M74LS240P

OCTAL BUFFER/LINE DRIVERS WITH 3-STATE OUTPUTS(INVERTED)

DESCRIPTION

The M74LS240P is a semiconductor integrated circuit containing 2 blocks of buffers with 3-state inverted output and common output control input for all 4 discrete circuits.

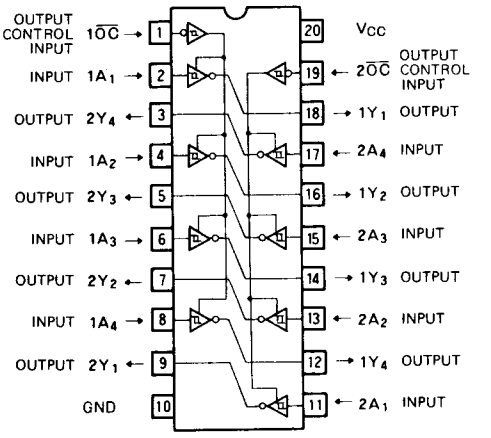
FEATURES

- Small input load factor (pnp input)
- Hysteresis provided (= 400mV typical)
- High breakdown input voltage ($V_I \geqq 5V$)
- Output control input having same phase for 2 circuits. ($1\overline{OC}$, $2\overline{OC}$)
- High fan-out, 3-state output. (I_{OL} = 24mA, I_{OH} = −15mA)
- Wide operating temperature range. (T_a = −20~ + 75°C)

APPLICATION

General purpose, for use in industrial and consumer equipment.

PIN CONFIGURATION (TOP VIEW)



Outline 20P4

FUNCTIONAL DESCRIPTION

The use of pnp transistors in the input circuits has enabled the achievement of small input load factor and high breakdown input voltage. With hysteresis characteristics, the buffer has a 3-state inverted output with high noise margin. When the output control input $\overline{OC}$ is low, high appears in the output Y if input A is low, and low appears in the Y if A is high. If, on the other hand, $\overline{OC}$ is high, all the outputs Y_1, Y_2, Y_3, and Y_4 are in a high-impedance state, irrespective of the status of A.

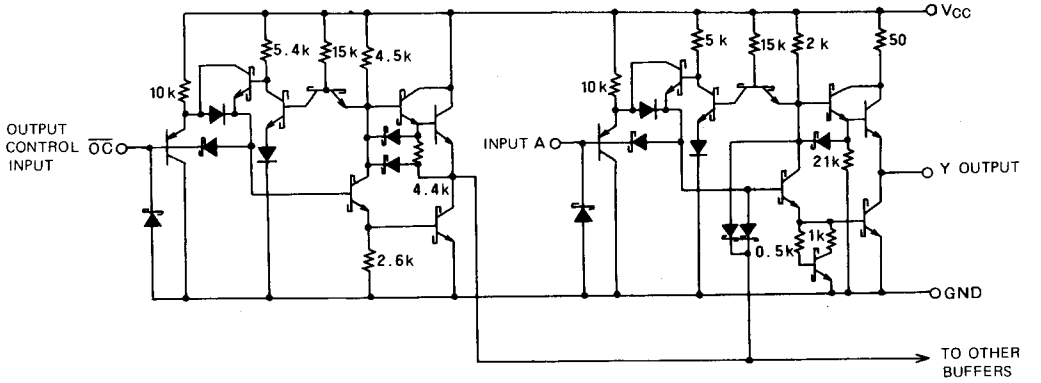
By connecting $1\overline{OC}$ with $2\overline{OC}$, it becomes possible to control the output of the 8 circuits. The output can be terminated with load resistor of 133Ω or over.

FUNCTION TABLE (Note 1)

A	$\overline{OC}$	Y
L	L	H
H	L	L
X	H	Z

Note 1: Z : high-impedance
X : irrelevant

CIRCUIT DIAGRAM (EACH BUFFER)



UNIT: Ω

MITSUBISHI ELECTRIC

OCTAL BUFFER/LINE DRIVERS WITH 3-STATE OUTPUTS(INVERTED)

ABSOLUTE MAXIMUM RATINGS ($T_a = -20 \sim +75°C$, 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	Off-state	−0.5 ~ +5.5	V
Topr	Operating free-air ambient temperature range		−20 ~ +75	℃
Tstg	Storage temperature range		−65 ~ +150	℃

