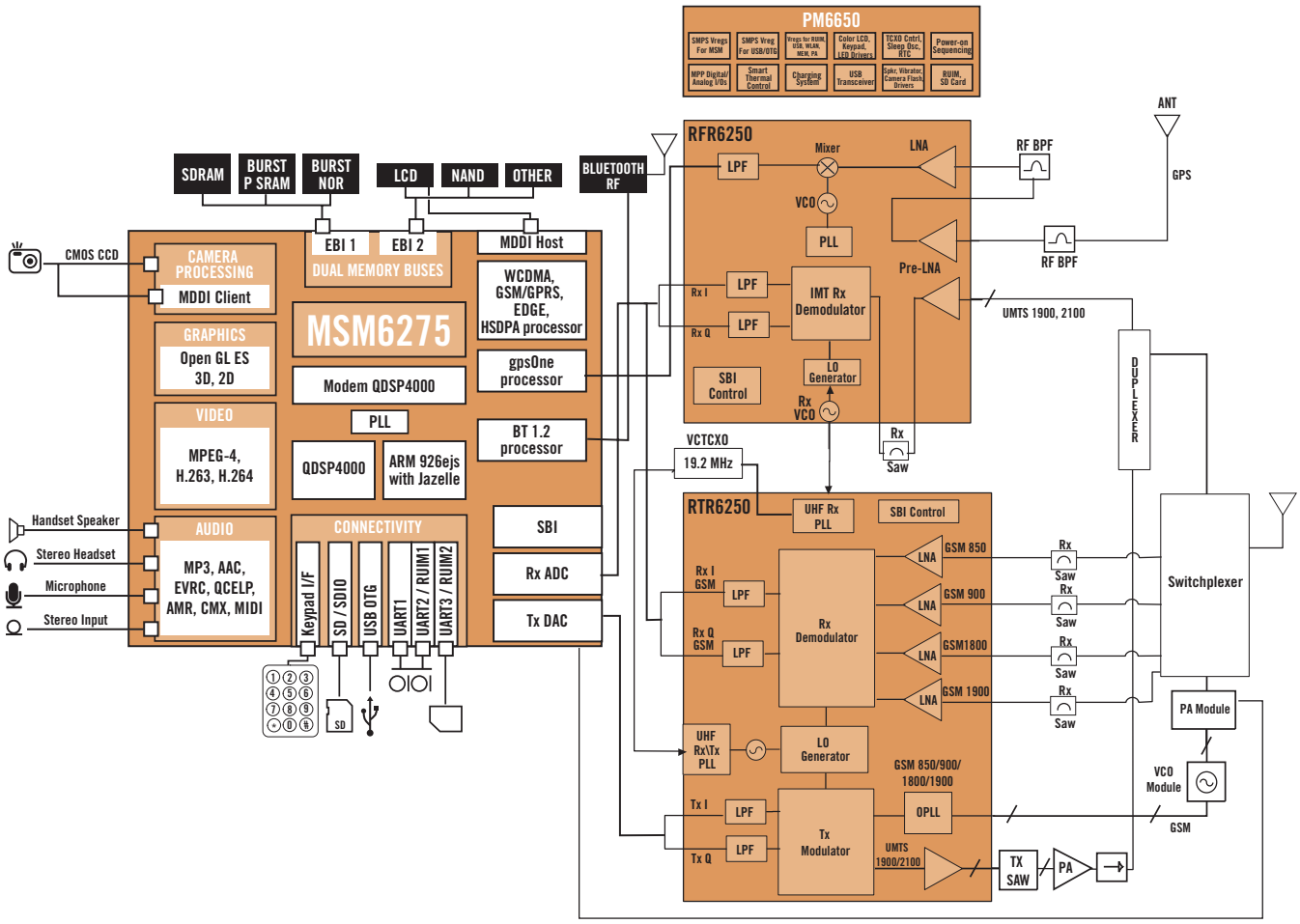


**MSM6275 Chipset Architecture Using QCT's radioOne Zero Intermediate Frequency (ZIF)**

## MSM6275 Chipset Solution


The global expansion of 3G WCDMA (UMTS) networks has extended the availability of high-speed wireless data access. With increased availability came increased demand for wireless devices that function as camera, camcorder, personal video player, MP3 audio player, gaming console and phone. To efficiently support next-generation data speeds and functionality, wireless devices must integrate applications processors with high-performance modems.

