FAIRCHILD SEMICONDUCTOR®

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# FXL4245
# Low-Voltage, Dual-Supply, 8-Bit, Signal Translator with Configurable Voltage Supplies, Signal Levels, and 3-State Outputs

## Features

- Bi-Directional Interface between Two Levels from 1.1V to 3.6V
- Fully Configurable, Inputs Track $V_{CC}$ Level
- Non-Preferential Power-up; Either $V_{CC}$ May Be Powered-up First
- Outputs Remain in 3-State until Active $V_{CC}$ Level is Reached
- Outputs Switch to 3-State if Either $V_{CC}$ is at GND
- Power-Off Protection
- Control Inputs ($T/\overline{R}$, $\overline{OE}$) Levels are Referenced To $V_{CCA}$ Voltage
- Packaged in 24-Pin MLP
- ESD Protection Exceeds:
  - 4kV Human Body Model (per JESD22-A114 & Mil Std 883e 3015.7)
  - 8kV Human Body Model I/O to GND (per JESD22-A114 & Mil Std 883e 3015.7)
  - 1kV Charge Device Model (per ESD STM 5.3)
  - 200V Machine Model (per JESD22-A115 & ESD STM5.2)

## Description

The FXL4245 is a configurable dual-voltage-supply translator designed for bi-directional voltage translation of signals between two voltage levels. The device allows translation between voltages as high as 3.6V to as low as 1.1V. The A port tracks the $V_{CCA}$ level and the B port tracks the $V_{CCB}$ level. Both ports are designed to accept supply voltage levels from 1.1V to 3.6V. This allows for bi-directional voltage translation over a variety of voltage levels: 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V.

The device remains in 3-state until both $V_{CC}$s reach active levels, allowing either $V_{CC}$ to be powered-up first. The device also contains power-down control circuits that place the device in 3-state if either $V_{CC}$ is removed.

The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow through the device. The $\overline{OE}$ input, when HIGH, disables both the A and B ports by placing them in a 3-state condition. The FXL4245 is designed with the control pins ($T/\overline{R}$ and $\overline{OE}$) supplied by $V_{CCA}$.

## Ordering Information

| Part Number | Eco Status | Package | Packing Method |
|---|---|---|---|
| FXL4245MPX | Green | 24-Pin Molded Leadless Package (MLP), JEDEC MO-220, 3.5 x 4.5mm | Tape and Reel |

*For Fairchild's definition of Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.*

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## Pin Configuration

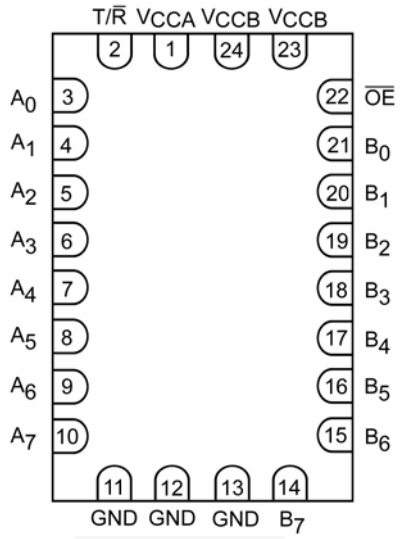



**Figure 1. Pin Configuration (Top Through View)**

## Pin Definitions

| Pin # | Name | Description |
|---|---|---|
| 1 | $V_{CCA}$ | Side-A Power Supply |
| 2 | $T/\overline{R}$ | Transmit / Receive Input |
| 3, 4, 5, 6, 7, 8, 9, 10 | $A_0$, $A_1$, $A_2$, $A_3$, $A_4$, $A_5$, $A_6$, $A_7$ | Side-A Inputs or 3-State Outputs |
| 11, 12, 13 | GND | Ground |
| 14, 15, 16, 17, 18, 19, 20, 21 | $B_7$, $B_6$, $B_5$, $B_4$, $B_3$, $B_2$, $B_1$, $B_0$ | Side-B Inputs or 3-State Outputs |
| 22 | $\overline{OE}$ | Output Enable Input |
| 23, 24 | $V_{CCB}$ | Side-B Power Supply |

