

**QUADRUPL 2-INPUT POSITIVE AND GATES WITH OPEN COLLECTOR OUTPUTS**

**DESCRIPTION**

The M74LS09P is a semiconductor integrated circuit containing 4 dual-input positive AND and negative OR gates with open collector output.

**FEATURES**

- Usable in wire-AND connection
- High breakdown input voltage ( $V_I \geq 15V$ )
- High breakdown output voltage ( $V_O \geq 7V$ )
- Low power consumption ( $P_d = 17mW$  typical)
- High speed ( $t_{pd} = 13ns$  typical)
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ C$ )

**APPLICATION**

General purpose, for use in industrial and consumer equipment.

**FUNCTIONAL DESCRIPTION**

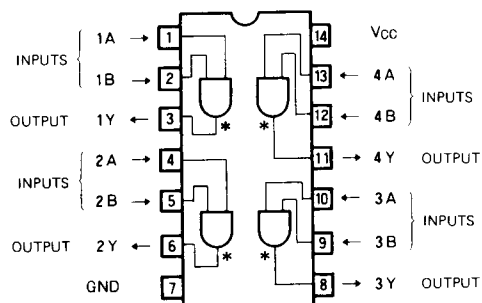
With the use of open collector output, the high-level output impedance can be freely selected by means of an external load resistor. This enables use in wire-AND, which has been impossible with conventional gates.

When both inputs A and B are high, output Y is high and when either or both of them are low, Y is low.

**FUNCTION TABLE**

A	B	Y
L	L	L
H	L	L
L	H	L
H	H	H

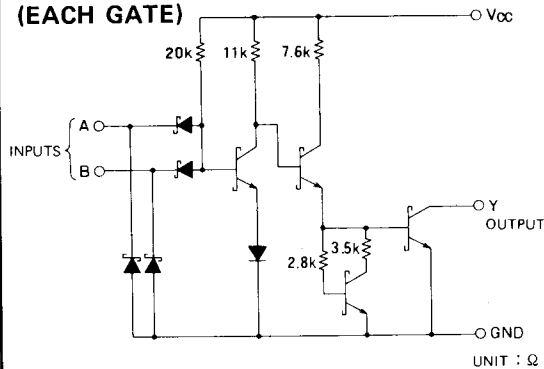
**PIN CONFIGURATION (TOP VIEW)**



\* : OPEN COLLECTOR OUTPUT

Outline 14P4

**CIRCUIT SCHEMATIC (EACH GATE)**



UNIT :  $\Omega$

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = -20 \sim +75^\circ C$ , unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
$V_{CC}$	Supply voltage		-0.5 ~ +7	V
$V_I$	Input voltage		-0.5 ~ +15	V
$V_O$	Output voltage	High-level state	-0.5 ~ +7	V
$T_{opr}$	Operating free-air ambient temperature range		-20 ~ +75	$^\circ C$
$T_{stg}$	Storage temperature range		-65 ~ +150	$^\circ C$

**QUADRUPLE 2-INPUT POSITIVE AND GATES WITH OPEN COLLECTOR OUTPUTS**

**RECOMMENDED OPERATING CONDITIONS** ( $T_a = -20 \sim +75^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
$V_{CC}$	Supply voltage		4.75	5	5.25	V
$I_{OH}$	High-level output current	$V_O = 5.5\text{V}$	0		100	$\mu\text{A}$
$I_{OL}$	Low-level output current	$V_{OL} \leq 0.4\text{V}$	0		4	mA
		$V_{OL} \leq 0.5\text{V}$	0		8	mA

