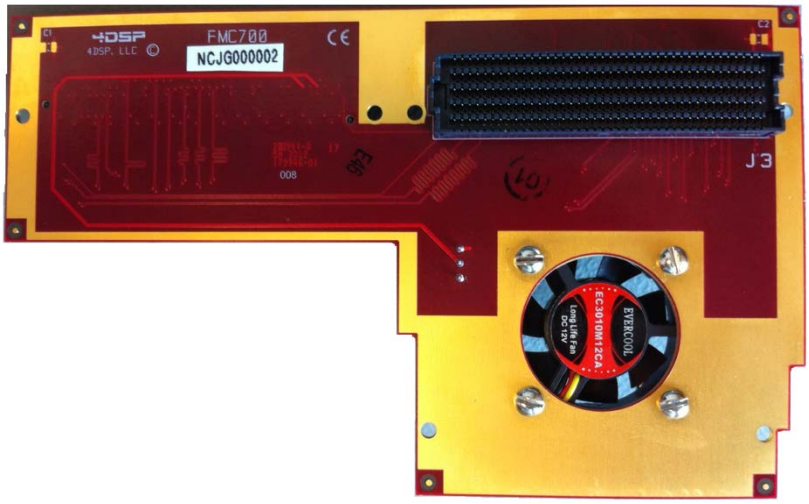
FMC700
User Manual



Abaco Systems, USA

Support Portal

Revision History

Date	Revision	Revision
2012/08/23	Initial draft	0.1
2012/10/03	Initial release	1.0

Table of Contents

Acronyms and related documents 4
1.1 Acronyms 4
1.2 Related Documents 4
2 General description 5
3 Installation 5
3.1 Requirements and handling instructions 5
4 Design 6
4.1 Physical specifications 6
4.1.1 Board Dimensions 6
4.1.2 Cooling Fan 6
5 Signals 7
5.1 User Defined Signal 7
5.1.1 HPC HA Signal 7
5.1.2 HPC LA Signal 8
5.1.3 LPC LA Signal 8
5.1.4 CLK Signal 8
5.2 GTX 9
5.2.1 HPC GTX Signal 9
5.2.2 LPC GTX Signal 9
5.3 Miscellaneous signals 10
5.3.1 PRSNT 10
5.3.2 JTAG 10
5.3.3 I2C Bus 10
5.3.4 GA 11
5.3.5 Power Good Signals 11
6 Power 11
6.1 HPC Power Signal 11
6.2 LPC Power Signal 11
6.3 VIO_B_M2C 11
7 Layers and Stack up 11
8 Environment 11
8.1 Temperature 11
8.2 Cooling 12
8.2.1 Convection cooling 12
9 Safety 12
10 EMC 12
11 Warranty 12
Appendix A FMC700 Pinout 13

Acronyms and related documents

1.1 Acronyms

CFM	Cubic Feet per Minute
ESD	ElectroStatic Discharge
HPC	High-Pin Count
FMC	FPGA Mezzanine Card
FPGA	Field Programmable Gate Array
JTAG	Join Test Action Group
LPC	Low-Pin Count
PCB	Printed Circuit Board

Table 1: Glossary

1.2 Related Documents

- FPGA Mezzanine Card (FMC) standard ANSI/VITA 57.1-2010
- KC705 Evaluation Board for the Kintex-7 FPGA User Guide, Xilinx

2 General description

The FMC700 is an adapter that recreates an FMC site from the KC705 LPC and HPC FMC sites in order to offer a HPC FMC site as close as possible to ANSI/VITA 57.1. This adapter connects to the KC705 via both FMC connectors and has a FMC standard HPC connector on the other side. The only limitation in regards to the FMC standard is the number of gigabit transceivers lanes available: the FMC700 offers only 5 gigabit transceiver lanes.

