



Sundance's Cutting-Edge Technology

An overview of Sundance's growing range of FMC Modules
for Rapid Prototyping and Low-Volume System Solutions



What is an FMC module?



FMC stands for **FPGA Mezzanine Card**.

It is a VITA standard that defines I/O mezzanine modules connected to an FPGA or other device carrier board.

It bridges FPGAs to a variety of interfaces for processing real-world signals. It originated in 2007 and was standardised by <https://www.vita.com/fmc> in 2008

<https://vita.militaryembedded.com/391-vita-fmc-opens-io-pipe-fpgas/>



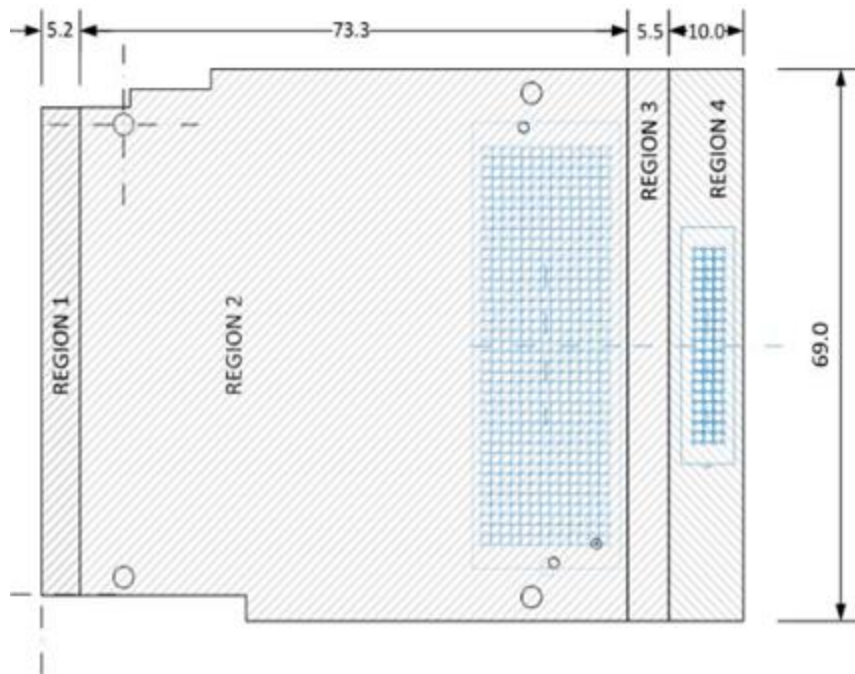
A FMC installed on a Sundance [SE120](#) PCIe Carrier Board

FMC Key Features

The FPGA Mezzanine Card standard defines a common footprint, connector, and form factor that allows I/O modules from different vendors to interoperate with various FPGA and carrier boards.

This enables flexible mixing and matching of I/O functions across platforms.

This separation of logic and I/O simplifies designs.



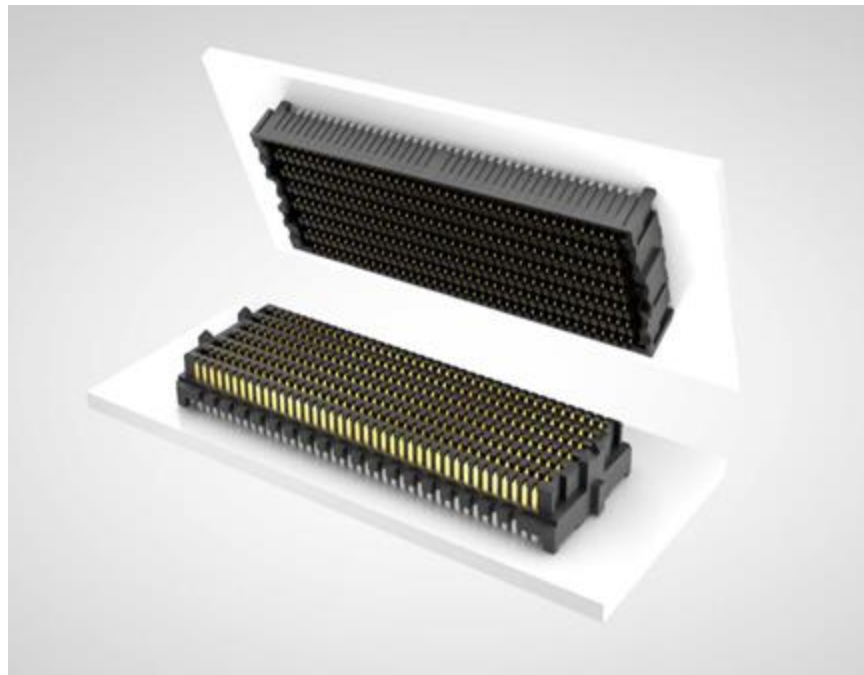
[VITA57](#) - FMC basic form-factor
Larger sizes are optional

