Operation Description

1. Overview:

Model name：TMRV075G

TMRV075G works with:

GSM quad band (GSM850/GSM900/DCS1800/PCS1900);

UMTS band (UMTS 2/4/5);

LTE FDD band 2,4,5,7,12,25,26,66,71; LTE TDD band 41.

NR FDD band 25,66,71,77; NR TDD band 41.

And CPU runs at 2.2GHz, with 128GB UFS Flash Memory and 6GB DDR4.

It can support HSDPA downlink and HSUPA uplink data rates, as well as Class 33 GPRS (in both uplink and downlink mode) and Full EDGE.

The main IC include

- **Base band + PMIC**
  - SM6450 from Qualcomm + PMIC(PM6450+PM6150C+PM7250B)
- **Memory (UFS+DDR4X)**
  - UFS+DDR4X（BWMEXX32H2A-48G-X_4266） ---- BIWIN
- **RF Transceiver**
  - SDR435 from Qualcomm
- **RF TRANSMIT MODULE**
  - FX5627Z from FEIXIANG，FX5627S from FEIXIANG
- **BT/WIFI /GPS Connector**
  - WCN3988 from Qualcomm
- **ALSP-Sensor**
  - HX32062SE from TIANYIHEXIN
- **DRX SAW**
  - B2/25+4/66: SFWG62DBB02 from WISOL
  - B3: LAS1843A0A-MC from SANAN
  - B7: LAS2655A0Y-MC from SANAN
  - B8: LAS0943A15-MC from SANAN
  - B12: RHFR11CA13AUB001 from TIANTONG
  - B5/26: RHFR11CA26AUB001 from TIANTONG
  - B41: FRN41CF3A006 from GrandeurRF
  - B41： FRN41CF4A006 from GrandeurRF
  - B41: RHFR11CA41BUB001 from TIANTONG
  - B41(TX): SF14-2593M5UUB1 from KYOCERA
  - B71: B39631B7517P810 from EPCOS
- **Duplexer**
  - –B2/25： B39202B1277P810 from EPCOS
  - –B4/66： B39222B1254L210 from EPCOS
  - –B2/25+4/66: B39222B8975L210 from EPCOS
  - –B5/26： SFX831AHD02 from WISOL
  - –B7： RHDX18CC07BUB001 from TIANTONG

–B12: B39741B8649P810 from EPCOS

–B71 B39681B1266P810 from EPCOS

- **RF connector**

–818002131 from DIANLIAN

–MM8030-2610RK0 from MURATA

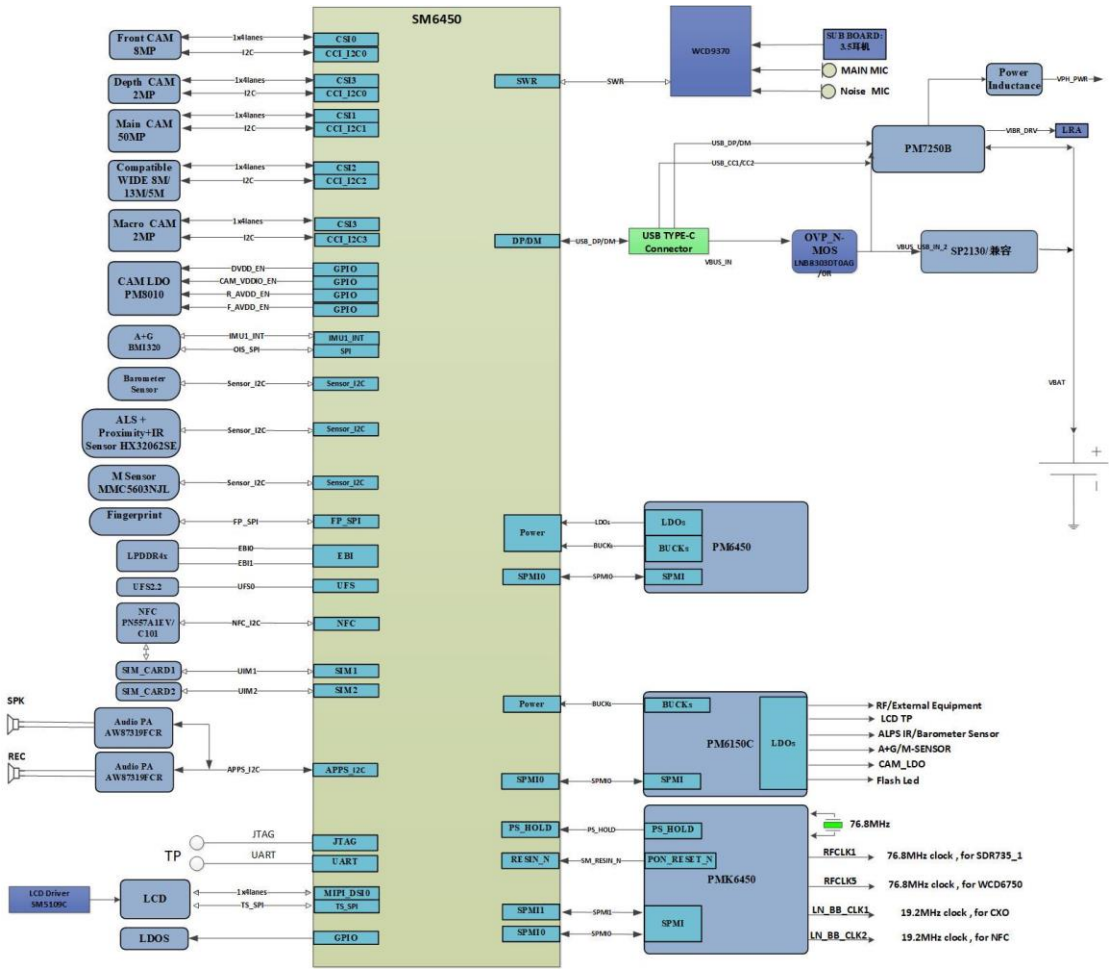
- **P-Sensor**
  - STK33562 from SENSORTEK
- **NFC**
  - THN31FGB1N from TSINGTENG MICRO

