

# Low-Voltage, Dual-Supply, 8-Bit, Signal Translator with Configurable Voltage Supplies, Bushold Data Inputs, 3-State Outputs and 26 $\Omega$ Series Resistors in the B-Port Outputs

## FXLH42245

### Description

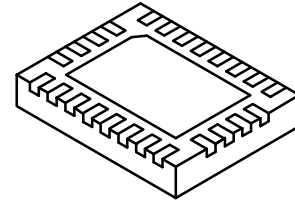
The FXLH42245 is a configurable dual-voltage-supply translator designed for bi-directional voltage translation of signals between two voltage levels. The device allows translation between voltages as high as 3.6 V to as low as 1.1 V. The A port tracks the  $V_{CCA}$  level and the B port tracks the  $V_{CCB}$  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 FXLH42245 is designed with the control pins ( $T/\bar{R}$  and  $\overline{OE}$ ) supplied by  $V_{CCA}$ .

### 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
- Bushold on Data Inputs Eliminates the need for External Pull-Up / Pull-Down Resistors
- 26  $\Omega$  Output Series Resistors on the B Port to Reduce Line Noise
- Power-Off Protection
- Control Input ( $T/\bar{R}$ ,  $\overline{OE}$ ) Levels are Referenced to  $V_{CCA}$  Voltage
- Packaged in 24-Pin MLP
- ESD Protection Exceeds:
  - ◆ 4 kV Human Body Model (JESD22-A114 & Mil Std 883e 3015.7)
  - ◆ 8 kV Human Body Model I/O to GND (JESD22-A114 & Mil Std 883e 3015.7)
  - ◆ 1 kV Charge Device Model (ESD STM 5.3)
  - ◆ 200 V Machine Model (JESD22-A115 & ESD STM5.2)



WQFN24, 4.5 x 3.5, 0.5P  
CASE 510CE

### MARKING DIAGRAM



\$Y = onsemi logo  
 &Z = Assembly Plant Code  
 &2 = 2-Digit Date Code  
 &K = 2-Digits Lot Run Traceability Code  
 FXLH42245 = Specific Device Code

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
FXLH42245MPX	WQFN24 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](http://www.onsemi.com/BRD8011/D).

# FXLH42245

## PIN CONFIGURATION

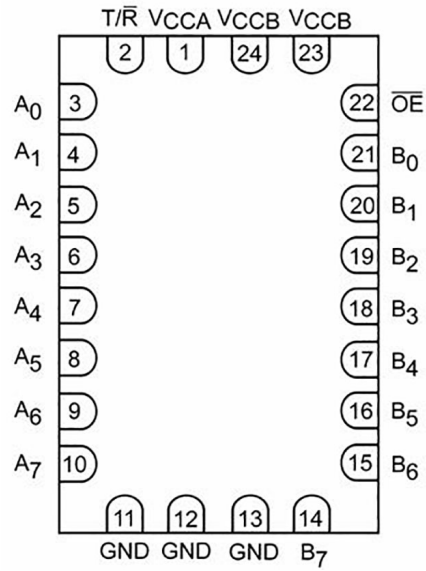


Figure 1. Pin Configuration (Top Through View)

## PIN DEFINITIONS

Pin No.	Name	Description
1	V <sub>CCA</sub>	Side-A Power Supply
2	T/R	Transmit / Receive Input
3, 4, 5, 6, 7, 8, 9, 10	A <sub>0</sub> , A <sub>1</sub> , A <sub>2</sub> , A <sub>3</sub> , A <sub>4</sub> , A <sub>5</sub> , A <sub>6</sub> , A <sub>7</sub>	Side-A Inputs or 3-State Outputs
11, 12, 13	GND	Ground
14, 15, 16, 17, 18, 19, 20, 21	B <sub>7</sub> , B <sub>6</sub> , B <sub>5</sub> , B <sub>4</sub> , B <sub>3</sub> , B <sub>2</sub> , B <sub>1</sub> , B <sub>0</sub>	Side-B Inputs or 3-State Outputs
22	OE	Output Enable Input
23, 24	V <sub>CCB</sub>	Side-B Power Supply

## TRUTH TABLE

Inputs		Description
OE	T/R	
LOW Voltage Level	LOW Voltage Level	Bus B Data to Bus A
LOW Voltage Level	HIGH Voltage Level	Bus A Date to Bus B
HIGH Voltage Level	Don't Care	3-State

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Condition	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	$V_{CCA} + 0.5$	V
		I/O Port B	-0.5	$V_{CCB} + 0.5$	
		Control Inputs (T/R, OE)	-0.5	4.6	
$V_O$	Output Voltage (Note 1)	Output 3-State	-0.5	4.6	V
		Output Active ( $A_n$ )	-0.5	$V_{CCA} + 0.5$	
		Output Active ( $B_n$ )	-0.5	$V_{CCB} + 0.5$	
$I_{IK}$	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			$\pm 50$	mA
$I_{CC}$	DC $V_{CC}$ or Ground Current per Supply Pin			$\pm 100$	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	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. I/O absolute maximum ratings must be observed.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CC</sub>	Power Supply	Operating V <sub>CCA</sub> or V <sub>CCB</sub>		1.1	3.6	V
V <sub>I</sub>	Input Voltage	Port A		0	V <sub>CCA</sub>	V
		Port B		0	V <sub>CCB</sub>	
		Control Input (T/R, OE)		0	V <sub>CCA</sub>	
I <sub>OH</sub> /I <sub>OL</sub>	Output Current	Port A V <sub>CCA</sub>	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	
		Port B V <sub>CCB</sub> Resistor Outputs	3.0 V to 3.6 V		±14	
			2.3 V to 2.7 V		±8	
			1.65 V to 1.95 V		±3	
			1.40 V to 1.65 V		±1	
			1.1 V to 1.4. V		±0.25	
T <sub>A</sub>	Operating Temperature, Free Air			−40	+85	°C
ΔV/Δt	Input Edge Rate	V <sub>CCA/B</sub> = 1.1 V to 3.6 V			10	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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

# FXLH42245

## ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V <sub>CCI</sub> (V)	V <sub>CC0</sub> (V)	Min	Max	Unit
V <sub>IH</sub>	HIGH Level Input (Note 3)	Data Inputs An, Bn	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 <sub>CCI</sub>	–	
			1.40 to 1.65		0.65 x V <sub>CCI</sub>	–	
			1.10 to 1.40		0.9 x V <sub>CCI</sub>	–	
		Control Pins $\overline{OE}$ , T/ $\overline{R}$ (Referenced to V <sub>CCA</sub> )	2.70 to 3.60	1.1 to 3.6	2.0	–	
			2.30 to 2.70		1.6	–	
			1.65 to 2.30		0.65 x V <sub>CCA</sub>	–	
			1.40 to 1.65		0.65 x V <sub>CCA</sub>	–	
			1.10 to 1.40		0.9 x V <sub>CCA</sub>	–	
V <sub>IL</sub>	LOW Level Input (Note 3)	Data Inputs An, Bn	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 <sub>CCI</sub>	
			1.40 to 1.65		–	0.35 x V <sub>CCI</sub>	
			1.10 to 1.40		–	0.10 x V <sub>CCI</sub>	
		Control Pins $\overline{OE}$ , T/ $\overline{R}$ (Referenced to V <sub>CCA</sub> )	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 <sub>CCA</sub>	
			1.40 to 1.65		–	0.35 x V <sub>CCA</sub>	
			1.10 to 1.40		–	0.10 x V <sub>CCA</sub>	
V <sub>OH</sub>	HIGH Level Output B Port (Note 4)	I <sub>OH</sub> = –100 $\mu$ A	1.1 to 3.6	1.1 to 3.6	V <sub>CC0</sub> to 0.2	–	V
		I <sub>OH</sub> = –6 mA	2.7	2.7	2.2	–	
		I <sub>OH</sub> = –8 mA	3.0	3.0	2.4	–	
		I <sub>OH</sub> = –12 mA	3.0	3.0	2.2	–	
		I <sub>OH</sub> = –4 mA	2.3	2.3	2.0	–	
		I <sub>OH</sub> = –6 mA	2.3	2.3	1.8	–	
		I <sub>OH</sub> = –8 mA	2.3	2.3	1.7	–	
		I <sub>OH</sub> = –3 mA	1.65	1.65	1.25	–	
		I <sub>OH</sub> = –1 mA	1.4	1.4	1.05	–	
		I <sub>OH</sub> = –0.25 mA	1.1	1.1	0.75 x V <sub>CC0</sub>	–	
	HIGH Level Output A Port (Note 4)	I <sub>OH</sub> = –100 $\mu$ A	1.1 to 3.6	1.1 to 3.6	V <sub>CC0</sub> to 0.2	–	
		I <sub>OH</sub> = –12 mA	2.7	2.7	2.2	–	
		I <sub>OH</sub> = –18 mA	3.0	3.0	2.4	–	
		I <sub>OH</sub> = –24 mA	3.0	3.0	2.2	–	
		I <sub>OH</sub> = –6 mA	2.3	2.3	2.0	–	
		I <sub>OH</sub> = –12 mA	2.3	2.3	1.8	–	
		I <sub>OH</sub> = –18 mA	2.3	2.3	1.7	–	
		I <sub>OH</sub> = –6 mA	1.65	1.65	1.25	–	
		I <sub>OH</sub> = –2 mA	1.4	1.4	1.05	–	
		I <sub>OH</sub> = –0.5 mA	1.1	1.1	0.75 x V <sub>CC0</sub>	–	

## ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Conditions	V <sub>CCI</sub> (V)	V <sub>CCO</sub> (V)	Min	Max	Unit
V <sub>OL</sub>	LOW Level Output B Port (Note 4)	I <sub>OH</sub> = 100 $\mu$ A	1.1 to 3.6	1.1 to 3.6	–	0.2	V
		I <sub>OH</sub> = 6 mA	2.7	2.7	–	0.4	
		I <sub>OH</sub> = 8 mA	3.0	3.0	–	0.55	
		I <sub>OH</sub> = 12 mA	3.0	3.0	–	0.80	
		I <sub>OH</sub> = 6 mA	2.3	2.3	–	0.4	
		I <sub>OH</sub> = 8 mA	2.3	2.3	–	0.6	
		I <sub>OH</sub> = 3 mA	1.65	1.65	–	0.3	
		I <sub>OH</sub> = 1 mA	1.4	1.4	–	0.35	
		I <sub>OH</sub> = 0.25 mA	1.1	1.1	–	0.3 x V <sub>CCO</sub>	
	LOW Level Output A Port (Note 4)	I <sub>OH</sub> = 100 $\mu$ A	1.1 to 3.6	1.1 to 3.6	–	0.2	
		I <sub>OH</sub> = 12 mA	2.7	2.7	–	0.4	
		I <sub>OH</sub> = 18 mA	3.0	3.0	–	0.4	
		I <sub>OH</sub> = 24 mA	3.0	3.0	–	0.55	
		I <sub>OH</sub> = 12 mA	2.3	2.3	–	0.4	
		I <sub>OH</sub> = 18 mA	2.3	2.3	–	0.6	
		I <sub>OH</sub> = 6 mA	1.65	1.65	–	0.3	
		I <sub>OH</sub> = 2 mA	1.4	1.4	–	0.35	
		I <sub>OH</sub> = 0.5 mA	1.1	1.1	–	0.3 x V <sub>CCO</sub>	
I <sub>L</sub>	Input Leakage Current, Control Pins	V <sub>I</sub> = V <sub>CCA</sub> or GND	1.1 to 3.6	3.6	–	±1.0	$\mu$ A
I <sub>I(HOLD)</sub>	Bushold Input Minimum Drive Current	V <sub>IN</sub> = 0.8	3.0	3.0	75	–	$\mu$ A
		V <sub>IN</sub> = 2.0	3.0	3.0	–75	–	
		V <sub>IN</sub> = 0.7	2.3	2.3	45	–	
		V <sub>IN</sub> = 1.6	2.3	2.3	–45	–	
		V <sub>IN</sub> = 0.57	1.65	1.65	25	–	
		V <sub>IN</sub> = 10.7	1.65	1.65	–25	–	
		V <sub>IN</sub> = 0.49	1.4	1.4	11	–	
		V <sub>IN</sub> = 0.91	1.4	1.4	–11	–	
		V <sub>IN</sub> = 0.11	1.1	1.1	–	4	
		V <sub>IN</sub> = 0.99	1.1	1.1	–	–4	
I <sub>I(OD)</sub>	Bushold Input Over-Drive Current-to-Current State	(Note 5)	3.6	3.6	450	–	$\mu$ A
		(Note 6)	3.6	3.6	–450	–	
		(Note 5)	2.7	2.7	300	–	
		(Note 6)	2.7	2.7	–300	–	
		(Note 5)	1.95	1.95	200	–	
		(Note 6)	1.95	1.95	–200	–	
		(Note 5)	1.6	1.6	120	–	
		(Note 6)	1.6	1.6	–120	–	
		(Note 5)	1.4	1.4	80	–	
		(Note 6)	1.4	1.4	–80	–	

## ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Conditions	V <sub>CCI</sub> (V)	V <sub>CCO</sub> (V)	Min	Max	Unit
I <sub>OFF</sub>	Power Off Leakage Current	A <sub>n</sub> , V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	0	3.6	–	±10	μA
		B <sub>n</sub> , V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	3.6	0	–	±10	
I <sub>OZ</sub>	3–State Output Leakage (V <sub>O</sub> , V <sub>CC</sub> or GND V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> )	A <sub>n</sub> , B <sub>n</sub> , $\overline{OE}$ = V <sub>IH</sub>	3.6	3.6	–	±10	μA
		B <sub>n</sub> , $\overline{OE}$ = Don't Care (Note 7)	0	3.6	–	±10	
		A <sub>n</sub> , $\overline{OE}$ = Don't Care (Note 7)	3.6	0	–	±10	
I <sub>CCA/B</sub>	Quiescent Supply Current (Note 8)	V <sub>I</sub> = V <sub>CCI</sub> or GND; I <sub>O</sub> = 0	1.1 to 3.6	1.1 to 3.6	–	20	μA
I <sub>CCZ</sub>			1.1 to 3.6	1.1 to 3.6	–	20	μA
I <sub>CCA</sub>		V <sub>I</sub> = V <sub>CCA</sub> or GND; I <sub>O</sub> = 0	0	1.1 to 3.6	–	–10	μA
			1.1 to 3.6	0	–	10	
I <sub>CCB</sub>		V <sub>I</sub> = V <sub>CCB</sub> or GND; I <sub>O</sub> = 0	1.1 to 3.6	0	–	–10	μA
			0	1.1 to 3.6	–	10	
ΔI <sub>CCA/B</sub>	Increase in I <sub>CC</sub> per Input; Other Inputs at V <sub>CC</sub> or GND	V <sub>IH</sub> = 3.0	3.6	3.6	–	500	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. V<sub>CCI</sub> = the V<sub>CC</sub> associated with the data input under test.

4. V<sub>CCO</sub> = the V<sub>CC</sub> associated with the output under test.

5. An external driver must source at least the specified current to switch LOW-to-HIGH.

6. An external driver must source at least the specified current to switch HIGH-to-LOW.

7. Don't care = any valid logic level.

8. Reflects current per supply, V<sub>CCA</sub> or V<sub>CCB</sub>.

## AC ELECTRICAL CHARACTERISTICS

V<sub>CCA</sub> = 3.0 V to 3.6 V

Symbol	Parameter	T <sub>A</sub> = –40°C to +85°C										Unit
		V <sub>CCB</sub> = 3.0 V to 3.6 V		V <sub>CCB</sub> = 2.3 V to 2.7 V		V <sub>CCB</sub> = 1.65 V to 1.95 V		V <sub>CCB</sub> = 1.4 V to 1.6 V		V <sub>CCB</sub> = 1.1 V to 1.3 V		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay A to B	0.5	3.9	0.5	4.5	0.9	5.9	1.0	7.4	1.6	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 <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable OE–to–B	0.7	4.8	1.0	5.1	1.5	6.7	1.5	7.1	2.0	18.0	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 <sub>PHZ</sub> , t <sub>PZL</sub>	Output Enable OE–to–B	0.4	4.3	0.4	4.4	0.9	5.2	1.7	6.8	2.0	19.0	ns
	Output Enable OE–to–A	0.2	3.7	0.2	3.7	0.2	3.7	0.2	3.7	0.2	3.7	

# FXLH42245

## AC ELECTRICAL CHARACTERISTICS (continued)

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

Symbol	Parameter	T <sub>A</sub> = −40°C to +85°C										Unit
		V <sub>CCB</sub> = 3.0 V to 3.6 V		V <sub>CCB</sub> = 2.3 V to 2.7 V		V <sub>CCB</sub> = 1.65 V to 1.95 V		V <sub>CCB</sub> = 1.4 V to 1.6 V		V <sub>CCB</sub> = 1.1 V to 1.3 V		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay A to B	0.5	4.3	0.6	4.8	0.9	6.0	1.0	7.6	1.6	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 <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable OE−to−B	0.8	5.1	1.0	5.5	1.5	6.9	1.5	7.4	2.0	19.0	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 <sub>PHZ</sub> , t <sub>PZL</sub>	Output Enable OE−to−B	0.4	4.6	0.4	4.8	0.9	5.3	1.7	7.1	2.0	19.0	ns
	Output Enable 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 <sub>A</sub> = −40°C to +85°C										Unit
		V <sub>CCB</sub> = 3.0 V to 3.6 V		V <sub>CCB</sub> = 2.3 V to 2.7 V		V <sub>CCB</sub> = 1.65 V to 1.95 V		V <sub>CCB</sub> = 1.4 V to 1.6 V		V <sub>CCB</sub> = 1.1 V to 1.3 V		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay A to B	0.5	4.6	0.7	5.1	1.1	6.2	1.1	7.8	1.7	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 <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable OE−to−B	0.8	5.4	1.0	5.9	1.5	7.3	1.5	7.7	2.0	20.0	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 <sub>PHZ</sub> , t <sub>PZL</sub>	Output Enable OE−to−B	0.4	4.7	0.4	4.9	1.0	5.4	1.7	7.2	2.0	19.0	ns
	Output Enable OE−to−A	0.5	5.0	0.5	5.0	0.5	5.0	0.5	5.0	0.5	5.0	

# FXLH42245

## AC ELECTRICAL CHARACTERISTICS (continued)

$V_{CCA} = 1.4 \text{ V to } 1.6 \text{ V}$

Symbol	Parameter	T <sub>A</sub> = −40°C to +85°C										Unit
		V <sub>CCB</sub> = 3.0 V to 3.6 V		V <sub>CCB</sub> = 2.3 V to 2.7 V		V <sub>CCB</sub> = 1.65 V to 1.95 V		V <sub>CCB</sub> = 1.4 V to 1.6 V		V <sub>CCB</sub> = 1.1 V to 1.3 V		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay A to B	0.7	4.8	0.8	5.3	1.2	6.4	1.3	7.9	1.7	22.0	ns
	Propagation Delay B to A	0.6	6.8	0.8	6.9	0.9	7.1	1.0	7.3	1.2	9.5	
t <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable OE−to−B	1.1	5.8	1.3	6.3	1.5	7.8	2.0	8.1	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 <sub>PHZ</sub> , t <sub>PZL</sub>	Output Enable OE−to−B	0.6	4.8	0.6	5.1	1.1	5.8	2.0	7.7	2.0	18.0	ns
	Output Enable OE−to−A	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	0.5	6.0	

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

Symbol	Parameter	T <sub>A</sub> = −40°C to +85°C										Unit
		V <sub>CCB</sub> = 3.0 V to 3.6 V		V <sub>CCB</sub> = 2.3 V to 2.7 V		V <sub>CCB</sub> = 1.65 V to 1.95 V		V <sub>CCB</sub> = 1.4 V to 1.6 V		V <sub>CCB</sub> = 1.1 V to 1.3 V		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay A to B	1.0	13.8	1.0	7.8	1.0	8.4	1.0	10.4	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 <sub>PZL</sub> , t <sub>PZH</sub>	Output Enable OE−to−B	1.5	12.6	1.5	9.6	1.5	10.6	2.0	11.6	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 <sub>PHZ</sub> , t <sub>PZL</sub>	Output Enable OE−to−B	1.2	15.0	0.9	7.6	1.2	8.6	2.0	10.6	3.0	21.0	ns
	Output Enable OE−to−A	2.0	15.0	2.0	12.0	2.0	12.0	2.0	12.0	2.0	12.0	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## CAPACITANCE

Symbol	Parameter	Conditions	Typical ( $T_A = 25^\circ\text{C}$ )	Unit
$C_{IN}$	Input Capacitance Control Pins ( $\overline{OE}$ , T/R)	$V_{CCA} = V_{CCB} = 3.3 \text{ V}$ , $V_I = 0 \text{ V}$ or $V_{CCA/B}$	4	pF
$C_{I/O}$	Input / Output Capacitance $A_n$ , $B_n$ Port	$V_{CCA} = V_{CCB} = 3.3 \text{ V}$ , $V_I = 0 \text{ V}$ 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

