

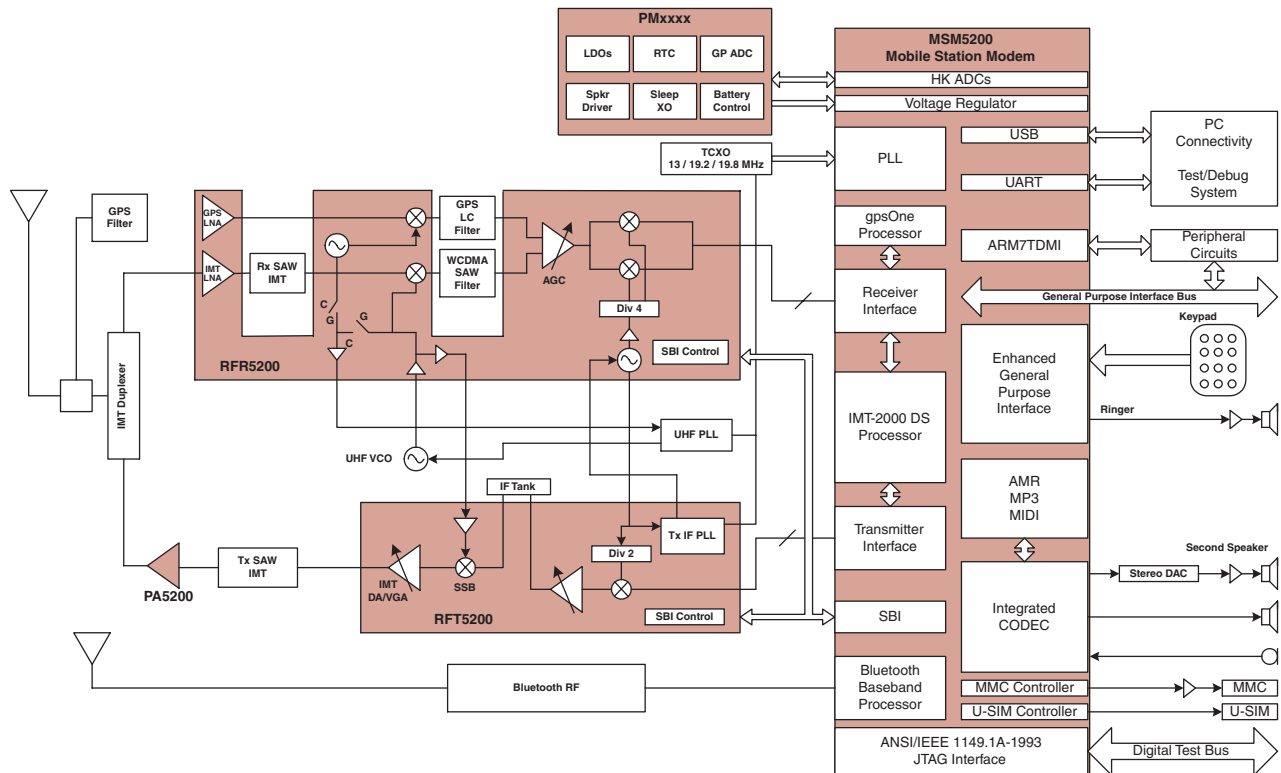
# MSM5200 CHIPSET SOLUTION



## MSM5200™ CHIPSET SOLUTION

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QUALCOMM CDMA TECHNOLOGIES

QUALCOMM's MSM5200 Chipset Solution



### OVERVIEW

At QUALCOMM CDMA Technologies (QCT), we strive to constantly improve the indispensable communication tools we all use every day. QCT creates state-of-the-art chipsets, system software, development tools and products – such as the Wireless Internet Launchpad™ suite of technologies and software – that support the most advanced digital wireless features and functionality available for wireless devices and base stations – while continually reducing complexity, cost and board-space requirements.

