

**U74LVC244****CMOS IC****OCTAL BUFFER/DRIVER WITH  
3-STATE OUTPUTS****■ DESCRIPTION**

The UTC **U74LVC244** contains two 4-bit line drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes data from the A to the Y. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

The UTC **U74LVC244** can be used in a mixed 3.3V/5V system environment.

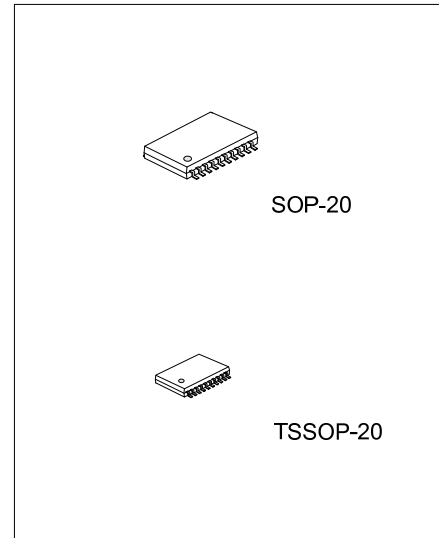
**■ FEATURES**

- \* Operate From 1.65V to 3.6V
- \* Input Accept Voltages to 5.5V
- \* Partial-Power-Down Mode Operation
- \* Max tpd is 5.9ns at 3.3V

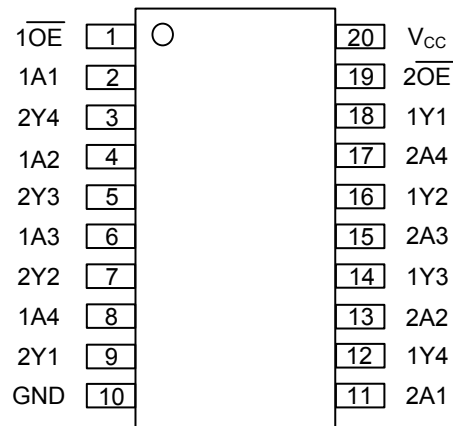
**■ ORDERING INFORMATION**

| Ordering Number  |                  | Package  | Packing   |
|------------------|------------------|----------|-----------|
| Lead Free        | Halogen Free     |          |           |
| U74LVC244L-S20-R | U74LVC244G-S20-R | SOP-20   | Tape Reel |
| U74LVC244L-P20-R | U74LVC244G-P20-R | TSSOP-20 | Tape Reel |

|                      |                 |                                   |
|----------------------|-----------------|-----------------------------------|
| U74LVC244L-S20-R<br> | (1)Packing Type | (1) R: Tape Reel                  |
|                      | (2)Package Type | (2) S20: SOP-20, P20: TSSOP-20    |
|                      | (3)Lead Free    | (3) G: Halogen Free, L: Lead Free |



