

**SN5420, SN54LS20, SN54S20,
SN7420, SN74LS20, SN74S20**
DUAL 4-INPUT POSITIVE-NAND GATES
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

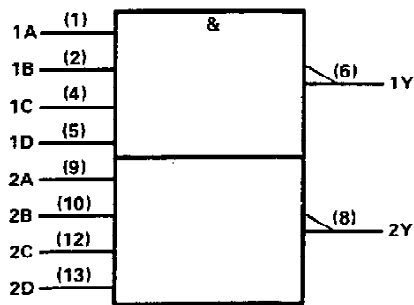
These devices contain two independent 4-input NAND gates.

The SN5420, SN54LS20, and SN54S20 are characterized for operation over the full military range of -55°C to 125°C. The SN7420, SN74LS20, and SN74S20 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

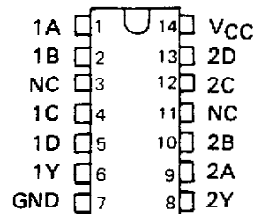
logic symbol†



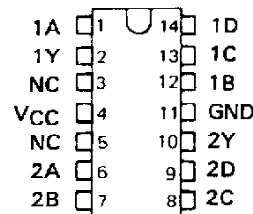
†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

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

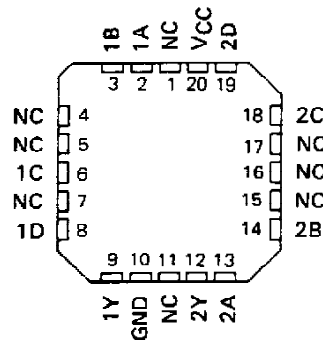
SN5420 . . . J PACKAGE
SN54LS20, SN54S20 . . . J OR W PACKAGE
SN7420 . . . N PACKAGE
SN74LS20, SN74S20 . . . D OR N PACKAGE
(TOP VIEW)



SN5420 . . . W PACKAGE
(TOP VIEW)

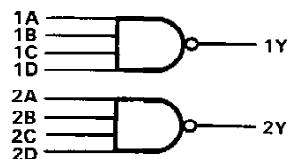


SN54LS20, SN54S20 . . . FK PACKAGE
(TOP VIEW)



NC - No internal connection

logic diagram



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

PRODUCTION DATA documents contain 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.



SN5420, SN7420
DUAL 4-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN5420			SN7420			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
I _{OH} High-level output current			-0.4			-0.4	mA
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 †	SN5420			SN7420			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -12 mA			-1.5			-1.5	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -0.4 mA	2.4	3.4		2.4	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-1.6			-1.6	mA
I _{OS} §	V _{CC} = MAX	-20		-55	-18		-55	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		2	4		2	4	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		6	11		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 V, T_A = 25°C.

§ Not more than one output should be shorted at a time.

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 = 400 Ω, C _L = 15 pF		12	22	ns
t _{PHL}					8	15	ns

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



SN54LS20, SN74LS20 DUAL 4-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54LS20			SN74LS20			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
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 †	SN54LS20		SN74LS20		UNIT		
		MIN	TYP ‡	MAX	MIN		TYP ‡	MAX
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5		-1.5	V	
V _{OH}	V _{CC} = MIN, V _{IL} = MAX, I _{OH} = -0.4 mA	2.5	3.4		2.7	3.4	V	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA		0.25	0.4		0.4	V	
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA				0.25	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 _{OS} §	V _{CC} = MAX	-20		-100	-20	-100	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0 V		0.4	0.8		0.4	0.8	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 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 V, T_A = 25°C.

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

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 = 2 kΩ,	C _L = 15 pF		9	15	ns
t _{PHL}						10	15	ns

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


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INSTRUMENTS

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SN54S20, SN74S20
DUAL 4-INPUT POSITIVE-NAND GATES

recommended operating conditions

	SN54S20			SN74S20			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
I _{OH} High-level output current			-1			-1	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 †	SN54S20			SN74S20			UNIT
		MIN	TYP ‡	MAX	MIN	TYP ‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.2			-1.2	V
V _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, I _{OH} = -1 mA	2.5	3.4		2.7	3.4		V
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA			0.5			0.5	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			50			50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V			-2			-2	mA
I _{OS} §	V _{CC} = MAX	-40		-100	-40		-100	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		5	8		5	8	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		10	18		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.

§ Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

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, B, C or D	Y	R _L = 280 Ω, C _L = 15 pF		3	4.5	ns
t _{PHL}					3	5	ns
t _{PLH}			R _L = 280 Ω, C _L = 50 pF		4.5		ns
t _{PHL}					5		ns

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



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
JM38510/07006BCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/07006BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/07006BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007B2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007B2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007BCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007BCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007BDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007SCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007SCA	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007SDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
JM38510/30007SDA	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
SN5420J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN5420J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN54LS20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SN54LS20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SN54S20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SN54S20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SN7420N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN7420N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74LS20D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DR	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DR	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DRE4	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20DRE4	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN74LS20J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SN74LS20N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS20N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS20N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74LS20N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LS20NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS20NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LS20NSR	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20NSR	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20NSRE4	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LS20NSRE4	ACTIVE	SO	NS	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74S20D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74S20D	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74S20DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74S20DE4	ACTIVE	SOIC	D	14	50	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74S20DR	OBSOLETE	SOIC	D	0		TBD	Call TI	Call TI
SN74S20DR	OBSOLETE	SOIC	D	0		TBD	Call TI	Call TI
SN74S20N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74S20N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74S20N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74S20N3	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI
SN74S20NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74S20NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SNJ5420J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SNJ5420J	OBSOLETE	CDIP	J	14		TBD	Call TI	Call TI
SNJ5420W	OBSOLETE	CFP	W	14		TBD	Call TI	Call TI
SNJ5420W	OBSOLETE	CFP	W	14		TBD	Call TI	Call TI
SNJ5420WA	OBSOLETE	CFP	WA	14		TBD	Call TI	Call TI
SNJ5420WA	OBSOLETE	CFP	WA	14		TBD	Call TI	Call TI
SNJ54LS20FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS20FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS20W	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LS20W	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54S20FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54S20FK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54S20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54S20J	ACTIVE	CDIP	J	14	1	TBD	Call TI	Level-NC-NC-NC

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SNJ54S20W	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC
SNJ54S20W	ACTIVE	CFP	W	14	1	TBD	Call TI	Level-NC-NC-NC

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

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⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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