Swift 2 / Swift 2 Plus
Service Manual V1.0

Contents

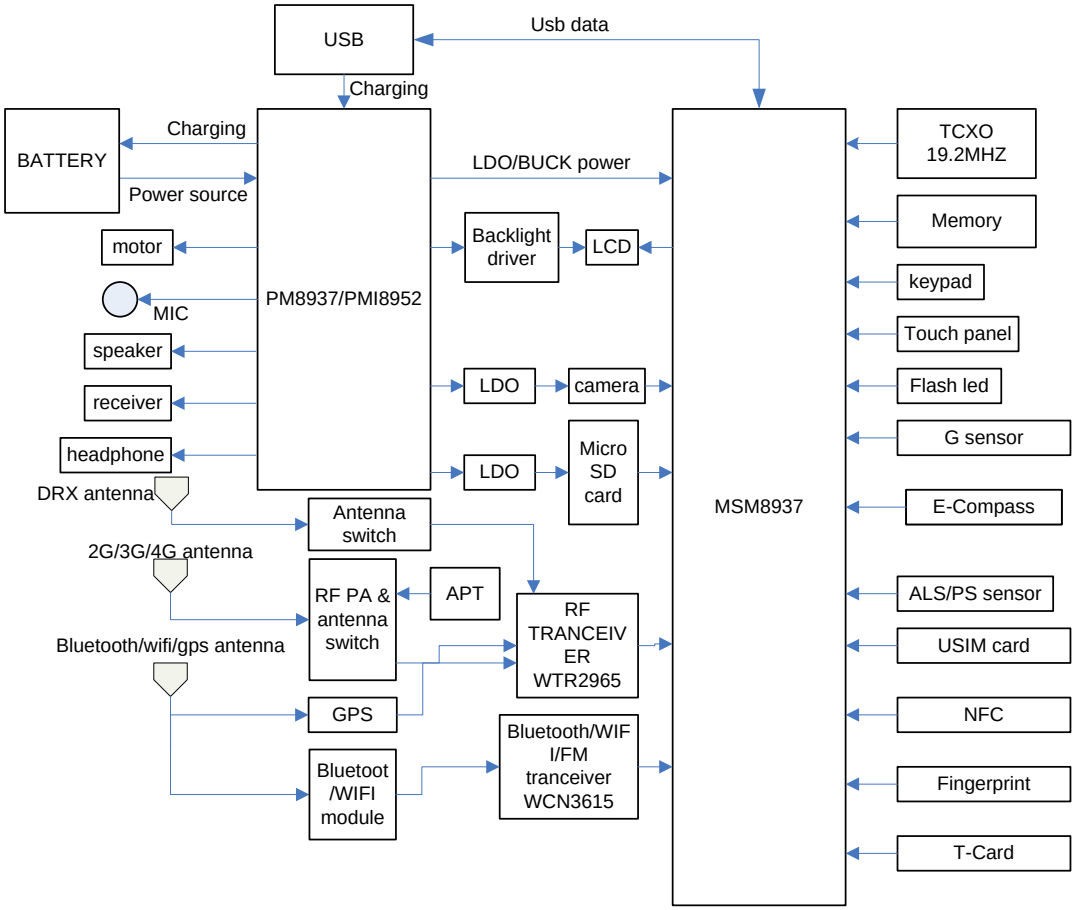
1. Swift^2 overview

1.1 Swift2 introduction

The development and design of the Swift2 PCBA is based on MSM8937 platform. The mainboard system mainly consists of the chip MSM8937+PM8937 +PMI8952+WTR2965, which are responsible for three part functions, namely baseband, power management chip and RF tranceiver. Swift2 PCBA is an all-in-one phone mainboard, which supports FDD-LET,TDD-LTE,GSM, WCDMA, and covers Bluetooth, WIFI,GPS,NFC,Fingerprint, Camera, and so forth.

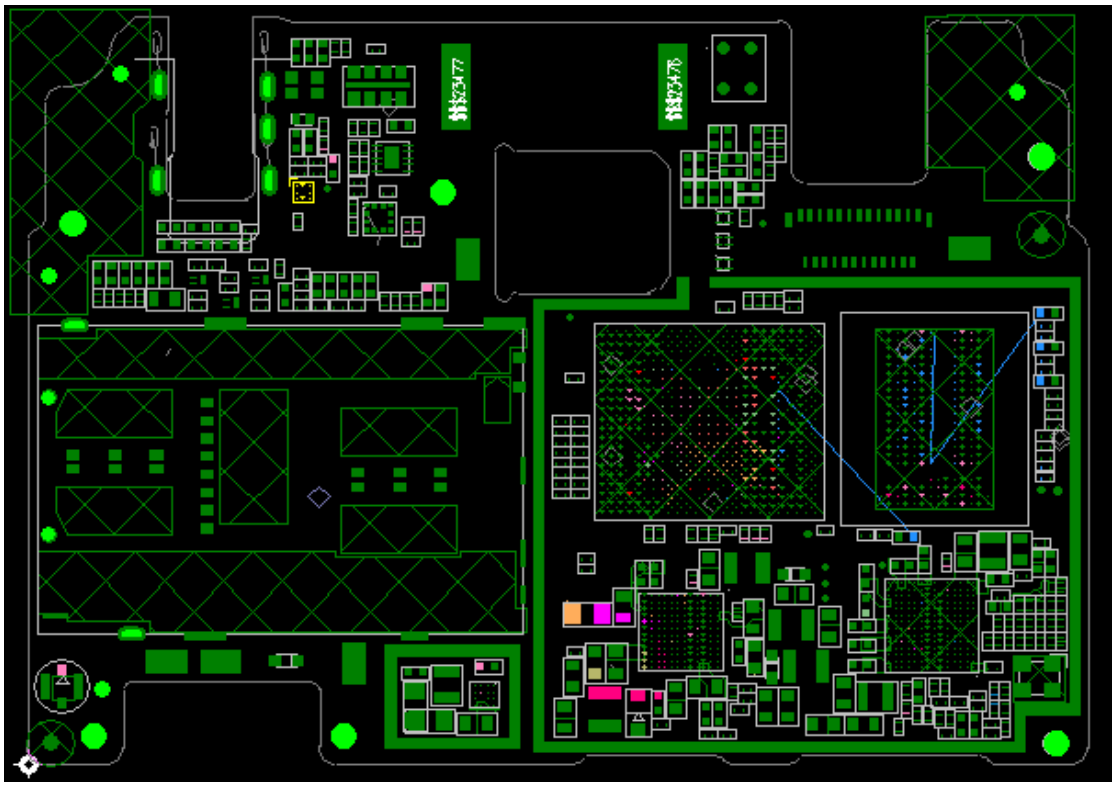
The maintenance of mainboard is one of the important links among mobile products rear-end producing. The speed and quality of maintenance relate to the rate of good products, production efficiency, and cost control throughout the producing. In the case of a reasonable design of product, in the end-producing, finding the significant proportion in the bad board should be SMT bad and component incoming material bad. So, when maintaining, first, s tart with the two aspects. The principal means of fault diagnosis are: (1) find that bad welding spots or components by microscopic examination and visual inspection; (2) guess failure positions from the fault phenomena; (3) confirm the fault units by signal detection.

1.2 Function diagram



1.3 Mainboard component distribution diagram

Mainboard TOP



Mainboard BOTTOM

1.4 Main IC Names

序号	名　称	规 格 型 号	位置码
1	BB_1.4GHz_LTE_WCDMA_TDSCDMA+GSM_800MHz_1900*1200_16MP_1.4*8_ROHS	MSM-8937	U1101
2	PMU_FOWNSP_5.78*5.78*0.65_ROHS	PM-8937	U0701
3	PMU_WLCSP-14_ROHS	PMI-8952	U0501
4	RF CMOS transceiver IC support LTE	WTR-2965	U3001
5	MEMORY_16GB-eMMC+16Gb-LPDDR3_1.8V_FBGA221_ROHS	H9TQ17ABJTACUR-KUM	U1801
6	WLAN/BT/FM　WCN3615 RF/ANALOG PB-FREE RHEA	WCN3615	U3602
7	G-SENSOR_3D_8-14bit_-0.3V-3.6V_VLGA-12_2*2*0.92mm_ROHS	MC3413-P	U2501
8	Digital_ALS_and_Proximity_Module	AP3426H	U2521
9	M-SENSOR_16bit_3D_8pin_WL-CSP_1.28*1.28*0.5mm_ROHS	ST480MC	U2551
10	RF_CMOS_Transceiver_IC_support_LTE_3.29*3.26*0.65mm_CS_ROHS	WTR-2965-0-59FOWNSP-TR-07-0	U3001
12	RF-SWITCH_SP3T_0.1-3.0GHz_1.15*1.15*0.55mm_ROHS	MXD8631	U3303
13	RF-TRX_Module_Quad-Band_GSM_Dual-Band_TD_LTE_B39_8_TRx_Switch_Ports_ROHS	SKY77910-21	U3301
14	RF-PA_Multimode_Multiband_ROHS	SKY77641-21	U3203
15	SPDT_Switch_for_3G/4G_Application	MXD8625A	U3302
16	SAW Single Filter for Band2 /Unbalanced/1109	SAFFB1G96AB0F0A	U3003
17	FILTER SAW 2655MHZ DRX-UNBAL 50/50 1109 B7	B39272B8818P810	U3405
	SAW_DRX_2655MHZ-B7-UNBAL_50/50_CH1109_ROHS	F6QA2G655M2QH	
18	SP4T_0.1-2.7GHz_2*2*0.6mm_ROHS	MXD8641	U3407
19	QFE2101(000-0) 15BWLNSP RF/ANALOG WHITE_TIGER (1.0.0) SMIC	QFE-2101-0-15BWLNSP-HR-70-0	U3501

2. RF

2.1 RF Overview

The WTR2965 device is a highly integrated and versatile RF CMOS transceiver IC that can be used in multimode, multiband applications – including Rx diversity. It is the first Qualcomm RF transceiver IC available in the smaller wafer-level package.

Multimode operation (see the applicable modem IC documents for specific capabilities): GSM/GPRS/EDGE /3GPP2 CDMA 1X and its variants / 3GPP WCDMA and its variants /3GPP LTE and its variants (FDD and TDD) – requires WTR2965 IC variant /TD-SCDMA .

radioOne ZIF architecture – direct downconversion from RF to analog baseband , Receiver signal path circuits: 16 LNA circuits: – Eight primary receiver (PRx) inputs: three low band, three mid band, and two high band – Eight diversity receiver (DRx) inputs: three low band, three mid band, and two high band – GNSS receiver input . External inter-stage filters are **not** required □ Six RF-to-baseband quadrature downconverters: PRx low, mid, and high band; DRx low band and mid/high band; and GNSS . Baseband filtering and amplifiers □ Three baseband interfaces to the baseband device: PRx, DRx, and GNSS .