FMC Key Features

Using FMC modules allows customizing the I/O capabilities for an FPGA carrier board, providing specific interfaces tailored to the application's needs.

This is more flexible than fixed I/O, enabling swappable modules to adapt the system I/O.

The FMC connector and routing are implemented on the carrier board, while interchangeable mezzanine modules plug in to provide the I/O resources.



FMC Key Features

Popular interfaces for FMC modules include analog, digital, and wireless interfaces for bridging FPGAs to real-world signals.

This simplifies integrating FPGA processing logic with instrumentation, communications, automotive, aerospace applications, and more.

The FMC+ is the latest update to standard and called VITA57.4 and has more I/O pins and bandwidth – More details:

<https://vita.militaryembedded.com/7734-deja-vu-the-ubiquity-of-vita-57/>




FMC+ connector on a Sundance's [PCIe/104](#) board

FMC Key Features

High speed differential pairs route signals between FMC modules and FPGAs, supporting multi-gigabit transfer rates for bandwidth intensive applications.

This enables high throughput data exchange.

FMC supports many standard interface types like GPIO, Ethernet, PCIe, SRIO, USB, SATA, ADC/DACs, and more.

This diversity allows tailoring modules for different needs.

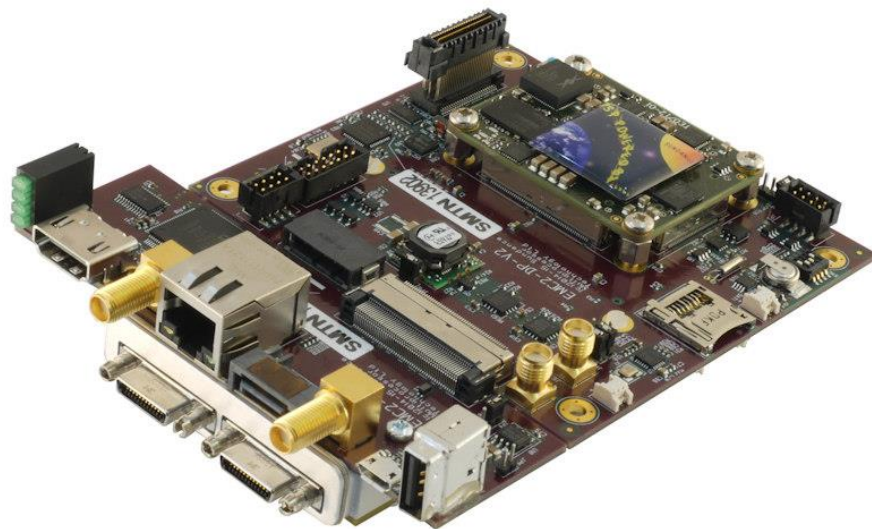


Sundance FMC carrier board in PXIe format
[PXIe/800](#)

FMC Key Features

The FPGA Mezzanine Card standard simplifies integrating real-world I/O and system interfaces into FPGA-based designs by physically and electrically decoupling the I/O modules from the FPGA processing cards.

This separation enables flexibility to combine compatible FPGA boards and I/O modules from different vendors to meet application needs.

Sundance [EMC²](#) PC/104 FPGA board with FMC Module for CameraLink Interface





Sundance's FMC Modules

- **Diverse Capabilities:**
 - Our range of FMC Modules offers diverse capabilities.
- **Standard Compatibility:**
 - Majority of our FMC Modules adhere to the default FMC board form factor standard.
- **Application-Specific Design:**
 - Some FMC Modules are tailored for specific applications and extended form-factor
- **Varied Functionality:**
 - Our FMC Modules provide a bespoke selection of IO, ADC, DAC, and imaging interfaces/

RF Module – FMC-HPC Connector, Extended Size

- PCIe104 form factor (only mechanical properties)
- Input frequency range 70 MHz – 6 GHz,
- input Bandwidth – tunable from 200 kHz to 56 MHz
- Output frequency range 50MHz – 6 GHz, TX EVM ≤ -40 dB
- Maximal output power 8 dBm at 800 MHz, 7.5 dBm at 2.4 GHz
- Built-in GNSS module LEA-8MT, for precision timing reference
- GNSS antenna, passive or active via one SMA connector



[FMC-SDR400P-6](#)



Vision Module – FMC-LPC or FMC-HPC Connector

- FMC-CL is a Camera Link FMC that interfaces to quad BASE, MEDIUM, and dual FULL and Extended FULL cameras.
- PoCL (Power over Camera Link) support
- Up to 85 MHz data rate
- ESD protection for all Camera Link signals
- Optional Dual SATA for direct disk interface
- LPC (low pin count) and HPC (high pin count)
- Commercial and Industrial grades
- Supports Sundance DSP Video Generator



[FMC-CL](#)



Vision Module – FMC-HPC Connector

- FMC-MIPI is particularly suitable for applications and R&D in Augmented Reality / Virtual Reality (AR/VR)
- Two MIPI CSI-2 input interfaces with 4 lanes, up to 0.9Gb/s per Lane converted to two 14 bit parallel interfaces;
- Two 18-bit parallel input interface converted to two MIPI DSI output interfaces with 4 lanes;
- Small footprint, HPC FMC module

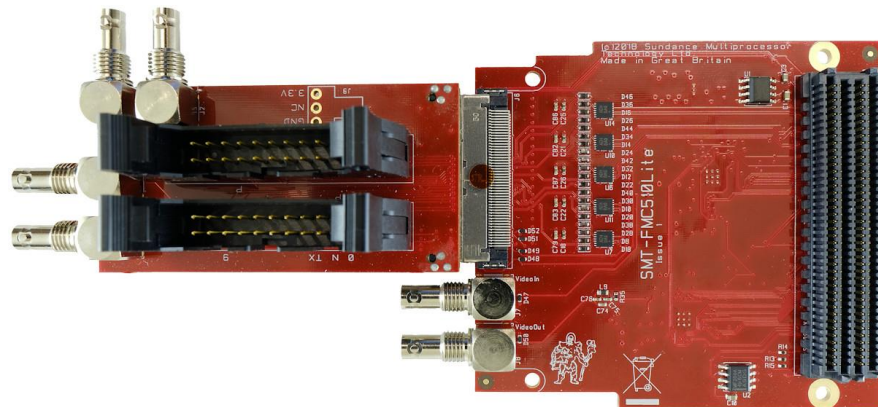


[FMC-MIPI](#)



Vision Module – FMC-LPC Connector

- BNC connector carrying analogue video out.
- BNC connector carrying analogue video in (optional).
- LSHM connector carrying:
- One analogue video output
- One analogue video input
- 10 pairs of full-duplex RS422

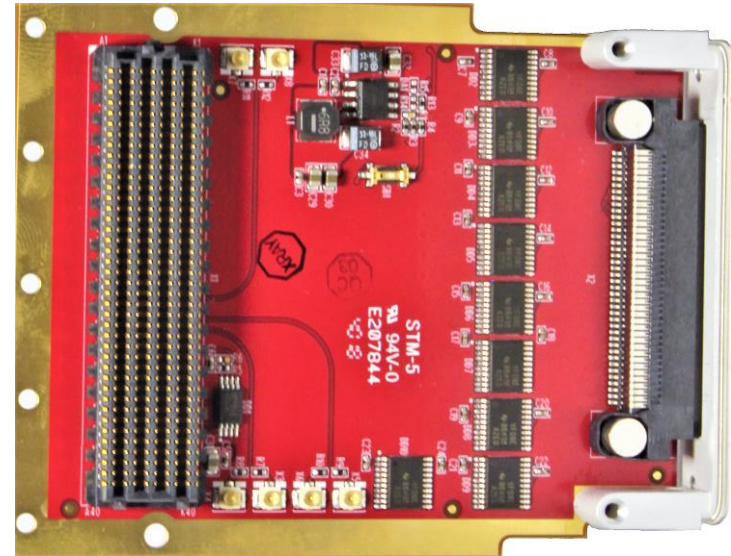


[SMT-FMC510L](#)



I/O Module – FMC-HPC Connector

- 68 Single-Ended IOs or 34 differential pairs without level translation
- Auto sense, level translation of all or some of the IOs from 1.8V to 3.3 or 5V
- Pass through option
- 3 differential pairs through 6x Samtec connectors RSP-122811-01
- Vadj from carrier card
- HPC FMC
- Conduction cooled

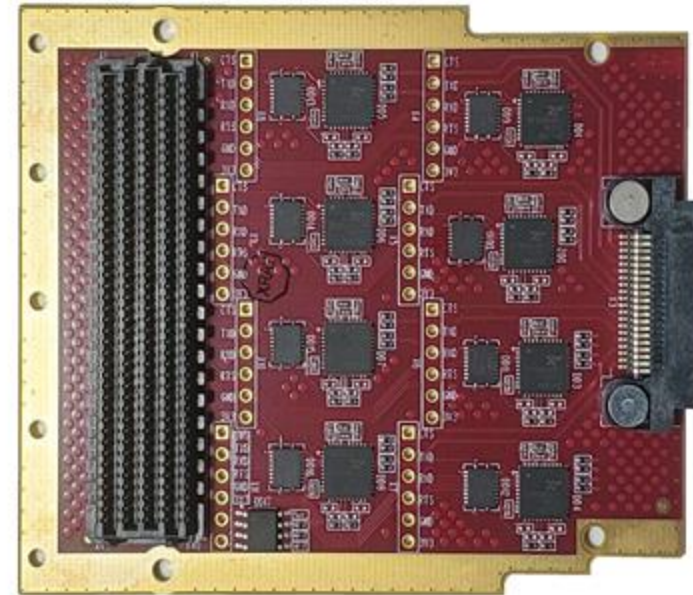


[FMC-GPIO68S](#)

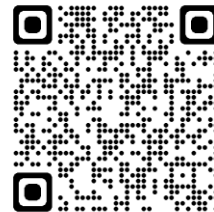


I/O Module – FMC-LPC Connector

- RS422 or RS485 or RS232 input interfaces – orderable option, separate for each channel.
- All output interfaces are ESD protected, ESD protection built-in IC.
- The main IC is SP339EER1-L.
- Total eight channels of RSxxx interfaces routed to Samtec right angle ERF8-020-01-L-D-RA-L-TR connector
- Supported VADJ levels 1.2V – 3.3V

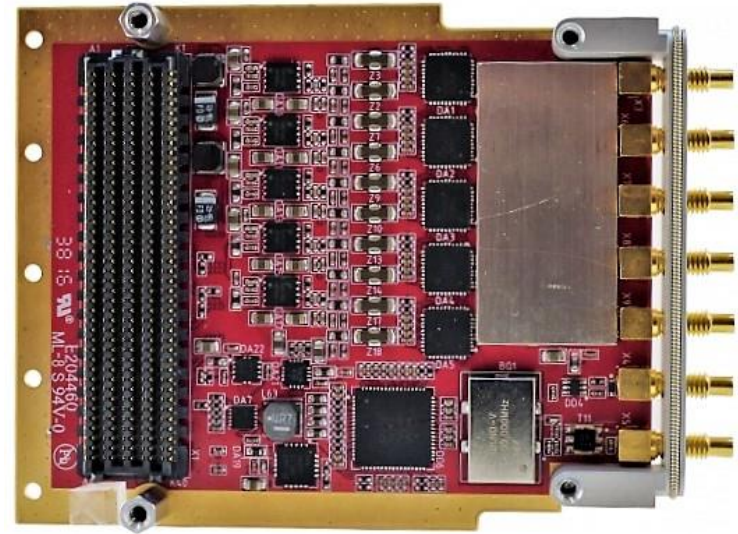


[FMC-RSxxx-8](#)

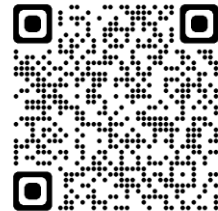


ADC Module – FMC-HPC Connector

- 5 x ADC 16 bit @ 500MS/s
- High Pin Count (HPC) FMC module
- Trigger Input
- External Clock up to 4 GHz
- 100 MHz onboard VCXO and 10MHz TCXO for reference clock
- Compliant with JESD204B subclass 1
- Time stamp with external trigger
- Deterministic delay



[FMC-ADC500-5](#)



RF-Module – FMC-HPC Connector

- 2 RF Channels, DC to 6 GHz acquisition
- Software tunable Channel Bandwidth
200 kHz-56 MHz
- 2 x Multiple Synchronized Input and
output
- AD9361 Dual 12 bits transceivers
- Tunable RF Bandpass Filters
- AD9656 Dual 16 bits AD converter (for
baseband RF)
- Conduction cooled



[FMC-SDR400](#)

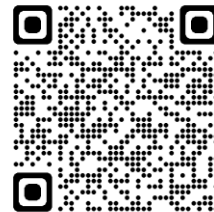


DAQ Module – FMC-HPC Connector

- 1 x ADC 12 bit @ 2.7 GSPS
- 2 x DAC 16 bit @ 2.8 GSPS
- High Pin Count (HPC) FMC module
- Trigger Input
- External Clock up to 4 GHz
- 100 MHz onboard VCXO
- External Clock up to 4 GHz
- 100 MHz onboard VCXO
- 4 x high-speed and 4 x low-speed differential lanes
- 10 x single-ended IOs
- Optional SATA for direct disk interface



[FMC-DAQ2P5](#)



I/O Module – FMC-LPC or FMC-HPC Connector

- LPC and HPC (high pin count)
- One transceiver on LA and one on HA banks.
- Can be used as an optional Dual SATA for direct disk interface.
- Low-cost IO board for FPGA boards.



[FMC-GPIO](#)



RF Module – FMC-LPC Connector

- FMC LPC connector for interfacing
- All electrical signals comply with Vita 57.1 FMC standard;
- 5 SSMC RF input connectors
- Input LNA HMC8410LP2FE
- The input tunable attenuator is HMC624A;
- TX path contains 22 dB TX amplifier ADL5611;
- External reference clock input
- Internal 40 MHz OCXO, +-100ppb, as an option, can be used 40 MHz TCXO;



[FMC-SDR400D](#)

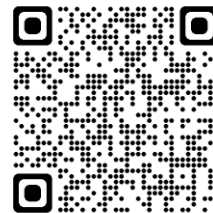


DAC Module

- 4-Channel DAC FMC Module – Low-Pin-Count
- 1.25 GHZ DAC
- Offer excellent SFDR performance better than 70dB
- 50 Ohm output
- Internal voltage regulator for low noise output.
- FPGA and DDR3 memory to hold waveform store
- Based on TI's DAC3484

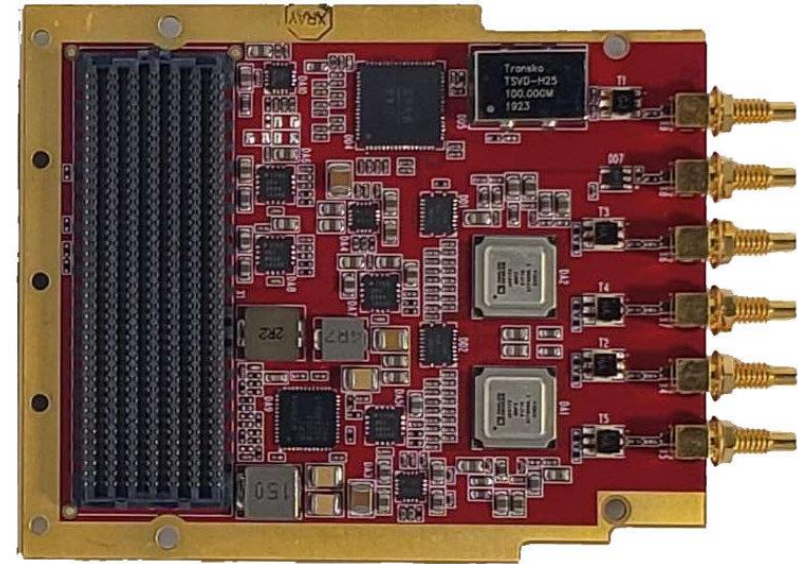


[SMT-FMC211](#)