– HW Version: V1.0

– SW Version: TMRV075G_0.03.03

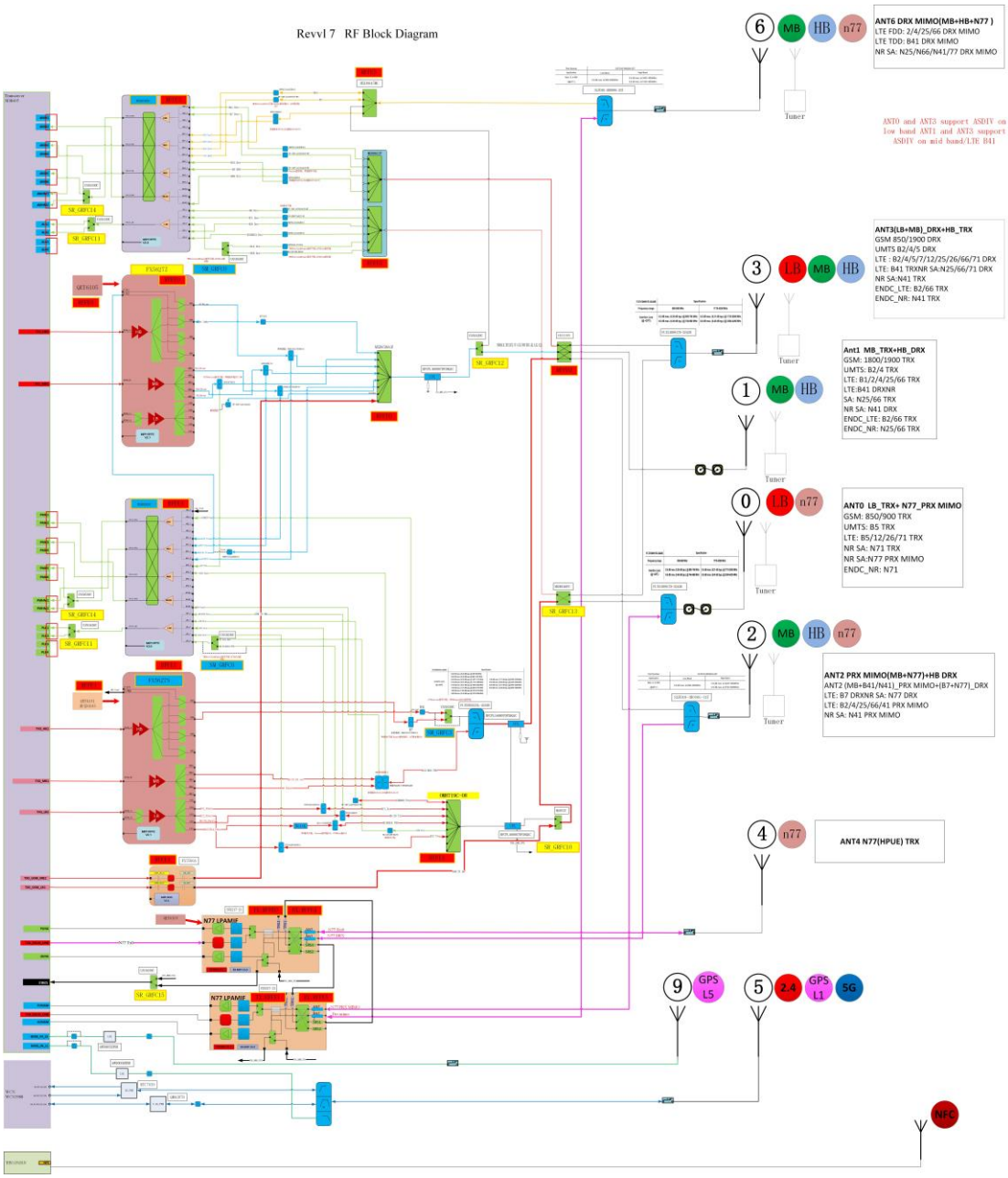
System diagram Overview:

1.1. Overview:



1.2. RF:

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



The antenna switching diversity (ASDiv)

This device implements the antenna swap feature (named ASDiv, antenna-switching diversity), the feature of Qualcomm platform. The table lists the frequency bands in which ASDiv is implemented.

Mode	Band	Frequency bands supported	Frequency bands which has ASDIV mechanism
Cellular	GSM	850,900,1800,1900	850,1900
	UMTS	Band 2,4,5	Band 2,4,5
	CDMA	/	Don’t support

	LTE	2, 4, 5, 7,12, 25, 26, 41, 66, 71	2,4,5,12,25,26,41,66,71
	5G NR	N25,N66,N41,N71,N77	N25,N66,N71
WLAN	802.11 a/b/g/n/ac	2412—2462 MHz	Don't support
		5180—5240 MHz	
		5260—5320 MHz	
		5500—5700 MHz	
		5745—5825 MHz	
Bluetooth	V5.1 with LE/ANT+	2402—2480 MHz	Don't support
NFC		13.56MHz	Don't support

The antenna switching diversity is a new feature which resolve the phone antenna death gribs for metal-back phone, the ASDiv feature enables simultaneous measurement of the two antennas in parallel. The user equipment (UE) must support the ASDiv feature enables simultaneous measurement of the two antennas in parallel. The user equipment (UE) must support Rx diversity (RxD) to use this benefit. In this case, Rx diversity (RxD) to use this benefit. In this case, the switch occurs between the primary receive antenna (PRx) and the diversity receive antenna (DRx). So the basic rules the switch occurs between the primary receive antenna (PRx) and the diversity receive antenna (DRx). So the basic rules of the ASDiv control algorithm is as following: of the ASDiv control algorithm is as following: RX based switch and TX RX based switch1. When one antenna RX signal is 8dB better than the other RX signal, RX based switch and TX RX based switch.

1. When one antenna RX signal is 8dB better than the other RX signal, the software will switch the TX signal to the better RX antenna.

2. When the TX signal is in MAX power in one antenna for the software will switch the TX signal to the better RX antenna.2. When the TX signal is in MAX power in one antenna for 50% higher of time, and the RX signal is larger than the threshold, 50% higher of time, and the RX signal is larger than the threshold, then he software will control TX signal to switch to the other antenna. then he software will control TX signal to switch to the other antenna.

