（CP3705A）

Operational Description

1. Overview:

CP3705A mobile phone works with GSM Band2/3/5/8， UMTS band (UMTS 2/4/5), LTE band2, 4, 5,7,12, 66, 71. And CPU runs up to 1.8GHz, with 32GB NAND Flash Memory and 24Gb LPDDR3. The WiFi support 802.11a/b/g/n/ac

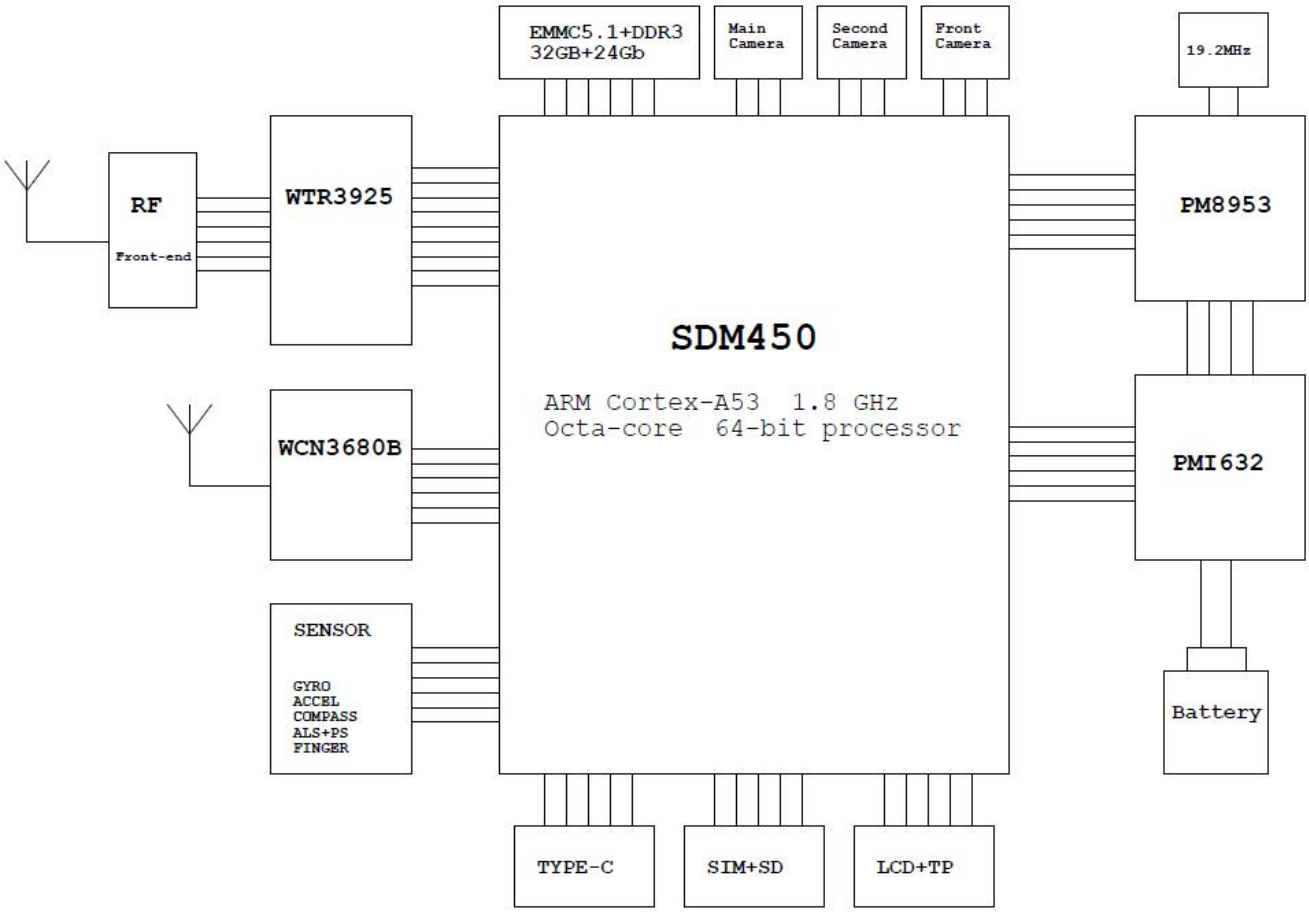
The main IC include

- **Base band + PMIC**
  - SDM450 +PM8953+PMI632 from Qualcomm
- **Memory (NAND + DDR)**
  - KMGX6001BM-B514---- SAMSUNG
- **RF Transceiver**
  - WTR-3925 from Qualcomm for GSM&UMTS&LTE
- **RF TRANSMITMODULE**
  - QPA4360 from Qualcomm
- **WIFI Transceiver**
  - WCN3680B from Qualcomm
- **DRXSAW**
  - B2/4/66: B39222B9936P810 from Epcos
  - B5：HDFB05RSS-B5 from HAODA
  - B7：HDFB07RSS-B5 from HAODA
  - B12: HDFB12RSS-B5 from HAODA
  - B71: B39631B8356P810 from Epcos

Duplxer/

- B2/B4/66: B39222M5000D310 from Epcos
- B5：SD18-0836R8UUQ1 from Kyocera
- B7：SD18-2535R8UUC1 from Kyocera
- B12: B39741B8649P810 from Epcos
- B71: B39661B1223L210 from Epcos

2.1. Overview:



2.2. RF:

RF (Radio Frequency) section is in charge of the signal transmit and receiving, signal modulation and demodulation.

Product technical parameters:

GSM/WCDMA/LTESpecs:

Items	Band mode	Frequency allocation(MHz)		Channel bandwidth	Modulation
		Uplink	Downlink		
GSM	Band 2	1850 - 1910	1930 - 1990	200KHz	GMSK/8PSK
	Band 3	1710 - 1785	1805 -1880	200KHz	GMSK/8PSK
	Band 5	824-849	869-894	200KHz	GMSK/8PSK
	Band 8	880 - 915	925 - 960	200KHz	GMSK/8PSK
	GPRS/EDGE	GPRS/EGPRS capability class B GPRS Multislot class 33 EDGE Multislot class 33			
	DTM	No			
	VoIP	No			
UMTS	Band 2	1850-1910	1930-1990	5MHz	QPSK/16QAM/64QAM
	Band 4	1710-1755	2110-2155	5MHz	QPSK/16QAM/64QAM
	Band 5	824-849	869-894	5MHz	QPSK/16QAM/64QAM
	VoIP	No			

Category	Downlink	Uplink			
	24	10			
FDD-LTE	Band 2	1850-1910	1930-1990	1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz	QPSK/16QAM/64QAM
	Band 4	1710-1755	2110-2155	1.4MHz/3MHz/5MHz/10MHz/15MHz/20MHz	QPSK/16QAM/64QAM
	Band 5	824-849	869-894	1.4MHz/3MHz/5MHz/10MHz	QPSK/16QAM/64QAM
	Band 7	2500 - 2570	2620 - 2690	5MHz/10MHz/15MHz /20MHz	QPSK/16QAM/64QAM
	Band 12	699-716	729-746	1.4MHz/3MHz/5MHz/10MHz	QPSK/16QAM/64QAM
	Band 66	1710-1780	2110-2200	5MHz/10MHz/15MHz /20MH	QPSK/16QAM/64QAM
	Band 71	663-698	617-652	5MHz/10MHz/15MHz /20MH	QPSK/16QAM/64QAM
	VoLTE	Yes			
	VoIP	Yes			
Category	Downlink	Uplink			
	6	6			

RF CA

LTE information	values
MIMO(support or not)	SIMO 1T2R
CA(Yes or not)	YES, DL 2CA(cat6)
CA information	CA_2C,CA_66C,CA_2A-4A,CA_2A-5A ,CA_2A-12A CA_2A-66A,CA_4A-5A,CA_4A-12A,CA_12A-66A, CA_2A-71A ,CA_4A-71A,CA_66A-71A

