

FMC Wideband RF Transceiver ADRV9009

Overview

The **FMC-ZU2RF-A** is a FMC for RF wireless communications applications based on the ADRV9009 component from Analog Devices Inc (ADI).

The **ADRV9009** component is a highly integrated, wideband RF transceiver offering dual channel transmitters and receivers, integrated synthesizers, and digital signal processing functions. The IC delivers a versatile combination of high performance and low power consumption required by 3G/4G/5G micro and macro base station equipment TDD applications.

The receiver path consists of two independent, wideband, direct conversion receivers with state-of-the-art dynamic range. The part also support a wide-bandwidth time-shared observation path receiver for use in TDD applications. The complete receiver subsystem includes automatic and manual attenuation control, dc offset correction, quadrature error correction (QEC), and digital filtering, thus eliminating the need of these functions in the digital baseband. Several auxiliary functions such as ADCs, DACs, and GPIOs for PA and RF-Front-End control are also integrated.

In addition to the autonomous AGC, it also has flexible external gain control modes, allowing significant flexibility in setting system level gain dynamically.

The received signals are digitized with a set of four high-dynamic range continuous-time sigma-delta ADCs which provide inherent anti-aliasing. The combination of the direct conversion architecture, which does not suffer from out-of-band mixing, and lack of aliasing relaxes the requirements of the RF filters compared as the traditional IF receivers.

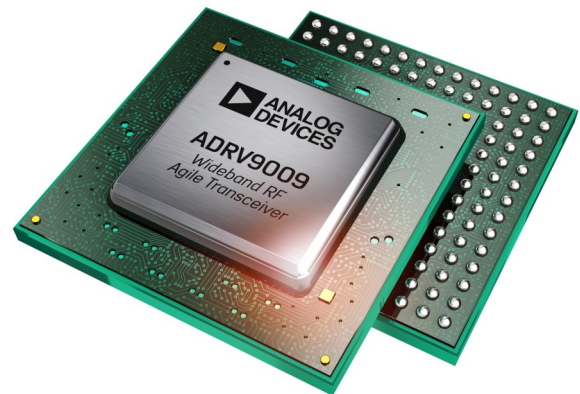
The transmitters use an innovative direct conversion modulator that archives high modulation accuracy with exceptional low noise.

The observation path consists of a wide bandwidth direct conversion receiver with state-of-the-art dynamic range.

The fully integrated phase-locked loops (PLLs) provide high performance, low power fractional-N frequency synthesis for the transmitter, the receiver paths. An additional synthesiser generates the clocks needed for the converters, digital circuits, and serial interface. All voltage-controlled oscillator (VCO) and loop filter components are integrated to minimize the external component count.

The high speed **JESD204B** interface supports up to 12 288 Mbps lane rates resulting in two lanes per transmitter, and a single lane per receiver in the widest bandwidth mode. The interface also supports interleaved mode for lower bandwidths thus reducing the total of high-speed data interface lane to one.

PanaTeQ offers the **VPX3-ZU1-SDR-C** development system based on the VPX3-ZU1 3U OpenVPX Zynq Ultrascale+ and the FMC-ZU2RF-A-W1A-AS for typical Software Defined Radio application, in both air-cooled and conduction cooled version.



