

# MITSUBISHI LSTTLs M74LS40P

## DUAL 4-INPUT POSITIVE NAND BUFFER

### DESCRIPTION

The M74LS40P is a semiconductor integrated circuit containing 2 built-in quadruple-input positive NAND and negative NOR buffer gates.

### FEATURES

- High fan-out ( $I_{OL} = 24\text{mA}$ ,  $I_{OH} = -1.2\text{mA}$ )
- High breakdown input voltage ( $V_I \geq 15\text{V}$ )
- Low power dissipation ( $P_d = 9\text{mW}$  typical)
- High speed ( $t_{pd} = 14\text{ns}$  typical)
- Low output impedance
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ\text{C}$ )

### APPLICATION

General purpose, for use in industrial and consumer equipment.

### FUNCTIONAL DESCRIPTION

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

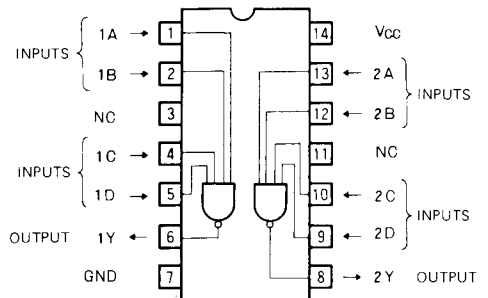
When all inputs A, B, C and D are high, output Y is low and when one or more of the inputs is low, Y is high.

### FUNCTION TABLE

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

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

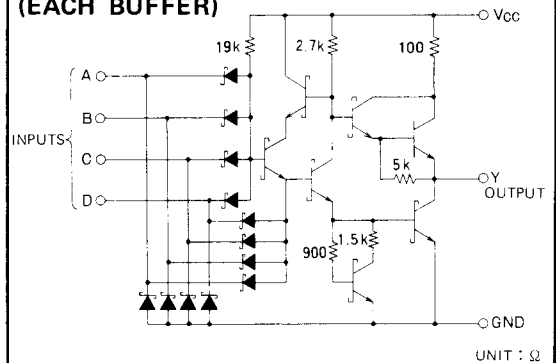
### PIN CONFIGURATION (TOP VIEW)



NC : NO CONNECTION

Outline 14P4

### CIRCUIT SCHEMATIC (EACH BUFFER)



UNIT :  $\Omega$

### ABSOLUTE MAXIMUM RATINGS ( $T_a = -20 \sim +75^\circ\text{C}$ , 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		$-20 \sim +75$	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		$-65 \sim +150$	$^\circ\text{C}$

DUAL 4-INPUT POSITIVE NAND BUFFER

RECOMMENDED OPERATING CONDITIONS (Ta = -20 ~ +75°C, unless otherwise noted)

Symbol	Parameter		Limits			Unit
			Min	Typ	Max	
VCC	Supply voltage		4.75	5	5.25	V
IOH	High-level output current	VOH ≥ 2.7V	0		-1.2	mA
IOL	Low-level output current	VOL ≤ 0.4V	0		12	mA
		VOL ≤ 0.5V	0		24	mA

ELECTRICAL CHARACTERISTICS (Ta = -20 ~ +75°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ*	Max	
VIH	High-level input voltage		2			V
VIL	Low-level input voltage				0.8	V
VIC	Input clamp voltage	VCC = 4.75V, IIC = -18mA			-1.5	V
VOH	High-level output voltage	VCC = 4.75V, VI = 0.8V, IOH = -1.2mA	2.7	3.4		V
VOL	Low-level output voltage	VCC = 4.75V, VI = 2V, IOL = 12mA		0.25	0.4	V
		IOL = 24mA		0.35	0.5	V
IIH	High-level input current	VCC = 5.25V, VI = 2.7V			20	μA
		VCC = 5.25V, VI = 10V			0.1	mA
IIl	Low-level input current	VCC = 5.25V, VI = 0.4V			-0.4	mA
IOS	Short-circuit output current (Note 1)	VCC = 5.25V, VO = 0V	-30		-130	mA
ICCH	Supply current, all outputs high	VCC = 5.25V, VI = 0V		0.45	1	mA
IcCL	Supply current, all outputs low	VCC = 5.25V, VI = Open		3	6	mA

