

# SN54ALS12A, SN74ALS12A TRIPLE 3-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

SDAS008A – MARCH 1984 – 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

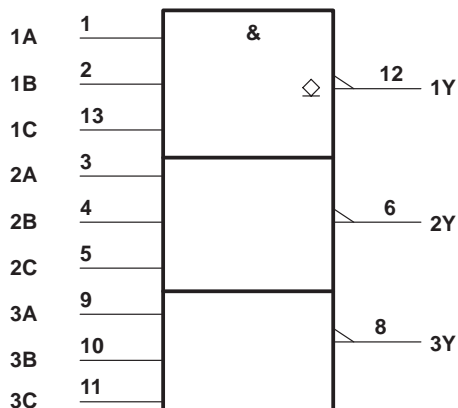
These devices contain three independent 3-input NAND gates with open-collector outputs. These gates perform the Boolean functions  $Y = \overline{A \cdot B \cdot C}$  or  $Y = \overline{\overline{A} + \overline{B} + \overline{C}}$  in positive logic. The open-collector outputs require pullup resistors 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 SN54ALS12A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS12A is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE  
(each gate)

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

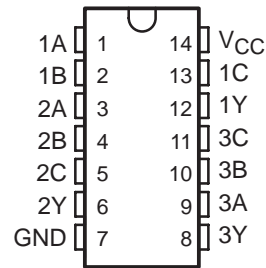
## logic symbol†



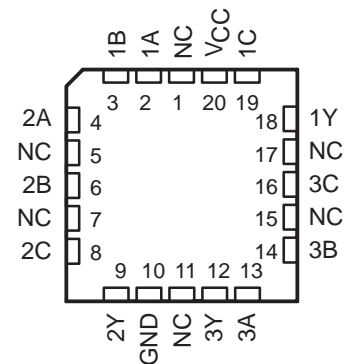
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

SN54ALS12A . . . J PACKAGE  
SN74ALS12A . . . D OR N PACKAGE  
(TOP VIEW)

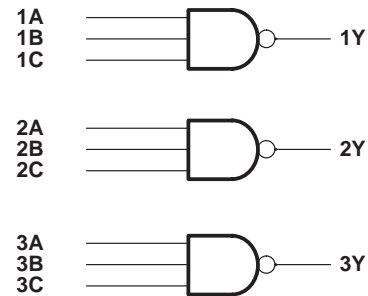


SN54ALS12A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## logic diagram (positive logic)



PRODUCTION DATA information is 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.

**TEXAS  
INSTRUMENTS**

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# SN54ALS12A, SN74ALS12A TRIPLE 3-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

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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            |
| Off-state output voltage                         | 7 V            |
| Operating free-air temperature range: SN54ALS12A | -55°C to 125°C |
| SN74ALS12A                                       | 0°C to 70°C    |
| Storage temperature range                        | -65°C to 150°C |

## recommended operating conditions

|          |                                | SN54ALS12A |     |     | SN74ALS12A |     |     | 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    |
| $V_{OH}$ | 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                    | SN54ALS12A |      |      | SN74ALS12A |      |      | UNIT |
|-----------|------------------------------------|------------|------|------|------------|------|------|------|
|           |                                    | MIN        | TYP† | MAX  | MIN        | TYP† | MAX  |      |
| $V_{IK}$  | $V_{CC} = 4.5$ V, $I_I = -18$ mA   |            |      | -1.5 |            |      | -1.5 | 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  |      |
| $I_{OH}$  | $V_{CC} = 4.5$ V, $V_{OH} = 5.5$ V |            |      | 0.1  |            |      | 0.1  | mA   |
| $I_I$     | $V_{CC} = 5.5$ 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   |
| $I_{CCH}$ | $V_{CC} = 5.5$ V, $V_I = 0$ V      |            | 0.32 | 0.6  |            | 0.32 | 0.6  | mA   |
| $I_{CCL}$ | $V_{CC} = 5.5$ V, $V_I = 4.5$ V    |            | 1.2  | 2.2  |            | 1.2  | 2.2  | mA   |

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

## switching characteristics (see Note 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 4.5$ V to 5.5 V,<br>$C_L = 50$ pF,<br>$R_L = 2$ k $\Omega$ ,<br>$T_A = \text{MIN to MAX}$ |     |            |     | UNIT |
|-----------|--------------|-------------|---|-----|------------|-----|------|
|           |              |             | SN54ALS12A  |     | SN74ALS12A |     |      |
|           |              |             | MIN   | MAX | MIN        | MAX |      |
| $t_{PLH}$ | Any          | Y           | 23  | 59  | 23         | 54  | ns   |
| $t_{PHL}$ | Any          | Y           | 5   | 26  | 5          | 18  | ns   |

NOTE 1: Load circuit and voltage waveforms are shown in Section 1 of *ALS/AS Logic Data Book, 1986*.



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