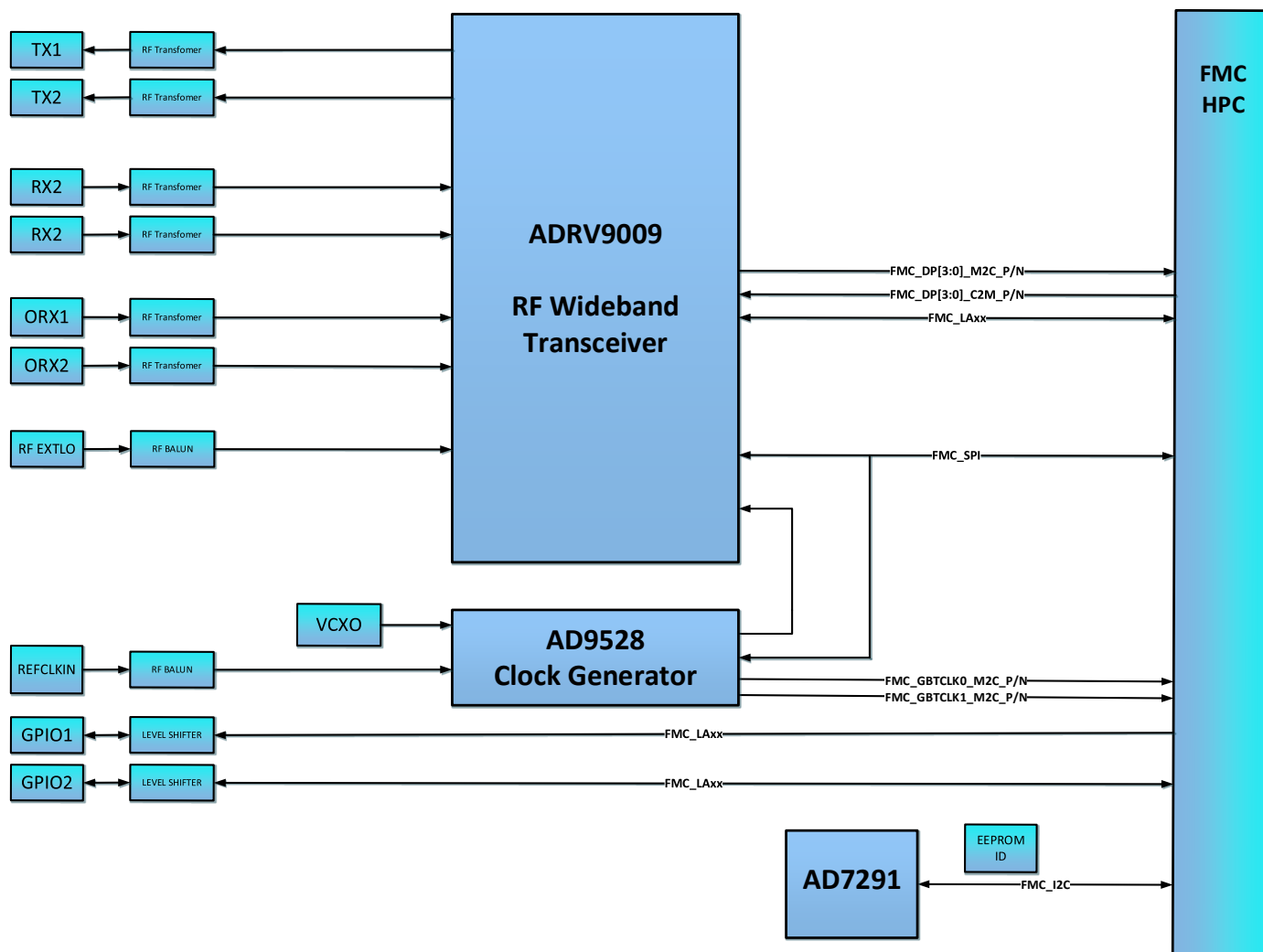
Key Features

- VITA 57.1-2010 specification compliant
- Fully HW/SW compatible with ADRV9009 Evaluation Board
- FMC High Pin Connector (HPC)
- JESD024B interface up to 12288 Mbps
 - 4x Tx
 - 4x Rx
- LA Bus LVDS and Singled-Ended
- Operates with VAdj = 2.5V to 1.5V
- Air and Conduction Cooled compatible design
- 2x SSMC for Dual Transmitters (Tx)
- 2x SSMC for Dual Receivers (Rx)
- 2x SSMC for Dual Observation Receiver (ORx, 450MHz BW max)
- 1x SSMC RF Ext LO Input/Output
- 1x SSMC Reference Clock Input
- 2x SSMC Dual GPIO (3.3V) 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)
- Fully integrated independent fractional-N radio frequency synthesizers
- On-board VCXO : 100.000MHz, 122.880MHz, 125.000MHz, 153.600MHz or 156.250MHz

