

TYPES SN5422, SN54H22, SN54LS22, SN54S22, SN7422, SN74H22, SN74LS22, SN74S22 DUAL 4-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

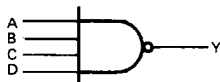
These devices contain two independent 4-input NAND gates. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate higher V_{OH} levels.

The SN5422, SN54H22, SN54LS22 and SN54S22 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7422, SN74H22, SN74LS22 and SN74S22 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

logic diagram (each gate)



positive logic

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

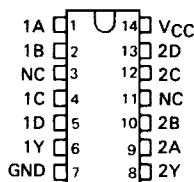
SN5422, SN54LS22, SN54S22 ... J OR W PACKAGE

SN54H22 ... J PACKAGE

SN7422, SN74H22 ... J OR N PACKAGE

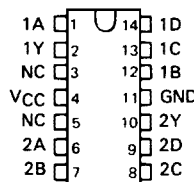
SN74LS22, SN74S22 ... D, J OR N PACKAGE

(TOP VIEW)



SN54H22 ... W PACKAGE

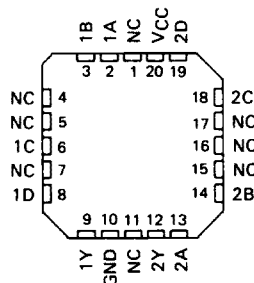
(TOP VIEW)



SN54LS22, SN54S22 ... FK PACKAGE

SN74LS22, SN74S22 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection

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PRODUCTION DATA

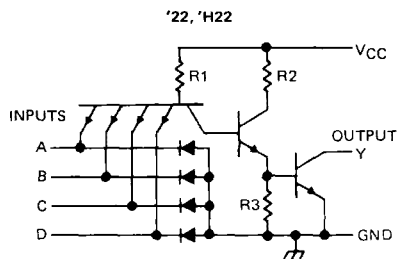
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS
INSTRUMENTS

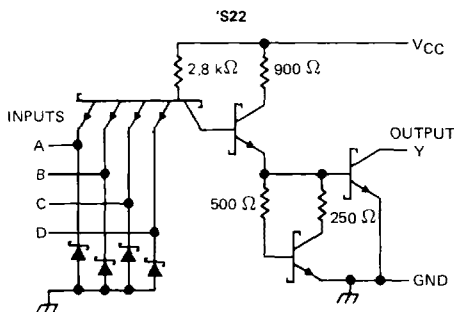
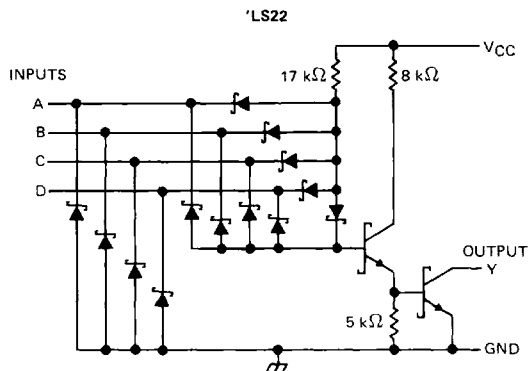
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TYPES SN5422, SN54H22, SN54LS22, SN54S22 SN7422, SN74H22, SN74LS22, SN74S22 DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

schematics (each gate)



CIRCUIT	R1	R2	R3
'22	4 k Ω	1.6 k Ω	1 k Ω
'H22	2.8 k Ω	760 Ω	470 Ω



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: '22, 'H22, 'S22	5.5 V
'LS22	7 V
Operating free-air temperature: 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.

TYPES SN5422, SN7422

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN5422			SN7422			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}	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$		-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_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$	0.2	0.4		V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		40		μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-1.6		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		2	4	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		6	11	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}	Any	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: See General Information Section for load circuits and voltage waveforms.

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TYPES SN54H22, SN74H22

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54H22			SN74H22			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}	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$		-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_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 20 \text{ mA}$		0.2	0.4	V
I_I	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1		mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		50		μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-2		mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		5	8.4	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		13	20	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}	Any	Y	$R_L = 280 \Omega, C_L = 25 \text{ pF}$		10	15	ns
t_{PHL}					7.5	12	ns

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

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TTL DEVICES

TYPES SN54LS22, SN74LS22

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54LS22			SN74LS22			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†	SN54LS22			SN74LS22			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
I_{OH}	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{OH} = 5.5 \text{ V}$			0.1			0.1	mA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 8 \text{ mA}$					0.35	0.5	
I_I	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA
I_{CCH}	$V_{CC} = \text{MAX}, V_I = 0 \text{ V}$		0.4	0.8		0.4	0.8	mA
I_{CCL}	$V_{CC} = \text{MAX}, V_I = 4.5 \text{ V}$		1.2	2.2		1.2	2.2	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}	Any	Y	$R_L = 2 \text{ k}\Omega,$	$C_L = 15 \text{ pF}$		17	32	ns
t_{PHL}						15	28	ns

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

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TTL DEVICES

TYPES SN54S22, SN74S22

DUAL 4-INPUT POSITIVE-NAND GATES WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54S22			SN74S22			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		3	6.6	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		10	18	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}	Any	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.