FPGA Mezzanine Card (FMC) prototype board

(KY-FMC_PRT)

Data Book
2013

International Distributors

Sky Blue Microsystems GmbH
Geisenhausenerstr. 18
81379 Munich, Germany
+49 89 780 2970, info@skyblue.de
www.skyblue.de

In Great Britain:
Zerif Technologies Ltd.
Winnington House, 2 Woodberry Grove
Finchley, London N12 0DR
+44 115 855 7883, info@zerif.co.uk
www.zerif.co.uk

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Revision History

Version	Date	Notes
0.1	16/6/2013	Initial Release
0.2	17/2/2015	Ref. clock description updated

2.1 Safety Precautions

With your ***FPGA Mezzanine Card (FMC) prototype board*** in hand, please take a minute to read carefully the precautions listed below in order to prevent unnecessary injuries to you or other personnel or cause damage to property.

- **Before using the product, read these safety precautions carefully to assure correct use.**
- **These precautions contain serious safety instructions that must be observed.**
- **After reading through this manual, be sure to act upon it to prevent misuse of product.**

Caution

In the event of a failure, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
If an unpleasant smell or smoking occurs, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
Do not disassemble, repair or modify the product. Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
Do not touch a cooling fan. As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
Do not place the product on unstable locations. Otherwise, it may drop or fall, resulting in injury to persons or failure.
If the product is dropped or damaged, do not use it as is. Otherwise, a fire or electric shock may occur.
Do not touch the product with a metallic object. Otherwise, a fire or electric shock may occur.
Do not place the product in dusty or humid locations or where water may splash. Otherwise, a fire or electric shock may occur.
Do not get the product wet or touch it with a wet hand. Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
Do not touch a connector on the product (gold-plated portion). Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Do not use or place the product in the following locations. ● Humid and dusty locations ● Airless locations such as closet or bookshelf ● Locations which receive oily smoke or steam ● Locations close to heating equipment ● Closed inside of a car where the temperature becomes high ● Static electricity replete locations ● Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
Do not place heavy things on the product. Otherwise, the product may be damaged.

2.2 Disclaimer

This product should be used as a rapid means to develop new and complex FMC systems. KAYA Instruments assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, KAYA Instruments assumes no responsibility for any damages caused by the following:

- Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts caused by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
- Secondary impact arising from use of this product or its unusable state (business interruption or others).
- Use of this product against the instructions given in this manual or malfunctions due to connection to other devices.

KAYA Instruments assumes no responsibility or liability for:

- Erasure or corruption of data arising from use of this product.
- Any consequences or other abnormalities arising from use of this product, or damage of this product not due to our responsibility or failure due to modification.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

3.1 Overview

KY-FMC_PRT breaks out the complete LA bank of signals from the standard FMC Low Pin count Connector and the standard power rail and control signals. The user can add standard 0.1 inch spaced components and sockets for a wide variety of active and passive devices thus enabling the development of very complex capabilities. Standard control signals are available for the user to complete the interface to the chosen carrier card.

3.2 Features

- VITA 57.1 FMC compliant
- Passive breakout of Low Pin count Connector (LPC) pins to 0.1" matrix grid for soldering or wire-wrapping
- Development 18x16 hole matrix
- Extended Ground rails and Power breakout for two power connections
- JTAG breakout available in development matrix
- 4 SMA connectors for high speed serial signals (SerDes)
- User determined V_{ref}
- 125MHz SerDes reference clock
- Control signals available for user connections in development matrix
- On board electrically erasable programmable memory, EEPROM, with 1Kb (128bytes) storage for identification and user data
- Supports air and conduction cooling FMC
- Single slot FMC
- -40°C to 85°C operating environment temperature (industrial grade)

3.3 Product Applications

- Provides rapid means to develop new and complex FMC systems for later integration to standard FMC form factor
- Breakout of High Speed serial interfaces, clocks and control signals enables easy completion of full capability FMC functions

3.4 Related documents and accessories

Documents:

- AT24C01B datasheet
- American National Standard for FPGA Mezzanine Card (FMC) Standard (ANSI/VITA 57.1-2008)

Accessories:

- Board Standoffs set

4.1 Block Diagram

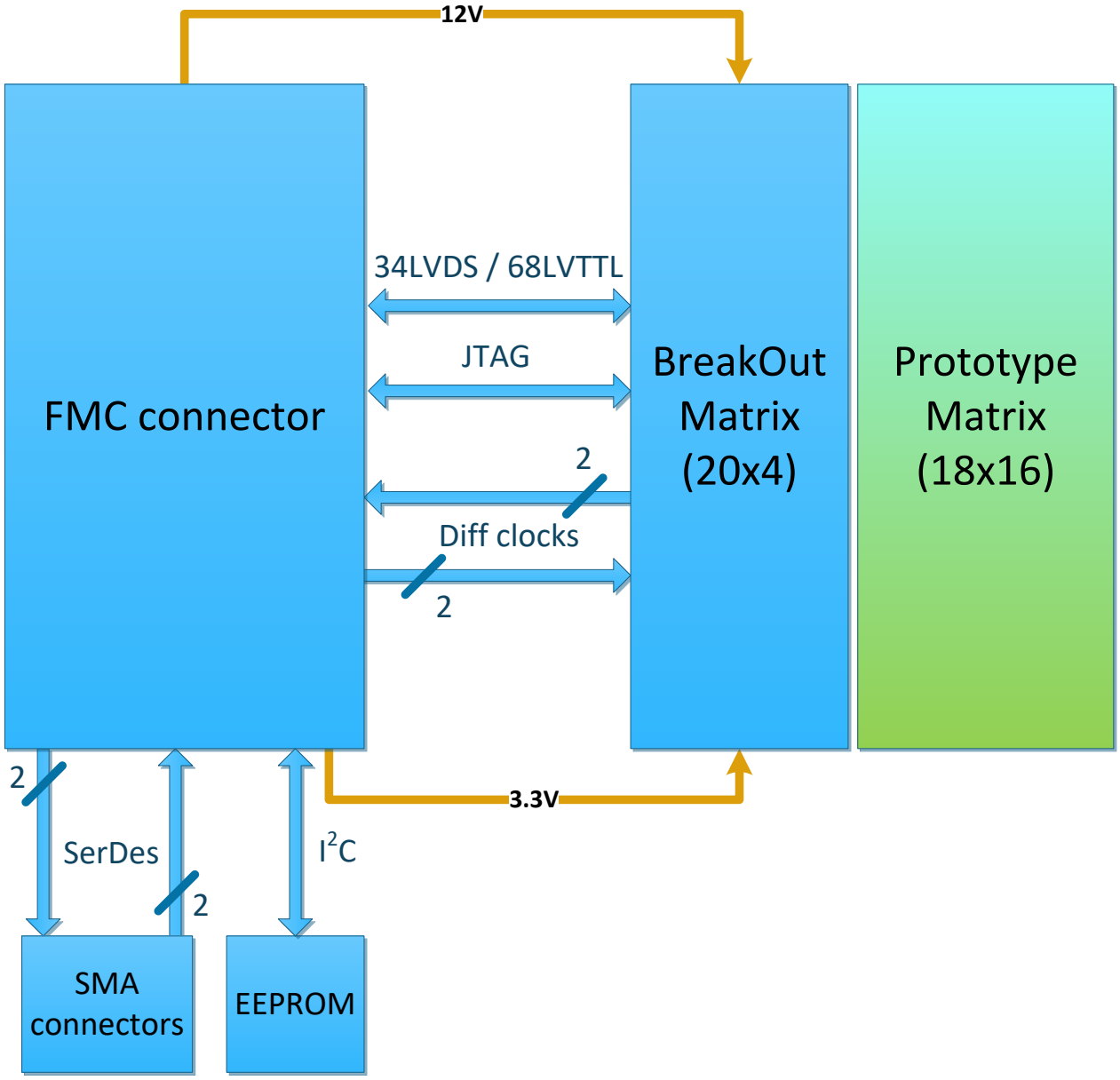

Figure 1 : KY-FMC_PRT block diagram

4.2 External View of the Board

Figure 2 shows the ***KY-FMC_PRT*** board specification.