Low operating voltages save battery current and allows the WTR IC power to be supplied by the PMIC's SMPS circuits for even greater power savings ,Power reduction features via the baseband IC control extends handset talk-time and standby time ,Dual SSBIs for efficient initialization, status, and control ,Discrete connections for critical real-time controls. 60-pin wafer-level nanoscale package (60 WLNSP) ,3.29 × 3.26 × 0.65 mm outline ,0.4 mm pitch ,Many ground pins for better electrical grounding, mechanical strength, and thermal continuity.

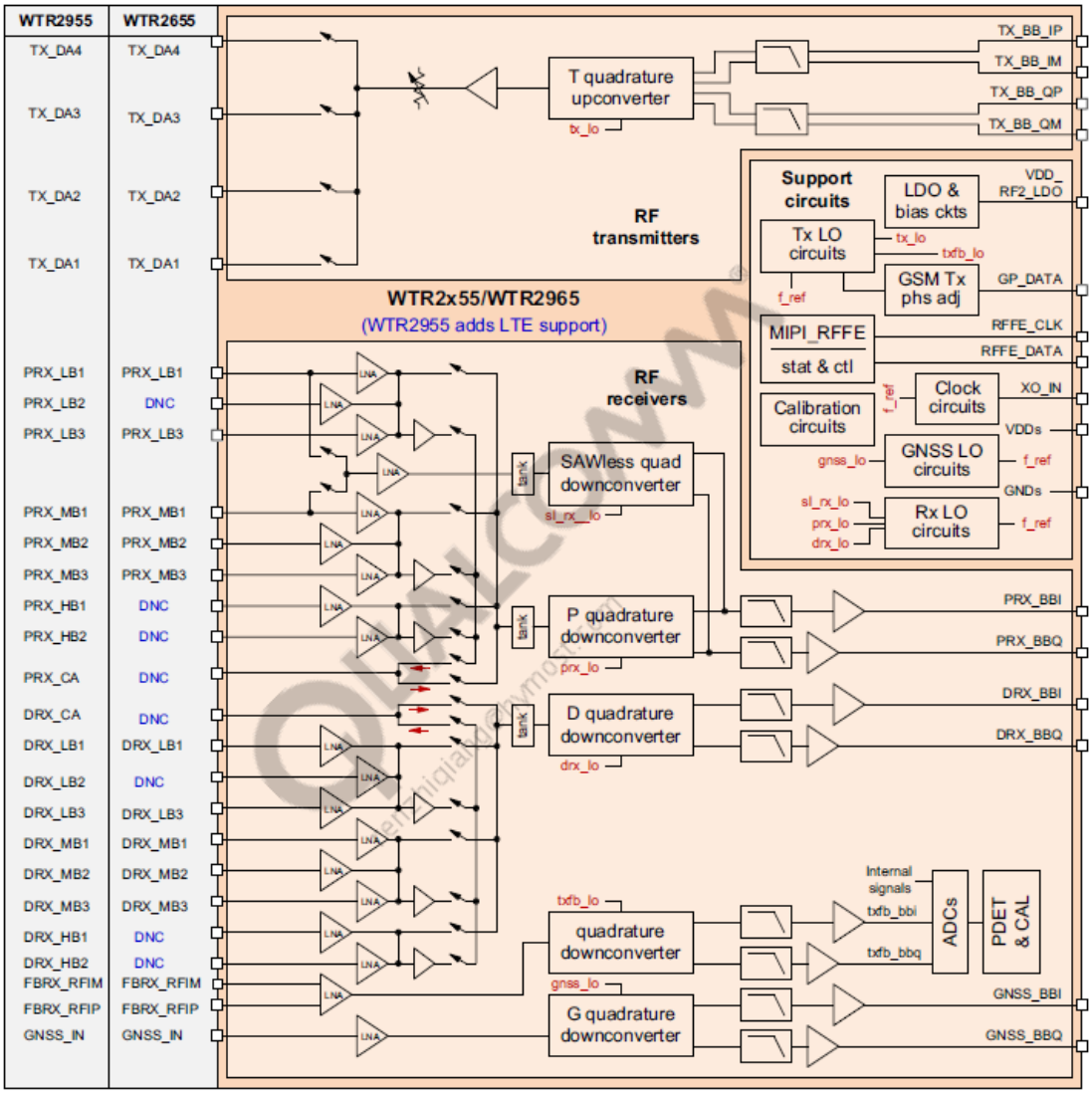
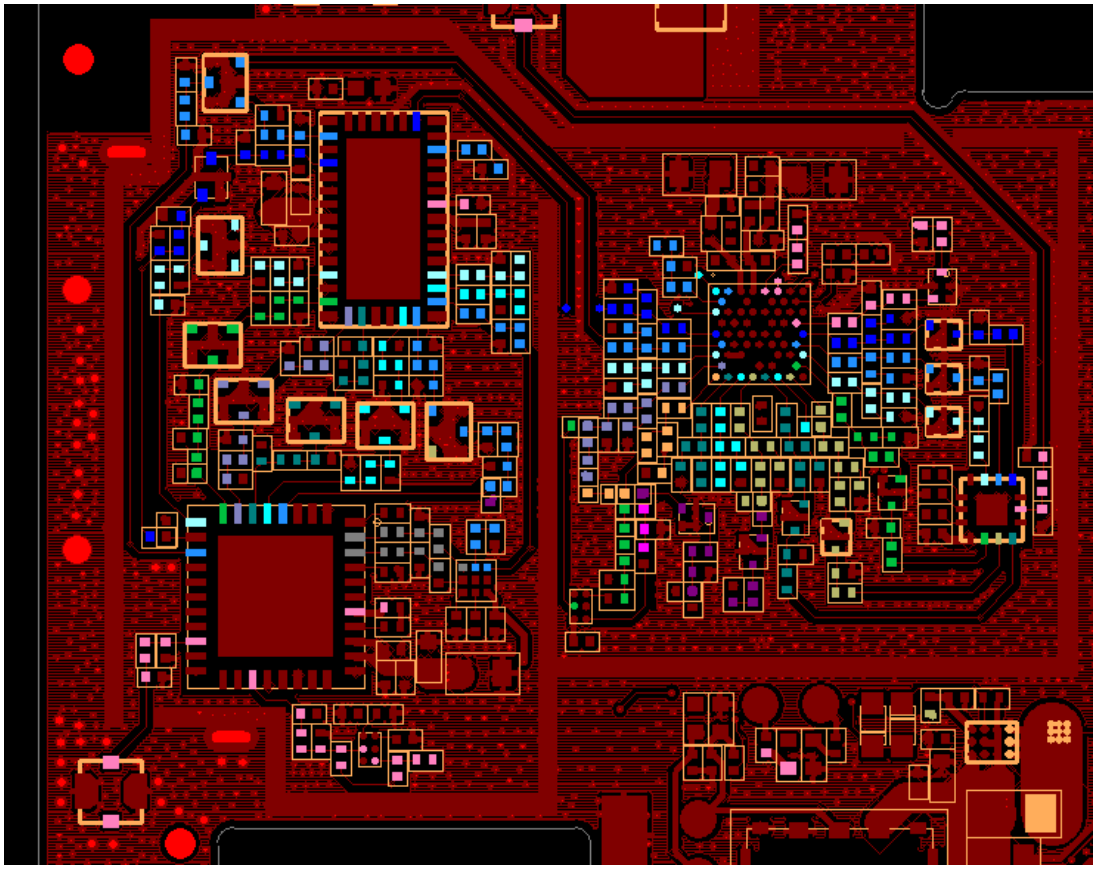


