24GHz Radar Development Kit

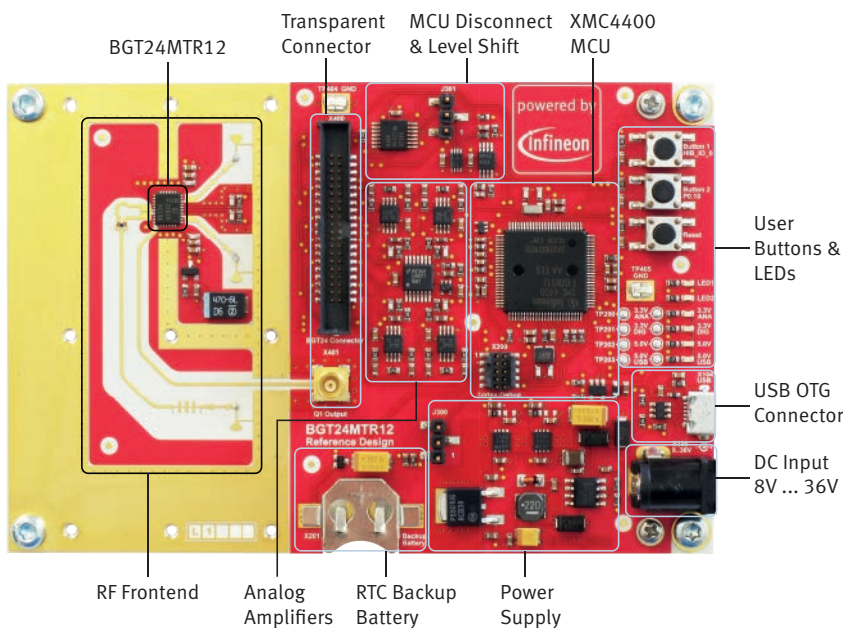## Based on Infineon's RF-Transceiver BGT24MTR12 and Microcontroller XMC4400

This development kit allows a customer to implement and test 24GHz Radar applications as Doppler movement detectors, FSK distance measurement or FMCW Tank Level measurement. It consists of BGT24MTR12 transceiver MMIC and a XMC4400 32-bit CPU for Signal processing.

The CPU is already preprogrammed with a Sample application what samples up to 4 IF channels of the Transceiver chip and sends it via a USB interface to a connected PC. An included PC application (Windows XP/Vista/7/8) can be used to display acquired data in time- and frequency domain. Using Infineon's DAVE™ development tool own applications can be written and tested (e.g. FMCW sweeps and signal processing). So this platform is a good starting point for own applications.

The development kit includes 12° x 25° Patch Antennas what can be exchanged by SMA connectors, so the user is free to use own antennas.

Reference Design Features

- BGT24MTR12 RF frontend chip
- Fixed patch antenna or SMA connector
- Dual analog amplifier stage for each Rx channel with a total gain of 55dB
- Transparent header with all signals from the BGT24MTR12 for external signal processing
- 50Ω MCX connector with Q1 signal from the RF frontend
- Jumper to disconnect the XMC4400 from the BGT24MTR12
- XMC4400 Microcontroller for sampling and signal processing of the analog signals onboard
- USB On the Go Host/Device support via micro USB connector
- Debug over Cortex 10-pin debug connector
- Reset push button
- 4 Power LEDs
- 2 User LEDs
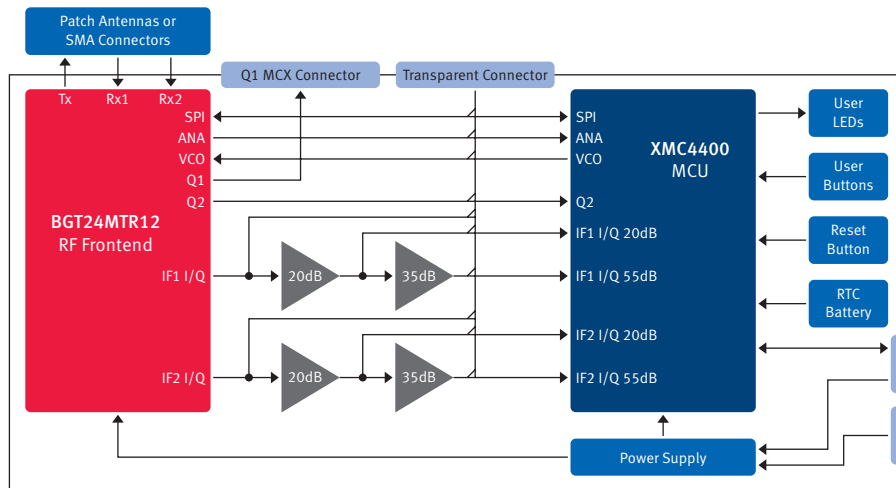- Power Supply via USB or external connector

Patched antennas are on the backside of the RF Frontend PCB (not shown in the picture).

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Block Diagram

BGT24MTR12

Infineon's BGT24MTR12 SiGe MMIC is located below a metallic encapsulation to reduce unwanted radiation. Every pin of this MMIC is accessible on a transparent connector and also from the XMC4400 CPU. RF input/output are fed to vias what go the other side of the PCB where an antenna or an SMA connector can be attached.

XMC4400 MCU

This CPU contains an ARM® Cortex™-M4 core. Applications can be stored into internal 512KB Flash memory. All analog signals from the RF frontend are sampled by internal ADC converters. BGT24MTR12 frequency control is done over 2 DAC channels.

External Antenna

This kit contains integrated Patch Antennas with an opening angle of 12° x 25°. These antennas also allow angle of arrival measurement. If an application needs higher RF bandwidth (e.g. for Tank Level applications) the antennas can be removed and replaced by SMA connectors, what allow the use of any custom 24GHz antenna.

Q1 MCX Connector

This connector outputs the divided down 24GHz carrier and allow the connection of an external PLL.

Transparent Connector

Every pin of the BGT24MTR12 chip is available on this connector and can be controlled by external user hardware.

IF Amplifier

This amplifier increases IF signal levels from BGT24MTR12 chip so they can be sampled from the XMC4400 AD converters. Two different gain stages allow processing of close and far Radar objects.

Power Supply

This Reference Design can be supplied over the USB connector or also by an external power supply (not included).

USB

This port is used to control the demo software or to transfer data to a PC application (a demo version of a USB stack is included).

User LEDs/Button

Different LEDs and Buttons can be used from User's application to create stand-alone applications.