- ● *EPIC* ™ **(Enhanced-Performance Implanted CMOS) 1-μm Process**
- ● **Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic (N) and Ceramic (J) DIPS**

SN54AC04 . . . J OR W PACKAGE
SN74AC04 . . . D, DB, N, OR PW PACKAGE
(TOP VIEW)

```
      ┌───┬──┐
1A  [ 1    14 ] V_CC
1Y  [ 2    13 ] 6A
2A  [ 3    12 ] 6Y
2Y  [ 4    11 ] 5A
3A  [ 5    10 ] 5Y
3Y  [ 6     9 ] 4A
GND [ 7     8 ] 4Y
      └──────┘
```
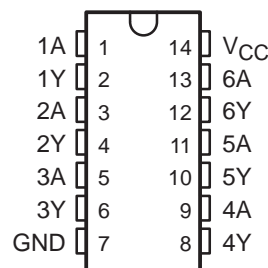
description

The 'AC04 contain six independent inverters. The devices perform the Boolean function $Y = \overline{A}$.

The SN54AC04 is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74AC04 is characterized for operation from −40°C to 85°C.

SN54AC04 . . . FK PACKAGE
(TOP VIEW)

```
              1Y  1A  NC  V_CC  6A
               3   2   1  20  19
          ┌────────────────────┐
2A  [  4  │                    │ 18 ]  6Y
NC  [  5  │                    │ 17 ]  NC
2Y  [  6  │                    │ 16 ]  5A
NC  [  7  │                    │ 15 ]  NC
3A  [  8  │                    │ 14 ]  5Y
          └────────────────────┘
               9  10  11  12  13
              3Y  GND  NC  4Y  4A
```
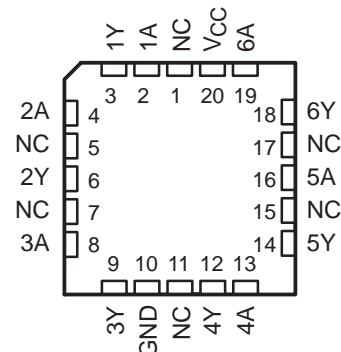
NC – No internal connection

FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

logic symbol[†]

```
1A  1  ┌─────1─────┐  2   1Y
2A  3  │           │  4   2Y
3A  5  │           │  6   3Y
4A  9  │           │  8   4Y
5A  11 │           │  10  5Y
6A  13 │           │  12  6Y
       └───────────┘
```
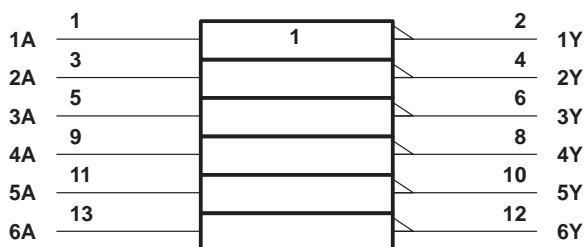
[†] This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the D, DB, J, N, PW, and W packages.

logic diagram, each inverter (positive logic)

```
A ──────────▷○────────── Y
```

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TEXAS INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

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}) . . . . ±20 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . ±50 mA
Continuous current through V_{CC} or GND . . . . ±200 mA
Maximum power dissipation at T_A = 55°C (in still air) (see Note 2): D package . . . . 1.25 W
DB package . . . . 0.5 W
N package . . . . 1.1 W
PW package . . . . 0.5 W
Storage temperature range, T_{stg} . . . . −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.

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°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero.

recommended operating conditions (see Note 3)

			SN54AC04		SN74AC04		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		2	6	2	6	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		−12		−12	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	8	0	8	ns/V
T_A	Operating free-air temperature		−55	125	−40	85	°C

NOTE 3:   Unused inputs must be held high or low to prevent them from floating.

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25°C$			SN54AC04		SN74AC04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$I_{OH} = -50\ \mu A$	3 V	2.9	2.99		2.9		2.9		V
		4.5 V	4.4	4.49		4.4		4.4		
		5.5 V	5.4	5.49		5.4		5.4		
	$I_{OH} = -12\ mA$	3 V	2.56			2.4		2.46		
	$I_{OH} = -24\ mA$	4.5 V	3.86			3.7		3.76		
		5.5 V	4.86			4.7		4.76		
	$I_{OH} = -50\ mA$†	5.5 V				3.85				
	$I_{OH} = -75\ mA$†	5.5 V						3.85		
V_{OL}	$I_{OH} = 50\ \mu A$	3 V		0.002	0.1		0.1		0.1	V
		4.5 V		0.001	0.1		0.1		0.1	
		5.5 V		0.001	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			2		40		20	μA
C_i	$V_I = V_{CC}$ or GND			2.8						pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 2 ms.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25°C$			SN54AC04		SN74AC04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	1.5	4.5	9	1	11	1	10	ns
t_{PHL}			1.5	4.5	8.5	1	10	1	9.5	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25°C$			SN54AC04		SN74AC04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	1.5	4	7	1	8.5	1	7.5	ns
t_{PHL}			1.5	3.5	6.5	1	7.5	1	7	

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

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\ pF$, $f = 1\ MHz$	45	pF

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PARAMETER MEASUREMENT INFORMATION

TEST	S1
t_{PLH}/t_{PHL}	Open
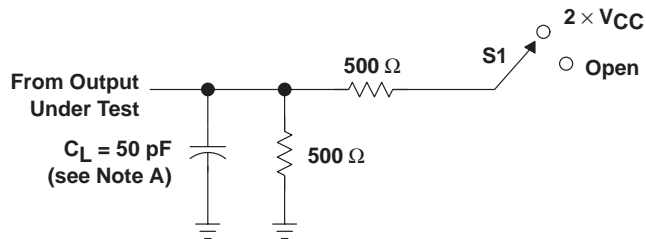
LOAD CIRCUIT
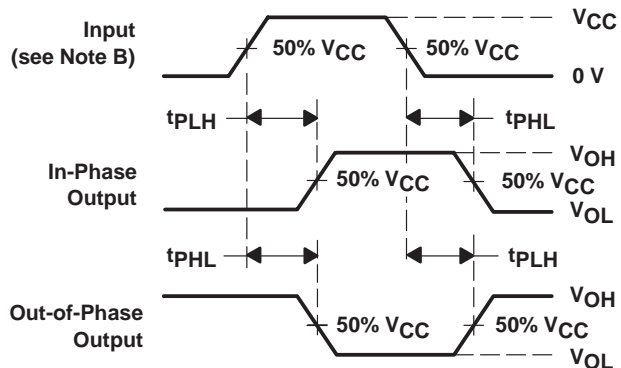
VOLTAGE WAVEFORMS

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 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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