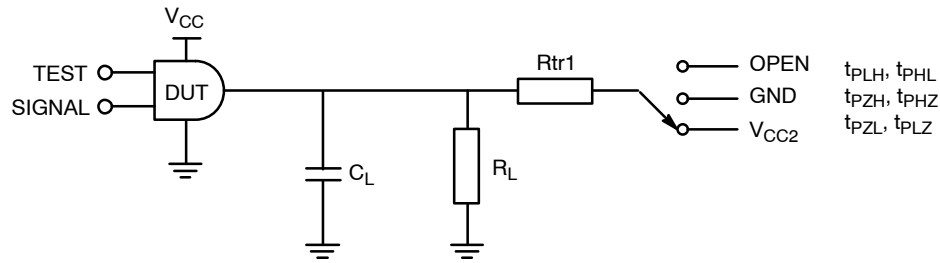


Figure 2. AC Test Circuit

Table 1. TEST CIRCUIT PARAMETERS

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

Table 2. AC LOAD TABLE

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

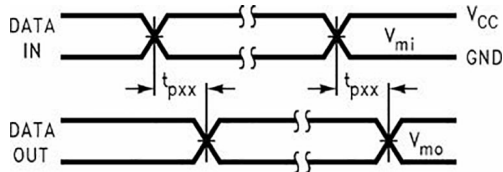
9. Input  $t_R = t_F = 2.0 \text{ ns}$ , 10% to 90%

Figure 3. Waveform for Inverting and Non-Inverting Functions

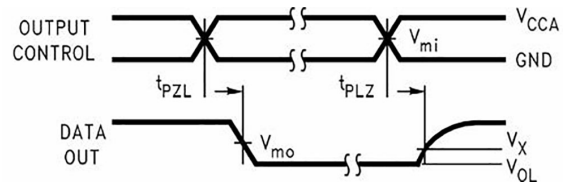
10. Input  $t_R = t_F = 2.0 \text{ ns}$ , 10% to 90%

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

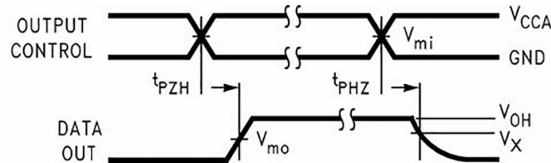
11. Input  $t_R = t_F = 2.0 \text{ ns}$ , 10% to 90%

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

Table 3.

Symbol	V <sub>CC</sub>				
	3.3 V ± 0.3 V	2.5 V ± 0.2 V	1.8 V ± 0.15 V	1.5 V ± 0.1 V	1.2 V ± 0.1 V
V <sub>MI</sub>	V <sub>CCI</sub> /2	V <sub>CCI</sub> /2	V <sub>CCI</sub> /2	V <sub>CCI</sub> /2	V <sub>CCI</sub> /2
V <sub>MO</sub>	V <sub>CC0</sub> /2	V <sub>CC0</sub> /2	V <sub>CC0</sub> /2	V <sub>CC0</sub> /2	V <sub>CC0</sub> /2
V <sub>X</sub>	V <sub>OH</sub> - 0.3 V	V <sub>OH</sub> - 0.15 V	V <sub>OH</sub> - 0.15 V	V <sub>OH</sub> - 0.1 V	V <sub>OH</sub> - 0.1 V
V <sub>Y</sub>	V <sub>OL</sub> + 0.3 V	V <sub>OL</sub> + 0.15 V	V <sub>OL</sub> + 0.15 V	V <sub>OL</sub> + 0.1 V	V <sub>OL</sub> + 0.1 V

12. For V<sub>MI</sub> V<sub>CC0</sub> = V<sub>CCA</sub> for control pins T/ $\overline{R}$  and  $\overline{OE}$  or V<sub>CCA</sub>/2.