**ELECTRICAL CHARACTERISTICS** ( $T_a = -20 \sim +75^\circ\text{C}$ , unless otherwise noted)

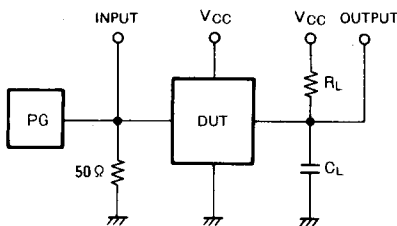
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ*	Max	
$V_{IH}$	High-level input voltage		2			V
$V_{IL}$	Low-level input voltage				0.8	V
$V_{IC}$	Input clamp voltage	$V_{CC} = 4.75\text{V}$ , $I_{IC} = -18\text{mA}$			-1.5	V
$I_{OH}$	High-level output current	$V_{CC} = 4.75\text{V}$ , $V_I = 2\text{V}$ , $V_O = 5.5\text{V}$			100	$\mu\text{A}$
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.75\text{V}$		0.25	0.4	V
		$V_I = 0.8\text{V}$		0.35	0.5	V
$I_{IH}$	High-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 2.7\text{V}$			20	$\mu\text{A}$
		$V_{CC} = 5.25\text{V}$ , $V_I = 10\text{V}$			0.1	mA
$I_{IL}$	Low-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 0.4\text{V}$			-0.4	mA
$I_{CCH}$	Supply current, all outputs high	$V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$		2.4	4.8	mA
$I_{CCL}$	Supply current, all outputs low	$V_{CC} = 5.25\text{V}$ , $V_I = 4.5\text{V}$		4.4	8.8	mA

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

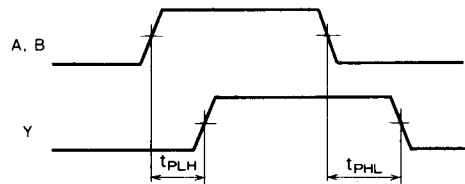
**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{PLH}$	High-to-low-level output propagation time	$R_L = 2\text{ k}\Omega$		15	35	ns
$t_{PHL}$	Low-to-high-level output propagation time	$C_L = 15\text{ pF}$ (Note 1)		10	35	ns

Note 1: Measurement circuit



**TIMING DIAGRAM** (Reference level = 1.3V)



(1) The pulse generator (PG) has the following characteristics:

PRR = 1MHz,  $t_r = 6\text{ns}$ ,  $t_f = 6\text{ns}$ ,  $t_w = 500\text{ns}$ ,

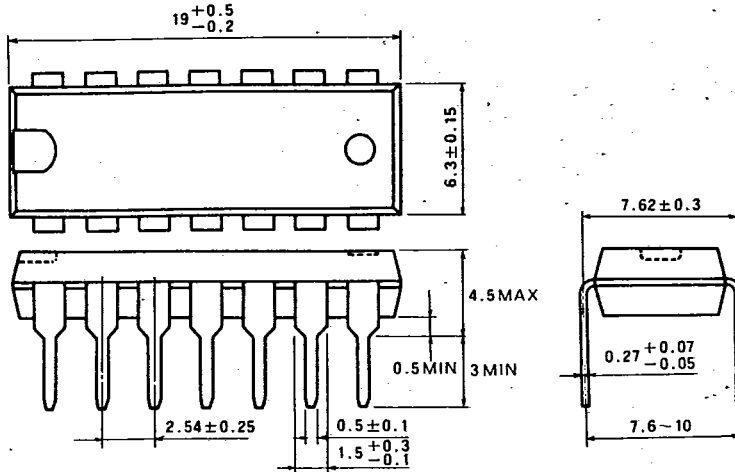
$V_p = 3\text{V}_{p-p}$ ,  $Z_0 = 50\Omega$

(2)  $C_L$  includes probe and jig capacitance.

T-90-20

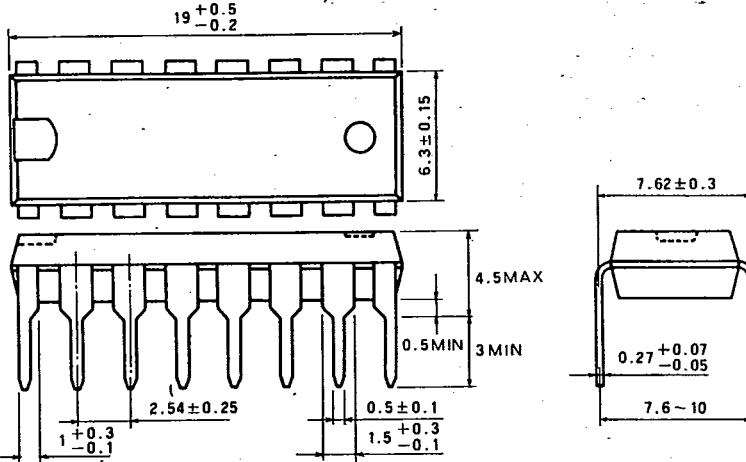
**TYPE 14P4 14-PIN MOLDED PLASTIC DIL**

Dimension in mm



**TYPE 16P4 16-PIN MOLDED PLASTIC DIL**

Dimension in mm



**TYPE 20P4 20-PIN MOLDED PLASTIC DIL**

Dimension in mm

