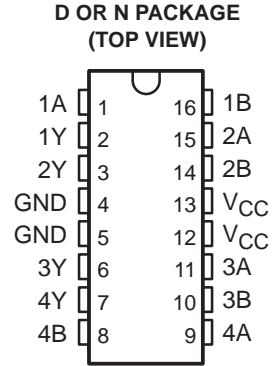


# 74AC11086 QUADRUPLE 2-INPUT EXCLUSIVE-OR GATE

SCAS081A – NOVEMBER 1989 – REVISED APRIL 1996

- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline (D) Packages and Standard Plastic 300-mil DIPs (N)



## description

This device contains four independent 2-input exclusive-OR gates. It performs the Boolean function  $Y = A \oplus B = \bar{A}B + A\bar{B}$  in positive logic.

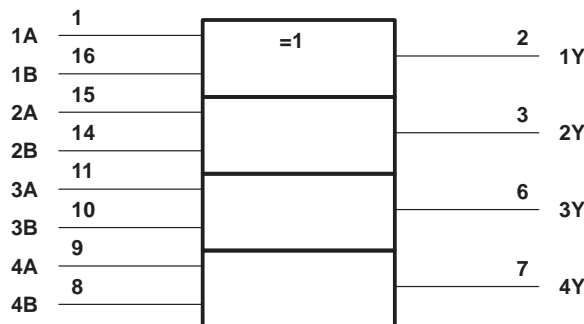
A common application is as a true/complement element. If one of the inputs is low, the other input is reproduced in true form at the output. If one of the inputs is high, the signal on the other input is reproduced inverted at the output.

The 74AC11086 is characterized for operation from -40°C to 85°C.

**FUNCTION TABLE  
(each gate)**

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

## logic symbol†



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



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**TEXAS  
INSTRUMENTS**

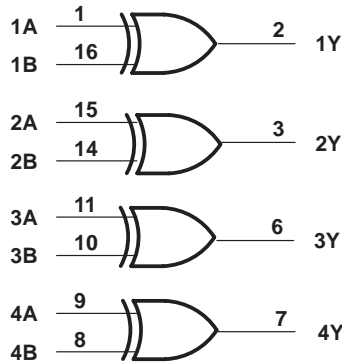
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## logic diagram (positive logic)



## exclusive-OR logic

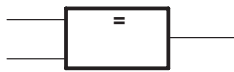
An exclusive-OR gate has many applications, some of which can be represented better by alternative logic symbols.

### EXCLUSIVE OR



These are five equivalent exclusive-OR symbols valid for a 74AC11086 gate in positive logic; negation may be shown at any two ports.

### LOGIC-IDENTITY ELEMENT



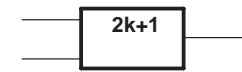
The output is active (high) if all inputs stand at the same logic level (i.e.,  $A=B$ ).

### EVEN-PARITY ELEMENT



The output is active (high) if an even number of inputs (i.e., 0 or 2) are active (high).

### ODD-PARITY ELEMENT



The output is active (high) if an odd number of inputs (i.e., only 1 of the 2) are active (high).

## 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 $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 100$ mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): D package .....	1.3 W
..... N package .....	1.1 W
Storage temperature range, $T_{stg}$ .....	$-65^\circ\text{C}$ to $150^\circ\text{C}$

† 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 maximum package power dissipation is calculated using a junction temperature of  $150^\circ\text{C}$  and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

# 74AC11086 QUADRUPLE 2-INPUT EXCLUSIVE-OR GATE

SCAS081A – NOVEMBER 1989 – REVISED APRIL 1996

## recommended operating conditions

		MIN	NOM	MAX	UNIT
V <sub>CC</sub>	Supply voltage	3	5	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 3 V	2.1		V
		V <sub>CC</sub> = 4.5 V	3.15		
		V <sub>CC</sub> = 5.5 V	3.85		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 3 V		0.9	V
		V <sub>CC</sub> = 4.5 V		1.35	
		V <sub>CC</sub> = 5.5 V		1.65	
V <sub>I</sub>	Input voltage	0		V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage	0		V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 3 V		-4	mA
		V <sub>CC</sub> = 4.5 V		-24	
		V <sub>CC</sub> = 5.5 V		-24	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 3 V		12	mA
		V <sub>CC</sub> = 4.5 V		24	
		V <sub>CC</sub> = 5.5 V		24	
Δt/Δv	Input transition rise or fall rate	0		10	ns/V
T <sub>A</sub>	Operating free-air temperature	-40		85	°C

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	3 V	2.9		2.9	V		
		4.5 V	4.4		4.4			
		5.5 V	5.4		5.4			
	I <sub>OH</sub> = -4 mA	3 V	2.58		2.48			
		4.5 V	3.94		3.8			
		5.5 V	4.94		4.8			
I <sub>OH</sub> = -75 mA <sup>†</sup>	5.5 V			3.85				
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	3 V			0.1	V		
		4.5 V			0.1			
		5.5 V			0.1			
	I <sub>OL</sub> = 12 mA	3 V		0.36	0.44			
		4.5 V		0.36	0.44			
		5.5 V		0.36	0.44			
I <sub>OL</sub> = 75 mA <sup>†</sup>	5.5 V			1.65				
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V		±0.1	±1	μA		
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V		4	40	μA		
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	3.5			pF		

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

# 74AC11086 QUADRUPLE 2-INPUT EXCLUSIVE-OR GATE

SCAS081A – NOVEMBER 1989 – REVISED APRIL 1996

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$t_{PLH}$	A or B	Y	1.5	5.6	9.4	1.5	10.6	ns
$t_{PHL}$			1.5	5.1	7.4	1.5	8.2	

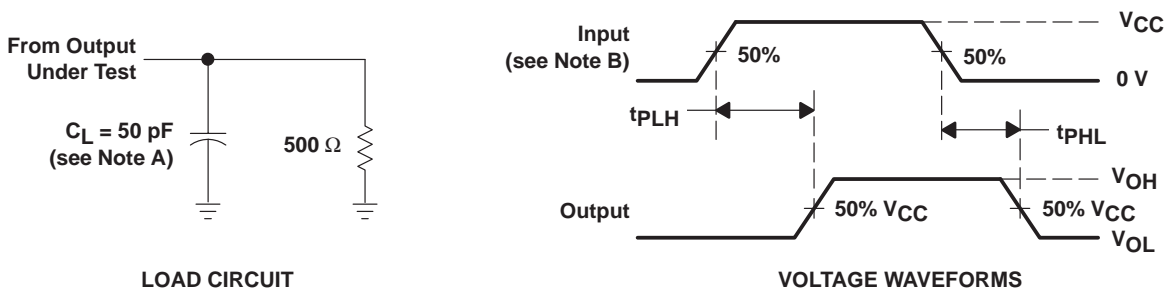
switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
$t_{PLH}$	A or B	Y	1.5	3.8	6.8	1.5	7.6	ns
$t_{PHL}$			1.5	3.8	6.2	1.5	6.8	

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

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

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r = 3\text{ ns}$ ,  $t_f = 3\text{ ns}$ .  
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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