

TYPES SN54H15, SN54LS15, SN54S15, SN74H15, SN74LS15, SN74S15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

REVISED APRIL 1985

- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

These devices contain three independent 3-input AND gates with open-collector outputs. 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 high V_{OH} levels.

The SN54H15, SN54LS15, and SN54S15 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74H15, SN74LS15, and SN74S15 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

logic diagram (each gate)

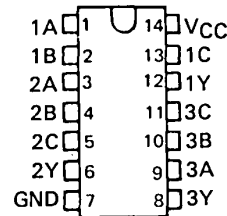


positive logic

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

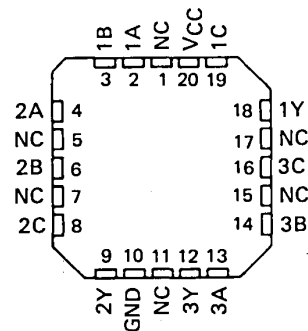
SN54H15, SN54LS15, SN54S15 ... J OR W PACKAGE
SN74H15 ... J OR N PACKAGE
SN74LS15, SN74S15 ... D, J OR N PACKAGE

(TOP VIEW)



SN54LS15, SN54S15 ... FK PACKAGE
SN74LS15, SN74S15 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection



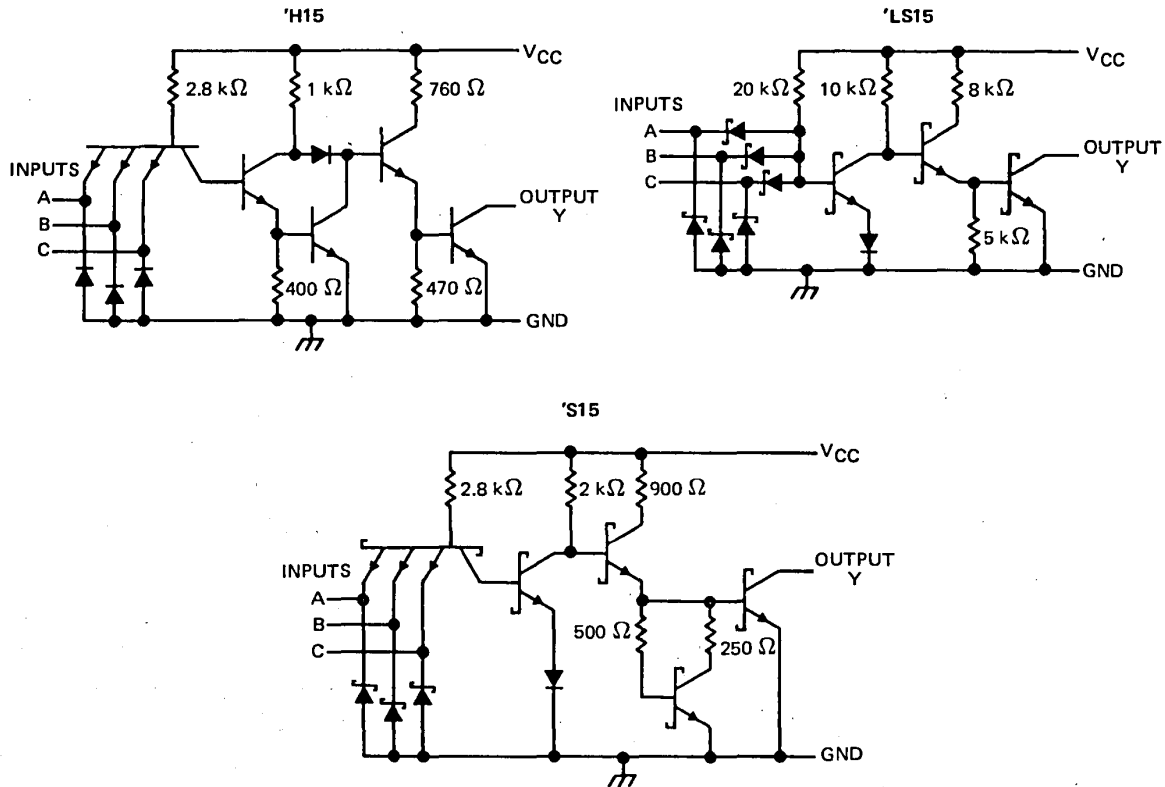
TTL DEVICES

TEXAS
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**TYPES SN54H15, SN54LS15, SN54S15,
SN74H15, SN74LS15, SN74S15
TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS**

schematics (each gate)



Resistor values shown are nominal.

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

| | |
|---|----------------|
| Supply voltage, V_{CC} (see Note 1) | 7 V |
| Input voltage: 'H15, 'S15 | 5.5 V |
| 'LS15 | 7 V |
| Off-state output voltage | 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.

TYPES SN54H15, SN74H15
TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| | SN54H15 | | | SN74H15 | | | 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 |
| V _{OH} High-level output voltage | | | 5.5 | | | 5.5 | V |
| 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† | SN54H15 | | | SN74H15 | | | UNIT |
|------------------|---|---------|------|-----|---------|------|-----|------|
| | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| V _{IK} | V _{CC} = MIN, I _I = -8 mA | | -1.5 | | | -1.5 | V | |
| I _{OH} | V _{CC} = MIN, V _{IH} = 2 V, V _{OH} = 5.5 V | | 0.25 | | | 0.25 | mA | |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA | 0.2 | 0.4 | | 0.2 | 0.4 | V | |
| I _I | V _{CC} = MAX, V _I = 5.5 V | | 0.1 | | | 0.1 | mA | |
| I _{IH} | V _{CC} = MAX, V _I = 2.4 V | | 50 | | | 50 | μA | |
| I _{IL} | V _{CC} = MAX, V _I = 0.4 V | | -2 | | | -2 | mA | |
| I _{CCH} | V _{CC} = MAX, V _I = 4.5 V | 15 | 25 | | 15 | 25 | mA | |
| I _{CCL} | V _{CC} = MAX, V _I = 0 V | 30 | 48 | | 30 | 48 | 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 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|--|-----|-----|-----|------|
| t _{PLH} | A, B, or C | Y | R _L = 280 Ω, C _L = 25 pF | | 12 | 18 | ns |
| t _{PHL} | | | | | 9 | 13 | ns |

NOTE 2: See General Information Section for load circuits and voltage waveforms.

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TTL DEVICES

TYPES SN54LS15, SN74LS15

TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| | SN54LS15 | | | SN74LS15 | | | 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 | | | V |
| V _{OH} High-level output voltage | | | | 5.5 | | | V |
| I _{OL} Low-level output current | | | | 4 | | | mA |
| T _A Operating free-air temperature | -55 | | | 125 | | | °C |

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

| PARAMETER | TEST CONDITIONS† | SN54LS15 | | SN74LS15 | | UNIT |
|------------------|---|----------|------|----------|-----|------|
| | | MIN | TYP‡ | MAX | MIN | |
| V _{IK} | V _{CC} = MIN, I _I = -18 mA | | | -1.5 | | V |
| I _{OH} | V _{CC} = MIN, V _{IH} = 2 V, V _{OH} = 5.5 V | | | 0.1 | | mA |
| V _{OL} | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA | 0.25 | | 0.4 | | V |
| | V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA | | | 0.35 | | |
| I _I | V _{CC} = MAX, V _I = 7 V | | | 0.1 | | mA |
| I _{IH} | V _{CC} = MAX, V _I = 2.7 V | | | 20 | | μA |
| I _{IL} | V _{CC} = MAX, V _I = 0.4 V | | | -0.4 | | mA |
| I _{CCH} | V _{CC} = MAX, V _I = 4.5 V | 1.8 | | 3.6 | | mA |
| I _{CCL} | V _{CC} = MAX, V _I = 0 V | 3.3 | | 6.6 | | 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 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|---|-----|-----|-----|------|
| t _{PLH} | A, B, or C | Y | R _L = 2 kΩ, C _L = 15 pF | 20 | 35 | | ns |
| t _{PHL} | | | | 17 | 35 | | ns |

NOTE 2: See General Information Section for load circuits and voltage waveforms.

TYPES SN54S15, SN74S15 TRIPLE 3-INPUT POSITIVE-AND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

| | SN54S15 | | | SN74S15 | | | 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 |
| V_{OH} High-level output voltage | 5.5 | | | 5.5 | | | V |
| I_{OL} Low-level output current | 20 | | | 20 | | | mA |
| T_A Operating free-air temperature | -55 | | | 125 | | | °C |

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

| PARAMETER | TEST CONDITIONS† | MIN | TYP‡ | MAX | UNIT |
|-----------|---|-----|------|------|------|
| V_{IK} | $V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$ | | | -1.2 | V |
| I_{OH} | $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{OH} = 5.5 \text{ V}$ | | | 0.25 | mA |
| V_{OL} | $V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 16 \text{ mA}$ | | | 0.5 | V |
| I_I | $V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$ | | | 1 | mA |
| I_{IH} | $V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$ | | | 50 | μA |
| I_{IL} | $V_{CC} = \text{MAX}$, $V_I = 0.5 \text{ V}$ | | | -2 | mA |
| I_{CCH} | $V_{CC} = \text{MAX}$, $V_I = 4.5 \text{ V}$ | | 10.5 | 19.5 | mA |
| I_{CCL} | $V_{CC} = \text{MAX}$, $V_I = 0 \text{ V}$ | | 24 | 42 | mA |

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

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

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------|--------------|-------------|--|-----|-----|-----|------|
| t_{PLH} | A, B, or C | Y | $R_L = 280 \Omega$, $C_L = 15 \text{ pF}$ | 5.5 | 8.5 | ns | |
| t_{PHL} | | | | 6 | 9 | ns | |
| t_{PLH} | | | $R_L = 280 \Omega$, $C_L = 50 \text{ pF}$ | 8.5 | ns | | |
| t_{PHL} | | | | 8 | ns | | |

NOTE 2: See General Information Section for load circuits and voltage waveforms.



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