



MSM6200 Chipset Architecture Using QCT's radioOne Zero Intermediate Frequency (ZIF)

Overview

QUALCOMM CDMA Technologies' (QCT) MSM6200™ single-chip multimode solution supports UMTS/GSM/GPRS systems while providing a proven suite of advanced Internet technologies. It represents a natural evolution of our product line, building on QCT's extensive CDMA expertise to develop a multimode solution that addresses the emerging worldwide UMTS/GSM/GPRS market, offering competitive system performance and rich feature sets that will allow handset manufacturers to minimize BOM and enable cost-effective 3G multimode products.

The MSM6200 chipset, part of QCT's MSM6xxx™ Mobile Station Modem™ (MSM™) family of chipsets and system software, uses QCT's radioOne™ Zero Intermediate Frequency (ZIF), or direct conversion, architecture, and is designed to support both the 3G Partnership Project User Equipment Frequency Division Duplex Direct Sequence Wideband CDMA (3GPP UE FDD DS-WCDMA) mode of the IMT-2000 standard and the Global System for Mobile communications (GSM)/ General Packet Radio Service (GPRS).

MSM6200™ CHIPSET SOLUTION

Supporting 384 kilobits per second (kbps), the MSM6200 solution provides manufacturers worldwide with the ability to develop consumer products that offer voice, position location technologies, high-speed data and video over wireless networks. Network operators will also benefit from the cost efficiencies and rapid time-to-market that the solution delivers for next-generation services.

Designing the MSM6200 solution into user equipment paves the way to true mobile multimedia applications. From circuit-switched high-end voice to packet-switched high-speed data, from audio to images and video, the MSM6200 solution supports a wide range of consumer products offering a variety of capabilities, including Personal Digital Assistant (PDA) and Internet applications such as e-mail, e-commerce, file transfer, Web access and more.

The MSM6200 chipset solution consists of the MSM6200 baseband processor, direct conversion RFL6200™ and RFR6200™ receive devices, the direct conversion RTR6200™ GSM transceiver and UMTS transmitter, PM6050™ power management device, and a compatible power amplifier device. These devices perform all of the signal processing and power management in the subscriber unit.

radioOne Technology

The radioOne solution offers a revolutionary technology for CDMA transceivers that uses direct conversion architecture for the wireless handset market. Direct conversion eliminates the need for large IF Surface Acoustic Wave (SAW) filters and additional IF circuitry, which reduces the handset BOM, resulting in cost-effective multi-band and multimode handsets that can be produced in smaller form factors.

Using advanced techniques developed by QCT to enable high-dynamic-range receivers, radioOne technology solves the problem of stringent interference specifications with which CDMA phones must comply. QCT's radioOne technology also incorporates the frequency synthesis and passive elements used in converting baseband signals to and from RF. A single package external VCO is used for the CDMA receiver and GSM transceiver, which will provide the capabilities needed to operate on systems around the world, and will simplify the procurement of parts and greatly reduce the cost of designing CDMA handsets.

MSM6200 Device Description



The MSM6200 chipset and system software builds on the successful architecture of QCT's MSM5200™ UMTS-only device, and is based on QCT's core CDMA systems expertise gained from years of field experience with this technology. The MSM6200 solution integrates both digital and analog functions into a single chip.

The MSM6200 solution includes advanced technologies such as Bluetooth™, as well as multimedia features such as Qtunes™ MP3 player software and MIDI-based multimedia software. Along with an optimized software solution for the UMTS and GSM/GPRS modem, QCT offers system development software, verification, test, debug, calibration, manufacturing and field test support using the UMTS designer development tools, which reduce time-to-market for a complete UMTS product.

