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

REVISED DECEMBER 1983

- **Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs**
- **Dependable Texas Instruments Quality and Reliability**

description

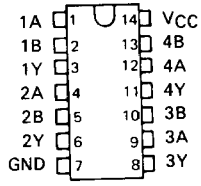
These devices contain four independent 2-input NAND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate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

The SN5403, SN54L03, 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.

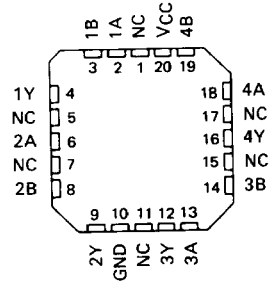
FUNCTION TABLE (each gate)

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

SN5403, SN54L03 . . . J PACKAGE
SN54LS03, SN54S03 . . . J OR W PACKAGE
SN7403 . . . J OR N PACKAGE
SN74LS03, SN74S03 . . . D, J OR N PACKAGE
(TOP VIEW)



SN54LS03, SN54S03 . . . FK PACKAGE
SN74LS03, SN74S03 . . . FN PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram (each gate)



positive logic

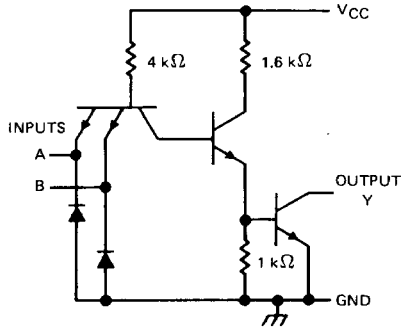
$$Y = \overline{A \cdot B} \text{ or } Y = \overline{A} + \overline{B}$$

3 TTL DEVICES

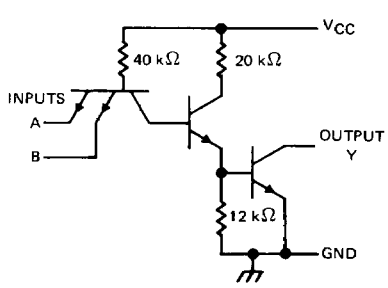
PRODUCTION DATA
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

schematics (each gate)

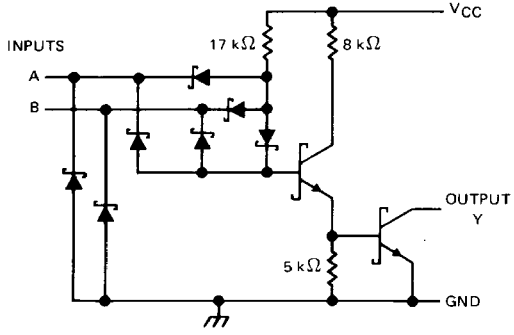
'03



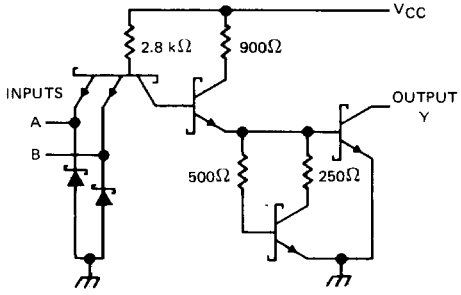
'L03



'LS03



'S03



Resistor values shown are nominal.

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

Supply voltage, V_{CC} (see Note 1): '03, 'LS03, 'S03 ..... 7 V
'L03 ..... 8 V
Input voltage: '03, 'L03, 'S03 ..... 5.5 V
'LS03 ..... 7 V
Off-state output voltage: 'L03 ..... 8 V
'LS03, 'S03 ..... 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.

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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	0		70	°C

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

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
V_{IK}	V_{CC} = MIN, I_I = −12 mA			−1.5	V
I_{OH}	V_{CC} = MIN, V_{IL} = 0.8 V, V_{OH} = 5.5 V			0.25	mA
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, I_{OL} = 16 mA		0.2	0.4	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.4 V			40	μA
I_{IL}	V_{CC} = MAX, V_I = 0.4 V			−1.6	mA
I_{CCH}	V_{CC} = MAX, V_I = 0 V		4	8	mA
I_{CCL}	V_{CC} = MAX, V_I = 4.5 V		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 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 = 4 kΩ, C_L = 15 pF		35	45	ns
t_{PHL}			R_L = 400 Ω, C_L = 15 pF		8	15	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

recommended operating conditions

	SN54L03			UNIT
	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	V
V_{IH} High-level input voltage	2			V
V_{IL} Low-level input voltage			0.6	V
V_{OH} High-level output voltage			5.5	V
I_{OL} Low-level output current			2	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†	SN54L03			UNIT
		MIN	TYP‡	MAX	
I_{OH}	V_{CC} = MIN, V_{IL} = 0.6 V, V_{OH} = 5.5 V			50	μA
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, I_{OL} = 2 mA		0.15	0.3	V
I_I	V_{CC} = MAX, V_I = 5.5 V			0.1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.4 V			10	μA
I_{IL}	V_{CC} = MAX, V_I = 0.3 V			−0.18	mA
I_{CCH}	V_{CC} = MAX, V_I = 0 V		0.44	0.8	mA
I_{CCL}	V_{CC} = MAX, V_I = 4.5 V		1.16	2.04	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 = 4 kΩ, C_L = 50 pF		60	90	ns
t_{PHL}					33	60	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

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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 V		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: See General Information Section for load circuits and voltage waveforms.

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†	MIN	TYP‡	MAX	UNIT
V_{IK}	V_{CC} = MIN, I_I = −18 mA			−1.2	V
I_{OH}	V_{CC} = MIN, V_{IL} = 0.8 V, V_{OH} = 5.5 V			0.25	mA
V_{OL}	V_{CC} = MIN, V_{IH} = 2 V, I_{OL} = 20 mA			0.5	V
I_I	V_{CC} = MAX, V_I = 5.5 V			1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.7 V			50	μA
I_{IL}	V_{CC} = MAX, V_I = 0.5 V			−2	mA
I_{CCH}	V_{CC} = MAX, V_I = 0 V		6	13.2	mA
I_{CCL}	V_{CC} = MAX, V_I = 4.5 V		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 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 = 280 Ω, C_L = 15 pF	2	5	7.5	ns
t_{PHL}				2	4.5	7	ns
t_{PLH}			R_L = 280 Ω, C_L = 50 pF		7.5		ns
t_{PHL}					7		ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

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