FAIRCHILD SEMICONDUCTOR™

September 1999
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# 74LVX541
# Low Voltage Octal Buffer/Line Driver with 3-STATE Outputs

## General Description

The LVX541 is an octal non-inverting buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density. The inputs tolerate up to 7V allowing interface of 5V systems to 3V systems.

## Features

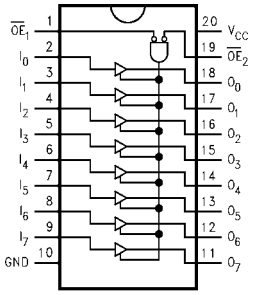
- Input voltage translation from 5V to 3V
- Ideal for low power/low noise 3.3V applications
- Guaranteed simultaneous switching noise level and dynamic threshold performance

## Ordering Code:

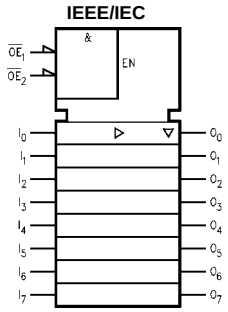
| Order Number | Package Number | Package Description |
|---|---|---|
| 74LVX541M | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74LVX541SJ | M20D | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74LVX541MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

## Connection Diagram




## Logic Symbol




## Pin Descriptions

| Pin Names | Descriptions |
|---|---|
| $\overline{OE}_1$, $\overline{OE}_2$ | 3-STATE Output Enable Inputs |
| $I_0$ - $I_7$ | Inputs |
| $O_0$ - $O_7$ | 3-STATE Outputs |

## Truth Table

| Inputs | | | Outputs |
|---|---|---|---|
| $\overline{OE}_1$ | $\overline{OE}_2$ | I | |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |
| L | L | L | L |

H = HIGH Voltage Level X = Immaterial
L = LOW Voltage Level Z = High Impedance

## 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 ($V_I$) | −0.5V to 7V |
| DC Output Diode Current ($I_{OK}$) | |
| $V_O$ = −0.5V | −20 mA |
| $V_O$ = $V_{CC}$ + 0.5V | +20 mA |
| DC Output Voltage ($V_O$) | −0.5V to $V_{CC}$ + 0.5V |
| DC Output Source | |
| or Sink Current ($I_O$) | ±25 mA |
| DC $V_{CC}$ or Ground Current | |
| ($I_{CC}$ or $I_{GND}$) | ±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 ($V_I$) | 0V to +5.5V |
| Output Voltage ($V_O$) | 0V to $V_{CC}$ |
| Operating Temperature ($T_A$) | −40°C to +85°C |
| Input Rise and Fall Time (Δt/ΔV) | 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°C | | | $T_A$ = −40°C to +85°C | | Units | Conditions | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | | |
| $V_{IH}$ | HIGH Level Input | 2.0 | 1.5 | | | 1.5 | | | | |
| | Voltage | 3.0 | 2.0 | | | 2.0 | | V | | |
| | | 3.6 | 2.4 | | | 2.4 | | | | |
| $V_{IL}$ | LOW Level Input | 2.0 | | | 0.5 | | 0.5 | | | |
| | Voltage | 3.0 | | | 0.8 | | 0.8 | V | | |
| | | 3.6 | | | 0.8 | | 0.8 | | | |
| $V_{OH}$ | HIGH Level Output | 2.0 | 1.9 | 2.0 | | 1.9 | | | | $I_{OH}$ = −50 μA |
| | Voltage | 3.0 | 2.9 | 3.0 | | 2.9 | | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = −50 μA |
| | | 3.0 | 2.58 | | | 2.48 | | | | $I_{OH}$ = −4 mA |
| $V_{OL}$ | LOW Level Output | 2.0 | | 0.0 | 0.1 | | 0.1 | | | $I_{OL}$ = 50 μA |
| | Voltage | 3.0 | | 0.0 | 0.1 | | 0.1 | V | $V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 50 μA |
| | | 3.0 | | | 0.36 | | 0.44 | | | $I_{OL}$ = 4 mA |
| $I_{OZ}$ | 3-STATE Output OFF-State Current | 3.6 | | | ±0.25 | | ±2.5 | μA | $V_{IN}$ = $V_{IH}$ or $V_{IL}$; $V_{OUT}$ = $V_{CC}$ or GND | |
| $I_{IN}$ | Input Leakage Current | 3.6 | | | ±0.1 | | ±1.0 | μA | $V_{IN}$ = 5.5V or GND | |
| $I_{CC}$ | Quiescent Supply Current | 3.6 | | | 4.0 | | 40.0 | μA | $V_{IN}$ = $V_{CC}$ or GND | |