To address this growing opportunity, QUALCOMM CDMA Technologies (QCT) developed the MSM6275™ Mobile Station Modem™ (MSM™) chipset and system software solution.

The MSM6275 solution integrates powerful applications processors into QUALCOMM's market-proven wireless modem, offering increased processing capacity combined with lower power consumption. With the MSM6275 chipset solution, handset manufacturers can design sleek wireless devices that boast the industry's most advanced image quality and resolution to provide enhanced 3D animation, gaming, streaming video, videoconferencing and more.

QUALCOMM's MSM6275 solution offers significantly increased processing speeds, higher resolution video and graphics, and extended usage times for gaming and video applications — all on a single chip. This single-chip solution eliminates the need for a separate applications processor, decreasing parts count, reducing bill-of-materials (BOM) costs and supporting the development of ultra-compact devices.

### MSM6275 Chipset Solution Benefits

- Eliminates the need for multimedia co-processors by integrating dedicated hardware cores into the MSM
- Enables impressive, user-compelling 3D graphics, multimedia, animation and video
- Provides longer run time for mobile devices and longer application usage time, compared with other industry solutions that use companion processors
- Provides superior image quality and resolution for video and graphics with Quarter Video Graphics Array (QVGA) resolution, a fourfold improvement over Quarter Common Intermediate Format (QCIF)
- Offers a higher degree of integration (digital and analog functions on a single chip) and dedicated hardware cores, which decrease power consumption while increasing power and quality

# MSM6275™ CHIPSET SOLUTION

- Eliminates the need for Intermediate Frequency (IF) components, decreasing printed-circuit-board area and reducing time-to-market development and BOM costs
- Enables a wide variety of location-based services and applications, including points of interest, personal navigation and friend finder
- Uses a single platform to provide dedicated support for all market-leading codecs and other multimedia formats to support operator deployments around the world

**MSM6275 Device Description**

The MSM6275 device integrates the ARM926EJ-S™ processor, offering the ARM® Jazelle™ Java® hardware accelerator; two low-power, high-performance QDSP4000™ digital signal processor (DSP) cores; hardware acceleration for video, imaging and graphics; and a wideband stereo codec to support enhanced digital audio applications. The hardware acceleration eliminates the need for the multimedia companion processors normally required for video and audio-based applications that support MP3 music files, a MIDI synthesizer, video and still-image record and playback, and 2D/3D graphics functions. By removing the need for costly applications co-processors and memory subsystems, the MSM6275 solution reduces BOM costs and increases standby and talk times. The MSM6275 solution integrates both digital and analog functions into a single chip.

The MSM6275 system solution consists of the MSM6275 baseband processor, complete with WCDMA (UMTS)/GSM/GPRS protocol stack and multimedia system software. The MSM6275 interfaces with the direct conversion RFR6250™ WCDMA (UMTS) and GPS receive device, the direct conversion RTR6250™ GSM transceiver and WCDMA (UMTS) transmit device, and multimedia system software. The baseband and RF chipsets are supported by QUALCOMM's powerOne™ series PM6650™ power management device.

**MSM6275 Device Features**

- Support for multimode operation — WCDMA (UMTS), GSM/GPRS, EDGE
- Support for WCDMA (UMTS) data rates up to 384 kbps
- Support for high speed downlink packet access (HSDPA), a next-generation feature of the WCDMA (UMTS) standard
- 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 gpsOne® position location technology functionality
- 72-polyphony MIDI wavetable synthesizer for high-quality music playback through the MSM6275 integrated wideband codec
- Quarter Video Graphics Array (QVGA) and Common Intermediate Format (CIF) resolutions for LCD
- Video telephony at 15 frames per second (fps), CIF resolution
- Video encode at 15 fps CIF for camcorder capability
- Video decode at 30 fps CIF resolution, streaming or offline
- Dedicated support for market-leading codecs, such as MPEG-4, H.263, H.264, and other multimedia formats to support operator deployments around the world
- High-quality digital camera processing, supporting CCD or CMOS image sensors up to 4.0 megapixel
- Advanced 2D/3D graphics support for more realistic game play and enhanced user interfaces
- High-speed, serial mobile display digital interface (MDDI), which optimizes the interconnection cost between the MSM and the LCD panel
- Integrated four-bit secure digital (SD) controller for SD and Mini SD cards
- Integrated Bluetooth® 1.2 baseband processor for wireless connectivity to peripherals
- Integrated WAP 2.0-compliant browser with support for Multimedia messaging service (MMS)-based applications
- Integrated JPEG encoder/decoder for content creation and MMS applications
- Integrated wideband stereo codec for digital audio applications
- Stereo (44.1 kHz and 48 kHz) wideband codec-capable of CD-quality playback
- Enhanced memory support supporting NAND, burst mode NOR, SDRAM and burst mode PSRAM
- Advanced 0.5 mm pitch packaging technology
- PureVoice® Voice Recognition (VR), including speaker-independent digit dialing
- Universal serial bus (USB) On-the-Go (OTG) functionality
- Subscriber identity module (SIM) card interface

## radioOne Technology

As with all members of the MSM6xxx™ family of chipset solutions, the MSM6275 solution features QUALCOMM's radioOne® Zero Intermediate Frequency (ZIF) architecture, which eliminates the need for Intermediate Frequency (IF) components. With radioOne technology, the MSM6275 chipset requires less printed-circuit-board area than previous generations and reduces time-to-market development and BOM costs.

## RFR6250 Device Description


The RFR6250 chip combines the functionality of QUALCOMM's RFL6200™ low noise amplifier (LNA), RFR6200™ (Rx) and RGR6200™ (GPS Rx) chips and the UHF Voltage Control Oscillator (VCO) into a single chip. Integrated into the RFR6250 device are LNAs for the WCDMA (UMTS) bands, with three gain settings that are programmable through the serial bus interface (SBI). Operating modes (Sleep, Rx and Rx/Tx), as well as LNA bias currents, are all automatically adjusted via software to minimize DC power consumption. Depending upon handset status, the LNA bias current adjusts accordingly to meet RF performance requirements with minimal power consumption.

The radioOne ZIF downconverter for WCDMA (UMTS) receiver is also integrated into the RFR6250 device. The device has a mixer which provides full RF-to-baseband downconversion for WCDMA (UMTS) bands. The Local Oscillator (LO) generation for direct conversion is integrated on-chip. An 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 MSM6275 chipset. The device is designed to operate with 2.7 to 3.0 V power supplies and is compatible with single-cell Li-Ion batteries. The RFR6250 device is fabricated using the advanced SiGe BiCMOS process, which provides high-frequency, high-precision analog circuits as well as low-power CMOS functions.

An Assisted-Global Positioning System (A-GPS) receiver is integrated into the RFR6250 device. The A-GPS receiver completes QUALCOMM's GPS solution for WCDMA (UMTS)/GSM/GPRS systems. QUALCOMM is dedicated to bringing the most cost-effective solutions for position location to the wireless marketplace, and the A-GPS solution offers the best WCDMA (UMTS) GPS sensitivity, selectivity and power handling in the industry. The GPS receiver circuitry includes LNAs, a downconverter, baseband filtering, VCO and LO generation. The A-GPS solution incorporates QUALCOMM's radioOne ZIF architecture. This chip is offered in a 7 mm x 7 mm 48-pin Quad Flat No-Lead (QFN48) package.

### RFR6250 Device Features

- Based on QUALCOMM's radioOne ZIF chipset, which eliminates the entire IF and reduces component count and space
- Integrated WCDMA (UMTS) 1900 & 2100 MHz-band LNAs support WCDMA (UMTS) operation
- Integrated WCDMA (UMTS) 1900 & 2100 MHz bands direct down converter — RF to baseband
- Integrated base band filters for WCDMA (UMTS) and A-GPS Rx
- Integrated UHF VCO for WCDMA (UMTS) operation
- Integrated A-GPS LNA
- Integrated A-GPS additional high-linearity pre-LNA
- Integrated A-GPS down converter
- Integrated VCOs for WCDMA (UMTS) and GPS receivers
- Integrated PLL circuit for WCDMA (UMTS) receiver
- QUALCOMM's efficient Serial Bus Interface (SBI)
- Power reduction feature control extends handset standby time
- Low-power supply voltage (2.7 to 3.0V), low-power dissipation
- Compatible with lower MSM voltage (1.8 to 3.0 Vdd)
- Available in small, thermally efficient package (QFN48 7 mm x 7 mm)

