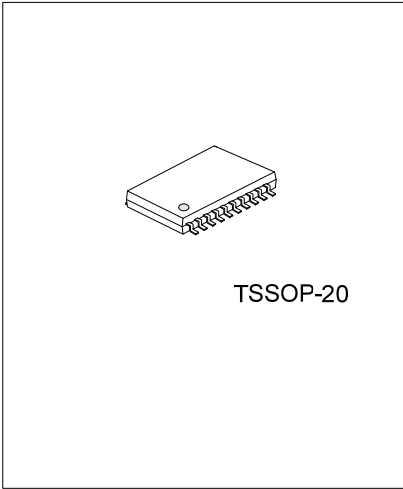




U74LVC563

CMOS IC

OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS



DESCRIPTION

The **U74LVC563** is a octal transparent D-TYPE latches with 3-state outputs. When the latch-enable (LE) is high, the \bar{Q} outputs follow the complements of the D inputs. When LE is low, the \bar{Q} outputs are latched at the inverses of the levels set up at the D inputs.

When the output-enable (\overline{OE}) input is high, the \bar{Q} outputs are in a high-impedance state, and the outputs neither load nor drive the bus lines. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pull-up components. While the outputs are in the high-impedance state, old data can be retained or new data can be entered, i.e. \overline{OE} does not affect the internal operations of the latches. When \overline{OE} is low, the \bar{Q} outputs are in a normal logic state (high or low levels).

The **U74LVC563** is designed for 1.65V to 3.6V operation. Inputs can be driven from either 3.3V or 5V devices, so the U74LVC563 can be used in a mixed 3.3V/5V system environment.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

FEATURES

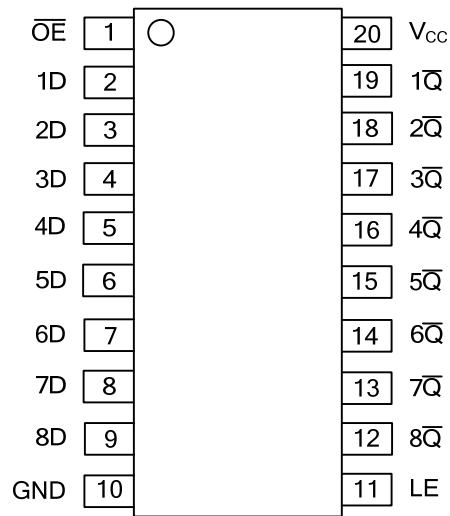
- * Wide supply voltage range from 1.65V to 3.6V
- * Max t_{PD} of 6.8 ns from D to \bar{Q} at 3.3V
- * Max t_{PD} of 7.6 ns from LE to \bar{Q} at 3.3V
- * Up to 5.5V inputs accept voltages
- * Low power consumption, $I_{CC} = 10\mu A$ (Max.) at 3.6V
- * $\pm 24mA$ output driver at 3V
- * I_{OFF} supports partial-power-down mode operation

ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|------------------|------------------|----------|-----------|
| Lead Free | Halogen Free | | |
| U74LVC563L-P20-R | U74LVC563G-P20-R | TSSOP-20 | Tape Reel |
| U74LVC563L-P20-T | U74LVC563G-P20-T | TSSOP-20 | Tube |

| | |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <p>U74LVC563L-P20-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p> | <p>(1) R: Tape Reel, T: Tube (2) P20: TSSOP-20 (3) G: Halogen Free, L: Lead Free</p> |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|

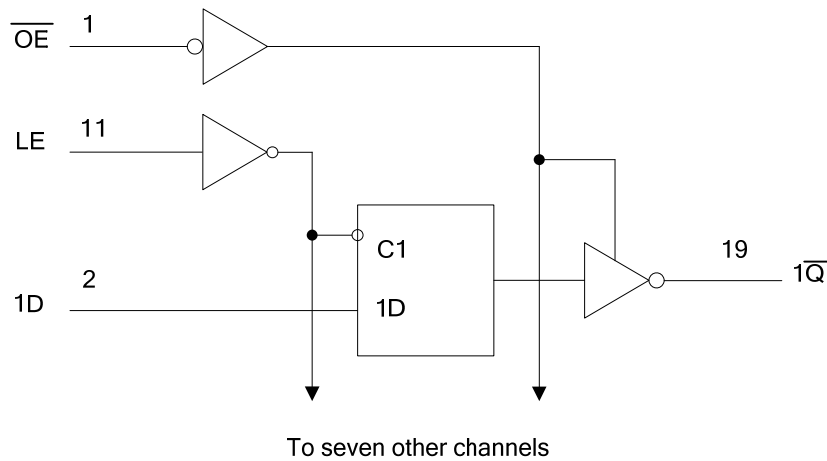
PIN CONFIGURATION



FUNCTION TABLE (each latch)

| INPUTS | | | OUTPUT |
|-----------------|----|---|------------------|
| \overline{OE} | LE | D | \overline{Q} |
| L | H | H | L |
| L | H | L | H |
| L | L | X | $\overline{Q_0}$ |
| H | X | X | Z |

LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-------------------------------------------------------------------------|-----------|--------------------|------|
| Supply Voltage | V_{CC} | -0.5~6.5 | V |
| Input Voltage | V_{IN} | -0.5~6.5 | V |
| Output Voltage (any output in the high-impedance or power-off state) | V_{OUT} | -0.5~6.5 | V |
| Output Voltage (any output in the high or low state) | V_{OUT} | -0.5~ $V_{CC}+0.5$ | V |
| Input Clamp Current | I_{IK} | -50 | mA |
| Output Clamp Current | I_{OK} | -50 | mA |
| Output Current | I_{OUT} | ±50 | mA |
| V_{CC} or GND Current | I_{CC} | ±100 | mA |
| Storage Temperature | T_{STG} | -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 COMDITIONS

| PARAMETER | SYMBOL | CONDITIONS | MIN | MAX | UNIT |
|------------------------------------|---------------------|-----------------------------|-----------------|-----------------|------|
| Supply Voltage | V_{CC} | Operating | 1.65 | 3.6 | V |
| | | Data retention only | 1.5 | | |
| High-Level Input Voltage | V_{IH} | $V_{CC} = 1.65V$ to $1.95V$ | $0.65 * V_{CC}$ | | V |
| | | $V_{CC} = 2.3V$ to $2.7V$ | 1.7 | | |
| | | $V_{CC} = 2.7V$ to $3.6V$ | 2 | | |
| Low-Level Input Voltage | V_{IL} | $V_{CC} = 1.65V$ to $1.95V$ | | $0.35 * V_{CC}$ | V |
| | | $V_{CC} = 2.3V$ to $2.7V$ | | 0.7 | |
| | | $V_{CC} = 2.7V$ to $3.6V$ | | 0.8 | |
| Input Voltage | V_{IN} | | 0 | 5.5 | V |
| Output Voltage | V_{OUT} | High or low state | 0 | V_{CC} | V |
| | | 3 state | 0 | 5.5 | |
| High-Level Output Current | I_{OH} | $V_{CC}=1.65V$ | | -4 | mA |
| | | $V_{CC}=2.3V$ | | -8 | |
| | | $V_{CC}=2.7V$ | | -12 | |
| | | $V_{CC}=3V$ | | -24 | |
| Low-Level Output Current | I_{OL} | $V_{CC}=1.65V$ | | 4 | mA |
| | | $V_{CC}=2.3V$ | | 8 | |
| | | $V_{CC}=2.7V$ | | 12 | |
| | | $V_{CC}=3V$ | | 24 | |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | | 0 | 10 | ns/V |
| Operating Temperature | T_A | | -40 | 85 | °C |

■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------|----------------------|-----|------|------|
| High-Level Output Voltage | V _{OH} | I _{OH} = -100μA, V _{CC} = 1.65V to 3.6V | V _{CC} -0.2 | | | V |
| | | I _{OH} = -4mA, V _{CC} = 1.65V | 1.2 | | | |
| | | I _{OH} = -8mA, V _{CC} = 2.3V | 1.7 | | | |
| | | I _{OH} = -12mA, V _{CC} = 2.7V | 2.2 | | | |
| | | I _{OH} = -12mA, V _{CC} = 3V | 2.4 | | | |
| Low-Level Output Voltage | V _{OL} | I _{OL} = 100μA, V _{CC} = 1.65V to 3.6V | | | 0.2 | V |
| | | I _{OL} = 4mA, V _{CC} = 1.65V | | | 0.45 | |
| | | I _{OL} = 8mA, V _{CC} = 2.3V | | | 0.7 | |
| | | I _{OL} = 12mA, V _{CC} = 2.7V | | | 0.4 | |
| | | I _{OL} = 24mA, V _{CC} = 3V | | | 0.55 | |
| Input Leakage Current (D, LE, or \overline{OE} inputs) | I _{I(LEAK)} | V _{IN} = 0 to 5.5V, V _{CC} = 3.6V | | | ±5 | μA |
| OFF-state Current | I _{OFF} | V _{IN} or V _O = 5.5V, V _{CC} = 0V | | | ±10 | μA |
| High-impedance state Current | I _{OZ} | V _O = 0 to 5.5V, V _{CC} = 3.6V | | | ±10 | μA |
| Quiescent Supply Current | I _{CC} | I _{OUT} = 0, V _{IN} = V _{CC} or GND, V _{CC} =3.6V | | | 10 | μA |
| | | V _{IN} =3.6V to 5.5V, in disabled state | | | 10 | |
| Additional quiescent Supply Current | Δ I _{CC} | One input at V _{CC} -0.6V, V _{CC} =2.7V to 3.6V, other inputs at V _{CC} or GND | | | 500 | μA |
| Input Capacitance | C _{IN} | V _{IN} = V _{CC} or GND, V _{CC} =3.3V (Note 1) | | 4 | | pF |
| Output Capacitance | C _{OUT} | V _{OUT} = V _{CC} or GND, V _{CC} =3.3V (Note 1) | | 5.5 | | pF |

