

# SN54AS1004A, SN74ALS1004, SN74AS1004A HEX INVERTING DRIVERS

SDAS074B – APRIL 1982 – REVISED JANUARY 1995

- 'AS1004A Offer High Capacitive-Drive Capability
- Driver Version of 'ALS04B and 'AS04
- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

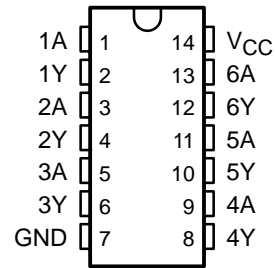
These devices contain six independent inverting drivers. They perform the Boolean function  $Y = \bar{A}$ .

The SN54AS1004A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS1004 and SN74AS1004A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

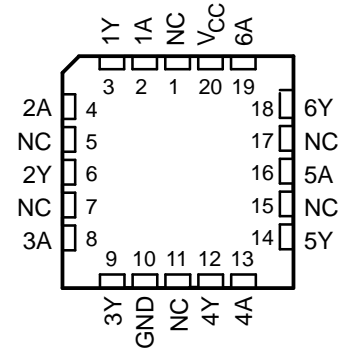
**FUNCTION TABLE**  
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

**SN54AS1004A . . . J PACKAGE**  
**SN74ALS1004, SN74AS1004A . . . D OR N PACKAGE**  
(TOP VIEW)

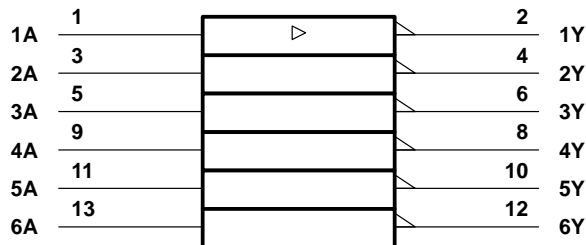


**SN54AS1004A . . . FK PACKAGE**  
(TOP VIEW)



NC – No internal connection

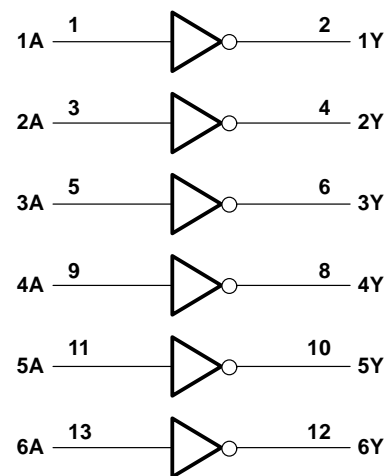
## logic symbol†



† 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.

## logic diagram (positive logic)



# SN54AS1004A, SN74ALS1004, SN74AS1004A

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

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Operating free-air temperature range, $T_A$ : SN74ALS1004	0°C to 70°C
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.

### recommended operating conditions

		SN74ALS1004			UNIT
		MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{OH}$	High-level output current			–15	mA
$I_{OL}$	Low-level output current			24	mA
$T_A$	Operating free-air temperature	0		70	°C

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

PARAMETER	TEST CONDITIONS		SN74ALS1004			UNIT
			MIN	TYP‡	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = −18 mA		−1.5			V
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = −0.4 mA		V <sub>CC</sub> − 2			V
	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = −3 mA	2.4	3.2		
		I <sub>OH</sub> = −15 mA	2			
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 12 mA	0.25	0.4	V	
		I <sub>OL</sub> = 24 mA	0.35	0.5		
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V	0.1			mA	
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V	20			μA	
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V	−0.1			mA	
I <sub>O§</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V	−30	−112		mA	
I <sub>CCH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0	0.84	3		mA	
I <sub>CCL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 4.5 V	7	12		mA	

‡ All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

### switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX††		UNIT
			SN74ALS1004		
			MIN	MAX	
t <sub>PLH</sub>	A	Y	1	7	ns
t <sub>PHL</sub>			1	6	

†† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



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## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

Supply voltage, $V_{CC}$	7 V
Input voltage, $V_I$	7 V
Operating free-air temperature range, $T_A$ : SN54AS1004A	–55°C to 125°C
SN74AS1004A	0°C to 70°C
Storage temperature range	–65°C to 150°C

<sup>†</sup> 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.

## recommended operating conditions<sup>‡</sup>

		SN54AS1004A			SN74AS1004A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$I_{OH}$	High-level output current			–40			–48	mA
$I_{OL}$	Low-level output current			40			48	mA
$T_A$	Operating free-air temperature	–55		125	0		70	°C

<sup>‡</sup> These high sink- or source-current devices are not recommended for use above 40 MHz.

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

PARAMETER	TEST CONDITIONS		SN54AS1004A			SN74AS1004A			UNIT
			MIN	TYP <sup>§</sup>	MAX	MIN	TYP <sup>§</sup>	MAX	
$V_{IK}$	$V_{CC} = 4.5$ V,	$I_I = -18$ mA			–1.2			–1.2	V
$V_{OH}$	$V_{CC} = 4.5$ V to 5.5 V,	$I_{OH} = -2$ mA	$V_{CC} - 2$			$V_{CC} - 2$			V
	$V_{CC} = 4.5$ V	$I_{OH} = -3$ mA	2.4	3.2		2.4	3.2		
		$I_{OH} = -40$ mA	2						
		$I_{OH} = -48$ mA				2			
$V_{OL}$	$V_{CC} = 4.5$ V	$I_{OL} = 40$ mA	0.25	0.5					V
		$I_{OL} = 48$ mA				0.35	0.5		
$I_I$	$V_{CC} = 5.5$ V,	$V_I = 7$ V			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5$ V,	$V_I = 2.7$ V			20			20	μA
$I_{IL}$	$V_{CC} = 5.5$ V,	$V_I = 0.4$ V			–0.5			–0.5	mA
$I_{O}^{\parallel}$	$V_{CC} = 5.5$ V,	$V_O = 2.25$ V	–50		–200	–50		–200	mA
$I_{CCH}$	$V_{CC} = 5.5$ V,	$V_I = 0$	3.5		5	3.5		5	mA
$I_{CCL}$	$V_{CC} = 5.5$ V,	$V_I = 4.5$ V	16		27	16		27	mA

<sup>§</sup> All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$ .

<sup>||</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



# SN54AS1004A, SN74ALS1004, SN74AS1004A

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### switching characteristics (see Figure 1)

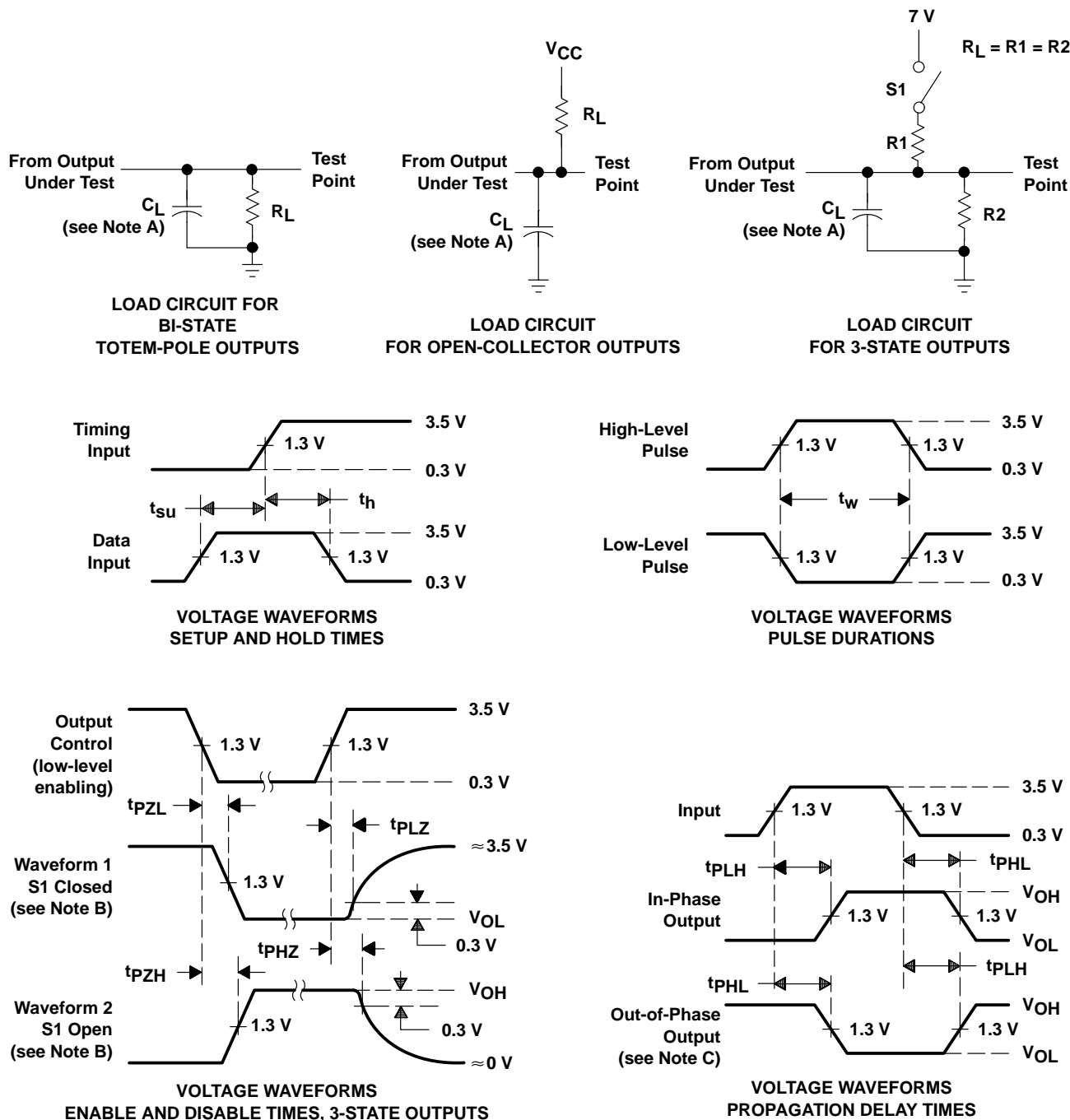
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54AS1004A		SN74AS1004A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1	5	1	4	ns
t <sub>PHL</sub>			1	5	1	4	

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



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PARAMETER MEASUREMENT INFORMATION  
SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

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