## Noise Characteristics (Note 3)

| Symbol | Parameter | $V_{CC}$ (V) | $T_A$ = 25°C | | Units | Conditions |
|---|---|---|---|---|---|---|
| | | | Typ | Limits | | |
| $V_{OLP}$ | Quiet Output Maximum Dynamic $V_{OL}$ | 3.3 | 0.5 | 0.8 | V | $C_L$ = 50 pF |
| $V_{OLV}$ | Quiet Output Minimum Dynamic $V_{OL}$ | 3.3 | −0.5 | −0.8 | V | $C_L$ = 50 pF |
| $V_{IHD}$ | Minimum HIGH Level Dynamic Input Voltage | 3.3 | | 2.0 | V | $C_L$ = 50 pF |
| $V_{ILD}$ | Maximum HIGH Level Dynamic Input Voltage | 3.3 | | 0.8 | V | $C_L$ = 50 pF |

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

## AC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ (V) | $T_A = 25°C$ | | | $T_A = -40°C$ to $+85°C$ | | Units | Conditions |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max | | |
| $t_{PLH}$ | Propagation Delay | 2.7 | | 6.1 | 11.3 | 1.0 | 13.5 | ns | $C_L = 15$ pF |
| $t_{PHL}$ | Time | | | 8.6 | 14.9 | 1.0 | 17.0 | | $C_L = 50$ pF |
| | | $3.3 \pm 0.3$ | | 4.7 | 7.0 | 1.0 | 8.5 | | $C_L = 15$ pF |
| | | | | 7.2 | 10.5 | 1.0 | 12.0 | | $C_L = 50$ pF |
| $t_{PZL}$ | 3-STATE Output | 2.7 | | 7.1 | 13.8 | 1.0 | 16.5 | ns | $C_L = 15$ pF, $R_L = 1$ kΩ |
| $t_{PZH}$ | Enable Time | | | 9.6 | 17.3 | 1.0 | 20.0 | | $C_L = 50$ pF, $R_L = 1$ kΩ |
| | | $3.3 \pm 0.3$ | | 6.8 | 10.5 | 1.0 | 12.5 | | $C_L = 15$ pF, $R_L = 1$ kΩ |
| | | | | 9.3 | 14.0 | 1.0 | 16.0 | | $C_L = 50$ pF, $R_L = 1$ kΩ |
| $t_{PLZ}$ | 3-STATE Output | 2.7 | | 11.6 | 17.9 | 1.0 | 20.0 | ns | $C_L = 50$ pF, $R_L = 1$ kΩ |
| $t_{PHZ}$ | Disable Time | $3.3 \pm 0.3$ | | 10.7 | 15.4 | 1.0 | 17.5 | | |
| $t_{OSLH}$ | Output to Output | 2.7 | | | 1.5 | | 1.5 | ns | $C_L = 50$ pF |
| $t_{OSHL}$ | Skew (Note 4) | 3.3 | | | 1.5 | | 1.5 | | |

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

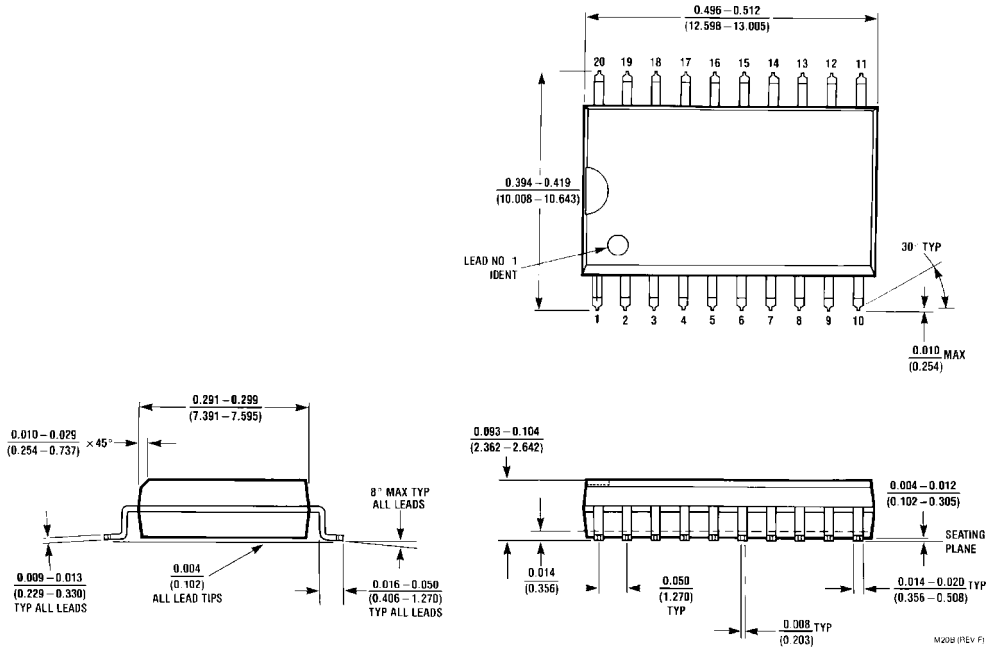
## Capacitance

| Symbol | Parameter | $T_A = +25°C$ | | | $T_A = -40°C$ to $+85°C$ | | Units |
|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | |
| $C_{IN}$ | Input Capacitance | | 4 | 10 | | 10 | pF |
| $C_{OUT}$ | Output Capacitance | | 6 | | | | pF |
| $C_{PD}$ | Power Dissipation Capacitance (Note 5) | | 19 | | | | pF |

**Note 5:** $C_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

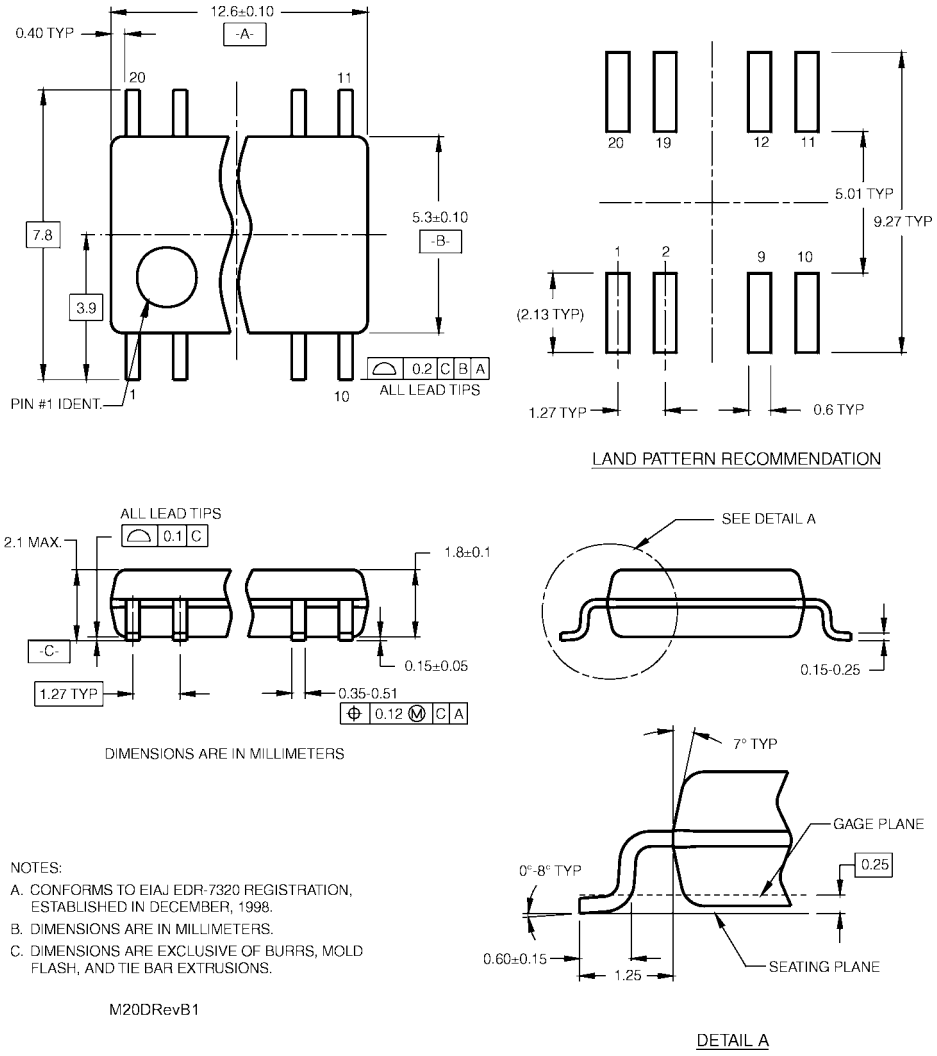
Average operating current can be obtained by the equation: $I_{CC(opr.)} = \dfrac{C_{PD} \times V_{CC} \times f_{IN} + I_{CC}}{8 \text{ (per bit)}}$

