HUAWEI

U8950 Maintenance Guide

V1.0

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Change History

Date	Version	Change Reason	Changed Chapter	Change Description	Author
2012.08.15	V1.0	Released the first version.			Bi Xiaotao and Zhang Shunzhi

Contents

1 Product Overview

1.1 Appearance

Figure 1-1 shows U8950.

Figure 1-1 U8950

1.2 Features

Table 1-1 lists the product features.

Table 1-1 U8950 product features

Item	Description
Form factor	Bar-type
Display	• Size: 4.5 inches • Type: TFT touchscreen • Colors: 16 million colors • Resolution: 960 x 540 pixels
Dimensions (H x W x D)	134 mm x 67.5 mm x 10.8 mm (5.28 in. x 2.66 in. x 0.43 in.)
Weight	About 150 g (including the battery)
Frequency bands	**U8950D/U8950-1/U8950N-1:** • GSM 850 MHz: 824–849 MHz (uplink), 969–894 MHz (downlink) • GSM 900 MHz: 890–915 MHz (uplink), 925–960 MHz (downlink) • GSM 1800 MHz: 1710–1785 MHz (uplink), 1805–1880 MHz (downlink) • GSM 1900 MHz: 1850–1910 MHz (uplink), 1930–1990 MHz (downlink) • W-CDMA 900 MHz: 880–915 MHz (uplink), 925–960 MHz (downlink) • W-CDMA 2100 MHz: 1920–1980 MHz (uplink), 2110–2170 MHz (downlink) **U8950-51/U8950N-51:** • GSM 850 MHz: 824–849 MHz (uplink), 969–894 MHz (downlink) • GSM 900 MHz: 890–915 MHz (uplink), 925–960 MHz (downlink) • GSM 1800 MHz: 1710–1785 MHz (uplink), 1805–1880 MHz (downlink) • GSM 1900 MHz: 1850–1910 MHz (uplink), 1930–1990 MHz (downlink) • W-CDMA 850 MHz: 824–849 MHz (uplink), 869–894 MHz (downlink) • W-CDMA 1900 MHz: 1850–1910 MHz (uplink), 1930–1960 MHz (downlink) • W-CDMA 2100 MHz: 1920–1980 MHz (uplink), 2110–2170 MHz (downlink)
Maximum transmission power	• GSM/GPRS 850/900 MHz: +33 dBm • GSM/GPRS 1800/1900 MHz: +30 dBm • W-CDMA 850/900/2100 MHz: +24 dBm • W-CDMA 1900 MHz: +23.5 dBm
Static sensitivity	• GSM 850/900/1800/1900 MHz: better than –109 dBm/200 kHz • W-CDMA 850/900/1900/2100 MHz: better than –109 dBm/200 kHz
Data services	• HSDPA: 7.2–8 Mbit/s • HSUPA: 5.76–6 Mbit/s

Item	Description
Ports	Standard micro-USB port, microSD card slot, and 3.5 mm headset jack
Processor	Qualcomm MSM8225, dual-core, 1.2 GHz
Storage space	• ROM: 4 GB (Available space: 2 GB) • RAM: 768 MB
Device control	Touch key feedback, volume keys, power key, charging indicator, gravity sensor, proximity light sensor, and brightness sensor
Temperature	• Operating: –10 ℃ to +40 ℃ • Storage: –10 ℃ to +40 ℃
Battery	• Capacity: 1930 mAh • Standby time (depending on user habits and network conditions): up to 380 hours (2G)/up to 380 hours (3G) • Talk time: up to 400 minutes (2G)/up to 400 minutes (3G) • Charging duration: 3 hours
Operating humidity	5% to 95% RH
Camera	8.0 MP BSI AF rear camera, 0.3 MP FF front camera
FM radio	Built-in FM radio
Bluetooth	3.0 EDR
WLAN	WLAN, WLAN routing, and C(CDMA)+W(Wi-Fi) function promoted by China Telecom
USB	USB 2.0
Power supply	100–240 V, 50/60 Hz, 1 A
Certification	Type Approval Certificate, Network Access License, and China Compulsory Certification
Sensor	Gravity sensor, proximity sensor, and ambient light sensor

Item	Description
NOTE AF: autofocus BSI: backside illumination EDR: Enhanced Data Rate FF: fixed focus FM: frequency modulation GPRS: general packet radio service GSM: Global System for Mobile Communications HSDPA: High-Speed Downlink Packet Access HSUPA: High-Speed Uplink Packet Access MP: Megapixel RAM: random access memory ROM: read only memory TFT: thin film transistor W-CDMA: Wideband Code Division Multiple Access WLAN: wireless local area network	

2 Applicable Scope and Precautions

2.1 Applicable Scope

This document provides repair instructions for technicians at service centers authorized by Huawei. Being Huawei proprietary, this document is accessible only for authorized service centers and companies. Although every effort was made to ensure the accuracy of this document, errors may still exist. If you find any errors or have any suggestions, contact Huawei's customer service.

2.2 Precautions

- Only qualified technicians are allowed to perform repair and calibration.
- Perform all operations in electrostatic discharge (ESD) rooms and wear ESD wrist straps throughout the operations.
- Ensure that all the components, screws, and insulators are properly installed after repair and calibration and all cables and wires are installed and connected correctly.
- Ensure that the soldering is lead-free and compliant with eco-friendly requirements.

ESD is the main cause of damage to electrostatic-sensitive components. Each ASC must exercise caution to avoid ESD damage and comply with the ESD protection requirements in this manual.

2.3 How to Obtain Product and Repair Information

To obtain product and maintenance information, visit Huawei website at:
http://www.huaweidevice.com/cn/technicaIndex.do

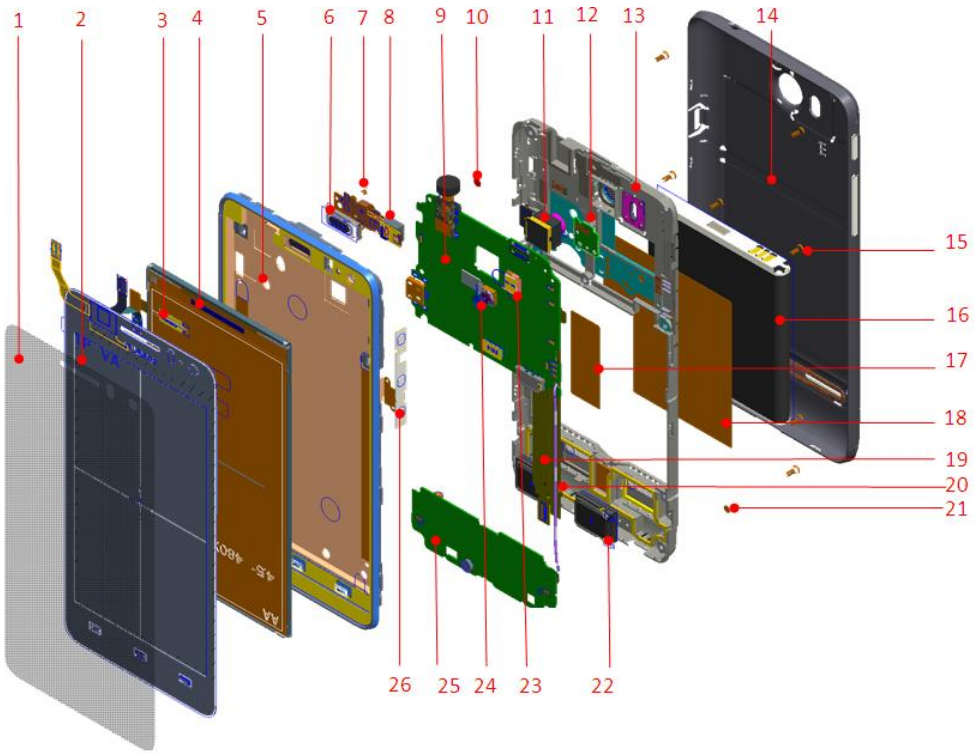
3 Exploded View and Components

3.1 Exploded View

The components listed in Figure 3-1 are structural parts of the phone, and cannot be used as reference when requesting spare parts.

Figure 3-1 shows the U8650 exploded view.

Figure 3-1 U8650 exploded view



3.2 Components List

Table 3-1 lists the components of U8650.

Table 3-1 Components of U8650

No.	Description	Quantity
1	LCD protector	1
2	Touchscreen	1
3	Receiver ornament	1
4	LCD	1
5	Front cover assembly	1
6	Receiver	1
7	M1.4 screw	2
8	Receiver FPC	1
9	Main PCBA	1
10	Waterproof label	2
11	Rear camera	1
12	Flash PCBA	1
13	Back cover assembly	1
14	Battery cover assembly	1
15	M1.4 x 3.5 screw	1
16	Battery	1
17	Network Access Flag	1
18	Type label	1
19	Main FPC	1
20	Cable	1
21	Tamper-resistant label	1
22	Speaker	2
23	Front camera support	1
24	Front camera	1
25	Antenna board	1
26	Volume-key FPC	1

No.	Description	Quantity
NOTE CMII: FPC: flexible printed circuit LCD: liquid crystal display PCBA: Printed Circuit Board Assembly		

4 Components on the PCBA

Figure 4-1 and Figure 4-2 show the components on the top and bottom sides of the PCBA.

Figure 4-1 Components on the PCBA top side

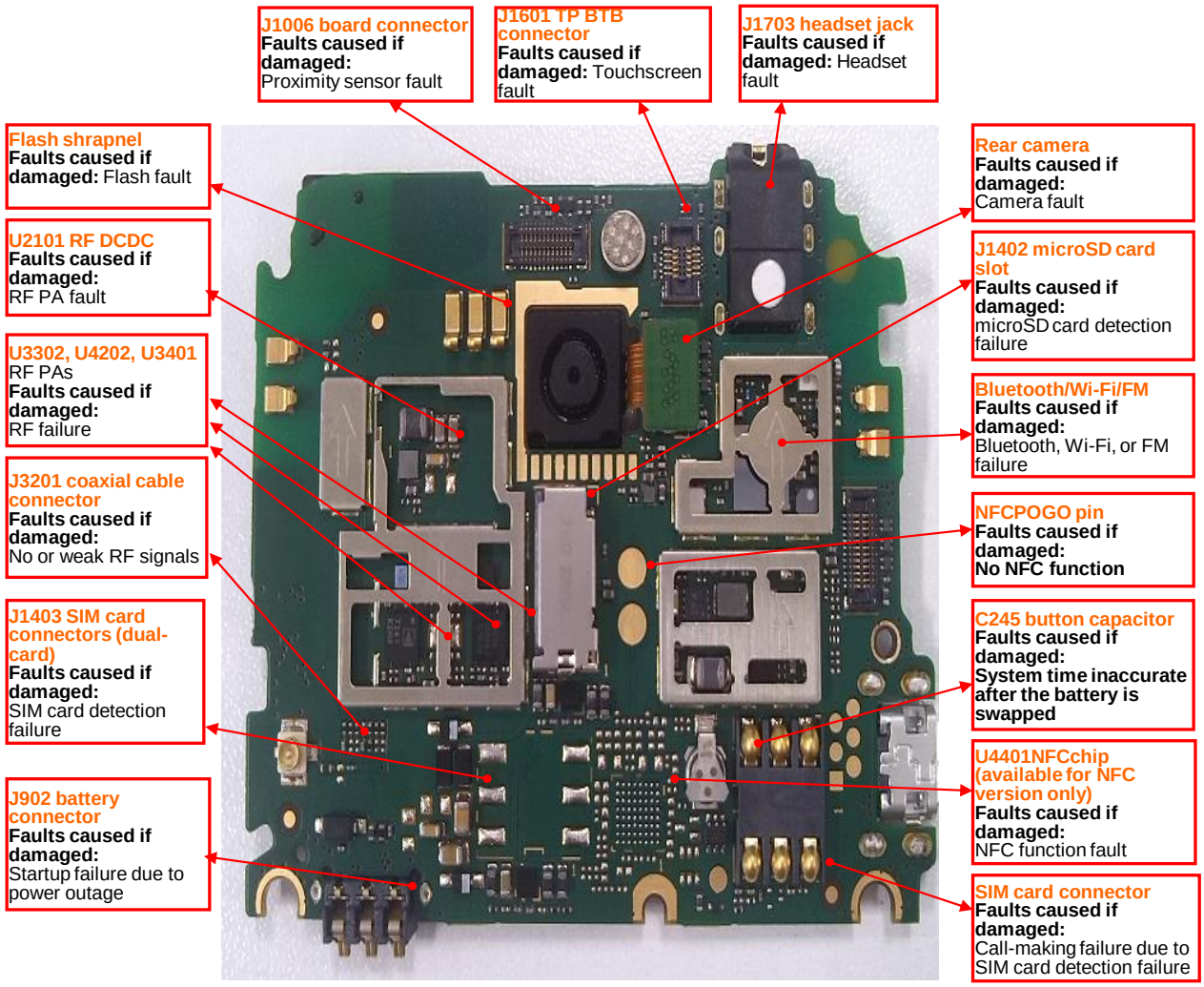


Figure 4-2 Components on the PCBA bottom side

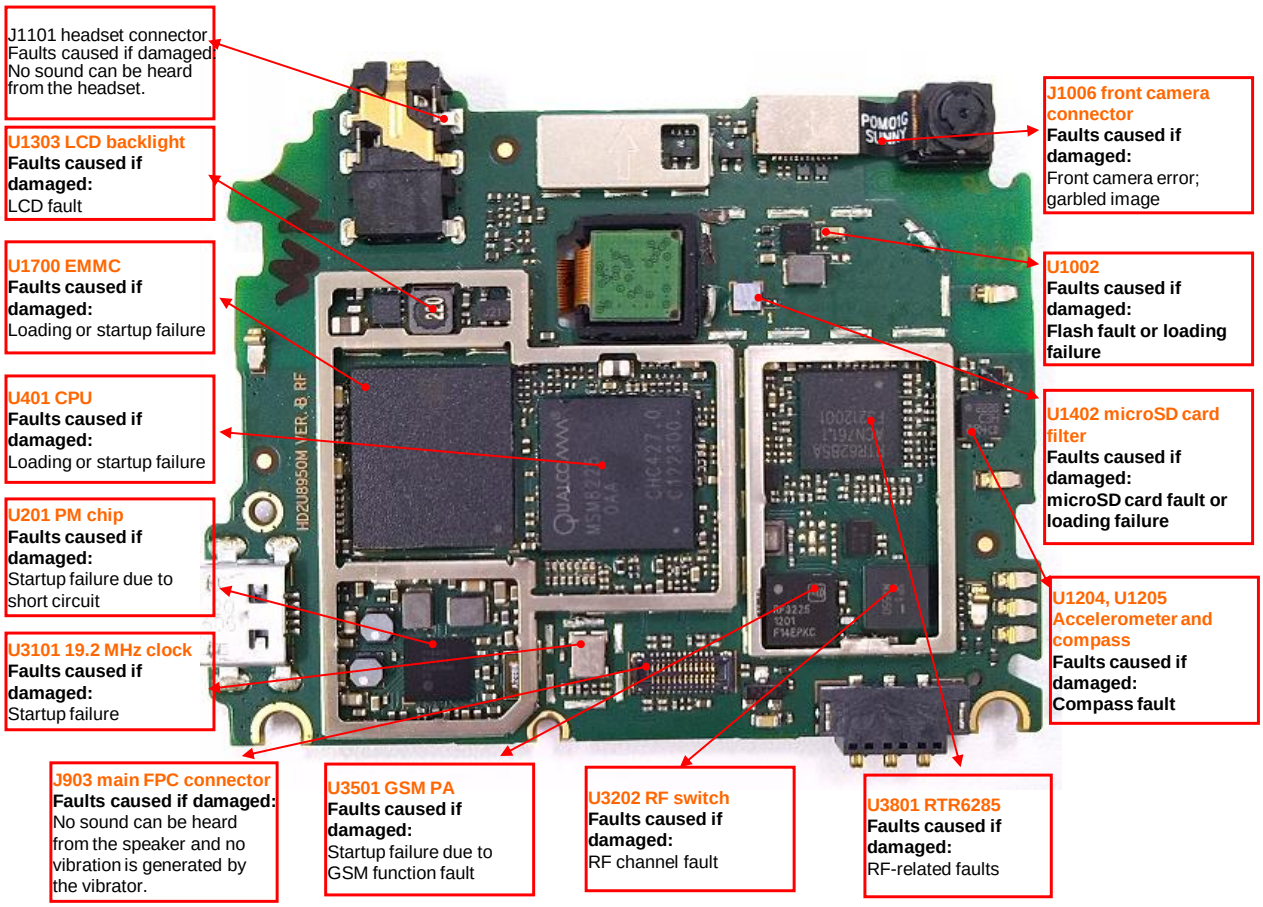


Table 4-1 is provided for reference only. It is subject to changes without any notices. The latest component list is available on Huawei's ITEM information system. If you have any questions, contact your local technical support.

