

**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 ( $I_{OL} = 24\text{mA}$ ,  $I_{OH} = -15\text{mA}$ )
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ\text{C}$ )

**APPLICATION**

General purpose, for use in industrial and consumer equipment.

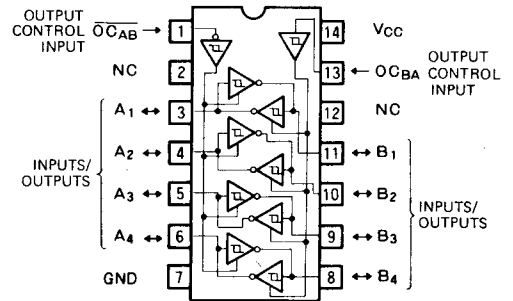
**FUNCTIONAL DESCRIPTION**

In this device the inputs and outputs are connected mutually to 2 circuits and the buffers with the 3-state 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

**PIN CONFIGURATION (TOP VIEW)**

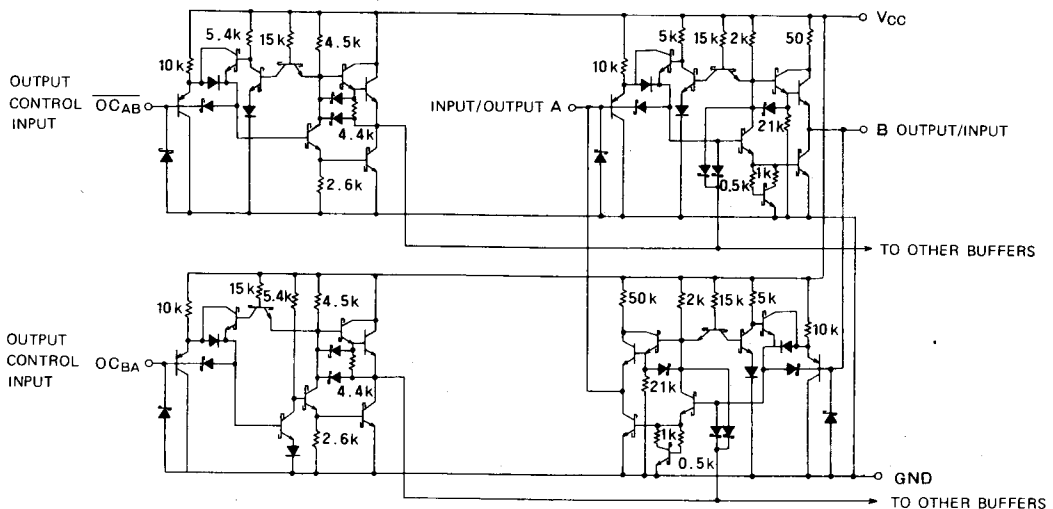


Outline 14P4 NC : NO CONNECTION

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)**



# **QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUT (INVERTED)**

## **FUNCTION TABLE** (Note 1)

$\overline{OC}_{AB}$	$OC_{BA}$	A	B
H	H	$\overline{0}$	1
L	H	*	*
H	L	Z	Z
L	L	1	$\overline{0}$

Note 1: 1 : Input pin

 $\overline{0}$  : Output pin (inverted)

\* : 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
		$V_I = 2\text{V}$ , $I_{OH} = -15\text{mA}$	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-state 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	$\mu\text{A}$
$I_{OZL}$	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	$\mu\text{A}$
$I_{IH}$	High-level input current	A, B			20	$\mu\text{A}$
		$\overline{OC}_{AB}, OC_{BA}$			20	
		A, B			0.1	mA
		$\overline{OC}_{AB}, OC_{BA}$			0.1	
$I_{IL}$	Low-level input current	$\overline{OC}_{AB}, OC_{BA}$			-0.2	mA
		A	$V_{CC} = 5.25\text{V}$		-0.2	
		B	$V_I = 0.4\text{V}$	$\overline{OC}_{AB} = OC_{BA} = 0\text{V}$ $\overline{OC}_{AB} = OC_{BA} = 4.5\text{V}$	-0.2	
$I_{OS}$	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 outputs 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	$V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$ , $V_I = 4.5\text{V}$		29	50	mA

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

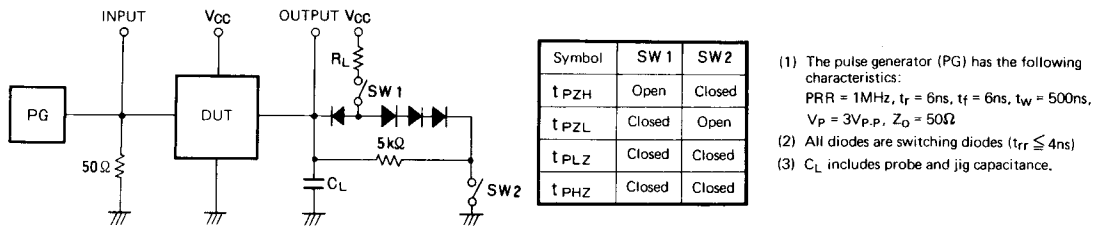
Note 2: All measurements should be done quickly and not more than one output should be shorted at a time.

QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUT (INVERTED)

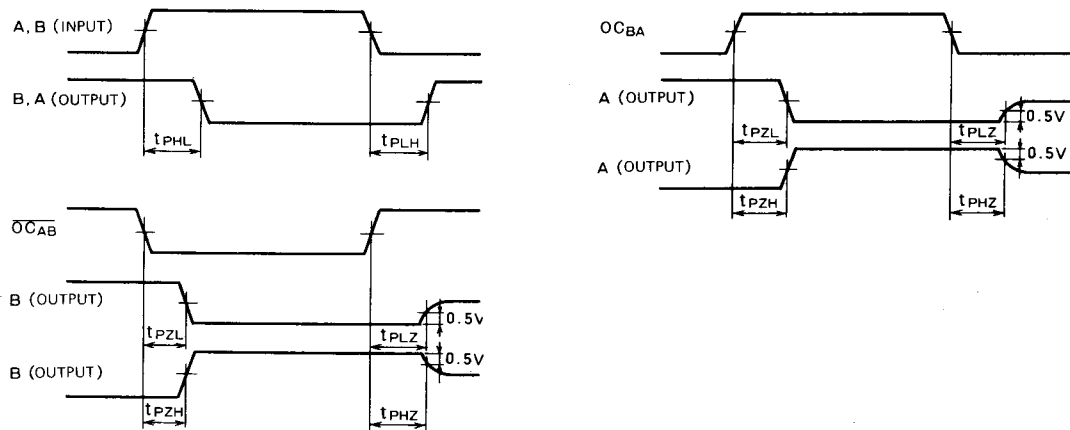
SWITCHING CHARACTERISTICS (V<sub>CC</sub> = 5V, T<sub>a</sub> = 25°C, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t <sub>PLH</sub>	Low-to-high-level, high-to-low-level output propagation time, from inputs A, B to outputs B, A	C <sub>L</sub> = 45pF (Note 3)		7	14	ns
t <sub>PHL</sub>				9	18	ns
t <sub>PZL</sub>	Output disable time from low-level	R <sub>L</sub> = 667Ω, C <sub>L</sub> = 45pF (Note 3)		15	40	ns
t <sub>PZH</sub>	Output enable time to high-level	R <sub>L</sub> = 667Ω, C <sub>L</sub> = 45pF (Note 3)		12	40	ns
t <sub>PLZ</sub>	Output enable time to low-level	R <sub>L</sub> = 667Ω, C <sub>L</sub> = 5 pF (Note 3)		11	25	ns
t <sub>PHZ</sub>	Output disable time from high-level	R <sub>L</sub> = 667Ω, C <sub>L</sub> = 5 pF (Note 3)		12	18	ns

Note 3: Measurement circuit

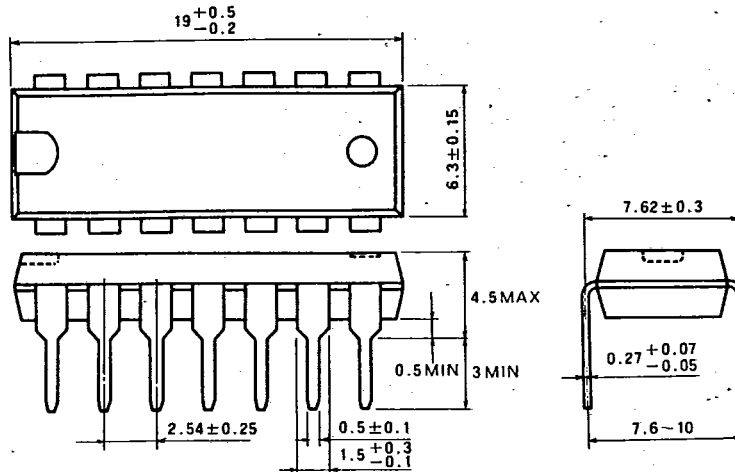


TIMING DIAGRAM (Reference level = 1.3V)



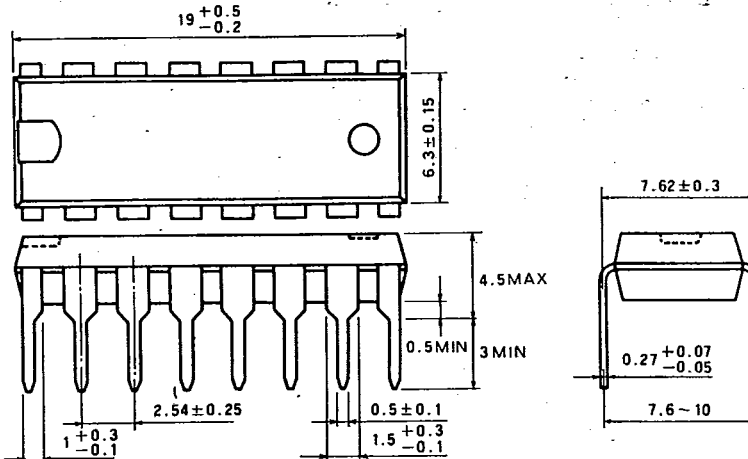
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