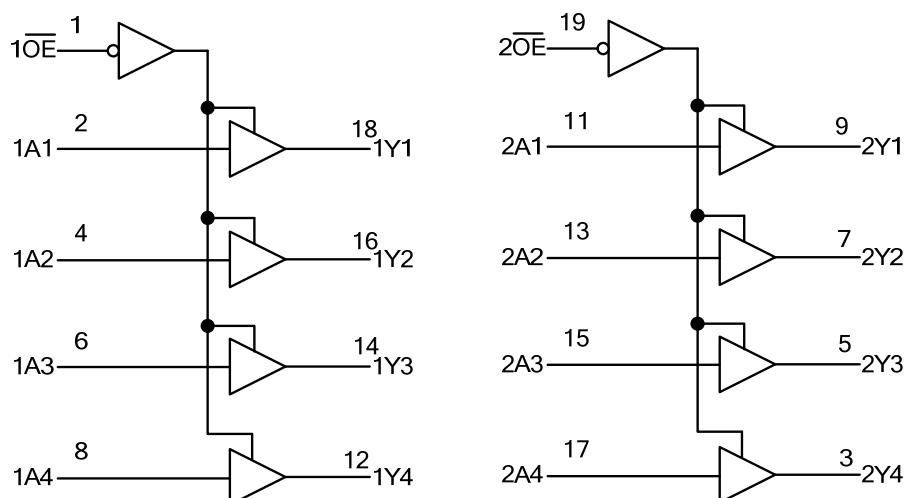
## PIN CONFIGURATION



## FUNCTION TABLE (each gate)

| INPUT( $\overline{OE}$ ) | INPUT(A) | OUTPUT(Y) |
|--------------------------|----------|-----------|
| H                        | X        | Z         |
| L                        | H        | H         |
| L                        | L        | L         |

## LOGIC DIAGRAM (Positive Logic)



### ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                      |          | SYMBOL           | RATINGS                   | UNIT |
|----------------------------------------------------------------|----------|------------------|---------------------------|------|
| Supply Voltage                                                 |          | V <sub>CC</sub>  | -0.5~6.5                  | V    |
| Input Voltage                                                  |          | V <sub>IN</sub>  | -0.5~ 6.5                 | V    |
| Voltage applied to output in high-impedance or power-off state |          | V <sub>OUT</sub> | -0.5~6.5                  | V    |
| Voltage applied to output in high or low state                 |          |                  | -0.5~V <sub>CC</sub> +0.5 |      |
| Input Clamp Current                                            |          | I <sub>IK</sub>  | -50                       | mA   |
| Output Clamp Current                                           |          | I <sub>OK</sub>  | -50                       | mA   |
| Output Current                                                 |          | I <sub>OUT</sub> | ±50                       | mA   |
| V <sub>CC</sub> or GND Current                                 |          | I <sub>CC</sub>  | ±100                      | mA   |
| Power dissipation                                              | SOP-20   | P <sub>D</sub>   | 500                       | mW   |
|                                                                | TSSOP-20 |                  | 450                       |      |
| Derate above Ta>60°C                                           | SOP-20   |                  | 7                         | mW/K |
|                                                                | TSSOP-20 |                  | 6.1                       |      |
| Operating Temperature                                          |          | T <sub>OPR</sub> | -40~ +125                 | °C   |
| Storage Temperature                                            |          | T <sub>STG</sub> | -65 ~ +150                | °C   |

Note: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER                 | SYMBOL    | CONDITIONS                            | MIN                  | TYP | MAX                  | UNIT |
|---------------------------|-----------|---------------------------------------|----------------------|-----|----------------------|------|
| Supply Voltage            | $V_{CC}$  | Operating                             | 1.65                 |     | 3.6                  | V    |
|                           |           | Data retention only                   | 1.5                  |     |                      | V    |
| Input Voltage             | $V_{IN}$  |                                       | 0                    |     | 5.5                  | V    |
| Output Voltage            | $V_{OUT}$ |                                       | 0                    |     | $V_{CC}$             | V    |
| High-Level Input Voltage  | $V_{IH}$  | $V_{CC}=1.65\text{V to }1.95\text{V}$ | $0.65 \times V_{CC}$ |     |                      | V    |
|                           |           | $V_{CC}=2.3\text{V to }2.7\text{V}$   | 1.7                  |     |                      | V    |
|                           |           | $V_{CC}=2.7\text{V to }3.6\text{V}$   | 2                    |     |                      | V    |
| Low-Level Input Voltage   | $V_{IL}$  | $V_{CC}=1.65\text{V to }1.95\text{V}$ |                      |     | $0.35 \times V_{CC}$ | V    |
|                           |           | $V_{CC}=2.3\text{V to }2.7\text{V}$   |                      |     | 0.7                  | V    |
|                           |           | $V_{CC}=2.7\text{V to }3.6\text{V}$   |                      |     | 0.8                  | V    |
| High-Level Output Current | $I_{OH}$  | $V_{CC}=1.65\text{V}$                 |                      |     | -4                   | mA   |
|                           |           | $V_{CC}=2.3\text{V}$                  |                      |     | -8                   | mA   |
|                           |           | $V_{CC}=2.7\text{V}$                  |                      |     | -12                  | mA   |
|                           |           | $V_{CC}=3\text{V}$                    |                      |     | -24                  | mA   |
| Low-Level Output Current  | $I_{OL}$  | $V_{CC}=1.65\text{V}$                 |                      |     | 4                    | mA   |
|                           |           | $V_{CC}=2.3\text{V}$                  |                      |     | 8                    | mA   |
|                           |           | $V_{CC}=2.7\text{V}$                  |                      |     | 12                   | mA   |
|                           |           | $V_{CC}=3\text{V}$                    |                      |     | 24                   | mA   |