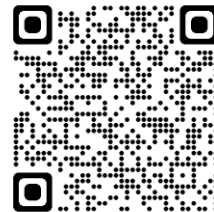


DAC Module – FMC-HPC+ Connector

- Two AD9172 Dual 16-bit 12GSPS Digital to Analog Converter, JESD204B based.
- HMC7044 – High performance 3.2GHz JESD204B jitter attenuator.
- Six connectors, SSMC type:
 - Four connectors for DAC output signals
 - One for reference clock
 - One Trigger input
- JESD204B Subclass 1 capable;
- 100 MHz onboard VCXO;

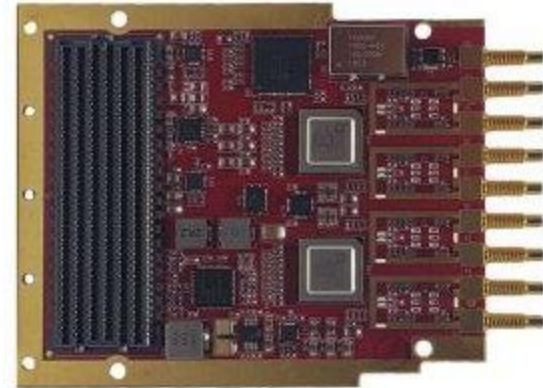


[FMCP-DAC12P0](#)



ADC Module – FMC-HPC+ Connector

- 4 channels of ADC at 3GS @ 14 bits
 - Using 2 AD9208 for 3GS/s
 - Using AD9689 for 2.6GS/s
- Flexible clocking
- Trigger and external clock inputs
- Supported by JESD204C class 1
- Supported by HMC7044 clock IC
- Conduction cooled

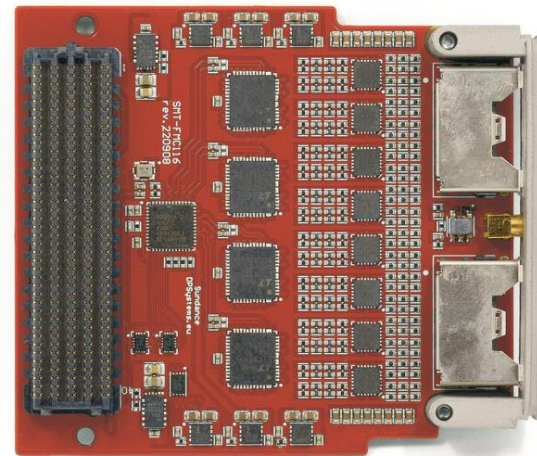


[FMCP-ADC3P0](#)

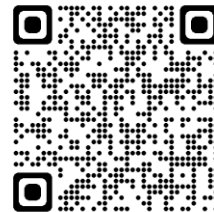


ADC Module – FMC-LPC or FMC-HPC Connector

- 16 channel 14-bit 125 MSPS A/D
 - Based on LTC2175-14
- ANSI/VITA 57.1-2010 compliant
- Single ended DC coupled inputs
- Programmable DC offset correction
- Samtec's ACCELERATE® ARF6-RA
 - Connects analogue signals to the board.
- Flexible clock tree enables
 - External or Internal clock,
 - External clock output
 - External or internal reference



[SMT-FMC116](#)



Vision, Control & Sensor Module – Extended Size FMC

- FMC-LPC I/O Module with ADC/DAC/CANS I/Os
- WiFi/BLE/GPS/GNSS/4G/ MODULES
- IMU/TEMPERATURE & HUMIDITY SENSOR
- AUDIO SENSORS
- USB3.0 & GPIO

