

# MITSUBISHI LSTTLs

## M74LS22P

### DUAL 4-INPUT POSITIVE NAND GATE WITH OPEN COLLECTOR OUTPUT

#### DESCRIPTION

The M74LS22P is a semiconductor integrated circuit containing two 4-input positive-logic NAND gates with open collector outputs, usable as negative-logic NOR gates.

#### FEATURES

- Usable in wire-AND connection
- High breakdown input voltage ( $V_i \geq 15V$ )
- High breakdown output voltage ( $V_O \geq 7V$ )
- Low power dissipation ( $P_d = 4mW$  typical)
- High speed ( $t_{pd} = 18ns$  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 outputs and SBD inputs featuring a high breakdown voltage, the high-level output impedance can be selected freely by use of an external load resistor. This permits wire-AND connection which has been impossible with conventional gates.

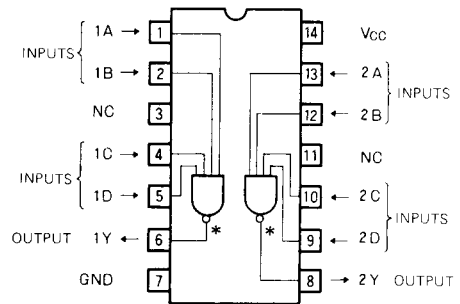
When inputs A, B, C and D are high, output Y is low and when one or more of the inputs is low, output Y is high.

#### FUNCTION TABLE

A	N	Y
L	L	H
H	L	H
L	H	H
H	H	L

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

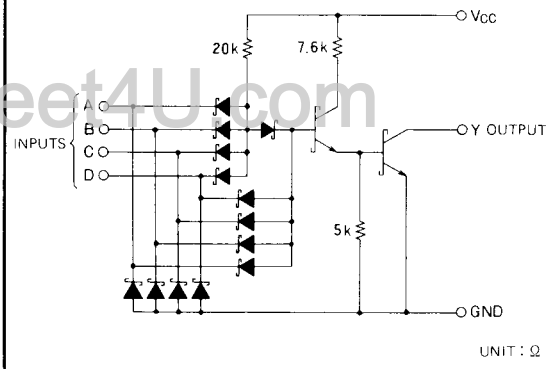
#### PIN CONFIGURATION (TOP VIEW)



\* : OPEN COLLECTOR OUTPUT  
NC : NO CONNECTION

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		$-0.5 \sim +7$	V
$V_i$	Input voltage		$-0.5 \sim +15$	V
$V_O$	Output voltage	High-level state	$-0.5 \sim +7$	V
$T_{opr}$	Operating free-air ambient temperature range		$-20 \sim +75$	$^\circ C$
$T_{stg}$	Storage temperature range		$-65 \sim +150$	$^\circ C$

## DUAL 4-INPUT POSITIVE NAND GATE WITH OPEN COLLECTOR OUTPUT

### 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	$\text{mA}$
		$V_{OL} \leq 0.5\text{V}$	0		8	$\text{mA}$

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

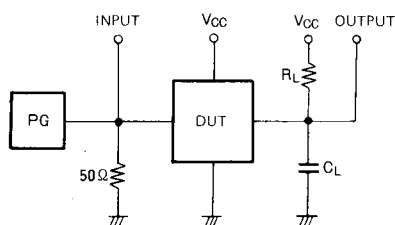
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ *	Max	
$V_{IH}$	High-level input voltage		2			V
$V_{IL}$	Low-level input voltage				0.8	V
$V_{IC}$	Input clamp voltage	$V_{CC} = 4.75\text{V}$ , $I_{IC} = -18\text{mA}$			-1.5	V
$I_{OH}$	High-level output current	$V_{CC} = 4.75\text{V}$ , $V_I = 0.8\text{V}$ $V_O = 5.5\text{V}$			100	$\mu\text{A}$
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.75\text{V}$ $V_I = 2\text{V}$	$I_{OL} = 4\text{mA}$	0.25	0.4	V
			$I_{OL} = 8\text{mA}$	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	$\text{mA}$
$I_{IL}$	Low-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 0.4\text{V}$			-0.4	$\text{mA}$
$I_{CCH}$	Supply current, all inputs high	$V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$		0.4	0.8	$\text{mA}$
$I_{CCL}$	Supply current, all inputs low	$V_{CC} = 5.25\text{V}$ , $V_I = 4.5\text{V}$		1.2	2.2	$\text{mA}$

