

SN54LS21, SN74LS21 DUAL 4-INPUT POSITIVE-AND GATES

SDLS139 – APRIL 1985 – 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

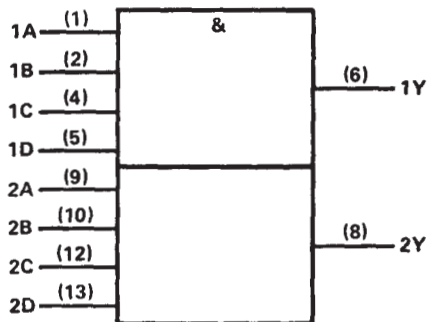
These devices contain two independent 4-input AND gates.

The SN54LS21 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74LS21 is characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each gate)

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

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.

SN54LS21 . . . J OR W PACKAGE
SN74LS21 . . . D OR N PACKAGE
(TOP VIEW)



SN54LS21 . . . FK PACKAGE
(TOP VIEW)



NC—No internal connection

logic diagram

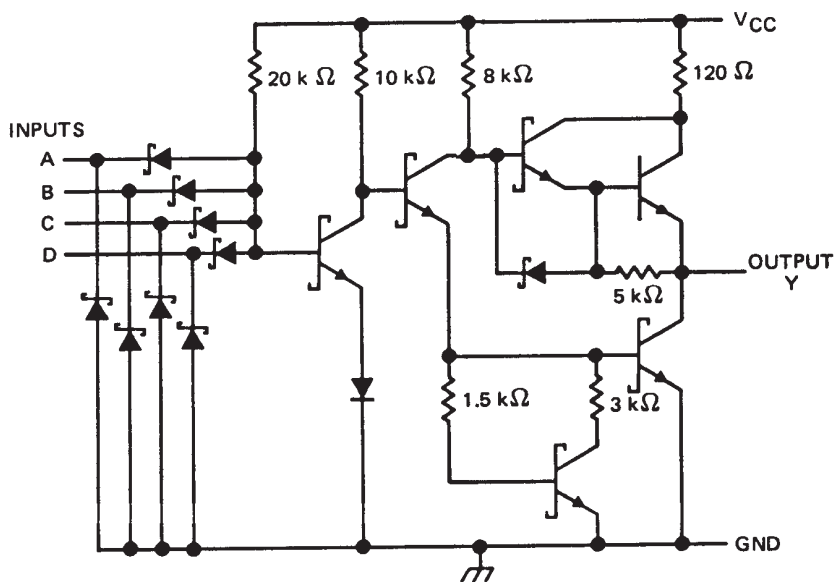


(positive logic) $Y = A \cdot B \cdot C \cdot D$ or $Y = \overline{\overline{A} + \overline{B} + \overline{C} + \overline{D}}$

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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	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 terminals.



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recommended operating conditions

	SN54LS21			SN74LS21			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 †	SN54LS21		SN74LS21		UNIT		
		MIN	TYP ‡	MAX	MIN		TYP ‡	MAX
V_{IK}	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$			-1.5		-1.5	V	
V_{OH}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OH} = -0.4 \text{ mA}$	2.5	3.4		2.7	3.4	V	
V_{OL}	$V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $I_{OL} = 4 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = \text{MIN}$, $V_{IL} = \text{MAX}$, $I_{OL} = 8 \text{ mA}$					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	
$I_{OS} §$	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA
I_{CCH}	$V_{CC} = \text{MAX}$, $V_I = 4.5 \text{ V}$		1.2	2.4		1.2	2.4	mA
I_{CCL}	$V_{CC} = \text{MAX}$, $V_I = 0 \text{ V}$		2.2	4.4		2.2	4.4	mA

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

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

§ 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, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$ (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Any	Y	$R_L = 2 \text{ k}\Omega$, $C_L = 15 \text{ pF}$		8	15	ns
t_{PHL}					10	20	ns

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

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