

DE9941A

SDR Demonstrator for Industrial IoT Modem Applications

Features

- Complete UHF modem solution
- On-board ARM controller with script handler and USB interface
- Credit card size – 87mm x 55mm
- Ample test points for signal interrogation

Functional Summary

- 12.5/25/50kHz channel support
- Supports m-QAM modulation
- 192kbps in a 50kHz channel
- 1 Watt transmit output
- Designed to meet EN 302 561 / EN 300 113

Applications

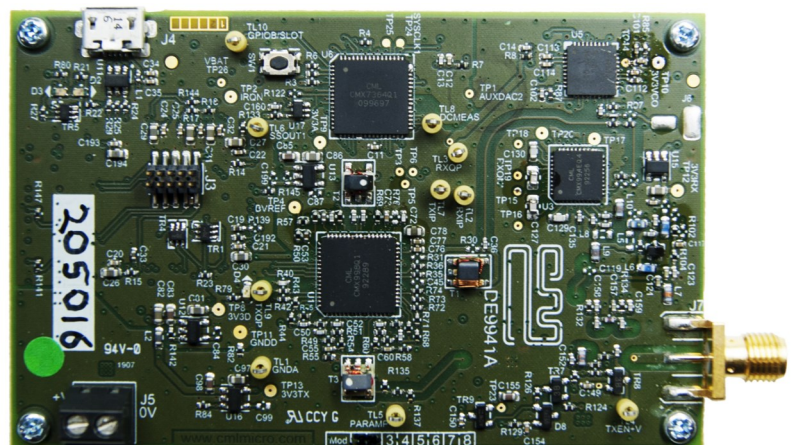
- VHF/UHF modems
 - Industrial IoT
 - Telemetry
 - SCADA
 - Real Time Kinematics
 - Military systems
- Satellite modems (IF stage)

The DE9941A is a compact UHF wireless data modem demonstration platform using the CMX994E Direct Conversion Receiver, the CMX998 Cartesian Feedback Loop Transmitter and the CMX7364 High Performance Multi-mode Wireless Data Modem. The credit card sized small form factor of the evaluation platform is due to the highly integrated nature of the CML IC solutions and its software defined architecture allows support of multiple channel bandwidths (12.5/25/50kHz) and modulation types with a single hardware design. Whilst the components used support operation from 100MHz to 1GHz the design is optimised for operation in the 350-400 MHz band.

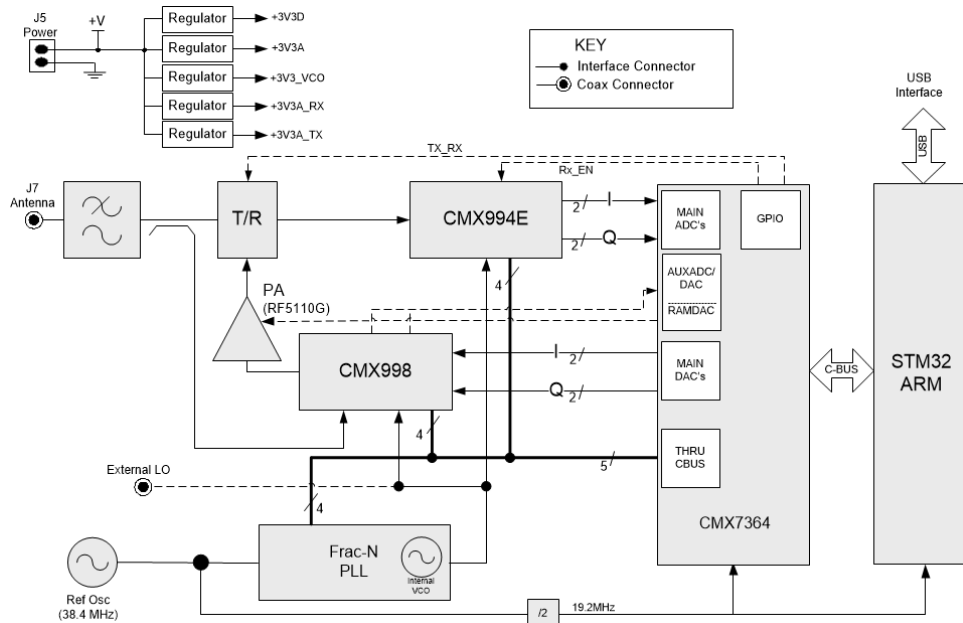
The board can be used to demonstrate receive and transmit performance with multi-level QAM, FSK and GMSK type modulation. Using the on-board ARM host controller, a full transceiver can be demonstrated interfacing to a host PC via USB, with scripts available to set up the board as a transceiver, as well as running BER tests and operation in transmit mode only.