## Truth Table

| Inputs | | Description |
|---|---|---|
| $\overline{OE}$ | $T/\overline{R}$ | |
| LOW Voltage Level | LOW Voltage Level | Bus B Data to Bus A |
| LOW Voltage Level | HIGH Voltage Level | Bus A Data to Bus B |
| HIGH Voltage Level | Don’t Care | 3-State |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | Conditions | | Min. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{CCA}$ | Supply Voltage | | | -0.5 | 4.6 | V |
| $V_{CCB}$ | | | | -0.5 | 4.6 | |
| $V_I$ | DC Input Voltage | I/O Port A | | -0.5 | 4.6 | V |
| | | I/O Port B | | -0.5 | 4.6 | |
| | | Control Inputs ($T/\overline{R}$, $\overline{OE}$) | | -0.5 | 4.6 | |
| $V_O$ | Output Voltage[1] | Output 3-State | | -0.5 | 4.6 | V |
| | | Output Active ($A_n$) | | -0.5 to $V_{CCA}$ | 0.5 | |
| | | Output Active ($B_n$) | | -0.5 to $V_{CCB}$ | 0.5 | |
| $I_{IK}$ | DC Input Diode Current | $V_I$ < 0V | | | -50 | mA |
| $I_{OK}$ | DC Output Diode Current | $V_O$ < 0V | | | -50 | mA |
| | | $V_O$ > $V_{CC}$ | | | 50 | |
| $I_{OH}/I_{OL}$ | DC Output Source/Sink Current | | | | ±50 | mA |
| $I_{CC}$ | DC $V_{CC}$ or Ground Current per Supply Pin | | | | ±100 | mA |
| $T_{STG}$ | Storage Temperature Range | | | -65 | +150 | °C |
| ESD | Electrostatic Discharge Capability | Human Body Model, JESD22-A114, Mil Std 883e 3015.7 | | | 4 | kV |
| | | | I/O to GND | | 8 | |
| | | Charged Device Model, JESD22-C101,STM 5.3 | | | 1 | |
| | | Machine Model, JESD22-A115,STM 5.2 | | | 200 | V |

**Note:**
1. I/O absolute maximum ratings must be observed.

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| Symbol | Parameter | Conditions | | Min. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Power Supply | Operating $V_{CCA}$ or $V_{CCB}$ | | 1.1 | 3.6 | V |
| $V_I$ | Input Voltage | Port A | | 0 | 3.6 | V |
| | | Port B | | 0 | 3.6 | |
| | | Control Inputs ($T/\overline{R}$, $\overline{OE}$) | | 0 | $V_{CCA}$ | |
| $I_{OH}/I_{OL}$ | Output Current | $V_{CC0}$ | 3.0V to 3.6V | | ±24 | mA |
| | | | 2.3V to 2.7V | | ±18 | |
| | | | 1.65V to 1.95V | | ±6 | |
| | | | 1.40V to 1.65V | | ±2 | |
| | | | 1.1V to 1.4V | | ±0.5 | |
| $T_A$ | Operating Temperature, Free Air | | | -40 | +85 | °C |
| $\Delta V/\Delta t$ | Minimum Input Edge Rate | $V_{CCA/B}$ =1.1V to 3.6V | | | 10 | ns/V |