External Dimensions: Width: 69mmx83mm

Board Thickness: 1.6mm

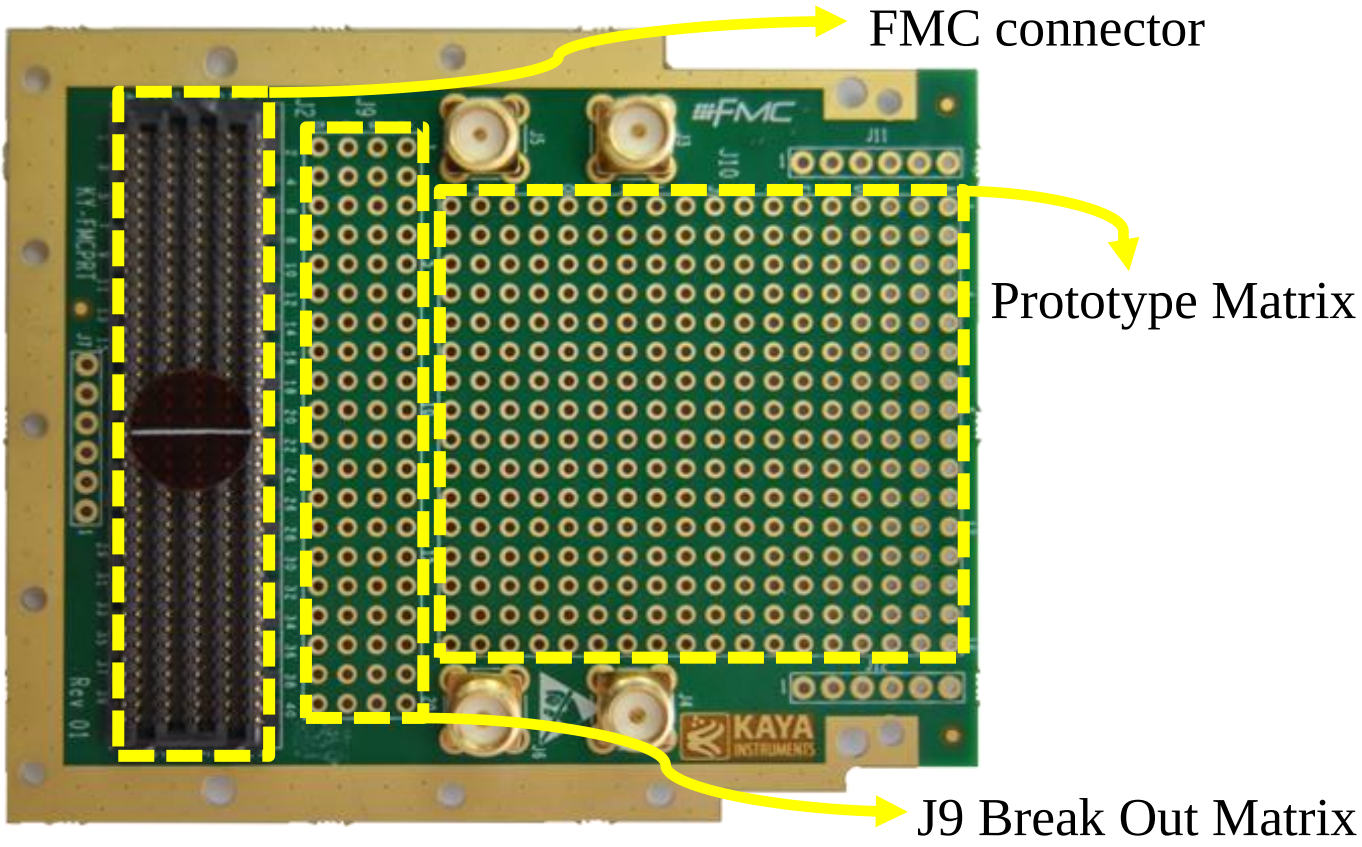

Figure 2 : KY-FMC2HSMC external view

5.1 FMC connector standard pin assignments

	K	J	H	G	F	E	D	C	B	A
1	VREF_B_M2C	GND	VREF_A_M2C	GND	PG_M2C	GND	PG_C2M	GND	RES1	GND
2	GND	CLK1_C2M_P	PRSNT_M2C_L	CLK0_C2M_P	GND	HA01_P_CC	GND	DP0_C2M_P	GND	DP1_M2C_P
3	GND	CLK1_C2M_N	GND	CLK0_C2M_N	GND	HA01_N_CC	GND	DP0_C2M_N	GND	DP1_M2C_N
4	CLK1_M2C_P	GND	CLK0_M2C_P	GND	HA00_P_CC	GND	GBTCLK0_M2C_P	GND	DP9_M2C_P	GND
5	CLK1_M2C_N	GND	CLK0_M2C_N	GND	HA00_N_CC	GND	GBTCLK0_M2C_N	GND	DP9_M2C_N	GND
6	GND	HA03_P	GND	LA00_P_CC	GND	HA05_P	GND	DP0_M2C_P	GND	DP2_M2C_P
7	HA02_P	HA03_N	LA02_P	LA00_N_CC	HA04_P	HA05_N	GND	DP0_M2C_N	GND	DP2_M2C_N
8	HA02_N	GND	LA02_N	GND	HA04_N	GND	LA01_P_CC	GND	DP8_M2C_P	GND
9	GND	HA07_P	GND	LA03_P	GND	HA09_P	LA01_N_CC	GND	DP8_M2C_N	GND
10	HA06_P	HA07_N	LA04_P	LA03_N	HA08_P	HA09_N	GND	LA06_P	GND	DP3_M2C_P
11	HA06_N	GND	LA04_N	GND	HA08_N	GND	LA05_P	LA06_N	GND	DP3_M2C_N
