Dual Supply, 2-Bit Voltage Translator / Isolator for I²C Applications

FXMAR2102

Description

The FXMAR2102 is a high−performance configurable dual−voltage−supply translator for bi−directional voltage translation over a wide range of input and output voltages levels. The FXMAR2102 also works in a push− pull environment.

BLOCK DIAGRAM

Figure 1. Block Diagram, 1 of 2 Channels

PIN CONFIGURATION

Figure 2. MicroPak (Top−Through View)

Figure 3. UMLP (Top

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V_{CCA}, V_{CCB}	Supply Voltage		–0.5	7.0	V
V_{IN}	DC Input Voltage	A Port	–0.5	7.0	
		B Port	–0.5	7.0	
		Control Input (OE)	–0.5	7.0	
V_O	Output Voltage (Note 2)	A_n Outputs 3−State	–0.5	7.0	V
		B_n Outputs 3−State	–0.5	7.0	
		A_n Outputs Active	–0.5	V_{CCA} + 0.5 V	
		B_n Outputs Active	–0.5	V_{CCB} + 0.5 V	
I_{IK}	DC Input Diode Current	At V_{IN} < 0 V	−	–50	mA
I_{OK}	DC Output Diode Current	At V_O < 0 V	−	–50	mA
		At V_O > V_{CC}	−	+50	
I_{OH} / I_{OL}	DC Output Source/Sink Current		–50	+50	mA
I_{CC}	DC V_{CC} or Ground Current per Supply Pin		−	±100	mA
P_D	Power Dissipation	At 400 KHz	−	0.129	mW
T_{STG}	Storage Temperature Range		–65	+150	°C
ESD	Electrostatic Discharge Capability	Human Body Model, B−Port Pins	−	8	kV
		Human Body Model, All Pins (JESD22−A114)	−	4	
		Charged Device Mode, JESD22−C101	−	2	

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.

2. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CCA}, V_{CCB}	Power Supply Operating		1.65	5.50	V
V_{IN}	Input Voltage (Note 3)	A−Port	0	5.5	V
		B−Port	0	5.5	
		Control Input (OE)	0	V_{CCA}	
Θ_{JA}	Thermal Resistance	8−Lead MicroPak	−	279	°C/W
		8−Lead Ultrathin MLP	−	302	
T_A	Free Air Operating Temperature		–40	+85	°C

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.

3. All unused inputs and I/O pins must be held at V_{CCI} or GND. V_{CCI} is the V_{CC} associated with the input side.

FUNCTIONAL DESCRIPTION

Power−Up / Power−Down Sequencing

FXM 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−

APPLICATION NOTES

The FXMAR2102 has open−drain I/Os and includes a total of four 10 kΩ internal pull−up resistors (R

capacitances approaching 400 pF. More I_{OL} increases the voltage drop across the I^2C translator. The I^2C application benefits when I^2C translators exhibit low V_{OL} performance. Figure 6 depicts typical FXMAR2102 V_{OL} performance vs. the competition, given a 0.4 V V_{IL}.

