

# SN54F38, SN74F38 QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS WITH OPEN-COLLECTOR OUTPUTS

SDFS013A – MARCH 1987 – REVISED OCTOBER 1993

- Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

## description

These devices contain four independent 2-input NAND buffer gates with open-collector outputs. They perform the Boolean functions  $Y = A \bullet B$  or  $Y = A + \overline{B}$  in positive logic.

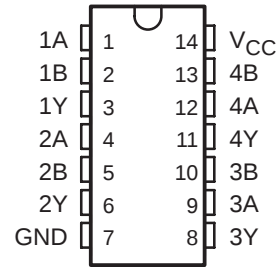
The open-collector outputs require pullup resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher  $V_{OH}$  levels.

The SN54F38 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74F38 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

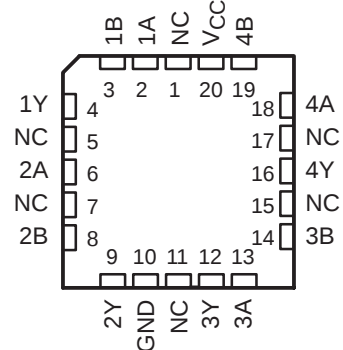
FUNCTION TABLE  
(each gate)

| INPUTS |   | OUTPUT<br>Y |
|--------|---|-------------|
| A      | B |             |
| H      | H | L           |
| L      | X | H           |
| X      | L | H           |

SN54F38 . . . J PACKAGE  
SN74F38 . . . D OR N PACKAGE  
(TOP VIEW)

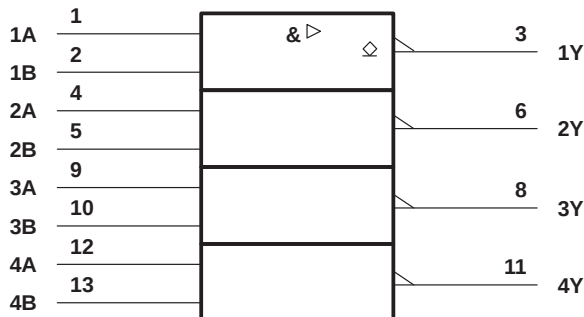


SN54F38 . . . FK PACKAGE  
(TOP VIEW)

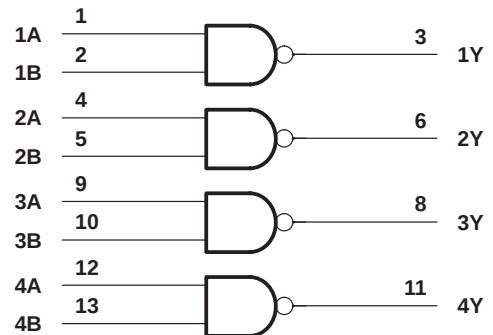


NC – No internal connection

## logic symbol†



## logic diagram (positive logic)



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

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

# SN54F38, SN74F38

## QUADRUPLE 2-INPUT POSITIVE-NAND BUFFERS

### WITH OPEN-COLLECTOR OUTPUTS

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#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                       |                    |
|-------------------------------------------------------|--------------------|
| Supply voltage range, $V_{CC}$                        | –0.5 V to 7 V      |
| Input voltage range, $V_I$ (see Note 1)               | –0.5 V to 7 V      |
| Input current range                                   | –30 mA to 5 mA     |
| Voltage range applied to any output in the high state | –0.5 V to $V_{CC}$ |
| Current into any output in the low state              | 128 mA             |
| Operating free-air temperature range: SN54F38         | –55°C to 125°C     |
| SN74F38                                               | 0°C to 70°C        |
| Storage temperature range                             | –65°C to 150°C     |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

