Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

August 2009

FXL4TD245

Low-Voltage Dual-Supply 4-Bit Signal Translator with Configurable Voltage Supplies and Signal Levels and 3-STATE Outputs and Independent Direction Controls

Features

- Bi-directional interface between any 2 levels from 1.1V to 3.6V
- Fully configurable: inputs track V_{CC} level
- Non-preferential power-up sequencing; 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 ($T/\overline{R}_n$, $\overline{OE}$) levels are referenced to V_{CCA} voltage
- Packaged in 16-terminal DQFN (2.5mm x 3.5mm) and 16-terminal MicroMLP (1.8mm x 2.6mm)
- ESD protections exceeds:
  - 4kV HBM ESD (per JESD22-A114 & Mil Std 883e 3015.7)
  - 8kV HBM I/O to GND ESD (per JESD22-A114 & Mil Std 883e 3015.7)
  - 1kV CDM ESD (per ESD STM 5.3)
  - 200V MM ESD (per JESD22-A115 & ESD STM5.2)

General Description

The FXL4TD245 is a configurable 4-bit dual-voltage-supply translator designed for both uni-directional and bi-directional voltage translation between two logic 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. 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. Internal power down control circuits place the device in 3-STATE if either V_{CC} is removed.

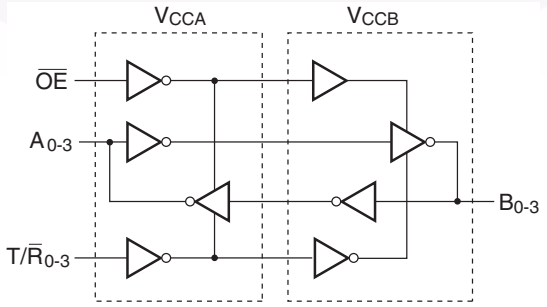
The Transmit/Receive ($T/\overline{R}$) inputs independently determine the direction of data through each of the four bits. The $\overline{OE}$ input, when HIGH, disables both the A and B Ports by placing them in a 3-STATE condition. The FXL4TD245 is designed so that the control pins ($T/\overline{R}$ and $\overline{OE}$) are supplied by V_{CCA}.

Ordering Information

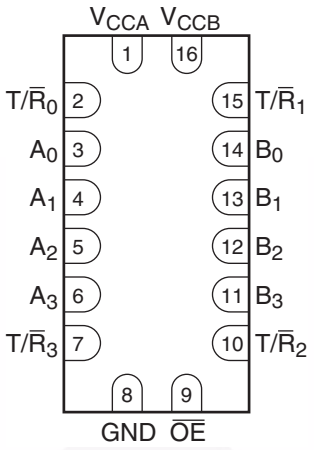
Order Number	Package Number	Eco Status	Package Description
FXL4TD245BQX	MLP016E	Green	16-Terminal Depopulated Quad Very-Thin Flat Pack, No Leads (DQFN), JEDEC MO-241, 2.5mm x 3.5mm
FXL4TD245UMX	UMLP16A	Green	16-Terminal Quad, Ultrathin, Molded Leadless Package (UMLP), 1.8mm x 2.6mm, 0.4mm Pitch

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

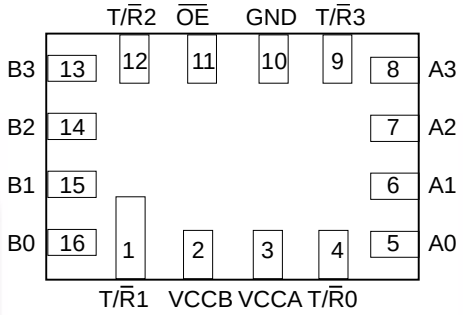
Functional Diagram



Connection Diagrams

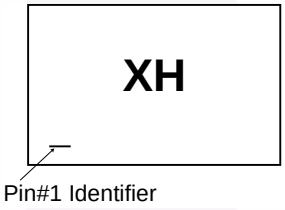


DQFN Pad Assignments (Top Through View)



MicroMLP Pad Assignments (Top Through View)