**Note:**
2. All unused inputs must be held at $V_{CCI}$ or GND.

## Electrical Characteristics

| Symbol | Parameter | Conditions | $V_{CCI}$ (V) | $V_{CCO}$ (V) | Min. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{IH}$ | HIGH Level Input(3) | Data Inputs $A_n$, $B_n$ | 2.70 to 3.60 | 1.1 to 3.6 | 2.0 | | V |
| | | | 2.30 to 2.70 | | 1.6 | | |
| | | | 1.65 to 2.30 | | 0.65 x $V_{CCI}$ | | |
| | | | 1.40 to 1.65 | | 0.65 x $V_{CCI}$ | | |
| | | | 1.10 to 1.40 | | 0.9 x $V_{CCI}$ | | |
| | | Control Pins $\overline{OE}$, T/$\overline{R}$ (Referenced to $V_{CCA}$) | 2.70 to 3.6 | 1.1 to 3.6 | 2.0 | | |
| | | | 2.30 to 2.70 | | 1.6 | | |
| | | | 1.65 to 2.30 | | 0.65 x $V_{CCA}$ | | |
| | | | 1.40 to 1.65 | | 0.65 x $V_{CCA}$ | | |
| | | | 1.10 to 1.40 | | 0.9 x $V_{CCA}$ | | |
| $V_{IL}$ | LOW Level Input(3) | Data Inputs $A_n$, $B_n$ | 2.70 to 3.60 | 1.1 to 3.6 | | 0.8 | V |
| | | | 2.30 to 2.70 | | | 0.7 | |
| | | | 1.65 to 2.30 | | | 0.35 x $V_{CCI}$ | |
| | | | 1.40 to 1.65 | | | 0.35 x $V_{CCI}$ | |
| | | | 1.10 to 1.40 | | | 0.10 x $V_{CCI}$ | |
| | | Control Pins /$\overline{OE}$, T/$\overline{R}$ (Referenced to $V_{CCA}$) | 2.70 to 3.60 | 1.1 to 3.6 | | 0.8 | |
| | | | 2.30 to 2.70 | | | 0.7 | |
| | | | 1.65 to 2.30 | | | 0.35 x $V_{CCI}$ | |
| | | | 1.40 to 1.65 | | | 0.35 x $V_{CCI}$ | |
| | | | 1.10 to 1.40 | | | 0.10 x $V_{CCI}$ | |
| $V_{OH}$ | HIGH Level Output(4) | $I_{OH}$ = -100µA | 1.1 to 3.6 | 1.1 to 3.6 | $V_{CC0}$ to 0.2 | | V |
| | | $I_{OH}$ = -12mA | 2.7 | 2.7 | 2.2 | | |
| | | $I_{OH}$ = -18mA | 3.0 | 3.0 | 2.4 | | |
| | | $I_{OH}$ = -24mA | 3.0 | 3.0 | 2.2 | | |
| | | $I_{OH}$ = -6mA | 2.3 | 2.3 | 2.0 | | |
| | | $I_{OH}$ = -12mA | 2.3 | 2.3 | 1.8 | | |
| | | $I_{OH}$ = -18mA | 2.3 | 2.3 | 1.7 | | |
| | | $I_{OH}$ = -6mA | 1.65 | 1.65 | 1.25 | | |
| | | $I_{OH}$ = -2mA | 1.4 | 1.4 | 1.05 | | |
| | | $I_{OH}$ = -0.5mA | 1.1 | 1.1 | 0.75 x $V_{CC0}$ | | |
| $V_{OL}$ | LOW Level Output(4) | $I_{OL}$ = 100µA | 1.1 to 3.6 | 1.1 to 3.6 | | 0.2 | V |
| | | $I_{OL}$ = 12mA | 2.7 | 2.7 | | 0.4 | |
| | | $I_{OL}$ = 18mA | 3.0 | 3.0 | | 0.4 | |
| | | $I_{OL}$ = 24mA | 3.0 | 3.0 | | 0.55 | |
| | | $I_{OL}$ = 12mA | 2.3 | 2.3 | | 0.4 | |
| | | $I_{OL}$ = 18mA | 2.3 | 2.3 | | 0.6 | |
| | | $I_{OL}$ = 6mA | 1.65 | 1.65 | | 0.3 | |
| | | $I_{OL}$ = 2mA | 1.4 | 1.4 | | 0.35 | |
| | | $I_{OL}$ = 0.5mA | 1.1 | 1.1 | | 0.3 x $V_{CC0}$ | |