WiFi Specs:

Frequencyrange	2412MHz – 2462 MHz		
IEEE	802.11b, 802.11g, 802.11n		
RF power802.11b	≤18dBm		
RF power802.11g	6M	≤18dBm	
	54M	≤17dBm	
RF power802.11n	MCS0	≤18dBm	
	MCS7	≤17dBm	
Modulation	BPSK/QPSK/16QAM/64QAM		
Number of channels	11		
Channel spacing	5MHz		
Support	hotspot	Peer-to-Peer	DFS detection
	Yes	No	No

Frequencyrange	5180MHz –5825MHz(5150MHz-5350MHz;5725MHz-5820MHz)		
IEEE	802.11a,802.11n，802.11ac		
RF power802.11a	6M	≤15.5dBm	
	54M	≤15.5dBm	
RF power802.11n	MCS0	≤15.5dBm	
	MCS7	≤15.5dBm	
RF power802.11ac	MCS0	≤14dBm	
	MCS9	≤14dBm	
Modulation	BPSK/QPSK/16QAM/64QAM		
Number of channels	12		
Channel spacing	40MHz		
Support	hotspot	Peer-to-Peer	DFS detection
	Yes(not support in DFS band)	No	No

WiFi Calling	Yes

BT Specs:

Frequencyrange	2402MHz – 2480 MHz
RF power	-4≤Power≤+4
Modulation	GFSK /π/4 DQPSK/8DPSK
Number of channels	79
Channel spacing	1MHz

Others:

Normal Supply Voltage (V d.c.)	3.85V
Maximum Extreme Supply Voltage (V d.c.)	4.40V
Minimum Extreme Supply Voltage (V d.c.)	3.60V
Minimum Extreme Temperature**	-20 degree
SIM/USIM Voltage	1.8 / 3v

ABSOLUTE MAXIMUM RATING of RF PA:

PA parameter	Specification		
	Min.	Typ.	Max.
Power supply voltage	0.8v	3.4v	4.2v
Power supply current	-	-	2.5A

The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range

QPA4360 3G/4GPA			
Band	Current/mA	Voltage/V	Power/dBm
WB2	570	3.4	22.5
WB4	580	3.4	22.5
WB5	550	3.4	22.5
LTE B2	580	3.4	22.5
LTE B4	600	3.4	22.5
LTE B5	560	3.4	22.5
LTE B7	630	3.4	22.5
LTE B12	560	3.4	22.5
LTE B66	610	3.4	22.5
LTE B71	570	3.4	22.5
GSM850	260	3.8	32.5
GSM900	270	3.8	32.5
DCS1800	190	3.8	29.5
PCS1900	210	3.8	29.5

power reduction

	Original Power (dBm)	When WiFi hotspot open The phone power (dBm)
LTE_B2	23.5	19.5
LTE_B4	24	20.2
LTE_B5	23	23
LTE_B7	23.2	19.5
LTE_B12	22.5	22.95
LTE_B66	23	19.5
LTE_B71	23.6	23.6
W2	23.5	19

W4	23.5	19
W5	23.5	23.5
G850	33.5	33.5
G900	33	33
G1800	30	30
G1900	29.5	29.5

2.2. BB:

BB(Base-Band) section is the control&management center of the mobile where OS(Operate System) running and provides the MMI for the mobile.

Platform feature:

Table 1-1 SDM450 features

Feature	SDM450 capability
Processors	
Applications	ARM Cortex-A53 microprocessor cores at 1.8 GHz ■ 64-bit processor ■ Octa-core: one quad with 512 KB L2 cache + one quad with 512 KB L2 cache ■ Primary boot processor
Modem system	aDSP: Hexagon DSP V56 850 MHz 768 KB L2 caches ■ SDM450: DSDS
RPM system	Cortex M3: Modem power manager (MPM) MPM coordinates shutdown/wakeup, clock rates, and VDDs
Memory support	
System memory via EBI	Non-PoP LPDDR3 SDRAM; 32-bit wide; up to 933 MHz
Graphics internal memory	136 KB unified SRAM pool on-chip memory (GMEM)
External memory via SDC	eMMC v5.1/SD3.0 flash devices
RF support	
RF operating bands	Defined by the WTR device
Air interfaces GSM CDMA WCDMA TD-SCDMA LTE WLAN/BT/FM NFC	 Yes Yes Yes Yes Yes Yes: all (with WCN3680B/WCN3660B) Yes
GNSS: Qualcomm® Location Suite engine	Gen 8C Lite; Support for three bands ***concurrently***: ■ GPS, BeiDou, and GLONASS or ■ GPS, BeiDou, and Galileo
Multimedia	
Display interfaces MIPI_DSI General display features	FHD+ (2160 × 1080) 60 fps; 16, 18, and 24 bpp RGB Dual MIPI DSI four-lane Wi-Fi display: 1080p 30 fps (Snapdragon UBWC) FHD+ (2160 × 1080) 60 fps + 1080p 30 fps external wireless display

Table 1-1 SDM450 features (cont.)

Feature	SDM450 capability
Camera interfaces	Camera
Number of CSIs	Three; 2.1 Gbps per lane
Primary (CSI0)	Four-lane; supports CMOS and CCD sensors, up to 21 MP sensors
Secondary (CSI1)	Four-lane; supports CMOS and CCD sensors, up to 21 MP sensors
Tertiary (CSI2)	Four-lane; supports CMOS and CCD sensors, up to 21 MP sensors
Configurations supported	Pixel manipulations, camera modes, image effects, and postprocessing techniques, including defective pixel correction
General camera features	I^2C controls **NOTE** The SDM450 supports three CSI lanes (up to 21 MP); however, only two can operate concurrently.
Mobile display processor	Qualcomm® Snapdragon™ Display Engine 515 for display processing
Video applications performance	
Encode	1080p60, H.264, H.265, and VP8
Decode	1080p60, H.264, H.265, VP8, and VP9
Wireless display support (decode + encode)	1080p60D + 1080p30E
Graphics	Adreno 506; up to a 600 MHz 3D graphics accelerator
Audio	
Low-power audio	Low-power audio for MP3 and AAC 5.1 playback; surround sound
Voice codec support	Versatile: many audio playback and voice modes; encoders for audio and FM recording; many concurrency modes
Audio codec support	G711; QCELP; EVRC, EVRC-B, EVRC-WB; AMR-NB, AMR-WB; GSM-EFR, GSM-FR, GSM-HR
Enhanced audio	MP3; aacPlus, eAAC; AMR-NB, AMR-WB, G.711, Windows Media Audio (WMA) 9/10 Pro
Synthesizer	Dolby Digital Plus and DTS-HD surround sound Qualcomm® Fluence™ V6.1 and Qualcomm® Fluence™ Pro noise cancellation technology AudioFX/Concert/Ensemble 128-voice polyphony wavetable
Web technologies	V8 JavaScript Engine optimizations WebKit browser JPEG hardware decode acceleration Networking stack IP and HTTP tuning Flash 10.x and video processor decode optimization
Messaging	Text messages; text encoding for SMS Multimedia messaging services: combined video (MPEG-4), still image (JPEG), voice tag (AMR), and text sent as message
Connectivity	
BLSP ports	Eight, 4 bits each; multiplexed serial interface functions
UART	Yes: up to 4 Mbps (only four ports)
I^2C	Yes: cameras, sensors, near field communicator (NFC), SMB, and so on
Serial peripheral interface (SPI) (master only)	Yes: cameras, sensors, and so on

Table 1-1 SDM450 features (cont.)

