

FMC Wideband RF Transceiver ADRV9029 (4x4)

Overview

The **FMC-ZU3RF-A** is a FMC for RF wireless communications applications based on the **ADRV9029** component from Analog Device Inc (ADI).

The **ADRV9029** is a highly integrated, radio frequency (RF) agile transceiver offering four independently controlled transmitters, dedicated observation receiver inputs for monitoring each transmitter channel, four independently controlled receivers, integrated synthesizers, and digital signal processing functions providing a complete transceiver solution.

The device provides the performance demanded by cellular infrastructure applications, such as small cell base station radios, macro 3G/4G/5G systems, and massive multiple in/multiple out (MIMO) base stations.

The **receiver subsystem consists of four independent**, wide bandwidth, direct conversion receivers with wide dynamic range.

The **four independent transmitters** use a direct conversion modulator resulting in low noise operation with low power consumption. The device also includes two wide bandwidth, time shared, observation path receivers with two inputs each for monitoring transmitter outputs. The complete transceiver subsystem includes automatic and manual attenuation control, dc offset correction, quadrature error correction (QEC), and digital filtering, eliminating the need for these functions in the digital baseband.

Other auxiliary functions such as analog-to-digital converters (ADCs), digital-to-analog converters (DACs), and general-purpose input/ outputs (GPIOs) that provide an array of digital control options are also integrated. To achieve a high level of RF performance, the transceiver includes five fully integrated phase-locked loops (PLLs). Two PLLs provide low noise and low power fractional-N RF synthesis for the transmitter and receiver signal paths.

A third fully integrated PLL supports an independent local oscillator (LO) mode for the observation receiver. The fourth PLL generates the clocks needed for the converters and digital circuits, and a fifth PLL provides the clock for the serial data interface. A multichip synchronization mechanism synchronizes the phase of all LOs and baseband clocks between multiple ADRV9029 chips.

All voltage controlled oscillators (VCOs) and loop filter components are integrated and adjustable through the digital control interface. This device contains a fully integrated, low power digital predistortion (DPD) adaptation engine for use in power amplifier linearization. DPD enables use of high efficiency power amplifiers, reducing the power consumption of base station radios while also reducing the number of SERDES lanes necessary to interface with baseband processors.

PanaTeQ offers the **VPX3-ZU1-SDR-D** development system based on the VPX3-ZU1 3U OpenVPX Zynq Ultrascale+ and the FMC-ZU3RF-A-W1A-AS for typical Software Defined Radio application, in both air-cooled and conduction cooled version.