Figure 1-1 WTR2x55/WTR2965 functional block diagram

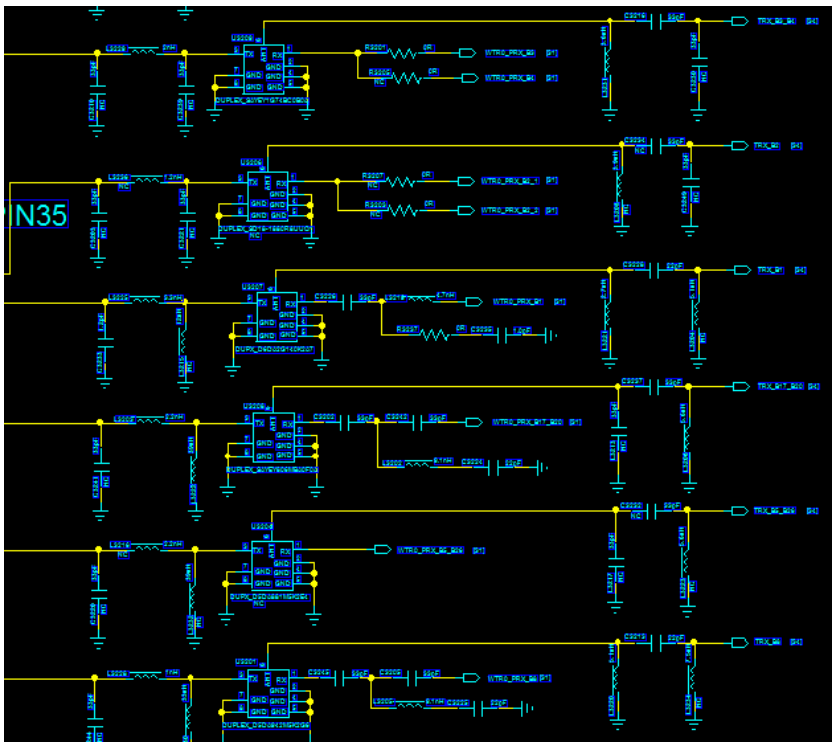
RF framework block diagram



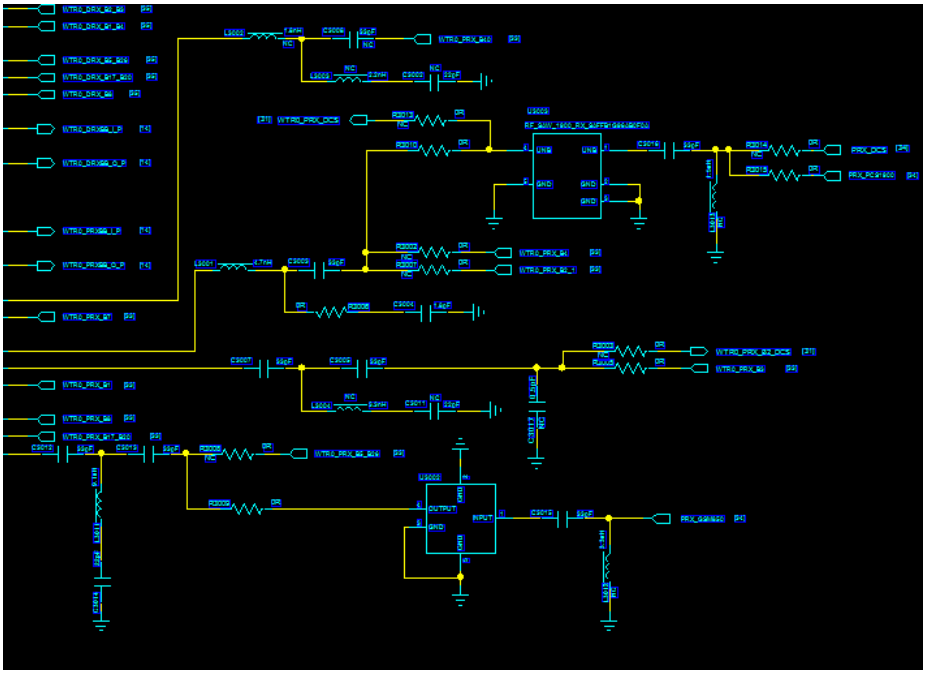
RF components placement

2.2 RF circuit description

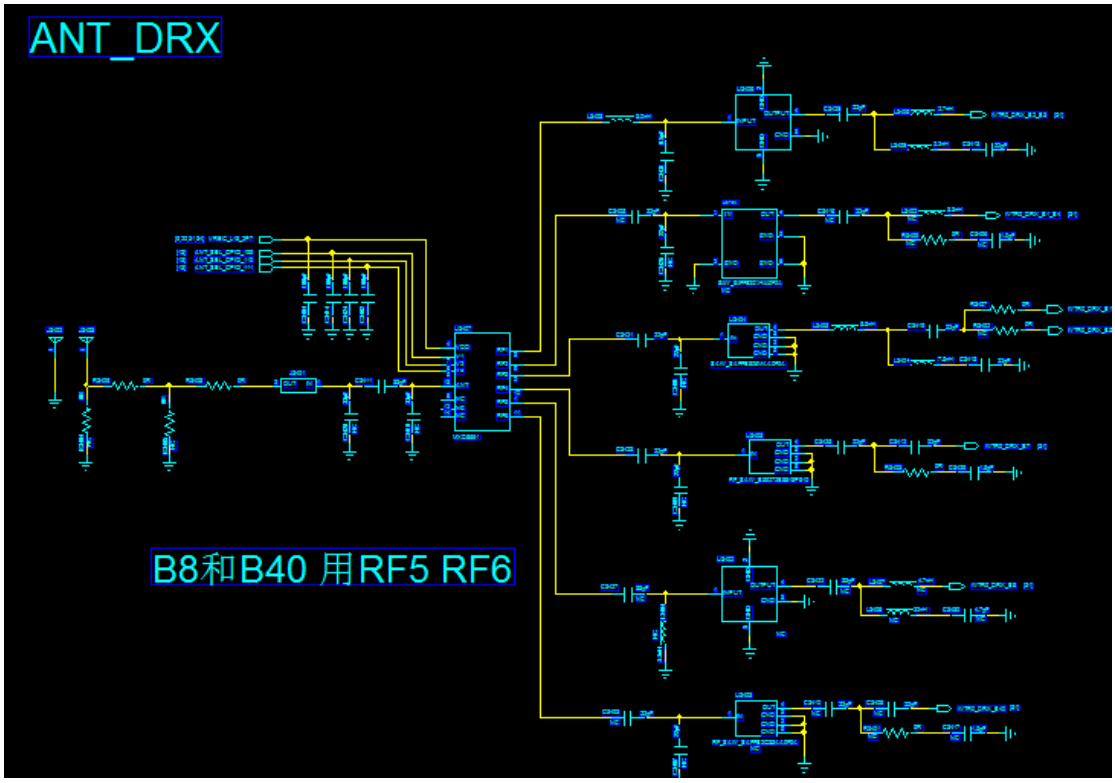
2.2.1 The circuit description of receiving part



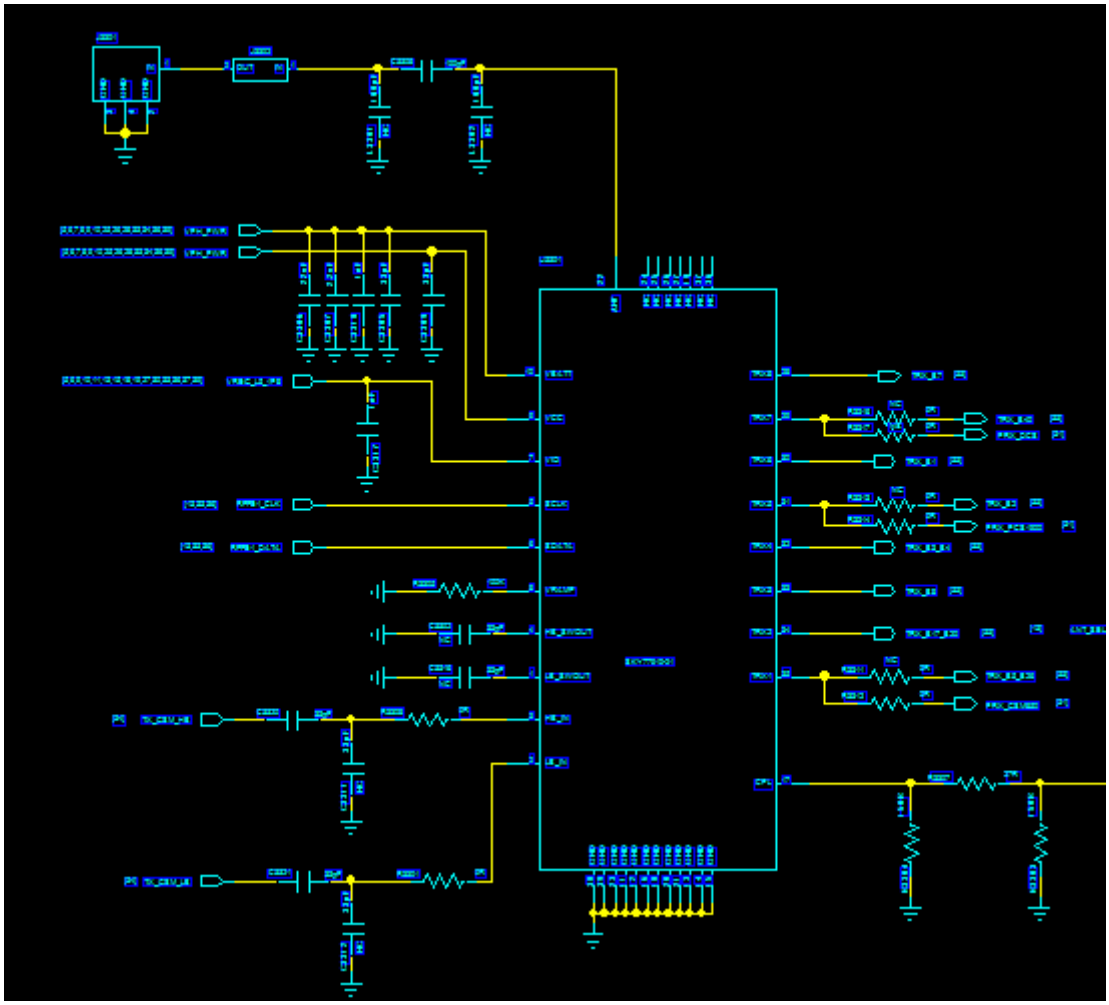
Receiving part matching circuits



RF transceiver receiving ports



LTE DRX receiving ports



Main Antenna port and RF switch

It can be seen from the schematic diagram, first, signal is received through antenna, reach RF MMPA(U3301) .

For GSM 850MHz signal comes from MMPA(U3301) TRX1 (PIN35) through SAW U3002 and RX matching circuit to transceiver PRX ports (PIN 28).

For PCS 1900MHz signal comes from MMPA(U3301) TRX5(PIN31) through SAW U3003 and RX matching circuit to transceiver PRX ports (PIN 5).

For WCDMA band1 signal comes from MMPA (U3301) TRX6 (PIN30) through duplexer U3207and RX matching circuit to transceiver RX ports (PIN 4).

For WCDMA band8 signal comes from MMPA (U3301) TRX3 (PIN33) through duplexer U3201and RX matching circuit to transceiver RX ports (PIN 14).

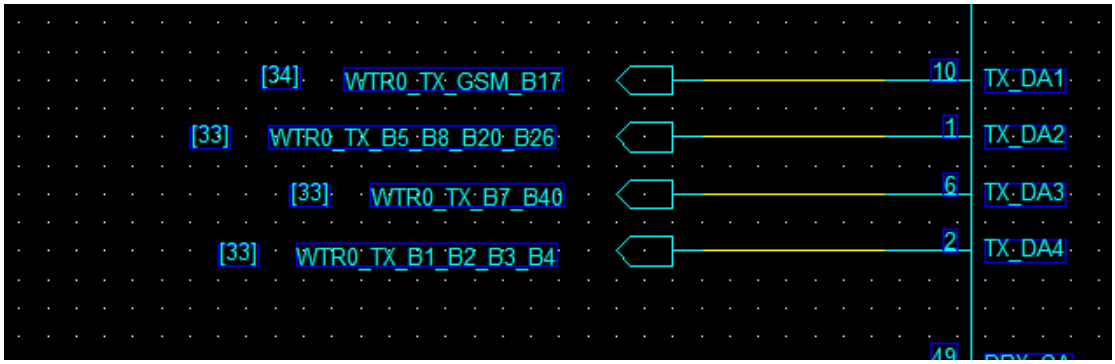
For LTE B3 signal comes from MMPA (U3301) TRX4(PIN32) through duplexer U3209 and RX

matching circuit to transceiver RX ports (PIN 9).

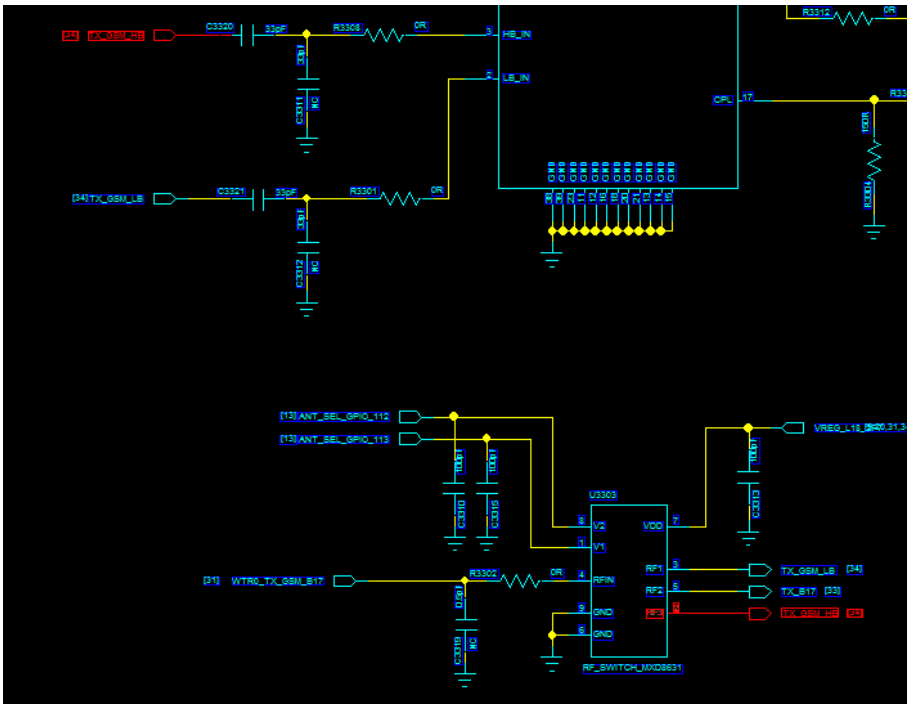
For LTE B7signal comes from MMPA (U3301) TRX8(PIN28) through duplexer U3205 and RX matching circuit to transceiver RX ports (PIN 8).

For LTE B20signal comes from MMPA (U3301) TRX2(PIN34) through duplexer U3208 and RX matching circuit to transceiver RX ports (PIN 21).

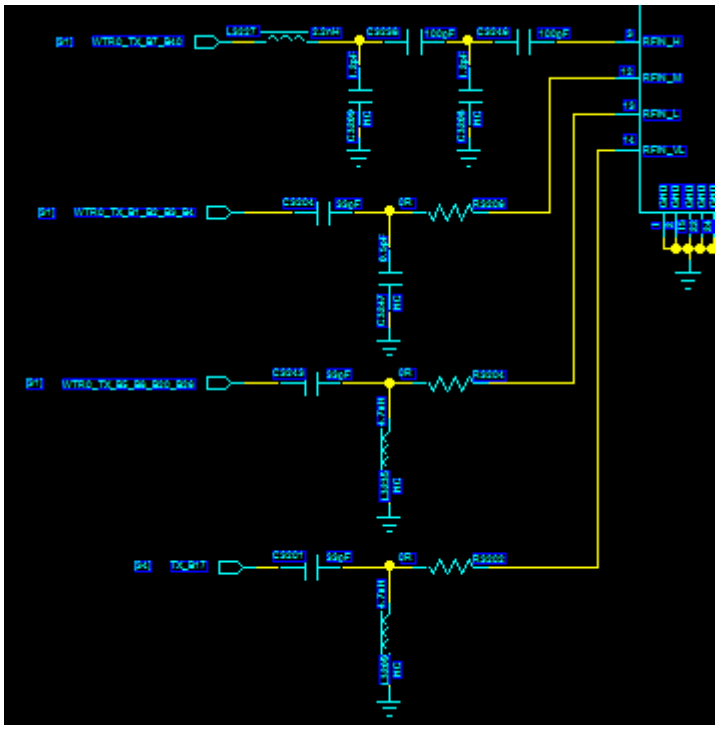
2.2.2 The circuit description of transmitting part



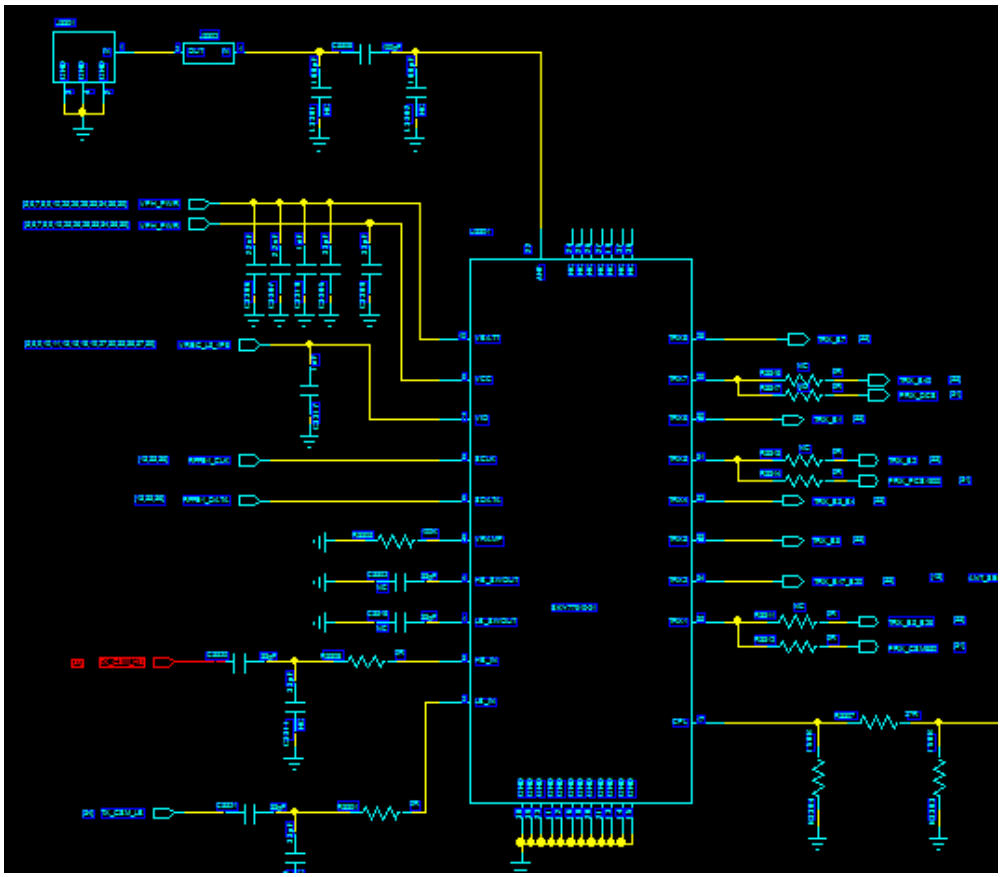
Transceiver transmitting ports



LB&MB GSM PA input ports



LB/MB/HB PA input ports



Antenna port

For GSM_HB signal comes from transceiver transmit ports TX_DA1 (PIN 10) to RF SWITCH U3303(PIN2) , then to MMPA U3301 HB_IN (PIN3).

For GSM_LB signal comes from transceiver transmit ports TX_DA1 (PIN 10) to RF SWITCH U3303(PIN3), then to MMPA U3301 LB_IN (PIN2).

For B7 signal comes from transceiver transmit ports TX_DA3 (PIN 6) to MMPA U3203 RFIN_H (PIN3).

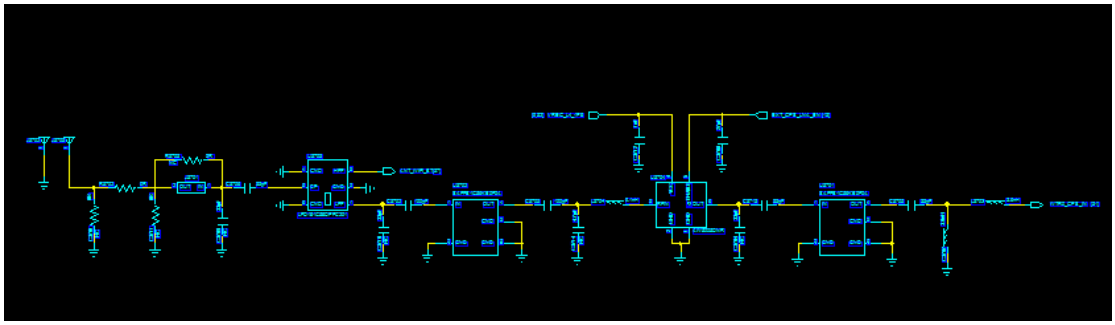
For B1_B3 signal comes from transceiver transmit ports TX_DA4 (PIN 2) to MMPA U3203 RFIN_M (PIN12).

For B8_B20 signal comes from transceiver transmit ports TX_DA2 (PIN 1) to MMPA U3203 RFIN_L (PIN13).

All 2G ,3G and 4G signals through goes from antenna switch to antenna.

2.3 WiFi/BT/GPS Part

2.3.1 GPS Part

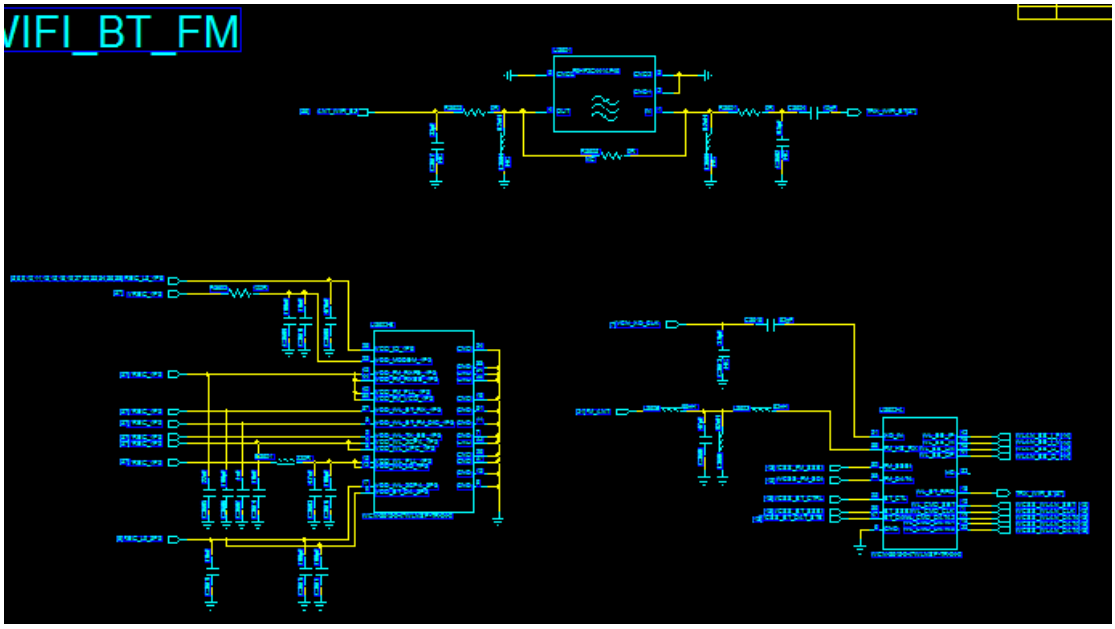


GPS signal first enters the switch(U3703), GPS saw U3702, LNA(U3704),after saw(U3701), input to WTR2965 chip within, demodulate signal .

GPS main problem：

The GPS fails to search satellite or the search- satellite GPS_REG_ON value is high, focus on checking the U3702 filters paste partial or Weld, then check the tcxo power supply of 1.8V, four voltage normal check whether the UART single working. If the power supply and may UART no working ,please check the MCP .

2.3.2 WIFI/BT/FM Part



WIFI BT share RF access, signal is entered by antenna, through switch U3703,U3601 2.4GHZ filter, filter sideband unwanted signal. The clock uses 26M clock provided separately. Data transfer interface and audio interface are directly connected to the CPU. Interface has SDIO is used for the WIFI signal transmission; PCM is used for the BT signal transmission.

WIFI main problems：

1. WCN-3615 chip has been calibrated before out of factory, production line directly do FT test. The probability that it appears problems by WiFi test is very low, the FT failure problems, please power off and restart the phone, first retest.

2. Wifi power test fail, please re-test, failed again to check whether the devices U3601 on the launch access has solder skips, and channel RC device.

