QUALCOMM CDMA Technologies

MSM7627 Chipset Training

Introductions and Chipset Overview

80-VM151-21 Rev. A

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Revision History

Revision	Date	Description
A	April 2009	Initial release

Agenda

- MSM7627™ chipset definition
- Feature comparison and key messages
- Chipset overview
  - RF
  - PMIC
  - Bluetooth®
  - WLAN
- Chipset documents

Key Messages

- Chipset definition
  - 65 nm baseband: MSM7627 (12 × 12 NSP)
  - RF Choices
    - Multimode: RTR6500™ and RTR6285™ IC
    - 1x only: RTR6500 IC
  - PMIC: PM7540™
  - Bluetooth: BTS4025™
  - WLAN: Atheros AR6002™
- Chipset hardware schedule
  - Engineering samples (ES) in January 2009
  - Commercial samples (CS) in May 2009

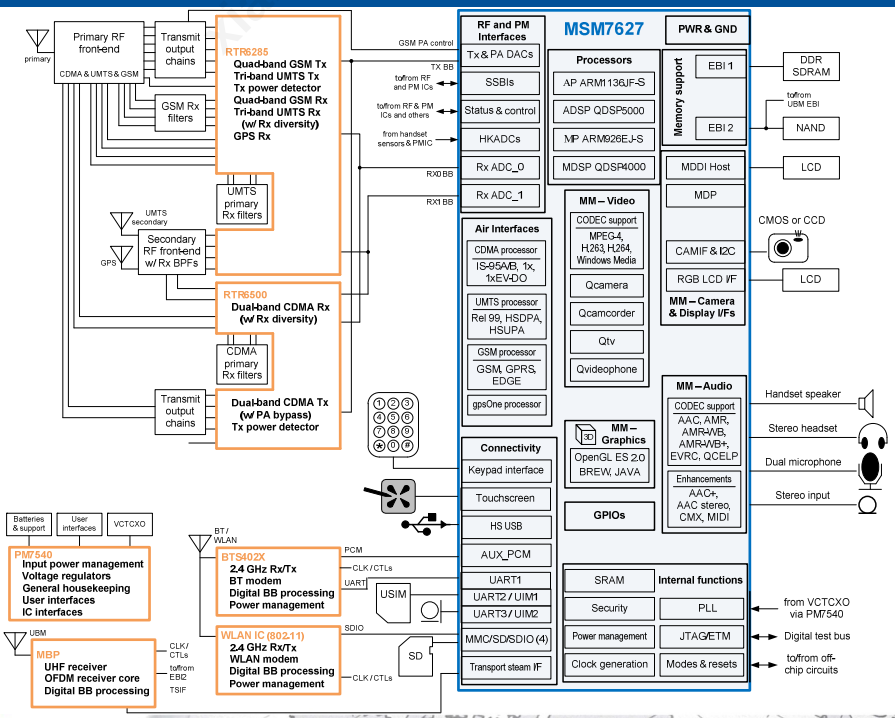
Key Messages (cont.)

- Improvements compared to MSM7625™ and MSM7600™/MSM7500A™
  - Bus/processor speed enhancements
    - 200 MHz AXI and AHB bus
    - 400 MHz ARM9™
    - 600 MHz ARM11™
  - 256 kB ARM11 L2 cache
  - ARM11 floating point
  - IMEM 256 kB (128 kB dedicated to graphics)
  - 512 kB ADSP L2 cache
  - 3D Graphics – Adreno 200
    - 27 M triangles/sec
    - Open GL ES 2.0, Open VG1.1, SVG Tiny 1.2
  - Boot from SD
  - WVGA MDDI/LCDC support, video encoding and decoding

Key Messages (cont.)

- Software compatibility with MSM7625
  - Same modem, RF, PMIC, companion chips (BT, WiFi, etc.)
- Close pin-compatibility with MSM7625
  - Package size of 12 × 12 NSP

MSM7627 System Block Diagram



MSM7627 Chipset Configurations

- Hardware configurations

PMIC	BT/WLAN	Baseband modem	RF configuration
PM7540	BTS4025 + AR6002	MSM7627	RTR6500 (1x-only)
			RTR6500 + RTR6285 (multimode)
			RTR6500 + MXU6219 (multimode)

  - **Bold** = default configuration in reference schematics

- Supported software

	BREW	Windows Mobile	Android	Symbian
Software support	√	√	√	√

MSM7627 Chipset Comparison

Features	MSM7600/MSM7500A	MSM7625	MSM7627
Process technology	65 nm CMOS (15 × 15 × 1.4 mm) 543 CSP	65 nm CMOS (11 × 11 × 1.05 mm) 456 NSP	65 nm CMOS (12 × 12 × 1.05 mm) 560 NSP
Processor	ARM1136-J™ 528 MHz/528 MHz* (apps) ARM926EJ-S™ 320 MHz/256 MHz* (modem) QDSP5000® 320 MHz/256 MHz* (apps) QDSP4000 122.88 MHz (modem)	ARM1136-J 528 MHz/528 MHz* (apps) ARM926EJ-S 320 MHz/256 MHz* (modem) QDSP5000 256 MHz (apps) QDSP4000 122.88 MHz (modem)	ARM1136JF-S 600 MHz (apps) ARM926EJ-S 400 MHz (modem) QDSP5000 320 MHz (apps) QDSP4000 122.88 MHz (modem)
Modem	IS-2000 CDMA 1X, IS-856 1xEV-DO Rev. A, WCDMA, GSM, GPRS, EDGE, DTM, HSDPA 7.2 Mbps, HSUPA 5.76 Mbps, Concurrency 7.2 Mbps DL + 2 Mbps UL	IS-2000 CDMA 1X, IS-856 1xEV-DO Rev. A, WCDMA, GSM, GPRS, EDGE, DTM, HSDPA 7.2 Mbps, HSUPA 5.76 Mbps, Concurrency 7.2 Mbps DL + 2 Mbps UL	IS-2000 CDMA 1X, IS-856 1xEV-DO Rev. A, WCDMA, GSM, GPRS, EDGE, DTM, HSDPA 7.2 Mbps, HSUPA 5.76 Mbps, Concurrency 7.2 Mbps DL + 2 Mbps UL
Rx enhancements	Equalizer, Rx diversity, SAIC	Equalizer, Rx diversity, SAIC	Equalizer, Rx diversity, SAIC
LCD support	16-bit/18-bit/24-bit (EBI2) 16-bit/18-bit/24-bit (MDDI)	16-bit/18-bit/24-bit (EBI2) 16-bit/18-bit/24-bit (MDDI) 16-bit/18-bit/24-bit LCD (RGB) controller	16-bit/18-bit/24-bit (EBI2) 16-bit/18-bit/24-bit (MDDI) 16-bit/18-bit/24-bit LCD (RGB) controller
MDDI support	Yes (two hosts and one client)	Yes (one host)	Yes (one host)
Broadcast interface	TSIF (DVB-H, ISDB-T, S-DMB)	TSIF (DVB-H, ISDB-T, S-DMB)	TSIF (DVB-H, ISDB-T, S-DMB)
Memory	Stacked: 256 Mbit 166 MHz DDR-SDRAM External: 32-bit 166 MHz DDR-SDRAM 8-bit/16-bit NAND flash 16-bit DeMUX OneNAND™	Stacked: N/A External: 32-bit 166 MHz DDR-SDRAM 8-bit/16-bit NAND flash 16-bit MUX OneNAND	Stacked: N/A External: 32-bit 200 MHz DDR-SDRAM 8-bit/16-bit NAND flash 16-bit MUX OneNAND
UART	Four (two HS and two standard)	Four (two HS and two standard)	Four (two HS and two standard)
SDIO	Four	Four	Four
Qcamera™ (viewfinder frame rate)	8 megapixel support MDDI – 30 fps WVGA	5 megapixel support MDDI – 30 fps VGA LCDC – 30 fps WQVGA	8 megapixel support MDDI – 30 fps WVGA LCDC – 30 fps WVGA
OS	ARM11: L4, Windows Mobile®, Linux® ARM9™: L4	ARM11: L4, WinMob, Linux ARM9: L4	ARM11: L4, WinMob, Linux ARM9: L4

Green text indicates different features than the MSM7625 device.
Red text indicates different features than the MSM7600/MSM7500A device.

MSM7627 Chipset Comparison (cont.)

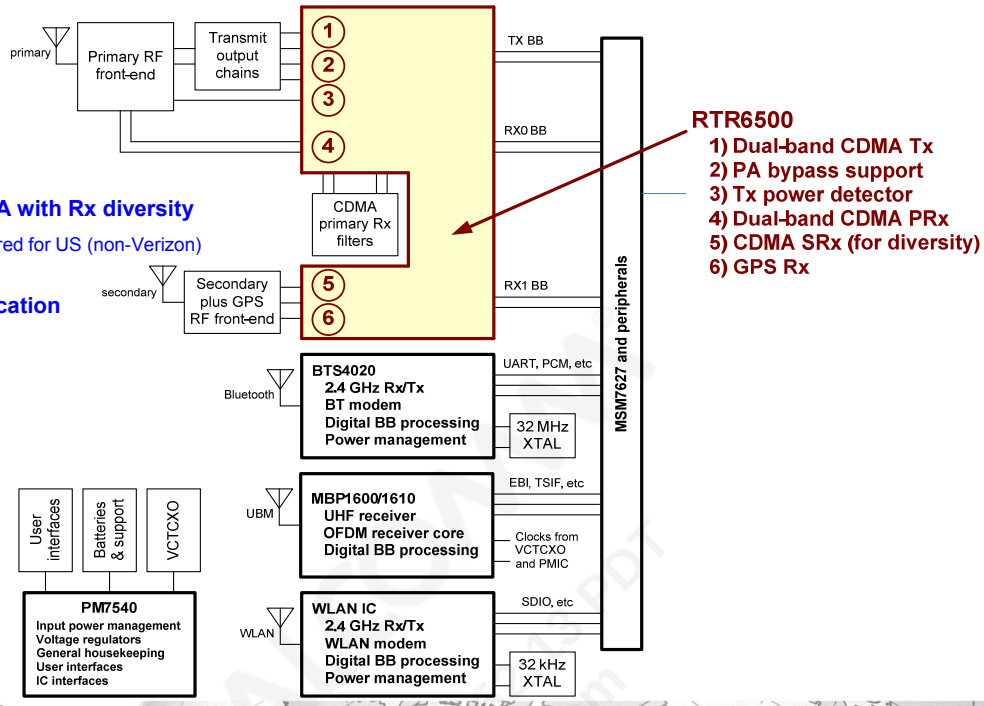
Features	MSM7600/MSM7500A	MSM7625	MSM7627
Qcamcorder™ (offline video encoding)	30 fps WVGA	24 fps QVGA	30 fps WVGA
Qtv™ (video decode)	30 fps WVGA streaming 30 fps VGA offline	15 fps WQVGA streaming 30 fps WQVGA offline	15 fps VGA streaming 30 fps WVGA offline
Qvideophone™ (video telephony)	15 fps QCIF	15 fps QCIF	15 fps QCIF
Audio/video decoders	MP3, AAC, AAC+, EAAC+, ADPCM, MPEG4, H263, H264, WMA v9, AMR-NB	MP3, AAC, AAC+, EAAC+, ADPCM, MPEG4, H263, H264, WMA v9, AMR-NB	MP3, AAC, AAC+, EAAC+, ADPCM, MPEG4, H263, H264, WMA v9, AMR-NB
2D/3D graphics acceleration	Hardware acceleration - 2 M - 4 M triangles/sec - 133 megapixels/sec	Not available	Adreno™ 200 WVGA 27 M triangles/sec 133 megapixels/sec fill rate Open GL®-ES 2.0/OpenVG 1.1/ SVG Tiny 1.2
Simultaneous polyphonic tones	128 polyphony Wavetable MIDI	128 polyphony Wavetable MIDI	128 polyphony Wavetable MIDI
Bluetooth®	BT 2.1 + EDR (BTS4025™ device)	BT 2.1 + EDR (BTS4025 device)	BT 2.1 + EDR (BTS4025 device)
USB	High-speed USB OTG (external PHY)	High-speed USB OTG (built-in PHY)	High-speed USB OTG (built-in PHY)
GPS	Standalone and assisted	Standalone and assisted	Standalone and assisted
USIM	Supports dual-voltage USIM via PMIC	Built-in support for dual-voltage USIM	Built-in support for dual-voltage USIM
UICC	One UICC	One UICC	One UICC
Digital rights management (DRM)	OMA DRM v2.0	OMA DRM v2.0	OMA DRM v2.0

Green text indicates different features than the MSM7625 device.
Red text indicates different features than the MSM7600/MSM7500A device.