QCT's MSM5200™ Mobile Station Modem (MSM™) chipset and system software is designed to address the 3G Partnership Project User Equipment Frequency Division Duplex Direct Sequence Wideband CDMA (3GPP UE FDD DS-WCDMA) mode of the IMT-2000 standard. Supporting 384 kilobits per second (kbps) on both the uplink and downlink, the MSM5200 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 MSM5200 solution into user equipment paves the way to true mobile multimedia applications. With low-to-medium data rates for higher mobility and even higher rates (up to 2 Mbps) for lower mobility applications, the 3GPP standard provides maximum

flexibility, yet sufficient bandwidth to offer fast and reliable data and voice services. From circuit-switched high-end voice to packet-switched high-speed data, from audio to images and video, the MSM5200 solution supports a wide range of consumer products offering a variety of capabilities, including Personal Digital Assistant (PDA) and Internet applications such as email, e-commerce, file transfer, Web access, and more.

# FUTURE QUALCOMM CDMA TECHNOLOGIES MSM5200™ CHIPSET

## MSM5200 DEVICE DESCRIPTION



The MSM5200 chipset and system software builds on the successful architecture of QCT's MSM3xxx and MSM5xxx families of CDMA devices, and is based on QCT's core CDMA systems expertise gained from years of field experience with this technology. The MSM5200 solution integrates both digital and analog

functions into a single chip.

The MSM5200 solution includes advanced technologies such as GPS-based position location and Bluetooth, as well as multimedia features such as Qtunes™ MP3 player software and Compact Media Extension™ (CMX™) MIDI-based multimedia software. Along with an

optimized software solution for the WCDMA 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 WCDMA product.

## MSM5200 General Device Enhancements

- Integrated audio codec
- Supports low-power, low-frequency crystal to enable TCXO shutoff
- Enhanced I/O support for faster RS-232
- 16-bit-wide memory support
- 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 and CMX software)
- Integrated USB device controller for fast and simple PC interconnect
- Interfaces with the MSP™ family of applications processors

## MSM5200 IMT-2000 DS Device Enhancements

- 3GPP Release 99 compliant
- Full 3GPP protocol stack including L1, L2:MAC/RLC/BMC/PDCP, L3:RRC, (G)MM, SS, CC, SMS, SM, RABM
- Data rates: 384 kbps on both the uplink and downlink
- Adaptive Multiple Rate (AMR) speech codec
- Support for convolutional and turbo coding
- USIM interface

## RFT5200™ DEVICE DESCRIPTION



The RFT5200™ baseband-to-RF transmit processor performs all transmit (Tx) signal processing functions required between QCT's MSM5200 chip and the power amplifier (PA) for WCDMA. The RFT5200 device incorporates previous generation functionality with third generation WCDMA capability to offer an advanced, tightly integrated WCDMA Tx solution, which simplifies RF PCB design

and shortens development cycle time. Using QCT's 5200 chipset (RFR5200, RFT5200, PA5200, and MSM5200 devices), a complete implementation for 3GPP UE Radio Transmission and Reception compliant handsets with GPS position location capability is realized with minimum circuitry.

The single-band RFT5200 device connects directly to the MSM5200 chip, utilizing an analog baseband interface. The baseband quadrature signals are upconverted to the IMT-2000 frequency band and amplified to provide signal drive capability to the PA. The RFT5200 device includes a quadrature baseband-to-IF upconverter, a programmable PLL for generating a Tx IF

frequency, IF VCO, single sideband upconversion from IF to RF, two IMT-2000 driver amplifiers, and Tx power control through an 85 dB VGA. As an added benefit, the single sideband upconversion eliminates the need for an IF SAW filter normally required between the upconverter and driver amplifier, providing overall board area and cost savings. Designed to meet the requirements for global IMT-2000/WCDMA markets, the RFT5200 device will operate over the following Tx frequency range:

- IMT-2000 band  
1920 MHz – 1980 MHz

Range of supply voltage is from 2.7 V to 3.3 V, which provides operating compatibility

for platforms utilizing a single-cell Li-Ion battery design. RFT5200 operating modes are controlled by the MSM5200 chip via the three-line serial bus interface (SBI) and include selective power-down, gain control, and punctured WCDMA transmission (gated Tx power) for optimal power savings and talk-time improvement. The RFT5200 device is fabricated on an advanced BiCMOS process, which accommodates both precision high-frequency analog circuits and low-power CMOS functions, and is provided in a 32-pad BCC++ plastic package that includes an exposed center ground slug for improved RF grounding, mechanical strength, and thermal continuity.