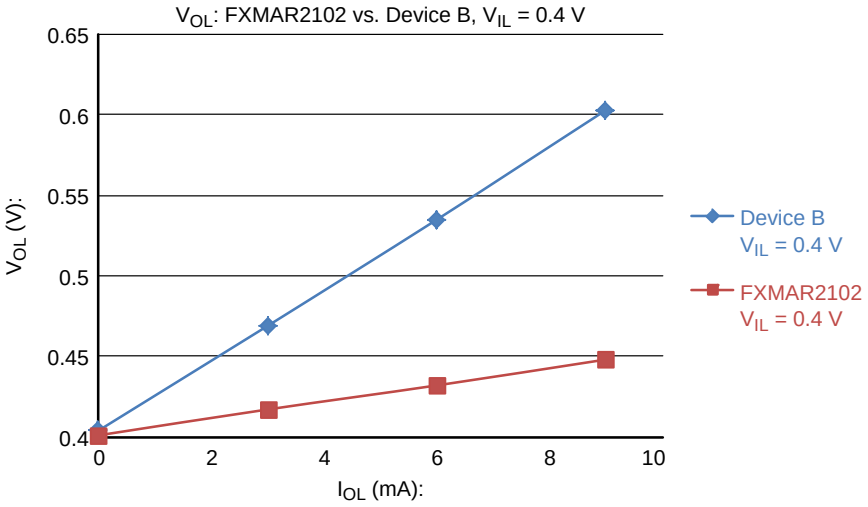


Figure 6. Device Comparison

I^2C−Bus Isolation

The FXMAR2102 supports I^2C−Bus isolation for the following conditions:

- Bus isolation if bus clear
- Bus isolation if either V_{CC} goes to ground

Bus Clear

Because the I^2C specification defines the minimum SCL frequency of DC, the SCL signal can be held LOW forever;

DYNAMIC OUTPUT ELECTRICAL C

OUTPUT RISE / FALL TIME (Note 10) (O

Symbol	Parameter
t_{rise}	Output Rise Time; A Port, B P
t_{fall}	Output Fall Time; A Port, B Po

10. Output rise and fall times guaranteed by
11. V_{CCO} is the V_{CC} associated with the ou
12. See Figure 12.
13. See Figure 13.

DYNAMIC OUTPUT ELECTRICAL C

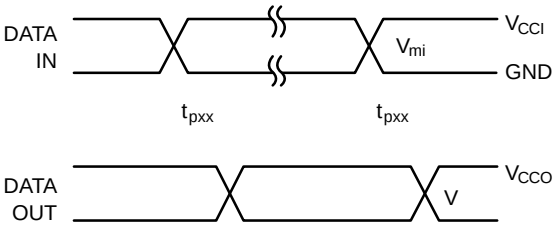
MAXIMUM DATA RATE (Note 14) (Output

V_{CCA}	Direction				
4.5 V to 5.5 V	A to B				
	B to A	50	50	40	

AC CHARACTERISTICS (Note 15) (Output load: C_L = 50 pF, R_{PU} = NC, push / pull driver, and T_A = −40°C to +85°C.)

Symbol	Parameter	V_{CCB}								Unit
		4.5 to 5.5 V		3.0 to 3.6 V		2.3 to 2.7 V		1.65 to 1.95 V		
		Typ	Max	Typ	Max	Typ	Max	Typ	Max	
V_{CCA} = 4.5 to 5.5 V										
t_{PLH}	A to B	1	3	1	3	1	3	1	3	ns
	B to A	1	3	2	4	3	5	4	7	
t_{PHL}	A to B	2	4	3	5	4	6	5	7	ns
	B to A	2	4	2	5	2	6	5	7	
t_{PZL}	OE to A	4	5	6	10	5	9	7	15	ns
	OE to B	3	5	4	7	5	8	10	15	
t_{PLZ}	OE to A	65	100	65	105	65	105	65	105	ns
	OE to B	5	9	6	10	7	12	9	16	
t_{skew}	A Port, B Port (Note 16)	0.50	1.50	0.50	1.00	0.50	1.00	0.50	1.00	ns
V_{CCA} = 3.0 to 3.6 V										
t_{PLH}	A to B	2.0	5.0	1.5	3.0	1.5	3.0	1.5	3.0	ns
	B to A	1.5	3.0	1.5	4.0	2.0	6.0	3.0	9.0	
t_{PHL}	A to B	2.0	4.0	2.0	4.0	2.0	5.0	3.0	5.0	ns
	B to A	2.0	4.0	2.0	4.0	2.0	5.0	3.0	5.0	
t_{PZL}	OE to A	4.0	8.0	5.0	9.0	6.0	11.0	7.0	15.0	ns
	OE to B	4.0	8.0	6.0	9.0	8.0	11.0	10.0	14.0	
t_{PLZ}	OE to A	100	115	100	115	100	115	100	115	ns
	OE to B	5	10	4	8	5	10	9	15	
t_{skew}	A Port, B Port (Note 16)	0.5	1.5	0.5	1.0	0.5	1.0	0.5	1.0	ns
V_{CCA} = 2.3 to 2.7 V										
t_{PLH}	A to B	2.5	5.0	2.5	5.0	2.0	4.0	1.0	3.0	

