

QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUT (NONINVERTED)

DESCRIPTION

The M74LS243P is a semiconductor integrated circuit containing 4 bus transmitters/receivers with 3-state non-inverted outputs.

FEATURES

- Two-way transmission for, or isolation from, two 4-bit data words
- Low input load factor (pnp input)
- Hysteresis provided (= 400 mV typical)
- High fan-out ($I_{OL} = 24\text{mA}$, $I_{OH} = -15\text{mA}$)
- Wide operating temperature range ($T_a = -20 \sim +75^\circ\text{C}$)

APPLICATION

General purpose, for use in industrial and consumer equipment.

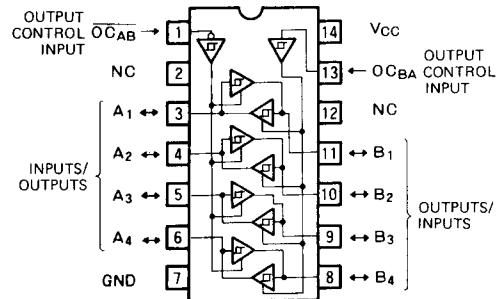
FUNCTIONAL DESCRIPTION

In this device the inputs and outputs are connected mutually to 2 circuits and the buffers with the 3-state non-inverted outputs are made two-way buffers.

Since the input section is provided with hysteresis, the noise margin is increased and the use of pnp transistors in the inputs reduces the input load factor.

The input/output direction is controlled by \overline{OC}_{AB} and \overline{OC}_{BA} . When \overline{OC}_{AB} and \overline{OC}_{BA} are low, input/output pins A are made the input pins and the output/input pins B are made the output pins. When \overline{OC}_{AB} and \overline{OC}_{BA} are high, pins B are made the input pins and A the output pins. When \overline{OC}_{AB} is high and \overline{OC}_{BA} is low, both A and B are put in the high-impedance state and A and B are isolated. When

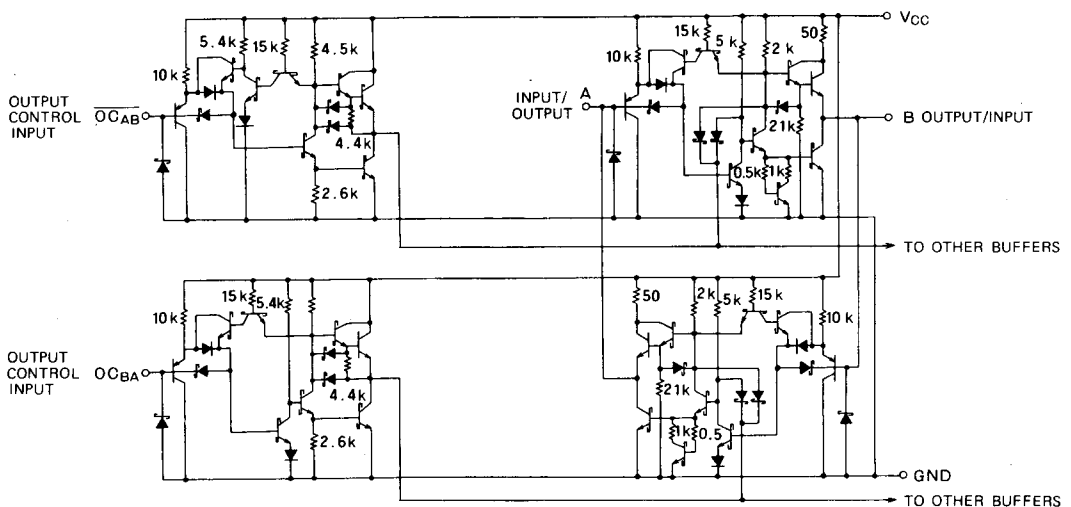
PIN CONFIGURATION (TOP VIEW)



Outline 14P4 NC : NO CONNECTION

\overline{OC}_{AB} is low and OC_{BA} is high, both A and B are put to the output state resulting in the possibility of oscillation and damage to the IC. Use in this state must therefore be avoided. This state resulting from the \overline{OC}_{AB} and OC_{BA} signals should be kept as short as possible. Termination is possible with a load resistor of not less than 133 ohms. Refer to M74LS241P for the typical characteristics.