*Continued on the following page…*

## Electrical Characteristics

| Symbol | Parameter | Conditions | $V_{CCI}$ (V) | $V_{CCO}$ (V) | Min. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $I_L$ | Input Leakage Current, Control Pins | $V_I$=$V_{CCA}$ or GND | 1.1 to 3.6 | 3.6 | | ±1.0 | µA |
| $I_{OFF}$ | Power Off Leakage Current | $A_n$, $V_I$ or $V_O$=0V to 3.6V | 0 | 3.6 | | ±10 | µA |
| | | $B_n$, $V_I$ or $V_O$=0V to 3.6V | 3.6 | 0 | | ±10 | |
| $I_{OZ}$ | 3-State Output Leakage ($0 \le V_O \le 3.6V$, $V_I$=$V_{IH}$ or $V_{IL}$) | $A_n$, $B_n$, /OE=$V_{IH}$ | 3.6 | 3.6 | | ±10 | µA |
| | | $B_n$, /OE= Don't Care[5] | 0 | 3.6 | | ±10 | |
| | | $A_n$, /OE= Don't Care[5] | 3.6 | 0 | | ±10 | |
| $I_{CCA/B}$ | Quiescent Supply Current[6] | $V_I$=$V_{CCI}$ or GND; $I_O$=0 | 1.1 to 3.6 | 1.1 to 3.6 | | 20 | µA |
| $I_{CCZ}$ | | | 1.1 to 3.6 | 1.1 to 3.6 | | 20 | |
| $I_{CCA}$ | | $V_I$=$V_{CCA}$ or GND; $I_O$=0 | 0 | 1.1 to 3.6 | | -10 | |
| | | | 1.1 to 3.6 | 0 | | 10 | |
| $I_{CCB}$ | | $V_I$=$V_{CCB}$ or GND; $I_O$=0 | 1.1 to 3.6 | 0 | | -10 | |
| | | | 0 | 1.1 to 3.6 | | 10 | |
| $\Delta I_{CCA/B}$ | Increase in $I_{CC}$ per Input; Other Inputs at $V_{CC}$ or GND | $V_{IH}$=3.0 | 3.6 | 3.6 | | 500 | µA |

**Notes:**

3. $V_{CCI}$ = the $V_{CC}$ associated with the data input under test.
4. $V_{CCO}$ = the $V_{CC}$ associated with the output under test.
5. Don't care = any valid logic level.
6. Reflects current per supply, $V_{CCA}$ or $V_{CCB}$.

## AC Electrical Characteristics

**$V_{CCA}$=3.0V to 3.6V**

| Symbol | Parameter | $T_A$= -40 to +85°C | | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CCB}$=3.0V to 3.6V | | $V_{CCB}$=2.3V to 2.7V | | $V_{CCB}$=1.65V to 1.95V | | $V_{CCB}$=1.4V to 1.6V | | $V_{CCB}$=1.1V to 1.3V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay A to B | 0.2 | 3.5 | 0.3 | 3.9 | 0.5 | 5.4 | 0.6 | 6.8 | 1.4 | 22.0 | ns |
| | Propagation Delay B to A | 0.2 | 3.5 | 0.2 | 3.8 | 0.3 | 4.0 | 0.5 | 4.3 | 0.8 | 13.0 | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable /OE to B | 0.5 | 4.0 | 0.7 | 4.4 | 1.0 | 5.9 | 1.0 | 6.4 | 1.5 | 17.0 | ns |
| | Output Enable /OE to A | 0.5 | 4.0 | 0.5 | 4.0 | 0.5 | 4.0 | 0.5 | 4.0 | 0.5 | 4.0 | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable /OE to B | 0.2 | 3.8 | 0.2 | 4.0 | 0.7 | 4.8 | 1.5 | 6.2 | 2.0 | 17.0 | ns |
| | Output Disable /OE to A | 0.2 | 3.7 | 0.2 | 3.7 | 0.2 | 3.7 | 0.2 | 3.7 | 0.2 | 3.7 | |