#### recommended operating conditions

|          |                                | SN54F38 |     |     | SN74F38 |     |     | 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    |
| $I_{IK}$ | Input clamp current            |         |     | –18 |         |     | –18 | mA   |
| $V_{OH}$ | High-level output voltage      |         |     | 4.5 |         |     | 4.5 | V    |
| $I_{OL}$ | Low-level output current       |         |     | 48  |         |     | 64  | 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          |                         | SN54F38 |                  |     | SN74F38 |                  |     | UNIT |
|-------------------|--------------------------|-------------------------|---------|------------------|-----|---------|------------------|-----|------|
|                   |                          |                         | MIN     | TYP <sup>‡</sup> | MAX | MIN     | TYP <sup>‡</sup> | MAX |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = 4.5 V, | I <sub>I</sub> = −18 mA | −0.73   | −1.2             |     |         | −1.2             | V   |      |
| V <sub>OL</sub>   | V <sub>CC</sub> = 4.5 V, | I <sub>OL</sub> = 48 mA | 0.3     | 0.5              |     | 0.3     | 0.5              | V   |      |
|                   | V <sub>CC</sub> = 4.5 V, | I <sub>OL</sub> = 64 mA | 0.3     | 0.5              |     | 0.3     | 0.5              |     |      |
| I <sub>I</sub>    | V <sub>CC</sub> = 5.5 V, | V <sub>I</sub> = 7 V    |         | 0.1              |     |         | 0.1              | mA  |      |
| I <sub>IH</sub>   | V <sub>CC</sub> = 5.5 V, | V <sub>I</sub> = 2.7 V  |         | 20               |     |         | 20               | μA  |      |
| I <sub>IL</sub>   | V <sub>CC</sub> = 5.5 V, | V <sub>I</sub> = 0.5 V  |         | − 0.6            |     |         | − 0.6            | mA  |      |
| I <sub>OH</sub>   | V <sub>CC</sub> = 4.5 V  |                         |         | 250              |     |         | 250              | μA  |      |
| I <sub>CCCH</sub> | V <sub>CC</sub> = 5.5 V, | V <sub>I</sub> = 0      | 4       | 7                |     | 4       | 7                | mA  |      |
| I <sub>CCCL</sub> | V <sub>CC</sub> = 5.5 V, | V <sub>I</sub> = 4.5 V  | 22      | 30               |     | 22      | 30               | mA  |      |

<sup>‡</sup> All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .



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### switching characteristics (see Note 2)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | V <sub>CC</sub> = 5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = 25°C |     |      | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |         |     | UNIT |
|------------------|-----------------|----------------|-------------------------------------------------------------------------------------------------------|-----|------|-------------------------------------------------------------------------------------------------------------------------|-----|---------|-----|------|
|                  |                 |                | ‘F38                                                                                                  |     |      | SN54F38                                                                                                                 |     | SN74F38 |     |      |
|                  |                 |                | MIN                                                                                                   | TYP | MAX  | MIN                                                                                                                     | MAX | MIN     | MAX |      |
| t <sub>PLH</sub> | A or B          | Y              | 6.7                                                                                                   | 9.6 | 12.5 | 6.2                                                                                                                     | 14  | 6.7     | 13  | ns   |
| t <sub>PHL</sub> |                 |                | 1                                                                                                     | 2.6 | 5    | 1                                                                                                                       | 6.5 | 1       | 5.5 |      |

