

MSM6250 Chipset Architecture Using QCT's radioOne Zero Intermediate Frequency (ZIF)

Overview

A complete system solution that operates on all GSM, GPRS and UMTS networks worldwide, QCT's MSM6250™ Mobile Station Modem™ (MSM™) chipset and system software offers a rich feature set of multimedia data applications and supports state-of-the-art position location capabilities. The MSM6250 device supports streaming video, audio, still-image and video encoding and decoding, 2D and 3D graphics acceleration, and Java® acceleration. It also integrates a megapixel camera interface, complete Bluetooth™ baseband support, and gpsOne™ position location technology.

The MSM6250 is a member of QCT's MSM6xxx™ family of 3G chipsets that offer more powerful processors, high-quality video, audio and graphics technologies and high-speed data connectivity. The MSM6250 solution delivers superior performance while reducing complexity, cost and board-space requirements.

The MSM6250 chipset also supports the Binary Runtime Environment for Wireless™ (BREW™) platforms. With BREW routines, protocols and tools, handset manufacturers and developers can develop embedded wireless applications and BREW-based products more quickly and easily.

The MSM6250 device integrates the ARM926EJ-S processor, offering the ARM® Jazelle™ Java™ hardware accelerator, two low-power, high-performance QDSP4000™ Digital Signal Processor (DSP) cores and a wide-band stereo codec for support of enhanced digital audio applications. The QDSP4000 core eliminates the need for the multimedia companion processors normally required for video and audio-based applications, playing MP3 music files, MIDI synthesizer, video and still-image record and playback, and 2D/3D graphics functions. By removing the need for costly application co-processors and memory subsystems, the MSM6250 solution reduces bill-of-materials (BOM) costs and increases standby and talk times.

MSM6250™ CHIPSET SOLUTION

Combine these features with QCT's radioOne™ Zero Intermediate Frequency (ZIF) direct conversion architecture - which eliminates the need for large IF Surface Acoustic Wave (SAW) filters and additional IF circuitry - and you have a system solution that enables the development of cost-effective multi-band, multimode handsets offering superior talk and standby times in smaller form factors.

The MSM6250 system solution supports data rates of up to 384 kbps, providing 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.

From circuit-switched high-end voice to packet-switched high-speed data, from audio to images and video, the MSM6250 system 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, multimedia file transfer, video streaming, picture messaging, Web access and more.

The MSM6250 system solution consists of the MSM6250 baseband processor, direct conversion RFL6200™ and RFR6200™ receive devices, the direct conversion RTR6250™ GSM transceiver and UMTS transmit device, powerOne™ series PM6650™ power management device, a compatible power amplifier device, a complete UMTS/GSM/GPRS protocol stack and multimedia system software. These devices, plus the system software, perform all of the signal processing and power management in the subscriber unit.

radioOne Technology

MSM chipsets using radioOne technology offer the benefits of direct conversion no matter what air interface is being used: CDMA, GSM, GPRS or UMTS. Using advanced techniques developed by QCT to enable high-dynamic-range receivers, radioOne ZIF technology solves the problem of stringent interference specifications with which CDMA phones must comply. The radioOne technology also incorporates the frequency synthesis and passive elements used in converting baseband signals to and from RF. For the UMTS receiver, a single external local oscillator is used, 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 UMTS handsets.

gpsOne Technology

By integrating the gpsOne baseband functionality, the MSM6250 chipset provides an Assisted-GPS (A-GPS) solution with unmatched acquisition speed, accuracy and sensitivity for services on GSM/GPRS/UMTS networks worldwide. This integrated solution addresses the rapidly expanding market for location-based services and will enable handset manufacturers to develop products to support a wide variety of applications with three standards-approved modes of operation: Mobile-Assisted, Mobile-Based and Standalone GPS.

The gpsOne capability enabled by the MSM6250 chipset can be accessed via QUALCOMM's Launchpad™ suite. The gpsOne API component of the Launchpad suite provides applications with easy access to location information and control over their operation. The MSM6250 chip leverages SnapTrack's proven A-GPS algorithms for multipath mitigation, power reduction, sensitivity enhancement and minimized wireless bandwidth utilization. These leading-edge algorithms, combined with the high level of integration, provide unmatched GPS acquisition speed, accuracy and sensitivity, while minimizing handset cost, space requirements and battery usage, and reducing communications bandwidth.

MSM6250 Device Description



The MSM6250 chipset and system software builds on the successful architectures of the MSM5200™ WCDMA device and the MSM6200™ complete UMTS system solution. The MSM6250 solution integrates both digital and analog functions into a single chip.

The MSM6250 solution also incorporates the advanced feature set of QUALCOMM's Launchpad suite of technologies, including Bluetooth connectivity capabilities, support for position location applications and multimedia features such as MPEG-4 video encoding/decoding, fast JPEG encoding/decoding, MP3 audio decoding, Advanced Audio Coding (AAC) decoding, a 2D/3D graphics accelerator for advanced gaming applications, a MIDI synthesizer and a megapixel digital camera interface.

