

# SN5427, SN54LS27, SN7427, SN74LS27 TRIPLE 3-INPUT POSITIVE-NOR GATES

SDLS089

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 three independent 3-input NOR gates.

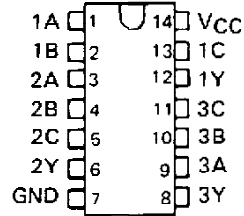
The SN5427 and SN54LS27 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7427 and SN74LS27 are characterized for operation from 0°C to 70°C.

SN5427, SN54LS27 . . . J OR W PACKAGE

SN7427 . . . N PACKAGE

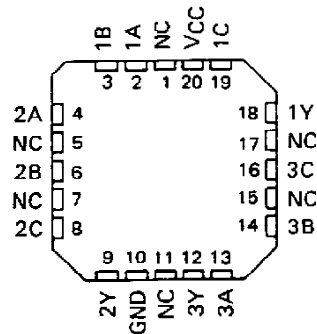
SN74LS27 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS27 . . . FK PACKAGE

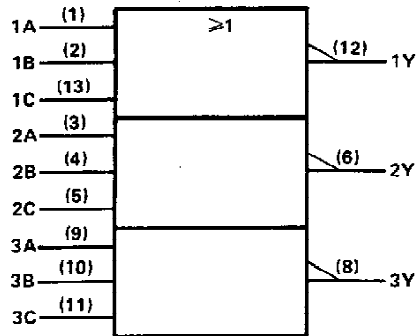
(TOP VIEW)



FUNCTION TABLE (each gate)

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

## logic symbol†

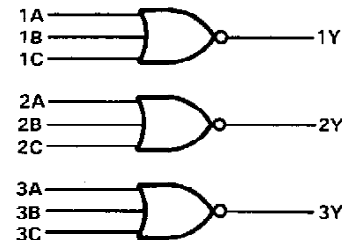


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

NC - No internal connection

## logic diagram



## positive logic

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

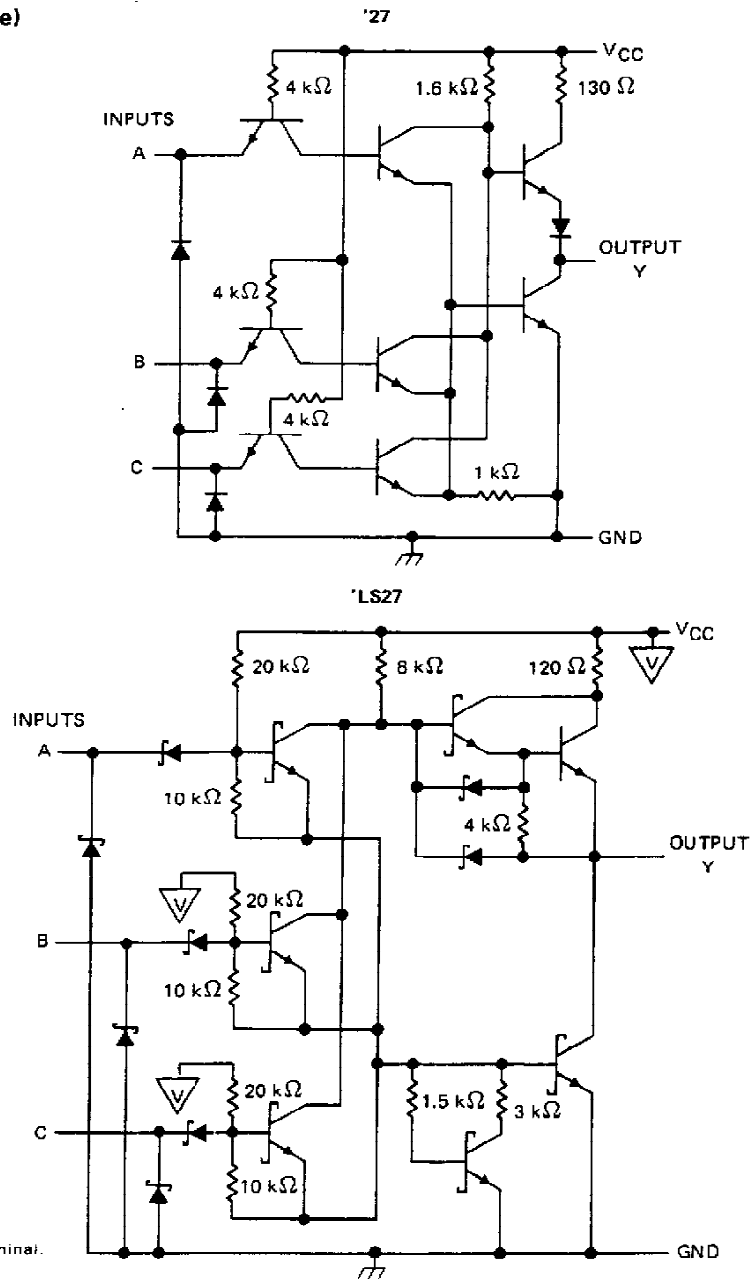
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# SN5427, SN54LS27, SN7427, SN74LS27 TRIPLE 3-INPUT POSITIVE-NOR GATES

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) ..... | 7 V            |
| Input voltage: '27 .....                    | 5.5 V          |
| 'LS27 .....                                 | 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.