# MSM6275™ CHIPSET SOLUTION

## RTR6250 Device Description


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

### RTR6250 WCDMA (UMTS) Transmit Section

The RTR6250 WCDMA (UMTS) baseband-to-RF transmit section performs all transmit (Tx) signal processing functions required between QCT's MSM6275 chip and the power amplifier (PA) for WCDMA (UMTS). Its direct upconversion architecture offers an advanced, highly integrated WCDMA (UMTS) Tx solution, which simplifies RF printed-circuit-board (PCB) design, shortens development cycle time, and reduces BOM and current consumption over traditional superheterodyne architectures. The RTR6250 chip is designed to meet the requirements for global WCDMA (UMTS) FDD markets, providing operation in the WCDMA (UMTS) 1900 band (1850 MHz — 1910 MHz) and WCDMA (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 3.0 V, which provides operating compatibility for platforms utilizing a single-cell Li-Ion battery design.

The RTR6250 device is fabricated using the advanced SiGe BiCMOS process, which accommodates both precision high-frequency analog circuits and low-power CMOS functions, and is provided in an 8 mm x 8 mm 56-pin Quad Flat No Lead (QFN56) plastic package.

### RTR6250 Device Features

- Integrated direct upconversion WCDMA (UMTS) transmitter for PCS (1900 MHz) and IMT (2100 MHz) bands
- Integrated GSM/GPRS quad-band (850/900/1800/1900) transceiver
- Eliminates image-reject filter between WCDMA (UMTS) upconverter and driver amplifier
- WCDMA (UMTS) Tx power control through 85 dB dynamic range VGA
- Integrated synthesizer and local oscillator (LO) generator system for GSM Tx/Rx and WCDMA (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 3.0 V
- QFN56 plastic chip scale (8 mm x 8 mm)

## powerOne Series PM6650 Device Description


The MSM6275 device also interfaces directly with the first in QCT's 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 MSM6275 system software.

The PM6650 chip offers unparalleled integration of power management functions for WCDMA (UMTS) 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 Key Features

- Complete battery management, voltage regulation, general housekeeping and user-interface functions for WCDMA (UMTS) terminals
- QUALCOMM's radioOne ZIF chipset (and all MSM-supported peripheral features) compatibility
- 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), providing high-efficiency voltage regulation for the MSM core, 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
- 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 with warm-up, synchronization, and buffering of the TCXO signal for optimal QPCH/catnap timing and maximum standby-time performance
- Automated power-on recovery from sudden momentary power loss
- Coin cell back-up battery support (including charging)
- 84 BCCS dual-row bump chip carrier package (7 mm x 7 mm)

# MSM6275™ CHIPSET SOLUTION

## The Launchpad Suite of Technologies

The Launchpad™ suite of applications technologies offers wireless operators and manufacturers a cost-effective, scalable and timely solution for providing advanced wireless data services. This seamlessly integrated solution enables advanced next-generation applications and services that incorporate multimedia, position location, connectivity, customized user interface and storage capabilities. Launchpad features are available for each QUALCOMM chipset, closely matching the specific functionality and cost-target objectives agreed upon in joint product planning with manufacturers and wireless service operators worldwide.

The MSM6275 solution supports the advanced feature set of QUALCOMM's Launchpad suite of technologies, including streaming video and audio; still-image and video encoding and decoding; 2D and 3D graphics acceleration; Java acceleration and a megapixel camera interface. The MSM6275 solution integrates gpsOne functionality — enabling a wide variety of location-based services and applications, including points of interest, personal navigation and friend finder.

Integrated into the MSM6275 solution are Bluetooth wireless connectivity and USB OTG host controller functionality, allowing seamless communication directly with printers, digital cameras, keyboards and other accessories.

## QUALCOMM's BREW Solution

The MSM6275 includes support for QUALCOMM's BREW® solution. BREW is a complete product and business system for the development and over-the-air deployment of data services on wireless devices. The BREW system provides the necessary tools and value-added services to developers, device manufacturers and wireless operators for application development and distribution, device configuration, and billing and payment. This chipset is also compatible with the Java runtime environment; the J2ME™ solution can be built entirely on the chipset's BREW software layer.

## 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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