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## 74LVX245

### Low Voltage Octal Bidirectional Transceiver

#### General Description

The LVX245 contains eight non-inverting bidirectional buffers and is intended for bus-oriented applications. The Transmit/Receive (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a high impedance condition.

#### Features

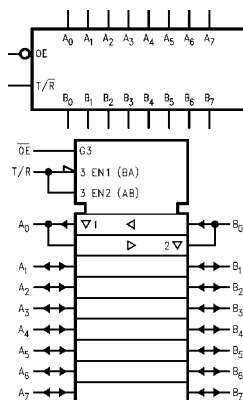
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

#### Ordering Code

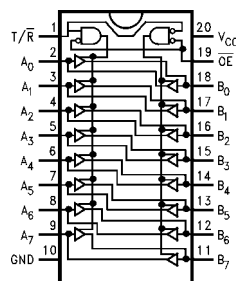
| Order Number | Package Number | Package Description                                                         |
|--------------|----------------|-----------------------------------------------------------------------------|
| 74LVX245M    | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  |
| 74LVX245SJ   | M20D           | Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide       |
| 74LVX245MTC  | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.  
Pb-Free package per JEDEC J-STD-020B.

#### Logic Symbols



#### Connection Diagram



#### Pin Descriptions

| Pin Names                      | Description                      |
|--------------------------------|----------------------------------|
| OE                             | Output Enable Input              |
| T/R                            | Transmit/Receive Input           |
| A <sub>0</sub> –A <sub>7</sub> | Side A Inputs or 3-STATE Outputs |
| B <sub>0</sub> –B <sub>7</sub> | Side B Inputs or 3-STATE Outputs |

#### Truth Table

| Inputs |     | Outputs             |
|--------|-----|---------------------|
| OE     | T/R |                     |
| L      | L   | Bus B Data to Bus A |
| L      | H   | Bus A Data to Bus B |
| H      | X   | HIGH-Z State        |

H = HIGH Voltage Level  
L = LOW Voltage Level

X = Immaterial

**Absolute Maximum Ratings** (Note 1)

|                                                            |                          |
|------------------------------------------------------------|--------------------------|
| Supply Voltage ( $V_{CC}$ )                                | -0.5V to +7.0V           |
| DC Input Diode Current ( $I_{IK}$ )                        |                          |
| $V_I = -0.5V$                                              | -20 mA                   |
| DC Input Voltage $\overline{T/R}, \overline{OE}$ ( $V_I$ ) | -0.5V to 7V              |
| DC Diode Current ( $I_{OK}$ )                              |                          |
| $V_O = -0.5V$                                              | -20 mA                   |
| $V_O = V_{CC} + 0.5V$                                      | +20 mA                   |
| DC Bus I/O Voltage ( $V_{I/O}$ )                           | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source<br>or Sink Current ( $I_O$ )              | $\pm 25$ mA              |
| DC $V_{CC}$ or Ground Current<br>( $I_{CC}$ or $I_{GND}$ ) | $\pm 75$ mA              |
| Storage Temperature ( $T_{STG}$ )                          | -65°C to +150°C          |
| Power Dissipation                                          | 180 mW                   |

**Recommended Operating Conditions** (Note 2)

|                                                         |                    |
|---------------------------------------------------------|--------------------|
| Supply Voltage ( $V_{CC}$ )                             | 2.0V to 3.6V       |
| Input Voltage $\overline{T/R}, \overline{OE}$ ( $V_I$ ) | 0V to 5.5V         |
| Bus I/O Voltage ( $V_{I/O}$ )                           | 0V to $V_{CC}$     |
| Operating Temperature ( $T_A$ )                         | -40°C to +85°C     |
| Input Rise and Fall Time ( $\Delta t/\Delta V$ )        | 0 ns/V to 100 ns/V |

**Note 1:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Note 2:** Unused inputs must be held HIGH or LOW. They may not float.