MSM6200 General Device Enhancements

- Integrated audio codec
- Enhanced memory support
 - SRAM and NOR FLASH
 - 16-bit-wide memories
- Embedded Bluetooth baseband processor
- Voice Recognition (optional)
 - Speaker-dependent, speaker-independent and voice-prompt support
 - Multiple-language support
- Integrated mass-storage device (MMC) controller
- Audio enhancement technology support (Qtunes software)
- Integrated USB device controller for fast and simple PC interconnect

MSM6200 UMTS Device Enhancements

- Support for 3GPP Revision 99, March 2002 Release
- Full 3GPP protocol stack including L1, L2:MAC/RLC/, L3:RRC, (G)MM, SS, CC, SMS, SM, RABM
- 384 kbps data rates
- Adaptive Multiple Rate (AMR) speech codec
- Support for convolutional and turbo coding
- Compressed Mode (Inter-RAT and Intra-RAT)
- USIM interface supporting USIM & SIM cards

MSM6200 GSM/GPRS Device Enhancements

- 3GPP Revision 99 compliant
- Full GSM/GPRS protocol stack
- Multi-slot Class 10/Class B capable
- Adaptive Multiple Rate (AMR) speech codec
 - Full and Half rates
- Full Rate (FR), Enhanced Full Rate (EFR) speech codecs and Half Rate (HR)

RTR6200 Device Description



The RTR6200 is a highly integrated RF device that incorporates a UMTS transmitter with a dual-band GSM/GPRS transceiver. It derives its architecture from QUALCOMM's radioOne direct conversion devices for CDMA.

RTR6200 UMTS Transmit Section

The RTR6200 UMTS baseband-to-RF transmit processor performs all Tx signal processing functions required between QCT's MSM6200 chip and the power amplifier (PA) for UMTS. Its direct upconversion architecture offers an advanced, tightly integrated UMTS Tx solution, which simplifies RF PCB design, shortens development cycle time, and reduces BOM and current consumption over traditional super-heterodyne architectures. The RTR6200 chip is designed to meet the requirements for global IMT-2000/UMTS FDD markets, providing operation in the IMT-2000 band (1920 MHz - 1980 MHz).

RTR6200 GSM/GPRS Transceiver Section

The RTR6200 device also has an integrated transceiver for GSM bands for both GSM and GPRS modes. It contains a dual-band GSM/GPRS translational loop transmitter which consists of lowpass filtering with DC offset correction circuitry, I/Q modulators and offset phase locked loop (OPLL). The transmit signals are derived from the baseband interface from the MSM6200. The signals are modulated to IF via the I/Q modulators, and then applied to the OPLL where its output drives the GSM or DCS PA. The GSM receiver contains two LNAs, two direct conversion mixers and lowpass filtering. Also on chip are two UHF PLLs designed to support Fast Channel Acquisition for GPRS and 3GPP Compress Mode operation.

The RTR6200 device's voltage range is from 2.7 to 3.1 V, which provides operating compatibility for platforms utilizing a single-cell Li-Ion battery design. The RTR6200 device is fabricated on an advanced SiGe BiCMOS process, which accommodates both precision high-frequency analog circuits and low-power CMOS functions, and is provided in a 48BCC++ plastic package.

RTR6200 Device Features

- Complete direct upconversion from analog baseband to IMT-2000 UMTS Tx, plus a complete direct conversion GSM900/DCS1800 transceiver
- Integrated UMTS Transmitter

- Elimination of image-reject filter between IMT UMTS upconverter and driver amplifier
- IMT-2000 driver amplifier outputs, eliminating external switches for possible differential Tx outputs
- UMTS Tx power control through 85 dB dynamic range VGA
- Simple single-pole RC baseband reconstruction filter between MSM6200 DAC and RTR6200 device
- Integrated synthesizer and LO generator system for GSM/DCS Tx/Rx and IMT/UMTS Tx bands, eliminating external RF components
 - Two UHF PLLs designed to support fast channel acquisition for GPRS and 3GPP compress mode operation
- GSM/DCS receiver with settable gain states
- Integrated differential LNAs, mixers and baseband filter for receive GSM operation
- Translational Loop Transmitter for GSM Tx/Rx
- Supply voltage from 2.7 to 3.3 V
- 48 BCCP plastic chip scale (7 mm x 7 mm)

RFL6200 Device Description



Integrated into the RFL6200 device is an IMT-band low-noise amplifier (LNA) with three gain settings that are programmable through the serial bus interface (SBI).

Operating modes-sleep, Receive (Rx), and Rx/Transmit (Tx)-as well as LNA bias currents are all automatically adjusted via software in order to minimize DC power consumption. Depending on handset status, the LNA bias current adjusts accordingly to meet RF performance requirements with minimal power consumption.

