

SN5408, SN54LS08, SN54S08  
SN7408, SN74LS08, SN74S08  
**QUADRUPLE 2-INPUT POSITIVE-AND GATES**  
SDLS033 – 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

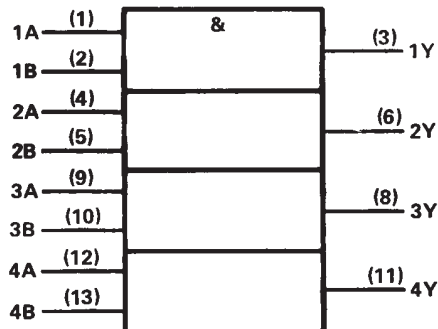
These devices contain four independent 2-input AND gates.

The SN5408, SN54LS08, and SN54S08 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7408, SN74LS08 and SN74S08 are characterized for operation from  $0^{\circ}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE (each gate)

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

#### logic symbol†

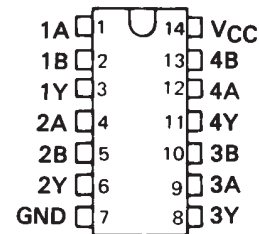


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

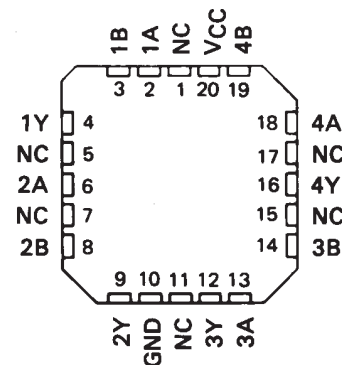
Pin numbers shown are for D, J, N, and W packages.

SN5408, SN54LS08, SN54S08 . . . J OR W PACKAGE  
SN7408 . . . J OR N PACKAGE  
SN74LS08, SN74S08 . . . D, J OR N PACKAGE

(TOP VIEW)