**DC Electrical Characteristics**

| Symbol   | Parameter                              | $V_{CC}$ | $T_A = +25^\circ C$ |     |            | $T_A = -40^\circ C$ to $+85^\circ C$ |           | Units   | Conditions                                                                                        |
|----------|----------------------------------------|----------|---------------------|-----|------------|--------------------------------------|-----------|---------|---------------------------------------------------------------------------------------------------|
|          |                                        |          | Min                 | Typ | Max        | Min                                  | Max       |         |                                                                                                   |
| $V_{IH}$ | HIGH Level                             | 2.0      | 1.5                 |     |            | 1.5                                  |           | V       |                                                                                                   |
|          | Input                                  | 3.0      | 2.0                 |     |            | 2.0                                  |           |         |                                                                                                   |
|          | Voltage                                | 3.6      | 2.4                 |     |            | 2.4                                  |           |         |                                                                                                   |
| $V_{IL}$ | LOW Level                              | 2.0      |                     |     | 0.5        |                                      | 0.5       | V       |                                                                                                   |
|          | Input                                  | 3.0      |                     |     | 0.8        |                                      | 0.8       |         |                                                                                                   |
|          | Voltage                                | 3.6      |                     |     | 0.8        |                                      | 0.8       |         |                                                                                                   |
| $V_{OH}$ | HIGH Level                             | 2.0      | 1.9                 | 2.0 |            | 1.9                                  |           | V       | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OH} = -50 \mu A$<br>$I_{OH} = -50 \mu A$<br>$I_{OH} = -4$ mA |
|          | Output                                 | 3.0      | 2.9                 | 3.0 |            | 2.9                                  |           |         |                                                                                                   |
|          | Voltage                                | 3.0      | 2.58                |     |            | 2.48                                 |           |         |                                                                                                   |
| $V_{OL}$ | LOW Level                              | 2.0      |                     | 0.0 | 0.1        |                                      | 0.1       | V       | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OL} = 50 \mu A$<br>$I_{OL} = 50 \mu A$<br>$I_{OL} = 4$ mA    |
|          | Output                                 | 3.0      |                     | 0.0 | 0.1        |                                      | 0.1       |         |                                                                                                   |
|          | Voltage                                | 3.0      |                     |     | 0.36       |                                      | 0.44      |         |                                                                                                   |
| $I_{OZ}$ | 3-STATE<br>Output<br>Off-State Current | 3.6      |                     |     | $\pm 0.25$ |                                      | $\pm 2.5$ | $\mu A$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$V_{OUT} = V_{CC}$ or GND                                        |
| $I_{IN}$ | Input Leakage Current                  | 3.6      |                     |     | $\pm 0.1$  |                                      | $\pm 1.0$ | $\mu A$ | $V_{IN} = 5.5V$ or GND                                                                            |
| $I_{CC}$ | Quiescent Supply Current               | 3.6      |                     |     | 4.0        |                                      | 40.0      | $\mu A$ | $V_{IN} = V_{CC}$ or GND                                                                          |

**Noise Characteristics** (Note 3)

| Symbol    | Parameter                                | $V_{CC}$<br>(V) | $T_A = 25^\circ C$ |       | Units | Conditions<br>$C_L$ (pF) |
|-----------|------------------------------------------|-----------------|--------------------|-------|-------|--------------------------|
|           |                                          |                 | Typ                | Limit |       |                          |
| $V_{OLP}$ | Quiet Output Maximum Dynamic $V_{OL}$    | 3.3             | 0.5                | 0.8   | V     | 50                       |
| $V_{OLV}$ | Quiet Output Minimum Dynamic $V_{OL}$    | 3.3             | -0.5               | -0.8  | V     | 50                       |
| $V_{IHD}$ | Minimum HIGH Level Dynamic Input Voltage | 3.3             |                    | 2.0   | V     | 50                       |
| $V_{ILD}$ | Maximum LOW Level Dynamic Input Voltage  | 3.3             |                    | 0.8   | V     | 50                       |

