QUADRUPLE 2-INPUT POSITIVE NAND BUFFER WITH OPEN COLLECTOR OUTPUT

DESCRIPTION

The M74LS38P is a semiconductor integrated circuit containing four 2-input positive NAND and negative NOR buffer gates with open collector outputs.

FEATURES

- Usable in wire-AND connection
- High fan-out (I_{OL} = 24mA max)
- High breakdown input voltage ($V_I \geqq$ 15V)
- High breakdown output voltage ($V_O \geqq$ 7V)
- Low power dissipation (P_d = 17.5mW typical)
- High speed (t_{pd} = 14ns typical)
- Wide operating temperature range (T_a = −20 ∼ +75°C)

APPLICATION

General purpose, for use in industrial and consumer equipment.

FUNCTIONAL DESCRIPTION

With the use of open collector outputs and SBD inputs having 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. The maximum low-level output current (I_{OL}) of 24mA makes this device suitable as a buffer gate. When inputs A and B are high, output Y is low and when one or both inputs are low, Y is high.

FUNCTION TABLE

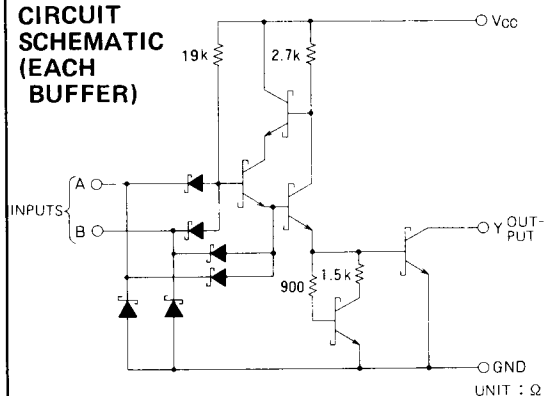| A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

PIN CONFIGURATION (TOP VIEW)
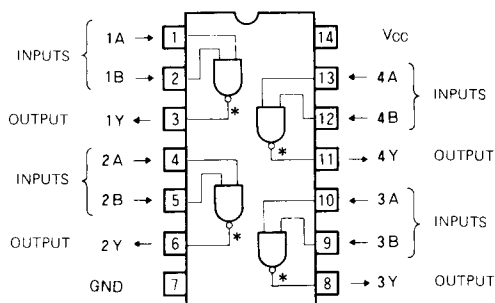
* : OPEN COLLECTOR OUTPUT

Outline 14P4

CIRCUIT SCHEMATIC (EACH BUFFER)

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 ∼ +7	V
T_{opr}	Operating free-air ambient temperature range		−20 ∼ +75	°C
T_{stg}	Storage temperature range		−65 ∼ +150	°C

QUADRUPLE 2-INPUT POSITIVE NAND BUFFER
WITH OPEN COLLECTOR OUTPUT

RECOMMENDED OPERATING CONDITIONS (Ta = −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	$V_O = 5.5V$	0		250	μA
I_{OL}	Low-level output current	$V_{OL} \leq 0.4V$	0		12	mA
		$V_{OL} \leq 0.5V$	0		24	mA

ELECTRICAL CHARACTERISTICS (Ta = −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
I_{OH}	High-level output current	$V_{CC} = 4.75V$, $V_I = 0.8V$, $V_O = 5.5V$				250	μA
V_{OL}	Low-level output voltage	$V_{CC} = 4.75V$	$I_{OL} = 12mA$		0.25	0.4	V
		$V_I = 2V$	$I_{OL} = 24mA$		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_{CCH}	Supply current, all outputs high	$V_{CC} = 5.25V$, $V_I = 0V$			0.9	2	mA
I_{CCL}	Supply current, all outputs low	$V_{CC} = 5.25V$, $V_I = $ Open			6	12	mA

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

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 output propagation time	$R_L = 667\Omega$			13	32	ns
t_{PHL}	High-to-low-level output propagation time	$C_L = 45pF$ (Note 1)			14	28	ns

