

SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

SDAS063B – APRIL 1982 – REVISED DECEMBER 1994

- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

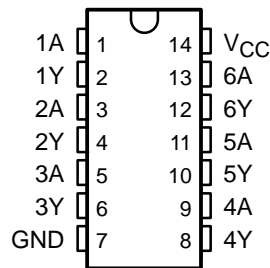
These devices contain six independent hex inverters. They perform the Boolean function $Y = \bar{A}$.

The SN54ALS04B and SN54AS04 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS04B and SN74AS04 are characterized for operation from 0°C to 70°C .

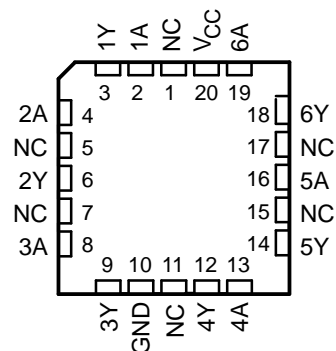
FUNCTION TABLE
(each inverter)

INPUT A	OUTPUT Y
H	L
L	H

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

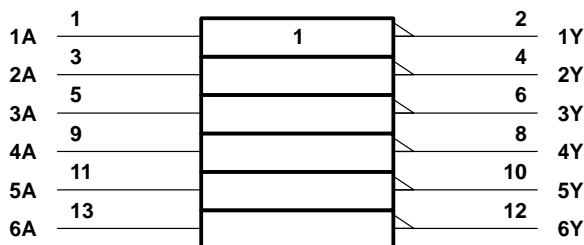


SN54ALS04B, SN54AS04 . . . FK PACKAGE
(TOP VIEW)



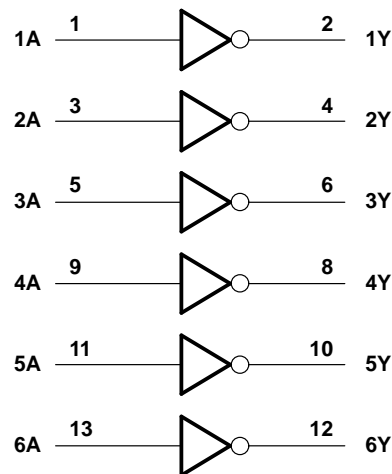
NC – No internal connection

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)



SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

SDAS063B – APRIL 1982 – REVISED DECEMBER 1994

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 : SN54ALS04B	-55°C to 125°C
SN74ALS04B	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

		SN54ALS04B			SN74ALS04B			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
				0.7§				
I_{OH}	High-level output current			-0.4			-0.4	mA
I_{OL}	Low-level output current			4			8	mA
T_A	Operating free-air temperature	-55		125	0		70	°C

‡ Applies over -55°C to 70°C temperature range

§ Applies over 70°C to 125°C temperature range

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_{IK}	$V_{CC} = 4.5 V$, $I_I = -18 mA$			-1.2			-1.2	V
V_{OH}	$V_{CC} = 4.5 V$ to $5.5 V$, $I_{OH} = -0.4 mA$	$V_{CC} - 2$			$V_{CC} - 2$			V
V_{OL}	$V_{CC} = 4.5 V$		0.25	0.4		0.25	0.4	V
						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}	$V_{CC} = 5.5 V$, $V_I = 0.4 V$			-0.1			-0.1	mA
$I_{O}^{\#}$	$V_{CC} = 5.5 V$, $V_O = 2.25 V$	-20		-112	-30		-112	mA
I_{CCH}	$V_{CC} = 5.5 V$, $V_I = 0$		0.65	1.1		0.65	1.1	mA
I_{CCL}	$V_{CC} = 5.5 V$, $V_I = 4.5 V$		2.9	4.4		2.9	4.2	mA

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

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



SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

SDAS063B – APRIL 1982 – REVISED DECEMBER 1994

switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R_L = 500\ \Omega,$ $T_A = \text{MIN to MAX}^\dagger$				UNIT
			SN54ALS04B		SN74ALS04B		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	3	17	3	11	ns
t_{PHL}			2	13	2	8	

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

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 : SN54AS04	-55°C to 125°C
SN74AS04	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

	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}	$V_{CC} = 4.5\text{ V},$ $I_I = -18\text{ mA}$			-1.2			-1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
V_{OL}	$V_{CC} = 4.5\text{ V},$ $I_{OL} = 20\text{ mA}$	0.35	0.5		0.35	0.5		V
I_I	$V_{CC} = 5.5\text{ V},$ $V_I = 7\text{ V}$		0.1			0.1		mA
I_{IH}	$V_{CC} = 5.5\text{ V},$ $V_I = 2.7\text{ V}$		20			20		μA
I_{IL}	$V_{CC} = 5.5\text{ V},$ $V_I = 0.4\text{ V}$		-0.5			-0.5		mA
I_{O}^{\parallel}	$V_{CC} = 5.5\text{ V},$ $V_O = 2.25\text{ V}$	-30	-112		-30	-112		mA
I_{CCH}	$V_{CC} = 5.5\text{ V},$ $V_I = 0$		3	4.8		3	4.8	mA
I_{CCL}	$V_{CC} = 5.5\text{ V},$ $V_I = 4.5\text{ V}$		14	26.3		14	26.3	mA

