

# MITSUBISHI LSTTLs

## M74LS20P

### DUAL 4-INPUT POSITIVE NAND GATE

#### DESCRIPTION

The M74LS20P is a semiconductor integrated circuit containing two 4-input positive NAND gates, usable as negative-logic NOR gates.

#### FEATURES

- High breakdown input voltage ( $V_I \geq 15V$ )
- Low power dissipation ( $P_D = 4mW$  typical)
- High speed ( $t_{pd} = 10ns$  typical)
- Low output impedance
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ C$ )

#### APPLICATION

General purpose, for use in industrial and consumer equipment.

#### FUNCTIONAL DESCRIPTION

The use of Schottky TTL technology enables the achievement of input high breakdown voltage, high speed, low power dissipation and high fan-out.

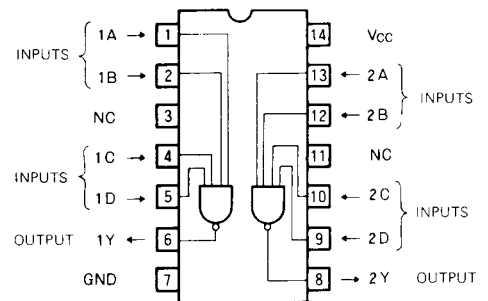
When inputs A, B and C are high, output Y is low, and when one or more of the inputs is low, output Y is high.

#### FUNCTION TABLE

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

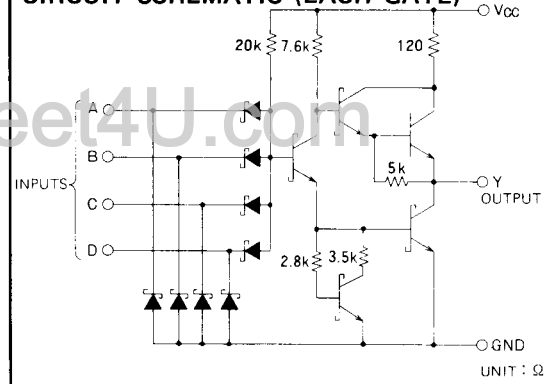
$$N = B \cdot C \cdot D$$

#### PIN CONFIGURATION (TOP VIEW)



Outline 14P4 NC: NO CONNECTION

#### 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	$-0.5 \sim V_{CC}$	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**
**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	$V_{OH} \geq 2.7\text{V}$	0		-400	$\mu\text{A}$
$I_{OL}$	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					V	
$V_{IC}$	Input clamp voltage	$V_{CC} = 4.75\text{V}$ , $I_{IC} = -18\text{mA}$			-1.5	V	
$V_{OH}$	High-level output voltage	$V_{CC} = 4.75\text{V}$ , $V_I = 0.8\text{V}$ , $I_{OH} = -400\mu\text{A}$	2.7	3.4		V	
$V_{OL}$	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	mA
$I_{IL}$	Low-level input current	$V_{CC} = 5.25\text{V}$ , $V_I = 0.4\text{V}$				-0.4	mA
$I_{OS}$	Short-circuit output current (Note 1)	$V_{CC} = 5.25\text{V}$ , $V_O = 0\text{V}$	-20			-100	mA
$I_{CCH}$	Supply current, all inputs high	$V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$		0.4	0.8	mA	
$I_{CCL}$	Supply current, all inputs low	$V_{CC} = 5.25\text{V}$ , $V_I = 4.5\text{V}$		1.2	2.2	mA	

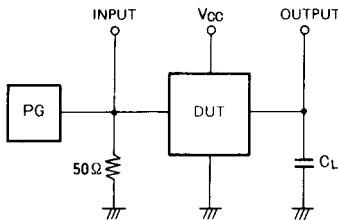
\* : All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$

Note 1: All measurements should be done quickly and not more than one output should be shorted at a time.

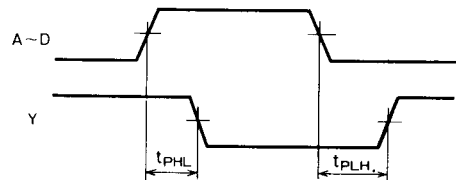
**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$t_{PLH}$	Low-to-high-level/high-to-low-level output propagation time	$C_L = 15\text{pF}$ (Note 2)		6	15	ns
$t_{PHL}$				13	15	ns

Note 2: Measurement circuit

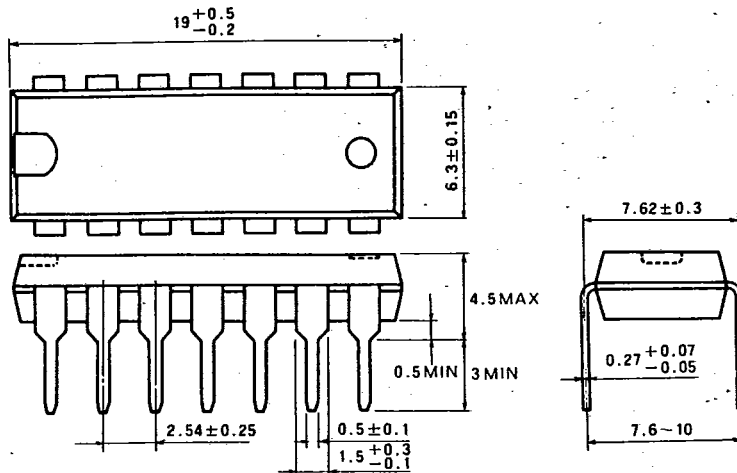


- The pulse generator (PG) has the following characteristics:  
 $\text{PRR} = 1\text{MHz}$ ,  $t_r = 6\text{ns}$ ,  $t_f = 6\text{ns}$ ,  $t_w = 500\text{ns}$ ,  
 $V_p = 3\text{V}_{p.p.}$ ,  $Z_0 = 50\Omega$ .
- $C_L$  includes probe and jig capacitance.

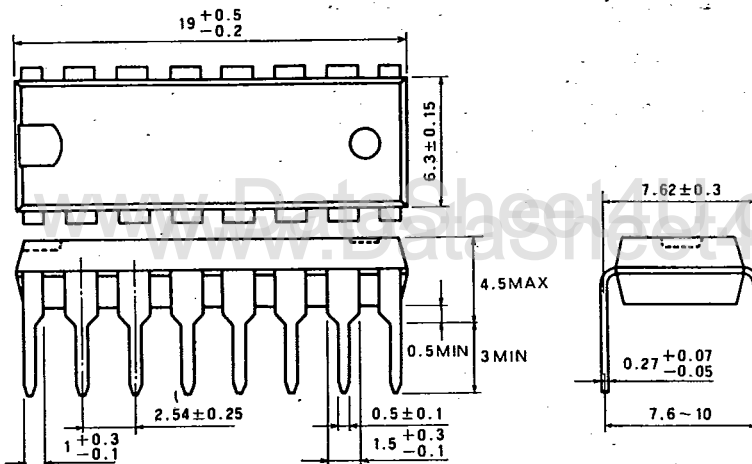
**TIMING DIAGRAM (Reference level = 1.3V)**


**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