RF Overview

RTR6285 and RTR6500

RF Architectures – 1x only

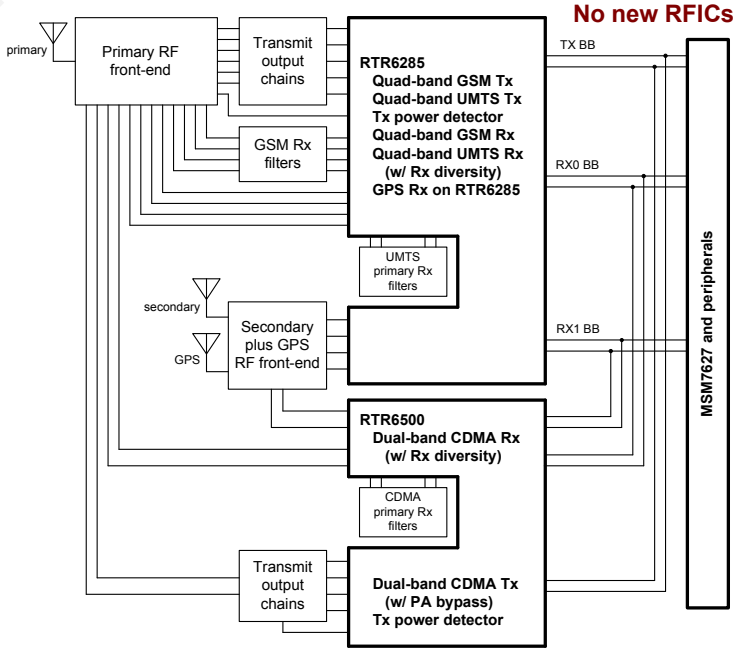


Application #1

- **Dual-band CDMA with Rx diversity**
  - FTS is required for US (non-Verizon) carriers
- **GPS position location**
- **Bluetooth**
- **UBM**
- **WLAN**

RF Architectures – Multimode

No new RFICs



Application #2

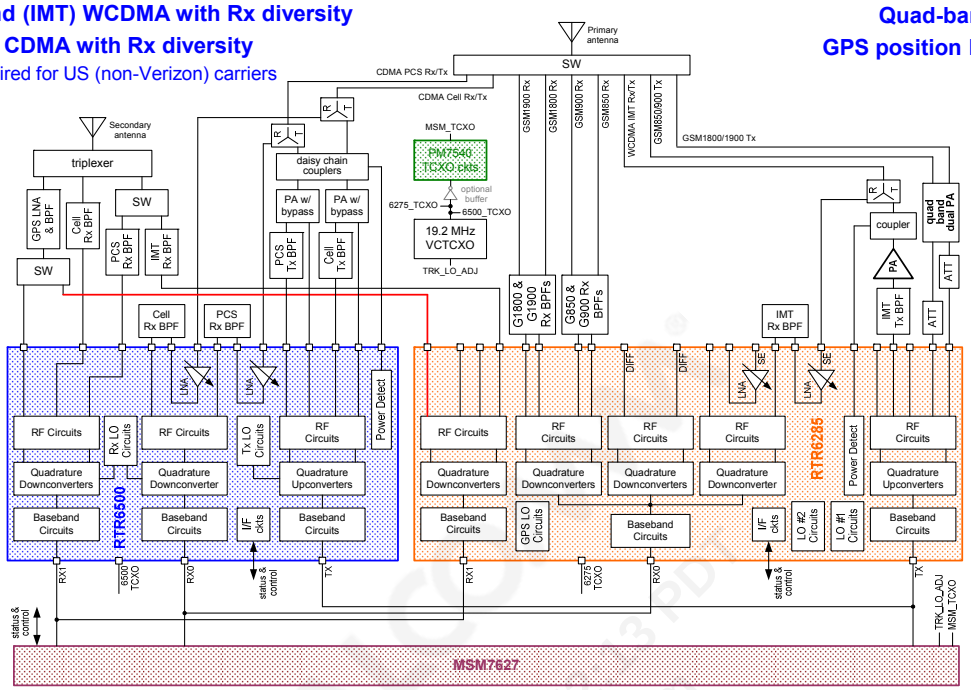
- **Quad-band UMTS with Rx diversity**
- **Dual-band CDMA with Rx diversity**
  - FTS is required for US (non-Verizon) carriers
- **Quad-band GSM**
- **GPS position location**
- **Bluetooth**
- **UBM**
- **WLAN**

