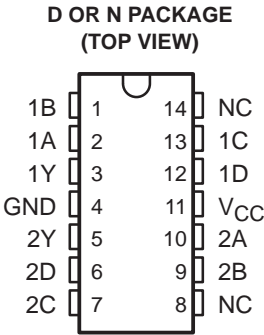


74AC11013

DUAL 4-INPUT POSITIVE-NAND SCHMITT TRIGGER

SCAS112 – MARCH 1990 – REVISED APRIL 1993

- Operation From Very Slow Edges
- Improved Line-Receiving Characteristics
- High Noise Immunity
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- μ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline Packages and Standard Plastic 300-mil DIPs



description

Each circuit functions as a 4-input NAND gate, but because of the Schmitt action, it has different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals.

The 74AC11013 is characterized for operation from -40°C to 85°C .

| FUNCTION TABLE | | | | |
|----------------|---|---|---|--------|
| INPUTS | | | | OUTPUT |
| A | B | C | D | Y |
| H | H | H | H | L |
| L | X | X | X | H |
| X | L | X | X | H |
| X | X | L | X | H |
| X | X | X | L | H |

EPIC is a trademark of Texas Instruments Incorporated.

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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77251-1443

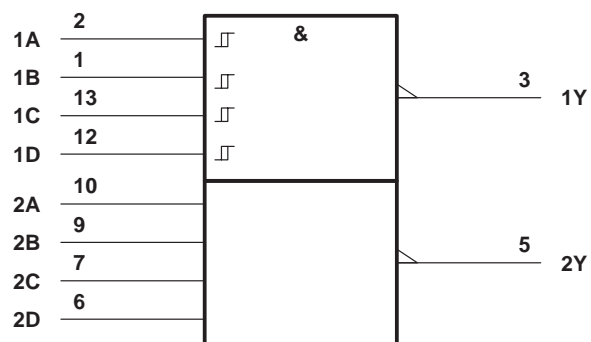
Copyright © 1993, Texas Instruments Incorporated

74AC11013

DUAL 4-INPUT POSITIVE-NAND SCHMITT TRIGGER

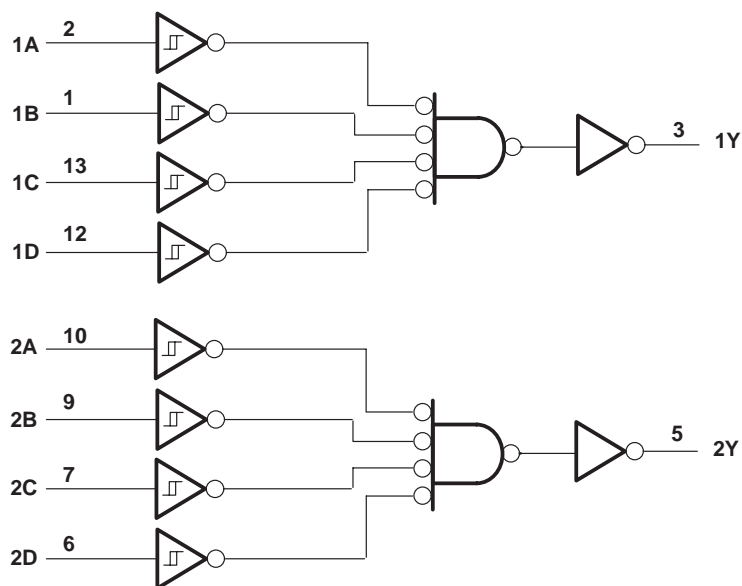
SCAS112 – MARCH 1990 – REVISED APRIL 1993

logic symbol†



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

logic diagram (positive logic)



74AC11013

DUAL 4-INPUT POSITIVE-NAND SCHMITT TRIGGER

SCAS112 – MARCH 1990 – REVISED APRIL 1993

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

| | |
|--|----------------------------|
| Supply voltage range, V_{CC} | –0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) | ±20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ±50 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±50 mA |
| Continuous current through V_{CC} or GND pins | ±100 mA |
| Storage temperature range | –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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

recommended operating conditions

| | | MIN | NOM | MAX | UNIT |
|---------------------|------------------------------------|------------------|-----|----------|------|
| V_{CC} | Supply voltage | 3 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | $V_{CC} = 3$ V | 2.2 | | V |
| | | $V_{CC} = 4.5$ V | 3.2 | | |
| | | $V_{CC} = 5.5$ V | 3.9 | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 3$ V | | 0.5 | V |
| | | $V_{CC} = 4.5$ V | | 0.9 | |
| | | $V_{CC} = 5.5$ V | | 1.1 | |
| V_I | Input voltage | 0 | | V_{CC} | V |
| V_O | Output voltage | 0 | | V_{CC} | V |
| I_{OH} | High-level output current | $V_{CC} = 3$ V | | –4 | mA |
| | | $V_{CC} = 4.5$ V | | –24 | |
| | | $V_{CC} = 5.5$ V | | –24 | |
| I_{OL} | Low-level output current | $V_{CC} = 3$ V | | 12 | mA |
| | | $V_{CC} = 4.5$ V | | 24 | |
| | | $V_{CC} = 5.5$ V | | 24 | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | | 10 | ns/V |
| T_A | Operating free-air temperature | –40 | | 85 | °C |



