GD54/74LS09
QUADRUPLE 2-INPUT POSITIVE AND GATES
WITH OPEN-COLLECTOR OUTPUTS

Description

This device contains four independent 2-input AND gates. It performs the Boolean functions $Y = A \cdot B$ or $Y = \overline{\overline{A} + \overline{B}}$ in positive logic. The open-collector outputs require pull up resistor to perform correctly. Open collector devices are often used to generate higher V_{OH} levels.

Pin Configuration

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

Function Table (each gate)

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

Pull-Up Resistor Equations

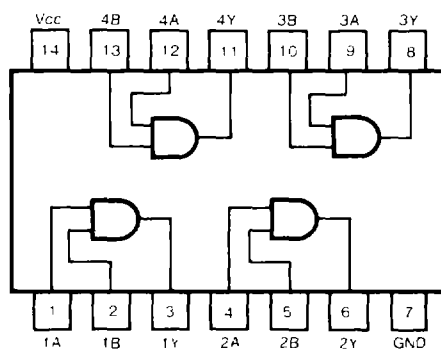$$R_{MAX} = \frac{V_{CC}(Min) - V_{OH}}{N_1(I_{OH}) + N_2(I_{IH})}$$

$$R_{MIN} = \frac{V_{CC}(Max) - V_{OL}}{I_{OL} - N_3(I_{IL})}$$

Where: $N_1(I_{OH})$ = total maximum output high current for all outputs tied to pull-up resistor
$N_2(I_{IH})$ = total maximum input high current for all inputs tied to pull-up resistor
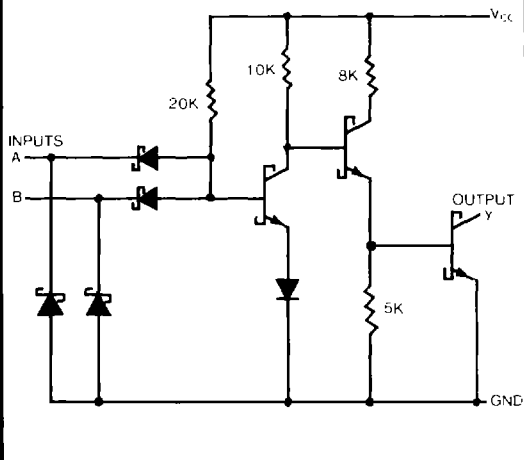$N_3(I_{IL})$ = total maximum input low current for all inputs tied to pull-up resistor

Circuit Schematic (each gate)

Absolute Maximum Ratings

- Supply voltage, Vcc 7V
- Input voltage 7V
- output voltage 7V
- Operating free-air temperature range 54LS .... −55°C to 125°C
    74LS .... 0°C to 70°C
- Storage temperature range .... −65°C to 150°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	
V_{OH}	High-level output voltage	54,74			5 5	V
I_{OL}	Low-level output current	54			4	mA
		74			8	
T_A	Operating free-air temperature	54	-55		125	°C
		74	0		70	

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

SYMBOL	PARAMETER	TEST CONDITION		MIN	TYP (Note 1)	MAX	UNIT
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	$V_{CC}=$Min, $I_I=-18$mA				-1 5	V
I_{OH}	High-level output current	$V_{CC}=$Min, $V_{IH}=$Min $V_{OH}=$Max				100	μA
V_{OL}	Low-level output voltage	$V_{CC}=$Min $V_{IL}=$Max	$I_{OL}=4$mA 54,74		0.25	0.4	V
			$I_{OL}=8$mA 74		0.35	0.5	
I_I	Input current at maximum input voltage	$V_{CC}=$Max, $V_I=7$V				0 1	mA
I_{IH}	High-level input current	$V_{CC}=$Max, $V_I=2.7$V				20	μA
I_{IL}	Low-level input current	$V_{CC}=$Max, $V_I=0.4$V				-0.4	mA
I_{CCH}	Supply current Total with outputs high	$V_{CC}=$Max			2.4	4 8	mA
I_{CCL}	Total with outputs low	$V_{CC}=$Max			4 4	8.8	mA

Note 1: All typical values are at $V_{CC}=5$V, $T_A=25$°C

Switching Characteristics, $V_{CC}=5$V, $T_A=25$°C

SYMBOL	PARAMETER	TEST CONDITION#	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	$C_L=15$pF, $R_L=2$kΩ		20	35	ns
t_{PHL}	Propagation delay time, high-to-low-level output			17	35	ns

#For load circuit and voltage wave forms, see page 3-11