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

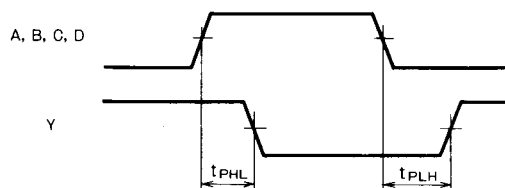
### SWITCHING CHARACTERISTICS ( $V_{CC} = 5\text{V}$ , $T_a = 25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{PLH}$	Low-to-high-level/high-to-low-level output propagation time	$R_L = 2\text{k}\Omega$		10	32	ns
$t_{PHL}$		$C_L = 15\text{pF}$ (Note 1)		25	28	ns

Note 1: Measurement circuit



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



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

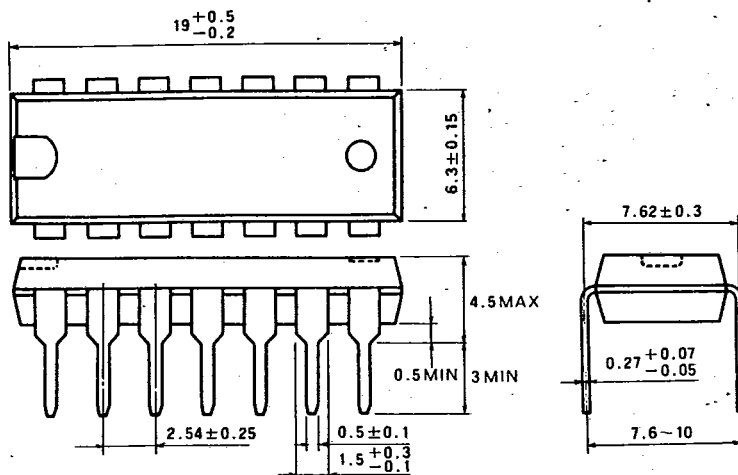
PRR = 1MHz,  $t_r = 6\text{ns}$ ,  $t_f = 6\text{ns}$ ,  $t_w = 500\text{ns}$ ;

$V_p = 3V_{p-p}$ ,  $Z_0 = 50\Omega$

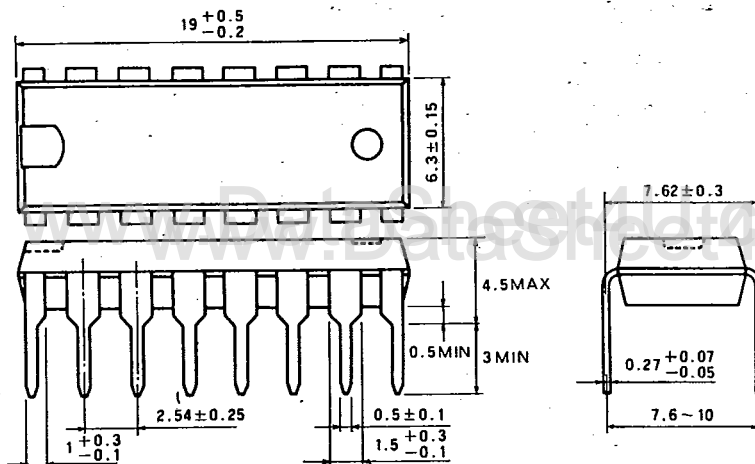
(2)  $C_L$  includes probe and jig capacitance.

**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

