

# SN74ALS02A, SN74AS02, SN54ALS02A, SN54AS02 QUADRUPLE 2-INPUT POSITIVE-NOR GATES

D2661, APRIL 1982 - REVISED JANUARY 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

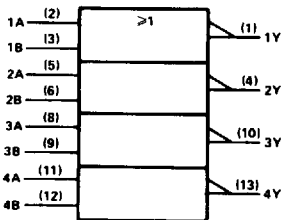
These devices contain four independent 2-input NOR gates. They perform the Boolean functions  $Y = \overline{A \cdot B}$  or  $Y = \overline{A + B}$  in positive logic.

The SN54ALS02A 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

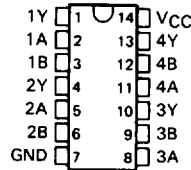
## logic symbol†



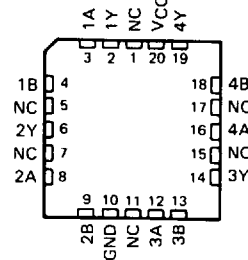
† This symbol is in accordance with ANSI/IEEE Std 91 1984 and IEC Publication 617-12.

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

SN54ALS02A, SN54AS02... J PACKAGE  
SN74ALS02A, SN74AS02... D OR N PACKAGE  
(TOP VIEW)

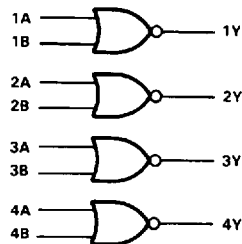


SN54ALS02A, SN54AS02... FK PACKAGE  
(TOP VIEW)



NC - No internal connection

## logic diagram (positive logic)



# SN74ALS02A, SN54ALS02A QUADRUPLE 2-INPUT POSITIVE-NOR GATES

## 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: SN54ALS02A .....	-55°C to 125°C
SN74ALS02A .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

## recommended operation conditions

	SN54ALS02A			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			0.7			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		0	70		°C

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

PARAMETER	TEST CONDITIONS	SN54ALS02A			SN74ALS02A			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, $I_{OH} = -0.4 mA$	$V_{CC}-2$			$V_{CC}-2$			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
$I_{OZ}^{\ddagger}$	$V_{CC} = 5.5 V, V_O = 2.25 V$		-30	-112		-30	-112	mA
$I_{CC}$	$V_{CC} = 5.5 V, V_I = 0 V$			0.86		0.86	2.2	mA
$I_{CCL}$	$V_{CC} = 5.5 V, V_I = 4.5 V$			2.16		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)	$V_{CC} = 5 V,$ $C_L = 50 pF,$ $R_L = 500 \Omega,$ $T_A = 25^\circ C$	$V_{CC} = 4.5 V$ to 5.5 V, $C_L = 50 pF,$ $R_L = 500 \Omega,$ $T_A = MIN$ to MAX				UNIT
				SN54ALS02A		SN74ALS02A		
				TYP	MIN	MAX	MIN	
$t_{PLH}$	A or B	Y		1	18	1	12	ns
$t_{PHL}$	A or B	Y	5	1	11	1	10	

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



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

## 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†
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			-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
$I_{O}^{\dagger}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-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)	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = \text{MIN to MAX}$				UNIT
			SN54AS02		SN74AS02		
			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	

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