UpLink MIMO

Mode	Band	Frequency bands supported
Cellular	NR UL MIMO	N41,N77

Product technical parameters:

GENERAL:

GSM

Items	GSM850	GSM900	DCS	PCS
Frequency allocation	TX(Uplink): 824M-849MHZ	TX(Uplink): 880M-915MHZ	TX(Uplink): 1710M-1785MHZ	TX(Uplink): 1850M-1910MHZ

	RX(Downlink): :869M-894MHZ	RX(Downlink): :925M-960MHZ	RX(Downlink): 1805M-1880MHZ	RX(Downlink): 1930M-1990MHZ
Channel band width	200KHz	200KHz	200KHz	200KHz
Channel	128-251	975-1023，0-124	512-885	512-810
Modulation	GMSK,8PSK	GMSK, 8PSK	GMSK, 8PSK	GMSK, 8PSK
TX/RX channel space	45MHz	45MHz	95MHz	80MHz
(Fn)Freq. calculating formula	Fn=824.2+(N-128)×0.2 N: Channel No. Unit: MHz	Fn=880.2+(N-975)×0.2 N: Channel No. Unit: MHz	Fn=1710.2+(N-512)×0.2 N: Channel No. Unit: MHz	Fn=1850.2+(N-512)×0.2 N: Channel No. Unit: MHz

GPRS/ EDGE

GPRS/ EDGE	---GPRS Class 33:CS-1~ CS-4 ---EDGE Class 33:MCS-1~ MCS-9	Application: WAP2.0
DTM Support	Not Support	
VOIP Support	Support	

WCDMA

Items		B2	B4	B5
Freq. allocation		TX(Uplink): 1850-1910MHZ RX(Downlink): 1930-1990MHZ	TX(Uplink): 1710-1755MHZ RX(Downlink): 2110-2155 MHZ	TX(Uplink): 824-849 MHZ RX(Downlink): 869-894 MHZ
Channel band width		5MHz	5MHz	5MHz
Channel		9262-9538	1312-1513	4132-4233
Modulation		Uplink：BPSK Downlink: QPSK	Uplink：BPSK Downlink: QPSK	Uplink：BPSK Downlink: QPSK
TX/RX channel space		80MHz	400MHz	45MHz
(Fn)Freq. calculating formula		Fn = 1852.4 + (N-9262)* 0.2 N: Channel No. Unit: MHz	Fn =1712.4 + (N-1312) *0.2 N: Channel No. Unit: MHz	Fn = 826.4 + (N-4132) *0.2 N: Channel No. Unit: MHz
Category	DL	24	24	24
	UL	6	6	6
MIMO, Multi-Cell		Uplink		
		Multi-Cell	MIMO	
		Yes	N/A	
VOIP Support		YES		

LTE

Item	Feature	
Supporting Standard	LTE Band2/4/5/7/12/25/26/41/66/71; LTE DL Cat16,UL Cat18	
Frequency Range	LTE(FDD2) Tx : 1850 – 1910 MHz LTE(FDD4) Tx : 1710 – 1755 MHz LTE(FDD5) Tx : 824 – 849 MHz LTE(FDD7) Tx : 2500 – 2570 MHz LTE(FDD12) Tx : 699 – 716 MHz LTE(FDD25) Tx : 1850-1915 MHz LTE(FDD26) Tx : 814-849MHz LTE(FDD41) Tx : 2496-2690MHz LTE(FDD66) Tx : 1710 – 1780 MHz LTE(FDD71) Tx : 663-698 MHz	LTE(FDD2) Rx : 1930 – 1990 MHz LTE(FDD4) Rx : 2110 – 2155 MHz LTE(FDD5) Rx : 869 – 894 MHz LTE(FDD7) Rx : 2620 – 2690 MHz LTE(FDD12) Rx : 729 – 746 MHz LTE(FDD25) Rx : 1930-1995 MHz LTE(FDD26) Rx : 859-894MHz LTE(FDD41) Rx : 2496-2690MHz LTE(FDD66) Rx : 2110 – 2200 MHz LTE(FDD71) Rx : 617-652 MHz
CA information	LTE 2 DL CC： CA_12A-66A;CA_25A-25A;CA_25A-26A;CA_25A-41A;CA_2A-12A;CA_2A-2A;CA_2A-4A;CA_2A-5A;CA_2A-66A;CA_2A-71A;CA_2C;CA_41A-41A;CA_41C;CA_4A-12A;CA_4A-4A;CA_4A-5A;CA_4A-71A;CA_5A-66A;CA_66A-66A;CA_66A-71A;CA_66B;CA_66C LTE 2 UL CC： CA_41C　CA 2A-12A CA 12A-66A　CA 2A-66A	
Application Standard	MMS、SUPL、RCS、IMS	

Modulation, Channel spacing and bandwidth:

	Modulation	Channel spacing	Channel bandwidth
LTE	Downlink: QPSK, 16QAM, 64QAM 256QAM Uplink: QPSK, 16QAM 64QAM,256QAM	Depends on the deployment scenario(Freq. block size & channel bandwidths) * Nominal Channel spacing = (BWchannel(1) + BWchannel(2))/2	Band 7/41/71 : 5/10/15/20MHz Band 2/4/25/66: 1.4/3/5/10/15/20MHz Band 5/12: 1.4/3/5/10MHz Band 26: 1.4/3/5/10/15MHz

Category

Category	Downlink		Uplink	
	Cat16		Cat18	
(Fn)Freq. calc. formula	FUL = FUL_low + 0.1(NUL – NOffs-UL)			
MIMO, Multi-Cell	Downlink		Uplink	
	MIMO	Multi-Cell	MIMO	Multi-Cell
	4*4	YES	NO	NO
VOLTE Support	YES			
LTE CA	YES			

NR

Item	Feature	
Supporting Standard	NR band: n25/n41/n66/n71/n77 class 3:n25/n66/n71/n41/n77 class 2:n41/n77	
Frequency Range	NR(FDD25) Tx : 1850-1915 MHz NR(TDD41) Tx : 2496-2690MHz NR(FDD66) Tx : 1710 - 1780 MHz NR(FDD71) Tx : 663-698 MHz NR(TDD77) Tx : 3300-4200 MHz	NR(FDD25) Rx : 1930-1995 MHz NR(FDD41) Rx : 2496-2690MHz NR(FDD66) Rx : 2110 - 2200 MHz NR(FDD71) Rx : 617-652 MHz NR(TDD77) Rx : 3300-4200 MHz
SA	n25/n41/n66/n71/n77	
ENDC	Max of 1CC in LTE DC_66A_n25A;DC_2A_n66A;DC_2A_n41A;DC_66A_n41A;DC_2A_n71A;DC_66A_n71A Max of 2CC in LTE，Support　DL_MIMO 2-2_2: DC_2A-66A_n25A;DC_2A-66A_n71A;DC_2A-2A_n71A;DC_2C_n71A;DC_2A-(n)71AA;DC_66A-(n)71AA;DC_2A-(n)66AA Max of 2CC in LTE，Support　DL_MIMO 2-2_4: DC_2C_n41A;DC_2A-2A_n41A Max of 2CC in LTE，Support　DL_MIMO 4-4_2: DC_66C_n71A;DC_66A-66A_n71A	

