



U74HC240

CMOS IC

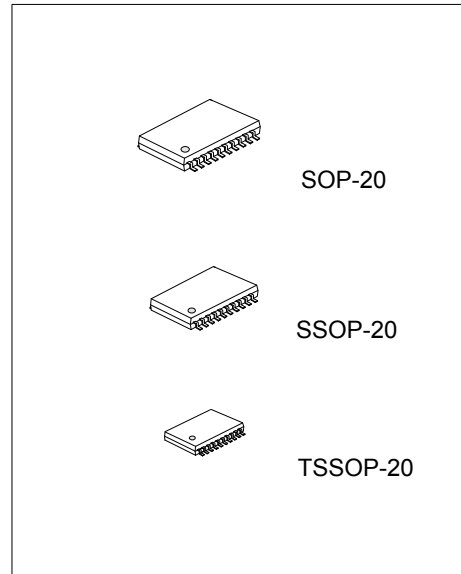
OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

DESCRIPTION

The **U74HC240** is a octal buffer and line driver with 3-state outputs. It is organized as two 4-bit buffers/drivers with separate output-enable (\overline{OE}) inputs. When \overline{OE} is high, the Y outputs are in a high-impedance state and the outputs neither load nor drive the bus lines. When \overline{OE} is low, the device passes inverted data from the A inputs to the Y outputs.

The U74HC240 is designed to improve the performance and density of 3-state memory address drivers, clock drivers and bus-oriented receivers and transmitters.

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; and the minimum value of the resistor is determined by the current-sinking capability of the driver.



FEATURES

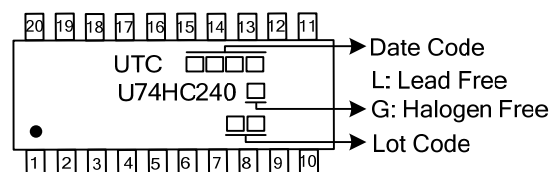
- * Wide supply voltage range from 2V to 6V
- * Max t_{pd} of 9 ns from A to Y at 6V
- * Low power consumption, $I_{CC} = 8 \mu A$ (Max.) at 6V
- * ± 6 mA output driver at 5V
- * Low Input Current of 1 μA Max

ORDERING INFORMATION

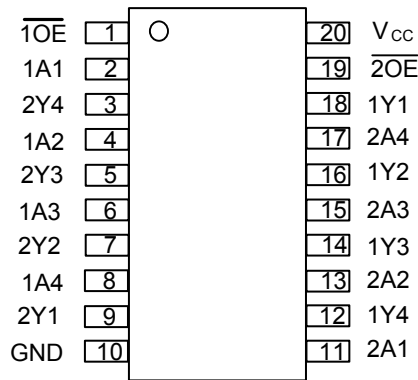
| Ordering Number | | Package | Packing |
|-----------------|-----------------|----------|-----------|
| Lead Free | Halogen Free | | |
| U74HC240L-S20-R | U74HC240G-S20-R | SOP-20 | Tape Reel |
| U74HC240L-R20-R | U74HC240G-R20-R | SSOP-20 | Tape Reel |
| U74HC240L-P20-R | U74HC240G-P20-R | TSSOP-20 | Tape Reel |

| | |
|------------------------|--|
| <p>U74HC240G-S20-R</p> | <p>(1) R: Tape Reel</p> <p>(2) S20: SOP-20, R20: SSOP-20, P20: TSSOP-20</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|------------------------|--|