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	$V_{OH} \geqq 2.4V$	0		−3	mA
		$V_{OH} \geqq 2V$	0		−15	mA
I_{OL}	Low-level output current	$V_{OL} \leqq 0.4V$	0		12	mA
		$V_{OL} \leqq 0.5V$	0		24	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
$V_{T+} - V_{T-}$	Hysteresis	$V_{CC} = 4.75V$		0.2	0.4		V
V_{IC}	Input clamp voltage	$V_{CC} = 4.75V$, $I_{IC} = -18mA$				−1.5	V
V_{OH}	High-level output voltage	$V_{CC} = 4.75V$	$V_I = 0.8V$, $I_{OH} = -3mA$	2.4	3.4		V
		$V_I = 2V$	$V_I = 0.5V$, $I_{OH} = -15mA$	2			V
V_{OL}	Low-level output voltage	$V_{CC} = 4.75V$	$I_{OL} = 12mA$		0.25	0.4	V
		$V_I = 0.8V$, $V_I = 2V$	$I_{OL} = 24mA$		0.35	0.5	V
I_{OZH}	Off-state high-level output current	$V_{CC} = 5.25V$, $V_I = 2V$, $V_O = 2.7V$				20	μA
I_{OZL}	Off-state low-level output current	$V_{CC} = 5.25V$, $V_I = 2V$, $V_O = 0.4V$				−20	μA
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	$V_{CC} = 5.25V$, $V_I = 0.4V$				−0.2	mA
I_{OS}	Short-circuit output current (Note 2)	$V_{CC} = 5.25V$, $V_O = 0V$		−40		−225	mA
I_{CCH}	Supply current, all outputs high	$V_{CC} = 5.25V$, $V_I = 0V$			17	27	mA
I_{CCL}	Supply current, all outputs low	$V_{CC} = 5.25V$, $V_I = 0V$, $V_I = 4.5V$			26	44	mA
I_{CCZ}	Supply current, all outputs off	$V_{CC} = 5.25V$, $V_I = 4.5V$			29	50	mA

* : All typical values are at $V_{CC} = 5V$, $Ta = 25°C$.
Note 2: 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, from input A to output Y	$C_L = 45pF$ (Note 3)		7	14	ns
t_{PHL}				9	18	ns
t_{PZL}	Output enable time to low-level	$R_L = 667Ω$, $C_L = 45pF$ (Note 3)		15	30	ns
t_{PZH}	Output enable time to high-level	$R_L = 667Ω$, $C_L = 45pF$ (Note 3)		12	40	ns
t_{PLZ}	Output disable time from low-level	$R_L = 667Ω$, $C_L = 5pF$ (Note 3)		11	25	ns
t_{PHZ}	Output disable time from high-level	$R_L = 667Ω$, $C_L = 5pF$ (Note 3)		12	18	ns

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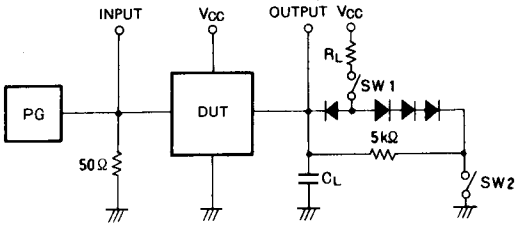
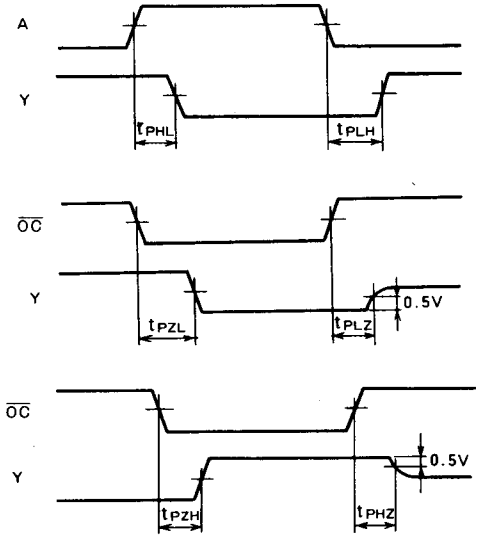
Note 3: Measurement circuit



Parameter	SW1	SW2
t_{PZH}	Open	Closed
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed
t_{PHZ}	Closed	Closed

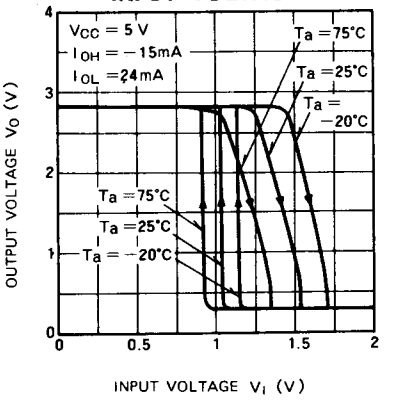
(1) The pulse generator (PG) has the following characteristics: PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_w = 500ns, $V_P = 3V_{P-P}$, $Z_O = 50\Omega$
(2) All diodes are switching diodes ($t_{rr} \leq 4$ns)
(3) C_L includes probe and jig capacitance.

TIMING DIAGRAM (Reference level = 1.3V)

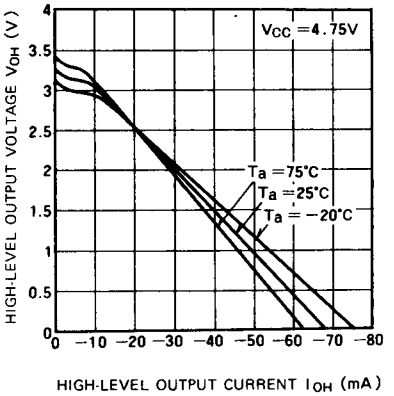


TYPICAL CHARACTERISITCS

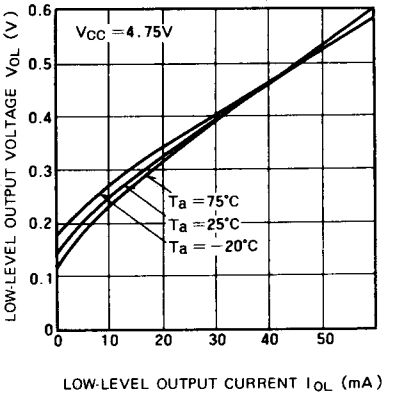
OUTPUT VOLTAGE VS INPUT VOLTAGE



HIGH-LEVEL OUTPUT VOLTAGE VS HIGH-LEVEL OUTPUT CURRENT

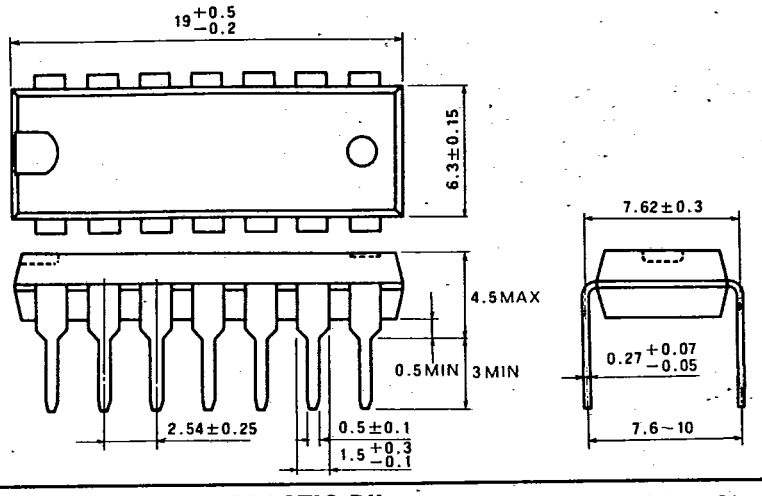


LOW-LEVEL OUTPUT VOLTAGE VS LOW-LEVEL OUTPUT CURRENT



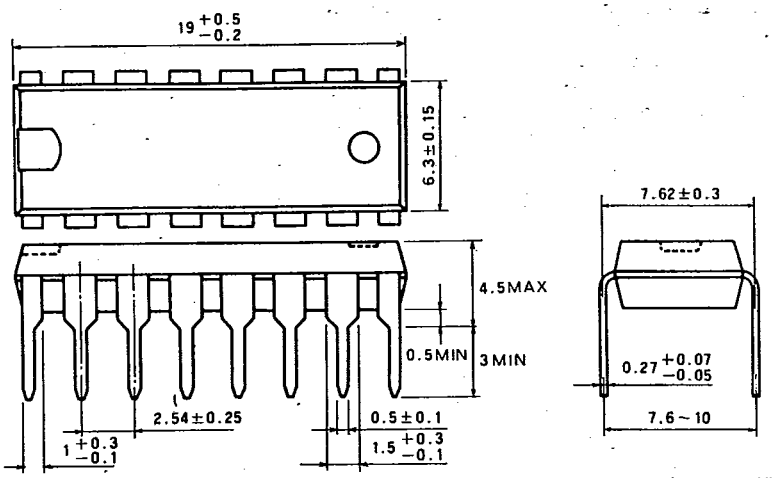
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm