



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 1.1 V to 3.6 V
- 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/\bar{R} , \overline{OE}) Levels are Referenced To V_{CCA} Voltage
- Packaged in 24-Pin MLP
- ESD Protection Exceeds:
 - 4 kV Human Body Model (per JESD22-A114 & Mil Std 883e 3015.7)
 - 8 kV Human Body Model I/O to GND (per JESD22-A114 & Mil Std 883e 3015.7)
 - 1 kV Charge Device Model (per ESD STM 5.3)
 - 200 V 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 3.6 V to as low as 1.1 V. 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 1.1 V to 3.6 V. This allows for bi-directional voltage translation over a variety of voltage levels: 1.2 V, 1.5 V, 1.8 V, 2.5 V, and 3.3 V.

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/\bar{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/\bar{R} and \overline{OE}) supplied by V_{CCA} .

Ordering Information

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

Pin Configuration

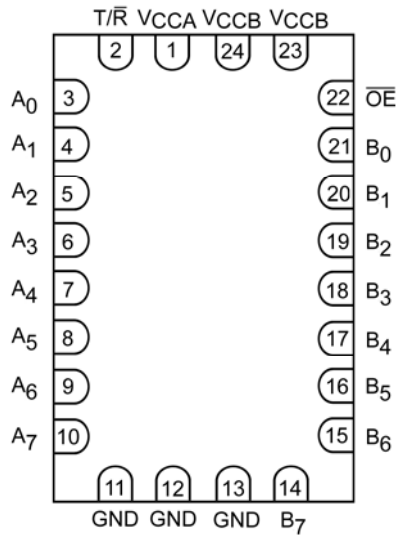


Figure 1. Pin Configuration (Top Through View)

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
DAP	No Connect	No Connect

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 ($\overline{T/R}$, \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	$V_I < 0$ V		-50	mA
I_{OK}	DC Output Diode Current	$V_O < 0$ V		-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	V
		Machine Model, JESD22-A115, STM 5.2		200	

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 ($\overline{T/R}$, \overline{OE})	0	V_{CCA}	
I_{OH}/I_{OL}	Output Current	V_{CC0}	3.0 V to 3.6 V	±24	mA
			2.3 V to 2.7 V	±18	
			1.65 V to 1.95 V	±6	
			1.40 V to 1.65 V	±2	
			1.1 V to 1.4 V	±0.5	
T_A	Operating Temperature, Free Air		-40	+85	°C
$\Delta V/\Delta t$	Minimum Input Edge Rate	$V_{CCA/B} = 1.1$ V to 3.6 V		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} = -100 μ A	1.1 to 3.6	1.1 to 3.6	V _{CCO} - 0.2		V
		I _{OH} = -12 mA	2.7	2.7	2.2		
		I _{OH} = -18 mA	3.0	3.0	2.4		
		I _{OH} = -24 mA	3.0	3.0	2.2		
		I _{OH} = -6 mA	2.3	2.3	2.0		
		I _{OH} = -12 mA	2.3	2.3	1.8		
		I _{OH} = -18 mA	2.3	2.3	1.7		
		I _{OH} = -6 mA	1.65	1.65	1.25		
		I _{OH} = -2 mA	1.4	1.4	1.05		
		I _{OH} = -0.5 mA	1.1	1.1	0.75 x V _{CCO}		
V _{OL}	LOW Level Output ⁽⁴⁾	I _{OL} = 100 μ A	1.1 to 3.6	1.1 to 3.6		0.2	V
		I _{OL} = 12 mA	2.7	2.7		0.4	
		I _{OL} = 18 mA	3.0	3.0		0.4	
		I _{OL} = 24 mA	3.0	3.0		0.55	
		I _{OL} = 12 mA	2.3	2.3		0.4	
		I _{OL} = 18 mA	2.3	2.3		0.6	
		I _{OL} = 6 mA	1.65	1.65		0.3	
		I _{OL} = 2 mA	1.4	1.4		0.35	
		I _{OL} = 0.5mA	1.1	1.1		0.3 x V _{CCO}	

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 =0 V to 3.6 V	0	3.6		±10	μA
		B _n , V _I or V _O =0 V to 3.6 V	3.6	0		±10	
I _{OZ}	3-State Output Leakage (0 ≤ V _O ≤ 3.6 V, 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	
ΔI _{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

 $V_{CCA}=3.0\text{ V to }3.6\text{ V}$

V _{CCA} =3.0 V to 3.6 V												
Symbol	Parameter	T _A = -40 to +85°C										Units
		V _{CCB} =3.0 V to 3.6 V		V _{CCB} =2.3 V to 2.7 V		V _{CCB} =1.65 V to 1.95 V		V _{CCB} =1.4 V to 1.6 V		V _{CCB} =1.1 V to 1.3 V		
		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	

 $V_{CCA}=2.3\text{ V to }2.7\text{ V}$

Symbol	Parameter	T _A = -40 to +85°C										Units
		V _{CCB} =3.0 V to 3.6 V		V _{CCB} =2.3 V to 2.7 V		V _{CCB} =1.65 V to 1.95 V		V _{CCB} =1.4 V to 1.6 V		V _{CCB} =1.1 V to 1.3 V		
		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	

 $V_{CCA}=1.65\text{ V to }1.95\text{ V}$

Symbol	Parameter	T _A = -40 to +85°C										Units
		V _{CCB} =3.0 V to 3.6 V		V _{CCB} =2.3 V to 2.7 V		V _{CCB} =1.65 V to 1.95 V		V _{CCB} =1.4 V to 1.6 V		V _{CCB} =1.1 V to 1.3 V		
		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) $V_{CCA}=1.4\text{ V to }1.6\text{ V}$

V _{CCA} =1.4 V to 1.6 V												
Symbol	Parameter	T _A = -40 to +85°C										Units
		V _{CCB} =3.0 V to 3.6 V		V _{CCB} =2.3 V to 2.7 V		V _{CCB} =1.65 V to 1.95 V		V _{CCB} =1.4 V to 1.6 V		V _{CCB} =1.1 V to 1.3 V		
		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	

 $V_{CCA}=1.1\text{ V to }1.3\text{ V}$

Symbol	Parameter	T _A = -40 to +85°C										Units
		V _{CCB} =3.0 V to 3.6 V		V _{CCB} =2.3 V to 2.7 V		V _{CCB} =1.65 V to 1.95 V		V _{CCB} =1.4 V to 1.6 V		V _{CCB} =1.1 V to 1.3 V		
		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	$T_A=+25^\circ\text{C}$	Units
			Typical	
C_{IN}	Input Capacitance	$V_{CCA}=V_{CCB}=0\text{ V}$, $V_I=0\text{ V}$ or $V_{CCA/B}$	4	pF
$C_{I/O}$	Input/Output Capacitance	$V_{CCA}=V_{CCB}=3.3\text{ V}$, $V_I=0\text{ V}$ or $V_{CCA/B}$	5	pF
C_{PD}	Power Dissipation Capacitance	$V_{CCA}=V_{CCB}=3.3\text{ V}$, $V_I=0\text{ V}$ or V_{CC} , $f=10\text{ MHz}$	20	pF

AC Loadings and Waveforms

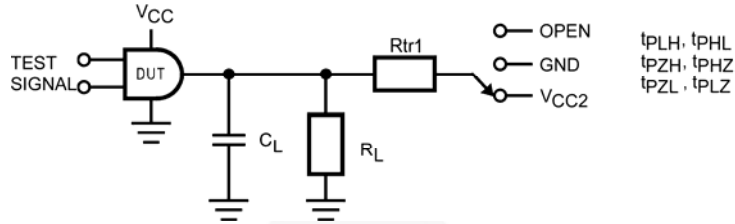
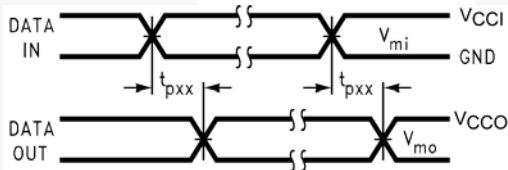