Top Mark



MicroMLP Top Mark (Top View)

Pin Assignment

DQFN Pin #	µMLP Pin #	Terminal Name	Description
1	3	V_{CCA}	Side A Power Supply
2	4	$T/\overline{R}_0$	Transmit/Receive Input
3–6	5–8	A_0–A_3	Side A Inputs or 3-STATE Outputs
7	9	$T/\overline{R}_3$	Transmit/Receive Input
8	10	GND	Ground
9	11	$\overline{OE}$	Output Enable Input
10	12	$T/\overline{R}_2$	Transmit/Receive Input
11–14	13–16	B_3–B_0	Side B Inputs or 3-STATE Outputs
15	1	$T/\overline{R}_1$	Transmit/Receive Input
16	2	V_{CCB}	Side B Power Supply

Truth Table

Inputs					Outputs
$\overline{OE}$	$T/\overline{R}_0$	$T/\overline{R}_1$	$T/\overline{R}_2$	$T/\overline{R}_3$	
L	L	X	X	X	B0 Data to A0 Output
L	H	X	X	X	A0 Data to B0 Output
L	X	L	X	X	B1 Data to A1 Output
L	X	H	X	X	A1 Data to B1 Output
L	X	X	L	X	B2 Data to A2 Output
L	X	X	H	X	A2 Data to B2 Output
L	X	X	X	L	B3 Data to A3 Output
L	X	X	X	H	A3 Data to B3 Output
H	X	X	X	X	3-State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

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 volts, outputs are in a HIGH-Impedance state. The control inputs ($T/\overline{R}_n$ 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 $\overline{OE}$ driver.

The recommended power-up sequence is the following:

1. Apply power to either V_{CC}.
2. Apply power to the $T/\overline{R}_n$ inputs (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 other V_{CC}.
4. Drive the $\overline{OE}$ input LOW to enable the device.

The recommended power-down sequence is the following:

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

Absolute Maximum Ratings

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.

Symbol	Parameter	Rating
V_{CCA}, V_{CCB}	Supply Voltage	−0.5V to +4.6V
V_I	DC Input Voltage	
	I/O Port A	−0.5V to +4.6V
	I/O Port B	−0.5V to +4.6V
	Control Inputs ($T/\overline{R}_n$, $\overline{OE}$)	−0.5V to +4.6V
V_O	Output Voltage[1]	
	Outputs 3-STATE	−0.5V to +4.6V
	Outputs Active (A_n)	−0.5V to V_{CCA} + 0.5V
	Outputs Active (B_n)	−0.5V to V_{CCB} + 0.5V
I_{IK}	DC Input Diode Current @ V_I < 0V	−50mA
I_{OK}	DC Output Diode Current @	
	V_O < 0V	−50mA
	V_O > V_{CC}	+50mA
I_{OH} / I_{OL}	DC Output Source/Sink Current	−50mA / +50mA
I_{CC}	DC V_{CC} or Ground Current per Supply Pin	±100mA
T_{STG}	Storage Temperature Range	−65°C to +150°C

Recommended Operating Conditions[2]

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	Rating
V_{CCA} or V_{CCB}	Power Supply Operating	1.1V to 3.6V
	Input Voltage	
	Port A	0.0V to 3.6V
	Port B	0.0V to 3.6V
	Control Inputs ($T/\overline{R}_n$, $\overline{OE}$)	0.0V to V_{CCA}
	Output Current in I_{OH}/I_{OL} with V_{CC} @	
	3.0V to 3.6V	±24mA
	2.3V to 2.7V	±18mA
	1.65V to 1.95V	±6mA
	1.4V to 1.65V	±2mA
	1.1V to 1.4V	±0.5mA
T_A	Free Air Operating Temperature	−40°C to +85°C
$\Delta t / \Delta V$	Maximum Input Edge Rate $V_{CCA/B}$ = 1.1V to 3.6V	10ns/V

Notes:

1. I_O Absolute Maximum Rating must be observed.
2. All unused inputs and I/O pins must be held at V_{CCI} or GND.

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CCI} (V)	V_{CCO} (V)	Min.	Max.	Units
V_{IH}	High Level Input Voltage[3]	Data Inputs A_n, B_n	2.7–3.6	1.1–3.6	2.0		V
			2.3–2.7		1.6		
			1.65–2.3		0.65 x V_{CCI}		
			1.4–1.65		0.65 x V_{CCI}		
			1.1–1.4		0.9 x V_{CCI}		
		Control Pins $\overline{OE}$, T/$\overline{R}_n$ (Referenced to V_{CCA})	2.7–3.6	1.1–3.6	2.0		
			2.3–2.7		1.6		
			1.65–2.3		0.65 x V_{CCA}		
			1.4–1.65		0.65 x V_{CCA}		
			1.1–1.4		0.9 x V_{CCA}		
V_{IL}	Low Level Input Voltage[3]	Data Inputs A_n, B_n	2.7–3.6	1.1–3.6		0.8	V
			2.3–2.7			0.7	
			1.65–2.3			0.35 x V_{CCI}	
			1.4–1.65			0.35 x V_{CCI}	
			1.1–1.4			0.1 x V_{CCI}	
		Control Pins $\overline{OE}$, T/$\overline{R}_n$ (Referenced to V_{CCA})	2.7–3.6	1.1–3.6		0.8	
			2.3–2.7			0.7	
			1.65–2.3			0.35 x V_{CCA}	
			1.4–1.65			0.35 x V_{CCA}	
			1.1–1.4			0.1 x V_{CCA}	
V_{OH}	High Level Output Voltage[4]	I_{OH} = –100μA	1.1–3.6	1.1–3.6	V_{CC0}–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 Voltage[4]	I_{OL} = 100μA	1.1–3.6	1.1- 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}	

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	V_{CCI} (V)	V_{CCO} (V)	Min.	Max.	Units
I_I	Input Leakage Current. Control Pins	$V_I = V_{CCA}$ or GND	1.1–3.6	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		±10.0	µA
		B_n, V_I or V_O = 0V to 3.6V	3.6	0		±10.0	
I_{OZ}	3-STATE Output Leakage[5] $0 \le V_O \le 3.6V$ $V_I = V_{IH}$ or V_{IL}	A_n, B_n $\overline{OE} = V_{IH}$	3.6	3.6		±10.0	µA
		B_n, $\overline{OE}$ = Don't Care	0	3.6		+10.0	
		A_n, $\overline{OE}$ = Don't Care	3.6	0		+10.0	
$I_{CCA/B}$	Quiescent Supply Current[6]	$V_I = V_{CCI}$ or GND; $I_O = 0$	1.1–3.6	1.1–3.6		20.0	µA
I_{CCZ}	Quiescent Supply Current[6]	$V_I = V_{CCI}$ or GND; $I_O = 0$	1.1–3.6	1.1–3.6		20.0	µA
I_{CCA}	Quiescent Supply Current	$V_I = V_{CCA}$ or GND; $I_O = 0$	0	1.1–3.6		−10.0	µA
		$V_I = V_{CCA}$ or GND; $I_O = 0$	1.1–3.6	0		10.0	µA
I_{CCB}	Quiescent Supply Current	$V_I = V_{CCB}$ or GND; $I_O = 0$	1.1–3.6	0		−10.0	µA
		$V_I = V_{CCB}$ or GND; $I_O = 0$	0	1.1–3.6		10.0	µA
$\Delta I_{CCA/B}$	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	$T_A = -40°C$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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	$T_A = -40°C$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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	$T_A = -40°C$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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	$T_A = -40°C$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ to A	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	

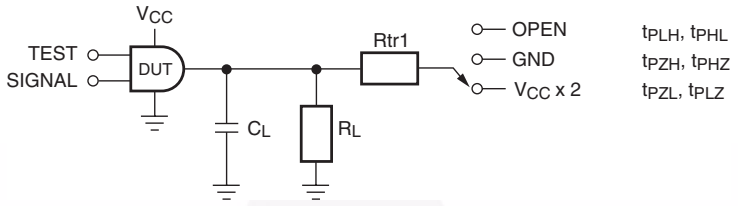
V_{CCA} = 1.1V to 1.3V

Symbol	Parameter	$T_A = -40°C$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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 $\overline{OE}$ 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	$T_A = +25°C$	Units
			Typical	
C_{IN}	Input Capacitance Control Pins ($\overline{OE}$, T/$\overline{R}$)	$V_{CCA} = V_{CCB} = 3.3V$, $V_I = 0V$ or $V_{CCA/B}$	4.0	pF
$C_{I/O}$	Input/Output Capacitance A_n, B_n Ports	$V_{CCA} = V_{CCB} = 3.3V$, $V_I = 0V$ or $V_{CCA/B}$	5.0	pF
C_{PD}	Power Dissipation Capacitance	$V_{CCA} = V_{CCB} = 3.3V$, $V_I = 0V$ or V_{CC}, F = 10MHz	20.0	pF

AC Loading and Waveforms

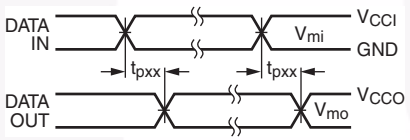


Test	Switch
t_{PLH}, t_{PHL}	OPEN
t_{PLZ}, t_{PZL}	V_{CCO} x 2 at V_{CCO} = 3.3 ± 0.3V, 2.5V ± 0.2V, 1.8V ± 0.15V, 1.5V ± 0.1V, 1.2V ± 0.1V
t_{PHZ}, t_{PZH}	GND

Figure 1. AC Test Circuit

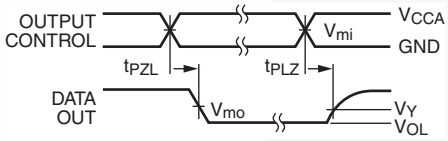
AC Load Table

V_{CCO}	C_L	R_L	Rtr1
1.2V ± 0.1V	15pF	2kΩ	2kΩ
1.5V ± 0.1V	15pF	2kΩ	2kΩ
1.8V ± 0.15V	15pF	2kΩ	2kΩ
2.5V ± 0.2V	15pF	2kΩ	2kΩ
3.3V ± 0.3V	15pF	2kΩ	2kΩ



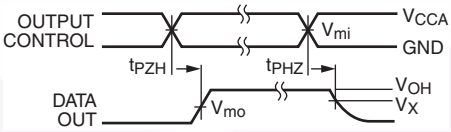
Input $t_R = t_F$ = 2.0 ns, 10% to 90%
Input $t_R = t_F$ = 2.5ns, 10% to 90%, @ V_I = 3.0V to 3.6V only

Figure 2. Waveform for Inverting and Non-Inverting Functions



Input $t_R = t_F$ = 2.0 ns, 10% to 90%
Input $t_R = t_F$ = 2.5ns, 10% to 90%, @ V_I = 3.0V to 3.6V only

Figure 3. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic



Input $t_R = t_F$ = 2.0 ns, 10% to 90%
Input $t_R = t_F$ = 2.5ns, 10% to 90%, @ V_I = 3.0V to 3.6V only

Figure 4. 3-STATE Output High Enable and Disable Times 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	$V_{OL}+0.3V$	$V_{OL}+0.15V$	$V_{OL}+0.15V$	$V_{OL}+0.1V$	$V_{OL}+0.1V$

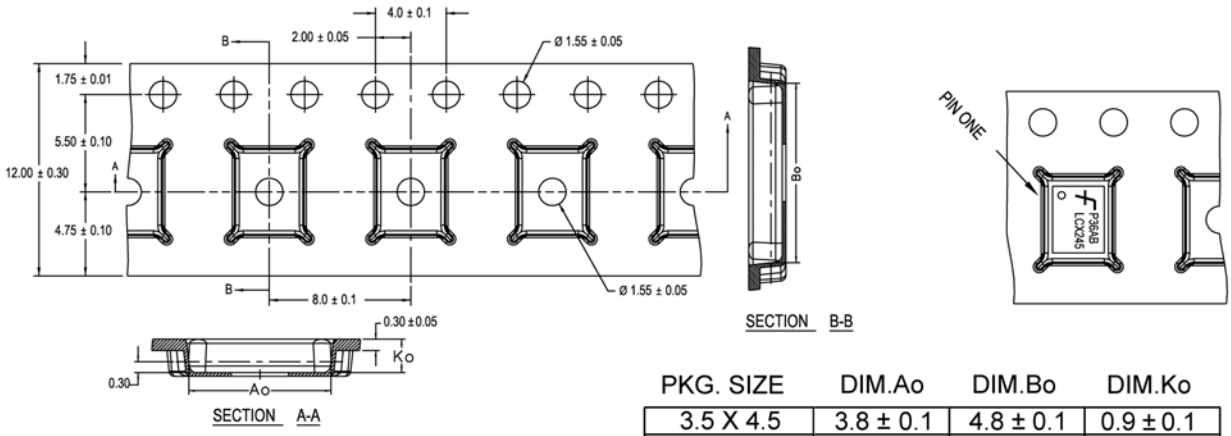
For V_{mi}: $V_{CCI} = V_{CCA}$ for Control Pins T/$\overline{R}$ and $\overline{OE}$, or $V_{CCA}/2$

Tape and Reel Specification

Tape Format for DQFN 10

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
BQX	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	2500/3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

Tape Dimensions millimeters



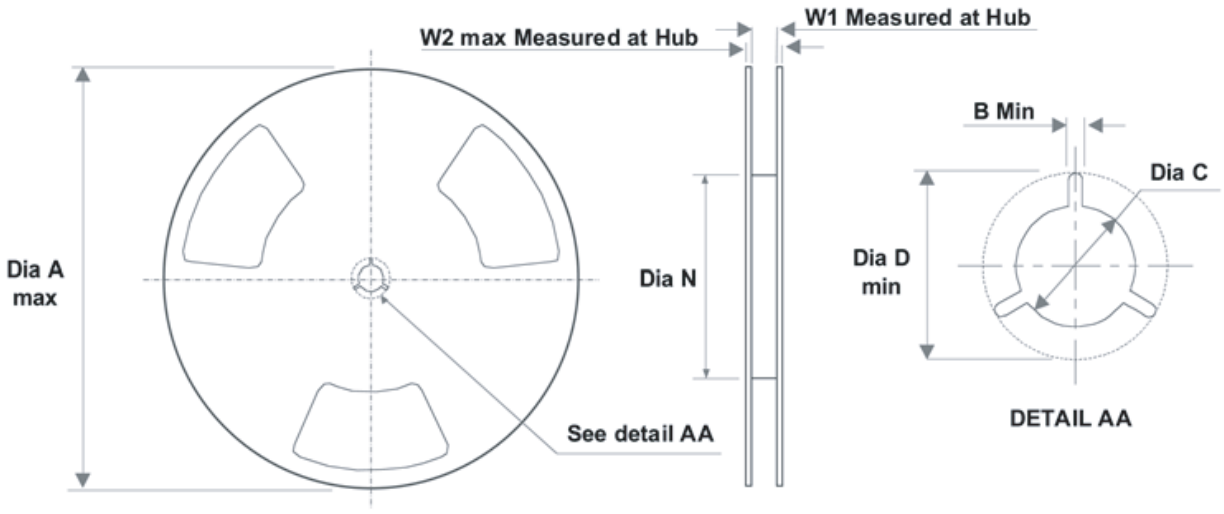
PKG. SIZE	DIM.Ao	DIM.Bo	DIM.Ko
3.5 X 4.5	3.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
3.0 X 3.0	3.3 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 4.5	2.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
2.5 X 3.5	2.8 ± 0.1	3.8 ± 0.1	0.9 ± 0.1
2.5 X 3.0	2.8 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 2.5	2.8 ± 0.1	2.8 ± 0.1	0.9 ± 0.1