## ELECTRICAL CHARACTERISTICS

| PARAMETER                           | SYMBOL        | TEST CONDITIONS                                                                        | MIN          | TYP | MAX     | UNIT    |
|-------------------------------------|---------------|----------------------------------------------------------------------------------------|--------------|-----|---------|---------|
| High-Level Output Voltage           | $V_{OH}$      | $V_{CC}=1.65V$ to $3.6V$ , $I_{OH}=-100\mu A$                                          | $V_{CC}-0.2$ |     |         | V       |
|                                     |               | $V_{CC}=1.65V$ , $I_{OH}=-4mA$                                                         | 1.29         |     |         |         |
|                                     |               | $V_{CC}=2.3V$ , $I_{OH}=-8mA$                                                          | 1.9          |     |         |         |
|                                     |               | $V_{CC}=2.7V$ , $I_{OH}=-12mA$                                                         | 2.2          |     |         |         |
|                                     |               | $V_{CC}=3V$ , $I_{OH}=-12mA$                                                           | 2.4          |     |         |         |
|                                     |               | $V_{CC}=3V$ , $I_{OH}=-24mA$                                                           | 2.3          |     |         |         |
| Low-Level Output Voltage            | $V_{OL}$      | $V_{CC}=1.65V$ to $3.6V$ , $I_{OH}=100\mu A$                                           |              |     | 0.1     | V       |
|                                     |               | $V_{CC}=1.65V$ , $I_{OH}=4mA$                                                          |              |     | 0.24    |         |
|                                     |               | $V_{CC}=2.3V$ , $I_{OH}=8mA$                                                           |              |     | 0.3     |         |
|                                     |               | $V_{CC}=2.7V$ , $I_{OH}=12mA$                                                          |              |     | 0.4     |         |
|                                     |               | $V_{CC}=3V$ , $I_{OH}=24mA$                                                            |              |     | 0.55    |         |
| Input Leakage Current               | $I_{I(LEAK)}$ | $V_{CC}=3.6V$ , $V_{IN}=5.5V$ or GND                                                   |              |     | $\pm 1$ | $\mu A$ |
| Power OFF Leakage Current           | $I_{OFF}$     | $V_{CC}=0V$ , $V_{IN}$ or $V_{OUT}=5.5V$                                               |              |     | $\pm 1$ | $\mu A$ |
| Output OFF-State Current            | $I_{OZ}$      | $V_{CC}=3.6V$ , $V_{OUT}=0$ or GND                                                     |              |     | $\pm 1$ | $\mu A$ |
| Quiescent Supply Current            | $I_Q$         | $V_{CC}=3.6V$ , $V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$                                    |              |     | 1       | $\mu A$ |
|                                     |               | $V_{CC}=3.6V$ , $3.6V \leq V_{IN} \leq 5.5V$ , $I_{OUT}=0$                             |              |     | 1       |         |
| Additional Quiescent Supply Current | $\Delta I_Q$  | $V_{CC}=2.7V$ to $3.6V$ , One input at $V_{CC}-0.6V$ , Other inputs at $V_{CC}$ or GND |              |     | 500     | $\mu A$ |
| Input Capacitance                   | $C_I$         | $V_{CC}=3.3V$ , $V_{IN}=V_{CC}$ or GND                                                 |              | 4   |         | pF      |
| Output Capacitance                  | $C_O$         | $V_{CC}=3.3V$ , $V_{OUT}=V_{CC}$ or GND                                                |              | 5.5 |         | pF      |