**$V_{CCA}$=2.3V to 2.7V**

| Symbol | Parameter | $T_A$= -40 to +85°C | | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CCB}$=3.0V to 3.6V | | $V_{CCB}$=2.3V to 2.7V | | $V_{CCB}$=1.65V to 1.95V | | $V_{CCB}$=1.4V to 1.6V | | $V_{CCB}$=1.1V to 1.3V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay A to B | 0.2 | 3.8 | 0.4 | 4.2 | 0.5 | 5.6 | 0.8 | 6.9 | 1.4 | 22.0 | ns |
| | Propagation Delay B to A | 0.3 | 3.9 | 0.4 | 4.2 | 0.5 | 4.5 | 0.5 | 4.8 | 1.0 | 7.0 | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable /OE to B | 0.6 | 4.2 | 0.8 | 4.6 | 1.0 | 6.0 | 1.0 | 6.8 | 1.5 | 17.0 | ns |
| | Output Enable /OE to A | 0.6 | 4.5 | 0.6 | 4.5 | 0.6 | 4.5 | 0.6 | 4.5 | 0.6 | 4.5 | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable /OE to B | 0.2 | 4.1 | 0.2 | 4.3 | 0.7 | 4.8 | 1.5 | 6.7 | 2.0 | 17.0 | ns |
| | Output Disable /OE to A | 0.2 | 4.0 | 0.2 | 4.0 | 0.2 | 4.0 | 0.2 | 4.0 | 0.2 | 4.0 | |

**$V_{CCA}$=1.65V to 1.95V**

| Symbol | Parameter | $T_A$= -40 to +85°C | | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CCB}$=3.0V to 3.6V | | $V_{CCB}$=2.3V to 2.7V | | $V_{CCB}$=1.65V to 1.95V | | $V_{CCB}$=1.4V to 1.6V | | $V_{CCB}$=1.1V to 1.3V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay A to B | 0.3 | 4.0 | 0.5 | 4.5 | 0.8 | 5.7 | 0.9 | 7.1 | 1.5 | 22.0 | ns |
| | Propagation Delay B to A | 0.5 | 5.4 | 0.5 | 5.6 | 0.8 | 5.7 | 1.0 | 6.0 | 1.2 | 8.0 | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable /OE to B | 0.6 | 5.2 | 0.8 | 5.4 | 1.2 | 6.9 | 1.2 | 7.2 | 1.5 | 18.0 | ns |
| | Output Enable /OE to A | 1.0 | 6.7 | 1.0 | 6.7 | 1.0 | 6.7 | 1.0 | 6.7 | 1.0 | 6.7 | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable /OE to B | 0.2 | 5.1 | 0.2 | 5.2 | 0.8 | 5.2 | 1.5 | 7.0 | 2.0 | 17.0 | ns |
| | Output Disable /OE to A | 0.5 | 5.0 | 0.5 | 5.0 | 0.5 | 5.0 | 0.5 | 5.0 | 0.5 | 5.0 | |

## AC Electrical Characteristics (Continued)

**$V_{CCA}$=1.4V to 1.6V**

| Symbol | Parameter | $T_A$= -40 to +85°C | | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CCB}$=3.0V to 3.6V | | $V_{CCB}$=2.3V to 2.7V | | $V_{CCB}$=1.65V to 1.95V | | $V_{CCB}$=1.4V to 1.6V | | $V_{CCB}$=1.1V to 1.3V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay A to B | 0.5 | 4.3 | 0.5 | 4.8 | 1.0 | 6.0 | 1.0 | 7.3 | 1.5 | 22.0 | ns |
| | Propagation Delay B to A | 0.6 | 6.8 | 0.8 | 6.9 | 0.9 | 7.1 | 1.0 | 7.3 | 1.3 | 9.5 | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable /OE to B | 1.1 | 7.5 | 1.1 | 7.6 | 1.3 | 7.7 | 1.4 | 7.9 | 2.0 | 20.0 | ns |
| | Output Enable /OE to A | 1.0 | 7.5 | 1.0 | 7.5 | 1.0 | 7.5 | 1.0 | 7.5 | 1.0 | 7.5 | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable /OE to B | 0.4 | 6.1 | 0.4 | 6.2 | 0.9 | 6.2 | 1.5 | 7.5 | 2.0 | 18.0 | ns |
| | Output Disable /OE to A | 1.0 | 6.0 | 1.0 | 6.0 | 1.0 | 6.0 | 1.0 | 6.0 | 1.0 | 6.0 | |