NR DLCA	CA_n25A-n71A;CA_n71B;CA_n25(2A);CA_n66A-n71A;CA_n66(2A);CA_n25A-n66A;CA_n71(2A);CA_n25A-n41A;CA_n41A-n66A;CA_n41A-n71A;CA_n66A-n77A;CA_n71A-n77A;CA_n25A-n77A
4X4 MIMO	n25/n41/n66/n77 (DL only)

Modulation, SCS and bandwidth:

	Modulation	SCS	Channel bandwidth
NR	Uplink CP-OFDM: QPSK, 16QAM, 64QAM 256QAM Uplink DFT-s−OFDM: PI/2 BPSK, QPSK, 16QAM 64QAM,256QAM	n25/66/71: 15KHz; n41/n77: 30KHz	n41/77:20, 30, 40, 50, 60,70, 80, 90, 100MHz n25/66/71:5, 10, 15, 20MHz

BT Specs:

Items	**Values**
Frequency Range	2402 MHz – 2480 MHz
RF Power Output	8.5dBm
Modulation	GFSK/8-DPSK/π/4-DQPSK(EDR)/GFSK(BLE)
Number or channels	79(EDR)/40(BLE)
Channel spacing	1MHz(EDR)/2MHz(BLE)
Version	5.1

PHY	**Modulation scheme**	**Coding scheme**		**Data rate**
		Access Header	Payload	
LE 2M PHY	2Msym/s 方式	无编码	无编码	2Mb/s
LE Coded PHY	1Msym/s 方式	编码 S=8	编码 S=8; 编码 S=2	125Kb/s 500Kb/s

Wi-Fi Specs:2.4G/5G

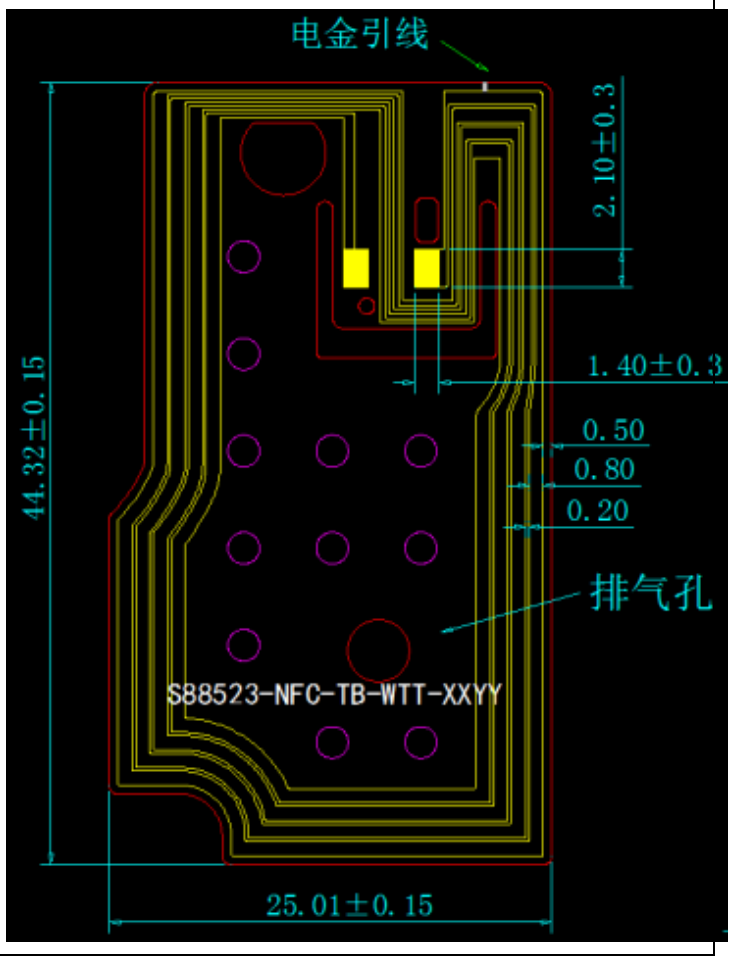
Frequency range 2.4G	2.412 GHz – 2.462 GHz (2.4GHz ISM Band)		
Frequency range 5G	5.15GH-5.35GHz /5.47GHz-5.85GHz		
IEEE	802.11b, 802.11g, 802.11n, 802.11a,802.11ac		
RF power 802.11b	≤22dBm		
RF power 802.11g	≤20dBm		
RF power 802.11n	2.4GHz:≤20dBm		
RF power 802.11n 20MHz	5GHz:≤20dBm		
RF power 802.11n 40MHz	5GHz:≤19.5dBm		
RF power 802.11a	≤20dBm		
RF power 802.11ac 20MHz&40MHz	≤17.5dBm		
RF power 802.11ac 80MHz	≤17dBm		
Modulation	DSSS/BPSK/QPSK/16QAM/64QAM/256QAM		
Channel spacing	2.4GHz:20/40MHz 5GHz:20/40/80MHz		
Hotspot Support	YES		
DFS	Support		
	Ad-Hoc	Peer-to-Peer	DFS detection
	No	YES (GC)	No

FM:

FMTransmitter	NO
FMReceiver	NO

NFC Specs:

Frequency range	13.56MHz+/-7KHz

Reader	ISO/IEC 14443A, ISO/IEC 14443B, ISO/IEC 15693, MIFARE 1K/4K,Sony Felica, reader for NFC Forum tags 1 to 4
Card	ISO/IEC 14443A, ISO/IEC 14443B, Type B', MIFARE,Sony Felica
Peer to peer	Active and passive 106 to 424kbps initiator and target,
Secure element interface	SWP/HCI
Type	Active/Passive
Antenna	

RECOMMENDABLE OPERATION CONDITION:

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**	-10 degree
SIM/USIM Voltage	1.8 / 3v

ABSOLUTE MAXIMUM RATING of RF 3G/4G/5G PA:

PA parameter	Specification		
	Min.	Typ.	Max.
Power supply voltage	3.0V	3.4v	4.6v

Power supply current	-	-	1A

ABSOLUTE MAXIMUM RATING of RF **2G** PA:

PA parameter	Specification		
	Min.	Typ.	Max.
Power supply voltage	3	3.5v	4.6v
Power supply current	-	-	3A

SAR Back off

Support SAR fallback in
GSM 850/1900
WCDMA Band 2/4/5;
LTE Band 2/4/5/12/25/26/41/66/71
5G NR N25/41/66/71/77.