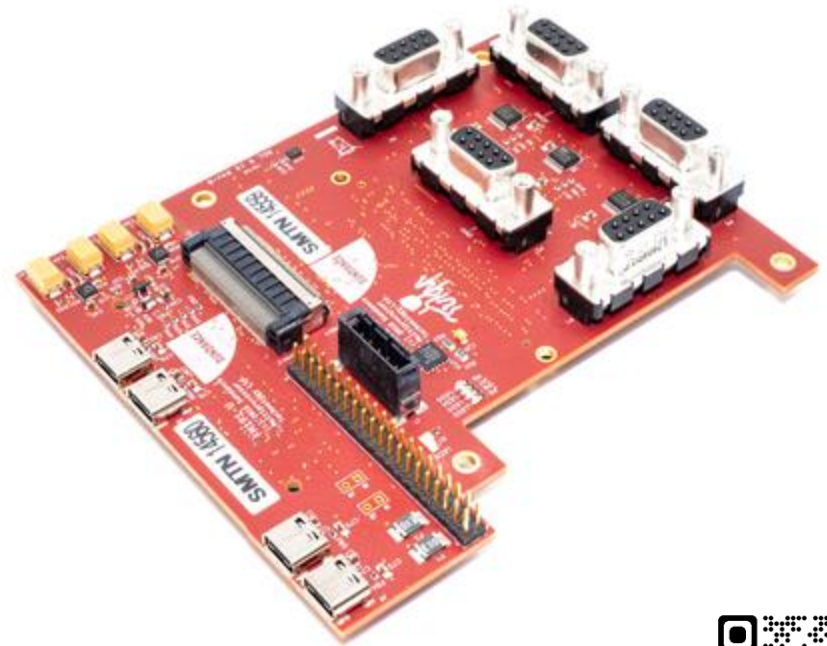


[FM192](#)



Vision, Control & Sensor Module - Extended Size FMC

- FMC LPC connector with I/O and single high-speed serial.
- Single +5 and +3.3V (external ATX connector) for powering external sensors via the DB9 connectors.
- 15x single-ended digital I/Os 5V TTL are accessible
- 12x analogue Inputs 5V TTL, with a resolution of 24-bits@2kSPS
- 8x analogue Outputs 5V TTL, with a resolution of 12-bits
- 4x USB C connections and 28x single-ended digital I/Os 5V TTL 40-pin GPIO connectors available via the expansion FM191-U board.



[FM191](#)



DAQ Module – FMC-LPC Connector

- VITA57.1 FMC-LPC
 - Subset; no MGT required for full performance
 - Local Artix-7 FPGA and DDR3
- Dual-channel ADC
 - 14 bits at 125 MSPS, based on ADC3244
 - SNR is typically around 72dBFS
 - SFDR around 90dBc
- Dual-channel DAC
 - 16 bits at 250 MSPS, based on AD9747
 - SFDR is around 82dBc
- PLL clock synthesizer
- External clock and trigger inputs.

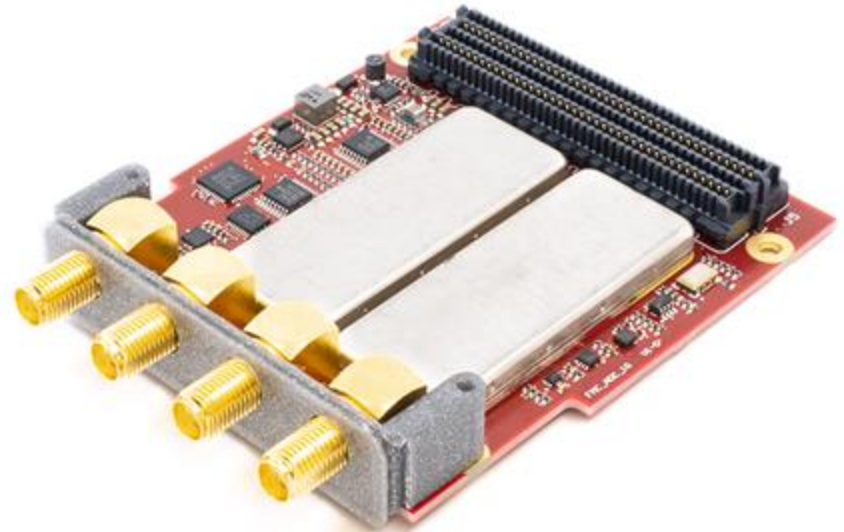


[SMT-FMC311](#)



ADC Module – LPC Module

- 2 channel 1GSPS 8 bit ADC
- 50 Ohm input is protected from overload
- 8 channel 12 bit I2C ADC monitors
- Developed in conjunction with CERN's Open Hardware Repository
- Software can select either one of the input channels to be sampled at 2 GSPS, by interleaving the 2 ADCs.



[FM582](#)