### RFT5200 Device Features

- Full upconversion from analog baseband to RF Tx
- Integrated I/Q modulator, IF VCO/PLL, SSB upconverter, VGA, and driver amplifiers
- Designed for single-band IMT-2000/WCDMA applications
- Eliminates image-reject filter between upconverter and driver amplifier
- Includes two IMT-2000 driver amplifier outputs, eliminating external switches for dual or differential outputs
- MSM5200-controlled operation via serial bus interface (SBI)
- Tx power control through 85 dB dynamic range VGA
- Puncture mode (gated Tx power) for extended talk-time performance
- Simple single-pole RC baseband reconstruction filter between MSM5200 DAC and RFT5200 device
- Supply voltage from 2.7 V to 3.3 V
- BCC++ 32-pad plastic chip scale package (5 mm x 5 mm x 0.8 mm)

# MSM5200 CHIPSET SOLUTION

## RFR5200™ DEVICE DESCRIPTION



The RFR5200™ is a fully integrated RF-to-baseband receiver-on-a-chip, performing all receive (Rx) signal processing functions for WCDMA in the IMT-2000 band and GPS signals from the antenna to the QCT's MSM5200 chip. The RFR5200 device leverages previous RFR3300 and IFR3300 circuit designs, extending RF performance into the IMT band

and adding LO functionality on-chip that enables simplified frequency plans. The RFR5200 device, fabricated on an advanced silicon germanium (SiGe) BiCMOS process which enables low-noise and high-linearity, offers the most integrated WCDMA receive solution available to shorten radio development time and reduce handset material costs. Using QCT's 5200 chipset (RFR5200, RFT5200, PA5200, and MSM5200 devices), a complete implementation for 3GPP UE Radio Transmission and Reception compliant handsets with GPS position location capability is realized with minimum circuitry.

The RFR5200 device includes

a receive front-end, which integrates two separate low noise amplifier (LNA) and mixer paths and interfaces with the antenna networks (RF duplexers, duplexers, and matching). One LNA/mixer path is for downconverting the received IMT-2000 band WCDMA signal to IF while the other LNA/mixer path is for likewise downconverting the GPS signals. The RFR5200 device also includes UHF LO distribution circuits, two IF AGC amplifiers, a quadrature IF-to-baseband downconverter, IF LO generation and distribution circuits, and in-phase (I) and quadrature (Q) baseband filters. The RFR5200 device connects directly to the MSM5200 chip utilizing an analog baseband interface; functionality and

modes of operation are controlled from the MSM5200 chip via the three-line Serial Bus Interface (SBI). Designed to meet the requirements for global IMT-2000/WCDMA markets, the RFR5200 device will operate over the following Rx frequency range:

- IMT-2000 band  
2110 MHz – 2170 MHz

Range of supply voltage is from 2.7 V to 3.15 V, which provides operating compatibility for platforms utilizing a single-cell Li-Ion battery design. The RFR5200 device is provided in a 48-pad BCC++ plastic package that includes an exposed center ground slug for improved RF grounding, mechanical strength, and thermal continuity.

### RFR5200 Device Features

- Full downconversion from RF to analog baseband
- Dual-band operation includes IMT and GPS
- Dual-mode operation includes WCDMA and GPS position location
- LNA for IMT band includes settable gain steps
- GPS downconversion includes image-reject mixer for simpler interstage filtering
- UHF LO buffer with selectable frequency divide ratios for easier frequency planning
- GPS UHF LO includes selectable frequency offsets
- Optimize RF performance via external bias resistors for LNA and mixer
- Selective programming modes to extend handset power savings
- IF LO circuits include on-chip VCO, selectable frequency divide ratios, and output buffer for the Tx LO
- MSM5200-controlled operation via serial bus interface (SBI)
- Supply voltage from 2.7 V to 3.15 V
- Simplified RF PCB design and shorter development cycle time
- Fabricated using SiGe BiCMOS process
- BCC++ 48-pad plastic chip scale package (7 mm x 7 mm x 0.8 mm)

# MSM5200 CHIPSET SOLUTION

## PA5200™ DEVICE DESCRIPTION

The PA5200™ device is a highly integrated power amplifier module for WCDMA handsets. The module integrates the core power amplifier function with input and output impedance matching circuits, a linear output power detector, improved DC bias circuitry, and internal temperature compensation. The PA5200 allows manufacturers to reduce PCB area and handset cost. Similarities to the PA3100 series allow phone designers familiar with those devices a quick and easy upgrade path, yet the PA5200 module offers three significant improvements over the 3100 series:

- Improved performance through integrated advance bias control with temperature compensation
- Added power detector functionality
- WCDMA band coverage

The integrated module provides cost savings and size reductions, while improving performance and reliability. The power amplifiers are

manufactured with advanced gallium arsenide heterojunction bipolar transistor (GaAs HBT) technology, which provides high efficiency. The integrated advance bias with temperature compensation provides improved and repeatable performance of the power amplifier over worst-case operating conditions.

The PA5200 module covers only the WCDMA band (1920 – 1980 MHz). The device includes the appropriate frequency-dependent impedance matching optimized for power, efficiency, and linearity. The built-in 50-ohm input and output matching requires no external components, permitting “drop and place” designs that streamline handset production cycles and reduce circuit board area.

The integrated power detector eliminates the need for external discrete circuitry, saving approximately 45 to 55 square mm of board space. Power detectors are used in WCDMA handsets to ensure that the maximum

power limits of 3GPP UE Radio Transmission and Reception specifications are not exceeded. In the past, most manufacturers implemented the power detection function by using discrete diodes, resistors, capacitors, and op amps; however, discrete methods require temperature compensation, sophisticated calibration, and supporting software to obtain the necessary accuracy. The PA5200 device’s integrated power detector provides a linear output voltage that accurately represents the detected power (in dBm) with up to 30 dB of dynamic range. This linear response includes built-in temperature compensation to simplify system software while assuring compliance with 3GPP UE Radio Transmission and Reception specifications.

The PA5200 module also offers a unique power step feature that allows it to be switched to low power mode under low-output power conditions, thereby consuming less current and extending a

handset’s overall talk-time. The power step is optimized for the 5200 generation and later MSM™ chipsets and system software. The PA5200 module allows a simple CMOS control interface to/from the MSM device. The PA5200 module is compatible with the MSM5200 chip (WCDMA modem) and is packaged in a 6 mm x 7.5 mm 13-pin Land Grid Array (LGA) with bottom side ground.

Designed to operate in handsets utilizing single-cell Li-Ion batteries, the PA5200 module operates from supply voltages as low as 3.2 V, and delivers high linear output power (+27 dBm) with typical gains of 25 dB that supplement the RFT5200 device to fulfill transmit requirements.

Together with the RFT5200 device, the PA5200 module provides the most integrated transmit chain solution for 3GPP UE Radio Transmission and Reception compliant handsets.



# MSM5200 CHIPSET SOLUTION



## MSM5200™ CHIPSET

### PA5200 Device Features

- Fully integrated power amplifier module
- RF input and output internally matched to 50 ohms
- Integrated bias control and temperature compensation for improved performance over worst-case operating conditions
- Temperature-compensated power detector functionality
- High linear output power: WCDMA +27 dBm
- Power step to decrease current consumption in WCDMA mode
- 5  $\mu$ A typically in power-down mode
- Highly efficient GaAs HBT technology
- Operating voltage 3.2 – 4.2 V
- Direct CMOS interface with MSM5200 chip
- Regulated bias is not required, external PFETs are eliminated
- 6 mm x 7.5 mm land grid array package

As with all QCT products, the MSM5200 chipset 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 multi-mode, multi-network chipsets, system software and development tools that will help ensure your competitive success in the wireless communications marketplace for 3G and beyond.