DIMENSIONS ARE IN MILLIMETERS

NOTES: unless otherwise specified

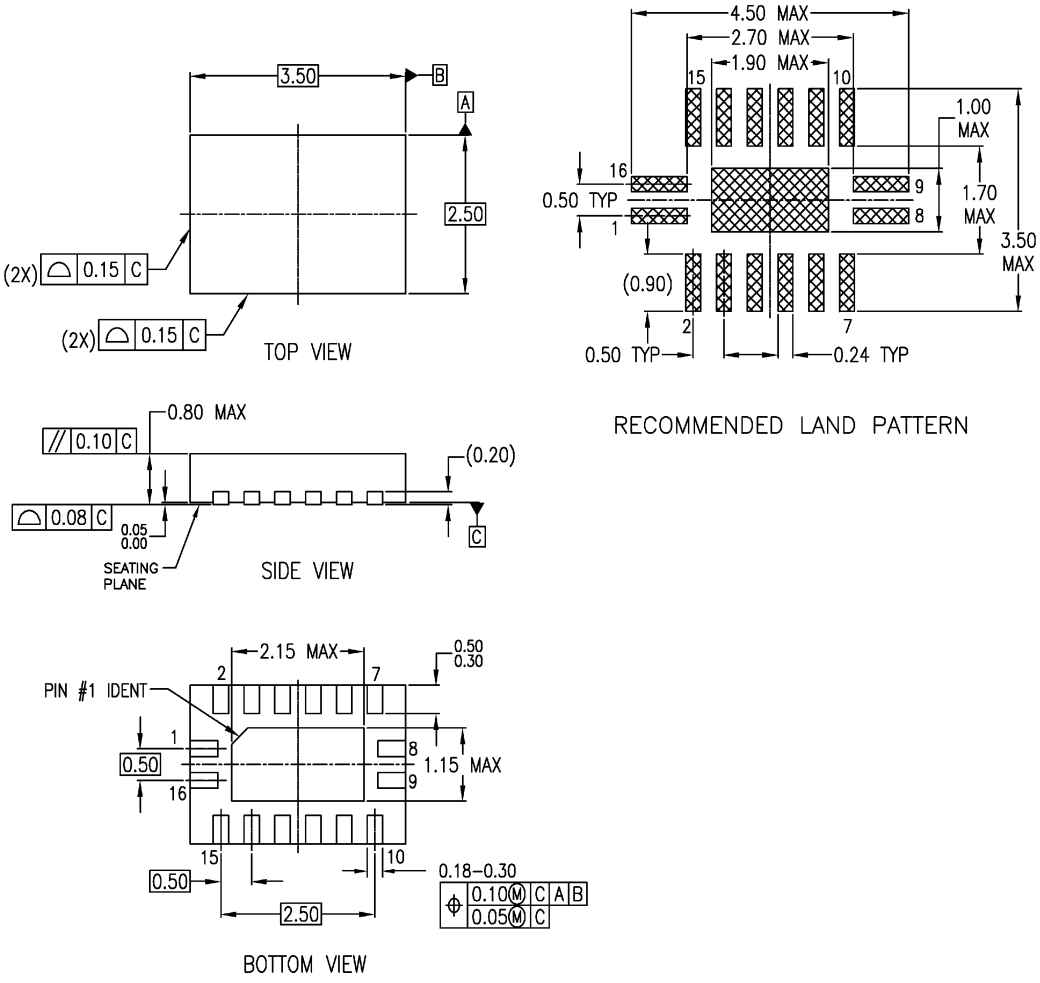
1. Cummulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is ±0.002[0.05] for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Diemension in inches rounded.

Reel Dimensions inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2
12 mm	13.0 (330)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	7.008 (178)	0.488 (12.4)	0.724 (18.4)

Physical Dimensions



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO–241, VARIATION AB
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