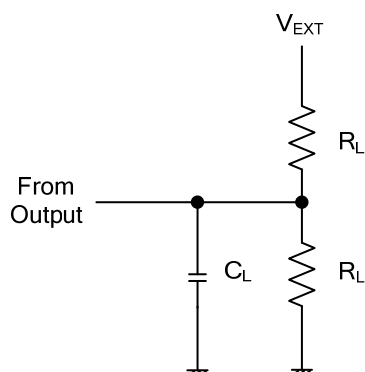
## SWITCHING CHARACTERISTICS

| PARAMETER                                  | SYMBOL    | TEST CONDITIONS         | MIN | TYP | MAX  | UNIT |
|--------------------------------------------|-----------|-------------------------|-----|-----|------|------|
| From Input(A) to Output(Y)                 | $t_{pd}$  | $V_{CC}=1.5V$           | 1   | 7   | 14.4 | ns   |
|                                            |           | $V_{CC}=1.8V \pm 0.15V$ | 1   | 5.9 | 10.4 |      |
|                                            |           | $V_{CC}=2.5V \pm 0.2V$  | 1   | 4.2 | 7.4  |      |
|                                            |           | $V_{CC}=2.7V$           | 1   | 4.2 | 6.7  |      |
|                                            |           | $V_{CC}=3.3V \pm 0.3V$  | 1.5 | 3.9 | 5.7  |      |
| From Input( $\overline{OE}$ ) to Output(Y) | $t_{en}$  | $V_{CC}=1.5V$           | 1   | 8.3 | 17.8 | ns   |
|                                            |           | $V_{CC}=1.8V \pm 0.15V$ | 1   | 6.4 | 12.1 |      |
|                                            |           | $V_{CC}=2.5V \pm 0.2V$  | 1   | 4.6 | 9.1  |      |
|                                            |           | $V_{CC}=2.7V$           | 1   | 5   | 8.4  |      |
|                                            |           | $V_{CC}=3.3V \pm 0.3V$  | 1.5 | 4.5 | 7.4  |      |
| From Input( $\overline{OE}$ ) to Output(Y) | $t_{dis}$ | $V_{CC}=1.5V$           | 1   | 7.2 | 15.6 | ns   |
|                                            |           | $V_{CC}=1.8V \pm 0.15V$ | 1   | 5.8 | 11.6 |      |
|                                            |           | $V_{CC}=2.5V \pm 0.2V$  | 1   | 3.7 | 7.3  |      |
|                                            |           | $V_{CC}=2.7V$           | 1   | 3.8 | 6.6  |      |
|                                            |           | $V_{CC}=3.3V \pm 0.3V$  | 1.5 | 3.8 | 6.3  |      |

## OPERATING CHARACTERISTICS

| PARAMETER                     | SYMBOL | TEST CONDITIONS                               | MIN | TYP | MAX | UNIT |
|-------------------------------|--------|-----------------------------------------------|-----|-----|-----|------|
| Power Dissipation Capacitance | Cpd    | $\overline{OE}=0$ , $f=10MHz$ , $V_{CC}=1.8V$ |     | 43  |     | pF   |
|                               |        | $\overline{OE}=0$ , $f=10MHz$ , $V_{CC}=2.5V$ |     | 43  |     |      |
|                               |        | $\overline{OE}=0$ , $f=10MHz$ , $V_{CC}=3.3V$ |     | 44  |     |      |
|                               |        | $\overline{OE}=1$ , $f=10MHz$ , $V_{CC}=1.8V$ |     | 1   |     |      |
|                               |        | $\overline{OE}=1$ , $f=10MHz$ , $V_{CC}=2.5V$ |     | 1   |     |      |
|                               |        | $\overline{OE}=1$ , $f=10MHz$ , $V_{CC}=3.3V$ |     | 2   |     |      |