12	GND	HA11_P	GND	LA08_P	GND	HA13_P	LA05_N	GND	DP7_M2C_P	GND
13	HA10_P	HA11_N	LA07_P	LA08_N	HA12_P	HA13_N	GND	GND	DP7_M2C_N	GND
14	HA10_N	GND	LA07_N	GND	HA12_N	GND	LA09_P	LA10_P	GND	DP4_M2C_P
15	GND	HA14_P	GND	LA12_P	GND	HA16_P	LA09_N	LA10_N	GND	DP4_M2C_N
16	HA17_P_CC	HA14_N	LA11_P	LA12_N	HA15_P	HA16_N	GND	GND	DP6_M2C_P	GND
17	HA17_N_CC	GND	LA11_N	GND	HA15_N	GND	LA13_P	GND	DP6_M2C_N	GND
18	GND	HA18_P	GND	LA16_P	GND	HA20_P	LA13_N	LA14_P	GND	DP5_M2C_P
19	HA21_P	HA18_N	LA15_P	LA16_N	HA19_P	HA20_N	GND	LA14_N	GND	DP5_M2C_N
20	HA21_N	GND	LA15_N	GND	HA19_N	GND	LA17_P_CC	GND	GBTCLK1_M2C_P	GND
21	GND	HA22_P	GND	LA20_P	GND	HB03_P	LA17_N_CC	GND	GBTCLK1_M2C_N	GND
22	HA23_P	HA22_N	LA19_P	LA20_N	HB02_P	HB03_N	GND	LA18_P_CC	GND	DP1_C2M_P
23	HA23_N	GND	LA19_N	GND	HB02_N	GND	LA23_P	LA18_N_CC	GND	DP1_C2M_N
24	GND	HB01_P	GND	LA22_P	GND	HB05_P	LA23_N	GND	DP9_C2M_P	GND
25	HB00_P_CC	HB01_N	LA21_P	LA22_N	HB04_P	HB05_N	GND	GND	DP9_C2M_N	GND
26	HB00_N_CC	GND	LA21_N	GND	HB04_N	GND	LA26_P	LA27_P	GND	DP2_C2M_P
