



**MOTOROLA**

# TYPES SN54ALS38, SN74ALS38 QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

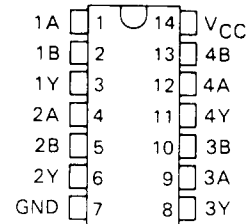
000220  
4/30  
USS 1702/1246

## description

These devices contain four independent 2-input NAND buffer gates with open-collector outputs. These NAND buffers perform the boolean functions  $Y = \bar{A} \cdot B$  or  $Y = \bar{A} + B$  in positive logic. 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 SN54ALS38 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS38 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

(TOP VIEW)

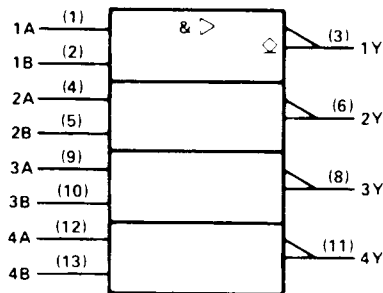


J Suffix—Case 632-07 (Ceramic)  
N Suffix—Case 646-05 (Plastic)

FUNCTION TABLE (each gate)

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

## logic symbol



Pin numbers shown are for J and N packages.

# TYPES SN54ALS38, SN74ALS38

## QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS

### WITH OPEN-COLLECTOR OUTPUTS

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: SN54ALS38 | - 55 °C to 125 °C |
| SN74ALS38                                       | 0 °C to 70 °C     |
| Storage temperature range                       | - 65 °C to 150 °C |

recommended operating conditions

|          |                                | SN54ALS38 |     |     | SN74ALS38 |     |     | 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    |
| $V_{OH}$ | High-level output voltage      |           |     | 5.5 |           |     | 5.5 | V    |
| $I_{OL}$ | Low-level output current       |           |     | 12  |           |     |     | mA   |
|          |                                |           |     |     |           |     | 24  |      |
| $T_A$    | Operating free-air temperature | - 55      |     | 125 | 0         |     | 70  | °C   |

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

| PARAMETER | TEST CONDITIONS   | SN54ALS38 |      |      | SN74ALS38 |      |      | UNIT |
|-----------|---|-----------|------|------|-----------|------|------|------|
|           |   | MIN       | TYP† | MAX  | MIN       | TYP† | MAX  |      |
| $V_{IK}$  | $V_{CC} = 4.5 \text{ V}$ ,<br>$I_I = -18 \text{ mA}$    |           |      | -1.5 |           |      | -1.5 | V    |
| $I_{OH}$  | $V_{CC} = 4.5 \text{ V}$ ,<br>$V_{OH} = 5.5 \text{ V}$  |           |      | 0.1  |           |      | 0.1  | mA   |
| $V_{OL}$  | $V_{CC} = 4.5 \text{ V}$ ,<br>$I_{OL} = 12 \text{ mA}$  |           | 0.25 | 0.4  |           | 0.25 | 0.4  | V    |
|           | $V_{CC} = 4.75 \text{ V}$ ,<br>$I_{OL} = 24 \text{ mA}$ |           |      |      |           | 0.35 | 0.5  |      |
| $I_I$     | $V_{CC} = 5.5 \text{ V}$ ,<br>$V_I = 7 \text{ V}$       |           |      | 0.1  |           |      | 0.1  | mA   |
| $I_{IH}$  | $V_{CC} = 5.5 \text{ V}$ ,<br>$V_I = 2.7 \text{ V}$     |           |      | 20   |           |      | 20   | μA   |
| $I_{IL}$  | $V_{CC} = 5.5 \text{ V}$ ,<br>$V_{IL} = 0.4 \text{ V}$  |           |      | 0.1  |           |      | -0.1 | mA   |
| $I_{CCH}$ | $V_{CC} = 5.5 \text{ V}$ ,<br>$V_I = 0 \text{ V}$       |           |      | 1.0  |           |      | 1.0  | mA   |
| $I_{CCL}$ | $V_{CC} = 5.5 \text{ V}$ ,<br>$V_I = 4.5 \text{ V}$     |           |      | 6.0  |           |      | 6.0  | mA   |

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

switching characteristics

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ ,<br>$C_L = 50 \text{ pF}$ ,<br>$R_L = 680 \text{ } \Omega$ ,<br>$T_A = \text{MIN to MAX}$ |     |           |     | UNIT |
|-----------|--------------|-------------|---|-----|-----------|-----|------|
|           |              |             | SN54ALS38   |     | SN74ALS38 |     |      |
|           |              |             | MIN   | MAX | MIN       | MAX |      |
| $t_{PLH}$ | A or B       | Y           | 6   | 28  | 6         | 23  | ns   |
| $t_{PHL}$ | A or B       | Y           | 6   | 21  | 6         | 18  | ns   |

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