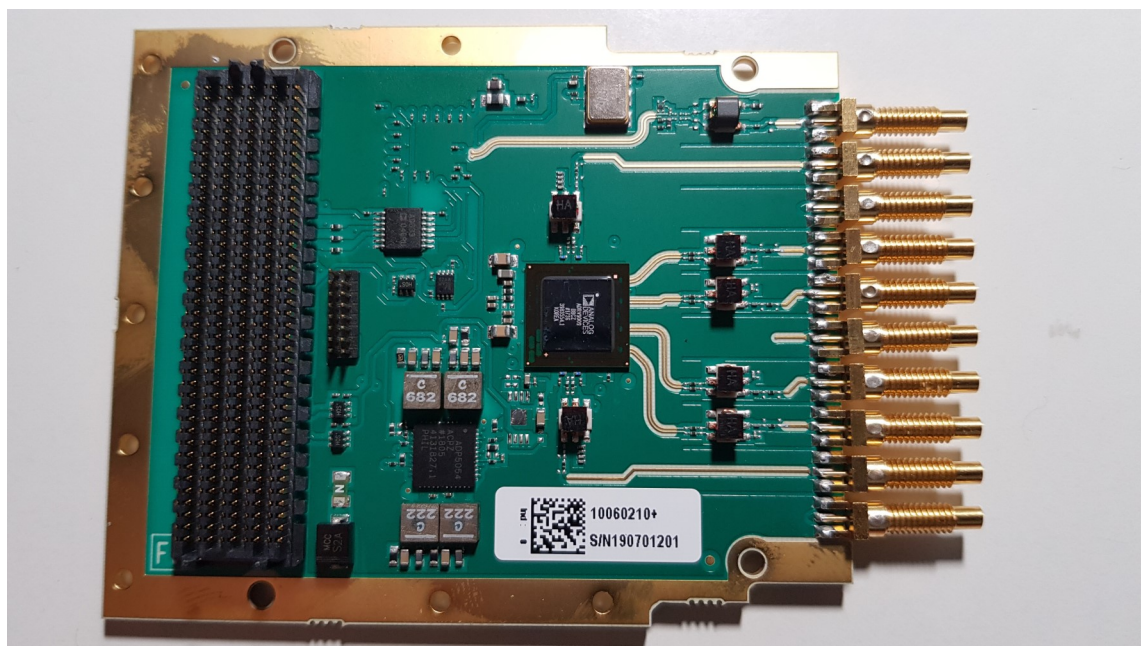
Typical Applications

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

Block Diagram



Board Picture



Board Specifications

- Fully HW/SW compatible with ADRV9009 Evaluation Board from ADI

FMC HPC Interface

- VITA 57.1 Specifications compliant
- Single Module Width 69mm, Depth 76.5mm
- 4x MGT DP[3:0]_M2C, 4x MGT DP[3:0]_C2M for JESD204B interfaces up to 12Gbps
- 2x MGTCLK[1:0]_M2C
- LA Bus for LVDS and Single-Ended signals
- VADJ = 2.5V to 1.5V

Board Main ADI Components

- ADRV9009: Integrated, Dual RF Transceiver with Observation Path
- AD9528 : JESD204B 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

Front I/O: 10x SSMC Connectors

- TX Transmitter Channel 1 Output
- TX Transmitter Channel 2 Output
- RX Receiver Channel 1 Input
- RX Receiver Channel 2 Input
- Observation Receiver Channel 1 Input
- Observation Receiver Channel 2 Input
- RF EXT LO Input/Output
- GPIO Input/Output 3.3V (FPGA)
- GPIO Input/Output 3.3V (FPGA)
- External Reference Clock Input

Environnemental Specifications

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

Product Codification

The FMC-ZU2RF-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-ZU2RF-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-ZU2RF-A-W1A-AS	75MHz - 6GHz	100.000MHz	Air Standard Cooled
FMC-ZU2RF-A-W1A-CC	75MHz - 6GHz	100.000MHz	Conduction Cooled
FMC-ZU2RF-A-W2A-AS	75MHz - 6GHz	122.880MHz	Air Standard Cooled
FMC-ZU2RF-A-W2A-CC	75MHz - 6GHz	122.880MHz	Conduction Cooled
FMC-ZU2RF-A-W3A-AS	75MHz - 6GHz	125.000MHz	Air Standard Cooled
FMC-ZU2RF-A-W3A-CC	75MHz - 6GHz	125.000MHz	Conduction Cooled
FMC-ZU2RF-A-W4A-AS	75MHz - 6GHz	153.600MHz	Air Standard Cooled
FMC-ZU2RF-A-W4A-CC	75MHz - 6GHz	153.600MHz	Conduction Cooled
FMC-ZU2RF-A-W5A-AS	75MHz - 6GHz	156.250MHz	Air Standard Cooled
FMC-ZU2RF-A-W5A-CC	75MHz - 6GHz	156.250MHz	Conduction Cooled

Reference	SDR System Development
VPX3-ZU1-SDR-C	4U Desktop Chassis Air Cooled, VPX3-ZU1-B1M-AS, RTM-ZU1, FMC-ZU2RF-A, Linux BSP, Cables