The DE9941A includes a Fractional-N PLL and VCO to provide local oscillator signals for the CMX994E and CMX998. The on-board ARM micro-controller, together with the control scripts, gives the user the ability to program the RF synthesizer to the correct operating frequencies. The design also includes a 1W power amplifier, harmonic filter and Tx/Rx switch. The modem's RF performance is designed to be compliant with EN 302 561 / EN 300 113 and all the circuits are provided with power-down capability to allow standby functionality.

The DE9941A operates from a single 4.5V supply.



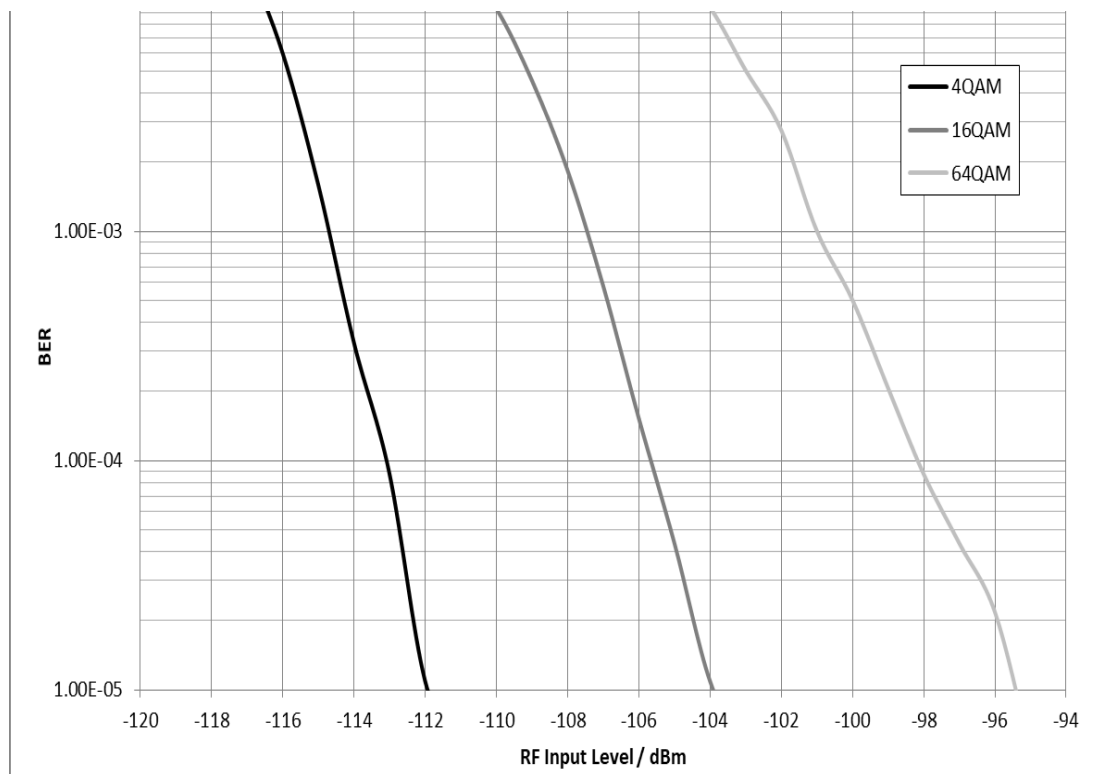
Block Diagram



Key Functionality

- **Main functionality (running 7364-FI-4)**
 - Optimised for 350 to 400MHz operation
 - 12.5/25/50kHz channel bandwidth
 - 4, 16 or 64 QAM modulation
 - Raw or coded data options
- **Digital interface**
 - USB 2.0
- **Monitoring and calibration**
 - Measurement of EVM, RSSI, Bit Error Rate
 - Measurement of DC offsets and calibration setup
 - Receive and transmit link logging
- **Power management**
 - 4.5V main supply
 - Selectable power down modes for individual ICs on the board
- **Physical format - 87mm x 55mm PCB with SMA RF antenna connector**

Typical sensitivity performance for QAM Modulation



FI-4x Firmware Functionality

4-QAM, 16-QAM, 32-QAM and **64-QAM** modulations are supported, with root raised cosine filtering with $\alpha=0.2$, 0.35 or a user programmable filter. The 7364FI 4.x supports up to 192kbps in a 50kHz channel, with channel estimation and equalization to provide robust performance under demanding channel conditions. For greater flexibility, different rate FEC modes are provided. Receive signal quality measurement is supported, making a useful assessment of link conditions. The 7364FI-4.x supports zero IF (I/Q) transmit and receive. QAM data is over-air compatible with the CMX7163FI-4.x.

The Function Image supports Adaptive Coded Modulation (ACM) features allow modulation type and block format to be changed on the fly via over-air commands that control a receiving CMX7364 baseband controller. These enable a Tx host to select optimum modulation and coding per burst to suit application message size, link channel quality and can also relax required Rx host message parsing speed. This feature makes the CMX7364 baseband controller a powerful solution that can operate in an optimised way whatever the state of the radio channel.

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