Plus Bluetooth, UBM, WLAN, and power management from other examples

Example Multimode RF Functional Block Diagram

Single-band (IMT) WCDMA with Rx diversity
Dual-band CDMA with Rx diversity
- FTS is required for US (non-Verizon) carriers

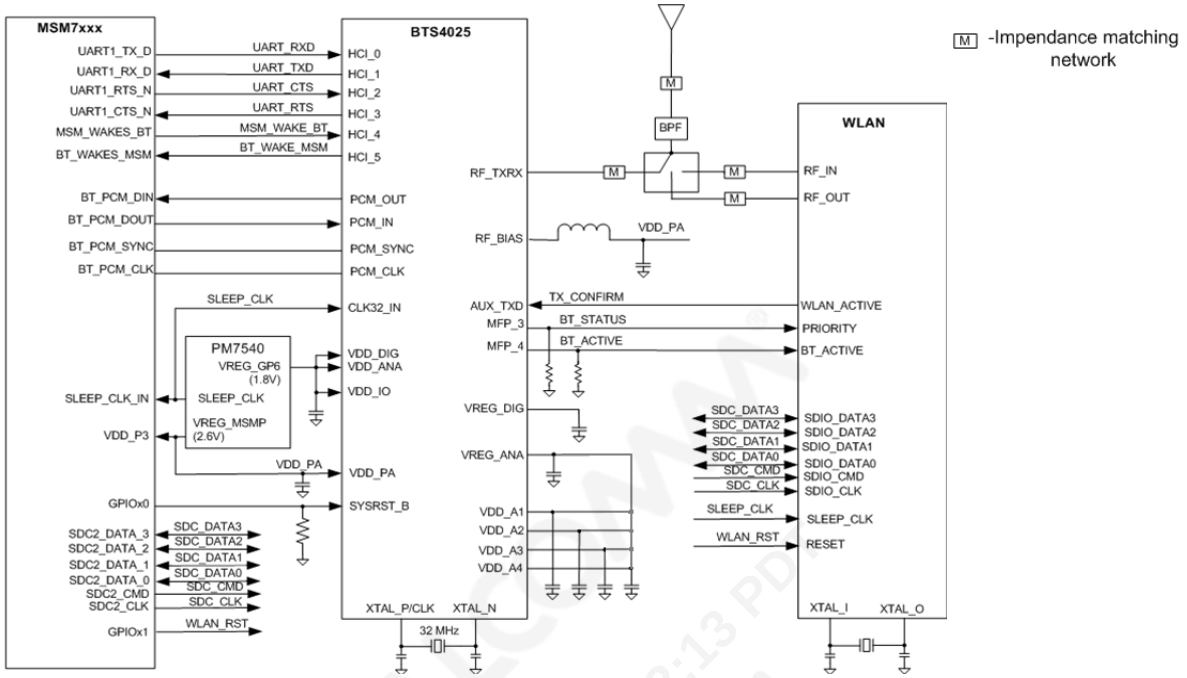
Quad-band GSM
GPS position location



Wireless Connectivity Overview

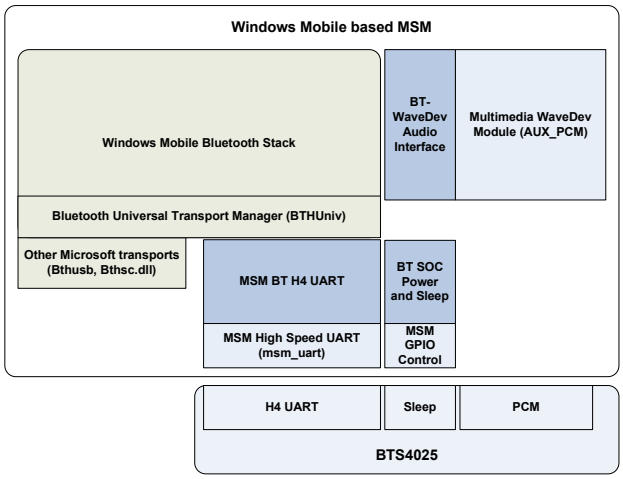
Bluetooth BTS4025 and WiFi Atheros AR6002

BTS4025™ and WLAN Interface



Bluetooth Software Plans

- Deliverables
  - Deliver a working and tested solution with the Windows Mobile upper-layer stack and profiles
    - Bluetooth 2.1 + EDR via BTS4025
    - High-speed UART interface and driver integration
    - PCM interface and audio control
    - Bluetooth power management and control
  - BTS4025 features
    - Low active and standby current consumption
    - Great RF performance



Power Management Overview

PM7540

Power Management IC Features

- Complete power management, housekeeping, and user interface functions for wireless devices – CDMA and non-CDMA handsets, modems, PC cards, PDAs, etc.
- This list of features is organized according to the five major functional blocks

Feature description

1) **Input Power Management**
   - Valid external supply attachment and removal detection
   - Supports external charger supplies and USB supplies as input power sources
   - Supports lithium-ion main batteries
   - Main battery charging (trickle, constant current, constant voltage, pulsed)
   - Supports coin cell back-up battery (including charging)
   - Battery voltage detectors with programmable thresholds
   - Under-voltage lockout function turns off IC at severely low VDD condition
   - VDD collapse protection
   - Charger current regulation and real-time monitoring for over-current protection
   - Charger transistor protection by power limit control
   - Control drivers for two external pass transistors and one battery MOSFET (optional)
   - Voltage, current, and power control loops
   - Automated recovery from Sudden Momentary Power Loss

Power Management IC Features (Cont.)

2) Output Voltage Regulation

One boost (step-up) switched-mode power supply (SMPS)
Four buck (step-down) switched-mode power supplies
18 low dropout regulator circuits with programmable output voltages
One MIC bias regulator circuit
Regulators can be individually enabled / disabled to save power
Supports dynamic voltage scaling (DVS) for MSMC1, MSMC2, and PA outputs
Low power mode available on most regulators
All regulated outputs are derived from common reference - close tracking

3) General Housekeeping

Analog multiplexer selects from 5 internal and up to 28 external inputs
Multiplexer output's offset and gain are adjusted to increase effective ADC resolution
Adjusted multiplexer output is buffered and routed to an MSM ADC
Dual oscillators (off-chip crystal and on-chip RC) assure MSM sleep clock
Crystal oscillator detector and automated switchover upon lost oscillation
Real Time Clock for tracking time and generating associated alarms
On-chip adjustments compensate for crystal oscillator frequency errors
Circuits control TXCO warm-up and synchronize, deglitch, and buffer the TCXO signal
TCXO buffer control for optimal QPH / catnap timing
Three stage over-temperature protection (smart thermal control)

Power Management IC Features (Cont.)

4) Handset-level User Interfaces

Four programmable current sinks for driving backlights, LEDs, and camera flash
Driver circuit compatible with 1.2 to 3.1 V vibration motors
Two-channel speaker driver with programmable gain, turn-on time, and muting
Speaker inputs and outputs are configurable for stereo or mono operation
Video (TV) amplifier drives a standard 75-Ohm port for camcorder or presentations

5) IC-level Interfaces

Configurable SBI (3-wire or single-wire) for efficient initialization, status, and control
Supports MSM's interrupt processing with an internal Interrupt Manager
Many functions monitored and reported through real-time and interrupt status
Dedicated circuits control power-on sequencing, including MSM reset
Events continuously monitored that might trigger power-on / power-off sequences
Supports and orchestrates soft resets
USB-OTG transceiver for interfacing between MSM and external devices
Two sets of RUIM level translators enable MSM interfacing with external modules

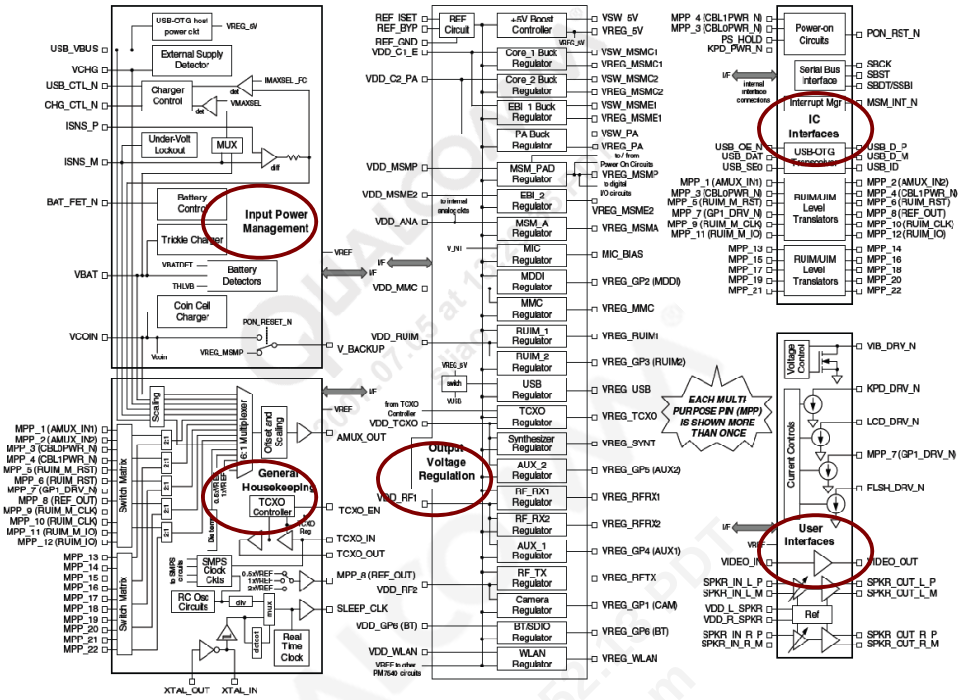
MPP Multi-Purpose Pins

22 pins can be configured as digital or analog I/Os, bi-directional I/Os, or current sinks

Pkg Package

137 CSP (7 mm x 7 mm x 1.2 mm) with a large center ground slug

PM7540 IC Block Diagram



Chipset Documents

MSM7627 Chipset Documentation

- Training materials

Document	Doc #
MSM7627 Chipset Training - Introduction and Chipset Overview	80-VM151-21
MSM7627 Chipset Training - Baseband Topics	80-VM151-25
MSM7627 Chipset Training - RF Transceiver IC Topics	80-VM151-26

- MSM7627 IC

Document	Doc #
MSM7627 Mobile Station Modem Device Specification	80-VM151-1
MSM7627 Mobile Station Modem Software Interface Manual	80-VM151-2
MSM7627 Mobile Station Modem IC User Guide	80-VM151-3
MSM7627 Mobile Station Modem Revision Guide	80-VM151-4

MSM7627 Chipset PMIC/RF Documentation

- RTR6285 IC

Document	Doc #
RTR6285/6280 RF Transceiver IC Device Specification	80-VD861-1
RTR6285/6280 RF Transceiver IC User Guide	80-VD861-3
RTR6285/6280 RF Transceiver IC Revision Guide	80-VD861-4
radioOne® Platform F/G (RFCMOS) Chipset Design Guidelines	80-VD861-6

- RTR6500 IC

Document	Doc #
RTR6500 Multiband CDMA RF Transceiver IC Device Specification	80-VC467-1
RTR6500 Multiband CDMA RF Transceiver IC User Guide	80-VC467-3
RTR6500 Multiband CDMA RF Transceiver IC Revision Guide	80-VC467-4
RTR6500 Multiband CDMA RF Transceiver Design Guidelines	80-VC467-5

- PM7540 IC

Document	Doc #
PM7540 Power Management IC Device Specification	80-VD691-1
PM7540 Power Management IC User Guide	80-VD691-3
PM7540 Power Management IC Revision Guide	80-VD691-4
PM7540 Power Management IC Design Guidelines	80-VD691-5

Questions?