**$V_{CCA}$=1.1V to 1.3V**

| Symbol | Parameter | $T_A$= -40 to +85°C | | | | | | | | | | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CCB}$=3.0V to 3.6V | | $V_{CCB}$=2.3V to 2.7V | | $V_{CCB}$=1.65V to 1.95V | | $V_{CCB}$=1.4V to 1.6V | | $V_{CCB}$=1.1V to 1.3V | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay A to B | 0.8 | 13.0 | 1.0 | 7.0 | 1.2 | 8.0 | 1.3 | 9.5 | 2.0 | 24.0 | ns |
| | Propagation Delay B to A | 1.4 | 22.0 | 1.4 | 22.0 | 1.5 | 22.0 | 1.5 | 22.0 | 2.0 | 24.0 | |
| $t_{PZH}$, $t_{PZL}$ | Output Enable /OE to B | 1.0 | 12.0 | 1.0 | 9.0 | 2.0 | 10.0 | 2.0 | 11.0 | 2.0 | 24.0 | ns |
| | Output Enable /OE to A | 2.0 | 22.0 | 2.0 | 22.0 | 2.0 | 22.0 | 2.0 | 22.0 | 2.0 | 22.0 | |
| $t_{PHZ}$, $t_{PLZ}$ | Output Disable /OE to B | 1.0 | 15.0 | 0.7 | 7.0 | 1.0 | 8.0 | 2.0 | 10.0 | 2.0 | 20.0 | ns |
| | Output Disable /OE to A | 2.0 | 15.0 | 2.0 | 12.0 | 2.0 | 12.0 | 2.0 | 12.0 | 2.0 | 12.0 | |

## Capacitance

| Symbol | Parameter | Conditions | $T_A$=+25°C Typical | Units |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{CCA}$=$V_{CCB}$=0V, $V_I$=0V or $V_{CCA/B}$ | 4 | pF |
| $C_{I/O}$ | Input/Output Capacitance | $V_{CCA}$=$V_{CCB}$=3.3V, $V_I$=0V or $V_{CCA/B}$ | 5 | pF |
| $C_{PD}$ | Power Dissipation Capacitance | $V_{CCA}$=$V_{CCB}$=3.3V, $V_I$=0V or $V_{CC}$, f=10MHz | 20 | pF |

## AC Loadings and Waveforms

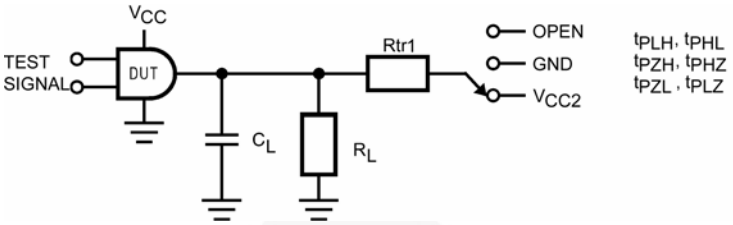
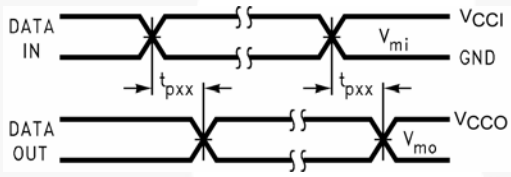



**Figure 2. AC Test Circuit**

| Test | Switch |
|---|---|
| $t_{PLH}$,$t_{PHL}$ | Open |
| $t_{PLZ}$,$t_{PZL}$ | $V_{CC0}$ • 2 at $V_{CCO}$=3.3 ± 0.3V, 2.5V ± 0.2V, 1.8V ± 0.15V, 1.5V ± 0.1V, 1.2V ± 0.1V |
| $t_{PHZ}$,$t_{PZH}$ | GND |