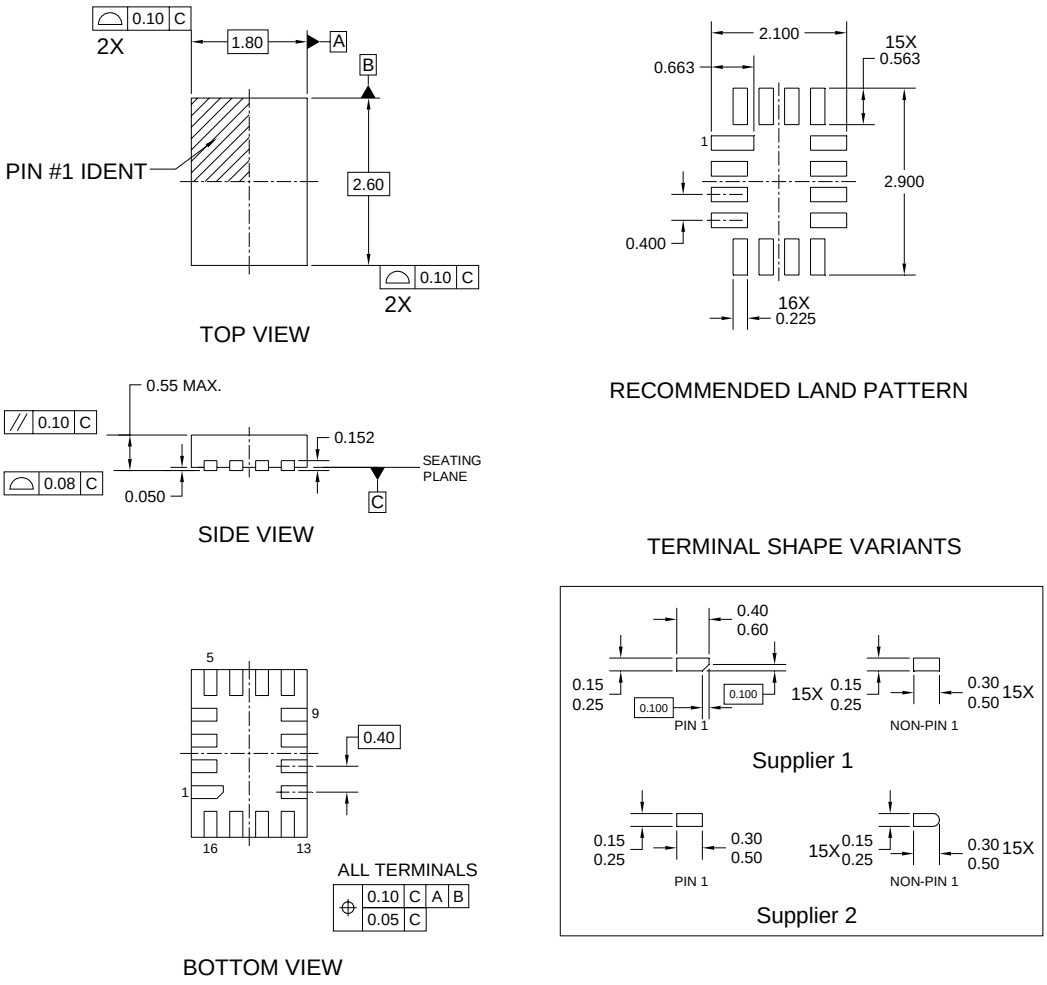
MLP016ErevA

Figure 5. 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241 2.5 x 3.5mm

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/.

Physical Dimensions



NOTES:

A. THIS PACKAGE IS NOT CURRENTLY REGISTERED WITH ANY STANDARDS COMMITTEE
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
D. TERMINAL SHAPE MAY VARY ACCORDING TO PACKAGE SUPPLIER, SEE TERMINAL SHAPE VARIANTS
E. LAND PATTERN IS A MINIMAL TOE DESIGN
F. DRAWING FILE NAME : UMLP16AREV3

Figure 5. 16-Terminal Quad, Ultrathin, Molded Leadless Package (UMLP), 1.8mm x 2.6mm

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/.

FAIRCHILD SEMICONDUCTOR®

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™
Auto-SPM™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
EcoSPARK®
EfficientMax™
EZSWITCH™*
E²™*
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource℠
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS™
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
The Power Franchise®
the power franchise
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TriFault Detect™
TRUECURRENT™*
µSerDes™
µ SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
XS™

* 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. I42

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