VITA 57.4 FMC+ Extender Card

For VITA 57.4 Applications

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1 Abstract

FPGA carrier card developers require easy-to-use options to confirm the operation of the VITA 57.4 FMC+ expansion connector typically found on these platforms. In some cases, the mating height of the standard FMC+ connectors may prevent fully leveraging the connectivity options of all FMC+ modules.

The VITA 57.4 FMC+ Extender Card (REF-212564-01) has been designed for placement between FPGA Carrier Cards and FMC+ Modules. This increased space can be used for additional I/O expansion during development. The FMC+ Extender Card also provides a cost-effective option for extending the life of the FPGA Carrier Card HSPC connectors used as test platforms. It is ideal for benchtop testing, system debugging, probing, or FPGA development.

The card provides FPGA designers an easy to use option for testing low-speed interfaces and high-speed multi-gigabit transceivers on any FPGA development board or FPGA carrier card. It can run system data or BER testing on all channels in parallel. This makes evaluation and development with an FPGA much easier.

This paper will explore the following details of the FMC+ Extender Card:

- Mechanical Dimensions and Assembly Features
- Connector Pin Assignments and Block Diagrams
- Qualification testing set-up and test results
2 Mechanical Dimensions

The FMC+ Extender Card provides a variant of the mechanical dimensions of an FMC+ card defined within ANSI/VITA 57.4-2019 Section 3. The electromechanical interface between the mating HSPC connectors conforms to ANSI/VITA 57.4-2019 Section 3. Specific mechanical dimensions of the card are highlighted below.

![Figure 1 - Mechanical Dimensions for FMC+ Extender Card](image-url)
3 Mechanical Design Features

Since many of the applications that involve VITA 57.4 systems are on highly populated with sensitive components, it is important to have an easy way to access the FMC+ carrier. The FMC+ Extender Card provides several mechanical features that ease mating and unmating.

The FMC+ Loopback Cards feature:

- The FMC+ Loopback cards have been designed to work in conjunction with the Micro Jack Screw Standoff (JSOM).
- Use JSOMs to carefully mate and unmate the FMC+ Loopback Cards to the FPGA carrier to avoid damages.
- An Allen-key unscrews and expands the jack screw, dividing the PCBs in a steady, even motion until the mezzanine is safely separated from its host.
4 Connector Pin Assignments

The FMC+ Extender Card conforms to the Connector Pin Assignments of the HSPC connector as defined within ANSI/VITA 57.4-2019 Section 5. The FMC+ Extender Card provides direct pass-through connectivity for all 560 pins from the HSPC male to HSPC female connectors. Specific pin assignments are highlighted below.

![Figure 2 - HSPC Connector Pin Assignments](image-url)
5 Block Diagrams

The FMC+ Extender Card provides basic throughput functionality for testing general FPGA carrier cards that contain the HSPC interface. Signals routed include:

- Gigabit data signals (MGTs)
- Gigabit reference clocks
- Control lines including JTAG (including IPMI support), I2C, addressing, and reserved signals
- All required power rails, sequencing, and control lines

Specific high-level signal routing for both cards are highlighted below.

![ASX Block Diagram](image)

**NOTE:** Block diagram shows pin numbers and not signal names.

Figure 3 - FMC+ Extender Card Block Diagram

Additional signal routing and circuitry details are contained in the schematics for the FMC+ Extender. Schematics are available from Samtec under NDA. Please e-mail KitsAndBoards@samtec.com for more details.
6 Testing the FMC+ Extender Cards

The FMC+ Extender Card has been designed to test low-speed signals and high-speed multi-gigabit transceivers on any FPGA development board or FPGA carrier card with the FMC+ interface.

6.1 Test Setup

General functional testing of power, control and low-speed signal are assumed with a successful power-up of the card. Key testing results are focused on verifying full-speed operation of the MGTs routed via the HSPC connectors.

To determine electrical performance of the FMC+ Extender Card, a Xilinx VCU118 was utilized as the FMC+ carrier along with the Samtec HSPC Loopback Card.

Figure 4 – FMC+ Extender Card Test Setup Utilizing the HSPC Loopback Card

6.2 Testing Results

The Test Setup ran over 24 channels and was found to be error free for over 15 hours of testing with a BER < 5.4e-14. The resulting data in Figure 5 and Figure 6.

Figure 5 – Eye Diagram for Test Setup 1
7 Conclusions

FPGA carrier card developers require easy-to-use options to confirm the operation of the VITA 57.4 FMC+ expansion connector typically found on these platforms. In some cases, the mating height of the standard FMC+ connectors may prevent fully leveraging the connectivity options of all FMC+ modules.

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The FMC+ Extender Cards have been tested on numerous, popular FPGA evaluation kits and carrier cards. Data rates on the MGTs have been confirmed to 28 Gbps and beyond.

Additional details on can be found at www.samtec.com/kits.