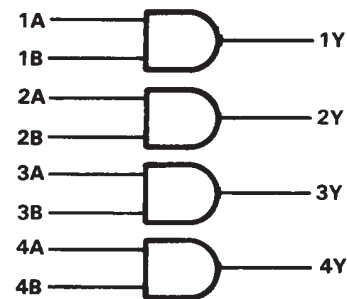


SN54LS08, SN54S08 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

#### logic diagram (positive logic)

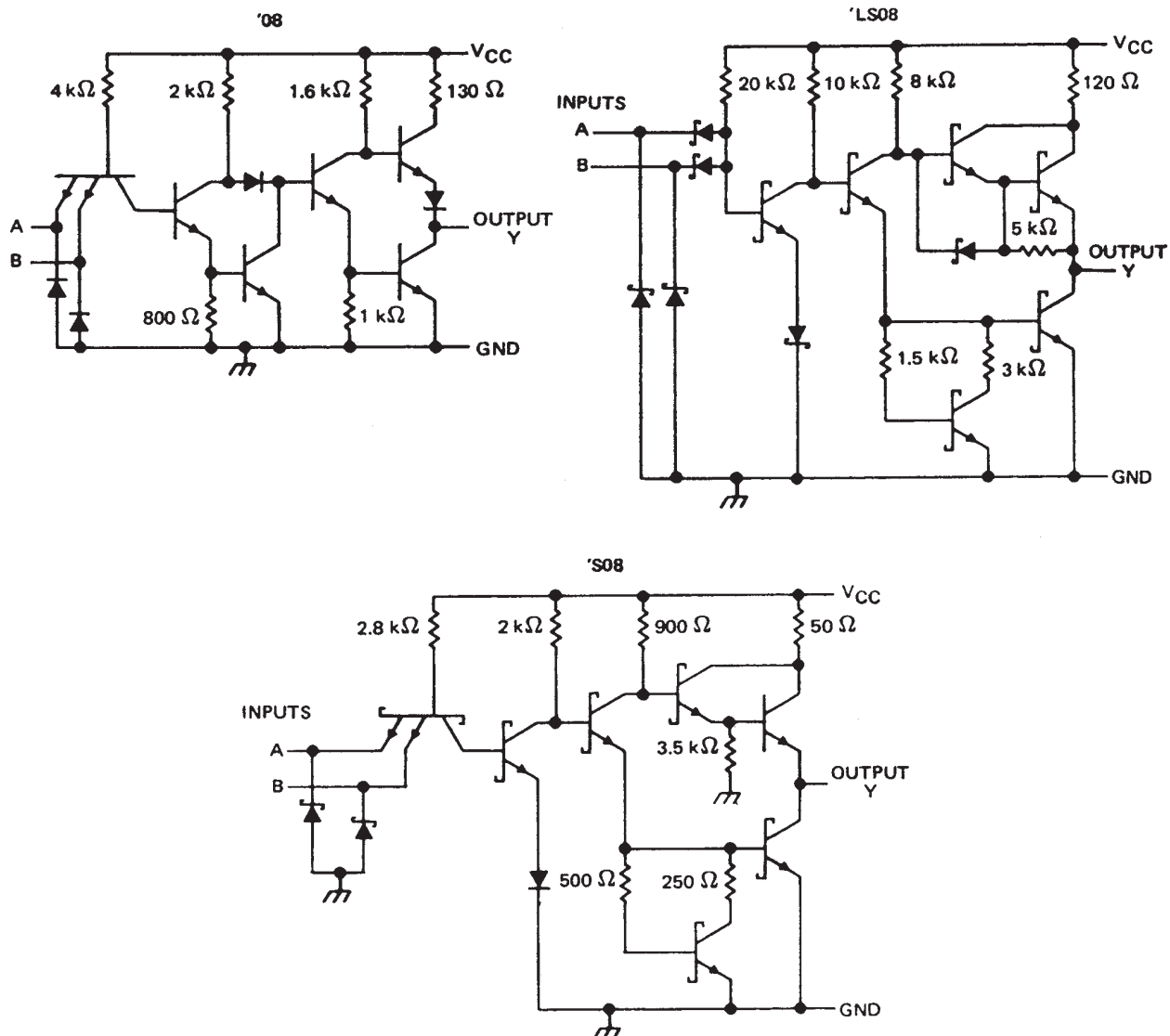


$$Y = A \cdot B \text{ or } Y = \overline{\overline{A} + \overline{B}}$$

# SN5408, SN54LS08, SN54S08 SN7408, SN74LS08, SN74S08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

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## schematics (each gate)



Resistor values are nominal.

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

|                                              |                |
|----------------------------------------------|----------------|
| Supply voltage, V <sub>CC</sub> (see Note 1) | 7 V            |
| Input voltage: '08, 'S08                     | 5.5 V          |
| 'LS08                                        | 7 V            |
| Operating free-air temperature range: 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.

SN5408, SN54LS08, SN54S08  
SN7408, SN74LS08, SN74S08  
**QUADRUPLE 2-INPUT POSITIVE-AND GATES**  
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**recommended operating conditions**

|                                               | SN5408 |     |       | SN7408 |     |       | 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       |        |     | 0.8   |        |     | 0.8   | V    |
| I <sub>OH</sub> High-level output current     |        |     | – 0.8 |        |     | – 0.8 | mA   |
| I <sub>OL</sub> Low-level output current      |        |     | 16    |        |     | 16    | 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 †                                                        | SN5408 |       |       | SN7408 |       |       | UNIT |
|-------------------|--------------------------------------------------------------------------|--------|-------|-------|--------|-------|-------|------|
|                   |                                                                          | MIN    | TYP ‡ | MAX   | MIN    | TYP ‡ | MAX   |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = – 12 mA                          |        |       | – 1.5 |        |       | – 1.5 | V    |
| V <sub>OH</sub>   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = – 0.8 mA | 2.4    | 3.4   |       | 2.4    | 3.4   |       | V    |
| V <sub>OL</sub>   | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 16 mA  |        | 0.2   | 0.4   |        | 0.2   | 0.4   | V    |
| I <sub>I</sub>    | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                            |        |       | 1     |        |       | 1     | mA   |
| I <sub>IH</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V                            |        |       | 40    |        |       | 40    | µA   |
| I <sub>IL</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                            |        |       | – 1.6 |        |       | – 1.6 | mA   |
| I <sub>OS</sub> § | V <sub>CC</sub> = MAX                                                    | – 20   |       | – 55  | – 18   |       | – 55  | mA   |
| I <sub>CCH</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V                            |        | 11    | 21    |        | 11    | 21    | mA   |
| I <sub>CCL</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V                              |        | 20    | 33    |        | 20    | 33    | 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.

**switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)**

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                | MIN | TYP  | MAX | UNIT |
|------------------|-----------------|----------------|------------------------------------------------|-----|------|-----|------|
| t <sub>PLH</sub> | A or B          | Y              | R <sub>L</sub> = 400 Ω, C <sub>L</sub> = 15 pF |     | 17.5 | 27  | ns   |
| t <sub>PHL</sub> |                 |                |                                                |     | 12   | 19  | ns   |

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

**SN5408, SN54LS08, SN54S08  
SN7408, SN74LS08, SN74S08  
QUADRUPLE 2-INPUT POSITIVE-AND GATES**

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**recommended operating conditions**

|                                      | SN54LS08 |     |       | SN74LS08 |     |       | 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     |          |     | 0.7   |          |     | 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 †                                                     | SN54LS08 |       |       | SN74LS08 |       |       | UNIT |
|-----------|-----------------------------------------------------------------------|----------|-------|-------|----------|-------|-------|------|
|           |                                                                       | MIN      | TYP‡  | MAX   | MIN      | TYP‡  | MAX   |      |
| $V_{IK}$  | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$                           |          |       | – 1.5 |          |       | – 1.5 | V    |
| $V_{OH}$  | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OH} = -0.4 \text{ mA}$ | 2.5      | 3.4   |       | 2.7      | 3.4   |       | V    |
| $V_{OL}$  | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, I_{OL} = 4 \text{ mA}$     | 0.25     | 0.4   |       | 0.25     | 0.4   |       | V    |
|           | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, I_{OL} = 8 \text{ mA}$     |          |       |       | 0.35     | 0.5   |       |      |
| $I_I$     | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$                              |          | 0.1   |       |          | 0.1   |       | mA   |
| $I_{IH}$  | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$                            |          | 20    |       |          | 20    |       | µA   |
| $I_{IL}$  | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$                            |          | – 0.4 |       |          | – 0.4 |       | mA   |
| $I_{OS}§$ | $V_{CC} = \text{MAX}$                                                 | – 20     |       | – 100 | – 20     |       | – 100 | mA   |
| $I_{CCH}$ | $V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$                            |          | 2.4   | 4.8   |          | 2.4   | 4.8   | mA   |
| $I_{CCL}$ | $V_{CC} = \text{MAX}, V_I = 0 \text{ V}$                              |          | 4.4   | 8.8   |          | 4.4   | 8.8   | 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, and the duration of the short-circuit should not exceed one second.

**switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$  (see note 2)**

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                | MIN | TYP | MAX | UNIT |
|-----------|-----------------|----------------|------------------------------------------------|-----|-----|-----|------|
| $t_{PLH}$ | A or B          | Y              | $R_L = 2 \text{ k}\Omega, C_L = 15 \text{ pF}$ |     | 8   | 15  | ns   |
| $t_{PHL}$ |                 |                |                                                |     | 10  | 20  | ns   |

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

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SN7408, SN74LS08, SN74S08  
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**recommended operating conditions**

|                                      | SN54S08 |     |     | SN74S08 |     |      | 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   |         |     | – 1 |         |     | – 1  | 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 †                                                     | SN54S08 |       |      | SN74S08 |       |      | UNIT |
|------------|-----------------------------------------------------------------------|---------|-------|------|---------|-------|------|------|
|            |                                                                       | MIN     | TYP ‡ | MAX  | MIN     | TYP ‡ | MAX  |      |
| $V_{IK}$   | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$                           |         |       | –1.2 |         |       | –1.2 | V    |
| $V_{OH}$   | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OH} = -1 \text{ mA}$   | 2.5     | 3.4   |      | 2.7     | 3.4   |      | V    |
| $V_{OL}$   | $V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, I_{OL} = 20 \text{ mA}$ |         |       | 0.5  |         |       | 0.5  | V    |
| $I_I$      | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$                            |         |       | 1    |         |       | 1    | mA   |
| $I_{IH}$   | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$                            |         |       | 50   |         |       | 50   | µA   |
| $I_{IL}$   | $V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$                            |         |       | –2   |         |       | –2   | mA   |
| $I_{OS} §$ | $V_{CC} = \text{MAX}$                                                 | –40     |       | –100 | –40     |       | –100 | mA   |
| $I_{CCH}$  | $V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$                            |         | 18    | 32   |         | 18    | 32   | mA   |
| $I_{CCL}$  | $V_{CC} = \text{MAX}, V_I = 0 \text{ V}$                              |         | 32    | 57   |         | 32    | 57   | 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, and the duration of the short-circuit should not exceed one second.

**switching characteristics,  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$  (see note 2)**

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                         | MIN | TYP | MAX | UNIT |
|-----------|-----------------|----------------|-----------------------------------------|-----|-----|-----|------|
| $t_{PLH}$ | A or B          | Y              | $R_L = 280 \Omega, C_L = 15 \text{ pF}$ | 4.5 | 7   |     | ns   |
| $t_{PHL}$ |                 |                |                                         | 5   | 7.5 |     | ns   |
| $t_{PLH}$ |                 |                | $R_L = 280 \Omega, C_L = 50 \text{ pF}$ | 6   |     |     | ns   |
| $t_{PHL}$ |                 |                |                                         | 7.5 |     |     | ns   |

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

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