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Model Name:	H20	Marketing Description :	H20 MODULE/HSUPA	

Baseband Portion

The Figure 1-1 shows the block diagram of H20. The baseband part of H20 consists of Qualcomm's MSM7225 communication processor chip, PM7540 power management chip and Hynix's MCP (with 1Gb NAND and 512Mb DDR SDRAM) memory chip.

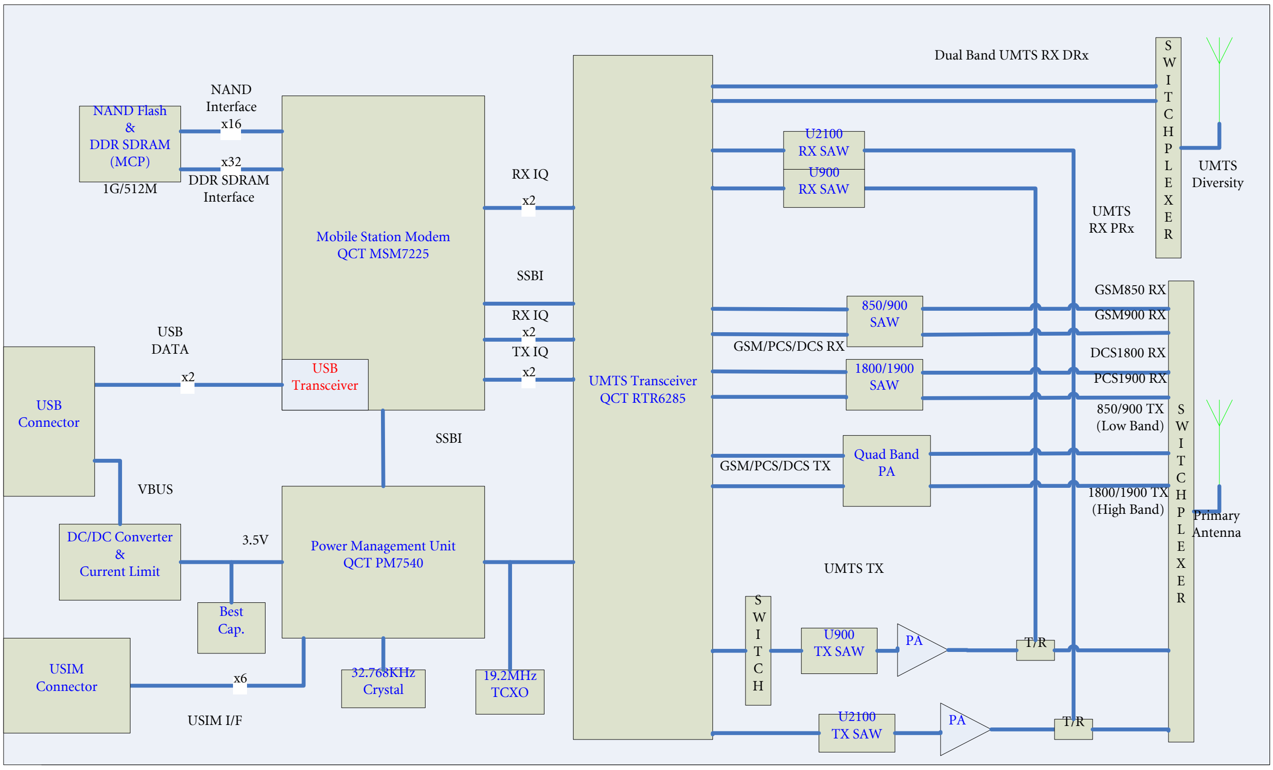


Figure 1-1. H20 Module Function Block Diagram

Main chip – MSM7225

The Qualcomm's MSM7225 plays the core role of H20 mobile station. The major task of MSM7225 is

1. To integrate communication functions that support UMTS/HSDPA/HSUPA and GSM/EDGE mode operation,
2. To perform baseband digital signal processing for packet data received from and transmitted to RF division, and the signal path in the receiving direction, the Qualcomm MSM7225 demodulates Rx digital baseband data from RTR6285, which converts the modulated RF signal into digital baseband data. In the transmission direction, the MSM7225 modulates and sends digital baseband data to RTR6285, which converts Tx digital baseband data into modulated RF.

3. To execute the MS (mobile station) system software
4. To interface the functional blocks such as memory and power management
5. To interface with the host system.

Moreover, there are several major subsystems contained in MSM7225. They are RF interface, UMTS/GSM subsystem, ARM processor Subsystem, and also supporting peripherals such as USB and USIM.

a. GSM/EDGE subsystem

The GSM/EDGE subsystem performs the digital GSM signal processing and PA gain controls for GPRS and EDGE supported.

b. UMTS /HSPA Subsystem

The UMTS/HSPA subsystem performs the digital WCDMA signal processing. Its components include:

■ Searcher engine
■ Demodulating fingers
■ Combining block
■ Frame deinterleaver
■ Viterbi decoder
■ Turbo decoder
■ Up-link subsystem

On the down-link channel the UMTS subsystem searches, demodulates, and decodes incoming CPICH, CCPCH, SCH, and traffic channel information. It extracts packet data from the down-link traffic channel and prepares the packet data for processing. For the uplink, the UMTS subsystem processes the packet data and modulates the up-link traffic channel (DCH).

c. ARM11 Processor Subsystem – application processor

The MSM7225 uses an embedded high performance ARM1136-J application processor for perform all application process. The ARM1136-J microprocessor, directed by the system software, dominates most of the functionality of H20, including control of the external peripherals such as the USB, USIM, and DDR SDRAM, NAND flash devices.

d. ARM9 Processor Subsystem – communication processor

The MSM7225 uses an embedded ARM926EJ-S microprocessor. The ARM926EJ-S microprocessor, directed by the system software, dominates all the communication features.

e. SSBI Interface

The SSBI of MSM7225 SBI is designed specifically to be a quick, low pin count control protocol to interface with RTR6285 and PM7540 ASICs. Using the SSBI, the RTR6285 and PM7540 devices can be configured for different operating modes and for minimum power consumption. The SSBI also controls DC baseband offset errors.

f. MODE Selection and JTAG Interface

The mode pins to the MSM7225 determine the overall operating mode of the ASIC. The options under the control of the mode inputs are Native mode, which is the normal subscriber unit operation, ETM mode, which enable the built-in trace mode, and test mode for factory testing.
The MSM7225 meets the intent of ANSI/IEEE 1149.1A-1993 feature list. The JTAG interface is used to for software debug or download during manufacturing.

g. GPIO for PMIC

The MSM7225 used GPIO port for perform PMIC PM7540 control purpose.

h. GPIO for RF Control

The RF interface communicates with RF circuits via signals to control signal gain in the Rx and Tx signal path, control DC offset errors, and maintain the frequency reference of system. In addition to SSBI signal, some GPIO pins of MSM7225 are used to control RF switch module for RF signal routing among GSM PA and RTR6285 via duplexer and antenna path. Enable/disable operation of TX VCO are also controlled by specific GPIO signals.

Memory

In H20, it used Hynix's MCP HYD0SQH0MF3P-5L60E (1Gb NAND and 512Mb DDR SDRAM) for storage software code, NV items, and file system data.

a. NAND Flash memory

Memory density: 1024Mb (64M x 16bit)
Working voltage: 1.8V
Access speed: 50ns

b. DDR SDRAM memory

Memory density: 512Mb (4M x 4Bank x 32bit)
Working voltage: 1.8V
Access speed: 166MHz (CL3)

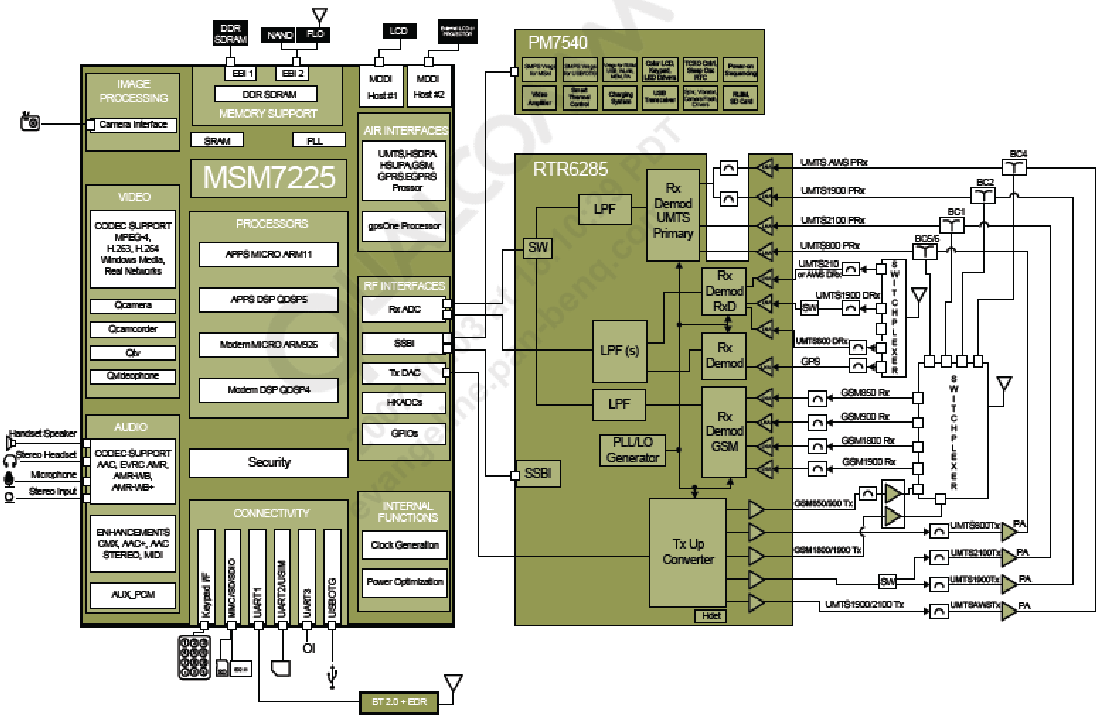
Power Management

PM7540 on H20 provides power management circuitry to support function shown as following:

- SMPS (Buck and Boost)
- Current driver, SIM driver
- RTC
- ADC multiplexer
- LDO
- TCXO buffer
- Intelligent power control

RF Portion

1. Introduction



On H20, RF circuit design is referenced from Qualcomm RTR6285 Platform F. The platform F supports GSM/EDGE Quad-band (GSM850/900, DCS1800 and PCS1900) and UMTS/HSDPA/HSUPA Quad-band UMTS-850, UMTS1900, UMTS-2100 and AWS (included Rx Diversity) variants. All receivers and transmitters use the radioOne ZIF architecture to eliminate intermediate frequencies, directly converting signals between RF and baseband. The Polar modulation technique is used to generate the required GSM/EDGE signal.

A generic, high-level functional block diagram of a Platform F series-based handset is shown in Figure 2-1. The mobile station (MS) antenna collects base station forward-link signals and radiates handset reverse-link signals. The MS antenna connects with receive and transmit paths through a switch module (and four duplexers for UMTS high-band and low-band operations). In H20, band requirements are GSM Quad-band (GSM850, GSM900, DCS1800 and PCS1900) and UMTS Dual band (WCDMA850/1900/2100), hence only Third duplexer for are required.

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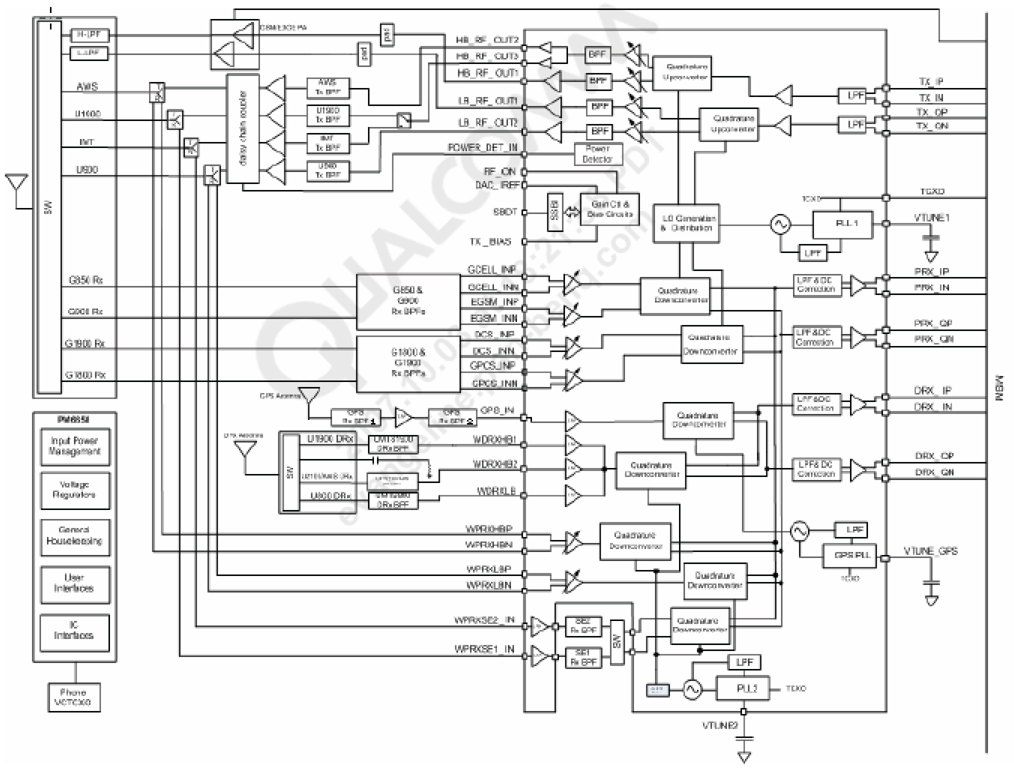

Figure 2-1 High-level Platform-F EU variant functional block diagram

2. GSM/GPRS/EDGE Subsystem

The GSM/GPRS/EDGE subsystem performs the digital GSM signal processing and PA gain controls for GPRS and EDGE supported.

3. WCDMA subsystem

The UMTS subsystem performs the digital WCDMA signal processing. Its components include:

■ Searcher engine

■ Demodulating fingers

■ Combining block

■ Frame deinterleaver

■ Viterbi decoder

■ Turbo decoder

■ Up-link subsystem

On the down-link channel the UMTS subsystem searches, demodulates, and decodes incoming CPICH, CCPCH, SCH, and traffic channel information. It extracts packet data from the down-link traffic channel and prepares the packet data for processing. For the uplink, the UMTS subsystem processes the packet data and modulates the up-link traffic channel (DCH).

4. UMTS Receiver

The UMTS receive signal from antenna is routed to a single-ended duplexer through front-end module and then inputs to RTR6285. The RF input signal is amplified by internal LNA of RTR6285. The signal amplified by the internal LNA and outputs through an external band-pass filter before being feedback to RTR6285. On-chip circuits down-convert the received signal directly from RF to baseband using radioOne Zero-IF techniques. The RTR6285 receive-chain analog baseband outputs connect to the MSM IC. The UMTS PRx and GSM Rx baseband outputs share the same inputs to the MSM IC

5. Secondary WCDMA receive path (Rx Diversity)

The RTR6285 has two additional secondary WCDMA input paths that stay on-chip; off-chip inter-stage filtering is not required. The two LNA outputs are routed to a single RF-to-baseband quadrature downconverter; again, only one LNA is active at a time.The secondary WCDMA downconverter outputs are multiplexed to drive a single set of baseband filter and buffer circuits. The secondary baseband output (in-phase and quadrature differential signals) is routed through the .DRX_I/Q. pins to the MSM device for further processing. This baseband interface supports WCDMA modes, which is active on the secondary path.

6. GSM Receiver

Either one of GSM850, EGSM, DCS, or PCS receive signals from antenna input is routed through front-end module to its respective band-pass filter inside it and then are applied to the RTR6285. The quad-band GSM/EDGE receive paths are very similar to the UMTS differential circuit paths in implementation. Differential inputs are used, with both paths beginning with gain-stepped LNA circuits. Gain control is provided through software and the serial interface. The LNA outputs drive the RF ports of quadrature RF-to-baseband down-converters (with a dedicated down-converter for each high and low band). The down-converted baseband outputs are multiplexed and routed to low-pass filters (one I and one Q) whose pass-band and stop-band characteristics are suitable for the GMSK-modulated signal. These filter circuits allow DC offset corrections and their outputs are buffered to interface with the MSM IC.

7. UMTS Transmitter

The UMTS TX path begins with differential baseband signals (I and Q) from the MSM device. These analog input signals are amplified, filtered, and applied to the quadrature up-converter mixers. The up-converter output is amplified by variable gain amplifiers that provide transmit AGC control to the respective TX paths. The AGC output is filtered and applied to the respective driver amplifier output of the RTR6285. The RTR6285 output driver stages deliver fairly high-level signals that are filtered and applied to the power amplifiers (PA). The PA outputs amplified signal to the antenna through a duplexer and front-end module

8. GSM Transmitter

The shared GSM 850/900 (low band) and GSM 1800/1900 (high band) transmit paths begin with the same baseband interface from the MSM IC that is used for the UMTS bands. The differential analog input signals are buffered, filtered by a set of low-pass filters, corrected for DC offsets, and then applied to the up-converter. This up-converter translates the GMSK-modulated signal directly to RF. The waveform, at the output, is the GMSK-modulated constant-envelope phase signal centered at the desired GSM 850/900 or GSM 1800/1900 channel frequency.

Depending on EGSM or DCS/PCS band, the RF signal is applied to respective input of a quad-band RF power amplifier. The RF power amplifier amplifies the RF signal in accordance with ramping signal output from MSM7225. The automated power control (APC) circuit that samples the transmit power and adjusts its level. The amplified RF signal inputs to the front-end module and is then routed to the antenna connect.