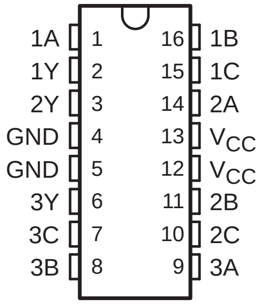
# 54ACT11010, 74ACT11010
# TRIPLE 3-INPUT POSITIVE-NAND GATES

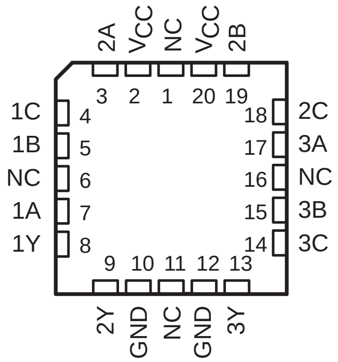
SCAS018A − D2957, JULY 1987 − REVISED APRIL 1993

- **Inputs Are TTL-Voltage Compatible**
- **Flow-Through Architecture to Optimize PCB Layout**
- **Center-Pin $V_{CC}$ and GND Configurations Minimize High-Speed Switching Noise**
- ***EPIC*™ (Enhanced-Performance Implanted CMOS) 1-µm Process**
- **500-mA Typical Latch-Up Immunity at 125°C**
- **Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**

**54ACT11010 . . . J PACKAGE**
**74ACT11010 . . . D OR N PACKAGE**
**(TOP VIEW)**



**54ACT11010 . . . FK PACKAGE**
**(TOP VIEW)**



NC − No internal connection

## description

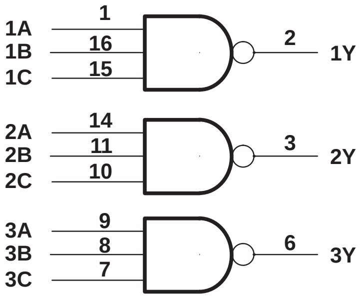
These devices contain three independent 3-input NAND gates. They perform the Boolean functions Y = $\overline{A \bullet B \bullet C}$ or Y = $\overline{A} + \overline{B} + \overline{C}$ in positive logic.

The 54ACT11010 is characterized for operation over the full military temperature range of −55°C to 125°C. The 74ACT11010 is characterized for operation from − 40°C to 85°C.

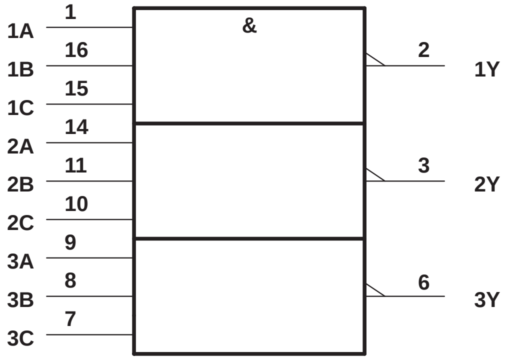
**FUNCTION TABLE**
**(each gate)**

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

## logic diagram (positive logic)



## 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, and N packages.

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

| | |
|---|---|
| Supply voltage range, $V_{CC}$ | – 0.5 V to 6 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 | ± 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 current ratings are observed.

## recommended operating conditions

| | | 54ACT11010 | | 74ACT11010 | | UNIT |
|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5.5 | 4.5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | 2 | | V |
| $V_{IL}$ | Low-level input voltage | | 0.8 | | 0.8 | V |
| $V_I$ | Input voltage | 0 | $V_{CC}$ | 0 | $V_{CC}$ | V |
| $V_O$ | Output voltage | 0 | $V_{CC}$ | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | | –24 | | –24 | mA |
| $I_{OL}$ | Low-level output current | | 24 | | 24 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | 10 | 0 | 10 | ns/V |
| $T_A$ | Operating free-air temperature | –55 | 125 | – 40 | 85 | °C |

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

| PARAMETER | TEST CONDITIONS | $V_{CC}$ | $T_A$ = 25°C | | | 54ACT11010 | | 74ACT11010 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $I_{OH}$ = – 50 µA | 4.5 V | 4.4 | | | 4.4 | | 4.4 | | V |
| | | 5.5 V | 5.4 | | | 5.4 | | 5.4 | | |
| | $I_{OH}$ = – 24 mA | 4.5 V | 3.94 | | | 3.7 | | 3.8 | | |
| | | 5.5 V | 4.94 | | | 4.7 | | 4.8 | | |
| | $I_{OH}$ = – 50 mA[‡] | 5.5 V | | | | 3.85 | | | | |
| | $I_{OH}$ = – 75 mA[‡] | 5.5 V | | | | | | 3.85 | | |
| $V_{OL}$ | $I_{OL}$ = 50 µA | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 5.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | $I_{OL}$ = 24 mA | 4.5 V | | | 0.36 | | 0.5 | | 0.44 | |
| | | 5.5 V | | | 0.36 | | 0.5 | | 0.44 | |
| | $I_{OL}$ = 50 mA[‡] | 5.5 V | | | | | 1.65 | | | |
| | $I_{OL}$ = 75 mA[‡] | 5.5 V | | | | | | | 1.65 | |
| $I_I$ | $V_I = V_{CC}$ or GND | 5.5 V | | | ± 0.1 | | ± 1 | | ± 1 | µA |
| $I_{CC}$ | $V_I = V_{CC}$ or GND, $I_O = 0$ | 5.5 V | | | 4 | | 80 | | 40 | µA |
| $\Delta I_{CC}$[§] | One input at 3.4 V,<br>Other inputs at GND or $V_{CC}$ | 5.5 V | | | 0.9 | | 1 | | 1 | mA |
| $C_i$ | $V_I = V_{CC}$ 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.

[§] This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or $V_{CC}$.

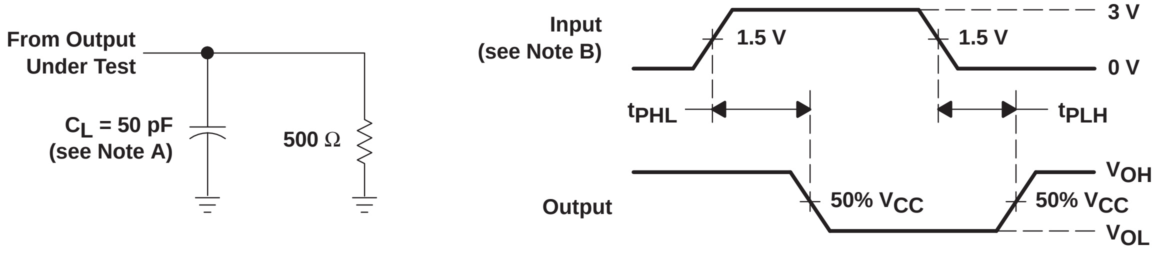
## switching characteristics over recommended ranges of supply voltage and free-air temperature (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A$ = 25°C | | | 54ACT11010 | | 74ACT11010 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | Any | Y | 1.5 | 5.8 | 8.2 | 1.5 | 9.3 | 1.5 | 8.9 | ns |
| $t_{PHL}$ | | | 1.5 | 5.7 | 7.4 | 1.5 | 8.7 | 1.5 | 8.2 | |

## operating characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance per gate | $C_L$ = 50 pF, f = 1 MHz | 27 | pF |

## PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

VOLTAGE WAVEFORMS

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

Figure 1. Load Circuit and Voltage Waveforms

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