Note: 1. All typical values are at V_{CC} = 3.3 V, T_A = 25 °C.

■ TIMING REQUIREMENTS(T_A =25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | MAX | UNIT |
|-----------------------------|-----------------|-----------------------------|-----|-----|------|
| Pulse duration, LE high | t _w | V _{CC} = 2.7V | 3.3 | | ns |
| | | V _{CC} = 3.3V±0.3V | 3.3 | | |
| Setup time, data before LE↓ | t _{SU} | V _{CC} = 2.7V | 2 | | ns |
| | | V _{CC} = 3.3V±0.3V | 2 | | |
| Hold time, data after LE↓ | t _H | V _{CC} = 2.7V | 1.5 | | ns |
| | | V _{CC} = 3.3V±0.3V | 1.5 | | |

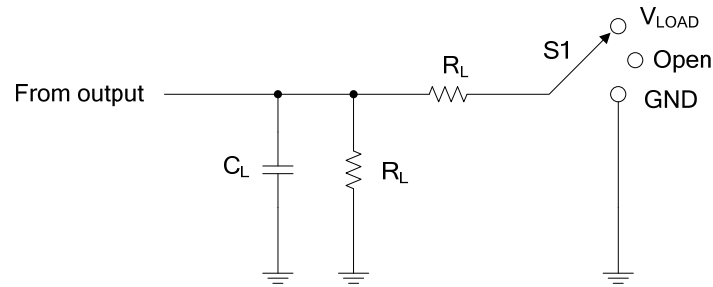
■ SWITCHING CHARACTERISTICS (T_A =25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | MAX | UNIT |
|-----------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------|-----|-----|------|
| Propagation delay from input D to output \overline{Q} | t _{PLH} /t _{PHL} (t _{PD}) | V _{CC} =2.7V, C _L =50pF, R _L =500Ω | | 7.8 | ns |
| | | V _{CC} =3.3±0.3V, C _L =50pF, R _L =500Ω | 1.5 | 6.8 | |
| Propagation delay from input LE to output \overline{Q} | t _{PLH} /t _{PHL} (t _{PD}) | V _{CC} =2.7V, C _L =50pF, R _L =500Ω | | 8.2 | ns |
| | | V _{CC} =3.3±0.3V, C _L =50pF, R _L =500Ω | 2 | 7.6 | |
| Propagation delay from input \overline{OE} to output \overline{Q} | t _{PZL} /t _{PZH} (t _{EN}) | V _{CC} =2.7V, C _L =50pF, R _L =500Ω | | 8.7 | ns |
| | | V _{CC} =3.3±0.3V, C _L =50pF, R _L =500Ω | 1.5 | 7.7 | |
| Propagation delay from input \overline{OE} to output \overline{Q} | t _{PLZ} /t _{PHZ} (t _{DIS}) | V _{CC} =2.7V, C _L =50pF, R _L =500Ω | | 7.6 | ns |
| | | V _{CC} =3.3±0.3V, C _L =50pF, R _L =500Ω | 1.5 | 7 | |

■ OPERATING CHARACTERISTICS (T_A =25°C)

| PARAMETER | SYMBOL | TEST CONDITIONS | TYP | UNIT |
|-------------------------------|-----------------|------------------------------------------------|-----|------|
| Power Dissipation Capacitance | C _{PD} | \overline{OE} = 0, f=10MHz, outputs enabled | 46 | pF |
| | | \overline{OE} = 1, f=10MHz, outputs disabled | 3 | |