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 WCDMA designer development tools, which reduce time-to-market for a complete UMTS product.

MSM6250 UMTS Features & Functions

- Support for 3GPP Revision 99, March 2002 Release
- Support for WCDMA data rates of up to 384 kbps
- High-performance ARM926EJ-S microprocessor core with memory management unit (MMU)
- ARM Jazelle Java hardware acceleration for faster Java-based games and other applets

- QDSP4000 high-performance DSP cores
- Integrated WAP 2.0 compliant browser with support for Multimedia Message Service (MMS)-based applications
- Integrated MPEG-4 encoder/decoder for MMS applications, streaming Video-on-Demand (VOD) and Video Conferencing
- Integrated JPEG encoder/decoder for content creation and MMS applications
- Integrated 2D/3D graphics accelerator engine for more realistic game play
- Integrated Bluetooth baseband processor for wireless connectivity to peripherals
- Integrated wideband stereo codec for digital audio applications
- Direct interface with advanced color LCD controllers and displays
- Direct interface to digital camera modules
- Stereo (44.1 kHz and 48 kHz) wideband codec capable CD-quality playback
- Enhanced memory support
 - NAND and Burst/Page Mode NOR FLASH
 - SDAM and SRAM
- Advanced 0.5 mm pitch packaging technology
- Voice Recognition (PureVoice VR™), including speaker-independent digit dialing
- Multimedia Card (MMC) or Secured Digital (SD) interface
- Universal Serial Bus (USB) On-The-Go (OTG)
- UMTS Subscriber Identity Module (USIM) card interface
- 64-polyphony MIDI wavetable synthesizer for high-quality music playback through the MSM6250 integrated wideband codec
- Industry-leading position location technology that offers unparalleled speed, accuracy and sensitivity

MSM6250™ CHIPSET SOLUTION

RFL6200 Device Description



Integrated into the RFL6200 device are low-noise amplifiers (LNAs) for the UMTS bands, with three gain settings that are programmable through the serial bus interface (SBI).

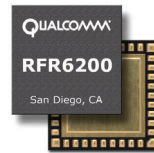
Operating modes — sleep, Receive (Rx), and Rx/Transmit (Tx) — as well as LNA bias currents are all automatically adjusted via software in order to minimize DC power consumption. Depending on handset status, the LNA bias current adjusts accordingly to meet RF performance requirements with minimal power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

- radioOne chipset eliminates receiver and transmitter IF, thereby reducing component count, space and cost
- Integrated LNA with programmable gain steps
- UMTS 1900/2100 MHz-band LNA supports WCDMA operation
- Low power consumption
- Small package: 16 BCCP (4 mm x 4 mm)
- Fabricated in SiGe BiCMOS 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 UMTS bands. The LO generation for direct conversion is integrated on-chip.

Increase in standby time is achieved by selective circuit power down, gain control and bias current. These features, along with all of the radioOne chipset functions, are controlled by the MSM6250 chipset.

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
- UMTS 1900/2100 MHz band direct down conversion - RF to baseband
- Only one single band external VCO is needed for all bands of operation (UMTS 1900/2100 MHz)
- Power reduction feature control and extend handset standby time
- Low-power supply voltage (2.7 to 3.1 V), low-power dissipation
- Compatible with lower MSM voltage (1.8 to 3.0 V_{dd})
- Available in small, thermally efficient package (40 BCCP)

RTR6250 Device Description



The RTR6250 is a highly integrated RF device that incorporates a UMTS transmitter with a quad-band GSM/GPRS transceiver. It derives its architecture from QUALCOMM's radioOne direct conversion devices for CDMA.

RTR6250 UMTS Transmit Section

The RTR6250 UMTS baseband-to-RF transmit section performs all transmit (Tx) signal processing functions required between QCT's MSM6250 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 superheterodyne architectures.

It is designed to meet the requirements for global UMTS FDD markets, providing operation in the UMTS 1900 band (1850 MHz - 1910 MHz) and UMTS 2100 band (1920 MHz - 1980 MHz).

RTR6250 GSM/GPRS Transceiver Section

The RTR6250 device also has an integrated transceiver for GSM bands and supports both GSM and GPRS modes. It contains a quad-band GSM translation loop transmitter which consists of low pass filtering with DC offset correction circuitry, I/Q modulators and offset phase locked loop (OPLL). The GSM receiver contains four LNAs, direct conversion mixers and low pass filtering. Also on-chip are two UHF PLLs designed to support Fast Channel Acquisition for GPRS and 3GPP Compress Mode operation.

The RTR6250 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 RTR6250 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 56QFN plastic package.

RTR6250 Device Features

- Complete direct upconversion from analog baseband to UMTS Tx, plus a complete direct conversion GSM 850/900/1800/1900 receiver
- Integrated UMTS Transmitter
- Eliminates image-reject filter between UMTS upconverter and driver amplifier
- UMTS Tx power control through 85 dB dynamic range VGA
- Integrated synthesizer and LO generator system for GSM Tx/Rx and UMTS Tx bands, eliminating external RF components
- Two UHF PLLs designed to support fast channel acquisition for GPRS and 3GPP compress mode operation
- GSM receivers with settable gain states
- Integrated differential LNAs, mixers and baseband filter for receive quad-band GSM operation
- Translational Loop Transmitter for GSM
- DC auto-calibration system for GSM Rx operation
- Supply voltage from 2.7 to 3.1 V
- 56QFN (quad flat none-lead) package (8 mm x 8 mm)

MSM6250™ CHIPSET SOLUTION

RGR6200 Device Description



Along with the MSM6250 chipset, the RGR6200™ chip is the only external device needed to provide industry-leading position location services and enable simultaneous GPS with UMTS/GSM/GPRS radio operation. The RGR6200 device interfaces directly to the

MSM6250 to provide highly accurate and affordable location-based services in three standards-approved modes of operation: Mobile-Assisted, Mobile-Based and Standalone GPS.

RGR6200 Device Features

- Low-Noise Amplifier (LNA)
- Optional high-linearity Pre-LNA for further sensitivity enhancement
- Quadrature downconverter (direct conversion)
- Voltage Control Oscillator (VCO)
- Lowpass filter, I and Q
- Phase-Locked Loop (PLL) circuit
- QUALCOMM's Serial Bus Interface (SBI)
- Low-power supply voltage 2.7 to 3.0 V
- 32-pin QFN package (5 mm x 5 mm)

powerOne Series PM6650 Device Description



The MSM6250 device also interfaces directly with the first in QCT's new powerOne series power management ICs, the PM6650 device. The PM6650 solution provides battery management and charging functions, including a USB charging option, and voltage regulation for the various MSM power

regimes, the radioOne chipset and all other MSM-supported peripheral features. Exceptional power savings are realized through the use of a switch-mode power supply (SMPS) from the PM6650 device to regulate the MSM's core voltage. All voltages generated for the MSM and radioOne RF chips are optimized for handset system control with the MSM6250 system software.

The PM6650 chip offers unparalleled integration of power management functions for CDMA terminals, affording a tremendous savings in size and BOM for handset design. Integrated features include a color LCD backlight driver, USB OTG transceiver, R-UIM and SD Card interface, PA bias control, speaker driver, real-time clock, TCXO control, and various general housekeeping and interface functions, making the PM6650 chip the ideal power management solution for feature-rich terminals.

PM6650 Device Features

- Complete battery management, voltage regulation, general housekeeping and user-interface functions for UMTS terminals
- Compatible with QUALCOMM's radioOne ZIF chipset and all MSM-supported peripheral features
- Trickle, fast, constant voltage and pulsed charging modes for the main battery, with current monitoring for over-current protection
- Available USB charging option with automatic charging source selection
- Complex power management, including MSM power-on sequencing and control, and dynamic voltage scaling for maximum power savings
- Switch-mode power supply (SMPS), which provides high-efficiency voltage regulation for the MSM core, and 1.8 V high-speed external bus interface and memory circuits

- SMPS voltage control for optimized PA Vdd and bias control for maximum talk-time performance
- SMPS voltage generation for white LEDs used for Color LCD backlighting
- USB OTG transceiver included
- Configurable Multi-Purpose Pins (MPPs) for digital or analog I/O utility functions such as general-purpose LED drivers, USIM or SD-Card-level translation, programmable resistors or digital switches
- High-current LED driver for Camera Flash application
- 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)
- Real-time clock for tracking time, calendar functions, programmed durations and generating associated alarms
- TCXO Control provides warm-up, synchronization, and buffering of the TCXO signal for optimal QPH/catnap timing and maximum standby-time performance
- Automated power-on recovery from sudden momentary power loss
- Support for coin cell back-up battery (including charging)
- 84 BCCS dual-row bump chip carrier package (7 mm x 7 mm)

QCT's Commitment to Customer Support

QCT is committed to providing its customers with the most advanced wireless technologies, products and tools in the world. The MSM6250 solution offers industry-leading multimedia and position location capabilities while enabling roaming between GSM and UMTS systems. With QCT's advanced chipsets and system software, there is no need for consumers to go without state-of-the-art features as they move from second-generation to third-generation technologies.

As with all QCT products, the MSM6250 system solution features the unparalleled customer support you have come to expect from your partner of choice for complete wireless communications solutions. QCT is committed to providing innovative multimode, multi-network chipsets, system software and development tools that will help ensure your competitive success in the wireless communications marketplace for 3G and beyond.

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