Figure 2. AC Test Circuit

Test	Switch
t_{PLH}, t_{PHL}	Open
t_{PLZ}, t_{PZL}	$V_{CC0} \bullet 2$ at $V_{CC0}=3.3 \pm 0.3 \text{ V}, 2.5 \text{ V} \pm 0.2 \text{ V}, 1.8 \text{ V} \pm 0.15 \text{ V}, 1.5 \text{ V} \pm 0.1 \text{ V}, 1.2 \text{ V} \pm 0.1 \text{ V}$
t_{PHZ}, t_{PZH}	GND

Table 1. AC Load Table

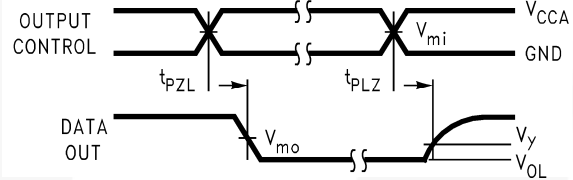
V_{CC0}	C_L	R_L	R_{tr1}
$1.2 \text{ V} \pm 0.1 \text{ V}$	15 pF	2 k Ω	2 k Ω
$1.5 \text{ V} \pm 0.1 \text{ V}$	15 pF	2 k Ω	2 k Ω
$1.8 \text{ V} \pm 0.15 \text{ V}$	30 pF	500 k Ω	500 k Ω
$2.5 \text{ V} \pm 0.2 \text{ V}$	30 pF	500 k Ω	500 k Ω
$3.3 \text{ V} \pm 0.3 \text{ V}$	30 pF	500 k Ω	500 k Ω



Note:

7. Input $t_R=t_F=2.0 \text{ ns}$, 10% to 90%

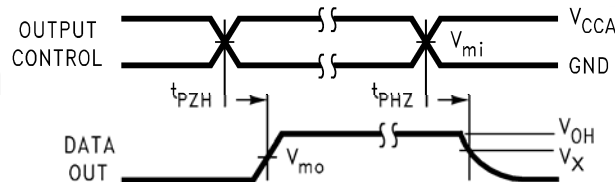
Figure 3. Waveform for Inverting and Non-Inverting Functions



Note:

8. Input $t_R=t_F=2.0 \text{ ns}$, 10% to 90%

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



Note:

9. Input $t_R=t_F=2.0 \text{ ns}$, 10% to 90%

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

Symbol	V_{CC}				
	$3.3 \text{ V} \pm 0.3 \text{ V}$	$2.5 \text{ V} \pm 0.2 \text{ V}$	$1.8 \text{ V} \pm 0.15 \text{ V}$	$1.5 \text{ V} \pm 0.1 \text{ V}$	$1.2 \text{ V} \pm 0.1 \text{ V}$
V_{MI}	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$
V_{MO}	$V_{CC0}/2$	$V_{CC0}/2$	$V_{CC0}/2$	$V_{CC0}/2$	$V_{CC0}/2$
V_X	$V_{OH} - 0.3 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$	$V_{OH} - 0.1 \text{ V}$	$V_{OH} - 0.1 \text{ V}$
V_Y	$V_{OL} + 0.3 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.15 \text{ V}$	$V_{OL} + 0.1 \text{ V}$	$V_{OL} + 0.1 \text{ V}$

Note:

10. For V_{MI} $V_{CC0}=V_{CCA}$ for control pins $\overline{T/R}$ 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 0 V, outputs are in a High-impedance state. The control inputs ($\overline{T/R}$ 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.