27	GND	HB07_P	GND	LA25_P	GND	HB09_P	LA26_N	LA27_N	GND	DP2_C2M_N
28	HB06_P_CC	HB07_N	LA24_P	LA25_N	HB08_P	HB09_N	GND	GND	DP8_C2M_P	GND
29	HB06_N_CC	GND	LA24_N	GND	HB08_N	GND	TCK	GND	DP8_C2M_N	GND
30	GND	HB11_P	GND	LA29_P	GND	HB13_P	TDI	SCL	GND	DP3_C2M_P
31	HB10_P	HB11_N	LA28_P	LA29_N	HB12_P	HB13_N	TDO	SDA	GND	DP3_C2M_N
32	HB10_N	GND	LA28_N	GND	HB12_N	GND	3P3VAUX	GND	DP7_C2M_P	GND
33	GND	HB15_P	GND	LA31_P	GND	HB19_P	TMS	GND	DP7_C2M_N	GND
34	HB14_P	HB15_N	LA30_P	LA31_N	HB16_P	HB19_N	TRST_L	GA0	GND	DP4_C2M_P
35	HB14_N	GND	LA30_N	GND	HB16_N	GND	GA1	12P0V	GND	DP4_C2M_N
36	GND	HB18_P	GND	LA33_P	GND	HB21_P	3P3V	GND	DP6_C2M_P	GND
37	HB17_P_CC	HB18_N	LA32_P	LA33_N	HB20_P	HB21_N	GND	12P0V	DP6_C2M_N	GND
38	HB17_N_CC	GND	LA32_N	GND	HB20_N	GND	3P3V	GND	GND	DP5_C2M_P
39	GND	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	DP5_C2M_N
40	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	RES0	GND
			LPC Connector	LPC Connector			LPC Connector	LPC Connector		

