

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

**DESCRIPTION**

The M74LS244P is a semiconductor integrated circuit containing 2 blocks of buffers with 3-state non-inverted output and common output controlling input for all 4 discrete circuits.

**FEATURES**

- Low input load factor (pnp input)
- Hysteresis provided (= 400mV typical)
- High breakdown input voltage ( $V_1 \geq 15V$ )
- Output control input having same phase for 2 circuits
- High fan-out, 3-state output  
( $I_{OL} = 24mA$ ,  $I_{OH} = -15mA$ )
- Wide operating temperature range ( $T_a = -20 \sim +75^\circ C$ )

**APPLICATION**

General purpose, for use in industrial and consumer equipment.

**FUNCTIONAL DESCRIPTION**

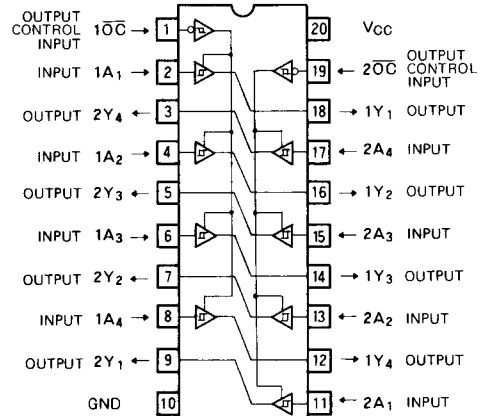
The use of pnp transistors in the input circuit has enabled the achievement of small input load factor. With hysteresis characteristics, the buffer has a 3-state noninverted output with high noise margin.

When output control input  $\overline{OC}$  is low, the output Y is low if input A is low and Y is high if A is high. When  $\overline{OC}$  is high, all of  $Y_1$ ,  $Y_2$ ,  $Y_3$ , and  $Y_4$  are in the 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 all 8 circuits simultaneously. Output can be terminated by a load resistor of  $133\Omega$  or over.

For standard characteristics, see M74LS241P.

**PIN CONFIGURATION (TOP VIEW)**



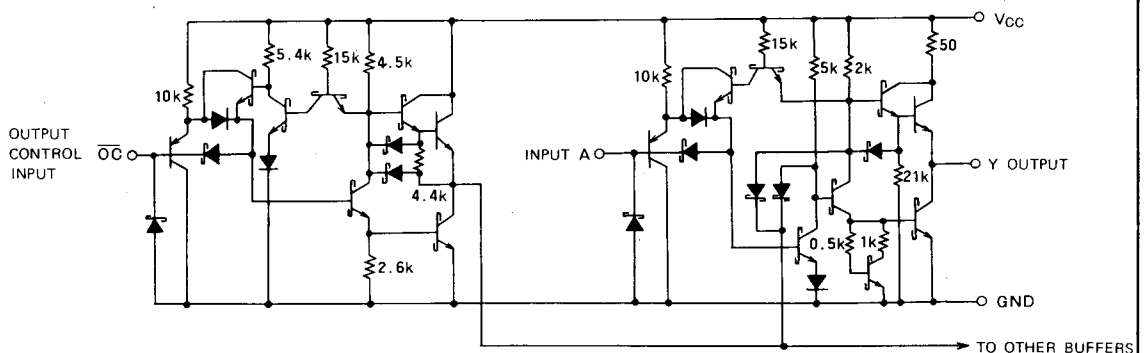
Outline 20P4

**FUNCTION TABLE (Note 1)**

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

Note 1: Z : high-impedance  
X : irrelevant

**CIRCUIT DIAGRAM (EACH BUFFER)**



UNIT:  $\Omega$

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**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                                |            | $-0.5 \sim +15$  | 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 | $V_{OH} \geq 2.4\text{V}$ |        |     | -3   | mA   |
|          |                           | $V_{OH} \geq 2\text{V}$   |        |     | -15  | mA   |
| $I_{OL}$ | Low-level output current  | $V_{OL} \leq 0.4\text{V}$ |        |     | 12   | mA   |
|          |                           | $V_{OL} \leq 0.5\text{V}$ |        |     | 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                            | $V_{CC} = 4.75\text{V}$                                                | 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    | 3.4  |      | 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-state high-level output current   | $V_{CC} = 5.25\text{V}$ , $V_I = 2\text{V}$ , $V_O = 2.7\text{V}$      |        |      | 20   | $\mu\text{A}$ |
| $I_{OZL}$         | Off-state low-level output current    | $V_{CC} = 5.25\text{V}$ , $V_I = 2\text{V}$ , $V_O = 0.4\text{V}$      |        |      | -20  | $\mu\text{A}$ |
| $I_{IH}$          | High-level input current              | $V_{CC} = 5.25\text{V}$ , $V_I = 2.7\text{V}$                          |        |      | 20   | $\mu\text{A}$ |
|                   |                                       | $V_{CC} = 5.25\text{V}$ , $V_I = 10\text{V}$                           |        |      | 0.1  | mA            |
| $I_{IL}$          | Low-level input current               | $V_{CC} = 5.25\text{V}$ , $V_I = 0.4\text{V}$                          |        |      | -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 outputs high      | $V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$ , $V_I = 4.5\text{V}$      |        | 17   | 27   | mA            |
| $I_{CCL}$         | Supply current, all outputs low       | $V_{CC} = 5.25\text{V}$ , $V_I = 0\text{V}$                            |        | 27   | 46   | mA            |
| $I_{CCZ}$         | Supply current, all outputs off       | $V_{CC} = 5.25\text{V}$ , $V_I = 4.5\text{V}$                          |        | 32   | 54   | mA            |

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

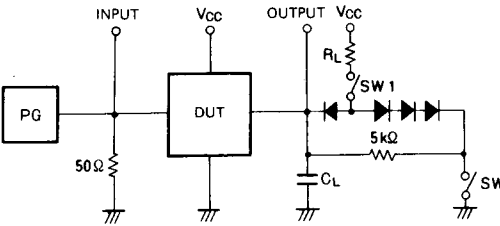
Note 2: All measurements should be done quickly, and not more than one output should be shorted at a time.