Feature	SDM450 capability
UIM	Two ports: dual voltage (1.8 V/2.85 V)
USB	One USB 3.0/USB 2.0
Secure digital interfaces	Up to two ports One 8-bit and one 4-bit SD 3.0; SD/MMC card; eMMC v5.1
Wireless connectivity WLAN Bluetooth FM radio	With WCN3680B/WCN3660B/WCN3615 802.11 b/g/n/ac Bluetooth 4.2 LE and earlier Rx
Touchscreen support	Capacitive panels via external IC (I^2C, SPI, and interrupts)
Audio interfaces MI^2S SLIMbus CDC PDM port	 Two ports (primary and secondary ports) One port SLIMbus interface to WCD9326/WCD9335 Interface between SDM450 and PM8953 for audio application
Configurable GPIOs	
Number of GPIO ports	142 GPIOs: GPIO_0 to GPIO_141
Input configurations	Pull-up, pull-down, keeper, or no pull
Output configurations	Programmable drive current
Top-level mode multiplexer	Provides a convenient way to program groups of GPIOs
Internal functions	
Security Crypto engine QFPROM Security controller	Secure boot, SFS, ARM TrustZone, Qualcomm® Trusted Execution Environment, secure debug, and Microsoft Windows Media DRM10 Increased throughput via increased frequencies and a new internal AXI-based data master; support for multiple execution environments per Crypto; algorithm to accelerate file system encryption (AES-XTS), IPSec, and SSL (HMAC-SHA, CCM, CMAC) Large fuse array, replaces previous-generation Qfuse chains; nonvolatile memory with faster and simpler programming Chip-wide configuration for security, feature enable, and debug; persistent storage of ID numbers and sensitive key data; secure HDCP key provisioning and secure debug facility; primary and secondary hardware key blocking for SFS
PLLs and clocks	Multiple clock regimes; watchdog and sleep timers 19.2 MHz CXO master clock input General-purpose outputs: M/N: D counter and PDM
Resource and power manager	Fundamental to power management Key blocks: RPM core, Cortex M3, security controller, and MPM Improved efficiency via clock control, split-rail power collapse, and voltage scaling; several low-power sleep modes
Debug	JTAG and QDSS
Others	Thermal sensors, modes, and resets; and peripheral subsystem

Table 1-1 SDM450 features (cont.)

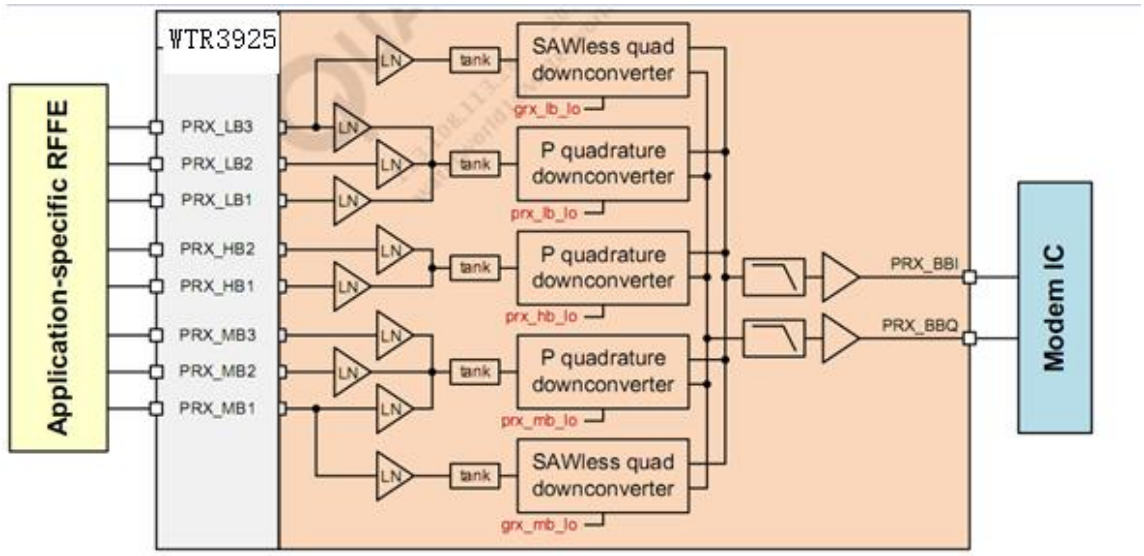
Feature	SDM450 capability
Chipset and RF front-end (RFFE) interface features	
WTR RFICs WLAN baseband data GNSS baseband data Status and control	WTR3925 or two WTR2965 One Rx and one Tx analog interface Rx analog interface SSBIs and discrete signals, as needed, via GPIOs
Power management	PM8953 + PMI8952 Two 2-line SPMI; dedicated clock and reset lines; plus other GPIOs as needed
Package dimensions	792 NSP; 14 × 12 × 0.84 mm