CIRCUIT DIAGRAM (EACH BUFFER)

UNIT: Ω

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FUNCTION TABLE (Note 1)

$\overline{OC_{AB}}$	OC_{BA}	A	B
H	H	O	I
L	H	*	*
H	L	Z	Z
L	L	I	O

Note 1: I : Input pin
O : Output (non-inverted) pin
* : Inhibited (A and B are made output pins)
Z : High-impedance (A, B are isolated)

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	A, B	$-0.5 \sim +5.5$	V
		$\overline{OC_{AB}}, OC_{BA}$	$-0.5 \sim +15$	V
V_O	Output voltage	Off-state	$-0.5 \sim +5.5$	V
T_{opr}	Operating free-air ambient temperature range		$-20 \sim +75$	$^\circ\text{C}$
T_{stg}	Storage temperature range		$-65 \sim +150$	$^\circ\text{C}$

RECOMMENDED OPERATING CONDITIONS ($T_a = -20 \sim +75^\circ\text{C}$, 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	$V_{OH} \geq 2.4\text{V}$	0	-3	mA
		$V_{OH} \geq 2\text{V}$	0	-15	mA
I_{OL}	Low-level output current	$V_{OL} \leq 0.4\text{V}$	0	12	mA
		$V_{OL} \leq 0.5\text{V}$	0	24	mA

ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$, 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 width	$V_{CC} = 4.75\text{V}$	0.2	0.4		V
V_{IC}	Input clamp voltage	$V_{CC} = 4.75\text{V}, I_{IC} = -18\text{mA}$			-1.5	V
V_{OH}	High-level output voltage	$V_{CC} = 4.75\text{V}, V_I = 0.8\text{V}, I_{OH} = -3\text{mA}$	2.4	3.1		V
		$V_I = 2\text{V}, V_I = 0.5\text{V}, I_{OH} = -15\text{mA}$	2			V
V_{OL}	Low-level output voltage	$V_{CC} = 4.75\text{V}, I_{OL} = 12\text{mA}$		0.25	0.4	V
		$V_I = 0.8\text{V}, V_I = 2\text{V}, I_{OL} = 24\text{mA}$		0.35	0.5	V
I_{OZH}	Off-stage high-level output current	$V_{CC} = 5.25\text{V}, V_I = 0.8\text{V}, V_I = 2\text{V}, V_O = 2.7\text{V}$			40	μA
I_{OZL}	Off-state low-level output current	$V_{CC} = 5.25\text{V}, V_I = 0.8\text{V}, V_I = 2\text{V}, V_O = 0.4\text{V}$			-200	μA
I_{IH}	High-level input current	A, B $\overline{OC_{AB}}, OC_{BA}$ $V_{CC} = 5.25\text{V}, V_I = 2.7\text{V}$			20	μA
		A, B $\overline{OC_{AB}}, OC_{BA}$ $V_{CC} = 5.25\text{V}, V_I = 5.5\text{V}$			0.1	mA
		$V_{CC} = 5.25\text{V}, V_I = 10\text{V}$			0.1	mA
I_{IL}	Low-level input current	$\overline{OC_{AB}}, OC_{BA}$ $V_{CC} = 5.25\text{V}$			-0.2	mA
		A $V_I = 0.4\text{V}$ $\overline{OC_{AB}} = \overline{OC_{BA}} = 0\text{V}$			-0.2	mA
		B $\overline{OC_{AB}} = \overline{OC_{BA}} = 4.5\text{V}$			-0.2	mA
I_{OS}	Short-circuit output current (Note 2)	$V_{CC} = 5.25\text{V}, V_O = 0\text{V}$	-40		-225	mA
I_{CCH}	Supply current, all output high	$V_{CC} = 5.25\text{V}, V_I = 0\text{V}, V_I = 4.5\text{V}$		22	38	mA
I_{CCL}	Supply current, all outputs low	$V_{CC} = 5.25\text{V}, V_I = 0\text{V}, V_I = 4.5\text{V}$		29	50	mA
I_{CCZ}	Supply current, all outputs off	$V_{CC} = 5.25\text{V}, V_I = 0\text{V}, V_I = 4.5\text{V}$		32	54	mA

* : All typical values are at $V_{CC} = 5\text{V}, T_a = 25^\circ\text{C}$.

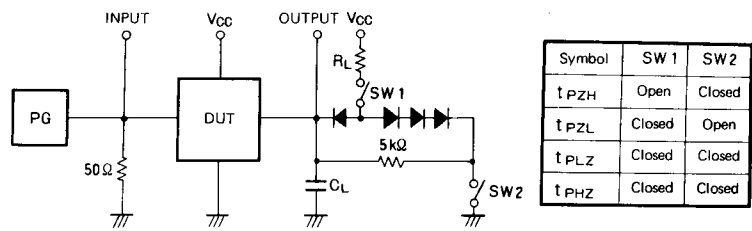
Note 2: All measurements should be done quickly and not more than one outputs should be shorted at a time.