The device is fabricated using SiGe BiCMOS process, which is suited for high performance RF circuits. The RFL6200 is packaged in a very small 16-pin bump chip carrier (16 BCCP).

RFL6200 Device Features

- Receiver and transmitter IF are eliminated by radioOne chipset, thereby reducing component count, space and cost
- Integrated LNA with programmable gain steps
- UMTS operation supported by IMT LNA
- Three CDMA gain settings
- Low power consumption
- Small package: 16 BCCP (4 mm x 4 mm)
- Fabricated in SiGe BiCMOS fabrication process

RFR6200 Device Description



The RFR6200 device is the radioOne zero IF downconverter. The device has a mixer which, when combined with the RFL6200, provides full RF-to-baseband downconversion for the IMT band. The local oscillator (LO) generation for direct conversion is integrated on chip.

The device is designed to operate with 2.7 to 3.1 V power supplies and is compatible with single-cell Li-Ion batteries.

The RFR6200 device is fabricated using SiGe BiCMOS process, which provides high-frequency, high-precision analog circuits as well as low power CMOS functions. Package type is 40 BCCP.

RFR6200 Device Features

- Compatibility with QUALCOMM's radioOne Zero IF chipset, which eliminates the entire IF and reduces component count and space
- IMT band direct downconversion - RF to baseband
- Power reduction feature control and extended handset standby time
- Low power supply voltage (2.7 to 3.1 V), low power dissipation
- Compatibility with lower MSM voltage (1.8 to 3.0 Vdd)
- Small, thermally efficient package (40 BCCP)

PM6050 Device Description



The MSM6200 device also interfaces directly with QCT's new power management chip, the PM6050 device, which provides battery management and charging functions, general housekeeping, and various functions supporting user interfaces. Both devices are optimized for handset system control with

the MSM6200 system software, which includes generating all the regulated voltages for the MSM and radioOne chipset.

The PM6050 device offers unparalleled integration of power management functions for CDMA terminals, affording further savings in size and BOM for the handset design. The PM6050 chip supports many additional handset features, such as real-time clock and speakerphone applications, making it the ideal power management solution for feature-rich terminals.

PM6050 Device Features

- Complete power management, housekeeping and user interface functions for CDMA handsets, modems, PC cards, PDAs, etc.
- Full compatibility with QUALCOMM's radioOne Zero-IF chipset
- Support of unregulated and regulated external supplies
- Trickle, constant current, constant voltage and pulsed charging of the main battery
- Support of coin cell backup battery (including charging)
- Current monitoring for over-current protection
- Automated recovery from sudden momentary power loss
- Eight low dropout regulator circuits with programmable output voltages
- 10-bit ADC for precise voltage and current measurements
- 10:1 analog multiplexer selects the ADC input signal (five wired internally, five accessible)
- Dual oscillators - 32.768 kHz off-chip crystal and on-chip RC assures MSM sleep clock
- Real-time clock and associated alarms
- TCXO circuit control of TCXO warm-up and synchronization and buffering of the TCXO signal
- Four programmable current sinks for driving backlights and LEDs
- Driver circuit compatibility with 1.3 or 3.0 V vibrator motors
- Speaker driver with programmable gain, turn-on time and muting; single-ended or differential operation (drives external 8-ohm speakers with volume controlled 500 mW)
- 13 functions monitored and reported through real-time and interrupt status signals
- Dedicated circuits for controlled power-on sequencing, including the MSM's reset signal

QUALCOMM's Complete Solution — Our Commitment to our Partners

QUALCOMM CDMA Technologies is enabling the future of communications. We work closely with our manufacturer and operator partners to develop solutions that meet market needs today and provide the technology foundation for the wireless communications of tomorrow. Our world-class CDMA engineers create detailed reference designs to accelerate testing and deployment for our partners. And our chipsets and system software are fully integrated and able to bring advanced features and functionality to today's wireless devices. With QUALCOMM CDMA Technologies, manufacturers and operators can offer sophisticated wireless solutions that succeed in the global marketplace.



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