3. Signal Flow

Brief of the mobile signal flow as below:

3.1. Receiver rinciple

RX signal flow chart(Figure1)：

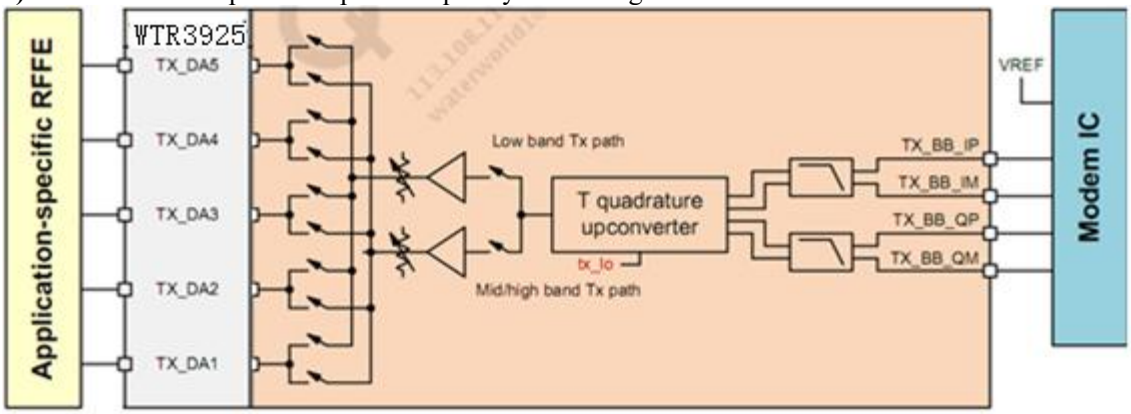


The serial signal mobile received go to RF Connector, and then transmit to transceiver WTR3925 via the selected band in RF switcher&SAW filter.IQ signals input to Transceiver for demodulation and de-code, then go to Base band.

3.3.Transmitter principle

1) After A/D and codec in SDM450, then send the digital signal to SDM450 for encode and modulation process, then sent to RF Transceiver via IQ signals.

2) WTR3925 implement uplink frequency converting



3. Tx signals output from PA, flow through RF-Connector to antenna.

Antenna details

Upper left： WBG Antenna
Upper right: Diversity Antenna
low right： Primary Antenna
Main antenna: monopole
Band: GSM850/900/1800/1900 UMTS: B2/4/5 LTE:B2/4/5/7/12/66/71

ANT GAIN	AVERAGE GAIN(dBi)	PEAK GAIN(dBi)
GSM850	-6.59	-3.3
GSM900	-7.58	-4.55
GSM1800	-5.2	-1.8
GSM1900	-4.91	-1.52
UMTS B2	-4.91	-1.52
UMTS B4	-5.2	-1.8
UMTS B5	-6.59	-3.3
LTE B2	-4.91	-1.52
LTE B4	-5.2	-1.8
LTE B5	-6.59	-3.3
LTE B7	-4.85	-0.91
LTE B12	-6.43	-3.25
LTE B66	-5.25	-1.84
LTE B71	-6.92	-3.59

WIFI/BT/GPS ANTENNA:

ANT GAIN	AVERAGE GAIN(dBi)	PEAK GAIN(dBi)
WIFI 2.4G/BT	-4.55	-0.52
WIFI 5G	-4.9	0.23
GPS	-3.21	0.83