

# SN54LS21, SN74LS21 DUAL 4-INPUT POSITIVE-AND GATES

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**

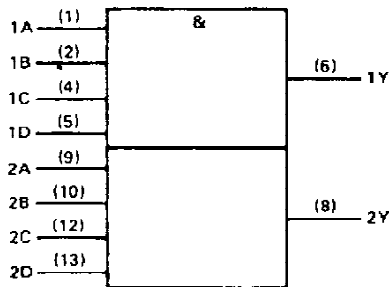
These devices contain two independent 4-input AND gates.

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

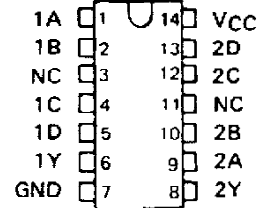
**logic symbol†**



† 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.

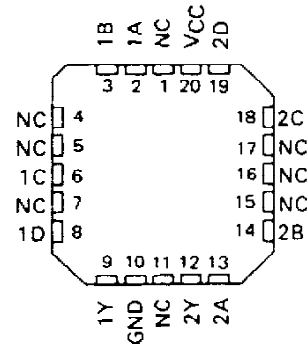
SN54LS21 . . . J OR W PACKAGE  
SN74LS21 . . . D OR N PACKAGE

(TOP VIEW)



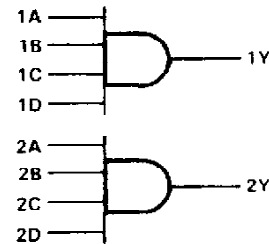
SN54LS21 . . . FK PACKAGE

(TOP VIEW)



NC—No internal connection

**logic diagram**

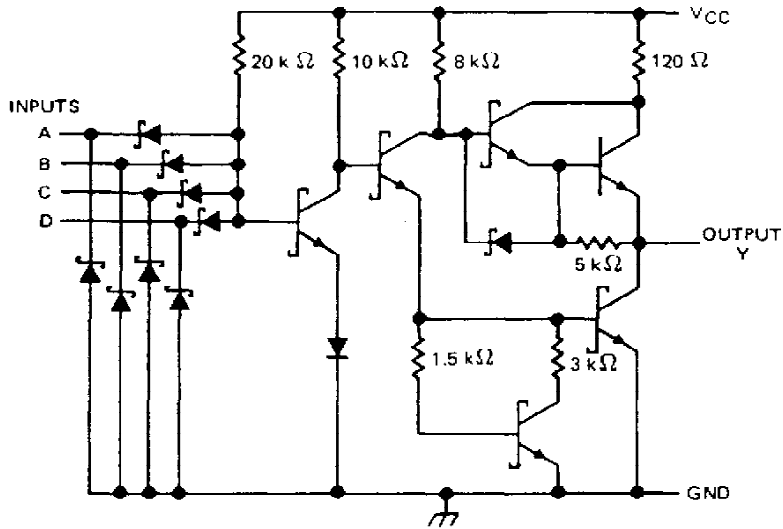


(positive logic)  $Y = A \cdot B \cdot C \cdot D$  or  $Y = \overline{\overline{A} + \overline{B} + \overline{C} + \overline{D}}$

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

**SN54LS21, SN74LS21**  
**DUAL 4-INPUT POSITIVE-AND GATES**

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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**SN54LS21, SN74LS21**  
**DUAL 4-INPUT POSITIVE-AND GATES**

**recommended operating conditions**

	SN54LS21			SN74LS21			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub> High-level input voltage	2			2			V
V <sub>IL</sub> Low-level input voltage			0.7			0.8	V
I <sub>OH</sub> High-level output current			-0.4			-0.4	mA
I <sub>OL</sub> Low-level output current			4			8	mA
T <sub>A</sub> 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 <sub>IK</sub>	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.5		-1.5	V	
V <sub>OH</sub>	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = -0.4 mA	2.5	3.4		2.7	3.4	V	
V <sub>OL</sub>	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OL</sub> = 4 mA		0.25	0.4		0.25	0.4	V
	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OL</sub> = 8 mA					0.35	0.5	
I <sub>I</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V			0.1		0.1	mA	
I <sub>IH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V			20		20	µA	
I <sub>IL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V			-0.4		-0.4	mA	
I <sub>OS</sub> §	V <sub>CC</sub> = MAX	-20		-100	-20		-100	mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V		1.2	2.4		1.2	2.4	mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Y	R <sub>L</sub> = 2 kΩ,	C <sub>L</sub> = 15 pF		8	15	ns
t <sub>PHL</sub>						10	20	ns

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



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