

**SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04  
HEX INVERTERS**

D2661, APRIL 1982—REVISED MAY 1986

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

**description**

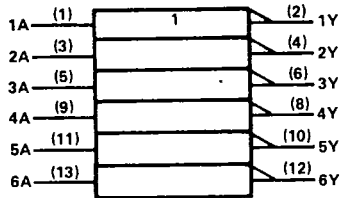
These devices contain six independent inverters. They perform the Boolean function  $Y = \bar{A}$ .

The SN54ALS04B and SN54AS04 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS04B and SN74AS04 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

**FUNCTION TABLE**  
(each inverter)

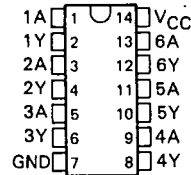
INPUT A	OUTPUT Y
H	L
L	H

**logic symbol†**



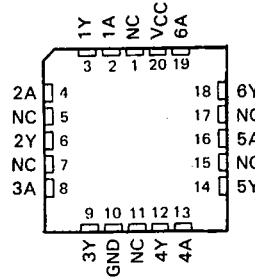
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, and N packages.

SN54ALS04B, SN54AS04 . . . J PACKAGE  
SN74ALS04B, SN74AS04 . . . D OR N PACKAGE  
(TOP VIEW)



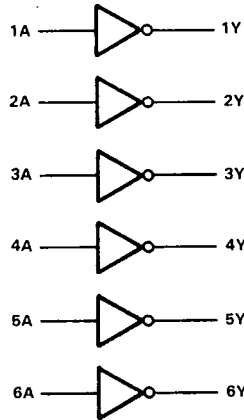
T-43-15

SN54ALS04B, SN54AS04 . . . FK PACKAGE  
(TOP VIEW)



NC—No internal connection

**logic diagram (positive logic)**



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**SN54ALS04B, SN74ALS04B  
HEX INVERTERS**

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

Supply voltage, VCC	7 V
Input voltage	7 V
Operating free-air temperature range: SN54ALS04B	-55°C to 125°C
SN74ALS04B	0°C to 70°C
Storage temperature range	-65°C to 150°C

**recommended operating conditions**

	SN54ALS04B			SN74ALS04B			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
VCC Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.7			0.8	V
I <sub>OH</sub> High-level output current			-0.4			-0.4	mA
I <sub>OL</sub> Low-level output current			4			8	mA
T <sub>A</sub> Operating free-air temperature	-65	125		0	70		°C

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

PARAMETER	TEST CONDITIONS	SN54ALS04B			SN74ALS04B			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V <sub>IK</sub>	VCC = 4.5 V, I <sub>I</sub> = -18 mA			-1.2			V	
V <sub>OH</sub>	VCC = 4.5 V to 5.5 V, I <sub>OH</sub> = -0.4 mA	VCC-2			VCC-2		V	
V <sub>OL</sub>	VCC = 4.5 V, I <sub>OL</sub> = 4 mA	0.25	0.4		0.25	0.4	V	
	VCC = 4.5 V, I <sub>OL</sub> = 8 mA				0.35	0.5		
I <sub>I</sub>	VCC = 5.5 V, V <sub>I</sub> = 7 V		0.1			0.1	mA	
I <sub>IH</sub>	VCC = 5.5 V, V <sub>I</sub> = 2.7 V		20			20	µA	
I <sub>IL</sub>	VCC = 5.5 V, V <sub>I</sub> = 0.4 V		-0.1			-0.1	mA	
I <sub>O</sub> ‡	VCC = 5.5 V, V <sub>O</sub> = 2.25 V	-30	-112	-30	-112		mA	
I <sub>CCH</sub>	VCC = 5.5 V, V <sub>I</sub> = 0 V		0.65	1.1		0.65	1.1	mA
I <sub>CCL</sub>	VCC = 5.5 V, V <sub>I</sub> = 4.5 V		2.9	4.2		2.9	4.2	mA

†All typical values are at VCC = 5 V, TA = 25°C.

‡The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

**switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	VCC = 4.5 V to 5.5 V, CL = 50 pF, RL = 500 Ω TA = MIN to MAX				UNIT
			SN54ALS04B		SN74ALS04B		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	3	14	3	11	ns
t <sub>PHL</sub>	A	Y	2	12	2	8	ns

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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ALS and AS Circuits

SN54AS04, SN74AS04  
HEX INVERTERS

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

Supply voltage, $V_{CC}$ .....	7 V
Input voltage .....	7 V
Operating free-air temperature range: SN54AS04 .....	-55°C to 125°C
SN74AS04 .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

recommended operating conditions

		SN54AS04			SN74AS04			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			-2			-2	mA
$I_{OL}$	Low-level output current			20			20	mA
$T_A$	Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54AS04			SN74AS04			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5 V, I_I = -18 mA$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5 V \text{ to } 5.5 V, I_{OH} = -2 mA$	$V_{CC}-2$			$V_{CC}-2$			V
$V_{OL}$	$V_{CC} = 4.5 V, I_{OL} = 20 mA$		0.35	0.5		0.35	0.5	V
$I_I$	$V_{CC} = 5.5 V, V_I = 7 V$			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
$I_{O†}$	$V_{CC} = 5.5 V, V_O = 2.25 V$	-30		-112	-30		-112	mA
$I_{CCH}$	$V_{CC} = 5.5 V, V_I = 0 V$		3	4.8		3	4.8	mA
$I_{CCL}$	$V_{CC} = 5.5 V, V_I = 4.5 V$		14	26.3		14	26.3	mA

†All typical values are at  $V_{CC} = 5 V, T_A = 25°C$ .

†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 Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 V \text{ to } 5.5 V,$ $C_L = 50 pF,$ $R_L = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54AS04		SN74AS04		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	1	6	1	5	ns
$t_{PHL}$	A	Y	1	4.5	1	4	ns

NOTE 1. Load circuit and voltage waveforms are shown in Section 1.

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ALS and AS Circuits