## FUNCTIONAL DESCRIPTION

### Power-Up/Power-Down Sequencing

FXL translators offer an advantage in that either V<sub>CC</sub> may be powered up first. This benefit derives from the chip design. When either V<sub>CC</sub> is at 0 V, outputs are in a High-impedance state. The control inputs (T/ $\overline{R}$  and  $\overline{OE}$ ) are designed to track the V<sub>CCA</sub> supply. A pull-up resistor tying  $\overline{OE}$  to V<sub>CCA</sub> 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:

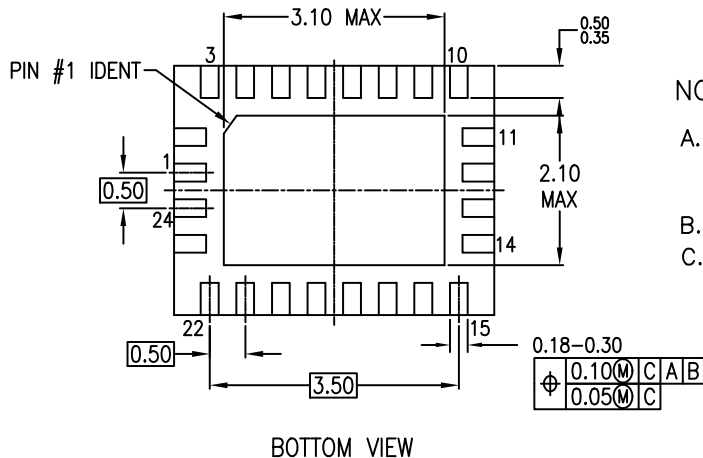
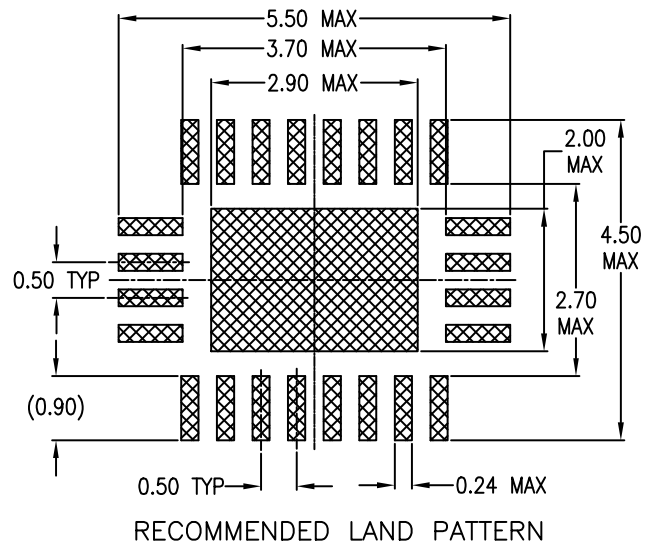
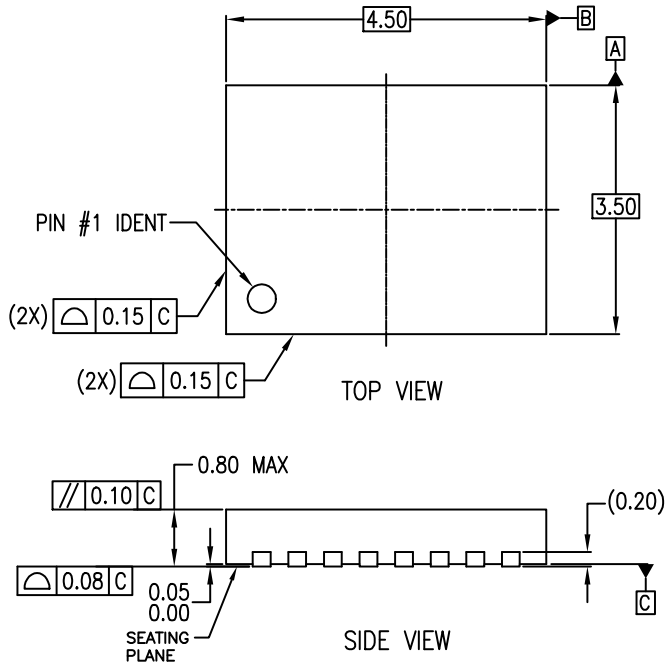
1. Apply power to either V<sub>CC</sub>.
2. Apply power to the T/ $\overline{R}$  input (logic HIGH for A-to-B operation; logic LOW for B-to-A operation) and to the respective data inputs (A port or B port). This may occur at the same time as step 1.
3. Apply power to the other V<sub>CC</sub>.
4. Drive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

**WQFN24 4.5x3.5, 0.5P**  
CASE 510CE  
ISSUE O


DATE 31 AUG 2016



**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

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