MARKING



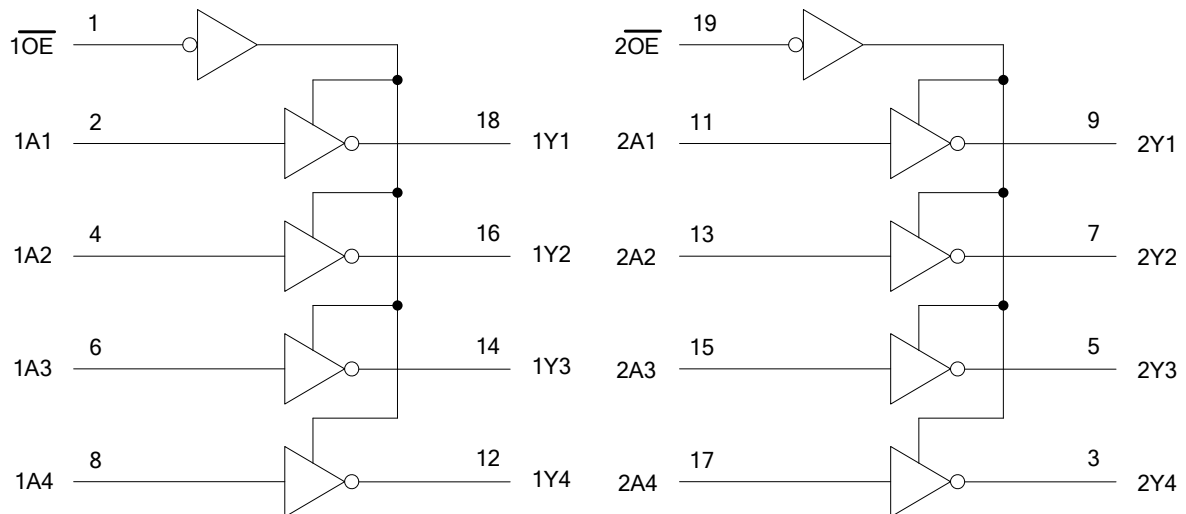
■ PIN CONFIGURATION



■ FUNCTION TABLE (each buffer)

| INPUTS | | OUTPUT |
|-----------------|---|--------|
| \overline{OE} | A | Y |
| L | H | L |
| L | L | H |
| H | X | Z |

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--|-----------|------------|------|
| Supply Voltage | V_{CC} | -0.5 ~ 7 | V |
| Input Clamp Current ($V_{IN} < 0$, or $V_{IN} > V_{CC}$) | I_{IK} | ± 20 | mA |
| Output Clamp Current ($V_{OUT} < 0$, or $V_{OUT} > V_{CC}$) | I_{OK} | ± 20 | mA |
| Output Current | I_{OUT} | ± 35 | mA |
| V_{CC} or GND Current | I_{CC} | ± 70 | mA |
| Storage Temperature | T_{STG} | -65 ~ +150 | °C |

Notes: 1. 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.
 2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------------------------|---------------------|-----------------|------|-----|----------|------|
| Supply Voltage | V_{CC} | | 2 | 5 | 6 | V |
| High-Level Input Voltage | V_{IH} | $V_{CC} = 2V$ | 1.5 | | | V |
| | | $V_{CC} = 4.5V$ | 3.15 | | | |
| | | $V_{CC} = 6V$ | 4.2 | | | |
| Low-Level Input Voltage | V_{IL} | $V_{CC} = 2V$ | | | 0.5 | V |
| | | $V_{CC} = 4.5V$ | | | 1.35 | |
| | | $V_{CC} = 6V$ | | | 1.8 | |
| Input Voltage | V_{IN} | | 0 | | V_{CC} | V |
| Output Voltage | V_{OUT} | | 0 | | V_{CC} | V |
| Input Transition Rise or Fall Rate | $\Delta t/\Delta v$ | $V_{CC} = 2V$ | | | 1000 | ns/V |
| | | $V_{CC} = 4.5V$ | | | 500 | |
| | | $V_{CC} = 6V$ | | | 400 | |
| Operating Temperature | T_A | | -40 | | +125 | °C |

