M74LS133P

SINGLE 13-INPUT POSITIVE NAND GATE

DESCRIPTION

The M74LS133P is a semiconductor integrated circuit containing one 13-input positive-logic NAND gate, usable as a negative logic NOR gate.

FEATURES

- High breakdown input voltage ($V_I \geqq 15V$)
- Low power dissipation (P_d = 2.5mW typical)
- High speed (t_{pd} = 11ns 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 PNP transistors for the inputs and active pull-up transistors for the outputs enables input high breakdown voltage, high speed, low power dissipation and high fan-out.

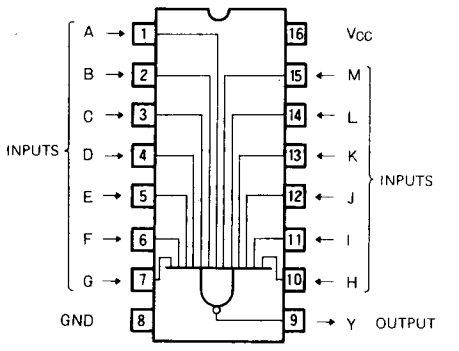
When inputs A through M are high, output Y is low and when one or more of the inputs is low, output Y is high.

FUNCTION TABLE

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

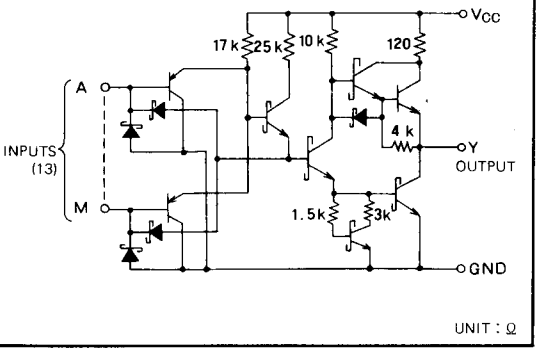
N = B・C・D・E・F・G・H・I ・J・K・L・M

PIN CONFIGURATION (TOP VIEW)



Outline 16P4

CIRCUIT SCHEMATIC



UNIT : Ω

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

SINGLE 13-INPUT POSITIVE NAND GATE

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

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75°C$, 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	$V_{CC} = 4.75V$, $V_I = 0.8V$, $I_{OH} = -400\mu A$		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	$V_{CC} = 5.25V$, $V_I = 0V$			0.35	0.5	mA
I_{CCL}	Supply current, all inputs low	$V_{CC} = 5.25V$, V_I = Open			0.6	1.1	mA

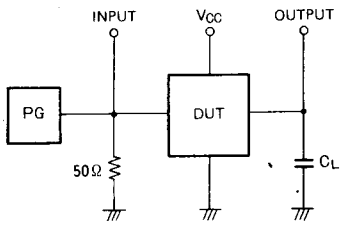
* : All typical values are at $V_{CC} = 5V$, $T_a = 25°C$

Note 1: All measurements should be done quickly.

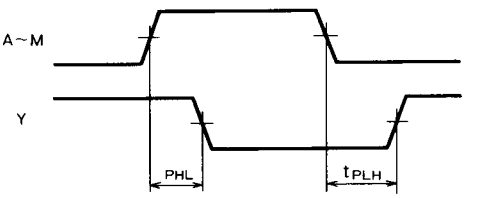
SWITCHING CHARACTERISTICS ($V_{CC} = 5V$, $T_a = 25°C$, unless otherwise noted)

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}				16	38	ns

Note 2: Measurement circuit



TIMING DIAGRAM (Reference level = 1.3V)



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

(2) C_L includes probe and jig capacitance.

PRECAUTION FOR USE

Connect pins not being used to the V_{CC} supply voltage.

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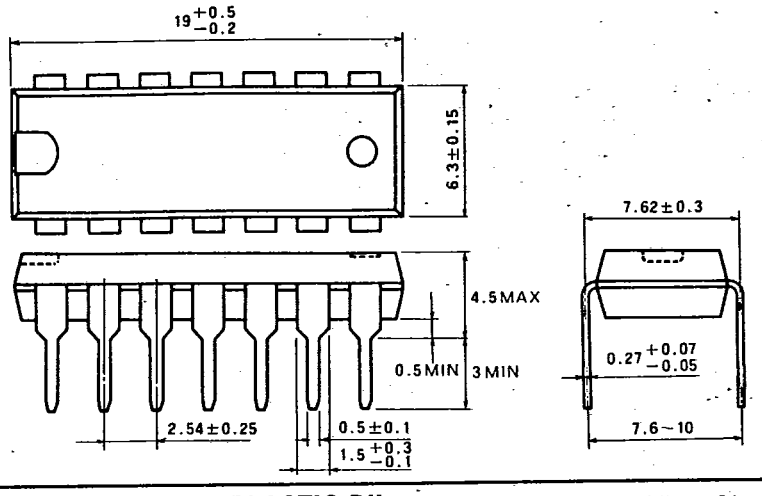
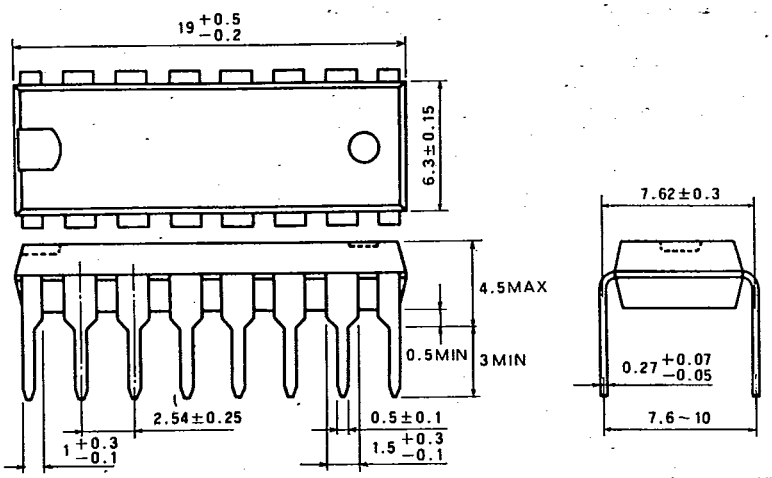
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm