

**SN5404, SN54LS04, SN54S04,
SN7404, SN74LS04, SN74S04
HEX INVERTERS**

DECEMBER 1983—REVISED MARCH 1988

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

description

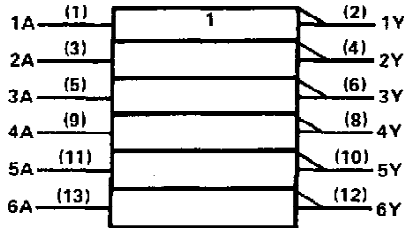
These devices contain six independent inverters.

The SN5404, SN54LS04, and SN54S04 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7404, SN74LS04, and SN74S04 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE (each inverter)

INPUTS	OUTPUT
A	Y
H	L
L	H

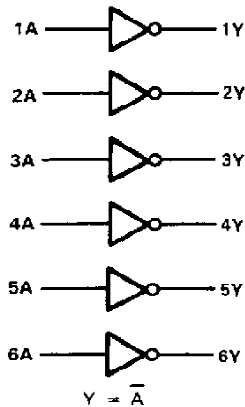
logic symbol †



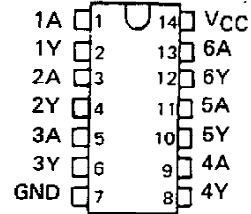
† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, and N packages.

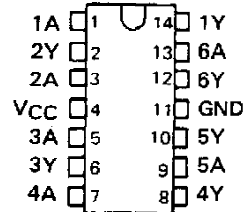
logic diagram (positive logic)



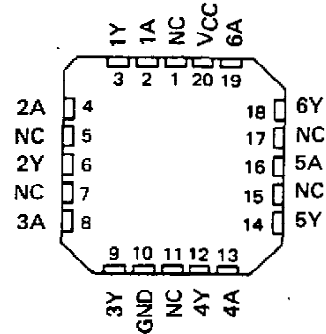
SN5404 . . . J PACKAGE
SN54LS04, SN54S04 . . . J OR W PACKAGE
SN7404 . . . N PACKAGE
SN74LS04, SN74S04 . . . D OR N PACKAGE
(TOP VIEW)



SN5404 . . . W PACKAGE
(TOP VIEW)



SN54LS04, SN54S04 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



SN5404, SN7404 HEX INVERTERS

recommended operating conditions

	SN5404			SN7404			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	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	-0.4			-0.4			mA
I _{OL} Low-level output current	16			16			mA
T _A Operating free-air temperature	-55			0			70 °C

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

PARAMETER	TEST CONDITIONS †	SN5404			SN7404			UNIT	
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX		
V _{IK}	V _{CC} = MIN, I _I = -12 mA	-1.5			-1.5			V	
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.4 mA	2.4	3.4		2.4	3.4		V	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA	0.2			0.2			V	
I _I	V _{CC} = MAX, V _I = 5.5 V	1			1			mA	
I _{IH}	V _{CC} = MAX, V _I = 2.4 V	40			40			μA	
I _{IL}	V _{CC} = MAX, V _I = 0.4 V	-1.6			-1.6			mA	
I _{OS} §	V _{CC} = MAX	-20		-55	-18		-55	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0 V	6			6			12	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	18			18			33	mA

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

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

§ Not more than one output should be shorted at a time.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 400 Ω,	C _L = 15 pF		12	22	ns
t _{PHL}						8	15	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

SN54LS04, SN74LS04 HEX INVERTERS

recommended operating conditions

	SN54LS04			SN74LS04			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage	0.7			0.8			V
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			°C

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

PARAMETER	TEST CONDITIONS †	SN54LS04		SN74LS04		UNIT
		MIN	TYP ‡	MAX	MIN	
V_{IK}	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.5		V
V_{OH}	$V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $I_{OH} = -0.4 \text{ mA}$	2.5	3.4	2.7	3.4	V
V_{OL}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 4 \text{ mA}$	0.25		0.4		V
	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 8 \text{ mA}$			0.25		
I_I	$V_{CC} = \text{MAX}$, $V_I = 7 \text{ V}$	0.1		0.1		mA
I_{IH}	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$	20		20		µA
I_{IL}	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$	-0.4		-0.4		mA
$I_{OS} §$	$V_{CC} = \text{MAX}$	-20		-100		mA
I_{CCH}	$V_{CC} = \text{MAX}$, $V_I = 0 \text{ V}$	1.2	2.4	1.2	2.4	mA
I_{CCL}	$V_{CC} = \text{MAX}$, $V_I = 4.5 \text{ V}$	3.6	6.6	3.6	6.6	mA

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

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

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT	
t_{PLH}	A	Y	$R_L = 2 \text{ k}\Omega$,	$C_L = 15 \text{ pF}$			9	15	ns
t_{PHL}					10	15	ns		

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

SN54S04, SN74S04 HEX INVERTERS

recommended operating conditions

	SN54S04			SN74S04			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	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			-1			-1	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 †	SN54S04			SN74S04			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.2			-1.2	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -1 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA			0.5			0.5	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			50			50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			-2			-2	mA
I _{OS} §	V _{CC} = MAX	-40		-100	-40		-100	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		15	24		15	24	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		30	54		30	54	mA

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

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

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 280 Ω,	C _L = 15 pF		3	4.5	ns
t _{PHL}						3	5	ns
t _{PLH}			R _L = 280 Ω,	C _L = 50 pF		4.5		ns
t _{PHL}						5		ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

TEXAS
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products 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, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

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

TI assumes no liability for applications assistance or customer product design. TI does not 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. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.




