- **Flow-Through Architecture Optimizes PCB Layout**
- **Center-Pin V_{CC} and GND Configuration Minimizes 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**

54AC11002 . . . J PACKAGE
74AC11002 . . . D OR N PACKAGE
(TOP VIEW)

```
        _____
1A  [ 1        16 ] 1B
1Y  [ 2        15 ] 2A
2Y  [ 3        14 ] 2B
GND [ 4        13 ] VCC
GND [ 5        12 ] VCC
3Y  [ 6        11 ] 3A
4Y  [ 7        10 ] 3B
4B  [ 8         9 ] 4A
        _____
```
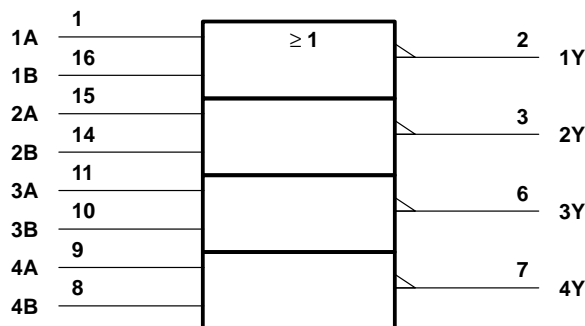
description

These devices contain four independent 2-input NOR gates. They perform the Boolean functions $Y = \overline{A \cdot B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

The 54AC11002 is characterized for operation over the full military temperature range of −55°C to 125°C. The 74AC11002 is characterized for operation from −40°C to 85°C.
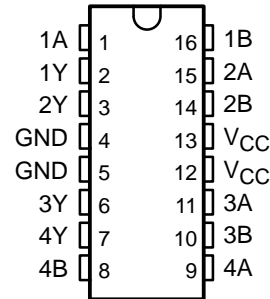
54AC11002 . . . FK PACKAGE
(TOP VIEW)

```
          2B  VCC  NC  VCC  3A
           3   2   1   20  19
2A  [ 4                    18 ] 3B
1B  [ 5                    17 ] 4A
NC  [ 6                    16 ] NC
1A  [ 7                    15 ] 4B
1Y  [ 8                    14 ] 4Y
           9   10  11  12  13
          2Y  GND  NC  GND  3Y
```

NC – No internal connection

FUNCTION TABLE
(each gate)

INPUTS		OUTPUT
A	**B**	**Y**
H	X	L
X	H	L
L	L	H

logic symbol†

```
1A  1 ─────┐  ≥1
1B  16 ────┤        ╲── 2  1Y
2A  15 ────┤
2B  14 ────┤        ╲── 3  2Y
3A  11 ────┤
3B  10 ────┤        ╲── 6  3Y
4A  9 ─────┤
4B  8 ─────┘        ╲── 7  4Y
```

logic diagram (positive logic)


```
1A  1 ─┐
1B  16 ┴─▷○── 2  1Y

2A  15 ┐
2B  14 ┴─▷○── 3  2Y

3A  11 ┐
3B  10 ┴─▷○── 6  3Y

4A  9 ─┐
4B  8 ─┴─▷○── 7  4Y
```
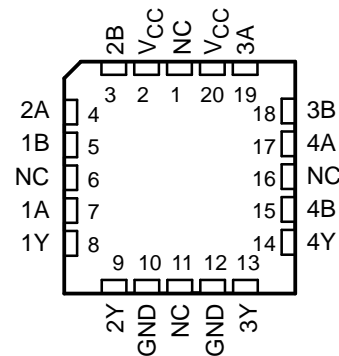
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, and N packages.

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TEXAS INSTRUMENTS

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2–1

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 . . . . ±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

			54AC11002			74AC11002			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

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

PARAMETER	TEST CONDITIONS	V$_{CC}$	T$_A$ = 25°C			54AC11002		74AC11002		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 (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	T$_A$ = 25°C			54AC11002		74AC11002		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t$_{PLH}$	A or B	Y	1.5	7	8.6	1.5	10.7	1.5	9.9	ns
t$_{PHL}$			1.5	6	7.5	1.5	9	1.5	8.4	

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			54AC11002		74AC11002		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t$_{PLH}$	A or B	Y	1.5	4.5	6.1	1.5	7.4	1.5	6.9	ns
t$_{PHL}$			1.5	4	5.7	1.5	6.8	1.5	6.4	

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	32	pF

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54AC11002, 74AC11002
QUADRUPLE 2-INPUT POSITIVE-NOR GATES

PARAMETER MEASUREMENT INFORMATION

From Output Under Test

$C_L = 50$ pF (see Note A)

500 Ω

Input (see Note B)

50%   50%

V_{CC}

0 V

t_{PHL} t_{PLH}

Output

50% V_{CC} 50% V_{CC}

V_{OH}

V_{OL}
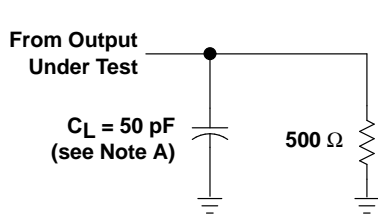
LOAD CIRCUIT
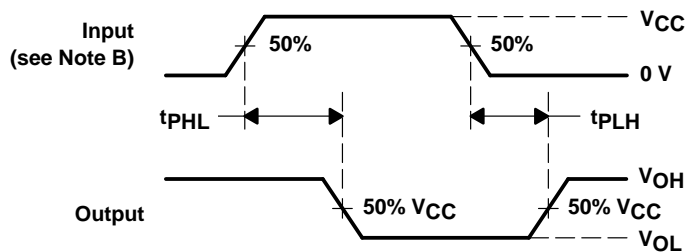
VOLTAGE WAVEFORMS

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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