Note 1: Measurement circuit
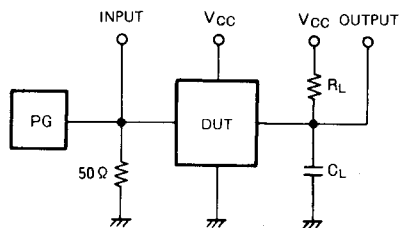
(1) The pulse generator (PG) has the following characteristics:
PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_W = 500ns,
V_P = 3V_{P-P}, Z_O = 50Ω.
(2) C_L includes probe and jig capacitance.

TIMING DIAGRAM (Reference level = 1.3V)

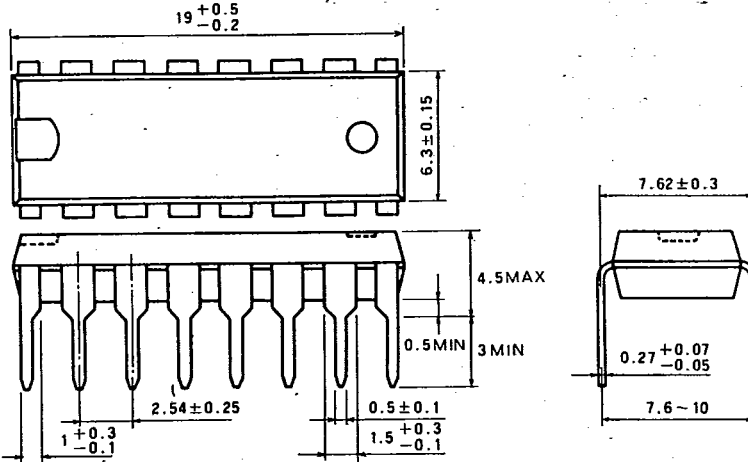MITSUBISHI ELECTRIC
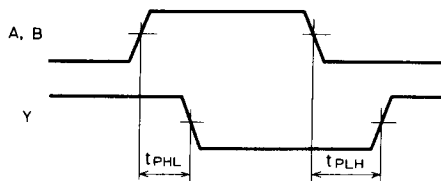
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm

$19^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN | 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1.5^{+0.3}_{-0.1}$

7.6 ~ 10
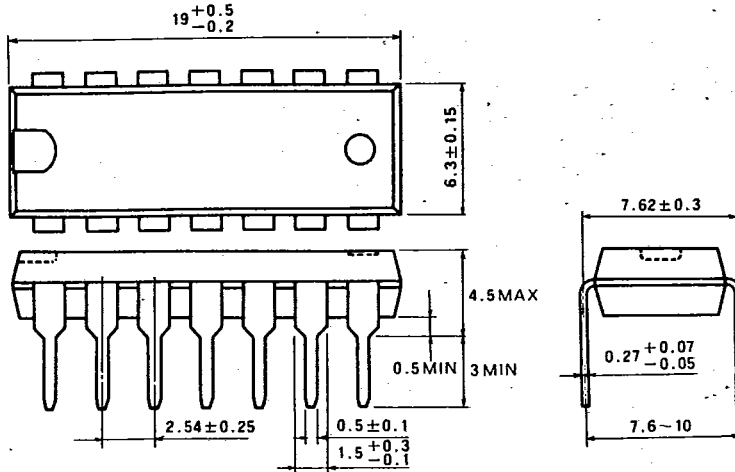
TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm

$19^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN | 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1^{+0.3}_{-0.1}$

$1.5^{+0.3}_{-0.1}$

7.6 ~ 10

TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

$24^{+0.5}_{-0.2}$

6.3 ± 0.15

7.62 ± 0.3

4.5 MAX

0.5 MIN | 3 MIN

$0.27^{+0.07}_{-0.05}$

2.54 ± 0.25

0.5 ± 0.1

$1.5^{+0.3}_{-0.1}$

$1^{+0.3}_{-0.1}$

7.6 ~ 10

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