TEXAS INSTRUMENTS
THE WORLD LEADER IN DSP AND ANALOG

[Products](#) | [Development Tools](#) | [Applications](#)

Advanced Search
 TI Home
 TI&ME
 Employment

Tech Support
 Comments
 Site Map
 TI Global

>> [Semiconductor Home](#) > [Products](#) > [Digital Logic](#) > [Gates and Inverters](#) > [Inverters](#) >

SN5404, Hex Inverters

Device Status: Active

- > [Description](#)
- > [Features](#)
- > [Datasheets](#)
- > [Pricing/Samples/Availability](#)
- > [Application Notes](#)
- > [Related Documents](#)
- > [Training](#)

Parameter Name	SN5404
Voltage Nodes (V)	5
Vcc range (V)	4.5 to 5.5
Input Level	TTL
Output Level	TTL
No. of Gates	6

Description

These devices contain six independent inverters.

The SN5404, SN54LS04, and SN54S04 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7404, SN74LS04, and SN74S04 are characterized for operation from 0°C to 70°C.

Features

- Package Options Include Plastic “Small Outline” Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

To view the following documents, [Acrobat Reader 3.x](#) is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

Datasheets

Full datasheet in Acrobat PDF: [sdls029.pdf](#) (241 KB)

Full datasheet in Zipped PostScript: [sdls029.psz](#) (266 KB)

Pricing/Samples/Availability

<u>Orderable Device</u>	<u>Package</u>	<u>Pins</u>	<u>Temp (°C)</u>	<u>Status</u>	<u>Price/unit USD (100-999)</u>	<u>Pack Qty</u>	<u>DSCC Number</u>	<u>Availability / Samples</u>
JM38510/00105BCA	<u>J</u>	14	-55 TO 125	ACTIVE	4.18	1		<u>Check stock or order</u>
JM38510/00105BDA	<u>W</u>	14	-55 TO 125	ACTIVE	7.10	1		<u>Check stock or order</u>
SN5404J	<u>J</u>	14	-55 TO 125	ACTIVE	1.14	1		<u>Check stock or order</u>
SNJ5404J	<u>J</u>	14	-55 TO 125	ACTIVE	1.34	1		<u>Check stock or order</u>
SNJ5404W	<u>W</u>	14	-55 TO 125	ACTIVE	5.85	1		<u>Check stock or order</u>

Application Reports

View Application Reports for [Digital Logic](#)

- [Designing With Logic](#) (SDYA009C - Updated: 06/01/1997)
- [Input And Output Characteristics Of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)

Related Documents

- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 4 KB - Updated: 05/06/1999)
- [Logic Selection Guide Second Half 2000](#) (SDYU001N, 5035 KB - Updated: 04/17/2000)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 284 KB - Updated: 07/28/2000)
- [More Power In Less Space - Technical Article](#) (SCAU001A, 850 KB - Updated: 03/01/1996)

Table Data Updated on: 9/5/2000




TEXAS INSTRUMENTS
THE WORLD LEADER IN DSP AND ANALOG

[Products](#) | [Development Tools](#) | [Applications](#)

Advanced Search
 TI Home
 TI&ME
 Employment

Tech Support
 Comments
 Site Map
 TI Global

>> [Semiconductor Home](#) > [Products](#) > [Digital Logic](#) > [Gates and Inverters](#) > [Inverters](#) >

SN54S04, Hex Inverters

Device Status: Active

- > [Description](#)
- > [Features](#)
- > [Datasheets](#)
- > [Pricing/Samples/Availability](#)
- > [Application Notes](#)
- > [Related Documents](#)
- > [Training](#)

Parameter Name	SN54S04
Voltage Nodes (V)	5
Vcc range (V)	4.5 to 5.5
Input Level	TTL
Output Level	TTL
No. of Gates	6

Description

These devices contain six independent inverters.

The SN5404, SN54LS04, and SN54S04 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7404, SN74LS04, and SN74S04 are characterized for operation from 0°C to 70°C.

Features

- Package Options Include Plastic “Small Outline” Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

To view the following documents, [Acrobat Reader 3.x](#) is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

Datasheets

Full datasheet in Acrobat PDF: [sdls029.pdf](#) (241 KB)

Full datasheet in Zipped PostScript: [sdls029.psz](#) (266 KB)

Pricing/Samples/Availability

<u>Orderable Device</u>	<u>Package</u>	<u>Pins</u>	<u>Temp (°C)</u>	<u>Status</u>	<u>Price/unit USD (100-999)</u>	<u>Pack Qty</u>	<u>DSCC Number</u>	<u>Availability / Samples</u>
JM38510/07003BCA	<u>J</u>	14	-55 TO 125	ACTIVE	5.01	1		<u>Check stock or order</u>
SN54S04J	<u>J</u>	14	-55 TO 125	ACTIVE	1.75	1		<u>Check stock or order</u>
SNJ54S04FK	<u>FK</u>	20	-55 TO 125	ACTIVE	8.94	1		<u>Check stock or order</u>
SNJ54S04J	<u>J</u>	14	-55 TO 125	ACTIVE	2.09	1		<u>Check stock or order</u>
SNJ54S04W	<u>W</u>	14	-55 TO 125	ACTIVE	8.35	1		<u>Check stock or order</u>

Application Reports

View Application Reports for [Digital Logic](#)

- [Designing With Logic](#) (SDYA009C - Updated: 06/01/1997)
- [Input And Output Characteristics Of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)

Related Documents

- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 4 KB - Updated: 05/06/1999)
- [Logic Selection Guide Second Half 2000](#) (SDYU001N, 5035 KB - Updated: 04/17/2000)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 284 KB - Updated: 07/28/2000)
- [More Power In Less Space - Technical Article](#) (SCAU001A, 850 KB - Updated: 03/01/1996)

Table Data Updated on: 9/5/2000