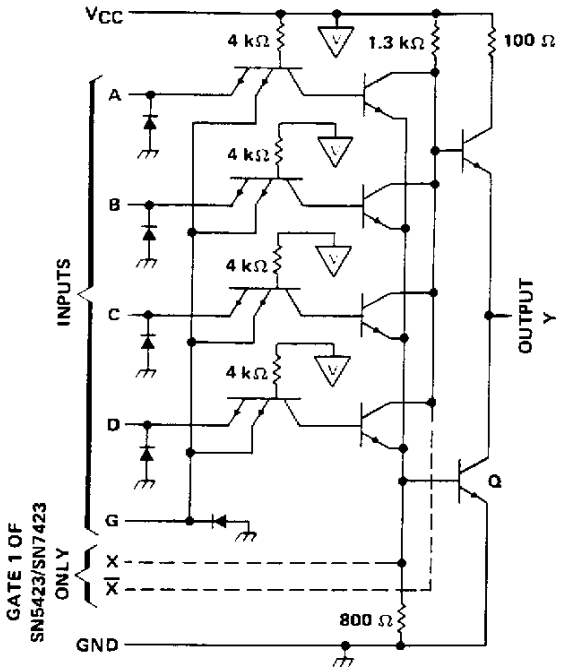



**SN5425/SN7425**




†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.
Pin numbers are for J, N, or W packages.

## schematic (each gate)




NOTES: A. Component values shown are nominal.
B. Both expander inputs are used simultaneously for expanding.
C. If expander is not used leave X and X open.
D. A total of four expander gates can be connected to the expander inputs.
▽ – $V_{CC}$ bus

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

Supply voltage $V_{CC}$ (see Note 1) . . . . . 7 V
Input voltage (see Note 1) . . . . . 5.5 V
Interemitter voltage (see Note 2) . . . . . 5.5 V
Operating free-air temperature range: SN5423, SN5425 Circuits . . . . . −55°C to 125°C
SN7423, SN7425 Circuits . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
2. This is the voltage between two emitters of a multiple-emitter transistor.

## recommended operating conditions

| | | | '23, '25 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 54 Family | 4.5 | 5 | 5.5 | V |
| | | 74 Family | 4.75 | 5 | 5.25 | |
| $V_{IH}$ | High-level input voltage | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | | −0.8 | mA |
| $I_{OL}$ | Low-level output current | 54 Family | | | 16 | mA |
| | | 74 Family | | | 16 | |
| $T_A$ | Operating free-air temperature range | 54 Family | −55 | | 125 | °C |
| | | 74 Family | 0 | | 70 | |

The '23 is designed for use with up to four '60 expanders.

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | | MIN | TYP‡ | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_I$ | | $V_{CC}$ = MIN, $I_I$ = – 12 mA | | | | | – 1.5 | V |
| $V_{OH}$ | | $V_{CC}$ = MIN, $V_{IL}$ = 0.8 V, $I_{OH}$ = – 0.8 mA | | | 2.4 | 3.4 | | V |
| $V_{OL}$ | | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $I_{OL}$ = 16 mA | | | | 0.2 | 0.4 | V |
| $I_I$ | | $V_{CC}$ = MAX, $V_I$ = 5.5 V | | | | | 1 | mA |
| $I_{IH}$ | data inputs | $V_{CC}$ = MAX, $V_I$ = 2.4 V | | | | | 40 | μA |
| | strobe inputs | | | | | | 160 | |
| $I_{IL}$ | data inputs | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | | | | – 1.6 | mA |
| | strobe inputs | | | | | | – 6.4 | |
| $I_{OS}$§ | | $V_{CC}$ = MAX | | 54 Family | – 20 | | – 55 | mA |
| | | | | 74 Family | – 18 | | – 55 | |
| $I_{CCH}$ | | $V_{CC}$ = MAX, All inputs at 0 V | | | | 8 | 16 | mA |
| $I_{CCL}$ | | $V_{CC}$ = MAX, All inputs at 5 V | | | | 10 | 19 | mA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type. Expander inputs X and $\overline{X}$ are open.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time.

## electrical characteristics (SN5423 circuits) using expander inputs, $V_{CC}$ = 4.5 V, $T_A$ = – 55°C

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP† | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_{\overline{X}}$ | Expander current | $V_{X\overline{X}}$ = 0.4 V, | $I_{OL}$ = 16 mA | | | | – 3.5 | mA |
| $V_{BE(Q)}$ | Base-Emitter voltage of output transistor (Q) | $I_{OL}$ = 16 mA, | $I_X + I_{\overline{X}}$ = 0.41 mA, | $R_{X\overline{X}}$ = 0 | | | 1.1 | V |
| $V_{OH}$ | High-level output voltage | $I_{OH}$ = – 0.4 mA, | $I_X$ = 0.15 mA, | $I_{\overline{X}}$ = – 0.15 mA | 2.4 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | $I_{OL}$ = 16 mA, | $I_X + I_{\overline{X}}$ = 0.3 mA, | $R_{X\overline{X}}$ = 114 Ω | | 0.2 | 0.4 | V |

## electrical characteristics (SN7423 circuits) using expander inputs, $V_{CC}$ = 4.75 V, $T_A$ = 0°C

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP† | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_{\overline{X}}$ | Expander current | $V_{X\overline{X}}$ = 0.4 V, | $I_{OL}$ = 16 mA | | | | – 3.8 | mA |
| $V_{BE(Q)}$ | Base-Emitter voltage of output transistor (Q) | $I_{OL}$ = 16 mA, | $I_X + I_{\overline{X}}$ = 0.62 mA, | $R_{X\overline{X}}$ = 0 | | | 1 | V |
| $V_{OH}$ | High-level output voltage | $I_{OH}$ = – 0.4 mA, | $I_X$ = 0.27 mA, | $I_{\overline{X}}$ = – 0.27 mA | 2.4 | 3.4 | | V |
| $V_{OL}$ | Low-level output voltage | $I_{OL}$ = 16 mA, | $I_X + I_{\overline{X}}$ = 0.43 mA, | $R_{X\overline{X}}$ = 130 Ω | | 0.2 | 0.4 | V |

† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C, N = 10, (see note 3)

| PARAMETER | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $t_{PLH}$ | $R_L$ = 400 Ω, | $C_L$ = 15 pF | | 13 | 22 | ns |
| $t_{PHL}$ | $R_L$ = 400 Ω, | $C_L$ = 15 pF | | 8 | 15 | ns |

NOTE 3: Switching characteristics of the SN5423 and SN7424 are tested with the expander pins open.

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