Receiver for Head SAR

1. The receiver works
2. The upper layer according to the KeyValue, to execute (send AT instruction) to reduce/restore the antenna power.

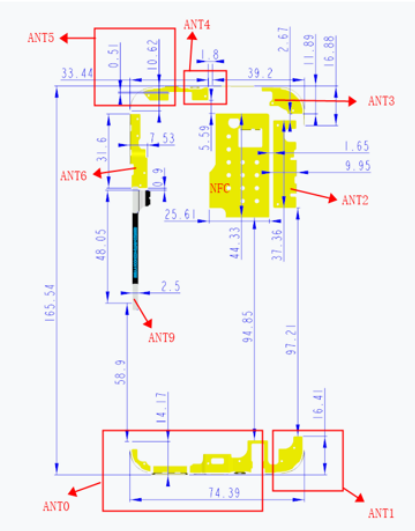
SAR Sensor for Limb&Body SAR

Type： **HX9036E**

(capacitive sensor)

1. When the hand is close to the antenna , the Sensor will detect and send a low pulse to AP, which will trigger the interrupt.

SAR sensor trigger distance



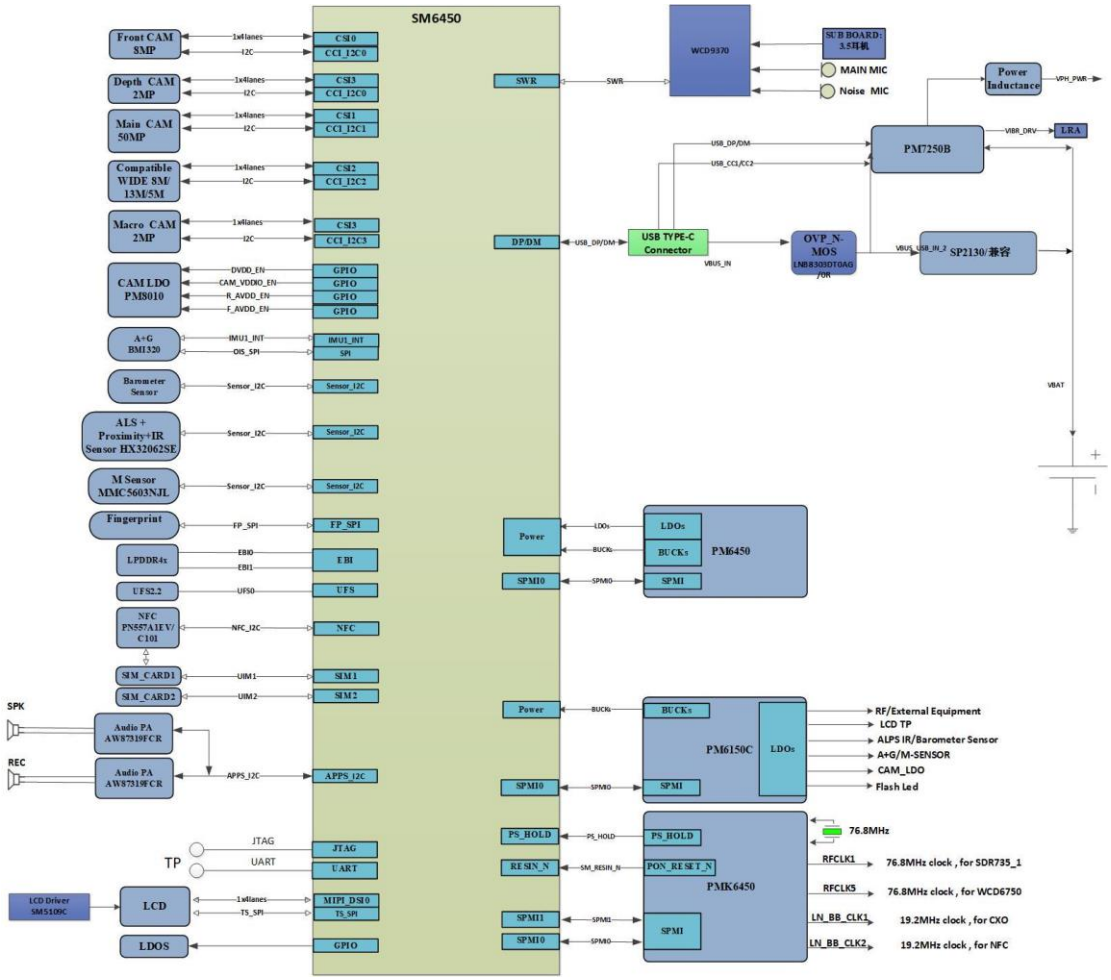
Distance test (mm)	CS0	CS2	CS4	CS5	CS7
	ANT0	ANT1	ANT3	ANT4	ANT5
Front	18	18	18	18	18
Rear	20	20	20	20	20
Top	NA	NA	20	20	18
Bottom	20	20	NA	NA	NA
Left	NA	18	18	NA	NA
Right	18	NA	NA	NA	18

2. AP performs interrupt processing, calls Driver, reads KeyValue(register address 0x04), and reports to the upper layer,The KeyValue reported to the upper level can be defined by the user.

3. The upper layer according to the reported KeyValue, to execute (send AT instruction) to reduce/restore the antenna power.

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.