## ■ TEST CIRCUIT AND WAVEFORMS



| $V_{CC}$         | $V_{IN}$ | $t_R/t_F$           | $V_M$      | $V_{\Delta}$ | $C_L$ | $R_L$        | $V_{EXT}$         |                   |                   |
|------------------|----------|---------------------|------------|--------------|-------|--------------|-------------------|-------------------|-------------------|
|                  |          |                     |            |              |       |              | $t_{PLH}/t_{PHL}$ | $t_{PZH}/t_{PHZ}$ | $t_{PZL}/t_{PLZ}$ |
| 1.5V             | $V_{CC}$ | $\leq 2\text{ns}$   | $V_{CC}/2$ | 0.1V         | 15pF  | 2K $\Omega$  | OPEN              | GND               | $2*V_{CC}$        |
| 1.8V $\pm$ 0.15V | $V_{CC}$ | $\leq 2\text{ns}$   | $V_{CC}/2$ | 0.15V        | 30pF  | 1K $\Omega$  | OPEN              | GND               | $2*V_{CC}$        |
| 2.5V $\pm$ 0.2V  | $V_{CC}$ | $\leq 2\text{ns}$   | $V_{CC}/2$ | 0.15V        | 30pF  | 500 $\Omega$ | OPEN              | GND               | $2*V_{CC}$        |
| 2.7V             | 2.7V     | $\leq 2.5\text{ns}$ | 1.5V       | 0.3V         | 50pF  | 500 $\Omega$ | OPEN              | GND               | 6V                |
| 3.3V $\pm$ 0.3V  | 2.7V     | $\leq 2.5\text{ns}$ | 1.5V       | 0.3V         | 50pF  | 500 $\Omega$ | OPEN              | GND               | 6V                |

Fig-1 Load circuitry

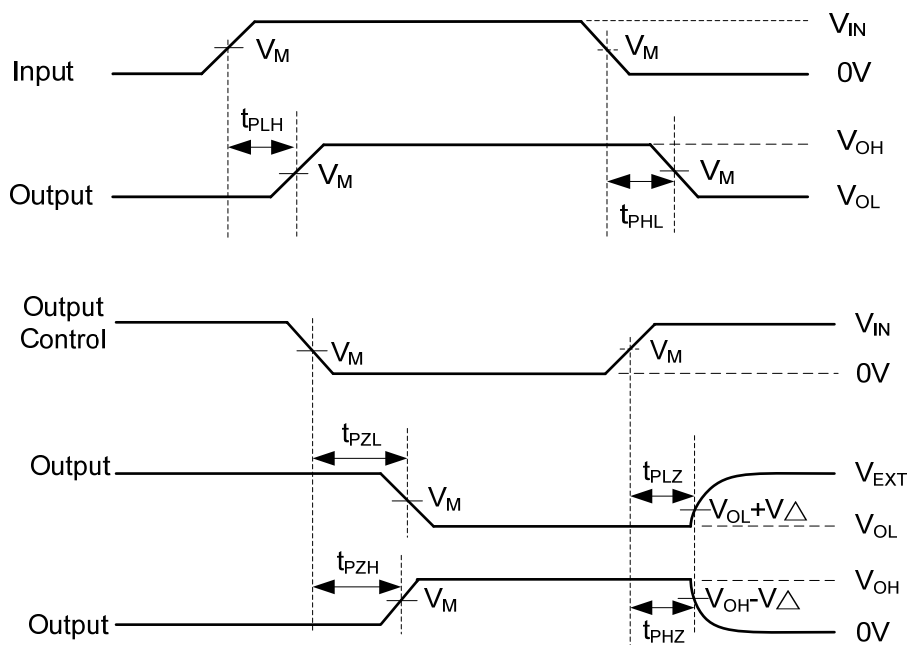


Fig-2 Propagation delay waves

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