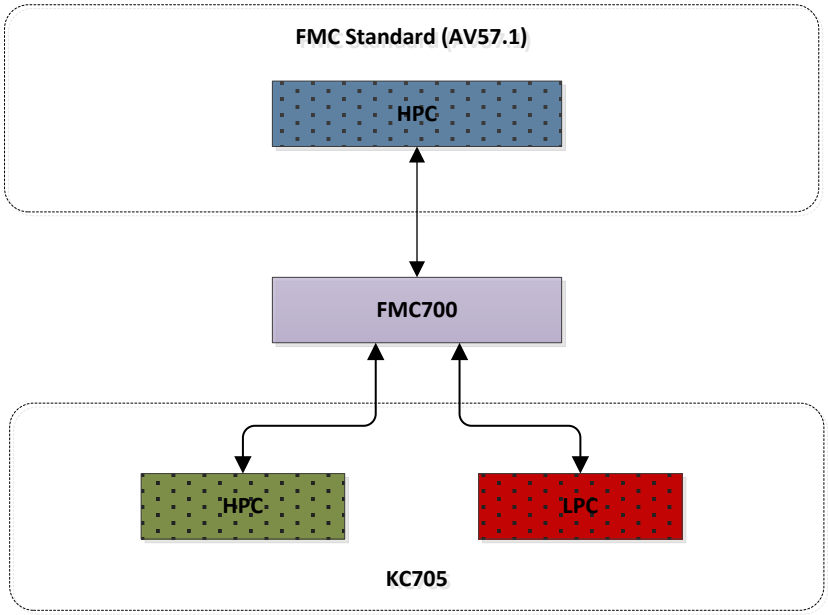


Figure 1: Adapter block diagram

3 Installation

3.1 Requirements and handling instructions

- The adapter must be installed on FMC connectors on KC705.
- Prevent electrostatic discharges by observing ESD precautions when handling the card.

4 Design

4.1 Physical specifications

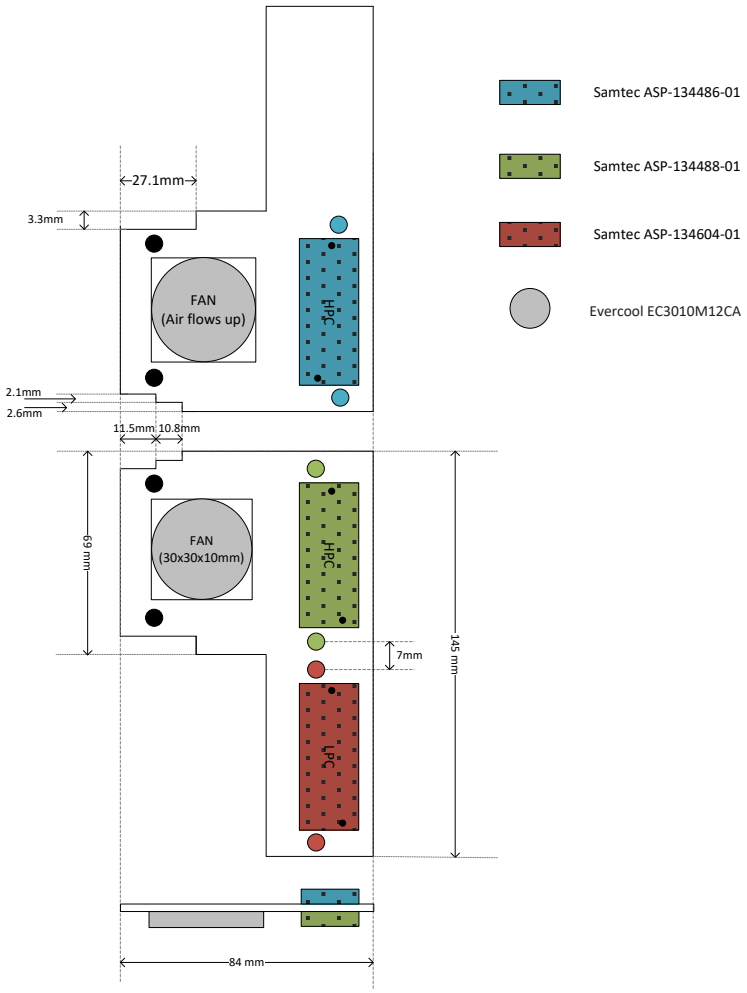


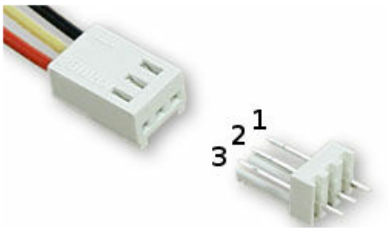
Figure 2: Floor plan

4.1.1 Board Dimensions

The stacking height is 10mm. For other dimensions, please refer to Figure 2.

4.1.2 Cooling Fan

The adapter has a 30x30x10mm cooling fan to provide additional cooling environment to the FMC which will be installed on the top. The fan flows 80mA and provides 3.28 CFM. The air flows up to the FMC and $12V_{DC}$ is provided to the fan through 3-pin fan connector. Figure 3 shows the 3-pin fan connector. Pin 1 and 2 are connected to ground and $12V_{DC}$ and pin 3 is not used. The installed cooling fan is Evercool 30x30x10mm DC Fan (P/N: EC3010M12CA). The connector is Molex 3-pin connector (P/N: 22-11-2032).



