D2661, APRIL 1982—REVISED MAY 1986

- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

## description

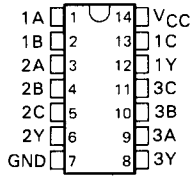
These devices contain three independent 3-input NOR gates. They perform the Boolean functions $Y = \overline{A+B+C}$ or $Y = \overline{A}\cdot\overline{B}\cdot\overline{C}$ in positive logic.

The SN54ALS27 and SN54AS27 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS27 and SN74AS27 are characterized for operation from 0°C to 70°C.

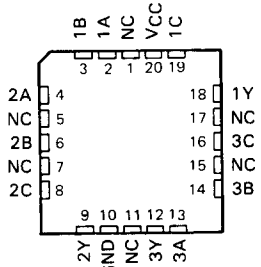
**FUNCTION TABLE (each gate)**

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

SN54ALS27, SN54AS27 . . . J PACKAGE
SN74ALS27, SN74AS27 . . . D OR N PACKAGE
(TOP VIEW)

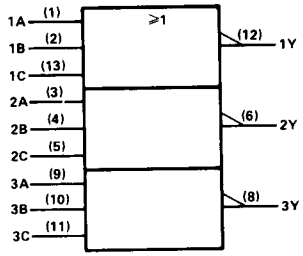



SN54ALS27, SN54AS27 . . . FK PACKAGE
(TOP VIEW)



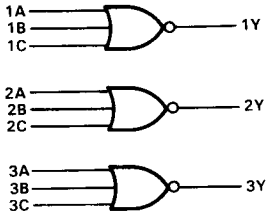

NC—No internal connection

## 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)



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

Supply voltage, $V_{CC}$ . . . . . 7 V
Input voltage . . . . . 7 V
Operating free-air temperature range: SN54ALS27 . . . . . −55°C to 125°C
SN74ALS27 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

### recommended operating conditions

| | | SN54ALS27 | | | SN74ALS27 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | 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 | | SN54ALS27 | | | SN74ALS27 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −0.4 mA | $V_{CC}$−2 | | | $V_{CC}$−2 | | | V |
| $V_{OL}$ | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 8 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −0.1 | | | −0.1 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −30 | | −112 | −30 | | −112 | mA |
| $I_{CCH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0 V | | 0.97 | 1.8 | | 0.97 | 1.8 | mA |
| $I_{CCL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 4.5 V | | 2 | 4 | | 2 | 4 | mA |

†All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

### switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54ALS27 | | SN74ALS27 | | |
| | | | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | Any | Y | 4 | 26 | 4 | 15 | ns |
| $t_{PHL}$ | Any | Y | 1 | 11 | 3 | 9 | ns |

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



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

Supply voltage, $V_{CC}$ . . . . . 7 V
Input voltage . . . . . 7 V
Operating free-air temperature range: SN54AS27 . . . . . −55°C to 125°C
SN74AS27 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

### recommended operating conditions

| | | SN54AS27 | | | SN74AS27 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | 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 | | | −2 | | | −2 | 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 | | SN54AS27 | | | SN74AS27 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −2 mA | $V_{CC}$−2 | | | $V_{CC}$−2 | | | V |
| $V_{OL}$ | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 20 mA | | 0.35 | 0.5 | | 0.35 | 0.5 | V |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | μA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −0.5 | | | −0.5 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −30 | | −112 | −30 | | −112 | mA |
| $I_{CCH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0 V | | 4 | 6.4 | | 4 | 6.4 | mA |
| $I_{CCL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 4.5 V | | 10.6 | 17.1 | | 10.6 | 17.1 | mA |

†All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

### switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54AS27 | | SN74AS27 | | |
| | | | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | Any | Y | 1 | 6.5 | 1 | 5.5 | ns |
| $t_{PHL}$ | Any | Y | 1 | 5 | 1 | 4.5 | ns |

NOTE 1. Load circuit and voltage waveforms are shown in Section 1.