■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | $T_A = 25^\circ C$ | | | $T_A = -40 \sim +125^\circ C$ | | | UNIT |
|---|---------------|--|--------------------|--------------------|-----------|-------------------------------|--------------------|-----------|---------|
| | | | MIN | TYP ⁽¹⁾ | MAX | MIN | TYP ⁽¹⁾ | MAX | |
| High-Level Output Voltage | V_{OH} | $V_{CC} = 2V, I_{OH} = -20 \mu A$ | 1.9 | 1.998 | | 1.9 | | | V |
| | | $V_{CC} = 4.5V, I_{OH} = -20 \mu A$ | 4.4 | 4.499 | | 4.4 | | | |
| | | $V_{CC} = 6V, I_{OH} = -20 \mu A$ | 5.9 | 5.999 | | 5.9 | | | |
| | | $V_{CC} = 4.5V, I_{OH} = -6 \text{ mA}$ | 3.98 | 4.3 | | 3.7 | | | |
| | | $V_{CC} = 6V, I_{OH} = -7.8 \text{ mA}$ | 5.48 | 5.8 | | 5.2 | | | |
| Low-Level Output Voltage | V_{OL} | $V_{CC} = 2V, I_{OL} = 20 \mu A$ | | 0.002 | 0.1 | | | 0.1 | V |
| | | $V_{CC} = 4.5V, I_{OL} = 20 \mu A$ | | 0.001 | 0.1 | | | 0.1 | |
| | | $V_{CC} = 6V, I_{OL} = 20 \mu A$ | | 0.001 | 0.1 | | | 0.1 | |
| | | $V_{CC} = 4.5V, I_{OL} = 6 \text{ mA}$ | | 0.17 | 0.26 | | | 0.4 | |
| | | $V_{CC} = 6V, I_{OL} = 7.8 \text{ mA}$ | | 0.15 | 0.26 | | | 0.4 | |
| Input Leakage Current (A or \overline{OE} inputs) | $I_{I(LEAK)}$ | $V_{CC} = 6V, V_{IN} = V_{CC}$ or GND | | ± 0.1 | ± 100 | | | ± 100 | μA |
| High-impedance state Current | I_{OZ} | $V_{CC} = 6V, V_O = V_{CC}$ or GND $V_{I(OE)} = V_{IL}$ or V_{IH} | | ± 0.01 | ± 0.5 | | | ± 10 | μA |
| Quiescent Supply Current | I_{CC} | $V_{CC} = 6V, V_{IN} = V_{CC}$ or GND $I_{OUT} = 0$ | | | 8 | | | 160 | μA |

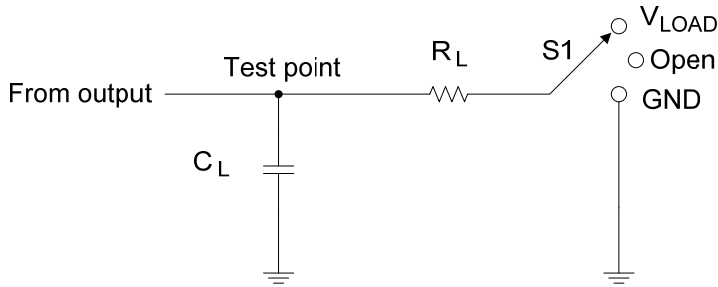
■ SWITCHING CHARACTERISTICS (Unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | T _A =25°C | | | T _A =-40~+125°C | | | UNIT | |
|--|-------------------------------------|---|-----------------------|-----|-----|----------------------------|-----|-----|------|----|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | | |
| Propagation delay from input A to output Y, t _{pd} | t _{PLH} / t _{PHL} | C _L =50pF, R _L =1kΩ | V _{CC} =2V | | 50 | 100 | | | 150 | ns |
| | | | V _{CC} =4.5V | | 10 | 20 | | | 30 | ns |
| | | | V _{CC} =6V | | 9 | 17 | | | 26 | ns |
| | | C _L =150pF, R _L =1kΩ | V _{CC} =2V | | 75 | 150 | | | 190 | ns |
| | | | V _{CC} =4.5V | | 15 | 30 | | | 38 | ns |
| | | | V _{CC} =6V | | 13 | 26 | | | 32 | ns |
| Output enable time from input \overline{OE} to output Y, t _{en} | t _{PZH} / t _{PZL} | C _L =50pF, R _L =1kΩ | V _{CC} =2V | | 75 | 150 | | | 225 | ns |
| | | | V _{CC} =4.5V | | 15 | 30 | | | 45 | ns |
| | | | V _{CC} =6V | | 13 | 26 | | | 38 | ns |
| | | C _L =150pF, R _L =1kΩ | V _{CC} =2V | | 100 | 200 | | | 250 | ns |
| | | | V _{CC} =4.5V | | 20 | 40 | | | 50 | ns |
| | | | V _{CC} =6V | | 17 | 34 | | | 43 | ns |
| Output disable time from input \overline{OE} to output Y, t _{dis} | t _{PHZ} / t _{PLZ} | C _L =50pF, R _L =1kΩ | V _{CC} =2V | | 44 | 150 | | | 225 | ns |
| | | | V _{CC} =4.5V | | 22 | 30 | | | 45 | ns |
| | | | V _{CC} =6V | | 21 | 26 | | | 38 | ns |
| Propagation of rise or fall, t _t | t _r / t _f | C _L =50pF, R _L =1kΩ | V _{CC} =2V | | 28 | 60 | | | 90 | ns |
| | | | V _{CC} =4.5V | | 8 | 12 | | | 18 | ns |
| | | | V _{CC} =6V | | 6 | 10 | | | 15 | ns |
| | | C _L =150pF, R _L =1kΩ | V _{CC} =2V | | 45 | 210 | | | 265 | ns |
| | | | V _{CC} =4.5V | | 17 | 42 | | | 53 | ns |
| | | | V _{CC} =6V | | 13 | 36 | | | 45 | ns |

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

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|-----------------|--|-----|-----|-----|------|
| Input Capacitance | C _{IN} | V _{CC} = 2V to 6V, V _{IN} = V _{CC} or GND | | 3 | 10 | pF |
| Power dissipation capacitance per buffer/driver | C _{PD} | No load | | 35 | | pF |