Table 1 : FMC connector standard pin assignments

5.2 J9 Signal connection

Pin on Break Out Matrix	Signal on Break Out Matrix	Pin on FMC	Signal on FMC	Pin on Break Out Matrix	Signal on Break Out Matrix	Pin on FMC	Signal on FMC
A1	A1	G3	CLK0_C2M_N	C11	C11	H23	LA19_N
B1	B1	G2	CLK0_C2M_P	D11	D11	H22	LA19_P
C1	C1	H5	CLK0_M2C_N	A12	A12	G22	LA20_N
D1	D1	H4	CLK0_M2C_P	B12	B12	G21	LA20_P
A2	A2	G7	LA00_N_CC	C12	C12	H26	LA21_N
B2	B2	G6	LA00_P_CC	D12	D12	H25	LA21_P
C2	C2	D9	LA01_N_CC	A13	A13	G25	LA22_N
D2	D2	D8	LA01_P_CC	B13	B13	G24	LA22_P
A3	A3	H8	LA02_N	C13	C13	D24	LA23_N
B3	B3	H7	LA02_P	D13	D13	D23	LA23_P
C3	C3	G10	LA03_N	A14	A14	H29	LA24_N
D3	D3	G9	LA03_P	B14	B14	H28	LA24_P
A4	A4	H11	LA04_N	C14	C14	G28	LA25_N
B4	B4	H10	LA04_P	D14	D14	G27	LA25_P
C4	C4	D12	LA05_N	A15	A15	D27	LA26_N
D4	D4	D11	LA05_P	B15	B15	D26	LA26_P
A5	A5	C11	LA06_N	C15	C15	C27	LA27_N
B5	B5	C10	LA06_P	D15	D15	C26	LA27_P
C5	C5	H14	LA07_N	A16	A16	H32	LA28_N
D5	D5	H13	LA07_P	B16	B16	H31	LA28_P
A6	A6	G13	LA08_N	C16	C16	G31	LA29_N
B6	B6	G12	LA08_P	D16	D16	G30	LA29_P
C6	C6	D15	LA09_N	A17	A17	H35	LA30_N
D6	D6	D14	LA09_P	B17	B17	H34	LA30_P
A7	A7	C15	LA10_N	C17	C17	G34	LA31_N
B7	B7	C14	LA10_P	D17	D17	G33	LA31_P
C7	C7	H17	LA11_N	A18	A18	H38	LA32_N
D7	D7	H16	LA11_P	B18	B18	H37	LA32_P
A8	A8	G16	LA12_N	C18	C18	G37	LA33_N
B8	B8	G15	LA12_P	D18	D18	G36	LA33_P
C8	C8	D18	LA13_N	A19	A19	D34	TRST_L
D8	D8	D17	LA13_P	B19	B19	D33	TMS
A9	A9	C19	LA14_N	C19	C19	D31	TDO
B9	B9	C18	LA14_P	D19	D19	D30	TDI
C9	C9	H20	LA15_N	A20	A20	D29	TCK
D9	D9	H19	LA15_P	B20	B20	H40	VADJ
A10	A10	G19	LA16_N	C20	C20	H1	VREF_A_M2C
B10	B10	G18	LA16_P	D20	D20	A37	GND
C10	C10	D21	LA17_N_CC	J4	SMA_CON	C7	DP0_M2C_N
D10	D10	D20	LA17_P_CC	J6	SMA_CON	C6	DP0_M2C_P
A11	A11	C23	LA18_N_CC	J3	SMA_CON	C3	DP0_C2M_N
B11	B11	C22	LA18_P_CC	J5	SMA_CON	C2	DP0_C2M_P

Table 2 : Signal connection

5.3 J11 and J12 Signal connection

Pin on Break Out Matrix	Signal on Break Out Matrix
1	FMC_PRT_VC3v3
2	FMC_PRT_VC3v3
3	FMC_PRT_VCC12
4	VADJ
5	FMC_PRT_GND
6	FMC_PRT_GND

Table 3 : Signal connection

5.4 I^2C

The I^2C SCL and SDA lines are connected directly to the FMC board. The EEPROM uses a standard FMC addressing.

5.5 SerDes Reference clock

The 125 MHz LVDS on-board oscillator is connected directly to the GBTCLK0_M2C pins of FMC Connectors (pins D4 and D5).

6.1 Power supplies

The board sources all the voltages from the FMC carrier. The following voltages are connected to FMC carrier.

Voltage on FMC	Connected to
3P3V	J11, J12
12P0V	J11, J12
3P3VAUX	Serial EEPROM
VADJ	J11, J12, J9
VREF	J9

Table 4 : Power supplies

6.2 Absolute maximum ratings

Specification	Values
3.3V power supply	–1.0V to +7.0V
12V power supply	-0.3 to 20
Storage Temperature	-55°C to 125°C
Operating Temperature	-40°C to 85°C
Voltage on I^2C signals	–1.0V to +7.0V

Table 5 : Absolute maximum ratings

6.3 Operating conditions

Parameter	Minimum	Typical	Maximum
3.3V power input	3.14V	3.3V	3.46V
12V power input	11.4V	12V	12.6V
I^2C VIL Input Low Level(1)	-0.6V		1V
I^2C VIH Input High Level(1)	2.31V		3.8V
I^2C Clock frequency(1)			400KHz

Table 6 : Operating conditions

(1) Please refer to Atmel AT24C01B datasheet for more information about I^2C operating conditions

7.1 Installation instructions

1. Before installing, turn off the power to the board.
2. Firmly press the ***KY_FMC_PRT*** to the carrier board.