MOBILE STATION MODEM

QUALCOMM
CDMA Technologies
Enabling the Future of Communications™

MSM3000™

OVERVIEW

The dual-mode Code Division Multiple Access Advanced Mobile Phone System (CDMA/AMPS) cellular telephone is a complex consumer communications instrument that relies heavily upon digital signal processing. To simplify the design and reduce the production cost of the subscriber unit, QUALCOMM has developed a Mobile Station Modem™ (MSM3000™) CDMA chipset solution, which includes the MSM3000 device as well as the IFT3000™ Transmit IF Converter and the IFR3000™ Receive IF Converter devices. This MSM3000 chipset solution performs all of the signal processing in the subscriber unit, from IF to audio.

The MSM3000 device integrates functions that support a dual-mode CDMA/FM subscriber unit. Subsystems within the MSM3000 device include a CDMA processor, a Digital FM (DFM) processor, a QUALCOMM-designed DSP for voice compression, an ARM7TDMI™ microprocessor and several peripheral interfaces that are used to support other functions. The MSM3000 device consumes less power and provides more flexibility than QUALCOMM's previous MSM2300™ and MSM2310™ CDMA chipset solutions.

The MSM3000 device is available in 176-pin Fine-Pitch

Figure 1. MSM3000 Device in a Subscriber Unit
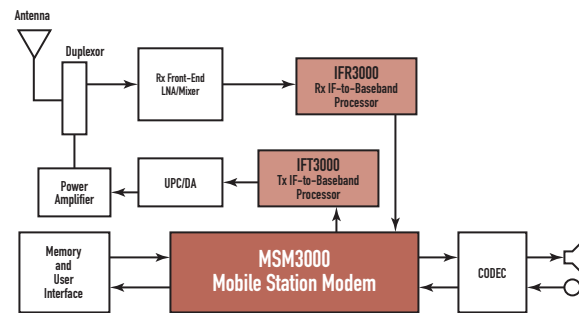
Ball Grid Array (FBGA), a 196-pin Plastic Ball Grid Array (PBGA) and 176-pin Thin Quad Flat Pack (TQFP) packages. The 176-pin FBGA package permits a 25 percent reduction in the mounting footprint and a 40 percent reduction in the volume of the alternative 196-ball PBGA package while providing the same functionality. The 176-pin FBGA package is also offered in a four-perimeter-rows-of-solder-balls (P4) configuration with a 0.8 mm ball pitch, making circuit routing and assembly easier, and enabling the use of cost effective printed circuit boards.

MSM3000 INTERFACES

The MSM3000 device demodulates Rx digital baseband data from the IFR3000 device. The IFR3000 device then converts the modulated IF signal from the RF section of the subscriber unit into digital baseband data. For transmission, the MSM3000 device modulates and sends digital baseband data to the IFT3000. The Tx signal path of the IFT3000 converts Tx digital baseband data into modulated IF. The MSM3000 device communicates with the external RF and analog baseband circuitry of the

subscriber unit to control signal gain in the RF Rx and Tx signal paths, reduce baseband offset errors and tune the system frequency reference. The MSM3000 device performs baseband digital signal processing and executes the subscriber unit system software. It is the central interface device in the subscriber unit, connecting RF, baseband and audio circuits, as well as controlling memory and user interface functions. The user interface of the subscriber unit typically includes the keypad,

LCD display, ringer, microphone and earpiece. These are either under the direct or indirect control of the MSM3000 device. The MSM3000 device also contains complete digital modulation and demodulation systems for both CDMA and AMPS cellular standards, as specified in IS-95A.

The subscriber unit system software controls most of the functionality and activates the features of the subscriber unit. System software is executed by an embedded ARM7TDMI

microprocessor within the MSM3000 device.

The CODEC interfaces directly with the microphone and earpiece, converting analog audio signals from the microphone into digital signals for the Vocoder. The CODEC also converts digital audio data from the Vocoder into analog audio for the earpiece. The MSM3000 device supports an auxiliary external Pulse Coded Modulation (PCM) interface. The auxiliary CODEC is optional within the subscriber unit.

QUALCOMM CDMA TECHNOLOGIES

MSM3000™

MSM3000 DEVICE ENHANCEMENTS

The MSM3000 device has several design enhancements which reduce power consumption and provide more features than the MSM2300/MSM2310 devices. The Q186 microprocessor in the MSM2300/MSM2310 devices has been replaced by the ARM7TDMI microprocessor in the MSM3000 device. The advantages of the ARM7TDMI microprocessor include:

- 4 Gbytes of memory space
- State-of-the-art software tool suite
- In-phone debug capabilities
- Improved SLEEP controller for significant standby power reduction

The MSM3000 device also includes the following enhancements:

- EVRC with noise suppression
- DFM Slotting improves standby time and reduces overall power consumption during DFM Mode
- Phase 1 High Speed Packet Data support
- 8 co-channel demod Rate Set 1: up to 76.8 kbps
- 6 co-channel demod Rate Set 2: up to 86.4 kbps
- Serial Bus Interface Master Controller, a 3-pin serial interface to the IFR3000 and IFT3000.
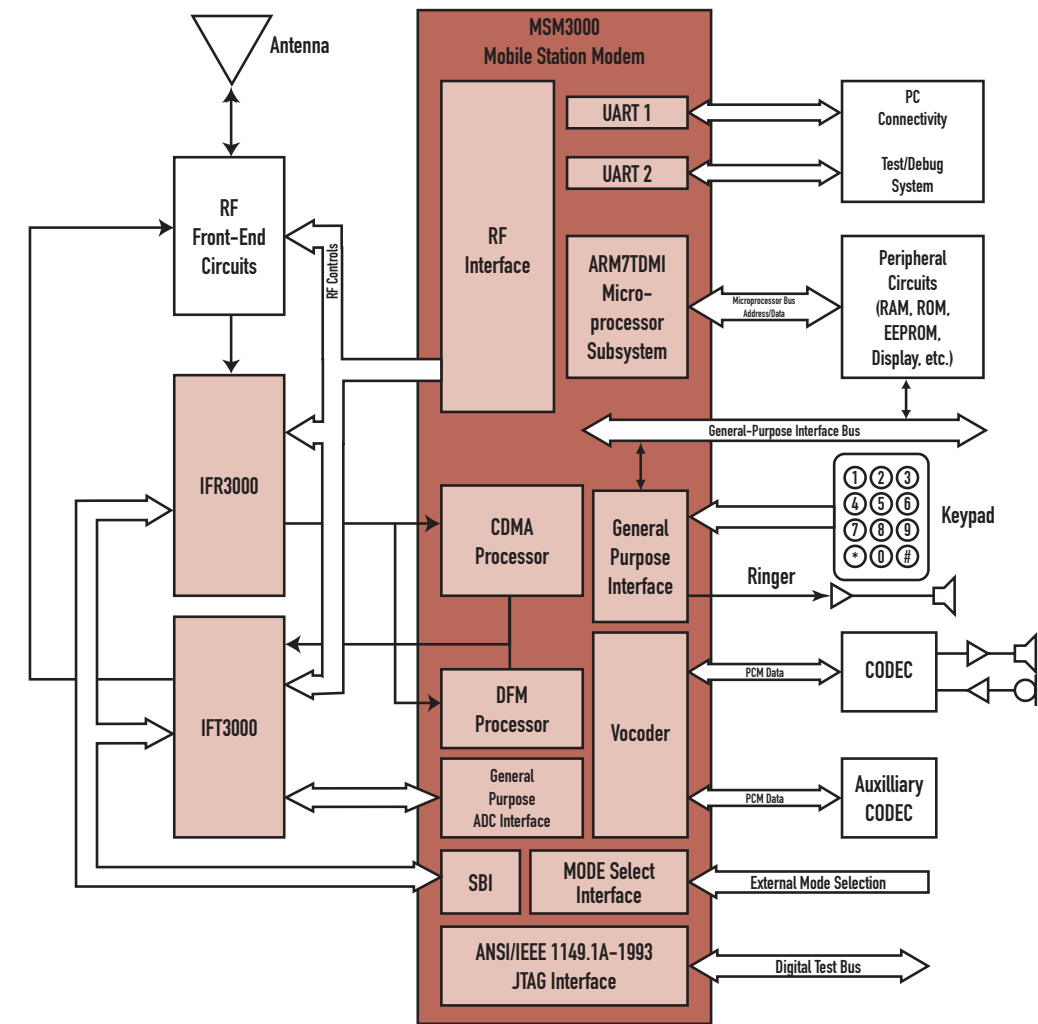
Figure 2. MSM3000 Device Functional Block Diagram

- Voice recognition
- Speaker-dependent, Speaker-independent and Voice-prompt support
- Multiple language support

- Supports low-power, low-frequency crystal to enable TCXO shutoff
- Three packages available:
  – 176-pin Fine-Pitch Ball Grid Array (FBGA)
  – 196-pin Plastic Ball Grid Array (PBGA)
  – 176-pin Thin Quad Flat Pack (TQFP)

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