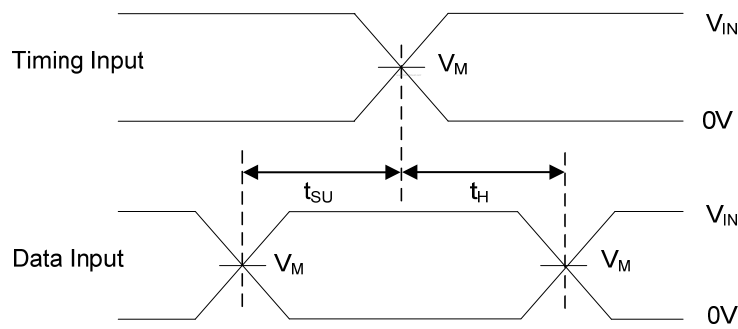
■ TEST CIRCUIT AND WAVEFORMS



Test Circuit

| TEST | S1 |
|-------------------|------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | V_{LOAD} |
| t_{PHZ}/t_{PZH} | GND |

| V_{CC} | Inputs | | V_M | V_{LOAD} | C_L | R_L | V_{Δ} |
|-----------------|----------|--------------|-------|------------|-------|--------------|--------------|
| | V_{IN} | t_R, t_F | | | | | |
| 2.7V | V_{CC} | $\leq 2.5ns$ | 1.5V | 6V | 50pF | 500 Ω | |
| 3.3V \pm 0.3V | V_{CC} | $\leq 2.5ns$ | 1.5V | 6V | 50pF | 500 Ω | 0.3V |

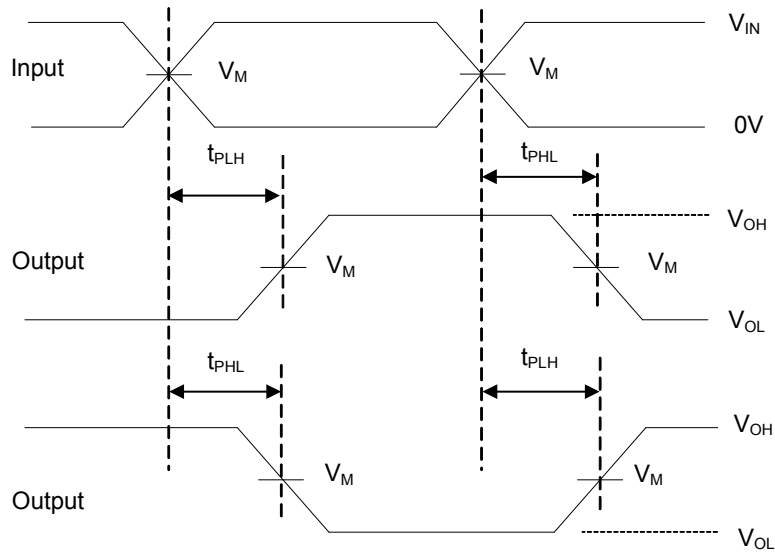


Voltage Waveforms Setup and Hold Times

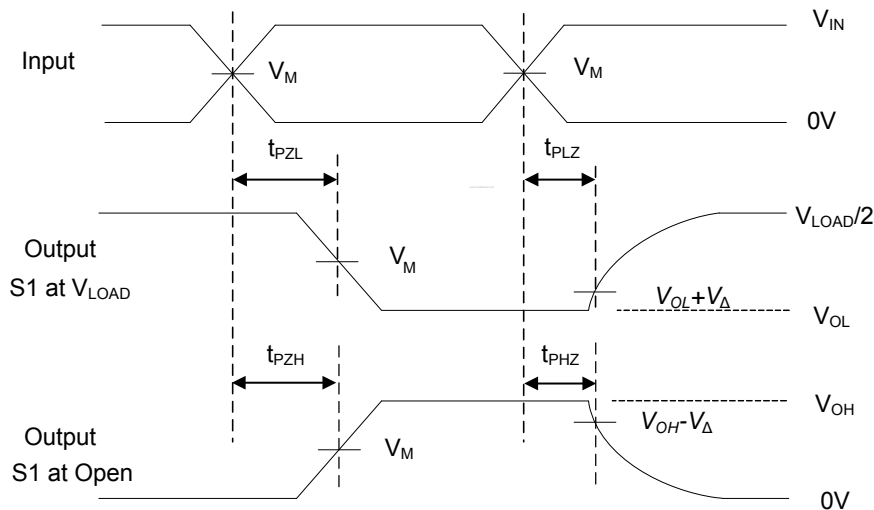


Voltage Waveforms Pulse Duration

■ TEST CIRCUIT AND WAVEFORMS(Cont.)



Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable and Disable Times

- Notes: 1. C_L includes probe and jig capacitance.
 2. All input pulses are supplied by generators having the following characteristics: $P_{RR} \leq 10\text{MHz}$, $Z_O = 50\Omega$.

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.