**Note 3:** Input  $t_r = t_f = 3$  ns

## AC Electrical Characteristics

| Symbol            | Parameter                         | V <sub>CC</sub><br>(V) | T <sub>A</sub> = +25°C |      |      | T <sub>A</sub> = -40°C to +85°C |      | Units | Conditions                                    |
|-------------------|-----------------------------------|------------------------|------------------------|------|------|---------------------------------|------|-------|-----------------------------------------------|
|                   |                                   |                        | Min                    | Typ  | Max  | Min                             | Max  |       |                                               |
| t <sub>PLH</sub>  | Propagation Delay Time            | 2.7                    |                        | 6.1  | 10.7 | 1.0                             | 13.5 | ns    | C <sub>L</sub> = 15 pF                        |
| t <sub>PHL</sub>  |                                   |                        |                        | 8.6  | 14.2 | 1.0                             | 17.0 |       | C <sub>L</sub> = 50 pF                        |
|                   |                                   | 3.3 ± 0.3              |                        | 4.7  | 6.8  | 1.0                             | 8.0  |       | C <sub>L</sub> = 15 pF                        |
|                   |                                   |                        |                        | 7.2  | 10.1 | 1.0                             | 11.5 |       | C <sub>L</sub> = 50 pF                        |
| t <sub>PZL</sub>  | 3-STATE Output Enable Time        | 2.7                    |                        | 9.0  | 16.9 | 1.0                             | 20.5 | ns    | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ |
| t <sub>PZH</sub>  |                                   |                        |                        | 11.5 | 20.4 | 1.0                             | 24.0 |       | C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ |
|                   |                                   | 3.3 ± 0.3              |                        | 7.1  | 11.0 | 1.0                             | 13.0 |       | C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 kΩ |
|                   |                                   |                        |                        | 9.6  | 14.5 | 1.0                             | 16.5 |       | C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ |
| t <sub>PLZ</sub>  | 3-STATE Output                    | 2.7                    |                        | 11.5 | 18.0 | 1.0                             | 21.0 | ns    | C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ |
| t <sub>PHZ</sub>  | Disable Time                      | 3.3 ± 0.3              |                        | 9.6  | 12.8 | 1.0                             | 14.5 |       | C <sub>L</sub> = 50 pF, R <sub>L</sub> = 1 kΩ |
| t <sub>OSLH</sub> | Output to Output Skew<br>(Note 4) | 2.7                    |                        |      | 1.5  |                                 | 1.5  | ns    | C <sub>L</sub> = 50 pF (Note 4)               |
| t <sub>OSHL</sub> |                                   | 3.3                    |                        |      | 1.5  |                                 | 1.5  |       |                                               |

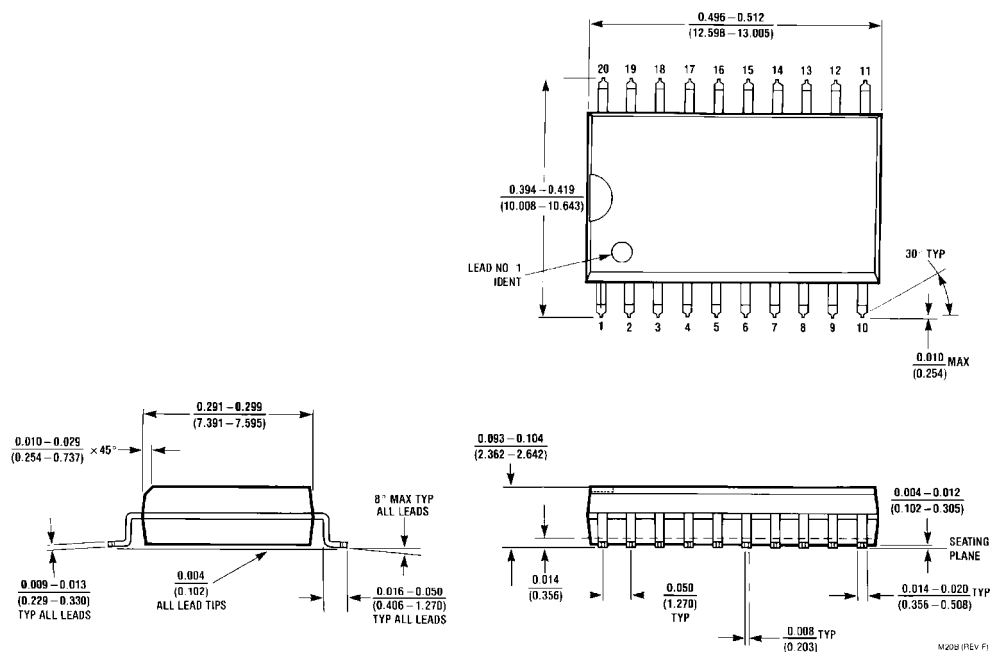
**Note 4:** Parameter guaranteed by design.  $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$ ,  $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$

## Capacitance

| Symbol          | Parameter                                          | T <sub>A</sub> = +25°C |     |     | T <sub>A</sub> = -40°C to +85°C |     | Units |
|-----------------|----------------------------------------------------|------------------------|-----|-----|---------------------------------|-----|-------|
|                 |                                                    | Min                    | Typ | Max | Min                             | Max |       |
| C <sub>IN</sub> | Input Capacitance T/R, OE                          |                        | 4   | 10  |                                 | 10  | pF    |
| C <sub>IO</sub> | Output Capacitance A <sub>n</sub> , B <sub>n</sub> |                        | 8   |     |                                 |     | pF    |
| C <sub>PD</sub> | Power Dissipation Capacitance (Note 5)             |                        | 21  |     |                                 |     | pF    |