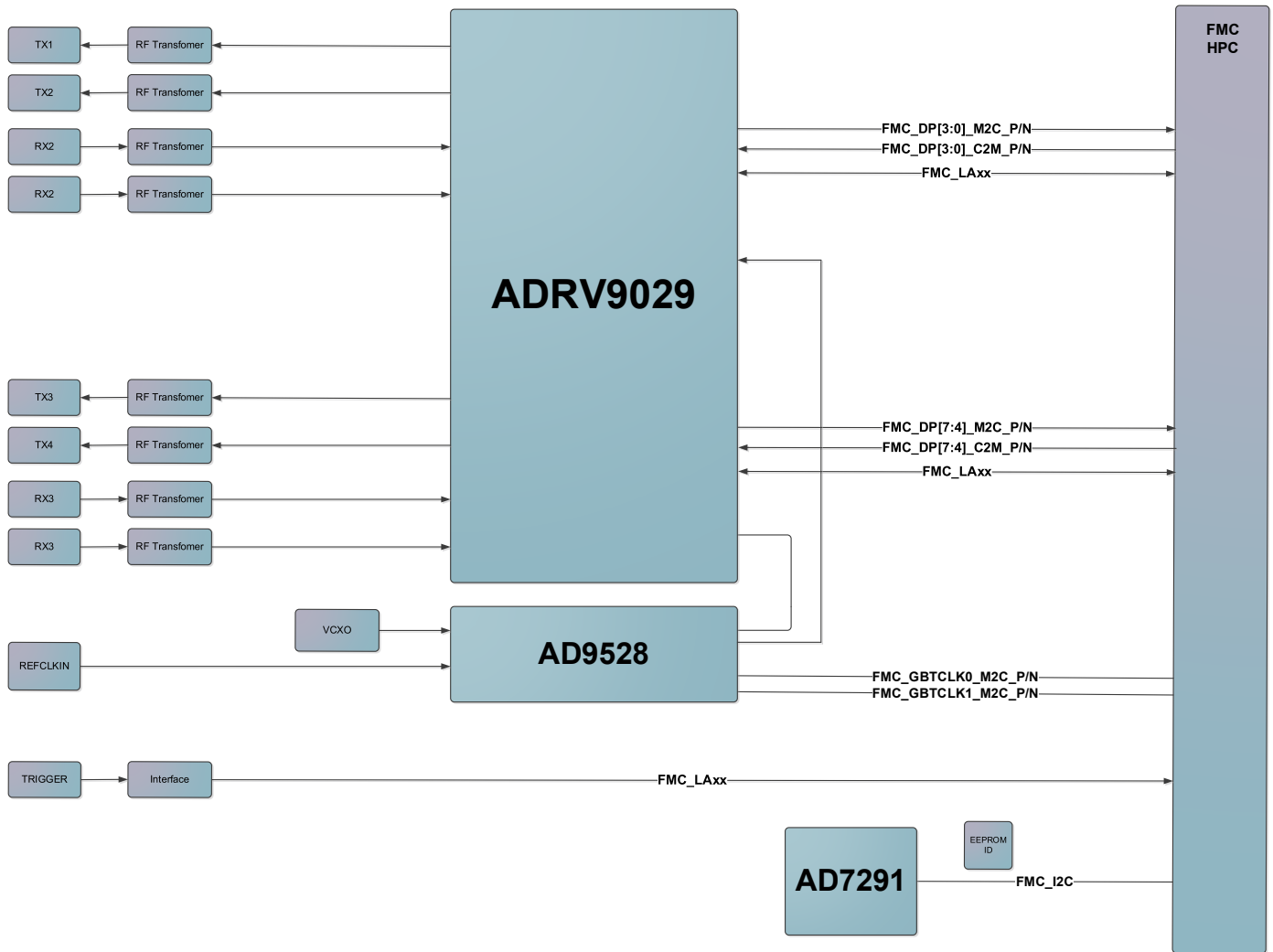
Key Features

- RF Transceiver Analog Devices ADRV9029 based FMC
- Vita 57.1-2010 specification compliant
- FMC High Pin Connector (HPC)
- JESD024B interface up to 12288 Mbps
 - 8x Tx
 - 8x Rx
- LA Bus LVDS and Singled-Ended
- Operates with VAdj = 2.5V to 1.5V
- Air and Conduction Cooled compatible
- Quad Transmitters (Tx)
- Quad Receivers (Rx)
- RF Ext LO Input/Output
- Reference Clock Input
- Trigger In and Out to/from FMC connector
- RF Coverage: 75MHz to 6.0 GHz
- Tx Synthesis Bandwidth Max: 450MHz
- Rx Bandwidth Max: 200MHz
- Support Time Division Duplex (TDD)
- Support Frequency Time Division (FTD)
- Fully integrated independent fractional-N radio frequency synthesizers
- On-board VCXO : 100.000MHz, 122.880MHz, 125.000MHz, 153.600MHz or 156.250MHz
- Air Cooled and Conduction Cooled