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# SN5427, SN7427 TRIPLE 3-INPUT POSITIVE-NOR GATES

## recommended operating conditions

|                                      | SN5427 |     |      | SN7427 |     |      | 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   |        |     | -0.8 |        |     | -0.8 | 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 †   | SN5427 |       |      | SN7427 |       |      | UNIT |
|------------|---|--------|-------|------|--------|-------|------|------|
|            |   | MIN    | TYP ‡ | MAX  | MIN    | TYP ‡ | MAX  |      |
| $V_{IK}$   | $V_{CC} = \text{MIN}$ , $I_I = -12 \text{ mA}$                                |        |       | -1.5 |        |       | -1.5 | V    |
| $V_{OH}$   | $V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -0.8 \text{ mA}$ | 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   |
| $I_{CCH}$  | $V_{CC} = \text{MAX}$ , $V_I = 0 \text{ V}$                                   |        | 10    | 16   |        | 10    | 16   | mA   |
| $I_{CCL}$  | $V_{CC} = \text{MAX}$ , See Note 2  |        | 16    | 26   |        | 16    | 26   | 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, B or C    | Y           | $R_L = 400 \Omega$ , $C_L = 15 \text{ pF}$ |     | 10  | 15  | ns   |
| $t_{PHL}$ |              |             |  |     | 7   | 11  | ns   |

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



# SN54LS27, SN74LS27

## TRIPLE 3-INPUT POSITIVE-NOR GATES

### recommended operating conditions

|   | SN54LS27 |     |      | SN74LS27 |     |      | UNIT |
|---|----------|-----|------|----------|-----|------|------|
|   | MIN      | NOM | MAX  | MIN      | NOM | MAX  |      |
| V <sub>CC</sub> Supply voltage                | 4.5      | 5   | 5.5  | 4.75     | 5   | 5.25 | V    |
| V <sub>IH</sub> High-level input voltage      | 2        |     |      | 2        |     |      | V    |
| V <sub>IL</sub> Low-level input voltage       |          |     | 0.7  |          |     | 0.8  | V    |
| I <sub>OH</sub> High-level output current     |          |     | -0.4 |          |     | -0.4 | mA   |
| I <sub>OL</sub> Low-level output current      |          |     | 4    |          |     | 8    | mA   |
| T <sub>A</sub> Operating free-air temperature | -55      |     | 125  | 0        |     | 70   | °C   |

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

| PARAMETER         | TEST CONDITIONS †   | SN54LS27 |       |      | SN74LS27 |       |      | UNIT |
|-------------------|---|----------|-------|------|----------|-------|------|------|
|                   |   | MIN      | TYP ‡ | MAX  | MIN      | TYP ‡ | MAX  |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA                          |          |       | -1.5 |          |       | -1.5 | V    |
| V <sub>OH</sub>   | V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = -0.4 mA | 2.5      | 3.4   |      | 2.7      | 3.4   |      | V    |
| V <sub>OL</sub>   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 4 mA    |          | 0.25  | 0.4  |          | 0.25  | 0.4  | V    |
|                   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 8 mA    |          |       |      |          | 0.35  | 0.5  |      |
| I <sub>I</sub>    | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V                             |          |       | 0.1  |          |       | 0.1  | mA   |
| I <sub>IH</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                           |          |       | 20   |          |       | 20   | μA   |
| I <sub>IL</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                           |          |       | -0.4 |          |       | -0.4 | mA   |
| I <sub>OS</sub> § | V <sub>CC</sub> = MAX   | -20      |       | -100 | -20      |       | -100 | mA   |
| I <sub>CCH</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V                             |          | 2     | 4    |          | 2     | 4    | mA   |
| I <sub>CCL</sub>  | V <sub>CC</sub> = MAX, See Note 2                                       |          | 3.4   | 6.8  |          | 3.4   | 6.8  | mA   |

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

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 3)

| PARAMETER        | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS        |                        | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|------------------------|------------------------|-----|-----|-----|------|
| t <sub>PLH</sub> | A, B or C    | Y           | R <sub>L</sub> = 2 kΩ, | C <sub>L</sub> = 15 pF |     | 10  | 15  | ns   |
| t <sub>PHL</sub> |              |             |                        |                        |     | 10  | 15  |      |

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

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**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| JM38510/00404BCA | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| JM38510/30302B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| JM38510/30302B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| JM38510/30302BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| JM38510/30302BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| JM38510/30302BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| JM38510/30302BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN5427J          | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN5427J          | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN54LS27J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN54LS27J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN7427N          | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN7427N          | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS27D        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27D        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DE4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DE4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DRE4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27DRE4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS27N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS27N3       | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS27N3       | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS27NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS27NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS27NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27NSRE4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS27NSRE4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SNJ5427J         | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SNJ5427J         | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SNJ5427W         | OBSOLETE              | CFP          | W               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SNJ5427W         | OBSOLETE              | CFP          | W               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SNJ54LS27FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS27FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS27J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS27J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS27W       | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS27W       | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

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<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
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|                  |  | Video & Imaging     | <a href="http://www.ti.com/video">www.ti.com/video</a>                   |
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