SM6450
Front CAM 8MP
Depth CAM 2MP
Main CAM 50MP
Compatible WIDE 8M/ 13M/5M
Macro CAM 2MP
CAM LDO PM8010
A+G BMI320
Barometer Sensor
ALS + Proximity+IR Sensor HX32062SE
M Sensor MMC5603NJL
Fingerprint
LPDDR4x
UFS2.2
NFC PN557A1EV/ C101
SIM_CARD1
SIM_CARD2
SPK
Audio PA AW87319FCR
REC
Audio PA AW87319FCR
TP
JTAG
UART
LCD Driver SM5109C
LCD
LDOS
CSI0
CCI_I2C0
CSI3
CCI_I2C0
CSI1
CCI_I2C1
CSI2
CCI_I2C2
CSI3
CCI_I2C3
GPIO
GPIO
GPIO
GPIO
IMU1_INT
SPI
Sensor_I2C
Sensor_I2C
Sensor_I2C
FP_SPI
EBI
UFS
NFC
SIM1
SIM2
APPS_I2C
MIPI_DSI0
TS_SPI
GPIO
SWR
DP/DM
Power
SPMI0
Power
SPMI0
PS_HOLD
RESIN_N
SPMI1
SPMI0
WCD9370
SUB BOARD 3.5耳机
MAIN MIC
Noise MIC
Power Inductance
VPH_PWR
PM7250B
VIBR_DRV
LRA
USB_DP/DM
USB_CC1/CC2
USB TYPE-C Connector
VBUS_IN
OVP_N-MOS
SP2130/兼容
VBAT
LDOs
BUCKs
PM6450
SPMI
BUCKs
PM6150C
LDOs
SPMI
PS_HOLD
PON_RESET_N
PMK6450
SPMI
RF/External Equipment
LCD TP
ALPS IR/Barometer Sensor
A+G/M-SENSOR
CAM_LDO
Flash Led
76.8MHz
RFCLK1
76.8MHz clock , for SDR735_1
RFCLK5
76.8MHz clock , for WCD6750
LN_BB_CLK1
19.2MHz clock , for CXO
LN_BB_CLK2
19.2MHz clock , for NFC

Main Features:

Table 1-1 SM6450 features

Feature	SM6450 capability
Processors	
Applications	Kryo 6xx CPU built on Arm Cortex technology ▪ Kryo Gold 2.2 GHz: Four high-performance cores ▪ Kryo Silver 1.8 GHz: Four low-power cores
Digital signal processing and artificial intelligence	Compute Hexagon DSP with dual HVX and Hexagon Co-processor (Hexagon CP) 2.0 and Hexagon Tensor Accelerator ▪ Used for video playback enhancements, virtual reality, computer vision, camera snapshot enhancements, video capture enhancement, machine learning, and so on ▪ The Hexagon CP is a vision and imaging hardware accelerator to offload and accelerate the Hexagon software algorithmic functions
Always-on system	Always-on subsystem with always-on processor Hardware-based resource and power management (RPMh) with hardware accelerators for voltage control and regulation, clock management, and resource communication
Low power island (LPI)	LPI with Hexagon DSP consists of Snapdragon sensor core and lowpower audio subsystem
Modem	2G/3G/4G/5G – Sub-6 GHz, mmWave bands (Rel. 16)
Qualcomm Location	Gen 9VT v5
Memory support	
System memory via non- PoP and EBI	▪ Dual-channel non-PoP high-speed memory – LPDDR4X SDRAM designed for a 2133 MHz (2 × 16-bit) clock ▪ LPDDR5 2750 MHz (2 × 16-bit) clock
External memory	
Via UFS	UFS3.1 G4 (2-lane)/UFS2.2
Via SDC	SD v3.0 4 bit for SD card
Other internal memory	172 kB IMEM 1.5 MB GMEM for graphics
RF support	
RF operating bands	Defined by the RF transceiver SDR435 and SDR735 devices mmWave support using SMR546 and QTM545 (with SDR735 only)
Air interfaces	
5G NR	Yes, Rel. 16
LTE	Yes, Rel.16 LTE multimode modem
CDMA, WCDMA, and GSM	Yes
WLAN/Bluetooth	Yes with WCN6750/WCN3988/WCN3998-1
Antenna sharing	Antenna shared between Wi-Fi and WAN

Table 1-1 SM6450 features (cont.)

Feature	SM6450 capability
GNSS – Integrated Qualcomm Location Suite engine	Gen 9VT; GPS, GLONASS, NavIC, BeiDou, Galileo, QZSS, and SBAS
Multimedia	
Display support	DPU1xxx: ▪ Maximum resolution for internal panel: FHD+ 120 Hz ▪ 1 × DSI DPHY (4-lane); DSI D-PHY v1.2; C-PHY 3-trios v1.1, VESA DSC 1.2 ▪ 4K30 DP1.4 (USB3 + DisplayPort concurrency)
Camera support	Qualcomm Spectra 6xx: 3 × 13 MP 30 fps ZSL Qualcomm Spectra 6xx ISP supports connectivity to multiple cameras due to four C-PHY/D- PHY interfaces. ▪ Real-time sensor input resolution: 13 + 13 + 13 MP ▪ 64 + 32 + 13 MP: 64 MP (actual senor output 16 MP after In sensor binning) + 32 MP (actual senor output 8 MP after In sensor binning) + 13 MP OR ▪ 48 + 32 + 13 MP: 48 MP (actual senor output 12 MP after In sensor binning) + 32 MP (actual senor output 8 MP after In sensor binning) + 13 MP ▪ Three IFE, 4 + 4 + 4 + 4 configuration, up to eight sensors, three concurrent MIPI CSI configuration ▪ 4 × D-PHY v1.2 /C-PHY 3-trios v1.2
Video processing unit (VPU)	VPU 6xx – fifth-generation UHD video processing unit ▪ Video decode: Up to 4K30 for H.264/H.265/VP9 ▪ Video encode: Up to 4K30 for H.264/H.265 ▪ Video concurrency: UHD30 decode +1080p30 encode ▪ HFR capture: 720p at 240 fps
Adreno graphic processing unit (GPU)	Adreno GPU A7xx OpenGL ES 3.2, Vulkan 1.x OpenCL 2.0, DX FL12
Audio (Low power audio subsystem)	LPI, improved voice UI concurrencies, ML hardware accelerator; V66M, LPI shared with Sensor SS ▪ eNPU/AI accelerator: Embedded AI accelerator for LPI and low power use cases ▪ Hardware adaptive filter enabled voice UI always by offloading echo cancellation processing ▪ Hardware resampler ▪ DSP offload for audio playback, including USB digital audio and Bluetooth audio
Codec	WCD937x/WCD938x high fidelity audio codec
Speaker amplifier	WSA883x class-H, low noise smart amplifier
Audio interfaces	▪ SLIMbus for WCN6750, WCN3988, and WCN3998-1 ▪ SoundWire interface (two Tx and two Rx data for codec) ▪ SoundWire MIC support ▪ Dedicated SoundWire interface for smart speaker amplifier ▪ 3 DMIC ports in LPI

Table 1-1 SM6450 features (cont.)

