

# GD54/74LS21

## DUAL 4-INPUT POSITIVE AND GATES

### Description

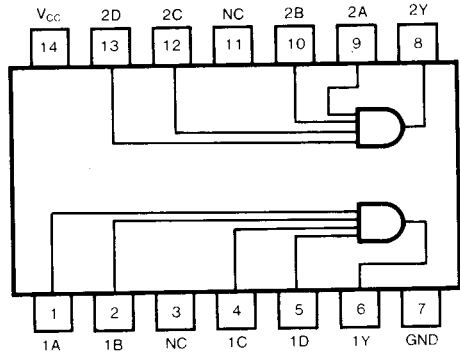
This device contains two independent 4-input AND gates. It performs the Boolean functions  $Y = A \cdot B \cdot C \cdot D$  or  $Y = \overline{A + B + C + D}$  in positive logic.

### Function Table (each gate)

INPUTS		OUTPUT
A	N*	Y
L	L	L
H	L	L
L	H	L
H	H	H

\*  $N = B \cdot C \cdot D$

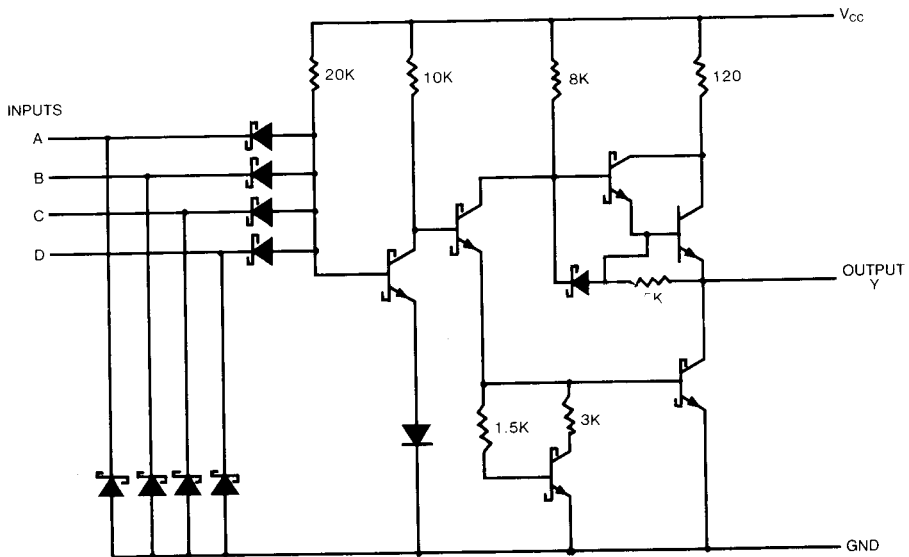
### Pin Configuration



NC: No internal connection

Suffix-Blank: Plastic Dual In Line Package  
 Suffix-J : Ceramic Dual In Line Package

### Circuit Schematics (each gate)



## Absolute Maximum Ratings

- Supply voltage,  $V_{CC}$  ..... 7V
- Input voltage ..... 7V
- Operating free-air temperature range 54LS .....  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$   
74LS .....  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$
- Storage temperature range .....  $-65^{\circ}\text{C}$  to  $150^{\circ}\text{C}$

## Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	NOM	MAX	UNIT	
$V_{CC}$	Supply voltage	54	4.5	5	5.5	V
		74	4.75	5	5.25	
$I_{OH}$	High-level output current	54,74		-400	$\mu\text{A}$	
$I_{OL}$	Low-level output current	54		4	mA	
		74		8		
$T_A$	Operating free-air temperature	54	-55	125	$^{\circ}\text{C}$	
		74	0	70		

**Electrical Characteristics** over recommended operating free-air temperature range (unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN TYP MAX			UNIT	
			(Note 1)				
$V_{IH}$	High-level input voltage		2			V	
$V_{IL}$	Low-level input voltage		54		0.7	V	
			74		0.8		
$V_{IK}$	Input clamp voltage	$V_{CC}=\text{Min}, I_I=-18\text{mA}$			-1.5	V	
$V_{OH}$	High-level output voltage	$V_{CC}=\text{Min}, V_{IH}=\text{Min}$	54	2.5	3.4	V	
		$I_{OH}=\text{Max}$	74	2.7	3.4		
$V_{OL}$	Low-level output voltage	$V_{CC}=\text{Min}, I_{OL}=4\text{mA}$	54,74		0.25	0.4	V
		$V_{IL}=\text{Max}, I_{OL}=8\text{mA}$	74		0.35	0.5	
$I_I$	Input current at maximum input voltage	$V_{CC}=\text{Max}, V_I=7\text{V}$			0.1	mA	
$I_{IH}$	High-level input current	$V_{CC}=\text{Max}, V_I=2.7\text{V}$			20	$\mu\text{A}$	
$I_{IL}$	Low-level input current	$V_{CC}=\text{Max}, V_I=0.4\text{V}$			-0.4	mA	
$I_{OS}$	Short-circuit output current	$V_{CC}=\text{Max}$ (Note 2)	-20		-100	mA	
$I_{CCH}$	Supply current	Total with outputs high	$V_{CC}=\text{Max}$		1.2	2.4	mA
$I_{CCL}$		Total with outputs low	$V_{CC}=\text{Max}$		2.2	4.4	mA

Note 1: All typical values are at  $V_{CC}=5\text{V}, T_A=25^{\circ}\text{C}$ .

Note 2: Not more than one output should be shorted at a time, and duration should not exceed one second.

## Switching Characteristics, $V_{CC}=5\text{V}, T_A=25^{\circ}\text{C}$

SYMBOL	PARAMETER	TEST CONDITION#	MIN	TYP	MAX	UNIT
$t_{PLH}$	Propagation delay time, low-to-high-level output	$C_L=15\text{pF}, R_L=2\text{k}\Omega$		8	15	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output			10	20	ns

#For load circuit and voltage waveforms, see page 3-11.