Pin	Name	Color
1	GND	black
2	+12VDC or +5VDC	red
3	Tachometric Signal	yellow

Figure 3: 3-Pin Fan Connector

5 Signals

All signals from KC705 HPC are fully connected to the FMC. Not-Connected signals from KC705 are passed by the FMC700. The required signals leading as close as AV57.1 are connected to the FMC through the FMC700. All pin assignments are summarized on the Appendix A.

5.1 User Defined Signal

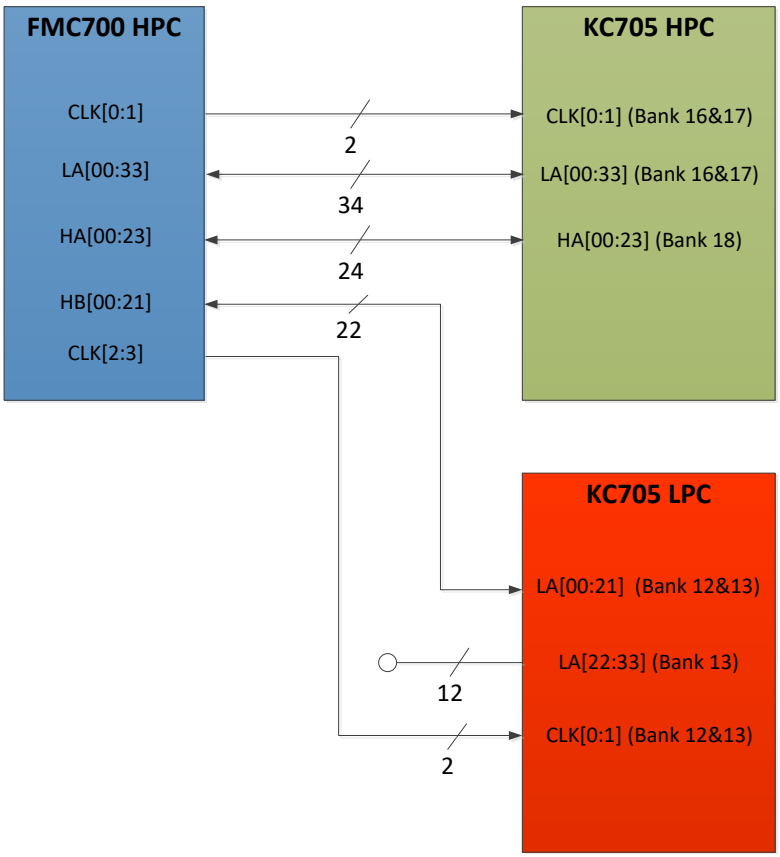


Figure 4: User Defined Signal Routing

5.1.1 HPC HA Signal

All 24 differential HA signals from KC705 HPC are connected to the FMC through the FMC700.

5.1.2 HPC LA Signal

All 34 differential LA signals from KC705 HPC are connected to the FMC through the FMC700.

5.1.3 LPC LA Signal

22 differential LA signals (LA00 to LA21) from KC705 LPC are connected to the FMC through the FMC700 and remaining LA signals (LA22 to LA33) are discarded. LPC_LA bank has 4 clock capable pairs (CC) and HPC_HB has 3 CC. Following table shows the CC connections.

LA BANK	LPC_LA00_CC	LPC_LA01_CC	LPC_LA017_CC	LPC_LA018_CC
HB BANK	HPC_HB00_CC	HPC_HB06_CC	HPC_HB17_CC	HPC_HB18

Table 2: CC connections between LA and HB banks

5.1.4 CLK Signal

FMC700 supports 2 differential clock signals from KC705 HPC through CLK[0:1]_M2C_P/N and other 2 differential clock signals from KC705 LPC through CLK[2:3]_BIDIR_P/N.

CLK_DIR determines the direction of FMC clock signals. CLK_DIR is unconnected in KC705, which enables all reference clock signal pairs are driven from the IO Mezzanine Module to the carrier card.

5.2 GTX

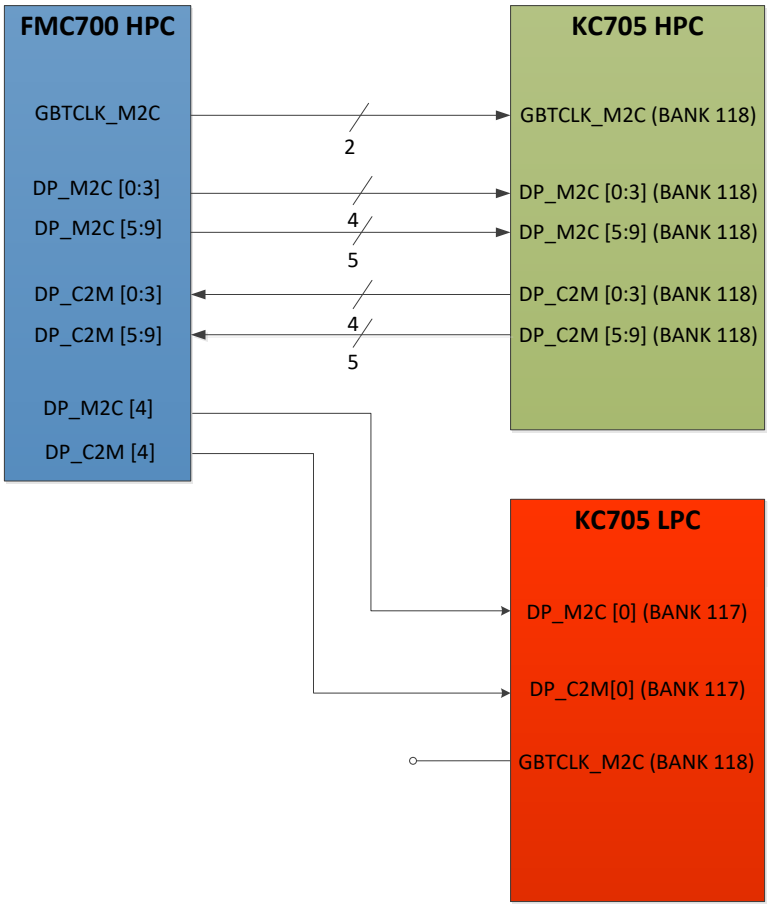


Figure 5: GTX Signal Routing

5.2.1 HPC GTX Signal

All differential GTX signals from KC705 HPC are fully connected to the FMC through the FMC700. KC705 provides only 4 differential GTX signals (DP [0:3]).

5.2.2 LPC GTX Signal

Differential GTX signals from KC705 LPC are routed to the FMC through the FMC700. These DP signals are connected to bank 117 while HPC GTX clock signals are connected to bank 118. This allows using HPC GTX clocks signals for LPC GTX signals.

5.3 Miscellaneous signals

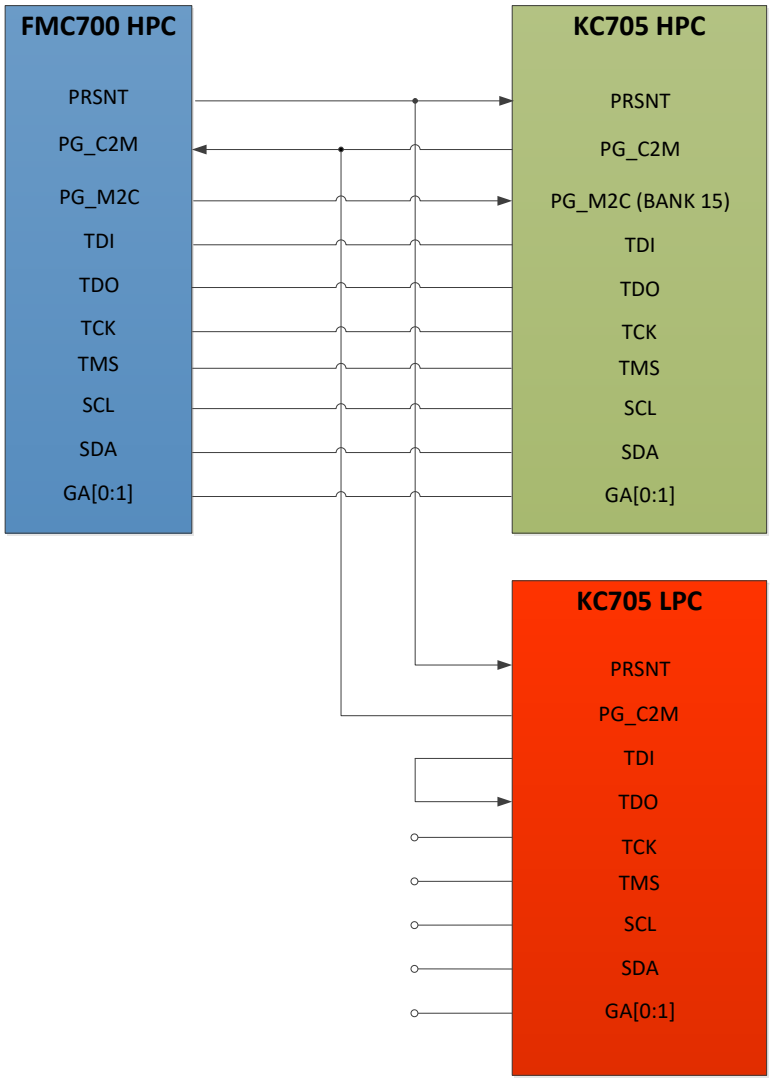


Figure 6: PRSNT, JTAG, I2C, GA, PG Signal Routing

5.3.1 PRSNT

Present signals from both KC705 HPC and LPC are shorted together and connected to the FMC.

5.3.2 JTAG

Only JTAG signals from KC705 HPC are connected to the FMC. TDI and TDO from KC705 LPC are shorted and the other signals are discarded.

5.3.3 I2C Bus

Only I2C bus signals from KC705 HPC are connected to the FMC and the signals from KC705 LPC are discarded.

5.3.4 GA

GA signals from KC705 HPC are connected to the FMC and the signals from KC705 LPC are discarded. Note: KC705 connects all GA signals to ground.

5.3.5 Power Good Signals

HPC PG_M2C passes through the FMC700 and PG_C2M are both connected to KC705 HPC and LPC.

6 Power

All pin assignments are summarized on the Appendix A.

6.1 HPC Power Signal

All power signals from KC705 HPC are fully connected to the FMC through the FMC700.

6.2 LPC Power Signal

Two VCC12_P ($12V_{DC}$) power signals are routed to the fan connector. VADJ, 3P3V and 3P3VAUX power signals are not connected to HPC power signals. HPC power signals use the same power as LPC power signals from KC705. Pin assignments are summarized on the Appendix A.

6.3 VIO_B_M2C

Normally the FMC determines the IO voltage level for the signalling standard on the HB bank through the VIO_B_M2C pins. Since the HB bank is connected to LPC LA bank on the KC705 the use of this adaptor board is limited to FMC modules which matching IO standards on bank LA, HA and HB. In other words VIO_B_M2C from the FMC should match VADJ from the KC705. VIO_B_M2C is not connected on the FMC700.

7 Layers and Stack up

The PCB has 4 layers. 2 ground layers are placed between top and bottom signal layers. Routing traces have 100Ω differential impedance. Trace lengths are matched in LA and BA banks, HB bank and GTX signal pairs.

8 Environment

8.1 Temperature

Operating temperature

- -40˚C to +85˚C (Industrial)

Storage temperature:

- -40˚C to +120˚C

8.2 Cooling

8.2.1 Convection cooling

The air flow provided by the fan installed on the adapter will dissipate the heat generated by the on board components from FMC.

9 Safety

This module presents no hazard to the user.

10 EMC

This module is designed to operate from within an enclosed host system, which is build to provide EMC shielding. Operation within the EU EMC guidelines is not guaranteed unless it is installed within an adequate host system. This module is protected from damage by fast voltage transients originating from outside the host system which may be introduced through the system.

11 Warranty

	Hardware	*Software/Firmware*
Basic Warranty (included)	1 Year from Date of Shipment	90 Days from Date of Shipment
Extended Warranty (optional)	2 Years from Date of Shipment	Year from Date of Shipment

Appendix A FMC700 Pinout

- AV57.1 shows the signal definitions of the AV57.1 Standard and KC705 shows the net names of the signals connected to KC705
- Yellow highlights indicate LPC signals from KC705, all other signals are from the KC705 HPC connector.

	A		B		C		D		E	
	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal
1	GND	GND	CLK_DIR	NC	GND	GND	PG_C2M	PWRCTL1_VCC4A_PG	GND	GND
2	DP1_M2C_P	FMC_HPC_DP1_M2C_P	GND	GND	DP0_C2M_P	FMC_HPC_DP0_C2M_P	GND	GND	HA01_P_CC	FMC_HPC_HA01_CC_P
3	DP1_M2C_N	FMC_HPC_DP1_M2C_N	GND	GND	DP0_C2M_N	FMC_HPC_DP0_C2M_N	GND	GND	HA01_N_CC	FMC_HPC_HA01_CC_N
4	GND	GND	DP9_M2C_P	NC	GND	GND	GBTCLK0_M2C_P	FMC_HPC_GBTCLK0_M2C_P	GND	GND
5	GND	GND	DP9_M2C_P	NC	GND	GND	GBTCLK0_M2C_N	FMC_HPC_GBTCLK0_M2C_N	GND	GND
6	DP2_M2C_P	FMC_HPC_DP2_M2C_P	GND	GND	DP0_M2C_P	FMC_HPC_DP0_M2C_P	GND	GND	HA05_P	FMC_HPC_HA05_P
7	DP2_M2C_N	FMC_HPC_DP2_M2C_N	GND	GND	DP0_M2C_N	FMC_HPC_DP0_M2C_N	GND	GND	HA05_N	FMC_HPC_HA05_N
8	GND	GND	DP8_M2C_P	NC	GND	GND	LA01_P_CC	FMC_HPC_LA01_P_CC	GND	GND
9	GND	GND	DP8_M2C_P	NC	GND	GND	LA01_N_CC	FMC_HPC_LA01_N_CC	HA09_P	FMC_HPC_HA09_P
10	DP3_M2C_P	FMC_HPC_DP3_M2C_P	GND	GND	LA06_P	FMC_HPC_LA06_P	GND	GND	HA09_N	FMC_HPC_HA09_N
11	DP3_M2C_N	FMC_HPC_DP3_M2C_N	GND	GND	LA06_N	FMC_HPC_LA06_N	LA05_P	FMC_HPC_LA05_P	GND	GND
12	GND	GND	DP7_M2C_P	NC	GND	GND	LA05_N	FMC_HPC_LA05_N	HA13_P	FMC_HPC_HA13_P
13	GND	GND	DP7_M2C_P	NC	GND	GND	GND	GND	HA13_N	FMC_HPC_HA13_N
14	DP4_M2C_P	FMC_LPC_DP0_M2C_P	GND	GND	LA10_P	FMC_HPC_LA10_P	LA09_P	FMC_HPC_LA09_P	GND	GND
15	DP4_M2C_P	FMC_LPC_DP0_M2C_N	GND	GND	LA10_N	FMC_HPC_LA10_N	LA09_N	FMC_HPC_LA09_N	HA16_P	FMC_HPC_HA16_P
16	GND	GND	DP6_M2C_P	NC	GND	GND	GND	GND	HA16_N	FMC_HPC_HA16_N
17	GND	GND	DP6_M2C_P	NC	GND	GND	LA13_P	FMC_HPC_LA13_P	GND	GND
18	DP5_M2C_P	NC	GND	GND	LA14_P	FMC_HPC_LA14_P	LA13_N	FMC_HPC_LA13_N	HA20_P	FMC_HPC_HA20_P
19	DP5_M2C_P	NC	GND	GND	LA14_N	FMC_HPC_LA14_N	GND	GND	HA20_N	FMC_HPC_HA20_N
20	GND	GND	GBTCLK1_M2C_P	FMC_HPC_GBTCLK1_M2C_P	GND	GND	LA17_P_CC	FMC_HPC_LA17_P_CC	GND	GND
21	GND	GND	GBTCLK1_M2C_N	FMC_HPC_GBTCLK1_M2C_N	GND	GND	LA17_N_CC	FMC_HPC_LA17_N_CC	HB03_P	FMC_LPC_LA03_P
22	DP1_C2M_P	FMC_HPC_DP1_C2M_P	GND	GND	LA18_P_CC	FMC_HPC_LA18_P_CC	GND	GND	HB03_N	FMC_LPC_LA03_N
23	DP1_C2M_N	FMC_HPC_DP1_C2M_N	GND	GND	LA18_N_CC	FMC_HPC_LA18_N_CC	LA23_P	FMC_HPC_LA23_P	GND	GND
24	GND	GND	DP9_C2M_P	NC	GND	GND	LA23_N	FMC_HPC_LA23_N	HB05_P	FMC_LPC_LA05_P
25	GND	GND	DP9_C2M_N	NC	GND	GND	GND	GND	HB05_N	FMC_LPC_LA05_N
26	DP2_C2M_P	FMC_HPC_DP2_C2M_P	GND	GND	LA27_P	FMC_HPC_LA27_P	LA26_P	FMC_HPC_LA26_P	GND	GND
27	DP2_C2M_N	FMC_HPC_DP2_C2M_N	GND	GND	LA27_N	FMC_HPC_LA27_N	LA26_N	FMC_HPC_LA26_N	HB09_P	FMC_LPC_LA09_P
28	GND	GND	DP8_C2M_P	NC	GND	GND	GND	GND	HB09_N	FMC_LPC_LA09_N
29	GND	GND	DP8_C2M_N	NC	GND	GND	TCK	FMC_HPC_TCK_BUF	GND	GND
30	DP3_C2M_P	FMC_HPC_DP3_C2M_P	GND	GND	SCL	FMC_HPC_IIC_SCL	TDI	FMC_TDI_BUFF	HB13_P	FMC_LPC_LA13_P
31	DP3_C2M_N	FMC_HPC_DP3_C2M_N	GND	GND	SDA	FMC_HPC_IIC_SDA	TDO	FMC_HPC_TDO_LPC_TDI	HB13_N	FMC_LPC_LA13_N
32	GND	GND	DP7_C2M_P	NC	GND	GND	3P3VAUX	VCC3V3	GND	GND
33	GND	GND	DP7_C2M_N	NC	GND	GND	TMS	FMC_HPC_TMS_BUF	HB19_P	FMC_LPC_LA19_P
34	DP4_C2M_P	FMC_LPC_DP0_C2M_P	GND	GND	GA0	GND	TRST_L	NC	HB19_N	FMC_LPC_LA19_N
35	DP4_C2M_N	FMC_LPC_DP0_C2M_N	GND	GND	12P0V	VCC12_P	GA1	GND	GND	GND
36	GND	GND	DP6_C2M_P	NC	GND	GND	3P3V	VCC3V3	HB21_P	FMC_LPC_LA21_P
37	GND	GND	DP6_C2M_N	NC	12P0V	VCC12_P	GND	GND	HB21_N	FMC_LPC_LA21_N
38	DP5_C2M_P	NC	GND	GND	GND	GND	3P3V	VCC3V3	GND	GND
39	DP5_C2M_N	NC	GND	GND	3P3V	VCC3V3	GND	GND	VADJ	VADJ
40	GND	GND	RES0	NC	GND	GND	3P3V	VCC3V3	GND	GND

	F		G		H		J		K	
	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal	AV57.1	KC705 Signal
1	PG_M2C	FMC_HPC_PG_M2C	GND	GND	VREF_A_M2C	NC	GND	GND	VREF_B_M2C	NC
2	GND	GND	CLK1_M1C_P	FMC_HPC_CLK1_M1C_P	PRSNT_M2C_B	FMC_HPC_PRSNT_M2C_B FMC_LPC_PRSNT_M2C_B	CLK3_BIDIR_P	FMC_LPC_CLK1_M2C_P	GND	GND
3	GND	GND	CLK1_M1C_N	FMC_HPC_CLK1_M1C_N	GND	GND	CLK3_BIDIR_N	FMC_LPC_CLK1_M2C_N	GND	GND
4	HA00_P_CC	FMC_HPC_HA00_CC_P	GND	GND	CLK0_M2C_P	FMC_HPC_CLK0_M2C_P	GND	GND	CLK2_BIDIR_P	FMC_LPC_CLK0_M2C_P
5	HA00_N_CC	FMC_HPC_HA00_CC_N	GND	GND	CLK0_M2C_N	FMC_HPC_CLK0_M2C_N	GND	GND	CLK2_BIDIR_N	FMC_LPC_CLK0_M2C_N
6	GND	GND	LA00_P_CC	FMC_HPC_LA00_CC_P	GND	GND	HA03_P	FMC_HPC_HA03_P	GND	GND
7	HA04_P	FMC_HPC_HA04_P	LA00_N_CC	FMC_HPC_LA00_CC_N	LA02_P	FMC_HPC_LA02_P	HA03_N	FMC_HPC_HA03_N	HA02_P	FMC_HPC_HA02_P
8	HA04_N	FMC_HPC_HA04_N	GND	GND	LA02_N	FMC_HPC_LA02_N	GND	GND	HA02_N	FMC_HPC_HA02_N
9	GND	GND	LA03_P	FMC_HPC_LA03_P	GND	GND	HA07_P	FMC_HPC_HA07_P	GND	GND
10	HA08_P	FMC_HPC_HA08_P	LA03_N	FMC_HPC_LA03_N	LA04_P	FMC_HPC_LA04_P	HA07_N	FMC_HPC_HA07_N	HA06_P	FMC_HPC_HA06_P
11	HA08_N	FMC_HPC_HA08_N	GND	GND	LA04_N	FMC_HPC_LA04_N	GND	GND	HA06_N	FMC_HPC_HA06_N
12	GND	GND	LA08_P	FMC_HPC_LA08_P	GND	GND	HA11_P	FMC_HPC_HA11_P	GND	GND
13	HA12_P	FMC_HPC_HA12_P	LA08_N	FMC_HPC_LA08_N	LA07_P	FMC_HPC_LA07_P	HA11_N	FMC_HPC_HA11_N	HA10_P	FMC_HPC_HA10_P
14	HA12_N	FMC_HPC_HA12_N	GND	GND	LA07_N	FMC_HPC_LA07_N	GND	GND	HA10_N	FMC_HPC_HA10_N
15	GND	GND	LA12_P	FMC_HPC_LA12_P	GND	GND	HA14_P	FMC_HPC_HA14_P	GND	GND
16	HA15_P	FMC_HPC_HA15_P	LA12_N	FMC_HPC_LA12_N	LA11_P	FMC_HPC_LA11_P	HA14_N	FMC_HPC_HA14_N	HA17_P_CC	FMC_HPC_HA17_CC_P
17	HA15_N	FMC_HPC_HA15_N	GND	GND	LA11_N	FMC_HPC_LA11_N	GND	GND	HA17_N_CC	FMC_HPC_HA17_CC_N
18	GND	GND	LA16_P	FMC_HPC_LA16_P	GND	GND	HA18_P	FMC_HPC_HA18_P	GND	GND
19	HA19_P	FMC_HPC_HA19_P	LA16_N	FMC_HPC_LA16_N	LA15_P	FMC_HPC_LA15_P	HA18_N	FMC_HPC_HA18_N	HA21_P	FMC_HPC_HA21_P
