M74LS242P

QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUT (INVERTED)

DESCRIPTION

The M74LS242P is a semiconductor integrated circuit containing 4 bus transmitters/receivers circuit with 3-state inverted outputs.

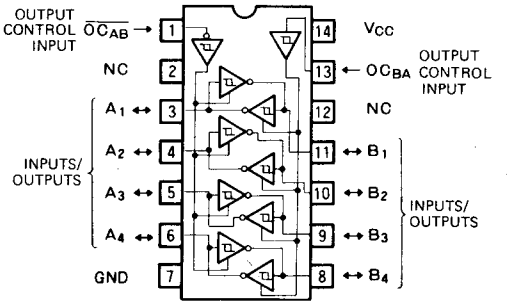
FEATURES

- Two-way transmission for, or isolation from, two 4-bit data words
- Low input load factor (pnp input)
- Hysteresis provided (= 400mV typical)
- High fan-out (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 14P4 NC : NO CONNECTION

FUNCTIONAL DESCRIPTION

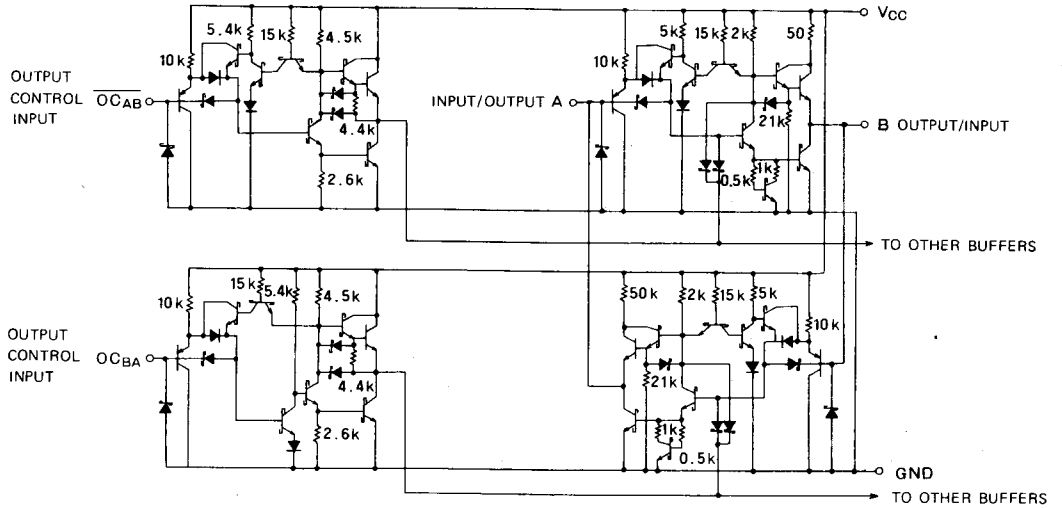
In this device the inputs and outputs are connected mutually to 2 circuits and the buffers with the 3-state inverted outputs are made two-way buffers.

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 OC_{BA}. When $\overline{OC_{AB}}$ and 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 OC_{BA} are high, pins B are made the input pins and A the output pins. When $\overline{OC_{AB}}$ is high and OC_{BA} is high and OC_{BA} is low, both A and B are put in the high-impedance state and A and B are isolated. When $\overline{OC_{AB}}$ 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 M74LS240P 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	$\overline{O}$	I
L	H	*	*
H	L	Z	Z
L	L	I	$\overline{O}$

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

ABSOLUTE MAXIMUM RATINGS (Ta = −20 ~ +75°C, unless otherwise noted)

Symbol	Parameter		Conditions	Limits	Unit
V_{CC}	Supply voltage			−0.5 ~ +7	V
V_I	Input voltage	A, B		−0.5 ~ +5.5	V
		$\overline{OC_{AB}}$, OC_{BA}		−0.5 ~ +15	V
V_O	Output voltage		Off-state	−0.5 ~ +5.5	V
Topr	Operating free-air ambient temperature range			−20 ~ +75	°C
Tstg	Storage temperature range			−65 ~ +150	°C

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	$V_{OH} \geqq 2.4V$	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 (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
$V_{T+} - V_{T-}$	Hysteresis width		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	3.1		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 = 0.8V, V_I = 2V, V_O = 2.7V				40	μA
I_{OZL}	Off-state low-level output current		V_{CC} = 5.25V, V_I = 0.8V, V_I = 2V, V_O = 0.4V				−200	μA
I_{IH}	High-level input current	A, B	V_{CC} = 5.25V, V_I = 2.7V				20	μA
		$\overline{OC_{AB}}$, OC_{BA}					20	
		A, B	V_{CC} = 5.25V, V_I = 5.5V				0.1	mA
		$\overline{OC_{AB}}$, OC_{BA}	V_{CC} = 5.25V, V_I = 10V				0.1	
I_{IL}	Low-level input current	$\overline{OC_{AB}}$, OC_{BA}	V_{CC} = 5.25V, V_I = 0.4V				−0.2	mA
		A		$\overline{OC_{AB}} = OC_{BA}$ = 0V			−0.2	
		B		$\overline{OC_{AB}} = OC_{BA}$ = 4.5V			−0.2	
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, V_I = 4.5V			22	38	mA
I_{CCL}	Supply current, all outputs low		V_{CC} = 5.25V, V_I = 0V, V_I = 4.5V			29	50	mA
I_{CCZ}	Supply current, all outputs off		V_{CC} = 5.25V, V_I = 0V, 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.