3. WIFI test EVM fail. This major and power, as well as the freq error, if the power is too high or the freq too big EVM may also lead to excessive, please re-test.

4. WIFI RX fail, main receiving sensitivity fails to pass, check whether U3602 has solder skips. Generally, production line testing has not shielded box, RX vulnerable to external signal interference, If come across such problems, can change the channel to do the test.

Bluetooth main problem：

Bluetooth does not need calibration, only need to check the function, if unable to search the device or Bluetooth can not be opened, check whether the U3601 and U3602 is welding bad or body bad.

3. Baseband section

3.1 Outline

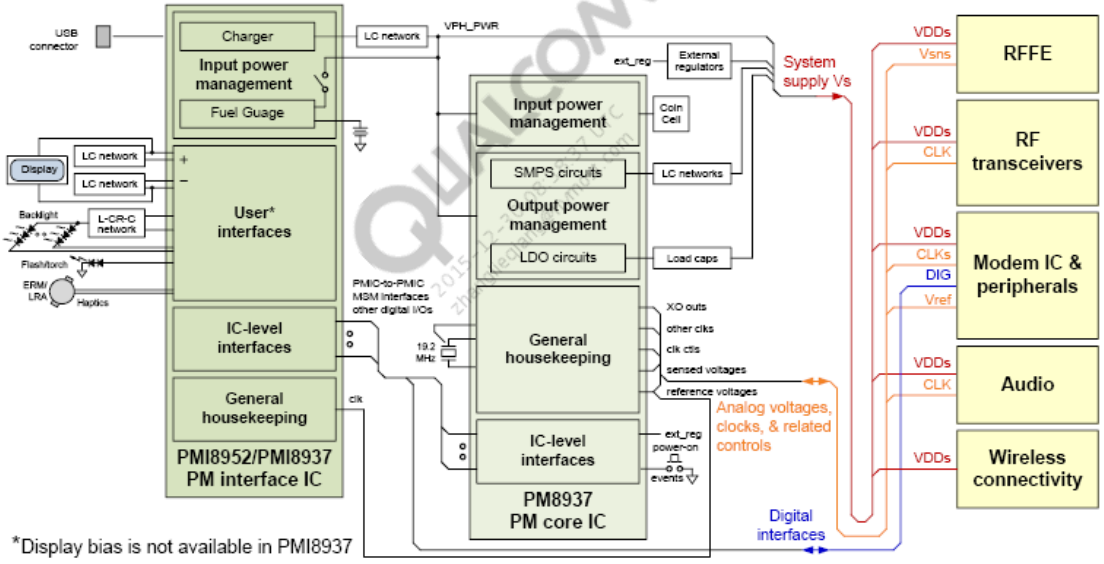
Baseband circuit completes main functions: the procedure data storage, keyboard input, and the communication between the RF module, RF power control, the control of the power management module, RUIM card interface, serial download interface, Camera, T-flash, Bluetooth, and MMI (man-machine interface, such as the display, backlight, buzzer, speaker, microphone, motors, etc.).

3.1.1 Memory

The baseband part has an MMC/LPDDR3 eMCP. Wherein the amount of eMMC storage 8GB, it stores a communication protocol layer and application layer software, and storing various system parameters, calibration parameters, such as RF control correction value of an audio signal, the IMEI number, and other important information and store user settings data such as phone number, CALL volume, and tone; LPDDR3 memory 3GB, temporary variables stored phone program run。

3.1.2 Power Management

- Functions divided between a PM core and the PM interface devices
- PM8937 can pair with either PMI8952 or PMI8937
- DC power sources for all wireless product circuits
- System and sleep clock sources for the entire chipset
- Digital interfaces between PMIC, PMI, and modem IC



3.1.3 Battery

2700mAh 3.8V lithium-ion battery.

3.1.4 SIM Card

SIM card interface is SIM card interface provided by MSM8937.

3.1.5 Audio frequency

The microphone is omnidirectional capacitor type. The largest impedance is 2.2KΩ。

Headset as a standard 3.5mm headphone jack port, the nominal resistance 32Ω。

Speaker adopts 11*15 specification, Receiver adopts 15*06 specification.

3.1.6 I/O Interface

I/O Connector Type-C USB interface standard. Mainly used for software, download picture messages。

3.1.7Display

The main screen is 5-inch color screen 1280*720（HD）.

3.2 Common Failure Analysis and Maintenance

Before cutting board after the completion of the production line SMT X-RAY inspection, according to the actual situation, X-RAY examination can not be found 100% badness, X-RAY inspection may omissions some fault plate flow down. If found fault plate in the testing process, the first step is to re-check of the X-RAY and carefully to see if there is even welding, lap welding, Weld, if normal, analyze the situation following the positioning。

3.2.1 Power failure Check

The failure phenomenon caused by a power failure: can not boot, shutdown leakage current boot large current.

The main reason for the problem: Weld, electrical the original filtering or ESD device to short-circuit, burning with the device is connected to a power source.

Positioning as well as steps to solve this type of problem is as follows：

1， Troubleshoot and connected to the power supply components of the welding, Weld, or the peripheral devices even tin。

2， with a multimeter rule out whether there is power to short-circuit, and step by step to troubleshoot the cause of the short (mainly: even tin, IC burned ESD protection device breakdown, capacitor breakdown)。

3， boot to test the power output is normal。

If a power output value is not normal, whether the view filter capacitor welding problems,

whether the breakdown, filter capacitor is broken, replace; excluded one by one, and finally you can navigate to the main chip damage。

Each the power test position and the normal boot value is shown in the following table

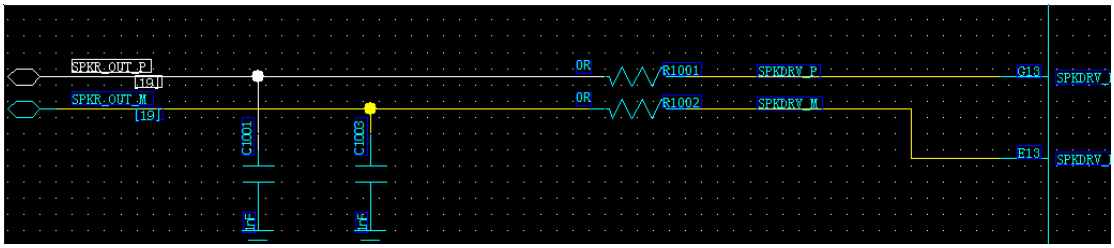
VREG output	Circuit type	Default voltage (V)	Rated current (mA)	Default on	Input VDD	Expected use
S1	SMPS	1.150	2500	✓	VBAT	MSM IC Core circuit (Modem, Camera SS, Graphics core)
S2	SMPS	1.150	3000		VBAT	A53 Application Processor Cores
S3	SMPS	1.3	1800	✓	VBAT	Analog blocks of WAN, WLAN, source for GR1 (LDOs L1 and L3) and GR2 (LDO L2) rails
S4	SMPS	2.1	1500	✓	VBAT	Codec Analog and source for GR3 (LDOs L4, L5 & L6) and GR7 (LDO L7) rails
L1	NMOS	1.225	600		GR1	WTR Low voltage rail
L2	NMOS	1.150	1200	✓	GR2	Memory (EBI/LPDDR2/LPDDR3/eMMC) and MIPI analog rails
L3	NMOS	1.200	1200	✓	GR1	Modem IC
L4	PMOS	2.050	300		GR3	WTR and GPS eLNA
L5	PMOS	1.800	300		GR3	Codec and memory 1.8 V rails
L6	PMOS	1.800	300	✓	GR3	Camera, Display and Transducer 1.8 V rails
L7	PMOS	1.800	150		GR7	Modem, WTR, BB_CLK driver and HK ADC
L8	PMOS	2.900	600	✓	GR4	eMMC/NAND core
L9	PMOS	3.300	600		GR5	Connectivity IC (WCN3620/WCN3660)
L10	PMOS	2.700	150		GR5	Camera (Front and Rear) Analog rails
L11	PMOS	2.800	600		GR4	SD/MMC card
L12	PMOS	2.800	150		GR5	MS8916 memory rail for SD
L13	PMOS	3.075	50		GR5	Codec and USB 3 V analog rails
L14	PMOS	1.800	50	✓	GR4	UIM 1
L15	PMOS	1.800	50	✓	GR4	UIM 2
L16	PMOS	1.800	50		GR4	UIM 3
L17	PMOS	2.850	600		GR5	LCD, transducers and camera 2.85 V rails
L18	PMOS	2.700	150		GR5	Available
VREF	—	0.6125	—	✓	—	LPDDR reference
MPP1	—	1.250	—	✓	—	MSM pad bias
VREG_XO	clock	1.800	5		GR3	XO oscillator circuits
VREG_RFCLK	clock	1.800	5		GR3	Low noise clock buffers

3.2.2 Audio faults

The audio part has main four parts including the speaker, receiver, mic and headphone. First undesirable phenomena distinguish what part of the problem, and then analyzed according to the following respective module.

（1）Speaker loop

The Swift2 phone's speaker circuit is as follow



Speaker Loop

Speaker Common faults and reasons：

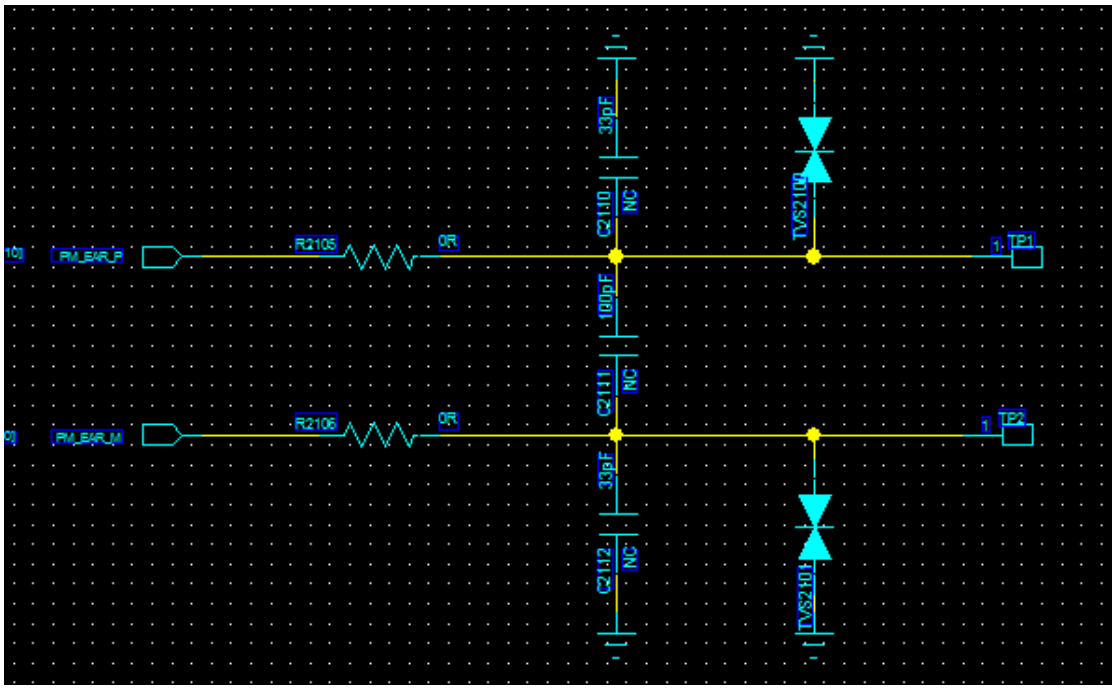
1， SPK Ringtones reasons: 1) light board, SPK itself is bad, or the connection FPC problem, the whole observation board board PFC Cartridge is skew, not in place 2) relevant component there is dry welding 3) software problems

2: SPK ringtones or murmur: 1) software volume settings 2) SPK ontology reasons

3. Switch machine ringtones, but engineering tests SPK OK: 1) scene mode is set to switch machine ringer off 2) software problems, itself boot ringtones;

(2) Receiver circuit

Swift2 phone receiver is embedded in the mobile phone front shell through shrapnel and motherboard connection. Mainly used for the call. Receiver circuit diagram as shown below.



