

SDLS028

**SN5403, SN54LS03, SN54S03,
SN7403, SN74LS03, SN74S03**

QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

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

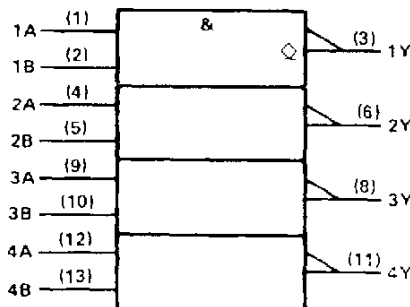
These devices contain four independent 2-input-NAND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN5403, SN54LS03 and SN54S03 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7403, SN74LS03 and SN74S03 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

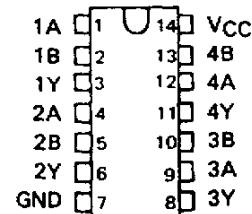
logic symbol †



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

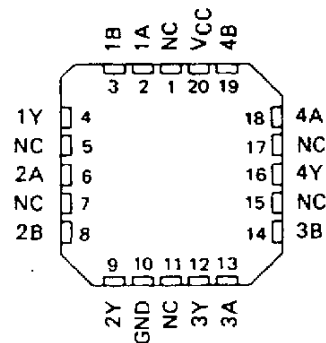
SN5403 . . . J OR W PACKAGE
SN54LS03, SN54S03 . . . J OR W PACKAGE
SN7403 . . . N PACKAGE
SN74LS03, SN74S03 . . . D OR N PACKAGE

(TOP VIEW)



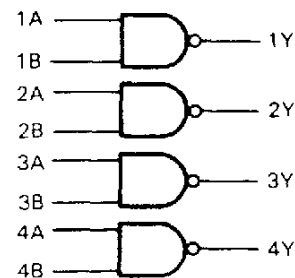
SN54LS03, SN54S03 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

logic diagram (positive logic)



$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A} + \overline{B}$$

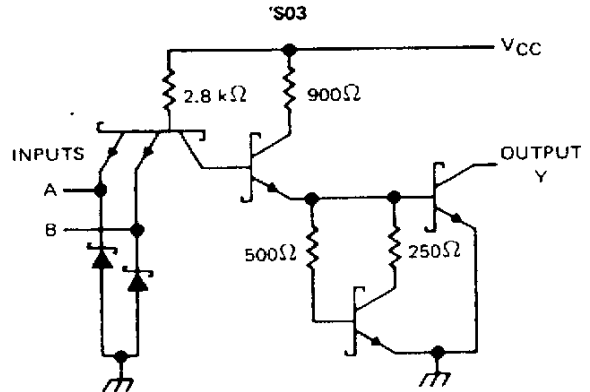
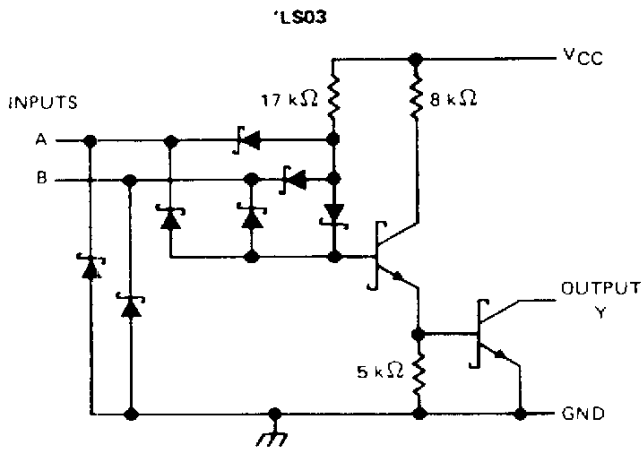
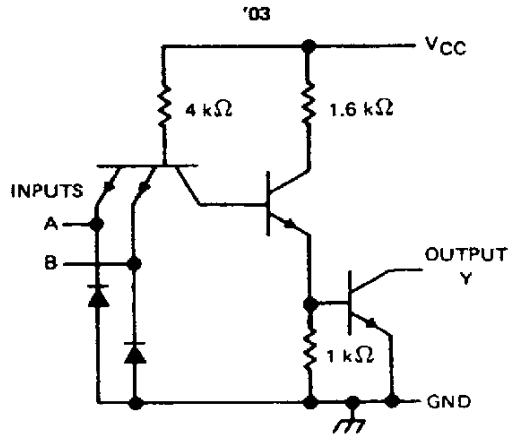
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**SN5403, SN54LS03, SN54S03,
SN7403, SN74LS03, SN74S03**
QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

schematics (each gate)



Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: '03, 'S03	5.5 V
'LS03	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

SN5403, SN7403

QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN5403			SN7403			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
V_{OH} High-level output voltage	5.5			5.5			V
I_{OL} Low-level output current	16			16			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 [†]	SN5403			SN7403			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5			-1.5	V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$						0.25	mA
	$V_{CC} = \text{MIN}, V_{IL} = 0.7 \text{ V}, V_{OH} = 5.5 \text{ V}$			0.25				
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0$		4	8		4	8	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		12	22		12	22	mA

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

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

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 or B	Y	$R_L = 4 \text{ k}\Omega,$	$C_L = 15 \text{ pF}$		35	45	ns
t_{PHL}			$R_L = 400 \Omega,$	$C_L = 15 \text{ pF}$		8	15	ns

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

SN54LS03, SN74LS03 QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54LS03			SN74LS03			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
V _{OH} High-level output voltage			5.5			5.5	V
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†	SN54LS03		SN74LS03		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5		-1.5	V	
I _{OH}	V _{CC} = MIN, V _{IL} = MAX, V _{OH} = 5.5 V			0.1		0.1	mA	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA		0.25	0.4		0.25	0.4	V
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA					0.35	0.5	
I _I	V _{CC} = MAX, V _I = 7 V			0.1		0.1	mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			20		20	μA	
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-0.4		-0.4	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0		0.8	1.6		0.8	1.6	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		2.4	4.4		2.4	4.4	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.

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 or B	Y	R _L = 2 kΩ, C _L = 15 pF		17	32	ns
t _{PHL}					15	28	ns

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

SN54S03, SN74S03 QUADRUPLE 2-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54S03			SN74S03			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
V_{OH} High-level output voltage			5.5			5.5	V
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 [†]	SN54S03			SN74S03			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.2			-1.2	V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$						0.25	mA
	$V_{CC} = \text{MIN}, V_{IL} = 0.7 \text{ V}, V_{OH} = 5.5 \text{ V}$			0.25				
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$			0.5			0.5	V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			50			50	μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$			-2			-2	mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0$		6	13.2		6	13.2	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		20	36		20	36	mA

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

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

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 or B	Y	$R_L = 280 \Omega, C_L = 15 \text{ pF}$	2	5	7.5	ns
t_{PHL}				2	4.5	7	ns
t_{PLH}			$R_L = 280 \Omega, C_L = 50 \text{ pF}$	7.5			ns
t_{PHL}				7			ns

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

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS03DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS03DR	SOIC	D	14	2500	367.0	367.0	38.0

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