## Physical Dimensions inches (millimeters) unless otherwise noted




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

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




NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

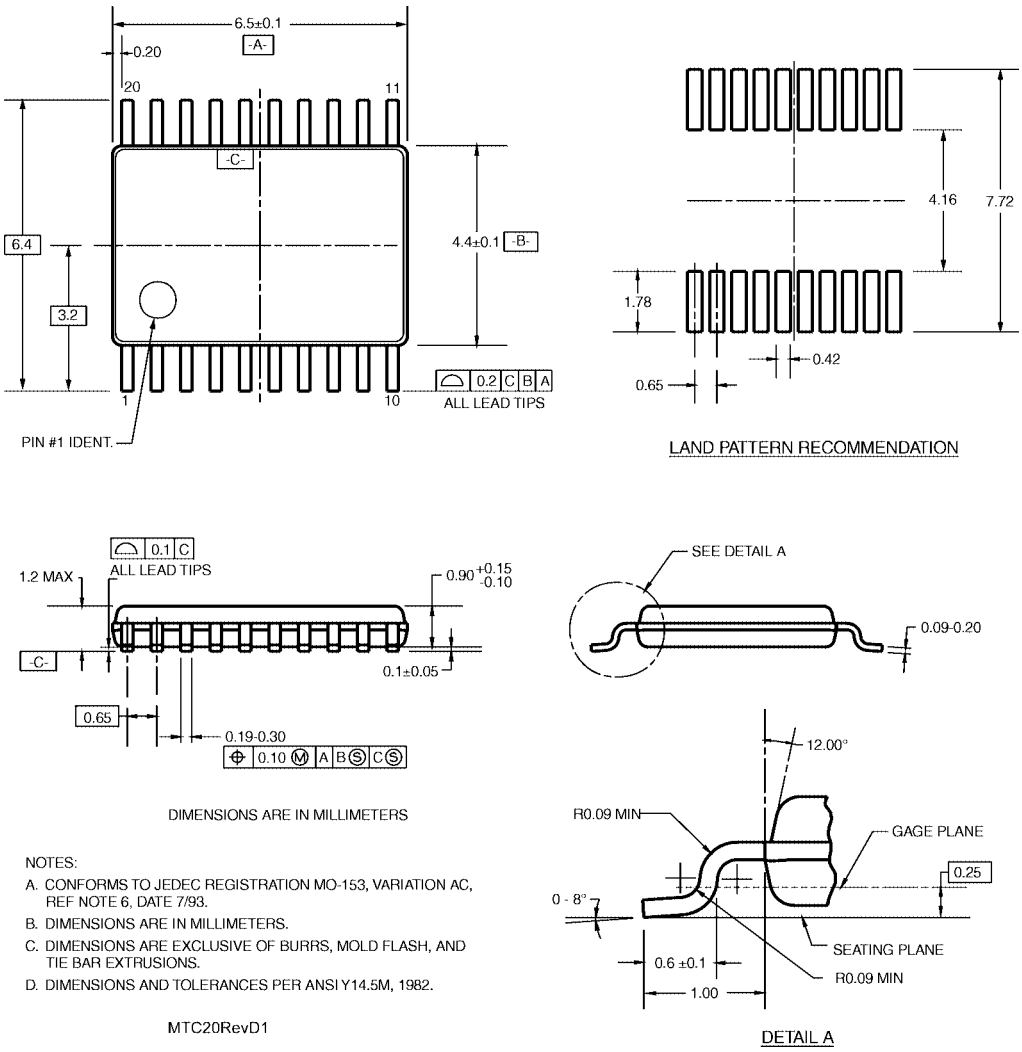
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

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

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




DIMENSIONS ARE IN MILLIMETERS

NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20RevD1

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



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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