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

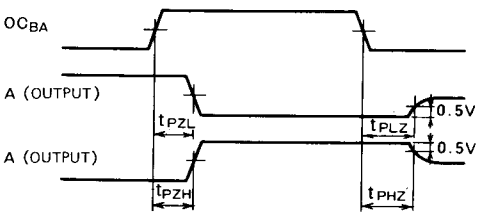
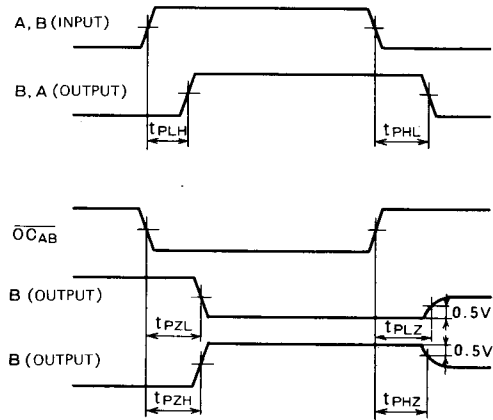
Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t _{PLH}	Low-to-high-level, high-to-low-level output propagation time, from inputs A, B to outputs B, A	C _L = 45pF (Note 3)		8	18	ns
t _{PHL}				9	18	ns
t _{PZH}	Output enable time to high-level	R _L = 667Ω, C _L = 45pF (Note 3)		15	40	ns
t _{PZL}	Output enable time to low-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 = 5 pF (Note 3)		11	25	ns
t _{PHZ}	Output disable time from high-level	R _L = 667Ω, C _L = 5 pF (Note 3)		12	18	ns

Note 3: Measurement circuit



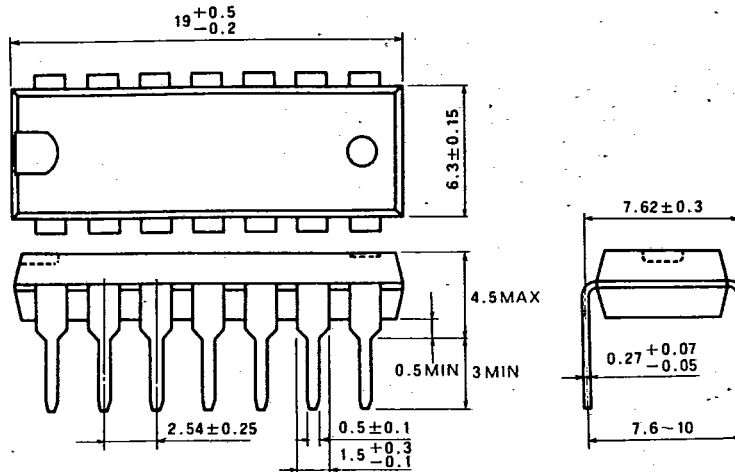
- (1) The pulse generator (PG) has the following characteristics:
PRR = 1MHz, t_r = 6ns, t_f = 6ns, t_w = 500ns, V_p = 3V_{p.p.}, Z₀ = 50Ω
- (2) All diodes are switching diodes (t_{rr} ≤ 4ns).
- (3) C_L includes probe and jig capacitance.

TIMING DIAGRAM (Reference level = 1.3V)



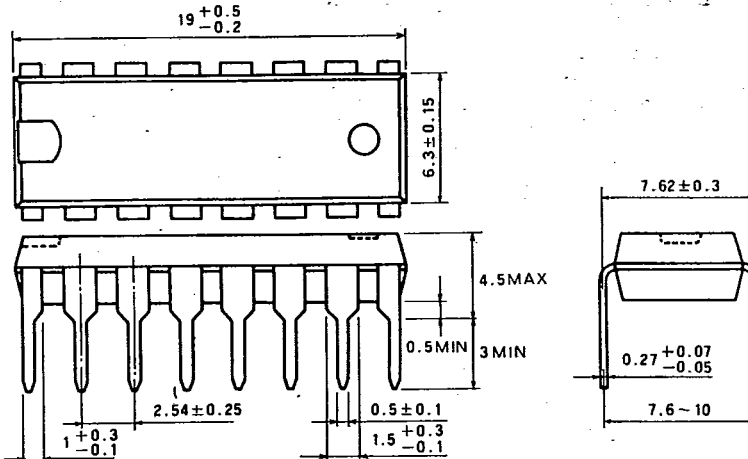
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