Receive Loop

Receiver Common faults and reasons:

1, Receiver without sound: 1) Receiver assembly adverse, the shrapnel and board poor contact 2) Receive ontology bad 3) the volume settings or software problems

2, Receiver noise or volume: 1) Receiver incoming material, whether caused by pad short circuit 2) relevant components have solder skips 3) software problems

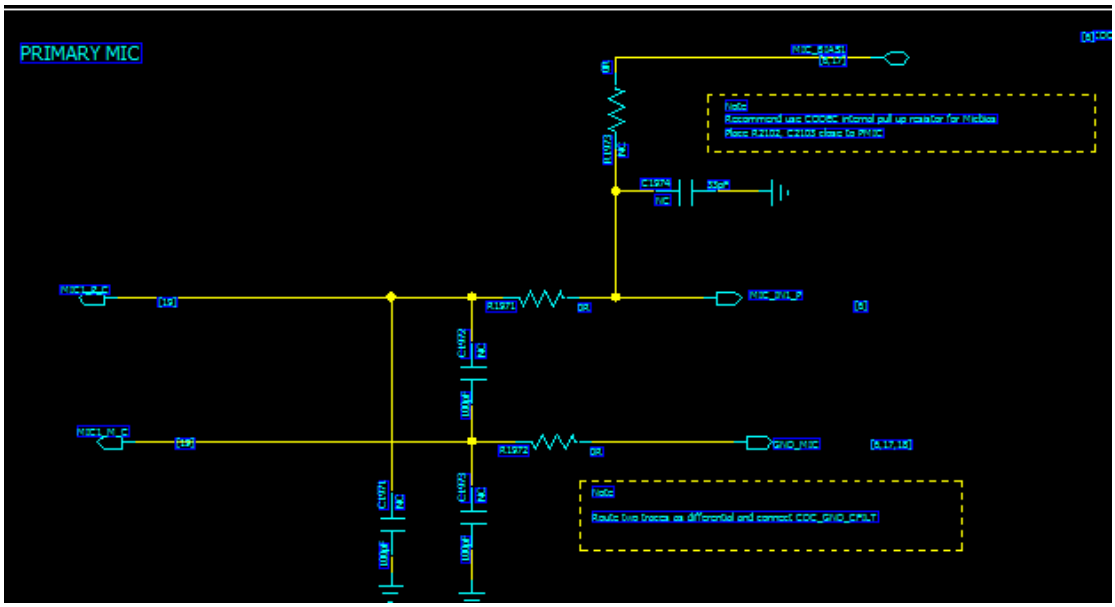
(3) Mic loop

The MSM8937 contains three MIC circuits, the main MIC, noise cancellation MIC and headphone MIC. The main MIC was inserted needle. Loop schematic diagram as following:

Main MIC common faults and causes

1 MIC unable to send words or recording: 1) MIC poor welding 2) MIC body bad

2 MIC noise or sound: 1) MIC ontology bad 2) software problems.



Main MIC

（4）Headphone loop

Swift2 phone use headphones with a standard 3.5mm headphone. Its circuit diagram is as follows:

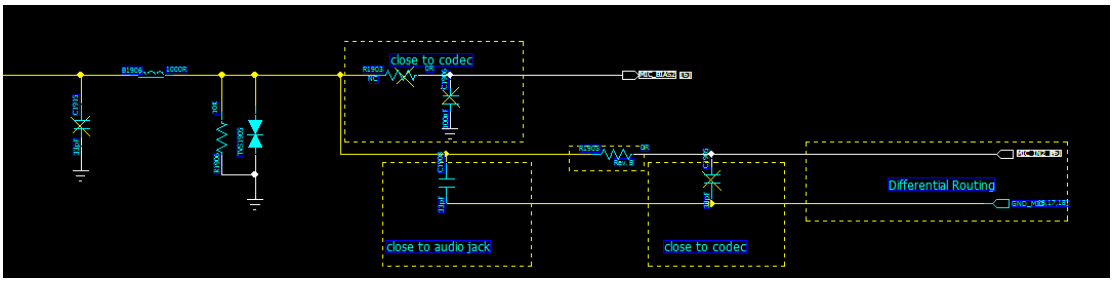
Headphones common faults and reasons:

1, headphones only one channel sound: 1) the headset is not inserted in place 2) Relevant component Weld. 3) Relevant component breakdown shorted to ground;

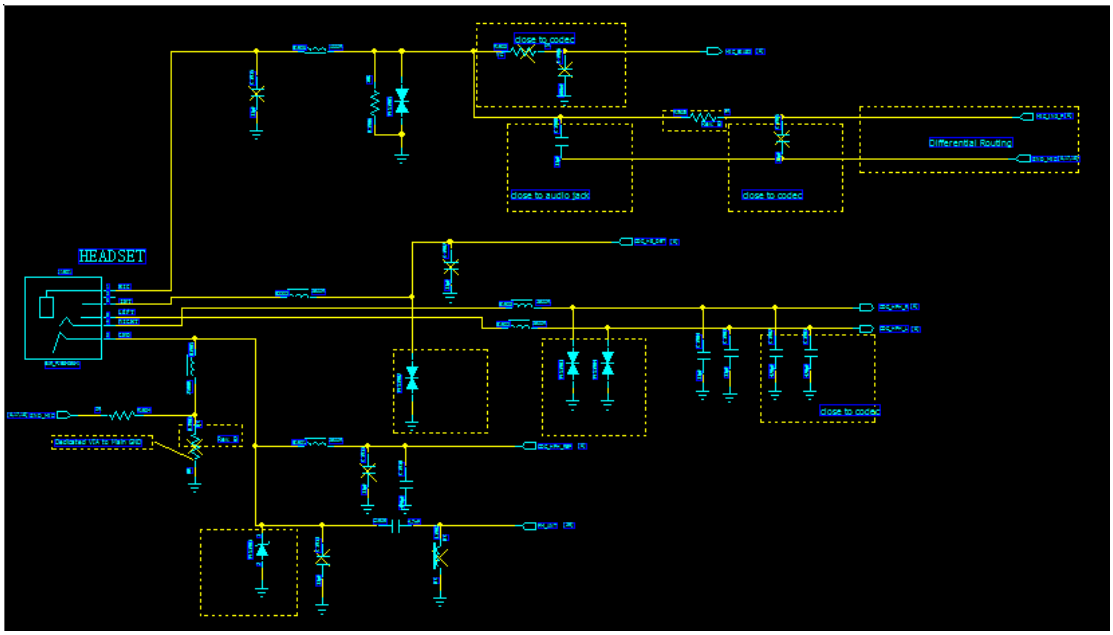
2 headphone left and right channels are no sound: 1) the headset is not inserted in place 2) Relevant component breakdown on the short circuit;

3, unplug the headphones bank borrowing does not recognize: 1) Relevant component Weld; 2) whether headphones Block shrapnel and motherboard good contact 3) software reasons

4 headset MIC no transmitter: 1) the headset is not inserted in place 2) Relevant component Weld 3) Relevant component breakdown on short-circuit;



Headset MIC

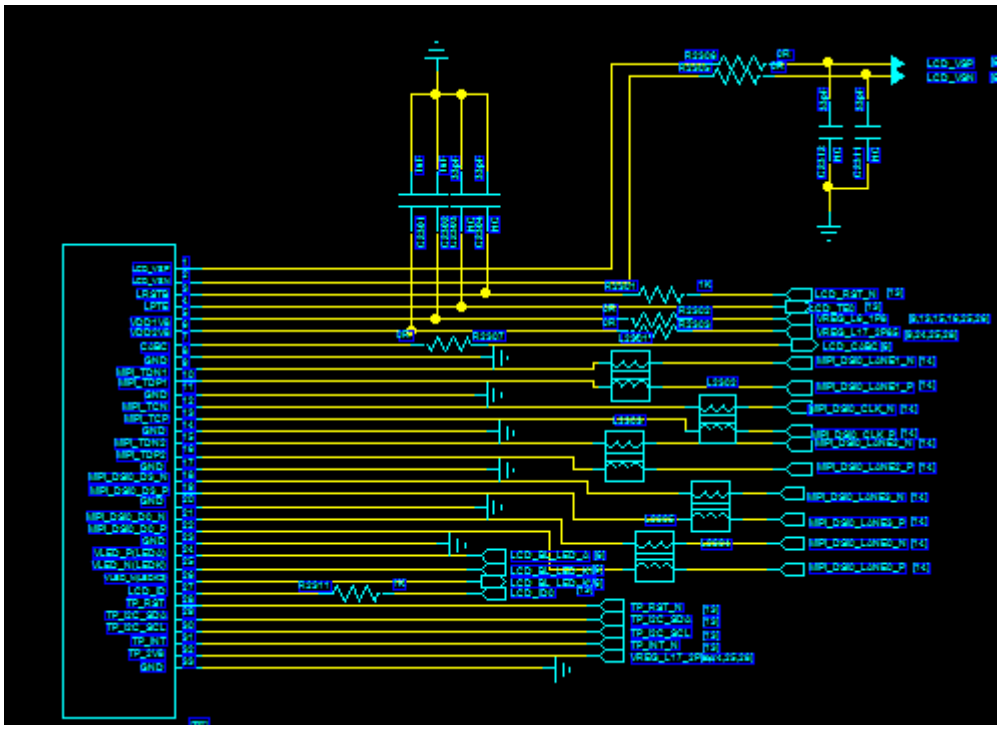


3.5mmHeadphone jack circuit

3.2.4 LCD Fault

5-inch HD LCD, The part of the circuit schematic as shown below. Common problems and causes of the LCD module:

1, LCD screen is blank. 1) LCD is not installed or and fixture poor contact) LCD backlight circuit is bad, check backlight so that the foot is pulled, check whether the u2001 welding problems, backlight IC whether Weld or shorted to ground. 3) LCD itself fault.



2, LCD blurred screen and white screen. Description LCD backlight circuit OK, just shows abnormal. The cause of the malfunction is usually: 1) LCD connector poor contact, poor welding and fixture poor contact 2) related components Weld or even tin short circuit 3) software problems

3. LCD black spots, bright spots, black lines, stripes Failure: LCD ontology bad.

3.2.5 FM

The CPU controls FM IC working condition through the I2C signal, when FM is working, should insert headphone as its antenna. FM outputs audio signal to the CPU Codec, amplify playing or record. FM common faults and causes:

1, FM cannot search frequency or less frequency reason: 1) headphone without inserting or not insert good 2) surrounding environment is bad, such as plant, garage, etc. FM signals itself is weak or no FM signals source 3) FM antenna circuit exists poor soldering or short circuit, lead to unable to receive FM signals or FM signals leak 4) software reason

2，FM without sound reasons or murmur 1) this FM radio frequency is invalid 2) FM weak signal 3）related component bad-welding 4) headphone was not put in place; 5) whether headphone socket shrapnel contacts with the mainboard well 6) whether headphone socket welding is OK

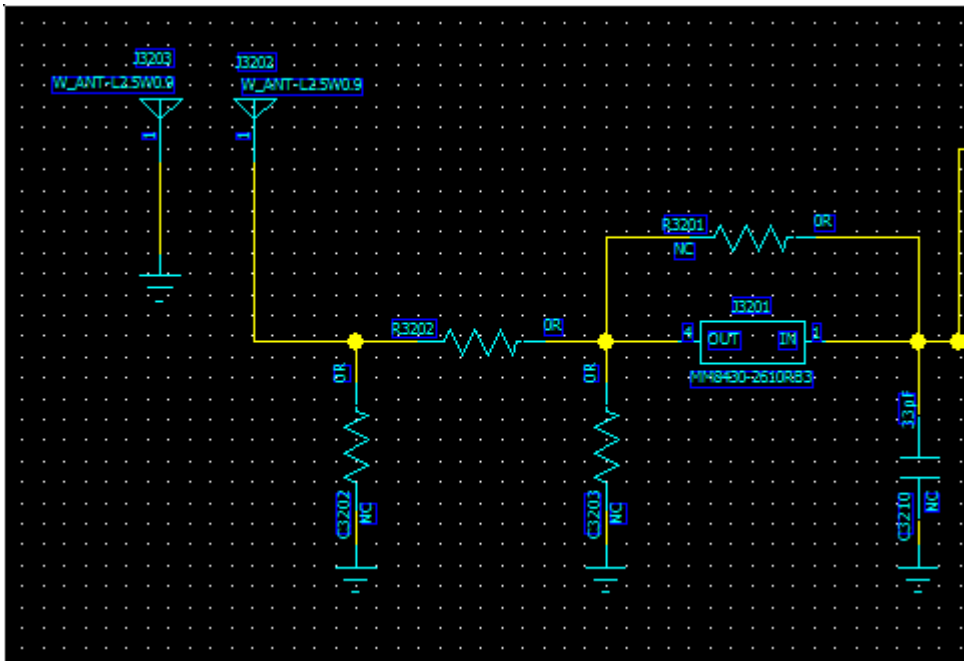
3，FM module operation failed. 1）Check whether the I2C and CLK signal are normal or not 2）Software fault

3.2.5 Bluetooth

Swift2 BT adopts WCN3615 chip. Data transfer interface and audio interface are directly connected to the CPU. Common failures are:

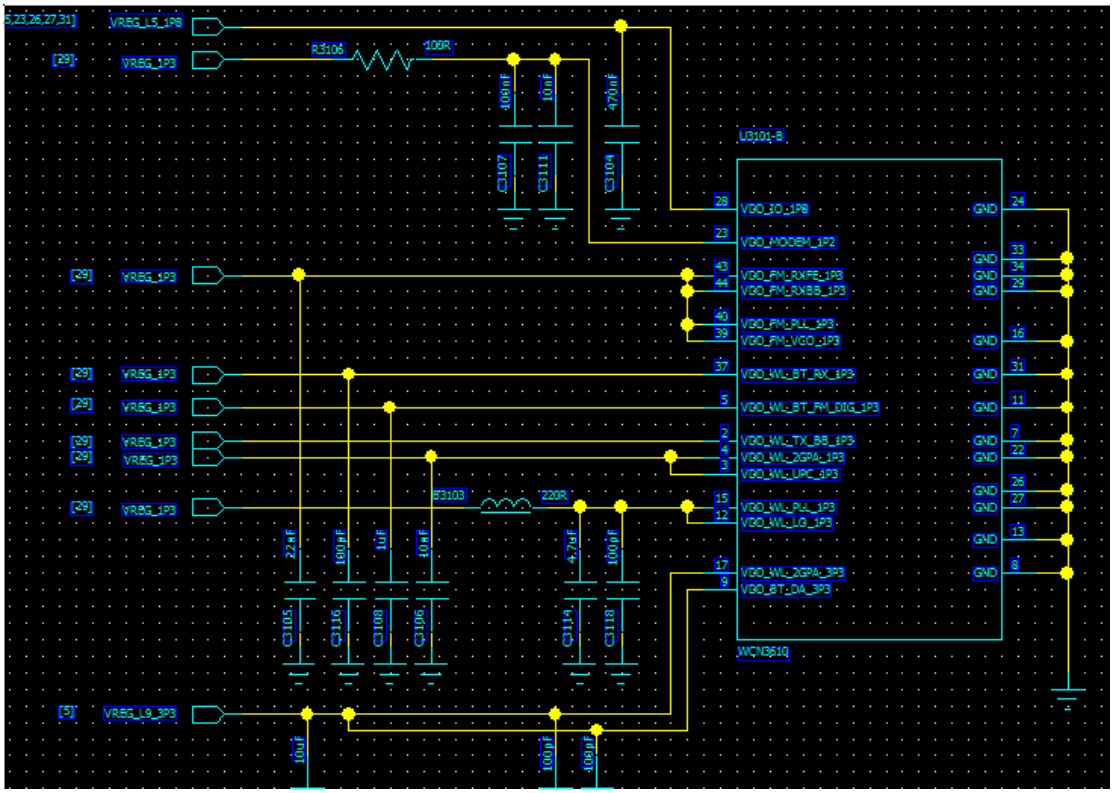
1, Bluetooth function failure, you need to check the Bluetooth is turned on, the Bluetooth Visibility settings are correct. The Bluetooth power supply and clock circuit the existence of the phenomenon of short circuit or Weld.

2, Bluetooth effective distance is short, easily disconnected. Need to check whether Bluetooth antenna circuit soldered or short circuit, Bluetooth antenna and motherboard contact well.



3.2.6 WIFI fault

WIFI function failure, you need to check the WIFI is turned on, WIFI visibility settings are correct. WIFI power supply and clock circuit whether there is a short circuit or Weld phenomenon.



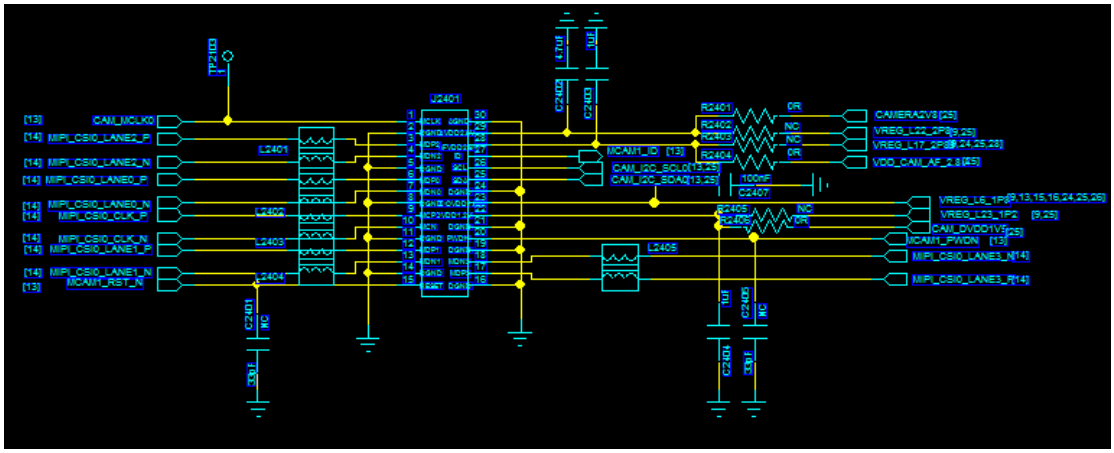
3.2.6 Camera fault

Connect with the CPU through a dedicated Camera IF port. Camera control is done through the I2C bus. Camera common fault and why:

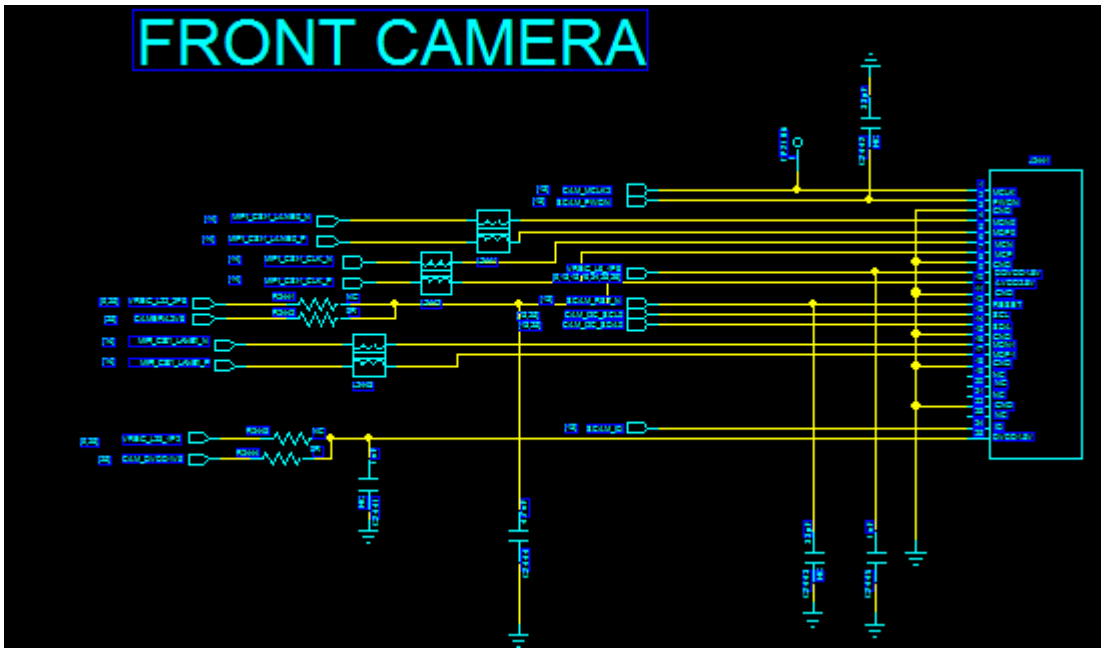
1, Camera initialization failed, could not enter the Camera the main interface. 1) Camera poor welding or poor contact 2) the Camera Ontology failure 3) Camera Power supply is not normal (Weld, or short-circuit led to) 4) related components welding problems

2, Camera Preview shows blurred screen or color is not normal. 1) Camera poor welding or poor contact. 2) related components welding 3) restore the factory settings after restart

3, Camera other problems, please replace the Camera try to confirm whether the Camera body has problems.