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

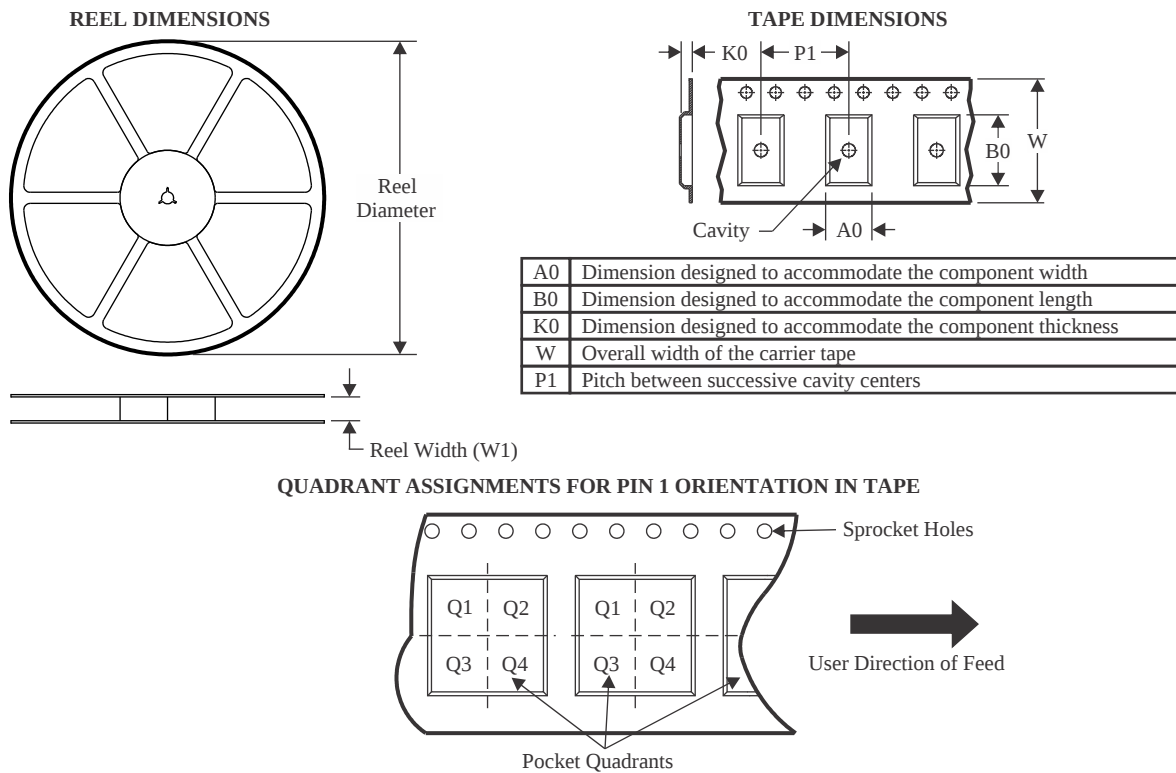
NOTE 2: Load circuits and waveforms are shown in Section 1.



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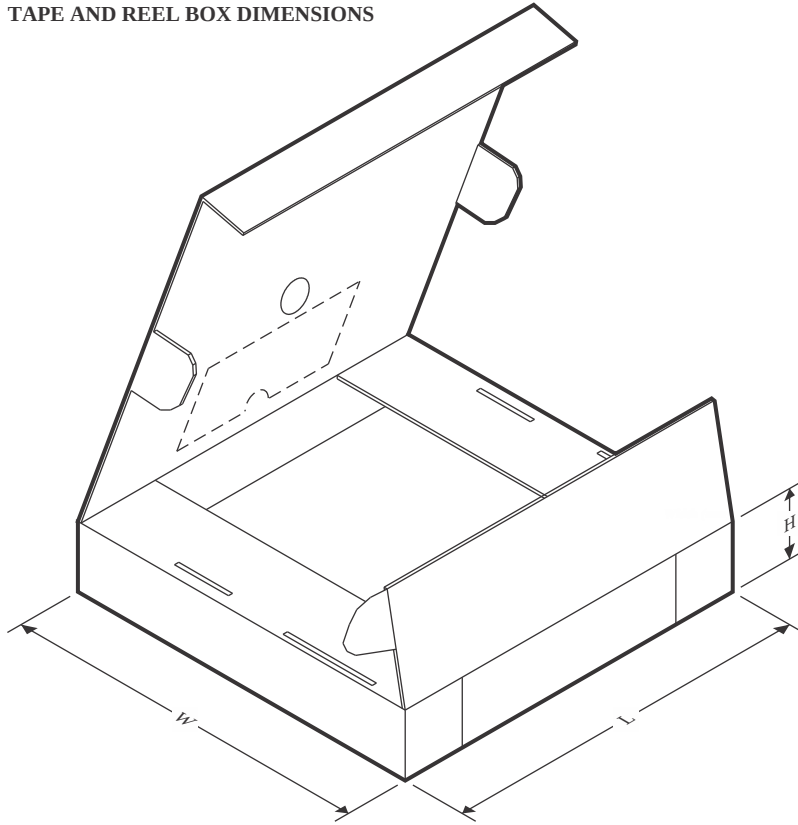
## TAPE AND REEL INFORMATION



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74F38DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74F38NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74F38DR  | SOIC         | D               | 14   | 2500 | 356.0       | 356.0      | 35.0        |
| SN74F38NSR | SO           | NS              | 14   | 2000 | 356.0       | 356.0      | 35.0        |

## TUBE



\*All dimensions are nominal

| Device   | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74F38D | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74F38N | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74F38N | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |

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