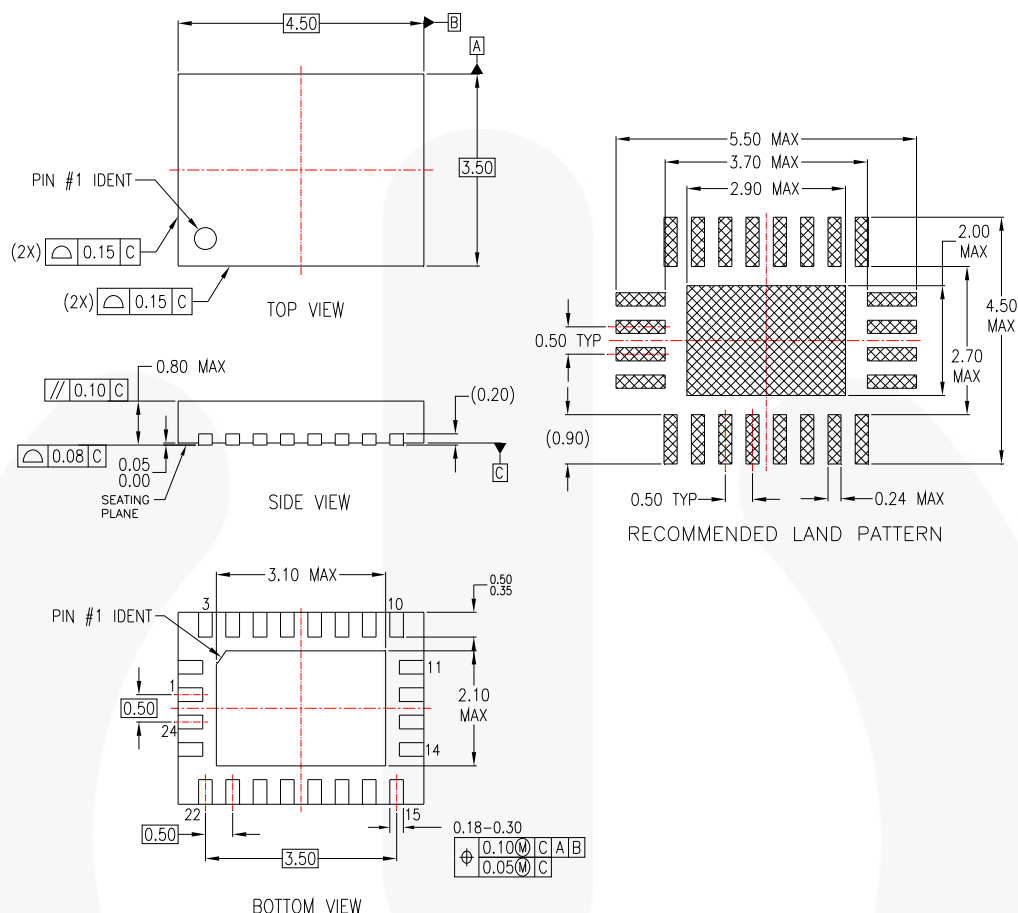
The recommended power-up sequence is:

1. Apply power to either V_{CC} .
2. Apply power to the $\overline{T/R}$ 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:

- CONFORMS TO JEDEC REGISTRATION MO-220, VARIATION WFSD-2 FOR DIMENSIONS ONLY. PIN NUMBERING DOES NOT COMPLY.
- DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP24Brev4

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

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/packaging/>.

For current tape and reel specifications, visit Fairchild Semiconductor's online packaging area:

http://www.fairchildsemi.com/packaging/MLP24B_TNR.pdf.




TRADEMARKS



The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AX-CAP®
BitSiC™
Build it Now™
CorePLUSTM
CorePOWER™
CROSSVOL7™
CTL™

Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™

ESBC™
 Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™

F-PFS™
FRFET®
Global Power Resource™
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®

 PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QST™
Quiet Series™
RapidConfigure™
 Saving our world, 1mW/WkV at a time™
SignalVise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™

 SYSTEM GENERAL®
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®
µSerDes™
 UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XST™
仙童™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. 168

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local
Sales Representative