

SN54HC10, SN74HC10 TRIPLE 3-INPUT POSITIVE-NAND GATES

SCLS083B – DECEMBER 1982 – REVISED MAY 1997

- Package Options Include Plastic Small-Outline (D) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

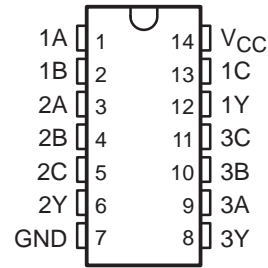
These devices contain three independent 3-input NAND gates. They perform the Boolean function $Y = A \cdot B \cdot C$ or $Y = A + B + C$ in positive logic.

The SN54HC10 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC10 is characterized for operation from -40°C to 85°C .

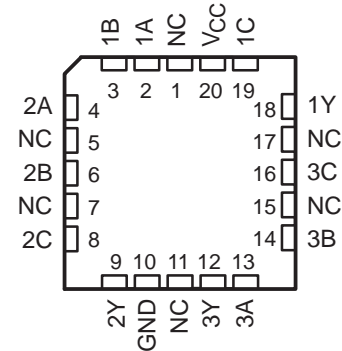
FUNCTION TABLE
(each gate)

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

SN54HC10 . . . J OR W PACKAGE
SN74HC10 . . . D OR N PACKAGE
(TOP VIEW)

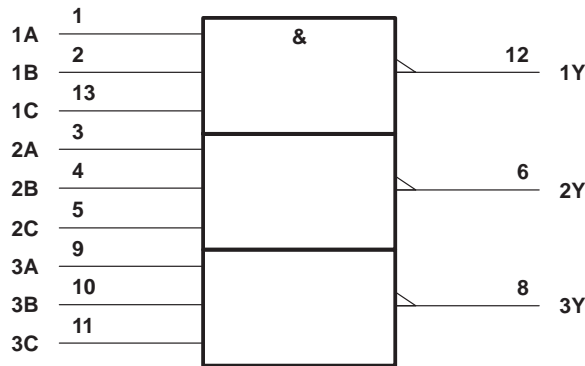


SN54HC10 . . . FK PACKAGE
(TOP VIEW)



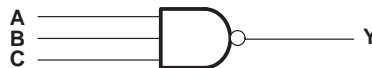
NC – No internal connection

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, N, and W packages.

logic diagram (positive logic)



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1997, Texas Instruments Incorporated

SN54HC10, SN74HC10

TRIPLE 3-INPUT POSITIVE-NAND GATES

SCLS083B – DECEMBER 1982 – REVISED MAY 1997

absolute maximum ratings over operating free-air temperature†

| | |
|---|----------------|
| Supply voltage range, V_{CC} | -0.5 V to 7 V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1) | ± 20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1) | ± 20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ± 25 mA |
| Continuous current through V_{CC} or GND | ± 50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): D package | 127°C/W |
| N package | 78°C/W |
| Storage temperature range, T_{stg} | -65°C to 150°C |

† 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

| | | SN54HC10 | | | SN74HC10 | | | UNIT |
|----------|---------------------------------------|------------------|-----|----------|----------|-----|----------|------|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 2 | 5 | 6 | 2 | 5 | 6 | V |
| V_{IH} | High-level input voltage | $V_{CC} = 2$ V | | 1.5 | 1.5 | | V | |
| | | $V_{CC} = 4.5$ V | | 3.15 | 3.15 | | | |
| | | $V_{CC} = 6$ V | | 4.2 | 4.2 | | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 2$ V | | 0 | 0.5 | 0 | 0.5 | V |
| | | $V_{CC} = 4.5$ V | | 0 | 1.35 | 0 | 1.35 | |
| | | $V_{CC} = 6$ V | | 0 | 1.8 | 0 | 1.8 | |
| V_I | Input voltage | 0 | | V_{CC} | 0 | | V_{CC} | V |
| V_O | Output voltage | 0 | | V_{CC} | 0 | | V_{CC} | V |
| t_t | Input transition (rise and fall) time | $V_{CC} = 2$ V | | 0 | 1000 | 0 | 1000 | ns |
| | | $V_{CC} = 4.5$ V | | 0 | 500 | 0 | 500 | |
| | | $V_{CC} = 6$ V | | 0 | 400 | 0 | 400 | |
| T_A | Operating free-air temperature | -55 | | 125 | -40 | | 85 | °C |