Feature	SM6450 capability
	▪ 5 MI²S with 2x data lanes to support full duplex stereo, or up to four channel Tx/Rx application ▪ 1 MI²S supports four data lanes for up to eight channels Tx/Rx application
Connectivity	
Qualcomm universal peripheral (QUP) ports	15: Multiplexed serial interface functions
USB	1 USB 3.1 port: Gen 1 (DisplayPort + data), support type-C with DisplayPort v1.4 USB 2.0 with BC1.2 support
PCIe	PCIe Gen 3 1-lane
Secure digital interfaces	▪ SDC2 (SD3.0) ▪ SDC2 is dual-voltage ▪ SD card; UFS
Touchscreen support	Capacitive panels via ext IC (I²C, SPI)
Configurable GPIOs	
Number of GPIO ports	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	Hardware ECC for ecdsa based Image authentication, ICE 3.2.1, GPCE 5.6, PRNG 3.0, HWKM
QFPROM	Fuse bits available for OEM use
Access control	XPU4, SMMU
Secure boot and tools	Secure Boot with Sec tools 2.0; easy to use tool set
User data encryption	File based encryption with HWKM
Storage security	Secure file system (SFS); fast trusted
TrustZone	Qualcomm trusted execution environment (TEE) v5.4
DRM	Widevine V16 L1, HDCP v2.3
QTEE services	IP protection, camera security, trusted UI, DSP security, device attestation, connection security, trusted location, and RTIC
TME	Introduce trust management engine (TME) for SOC Root of Trust
Boot sequence	1. TME ROM FW+ applications PBL 2. XBL 3. SHRM 4. AOP 5. HLOS 6. Rest of subsystems Emergency boot over USB 3.1
PLLs and clocks	▪ Multiple clock regimes; watchdog and sleep timers ▪ Input: 19.2 MHz CXO ▪ General purpose outputs: M/N counter and PDM

Table 1-1 SM6450 features (cont.)

Feature	SM6450 capability
Debug	JTAG, design for software debug (DFSD), and embedded USB debug (EUD)
Chipset interface features	
QLink	QLink0 port for sub-6 applications and QLink1 for mmWave applications
Power management	Single SPMI; plus other lines, as needed, via GPIOs, I^2C for PM6450 + PM6150C + PMK6450 + PMR735A + 2x PM8010 + PM7250B + SMB1393/SMB1394 **Note:** PMR735A is exclusively for mmWave only. PM8010 is exclusively for camera only.
Wireless connectivity WLAN/Bluetooth	 WCN6750: PCIe interface SLIMbus/UART interface WCN3988/WCN3998-1: I/Q differential pair interface/UART interface
Fabrication technology and package	
Digital die	4 nm process
Non-PoP – small, thermally efficient package	12.4 × 12.0 × 0.89 mm

Signal Flow

Brief of the mobile signal flow as below:

3.1. Receiver principle

RX signal flow chart (RF Block diagram)：

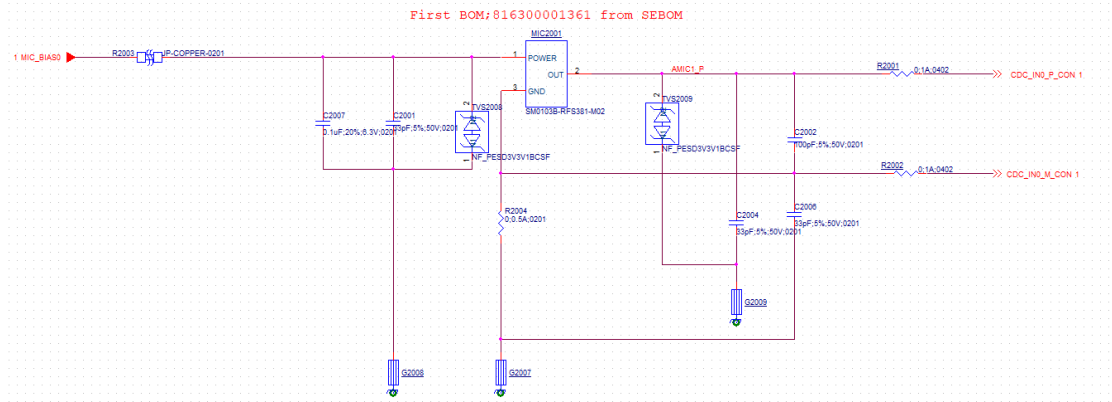
The aerial signal mobile received go to RF Connector, and then transmit to transceiver via the selected band in RF switcher & SAW filter. DRF signals input to Transceiver for demodulation and de-code, then Go to Baseband, With DSP handling, the serial voice data transmit to receiver.

3.2. Transmitter principle

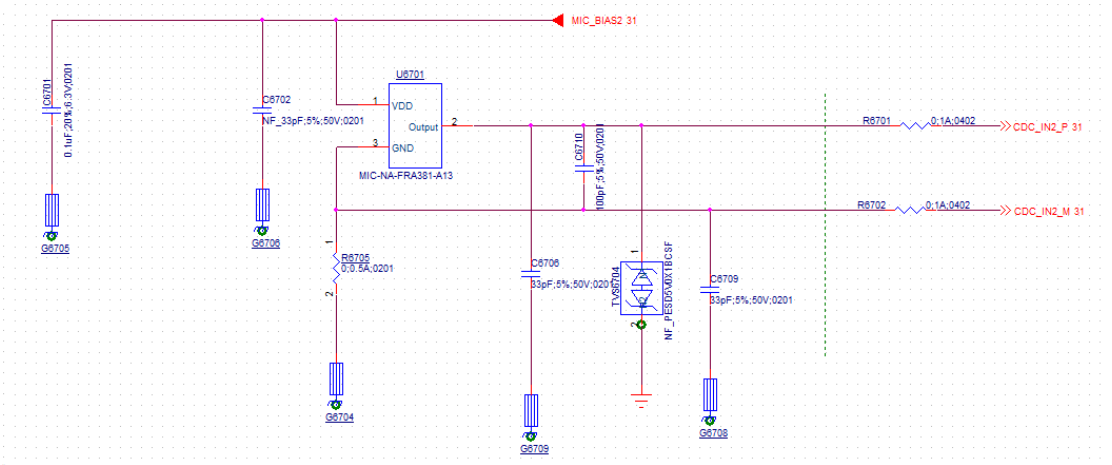
1) Audio signal input from Microphone, Microphone convert the voice signal to analog signal and input to PMIC WCD-9370.