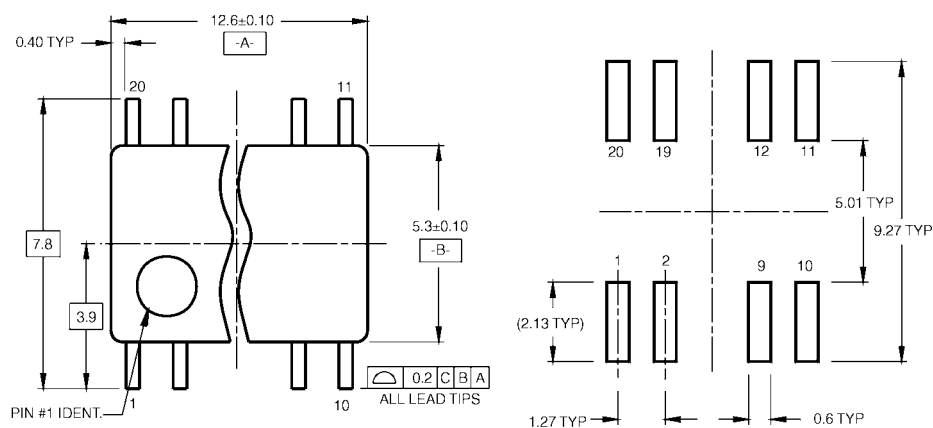
**Note 5:** C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

$$\text{Average operating current can be obtained by the equation: } I_{CC(opr.)} = \frac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{8 \text{ (per bit)}}$$



**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B**

# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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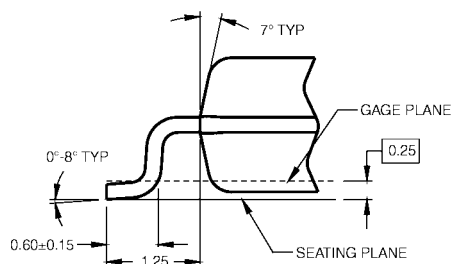


DIMENSIONS ARE IN MILLIMETERS

## NOTES:

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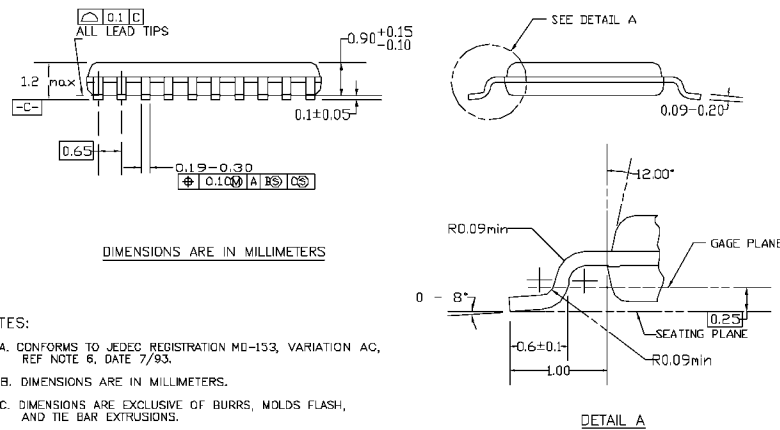
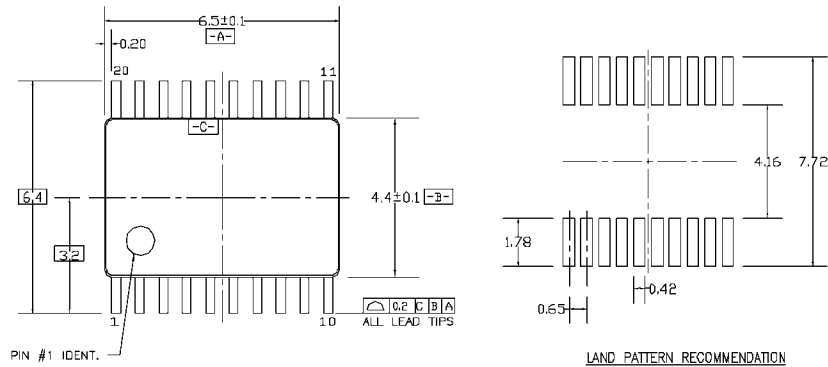
M20DRevB1



DETAIL A

**Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**

## Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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MTC20REV D1

### 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC20

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