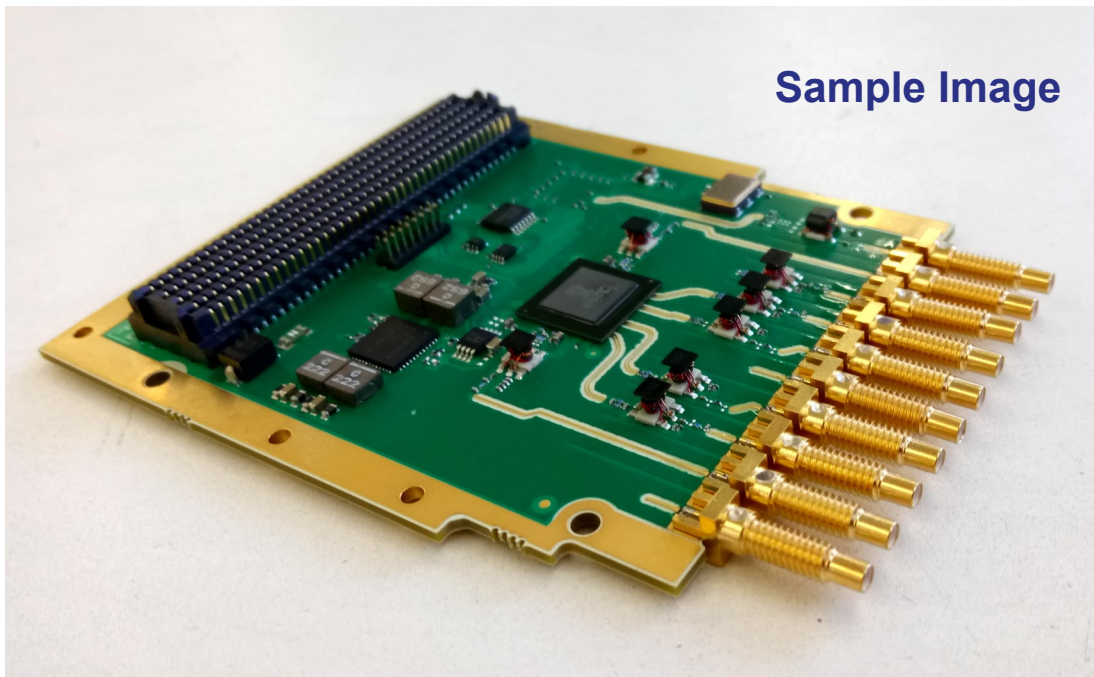
Typical Applications

- Software Defined Radio
- Electronic Warfare
- Wireless Infrastructure 3G/4G/5G
- TDD and FDD active Antenna Systems
- Drones and UAVs
- Military Communications

Block Diagram



Board Picture



Board Specifications

FMC HPC Interface

- VITA 57.1 Specifications compliant
- Single Module Width 69mm, Depth 76.5mm
- 8x MGT DP[3:0]_M2C, 8x MGT DP[3:0]_C2M for JESD204B interfaces up to 12.288Gbps
- 2x MGTCLK[1:0]_M2C
- LA Bus for LVDS and Single-Ended signals
- VADJ = 2.5V to 1.5V

Board Main ADI Components

- ADRV9029: Integrated, Dual RF Transceiver with Observation Path
- AD9528 : JED204B Clock Generator with 14 LVDS/HSTL Outputs
- AD7291 : 8-Channel, I2C, 12-bit SAR ADC with Temperature Sensor

RF Performances

- RF coverage 75MHz to 6.0GHz
- Tx synthesis bandwidth to 450MHz
- Rx bandwidth to 200MHz

On-board VCXO Options

- 100.000MHz
- 122.880MHz
- 125.000MHz
- 153.600MHz
- 156.250MHz
- For other values, please contact us

Front I/O: 10x micro SSMC Connectors

- TX Transmitter Channel 1 Output
- TX Transmitter Channel 2 Output
- TX Transmitter Channel 3 Output
- TX Transmitter Channel 4 Output
- RX Receiver Channel 1 Input
- RX Receiver Channel 2 Input
- RX Receiver Channel 3 Input
- RX Receiver Channel 4 Input
- Trigger I/O (FPGA)
- External Reference Clock Input

Environnemental Specifications

- Commercial Ruggedized 0-50C
- Conduction Cooled -40C to 70C at Thermal Interface

Product Codification

The FMC-ZU3RF-A can be assembled with different versions. The cooling technique et ruggedization level are also available options. The following table shows the product coding for all these options.

FMC-ZU3RF-A- W 1 A - AS

	Tuning Frequency Range	
W	Wide	75MHz - 6GHz

	VCXO Frequency
1	100.000 MHz
2	122.880 MHz
3	125.000 MHz
4	153.600 MHz
5	156.250 MHz

	Option
A	Default

	Ruggedization Level	VITA 47
AS	Air Standard	EAC4
AR	Air Rugged	EAC6
CC	Conduction Cooled	ECC3
CR	Conduction Rugged	ECC4

Ordering Information

The following product references are offered by PanaTeQ as standard products. Other combinations of devices, speed grade, memory and cooling can be specially ordered. Please contact us for details

Reference	Tuning Range	VCXO	Ruggedization Level
FMC-ZU3RF-A-W1A-AS	75MHz - 6GHz	100.000MHz	Air Standard Cooled
FMC-ZU3RF-A-W1A-CC	75MHz - 6GHz	100.000MHz	Conduction Cooled
FMC-ZU3RF-A-W2A-AS	75MHz - 6GHz	122.880MHz	Air Standard Cooled
FMC-ZU3RF-A-W2A-CC	75MHz - 6GHz	122.880MHz	Conduction Cooled
FMC-ZU3RF-A-W3A-AS	75MHz - 6GHz	125.000MHz	Air Standard Cooled
FMC-ZU3RF-A-W3A-CC	75MHz - 6GHz	125.000MHz	Conduction Cooled
FMC-ZU3RF-A-W4A-AS	75MHz - 6GHz	153.600MHz	Air Standard Cooled
FMC-ZU3RF-A-W4A-CC	75MHz - 6GHz	153.600MHz	Conduction Cooled
FMC-ZU3RF-A-W5A-AS	75MHz - 6GHz	156.250MHz	Air Standard Cooled
FMC-ZU3RF-A-W5A-CC	75MHz - 6GHz	156.250MHz	Conduction Cooled

Reference	SDR System Development
VPX3-ZU1-SDR-D	4U Desktop Chassis Air Cooled, VPX3-ZU1-B1M-AS, RTM-ZU1-A, FMC-ZU3RF-A, Linux BSP, Cables