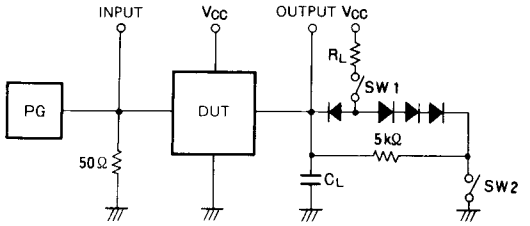
MITSUBISHI ELECTRIC

QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUT (INVERTED)

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 inputs A, B to outputs B, A	C_L = 45pF (Note 3)		7	14	ns
t_{PHL}				9	18	ns
t_{PZL}	Output disable time from low-level	R_L = 667Ω, C_L = 45pF (Note 3)		15	40	ns
t_{PZH}	Output enable time to high-level	R_L = 667Ω, C_L = 45pF (Note 3)		12	40	ns
t_{PLZ}	Output enable time to 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

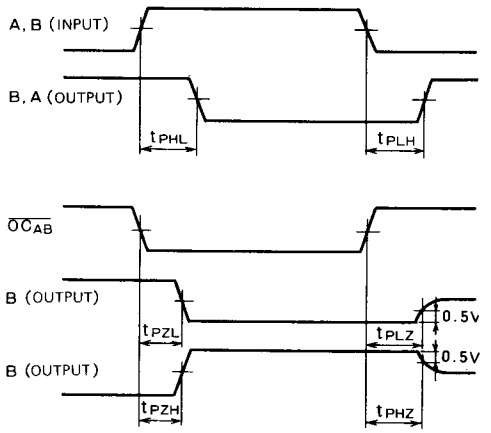
Note 3: Measurement circuit

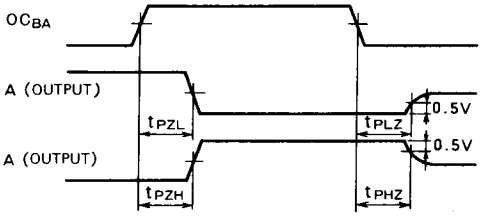


Symbol	SW1	SW2
t_{PZH}	Open	Closed
t_{PZL}	Closed	Open
t_{PLZ}	Closed	Closed
t_{PHZ}	Closed	Closed

(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 = 50Ω
(2) All diodes are switching diodes ($t_{rr} \leqq$ 4ns)
(3) C_L includes probe and jig capacitance.

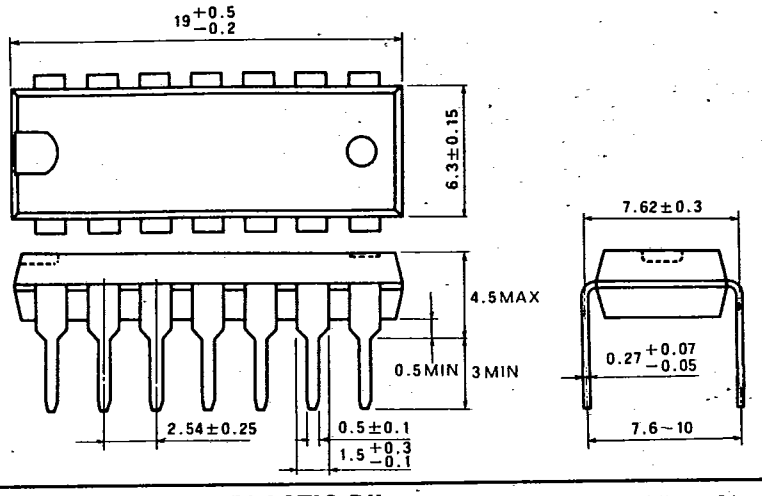
TIMING DIAGRAM (Reference level = 1.3V)





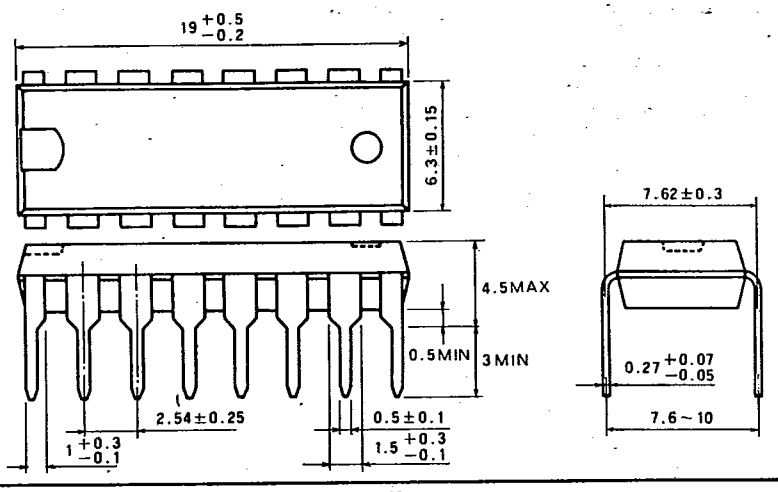
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm