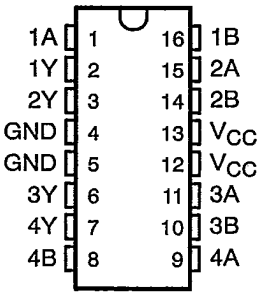
# 54AC11810, 74AC11810
# QUADRUPLE 2-INPUT EXCLUSIVE-NOR GATES

T-43-21-00

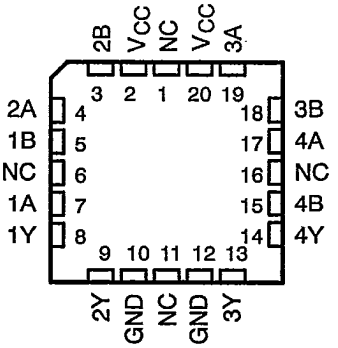
D3580, JUNE 1990

- **Flow-Through Architecture to Optimize PCB Layout**
- **Center-Pin $V_{CC}$ and GND Configurations to 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**

**54AC11810 . . . J PACKAGE**
**74AC11810 . . . D OR N PACKAGE**
**(TOP VIEW)**




**54AC11810 . . . FK PACKAGE**
**(TOP VIEW)**




NC – No internal connection

## description

These devices contain four independent Exclusive-NOR gates. They perform the Boolean functions $Y = \overline{A \oplus B} = (A + \overline{B}) \cdot (\overline{A} + B)$ in positive logic.

A common application is a true/complement element. If one of the inputs is high, the other input will be reproduced in true form at the output. If one of the inputs is low, the signal on the other input will be reproduced inverted at the output.

The 54AC11810 is characterized for operation over the full military temperature range of – 55°C to 125°C. The 74AC11810 is characterized for operation from – 40°C to 85°C.

**FUNCTION TABLE**

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

EPIC is a trademark of Texas Instruments Incorporated.

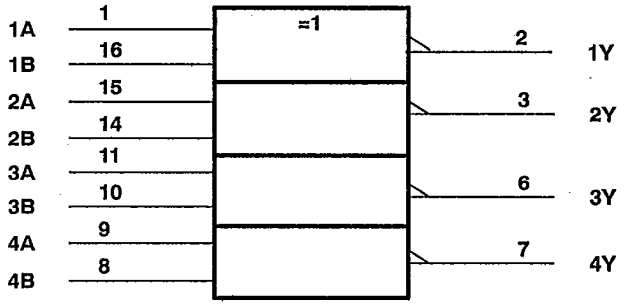


TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# 54AC11810, 74AC11810
# QUADRUPLE 2-INPUT EXCLUSIVE-NOR GATES

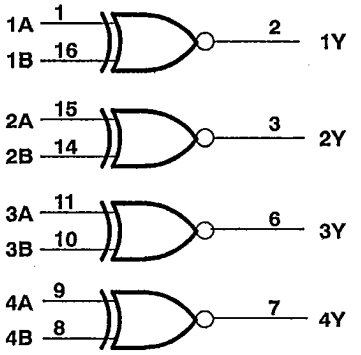
T-43-21

## 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, and N packages.

## logic diagram (positive logic)




## 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 to $V_{CC}$ + 0.5 V
Output voltage range, $V_O$ (see Note 1) ..... −0.5 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 current ratings are observed.

## recommended operating conditions

| | | | 54AC11810 | | | 74AC11810 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 3 | 5 | 5.5 | 3 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 3 V | 2.1 | | | 2.1 | | | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | | | 3.15 | | | |
| | | $V_{CC}$ = 5.5 V | 3.85 | | | 3.85 | | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 3 V | | | 0.9 | | | 0.9 | V |
| | | $V_{CC}$ = 4.5 V | | | 1.35 | | | 1.35 | |
| | | $V_{CC}$ = 5.5 V | | | 1.65 | | | 1.65 | |
| $V_I$ | 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 | $V_{CC}$ = 3 V | | | −4 | | | −4 | mA |
| | | $V_{CC}$ = 4.5 V | | | −24 | | | −24 | |
| | | $V_{CC}$ = 5.5 V | | | −24 | | | −24 | |
| $I_{OL}$ | Low-level output current | $V_{CC}$ = 3 V | | | 12 | | | 12 | mA |
| | | $V_{CC}$ = 4.5 V | | | 24 | | | 24 | |
| | | $V_{CC}$ = 5.5 V | | | 24 | | | 24 | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | | 0 | | 10 | 0 | | 10 | ns/V |
| $T_A$ | Operating free-air temperature | | −55 | | 125 | −40 | | 85 | °C |

T-43-21

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

| PARAMETER | TEST CONDITIONS | $V_{CC}$ | $T_A$ = 25°C | | | 54AC11810 | | 74AC11810 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $I_{OH}$ = −50 µA | 3 V | 2.9 | | | 2.9 | | 2.9 | | V |
| | | 4.5 V | 4.4 | | | 4.4 | | 4.4 | | |
| | | 5.5 V | 5.4 | | | 5.4 | | 5.4 | | |
| | $I_{OH}$ = −4 mA | 3 V | 2.58 | | | 2.4 | | 2.48 | | |
| | $I_{OH}$ = −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 | 3 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | | 5.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | $I_{OL}$ = 12 mA | 3 V | | | 0.36 | | 0.5 | | 0.44 | |
| | $I_{OL}$ = 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 |
| $C_i$ | $V_I$ = $V_{CC}$ 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 (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A$ = 25°C | | | 54AC11810 | | 74AC11810 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A or B | Y | 1.7 | 5.5 | 7.7 | 1.7 | 10.1 | 1.7 | 9 | ns |
| $t_{PHL}$ | | | 1.8 | 5.1 | 7 | 1.8 | 9.1 | 1.8 | 8.3 | |



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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A$ = 25°C | | | 54AC11810 | | 74AC11810 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A or B | Y | 1.5 | 3.9 | 6.1 | 1.5 | 7.9 | 1.5 | 7 | ns |
| $t_{PHL}$ | | | 1.6 | 3.9 | 5.8 | 1.6 | 7.5 | 1.6 | 7 | |

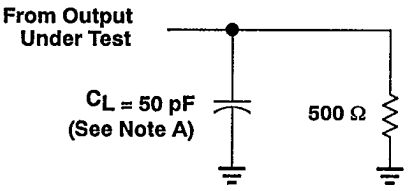


## operating characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

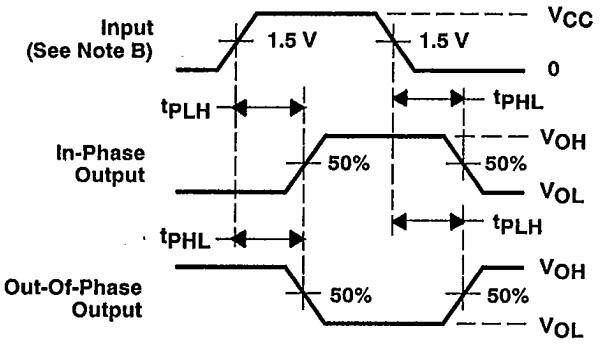
| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance | $C_L$ = 50 pF, f = 1 MHz | 24 | pF |

# 54AC11810, 74AC11810
# QUADRUPLE 2-INPUT EXCLUSIVE-NOR GATES

## PARAMETER MEASUREMENT INFORMATION




LOAD CIRCUIT




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

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 transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**