

# SN54ALS02, SN54AS02, SN74ALS02A, SN74AS02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

SDAS111A – APRIL 1982 – REVISED JANUARY 1994

- Package Options include Plastic Small Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

## description

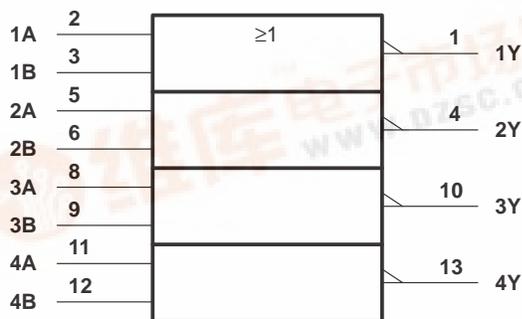
These devices contain four independent 2-input NOR gates. They perform the Boolean functions  $Y = \overline{A \cdot B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

The SN54ALS02 and SN54AS02 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS02A and SN74AS02 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE  
(each gate)

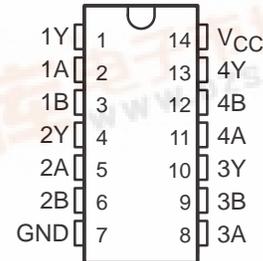
INPUTS		OUTPUT
A	B	Y
H	X	L
X	H	L
L	L	H

## logic symbol†

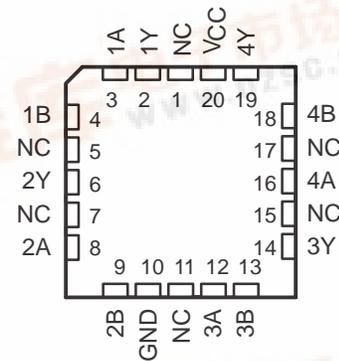


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, and N packages.

SN54ALS02, SN54AS02 . . . J PACKAGE  
SN74ALS02A, SN74AS02 . . . D OR N PACKAGE  
(TOP VIEW)

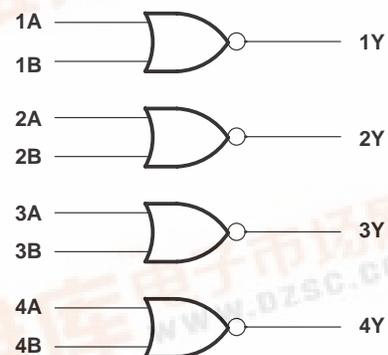


SN54ALS02, SN54AS02 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## logic diagram (positive logic)



# SN54ALS02, SN54AS02, SN74ALS02A, SN74AS02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

SDAS111A – APRIL 1982 – REVISED JANUARY 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:	SN54ALS02, SN54AS02 $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ SN74ALS02A, SN74AS02 $0^{\circ}\text{C}$ to $70^{\circ}\text{C}$
Storage temperature range	$-65^{\circ}\text{C}$ to $150^{\circ}\text{C}$

## recommended operating conditions

		SN54ALS02			SN74ALS02A			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			V		
					0.8†					
					0.7‡					
$I_{OH}$	High-level output current				-0.4			mA		
$I_{OL}$	Low-level output current				4			8	mA	
$T_A$	Operating free-air temperature	-55			125			0	70	$^{\circ}\text{C}$

† Tested at  $-55^{\circ}\text{C}$  to  $70^{\circ}\text{C}$

‡ Tested at  $70^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  per MIL-STD-883, Method 5005, sub-group 1, 2, and 3. Static test is performed at  $25^{\circ}\text{C}$ ,  $125^{\circ}\text{C}$ , and  $-55^{\circ}\text{C}$ .

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

PARAMETER	TEST CONDITIONS	SN54ALS02			SN74ALS02A			UNIT
		MIN	TYP§	MAX	MIN	TYP§	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$	-1.5			-1.5			V
$V_{OH}$	$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$						V
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 4\text{ mA}$	0.25 0.4			0.25 0.4			V
	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 8\text{ mA}$				0.35 0.5			
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$	0.1			0.1			mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$	20			20			$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$	-0.1			-0.1			mA
$I_{O\uparrow}$ ¶	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-30 -112			-30 -112			mA
$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0\text{ V}$	0.86 2.2			0.86 2.2			mA
$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 4.5\text{ V}$	2.16 4			2.16 4			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,  $I_{OS}$ .

## switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5\text{ V}$ , $C_L = \text{pF}$ , $R_L = 500\ \Omega$ , $T_A = 25^{\circ}\text{C}$		$V_{CC} = 4.5\text{ V}$ to $5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = \text{MIN to MAX}\#$				UNIT
			ALS02	SN54ALS02		SN54ALS02A			
				TYP	MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	Y	7	1	16	3	12	ns	
$t_{PHL}$	A or B	Y	5	1	7.5	3	7.5	ns	

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

NOTE 1: Load circuit and voltage waveforms are shown in Section 1 of the *ALS/AS Logic Data Book*, 1986.

# SN54ALS02, SN54AS02, SN74ALS02A, SN74AS02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

SDAS111A – APRIL 1982 – REVISED JANUARY 1994

## recommended operating conditions

	SN54AS02			SN74AS02			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	SN54AS02			SN74AS02			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
$I_{O}^{\ddagger}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-30		-112	-30		-112	mA
$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0\text{ V}$		3.7	5.9		3.7	5.9	mA
$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 4.5\text{ V}$		12.5	20.1		12.5	20.1	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,  $I_{OS}$ .

## switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = \text{MIN to MAX}^{\S}$				UNIT
			SN54ALS02		SN54ALS02		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	Y	1	5	1	4.5	ns
$t_{PHL}$	A or B	Y	1	5	1	4.5	ns

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

NOTE 1: Load circuit and voltage waveforms are shown in Section 1 of the ALS/AS Logic Data Book, 1986.

## **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.