20	HA19_N	FMC_HPC_HA19_N	GND	GND	LA15_N	FMC_HPC_LA15_N	GND	GND	HA21_N	FMC_HPC_HA21_N
21	GND	GND	LA20_P	FMC_HPC_LA20_P	GND	GND	HA22_P	FMC_HPC_HA22_P	GND	GND
22	HB02_P	FMC_LPC_LA02_P	LA20_N	FMC_HPC_LA20_N	LA19_P	FMC_HPC_LA19_P	HA22_N	FMC_HPC_HA22_N	HA23_P	FMC_HPC_HA23_P
23	HB02_N	FMC_LPC_LA02_N	GND	GND	LA19_N	FMC_HPC_LA19_N	GND	GND	HA23_N	FMC_HPC_HA23_N
24	GND	GND	LA22_P	FMC_HPC_LA22_P	GND	GND	HB01_P	FMC_LPC_LA06_P	GND	GND
25	HB04_P	FMC_LPC_LA04_P	LA22_N	FMC_HPC_LA22_N	LA21_P	FMC_HPC_LA21_P	HB01_N	FMC_LPC_LA06_N	HB00_P_CC	FMC_LPC_LA00_CC_P
26	HB04_N	FMC_LPC_LA04_N	GND	GND	LA21_N	FMC_HPC_LA21_N	GND	GND	HB00_N_CC	FMC_LPC_LA00_CC_N
27	GND	GND	LA25_P	FMC_HPC_LA25_P	GND	GND	HB07_P	FMC_LPC_LA07_P	GND	GND
28	HB08_P	FMC_LPC_LA08_P	LA25_N	FMC_HPC_LA25_N	LA24_P	FMC_HPC_LA24_P	HB07_N	FMC_LPC_LA07_N	HB06_P_CC	FMC_LPC_LA01_CC_P
29	HB08_N	FMC_LPC_LA08_N	GND	GND	LA24_N	FMC_HPC_LA24_N	GND	GND	HB06_N_CC	FMC_LPC_LA01_CC_N
30	GND	GND	LA29_P	FMC_HPC_LA29_P	GND	GND	HB11_P	FMC_LPC_LA11_P	GND	GND
31	HB12_P	FMC_LPC_LA12_P	LA29_N	FMC_HPC_LA29_N	LA28_P	FMC_HPC_LA28_P	HB11_N	FMC_LPC_LA11_N	HB02_P	FMC_LPC_LA10_P
32	HB12_N	FMC_LPC_LA12_N	GND	GND	LA28_N	FMC_HPC_LA28_N	GND	GND	HB02_N	FMC_LPC_LA10_N
33	GND	GND	LA31_P	FMC_HPC_LA31_P	GND	GND	HB15_P	FMC_LPC_LA15_P	GND	GND
34	HB16_P	FMC_LPC_LA16_P	LA31_N	FMC_HPC_LA31_N	LA30_P	FMC_HPC_LA30_P	HB15_N	FMC_LPC_LA15_N	HB02_P	FMC_LPC_LA14_P
35	HB16_N	FMC_LPC_LA16_N	GND	GND	LA30_N	FMC_HPC_LA30_N	GND	GND	HB02_N	FMC_LPC_LA14_N
36	GND	GND	LA33_P	FMC_HPC_LA33_P	GND	GND	HB18_P	FMC_LPC_LA18_CC_P	GND	GND
37	HB20_P	FMC_LPC_LA20_P	LA33_N	FMC_HPC_LA33_N	LA32_P	FMC_HPC_LA32_P	HB18_N	FMC_LPC_LA18_CC_N	HB17_P_CC	FMC_LPC_LA17_CC_P
38	HB20_N	FMC_LPC_LA20_N	GND	GND	LA32_N	FMC_HPC_LA32_N	GND	GND	HB17_N_CC	FMC_LPC_LA17_CC_N
39	GND	GND	VADJ	VADJ	GND	GND	VIO_B_M2C	NC	GND	GND
40	VADJ	VADJ	GND	GND	VADJ	VADJ	GND	GND	VIO_B_M2C	NC

* Note: All NC signals are passed by FMC700.