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

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



SN54ALS04B, SN54AS04, SN74ALS04B, SN74AS04 HEX INVERTERS

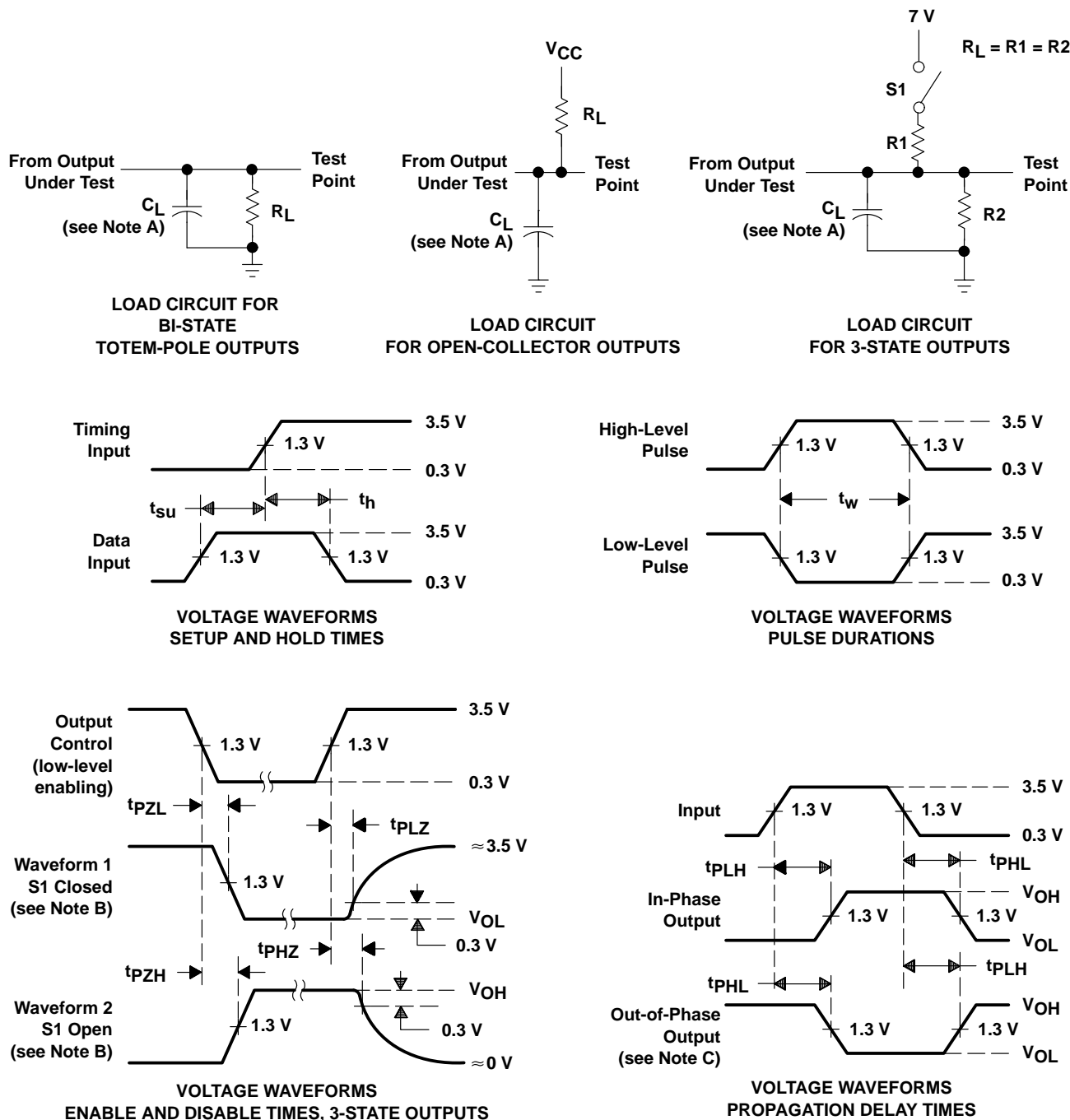
SDAS063B – APRIL 1982 – REVISED DECEMBER 1994

switching characteristics (see Figure 1)

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

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

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

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.