

# SN54ALS02, SN54AS02, SN74ALS02, SN74AS02 QUAD 2-INPUT POSITIVE-NOR GATES

SDAS111 – D2661, APRIL 1982 – REVISED SEPTEMBER 1987

- 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

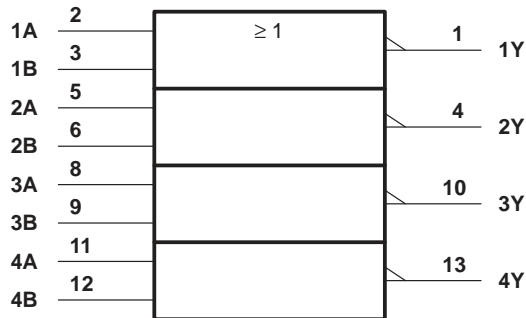
These devices contain four independent 2-input NOR gates. They perform the Boolean functions  $Y = \overline{A \cdot B}$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

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 SN74ALS02 and SN74AS02 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

FUNCTION TABLE  
(each gate)

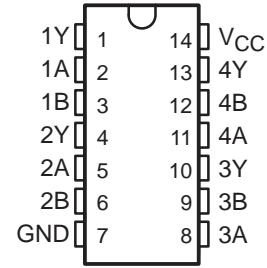
INPUTS		OUTPUT
A	B	Y
H	X	L
X	H	L
L	L	H

## logic symbol†

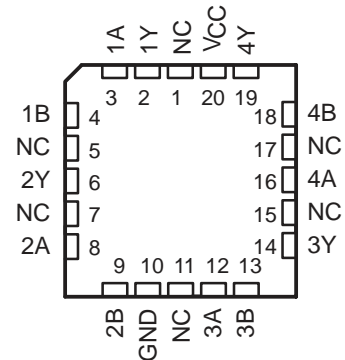


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for D, J, and N packages.

SN54ALS02, SN54AS02 . . . J PACKAGE  
SN74ALS02, SN74AS02 . . . D OR N PACKAGE  
(TOP VIEW)

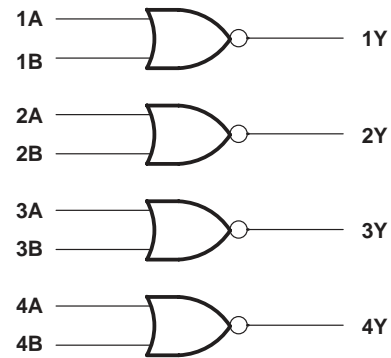


SN54ALS02, SN54AS02 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## logic diagram (positive logic)



# SN54ALS02, SN74ALS02 QUAD 2-INPUT POSITIVE-NOR GATES

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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:	
SN54ALS02	–55°C to 125°C
SN74ALS02	0°C to 70°C
Storage temperature range	–65°C to 150°C

## recommended operating conditions

		SN54ALS02			SN74ALS02			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			–0.4	mA
$I_{OL}$	Low-level output current			4			8	mA
$T_A$	Operating free-air temperature	–55		125	0		70	°C

† Tested at –55°C to 70°C.

‡ Tested at 70°C to 125°C, per MIL-STD-833, method 5005, sub-group 1, 2, and 3. Static test is performed at 25°C, 125°C, and –55°C.

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

PARAMETER	TEST CONDITIONS	SN54ALS02			SN74ALS02			UNIT
		MIN	TYP§	MAX	MIN	TYP§	MAX	
$V_{IK}$	$V_{CC} = 4.5 V$ , $I_I = -18 mA$			–1.5			–1.5	V
$V_{OH}$	$V_{CC} = 4.5 V$ to 5.5 V, $I_{OH} = -0.4 mA$	$V_{CC}-2$						V
$V_{OL}$	$V_{CC} = 4.5 V$ , $I_{OL} = 4 mA$		0.25	0.4		0.25	0.4	V
	$V_{CC} = 4.5 V$ , $I_{OL} = 8 mA$					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
$I_{IL}$	$V_{CC} = 5.5 V$ , $V_I = 0.4 V$			–0.1			–0.1	mA
$I_{O}^{\parallel}$	$V_{CC} = 5.5 V$ , $V_O = 2.25 V$	–30		–112	–30		–112	mA
$I_{CCH}$	$V_{CC} = 5.5 V$ , $V_I = 0 V$		0.86	2.2		0.86	2.2	mA
$I_{CCL}$	$V_{CC} = 5.5 V$ , $V_I = 4.5 V$		2.16	4		2.16	4	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,  $I_{OS}$ .

## switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5 V$ , $C_L = pF$ , $R_L = 500 \Omega$ , $T_A = 25^\circ C$	$V_{CC} = 4.5 V$ to 5.5 V, $C_L = 50 pF$ , $R_L = 500 \Omega$ , $T_A = MIN$ to MAX#				UNIT
				'ALS02		SN54ALS02		
				TYP	MIN	MAX	MIN	
$t_{PLH}$	A or B	Y	7	1	16	3	12	ns
$t_{PHL}$	A or B	Y	5	1	7.5	3	7.58	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.



# SN54AS02, SN54ALS02 QUAD 2-INPUT POSITIVE-NOR GATES

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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: SN54AS02 .....	–55°C to 125°C
SN74AS02 .....	0°C to 70°C
Storage temperature range .....	–65°C to 150°C

## 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
$I_{O‡}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	–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.



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