TIMING DIAGRAMS



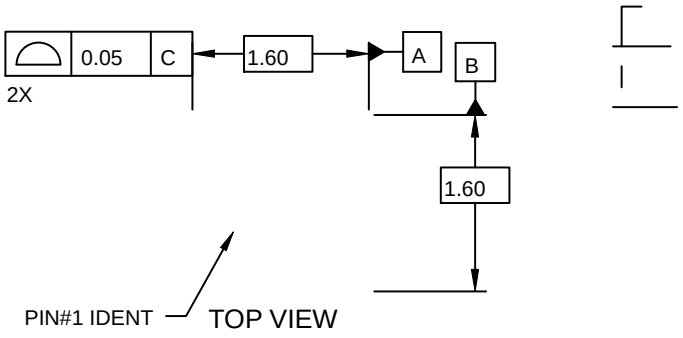
ORDERING INFORMATION

Part Number	Operating Temperature Range	Top Mark	Package	Packing Method[†]
FXMAR2102L8X	−40 to +85°C	BU	8−Lead MicroPak, 1.6 mm Wide (Pb−Free)	5000 / Tape & Reel
FXMAR2102UMX			8−Lead Ultrathin MLP, 1.2 mm x 1.4 mm (Pb−Free)	

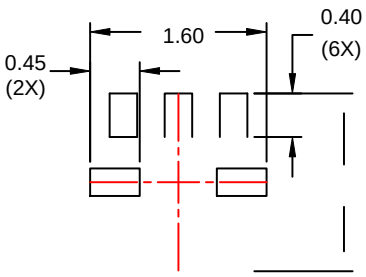
UQFN8, 1.40x1.20, 0.40P
CASE 523AS
ISSUE B

UQFN8 1.6X1.6, 0.5P
CASE 523AY
ISSUE O

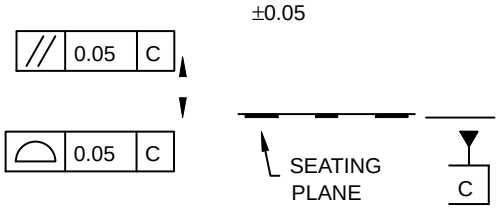
DATE 31 AUG 2016



TOP VIEW



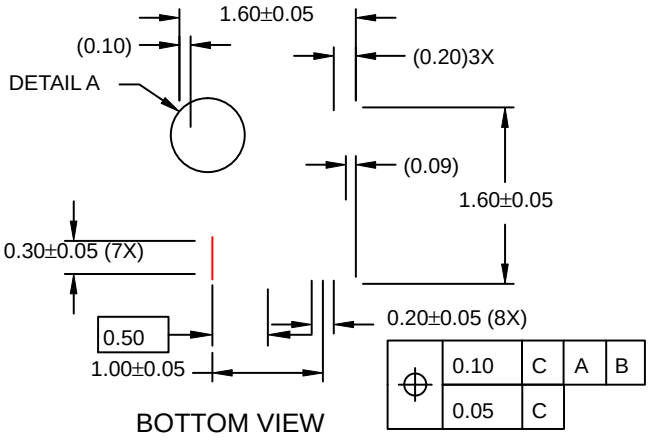
RECOMMENDED
LAND PATTERN



SIDE VIEW

NOTES:

A. PACKAGE CONFORMS TO JEDEC MO−



BOTTOM VIEW

DETAIL A
SCALE : 2X