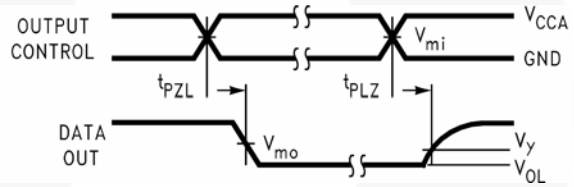
**Table 1. AC Load Table**

| $V_{CC0}$ | $C_L$ | $R_L$ | Rtr1 |
|---|---|---|---|
| 1.2V ± 0.1V | 15pF | 2kΩ | 2kΩ |
| 1.5V ± 0.1V | 15pF | 2kΩ | 2kΩ |
| 1.8V ± 0.15V | 30pF | 500kΩ | 500kΩ |
| 2.5V ± 0.2V | 30pF | 500kΩ | 500kΩ |
| 3.3V ± 0.3V | 30pF | 500kΩ | 500kΩ |



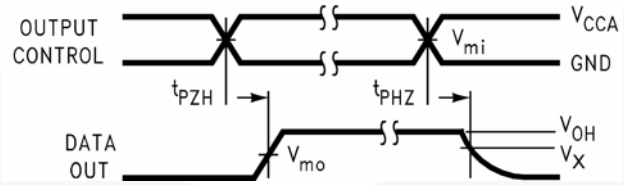

**Note:**
7. Input $t_R$=$t_F$=2.0ns, 10% to 90%

**Figure 3. Waveform for Inverting and Non-Inverting Functions**




**Note:**
8. Input $t_R$=$t_F$=2.0ns, 10% to 90%

**Figure 4. 3-State Output Low Enable and Disable for Low Voltage Logic**




**Note:**
9. Input $t_R$=$t_F$=2.0ns, 10% to 90%

**Figure 5. 3-State Output High Enable and Disable for Low Voltage Logic**

| Symbol | $V_{CC}$ | | | | |
|---|---|---|---|---|---|
| | 3.3V ± 0.3V | 2.5V ± 0.2V | 1.8V ± 0.15V | 1.5V ± 0.1V | 1.2V ± 0.1V |
| $V_{MI}$ | $V_{CCI}$/2 | $V_{CCI}$/2 | $V_{CCI}$/2 | $V_{CCI}$/2 | $V_{CCI}$/2 |
| $V_{MO}$ | $V_{CCO}$/2 | $V_{CCO}$/2 | $V_{CCO}$/2 | $V_{CCO}$/2 | $V_{CCO}$/2 |
| $V_X$ | $V_{OH}$ - 0.3V | $V_{OH}$ – 0.15V | $V_{OH}$ – 0.15V | $V_{OH}$ – 0.1V | $V_{OH}$ – 0.1V |
| $V_Y$ | $V_{OL}$ + 0.3V | $V_{OL}$ + 0.15V | $V_{OL}$ + 0.15V | $V_{OL}$ + 0.1V | $V_{OL}$ + 0.1V |

**Note**:
10. For $V_{MI}$ $V_{CCO}$=$V_{CCA}$ for control pins T/$\overline{R}$ and $\overline{OE}$ or $V_{CCA}$/2.

## Functional Description

### Power-Up/Power-Down Sequencing

FXL translators offer an advantage in that either $V_{CC}$ may be powered up first. This benefit derives from the chip design. When either $V_{CC}$ is at 0V, outputs are in a High-impedance state. The control inputs (T/$\overline{R}$ and $\overline{OE}$) are designed to track the $V_{CCA}$ supply. A pull-up resistor tying $\overline{OE}$ to $V_{CCA}$ should be used to ensure that bus contention, excessive currents, or oscillations do not occur during power-up/power-down. The size of the pull-up resistor is based upon the current-sinking capability of the OE driver.