74AC11013

DUAL 4-INPUT POSITIVE-NAND SCHMITT TRIGGER

SCAS112 – MARCH 1990 – REVISED APRIL 1993

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|--|---|-----------------|-----------------------|------|------|------|------|------|
| | | | MIN | TYP | MAX | | | |
| V _{T+} | | 3 V | | 2.2 | | 2.2 | | V |
| | | 4.5 V | | 3.2 | | 3.2 | | |
| | | 5.5 V | | 3.9 | | 3.9 | | |
| V _{T-} | | 3 V | 0.5 | | | 0.5 | | V |
| | | 4.5 V | 0.9 | | | 0.9 | | |
| | | 5.5 V | 1.1 | | | 1.1 | | |
| V _{hys} (V _{T+} – V _{T-}) | | 3 V | 0.3 | | 1.2 | 0.3 | 1.2 | V |
| | | 4.5 V | 0.4 | | 1.4 | 0.4 | 1.4 | |
| | | 5.5 V | 0.5 | | 1.6 | 0.5 | 1.6 | |
| V _{OH} | I _{OH} = – 50 µA | 3 V | | 2.9 | | 2.9 | | V |
| | | 4.5 V | | 4.4 | | 4.4 | | |
| | | 5.5 V | | 5.4 | | 5.4 | | |
| | I _{OH} = – 4 mA | 3 V | | 2.58 | | 2.48 | | |
| | | 4.5 V | | 3.94 | | 3.8 | | |
| | | 5.5 V | | 4.94 | | 4.8 | | |
| | I _{OH} = – 75 mA† | 5.5 V | | | | 3.85 | | |
| V _{OL} | I _{OL} = 50 µA | 3 V | | | 0.1 | | 0.1 | V |
| | | 4.5 V | | | 0.1 | | 0.1 | |
| | | 5.5 V | | | 0.1 | | 0.1 | |
| | I _{OL} = 12 mA | 3 V | | | 0.36 | | 0.44 | |
| | | 4.5 V | | | 0.36 | | 0.44 | |
| | | 5.5 V | | | 0.36 | | 0.44 | |
| | I _{OL} = 75 mA† | 5.5 V | | | | | 1.65 | |
| I _I | V _I = V _{CC} or GND | 5.5 V | | | ±0.1 | | ±1 | µA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 4 | | 40 | µA |
| C _i | V _I = V _{CC} or GND | 5 V | | 3.5 | | | | pF |

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|-----------------|----------------|-----------------------|-----|-----|-----|-----|------|
| | | | MIN | TYP | MAX | | | |
| t _{PLH} | A, B, C, D | Y | 2.5 | 6.4 | 8.7 | 2.5 | 9.7 | ns |
| t _{PHL} | | | 2.3 | 6.5 | 8.7 | 2.3 | 9.9 | |

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|-----------------|----------------|-----------------------|-----|-----|-----|-----|------|
| | | | MIN | TYP | MAX | | | |
| t _{PLH} | A, B, C, D | Y | 2 | 4.2 | 6.4 | 2 | 7.1 | ns |
| t _{PHL} | | | 2 | 4.4 | 6.9 | 2 | 7.8 | |

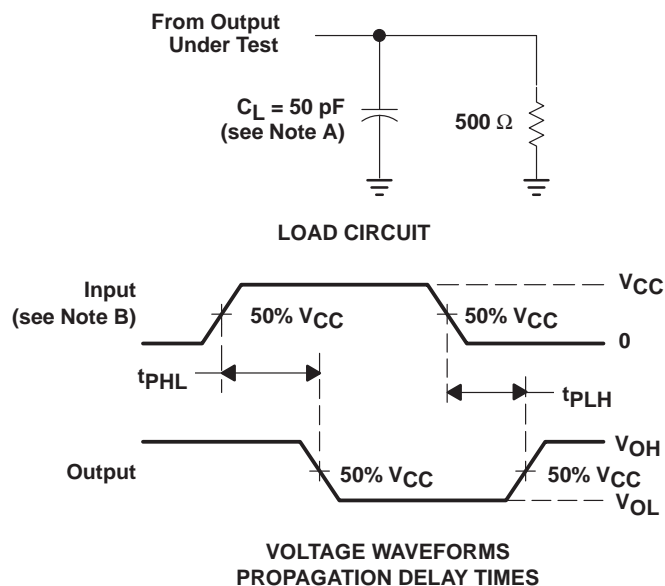


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77251-1443

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|---|-----|------|
| C_{pd} Power dissipation capacitance | $C_L = 50\text{ pF}$, $f = 1\text{ MHz}$ | 29 | pF |

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. Input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r = 3\text{ ns}$, $t_f = 3\text{ ns}$.
 C. The outputs are measured one at a time with one input transition per measurement.

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.