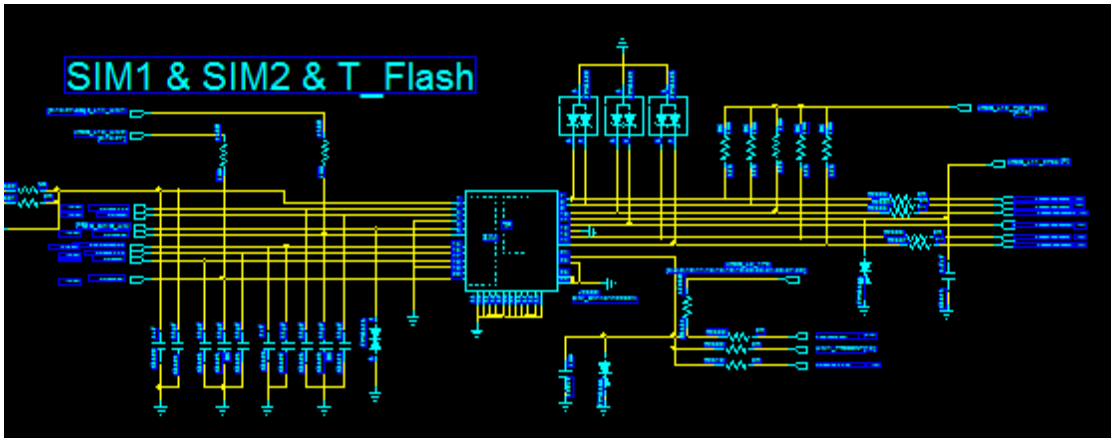
Back camera



Front camera

3.2.7 SIM card failure

Swift2 SIM card module circuit is connected directly with PMIC through eight-path signal from SUIM slot. The major failure of the module does not know the card, the reason usually: 1) USIM card GSM card and USIM deck poor contact 2) poor USIM card socket welding 3) software problem cause the phone to pick a card, change the card to confirm. 4) SIM card holder exist Weld; 5) card exceeds the itinerary or inserted upside.



SIM card circuit

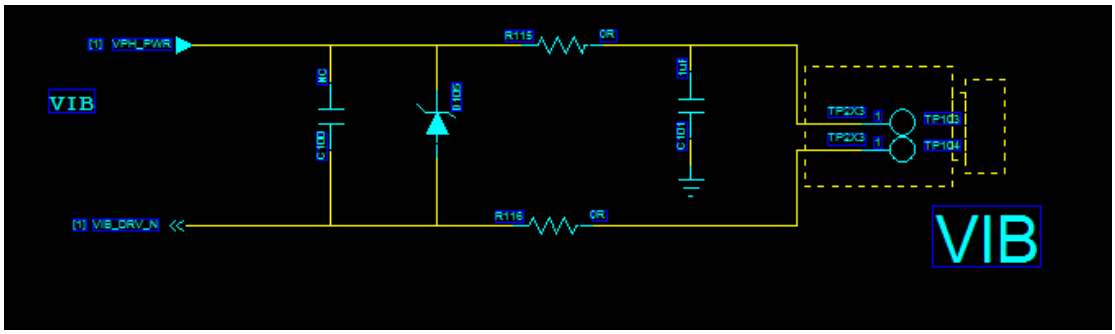
3.2.8 Motor test is invalid

Swift2 adopts flat motor, with simple circuit. As shown below. Common motor failures and the reasons are:

1, the motor without vibration 1) motor and motherboard contacted poor 2) motor body bad 3) R215 bad 4) whether the FPC installed partial

2, the motor was felt as weak 1) motor ontology bad) the cause of the software settings

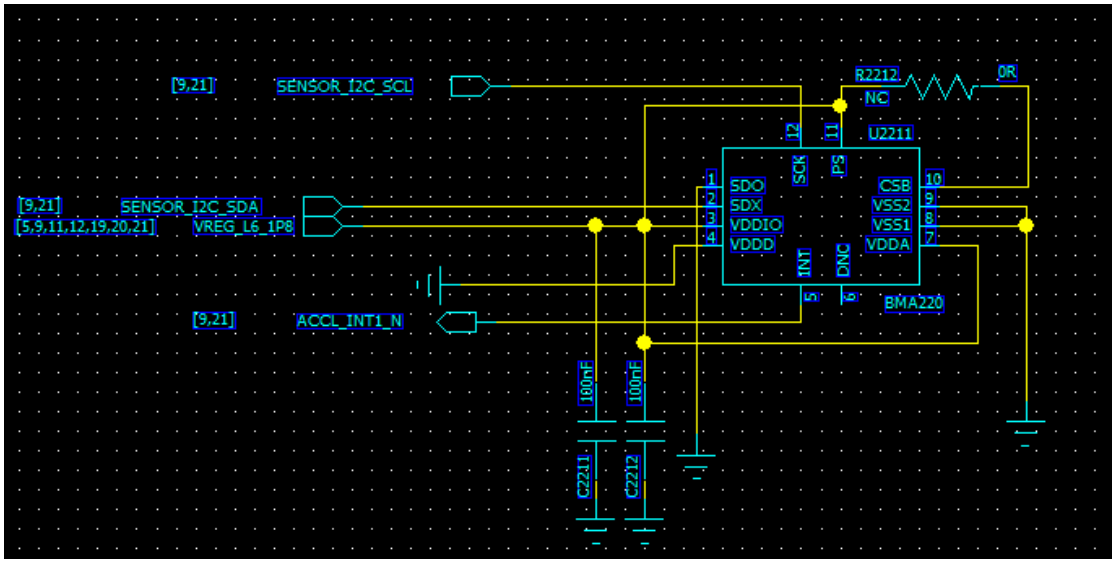
3 motor vibration sometimes 1) motor and motherboard poor contact



3.2.9 Gravity Sensor

Swift2 G-Sensor circuit is very simple, Power offer power to the Sensor IC power, I2C bus transfer command and data. G-Sensor faults and the reasons:

1, Sensor without functions: whether the paster is OK



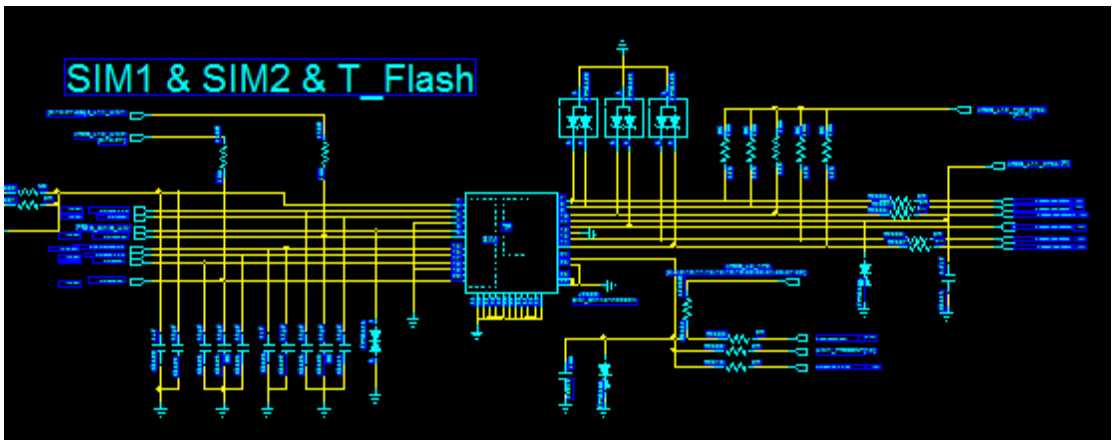
3.2.10 T-Flash fault

Swift2 T - Flash circuit is connected with CPU through the special SDIO bus, circuit diagram shown below. T - Flash the common faults and reasons are:

1, T–Flash read-write test is failure. 1) T - flash for fault card or and T kaka seat have had no contact with good 2) below the resistance there may be short circuit, or virtual welding phenomenon. Capacitance may on short circuit. (using a multimeter to test whether T card signal and ground and VMCH short circuit can eliminate) 3) software reason

2, T card not to know card: T holder PIN feet virtual welding, on MLV welding reverse and capacitance breakdown

3, T - Flash can't through the USB for transmission. 1) T - Flash itself, speaking, reading and writing test failure fault 2) software fault 3) USB fault



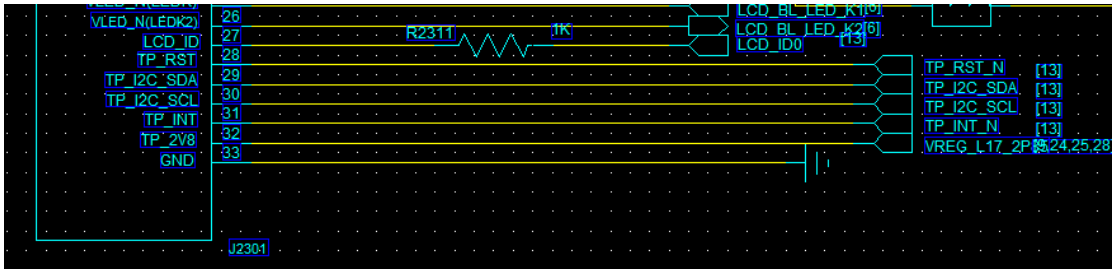
T card circuit

3.2.11Touch Panel function

Touch Panel common fault and reasons are:

1. The Sensor sensitivity low, slow reaction: software problem;

4. Touch Panel function NG, at present is mainly due to FPC itself partial long cause, the I2C initialization failed;



TP circuit

3.2.13 Cannot boot failure

Can't boot failure is the phone fault with highest probability of occurrence. Software problems, welding problem, device failure is the main factor causing failing to boot. Maintenance process can cooperate with LCD and startup current, as well as the keyboard and so on to orientate approximately.

1, Power off leak current is large. The main failure reason is VBAT connected components had to earth short circuit problem. Usually radio frequency PA burned or welding problem cause. The simpler method is looking for is a hot devices, general such devices have larger may on short circuit.

2, Boot without current, LCD no display, keyboard, etc not bright. 1) boot key SMT bad 2) battery connector bad contact (through the plug charging machines)

3, Crashed when boot, 1）can try to re-download the software, 2）replace memory

4, Current is large when boot.　LCD displays normally, even can enter the IDIE interface, single board is very hot 1) The individual power circuit short circuit to ground phenomenon exists in the phone, which is usually the problem that ESD protective devices of module circuit breakdown short circuit to ground or weld problems.