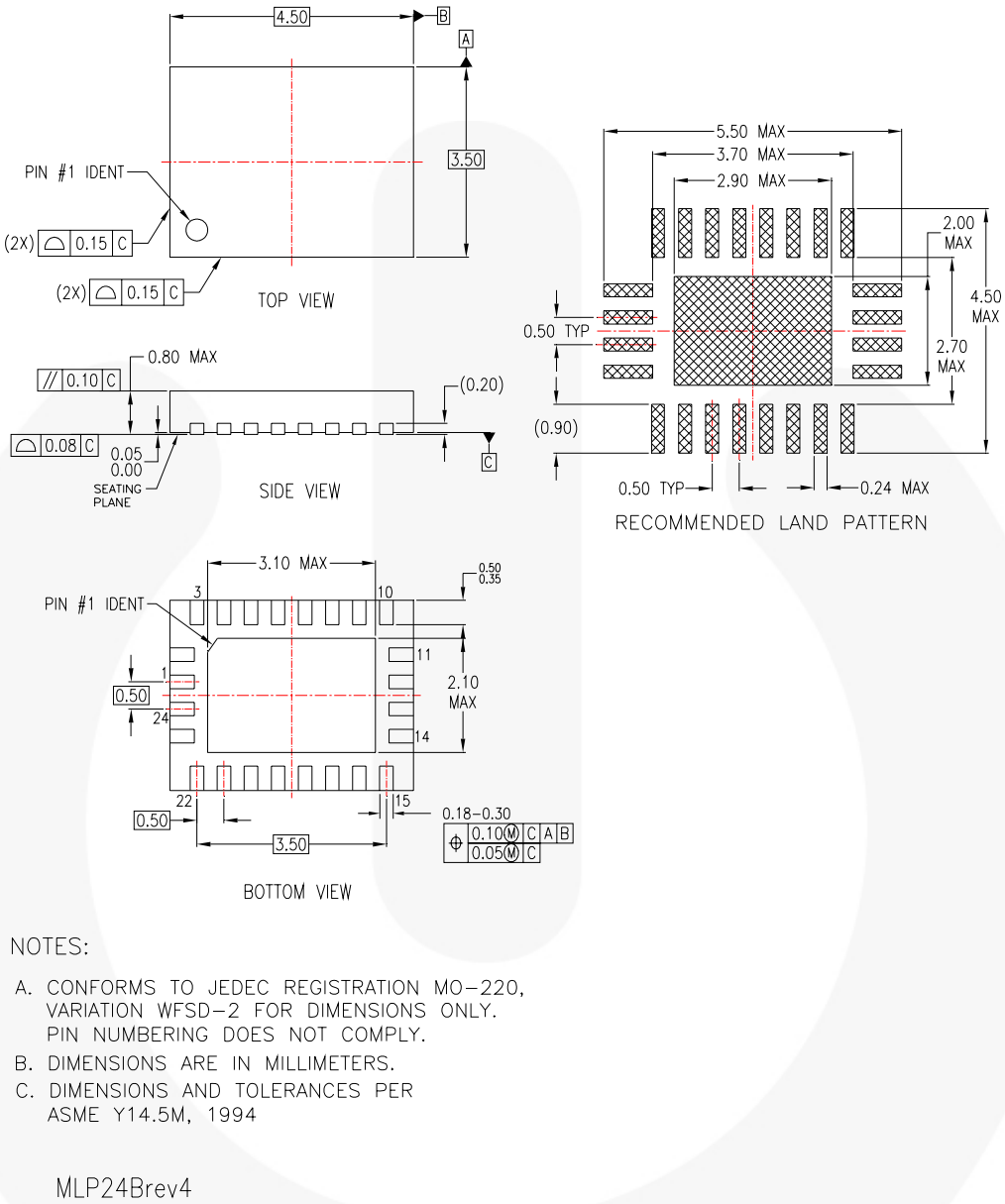
The recommended power-up sequence is:

1. Apply power to either $V_{CC}$.
2. Apply power to the T/$\overline{R}$ input (logic HIGH for A-to-B operation; logic LOW for B-to-A operation) and to the respective data inputs (A port or B port). This may occur at the same time as step 1.
3. Apply power to the other $V_{CC}$.
4. Drive the $\overline{OE}$ input LOW to enable the device.

The recommended power-down sequence is:

1. Drive $\overline{OE}$ input HIGH to disable the device.
2. Remove power from either $V_{CC}$.
3. Remove power from the other $V_{CC}$.

## Physical Dimensions




NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO–220, VARIATION WFSD–2 FOR DIMENSIONS ONLY. PIN NUMBERING DOES NOT COMPLY.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP24Brev4

**Figure 6. 24-Pin Molded Leadless Package (MLP), JEDEC MO-220, 3.5 x 4.5mm**

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