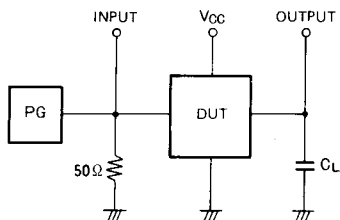
\* : All typical values are at VCC = 5V, Ta = 25°C

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

SWITCHING CHARACTERISTICS (VCC = 5V, Ta = 25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
tPLH	Low-to-high-level output propagation time	CL = 45pF (Note 2)		7	24	ns
tPHL	High-to-low-level output propagation time			20	24	ns

Note 2: Measurement circuit

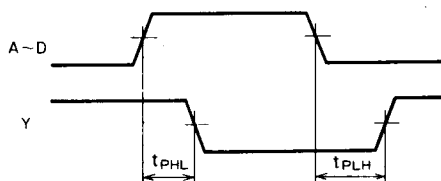


(1) The pulse generator (PG) has the following characteristics:

PRR = 1MHz, tr = 6ns, tf = 6ns, tw = 500ns, Vp = 3Vp-p, Z0 = 50Ω.

(2) CL includes probe and jig capacitance.

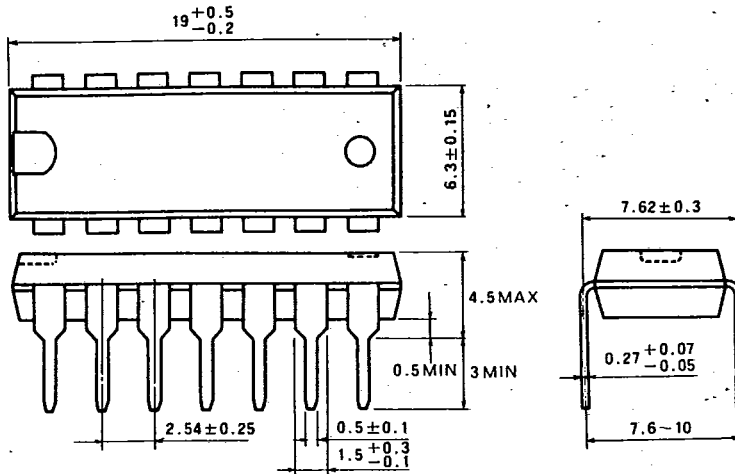
TIMING DIAGRAM (Reference level = 1.3V)



T-90-20

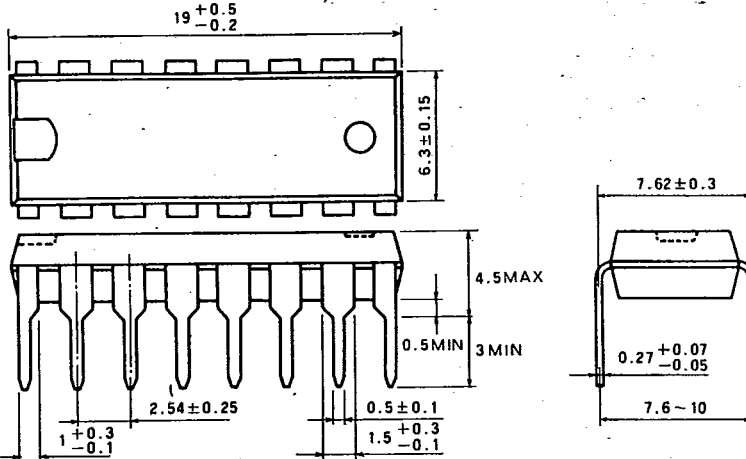
**TYPE 14P4 14-PIN MOLDED PLASTIC DIL**

Dimension in mm



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

Dimension in mm



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

Dimension in mm

