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 ($V_I \geqq 15V$)
- Low power dissipation (P_d = 4mW typical)
- High speed (t_{pd} = 10ns typical)
- Low output impedance
- Wide operating temperature range (T_a = −20 ~ +75°C)

APPLICATION

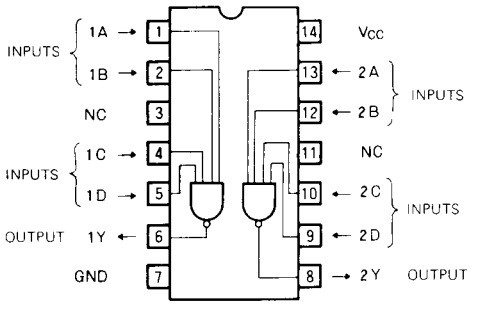
General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

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

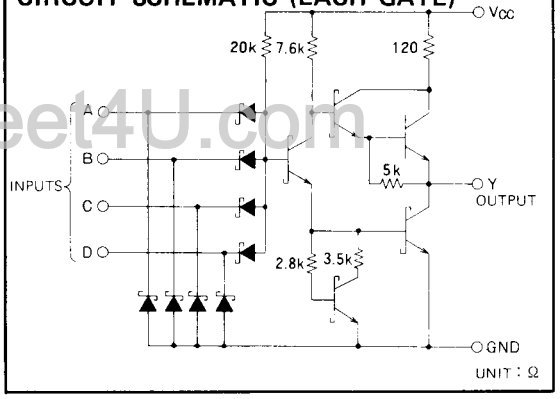
When inputs A, B and C are high, output Y is low, and when one or more of the inputs is low, output Y is high.

PIN CONFIGURATION (TOP VIEW)



Outline 14P4 NC: NO CONNECTION

CIRCUIT SCHEMATIC (EACH GATE)



FUNCTION TABLE

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

N=B·C·D

ABSOLUTE MAXIMUM RATINGS (T_a = −20 ~ +75°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 ~ V_{CC}	V
T_{opr}	Operating free-air ambient temperature range		−20 ~ +75	°C
T_{stg}	Storage temperature range		−65 ~ +150	°C

DUAL 4-INPUT POSITIVE NAND GATE

RECOMMENDED OPERATING CONDITIONS (T_a = −20 ~ +75°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	$V_{OH} \geqq 2.7V$	0		−400	μA
I_{OL}	Low-level output current	$V_{OL} \leqq 0.4V$	0		4	mA
		$V_{OL} \leqq 0.5V$	0		8	mA

ELECTRICAL CHARACTERISTICS (T_a = −20 ~ +75°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}=4.75V, I_{IC}=−18mA				−1.5	V
V_{OH}	High-level output voltage	V_{CC}=4.75V, V_I=0.8V, I_{OH}=−400μA		2.7	3.4		V
V_{OL}	Low-level output voltage	V_{CC}=4.75V, V_I=2V	I_{OL}=4mA		0.25	0.4	V
			I_{OL}=8mA		0.35	0.5	V
I_{IH}	High-level input current	V_{CC}=5.25V, V_I=2.7V				20	μA
		V_{CC}=5.25V, V_I=10V				0.1	mA
I_{IL}	Low-level input current	V_{CC}=5.25V, V_I=0.4V				−0.4	mA
I_{OS}	Short-circuit output current (Note 1)	V_{CC}=5.25V, V_O=0V		−20		−100	mA
I_{CCH}	Supply current, all inputs high	V_{CC}=5.25V, V_I=0V			0.4	0.8	mA
I_{CCL}	Supply current, all inputs low	V_{CC}=5.25V, V_I=4.5V			1.2	2.2	mA

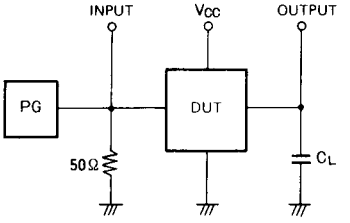
* : All typical values are at V_{CC}=5V, Ta=25°C

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

SWITCHING CHARACTERISTICS (V_{CC}=5V, Ta=25°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=15pF (Note 2)		6	15	ns
t_{PHL}				13	15	ns

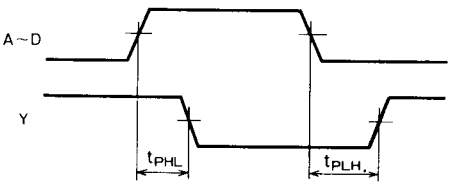
Note 2: Measurement circuit



(1) The pulse generator (PG) has the following characteristics:
PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_w = 500ns,
V_P = $3V_{P-P}$, Z_O = 50Ω.

(2) C_L includes probe and jig capacitance.

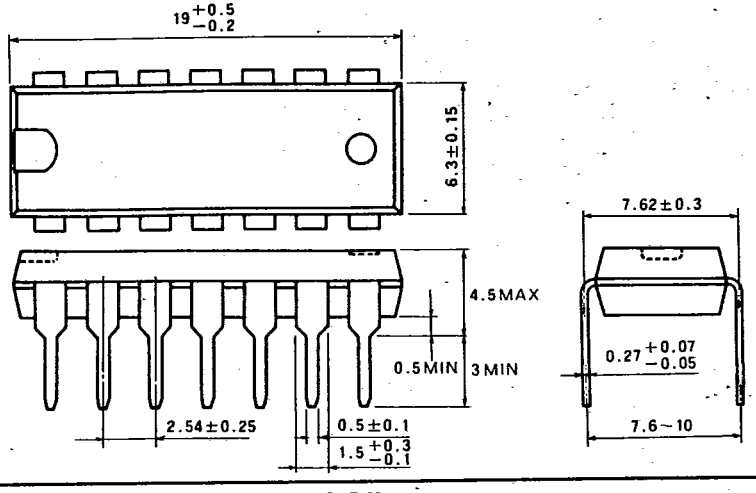
TIMING DIAGRAM (Reference level = 1.3V)



MITSUBISHI ELECTRIC

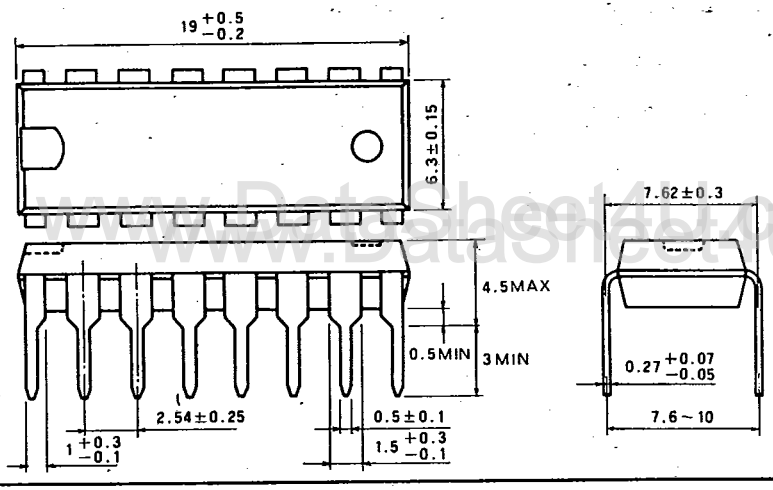
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm