



U74LVC245

CMOS IC

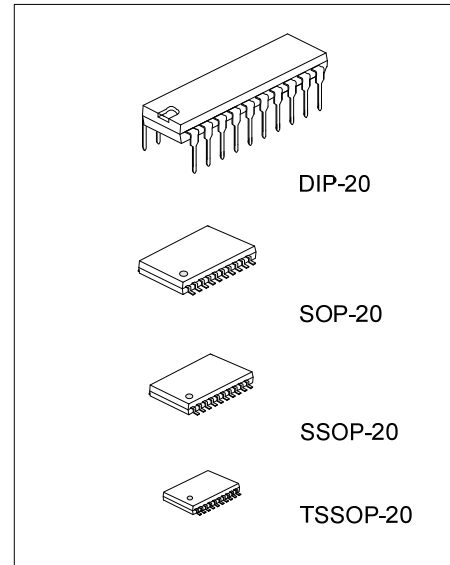
OCTAL BUS TRANSCEIVER WITH 3-STATE OUTPUTS

DESCRIPTION

The **U74LVC245** is designed for the communication between data buses asynchronously. While the direction-control(DIR) is high, data transmits from the A bus to the B bus. Data transmits from the B bus to the A bus if DIR is low. The output-enable(\overline{OE}) will isolate the device from the buses when high voltage is applied on it.

FEATURES

- * Operate From 1.65V to 3.6V
- * Input Accept Voltages to 5.5V
- * Partial-Power-Down Mode Operation



ORDERING INFORMATION

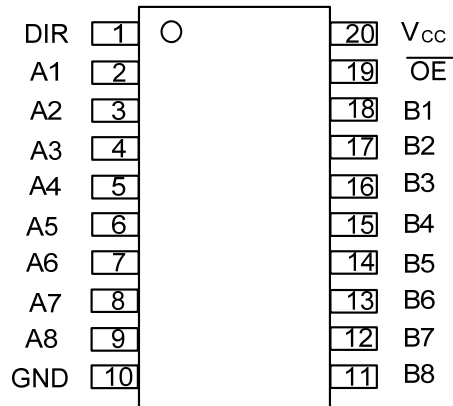
| Ordering Number | | Package | Packing |
|------------------|------------------|----------|-----------|
| Lead Free | Halogen Free | | |
| U74LVC245L-D20-T | U74LVC245G-D20-T | DIP-20 | Tube |
| U74LVC245L-S20-R | U74LVC245G-S20-R | SOP-20 | Tape Reel |
| U74LVC245L-R20-R | U74LVC245G-R20-R | SSOP-20 | Tape Reel |
| U74LVC245L-P20-R | U74LVC245G-P20-R | TSSOP-20 | Tape Reel |

| | |
|--|---|
| <p>U74LVC245G-D20-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p> | <p>(1) T: Tube, R: Tape Reel (2) D20: DIP-20, S20: SOP-20, R20: SSOP-20 P20: TSSOP-20 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

MARKING

| DIP-20 | SOP-20 / SSOP-20 / TSSOP-20 |
|---|---|
| <p>20 19 18 17 16 15 14 13 12 11 → Date Code UTC □□□□ L: Lead Free U74LVC245 □ → G: Halogen Free □□ → Lot Code 1 2 3 4 5 6 7 8 9 10</p> | <p>20 19 18 17 16 15 14 13 12 11 → Date Code UTC □□□□ L: Lead Free U74LVC245 □ → G: Halogen Free □□ → Lot Code 1 2 3 4 5 6 7 8 9 10</p> |

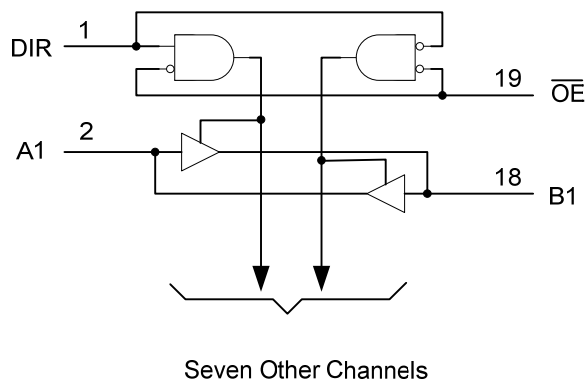
■ PIN CONFIGURATION



■ FUNCTION TABLE (each gate)

| INPUT | | FUNCTION |
|-----------------|-----|-----------------------------------|
| \overline{OE} | DIR | |
| H | x | Isolation |
| L | H | Transmit data from A bus to B bus |
| L | L | Transmit data from B bus to A bus |

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--|-----------|---------------------|------|
| Supply Voltage | V_{CC} | -0.5 ~ 6.5 | V |
| Input Voltage | V_{IN} | -0.5 ~ 6.5 | V |
| Voltage Applied To Output In High-Impedance or Power-off State | V_{OUT} | -0.5 ~ 6.5 | V |
| Voltage Applied to Output In High or Low State | | -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 |
| Operating Temperature | T_{OPR} | -40 ~ +125 | °C |
| 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.

■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---------------------|---------------|---------|------|
| Junction to Ambient | θ_{JA} | 60 | °C/W |
| | | 85 | °C/W |
| | | 106 | °C/W |
| | | 110 | °C/W |

■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------|-----------|--|------|-----|----------|------|
| Supply Voltage | V_{CC} | Operating | 1.65 | | 3.6 | V |
| | | Data retention only | 1.5 | | | V |
| Input Voltage High-Level | V_{IH} | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 0.65 | | | 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 |
| Input Voltage Low-Level | V_{IL} | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | | | 0.35 | 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 |
| Input Voltage | V_{IN} | | 0 | | 5.5 | V |
| Output Voltage | V_{OUT} | | 0 | | V_{CC} | V |

■ ELECTRICAL CHARACTERISTICS

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

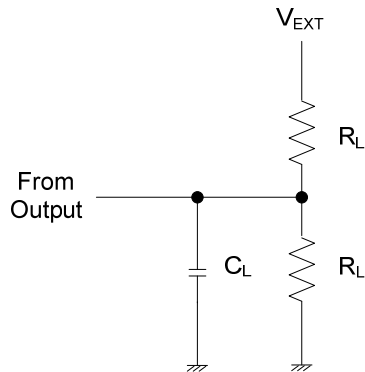
■ SWITCHING CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|-------------------|-------------------------|-----|-----|------|------|
| Propagation Delay From A to B or B to A | t_{PLH}/t_{PHL} | $V_{CC}=1.8V \pm 0.15V$ | 1 | 6 | 12.2 | ns |
| | | $V_{CC}=2.5V \pm 0.2V$ | 1 | 3.9 | 7.8 | ns |
| | | $V_{CC}=2.7V$ | 1 | 4.2 | 7.1 | ns |
| | | $V_{CC}=3.3V \pm 0.3V$ | 1.5 | 3.8 | 6.1 | ns |
| Propagation Delay From \overline{OE} to A or B | t_{PZL}/t_{PZH} | $V_{CC}=1.8V \pm 0.15V$ | 1 | 7 | 14.8 | ns |
| | | $V_{CC}=2.5V \pm 0.2V$ | 1 | 4.5 | 10 | ns |
| | | $V_{CC}=2.7V$ | 1 | 5.4 | 9.3 | ns |
| | | $V_{CC}=3.3V \pm 0.3V$ | 1.5 | 4.4 | 8.3 | ns |
| Propagation Delay From \overline{OE} A to A or B | t_{PLZ}/t_{PHZ} | $V_{CC}=1.8V \pm 0.15V$ | 1 | 7.8 | 16.5 | ns |
| | | $V_{CC}=2.5V \pm 0.2V$ | 1 | 4 | 9 | ns |
| | | $V_{CC}=2.7V$ | 1 | 4.4 | 8.3 | ns |
| | | $V_{CC}=3.3V \pm 0.3V$ | 1.7 | 4.1 | 7.3 | ns |

■ OPERATING CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|----------|---|-----|-----|-----|------|
| Power Dissipation Capacitance | C_{PD} | $\overline{OE} = 0$, $f=10MHz$, $V_{CC}=1.8V$ | | 42 | | pF |
| | | $\overline{OE} = 0$, $f=10MHz$, $V_{CC}=2.5V$ | | 43 | | pF |
| | | $\overline{OE} = 0$, $f=10MHz$, $V_{CC}=3.3V$ | | 45 | | pF |
| | | $\overline{OE} = 1$, $f=10MHz$, $V_{CC}=1.8V$ | | 1 | | pF |
| | | $\overline{OE} = 1$, $f=10MHz$, $V_{CC}=2.5V$ | | 1 | | pF |
| | | $\overline{OE} = 1$, $f=10MHz$, $V_{CC}=3.3V$ | | 2 | | pF |

TEST CIRCUIT AND WAVEFORMS



| V _{CC} | V _{IN} | t _R /t _F | V _M | V Δ | C _L | R _L | V _{EXT} | | |
|------------------|-----------------|--------------------------------|--------------------|------------|----------------|----------------|------------------------------------|------------------------------------|------------------------------------|
| | | | | | | | t _{PLH} /t _{PHL} | t _{PZH} /t _{PHZ} | t _{PZL} /t _{PLZ} |
| 1.8V \pm 0.15V | V _{CC} | \leq 2ns | V _{CC} /2 | 0.15V | 30 pF | 1 k Ω | OPEN | GND | 2*V _{CC} |
| 2.5V \pm 0.2V | V _{CC} | \leq 2ns | V _{CC} /2 | 0.15V | 30 pF | 500 Ω | OPEN | GND | 2*V _{CC} |
| 2.7 V | 2.7 V | \leq 2.5ns | 1.5V | 0.3V | 50 pF | 500 Ω | OPEN | GND | 6 V |
| 3.3V \pm 0.3V | 2.7 V | \leq 2.5ns | 1.5V | 0.3V | 50 pF | 500 Ω | OPEN | GND | 6 V |

Fig. 1 Load circuitry

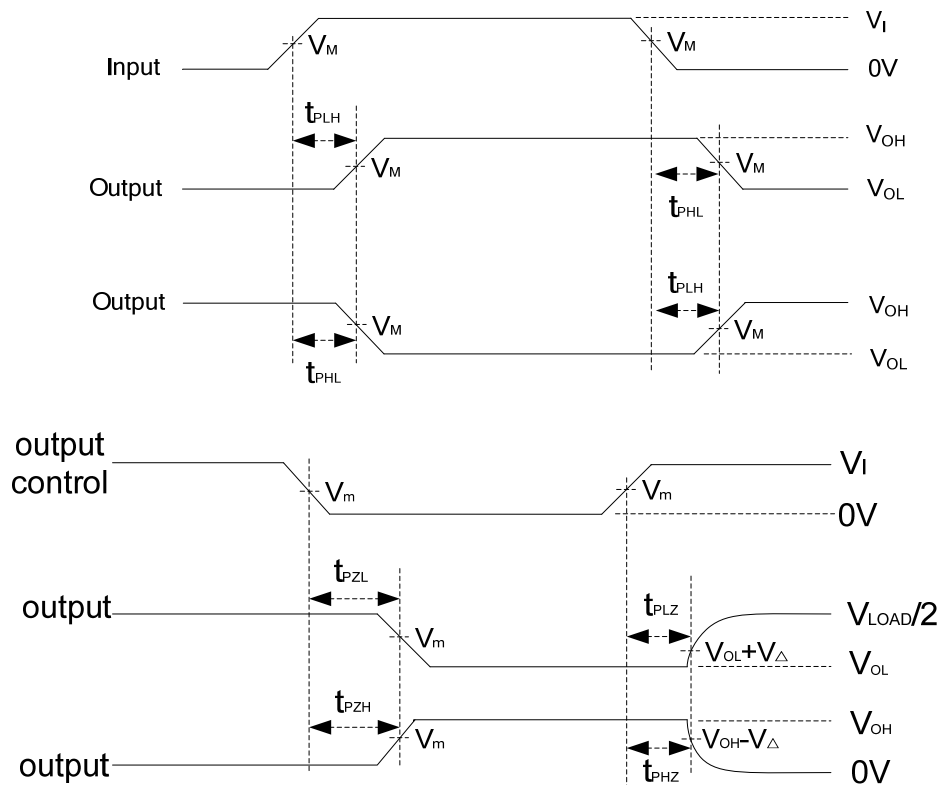


Fig. 2 Propagation delay waves

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