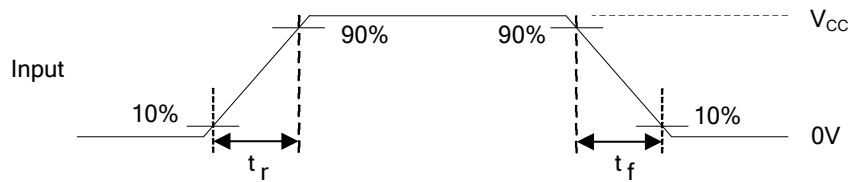
TEST CIRCUIT AND WAVEFORMS



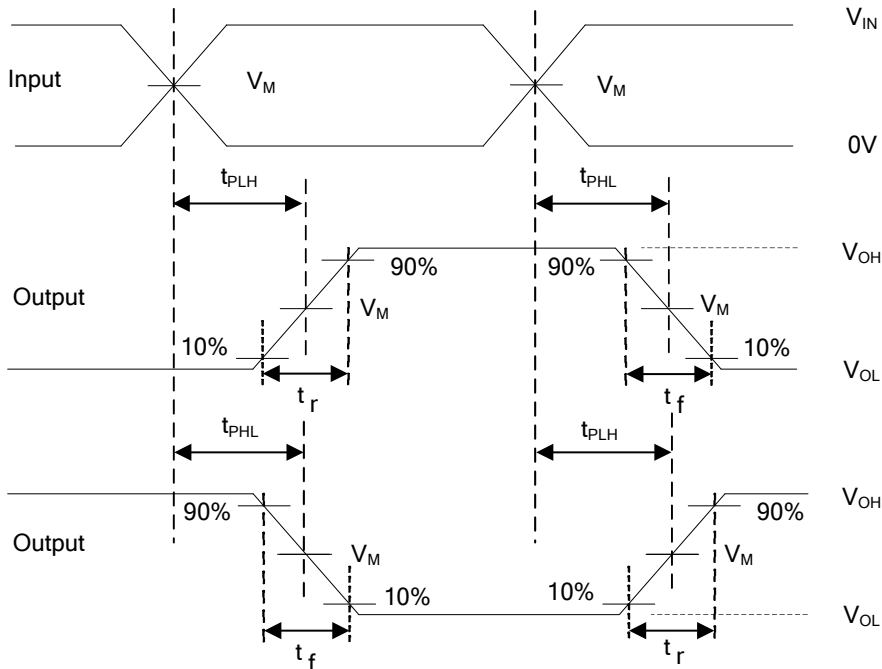
| TEST | S1 |
|-------------------|------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | V_{LOAD} |
| t_{PHZ}/t_{PZH} | GND |

TEST CIRCUIT

| Inputs | | V_M | V_{LOAD} | C_L | R_L |
|----------|-------------------|------------|------------|-------------|-------|
| V_{IN} | t_r, t_f | | | | |
| V_{CC} | $\leq 6\text{ns}$ | $V_{CC}/2$ | V_{CC} | 50 or 150pF | 500Ω |

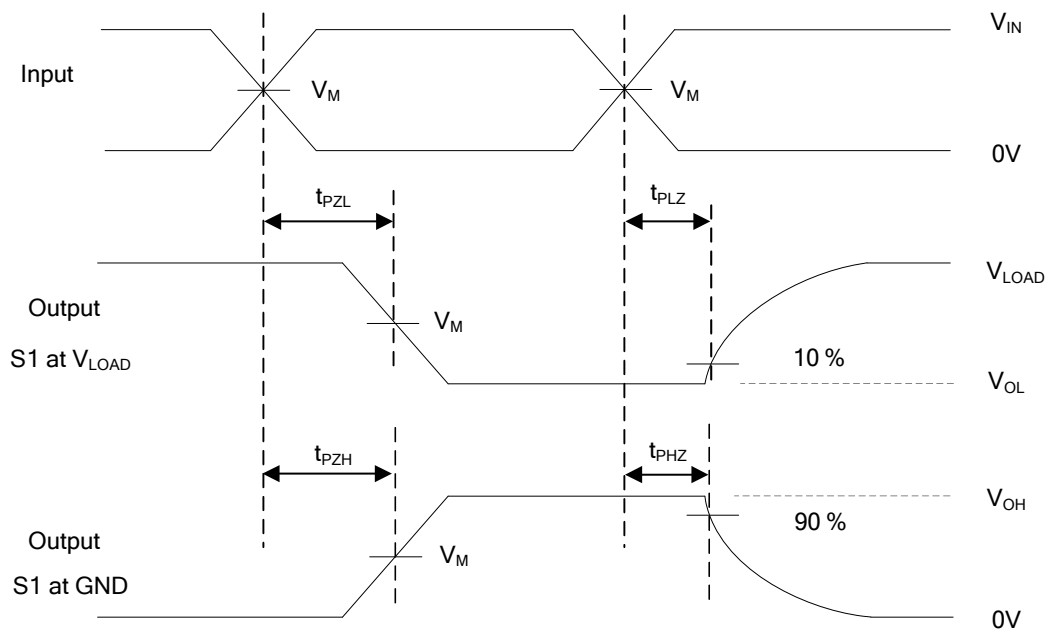


VOLTAGE WAVEFORMS INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

■ TEST CIRCUIT AND WAVEFORMS (Cont.)



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: PRR ≤ 1 MHz, $Z_O = 50\Omega$.

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