**SWITCHING CHARACTERISTICS** ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , 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 | $C_L = 45\text{pF}$ (Note 3)                     |        | 8   | 18  | ns   |
| $t_{PHL}$ |                                                                                        |                                                  |        | 9   | 18  | ns   |
| $t_{PZH}$ | Output enable time to high-level                                                       | $R_L = 667\Omega$ , $C_L = 45\text{pF}$ (Note 3) |        | 15  | 30  | ns   |
| $t_{PZL}$ | Output enable time to low-level                                                        | $R_L = 667\Omega$ , $C_L = 45\text{pF}$ (Note 3) |        | 12  | 40  | ns   |
| $t_{PLZ}$ | Output disable time from low-level                                                     | $R_L = 667\Omega$ , $C_L = 5\text{pF}$ (Note 3)  |        | 11  | 25  | ns   |
| $t_{PHZ}$ | Output disable time from high-level                                                    | $R_L = 667\Omega$ , $C_L = 5\text{pF}$ (Note 3)  |        | 12  | 18  | ns   |

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

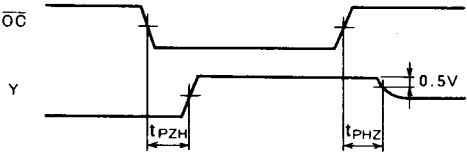
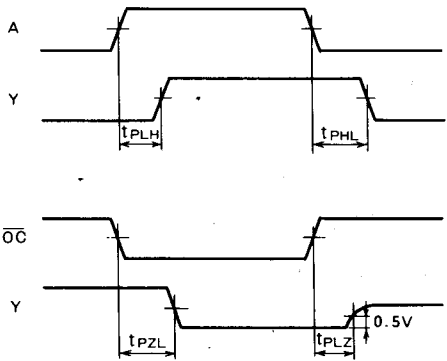
Note 3: Measurement circuit



| Symbol | SW 1   | SW 2   |
|--------|--------|--------|
| t PZH  | Open   | Closed |
| t PZL  | Closed | Open   |
| t PLZ  | Closed | Closed |
| t PHZ  | Closed | Closed |

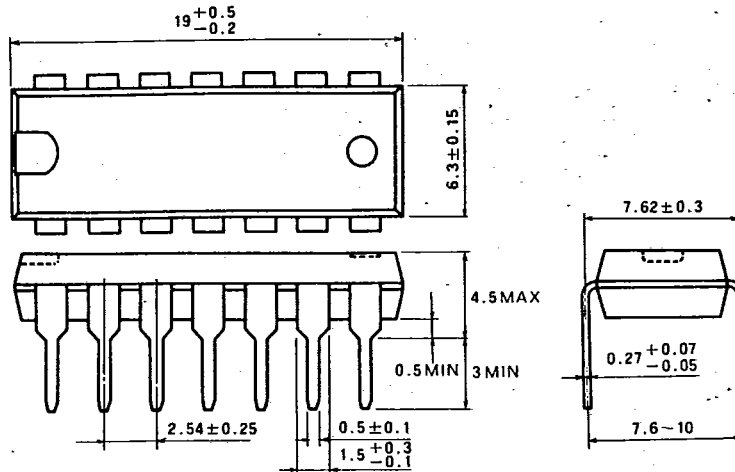
- (1) The pulse generator (PG) has the following characteristics:  
PRR = 1MHz,  $t_r = 6\text{ns}$ ,  $t_f = 6\text{ns}$ ,  $t_W = 500\text{ns}$ ,  
 $V_P = 3V_{P-P}$ ,  $Z_O = 50\Omega$   
(2) All diodes are switching diodes ( $t_{rr} \leq 4\text{ns}$ )  
(3)  $C_L$  includes probe and jig capacitance.

TIMING DIAGRAM (Reference level = 1.3V)



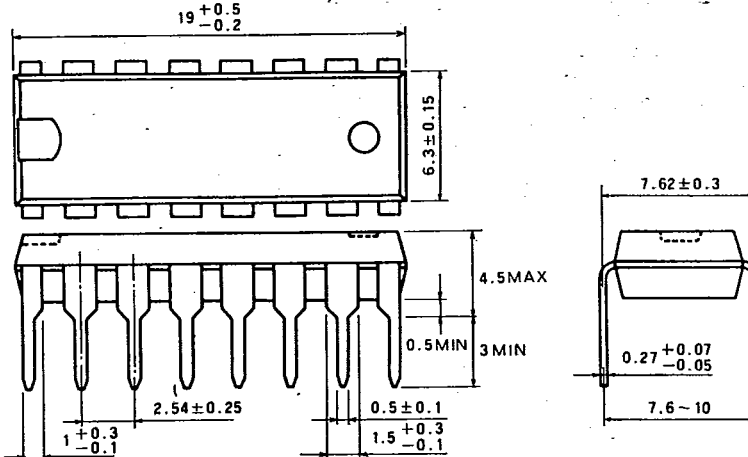
TYPE 14P4 14-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 16P4 16-PIN MOLDED PLASTIC DIL

Dimension in mm



TYPE 20P4 20-PIN MOLDED PLASTIC DIL

Dimension in mm