SN54HC10, SN74HC10 TRIPLE 3-INPUT POSITIVE-NAND GATES

SCLS083B – DECEMBER 1982 – REVISED MAY 1997

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

| PARAMETER | TEST CONDITIONS | | V _{CC} | T _A = 25°C | | | SN54HC10 | | SN74HC10 | | UNIT |
|-----------------|---|---------------------------|-----------------|-----------------------|-------|------|----------|-------|----------|-------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | V _I = V _{IH} or V _{IL} | I _{OH} = -20 μA | 2 V | 1.9 | 1.998 | | 1.9 | | 1.9 | V | |
| | | | 4.5 V | 4.4 | 4.499 | | 4.4 | | 4.4 | | |
| | | | 6 V | 5.9 | 5.999 | | 5.9 | | 5.9 | | |
| | | I _{OH} = -4 mA | 4.5 V | 3.98 | 4.3 | | 3.7 | | 3.84 | | |
| | | I _{OH} = -5.2 mA | 6 V | 5.48 | 5.8 | | 5.2 | | 5.34 | | |
| V _{OL} | V _I = V _{IH} or V _{IL} | I _{OL} = 20 μA | 2 V | | 0.002 | 0.1 | | 0.1 | | 0.1 | V |
| | | | 4.5 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | | 6 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | I _{OL} = 4 mA | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| | | I _{OL} = 5.2 mA | 6 V | | 0.15 | 0.26 | | 0.4 | | 0.33 | |
| I _I | V _I = V _{CC} or 0 | | 6 V | | ±0.1 | ±100 | | ±1000 | | ±1000 | nA |
| I _{CC} | V _I = V _{CC} or 0, I _O = 0 | | 6 V | | | 2 | | 40 | | 20 | μA |
| C _i | | | 2 V to 6 V | | 3 | 10 | | 10 | | 10 | pF |

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} | T _A = 25°C | | | SN54HC10 | | SN74HC10 | | UNIT |
|-----------------|--------------|-------------|-----------------|-----------------------|-----|-----|----------|-----|----------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{pd} | A, B, or C | Y | 2 V | | 35 | 95 | | 145 | | 120 | ns |
| | | | 4.5 V | | 10 | 19 | | 29 | | 24 | |
| | | | 6 V | | 9 | 16 | | 25 | | 20 | |
| t _t | | Y | 2 V | | 23 | 75 | | 110 | | 95 | ns |
| | | | 4.5 V | | 6 | 15 | | 22 | | 19 | |
| | | | 6 V | | 5 | 13 | | 19 | | 16 | |

operating characteristics, T_A = 25°C

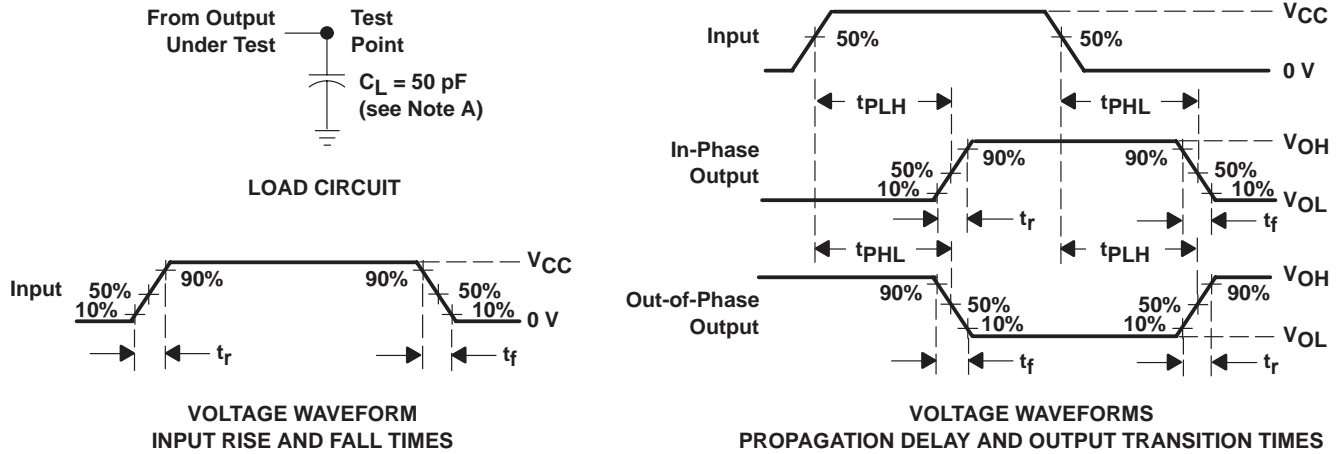
| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------|-----|------|
| C _{pd} Power dissipation capacitance per gate | No load | 25 | pF |



SN54HC10, SN74HC10 TRIPLE 3-INPUT POSITIVE-NAND GATES

SCLS083B – DECEMBER 1982 – REVISED MAY 1997

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A. C_L includes probe and test-fixture capacitance.
 - B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - C. The outputs are measured one at a time with one input transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.