Microphone circuit:

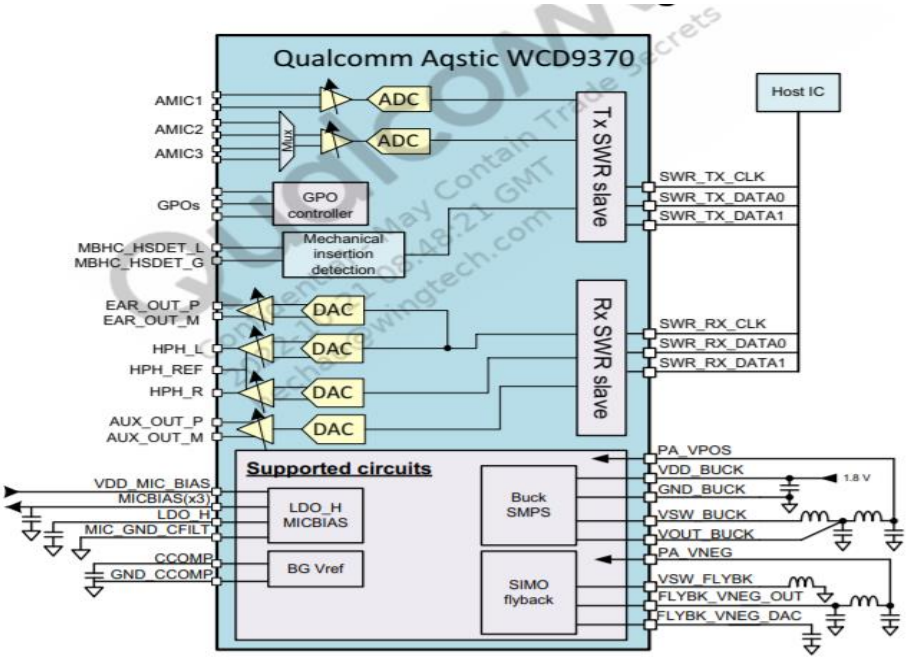
Primary MIC



Sencond MIC

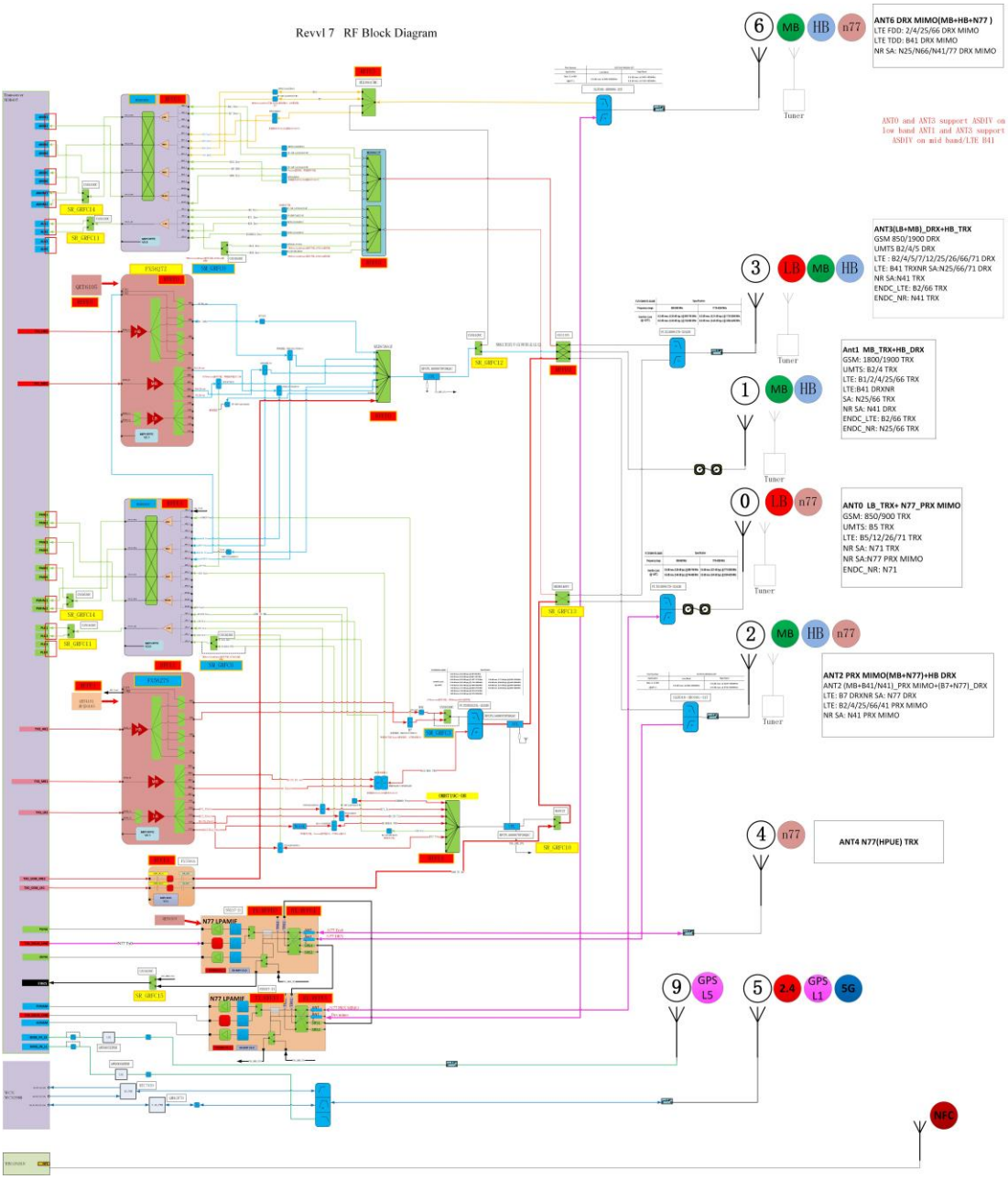


2) After A/D and codec in WCD-9370, then send the digital signal WCD-9370 for encode and modulation process, then D/A converter divided into IO signals to RF Transceiver.



3) With uplink frequency converting, then to PA

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



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