Table 4-1 U8650 BOM list

BOM Code	Description	Location No.
14240229	Angle,SMT,Arc type,Terminal Dedicated	J1703
14240243	Card Connecter,MicroSD Receptacle,10pin,1.1mm,Without Lock,Without Hold Peg,1.0mm,TF Header height 2.45mm,Terminal Dedicated	J1402
14240271	Card Block Connector,Battery connector,3pin,Side Contact,2.5mm,With Plastic Peg,1.45mm,Mid Mount	J902
39200461	Terminal Baseband Process	U401

BOM Code	Description	Location No.
	IC,WCDMA/GSM Dualmode BASEBAND PROCESSOR MSM8225-0-AA,1.2V/1.8V/2.85V,576 NSP(Pb free)	
39200332	Power Management IC(PM8029),3.0–4.4V,140WLNSP(pb-free),Terminal Dedicated	U201
40060391	MCP,4GB(x8) eMMC,52MHz,1024KB,3.3V/1.8V, FBGA153,6Gb(x32) LPDDR1,Terminal Dedicated	U1700
47100551	RF Power Amplifying Module,880–915MHz,31dB max. at Pout=28.5dBm,28.5dBm,QFN,Terminal Dedicated, APT	U3401
13010262	2140MHz,3.0dB,50V,1411,Terminal Dedicated	U3702
39200333	Terminal Dedicated IC,WCMDA/GSM Radio Transceiver(RTR6285A),2.7V/2.6V/2.1V,137CSP,Terminal Dedicated	U3801
47090053	RF LNA,1575MHz,14dB min.,1.6dB max.,SOT886,Terminal Dedicated	U4101
39210010	Terminal Baseband process IC,Single Band 2.4GHz WLAN/Bluetooth 2.1/FM Single chip-BCM4330,2.3–5.5V,WLBGA133(Pb-free)	U6011
12020216	Crystal,37.4MHz,10pF/8.3pF/9pF,+/-10ppm,80ohm,2016,Terminal Dedicated	X6201
47100464	RF Power Amplifying Module,1920MHz–1980MHz,28dB typ. at Pout=28dBm,28dBm,QFN,Terminal Dedicated	U3302
39110733	Switching Regulators,0.4–3.4V,<3%,2.5A,WLCSP,SMT,1.75mm x 1.75mm,Terminal Dedicated	U2101
38140069	Semiconductor Sensor,E-Compass,WLCSP(Pb-free),3axis,Terminal Dedicated	U1205
38140064	Semiconductor Sensor,Accelerometer,LGA,3axis,Te	U1204

BOM Code	Description	Location No.
	rminal Dedicated	
39110620	Power Driver,1.5A LED flash driver IC,CSP,Terminal Dedicated	U1002
15060228	MOSFET,P Channel,-12V,-2.4A,112mohm,-8V, SOT23,from 15060150,TS16949,Terminal Dedicated	Q201
22050053	Microphone, -44dB, D4.0mm*1.3mm,SMT,Terminal Dedicated	MIC1502
07050089	NTC,47000ohm,0402,1.0*0.5*0.35mm,Terminal Dedicated	RT501
38020055	Analog Switch,P-channel MOSFET load switch-1.2–3.6V-50mohm-WLCSP-Terminal dedicated	U1231
15040295	Transient Suppression Diode,6V,25V,3A,9 channel TVS+EMI filter-CSP,Terminal Dedicated	U1402
12070013	Temperature Compensated Crystal Oscillator,19.2MHz,+/-0.2ppm,2.8V, +/-2.0ppm,Terminal Dedicated	U3101
47140032	RF Switch,824-960MHz/1710--2170MHz,1.2/2.8,1.6/2.8,30/24,Terminal Dedicated,TS16949	U3202

5 Software Upgrade

5.1 Upgrade Preparation

Prepare the items listed in Table 5-1

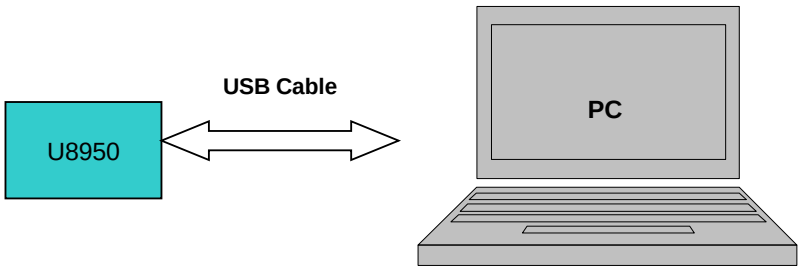
Table 5-1 Items to be prepared before a software upgrade

Category	Item	Description
Upgrade environment	Computer	Operating system: Windows 2000/Windows XP
	USB cable	BOM code: 02450768
	Upgrade tool	NewMultiDownloadU
	microSD card	The available space must be greater than 2 GB.
	Battery	The power remaining must be more than two bars.
Upgrade file	NewMultiDownloadU	This version is provided for reference only. Please download the latest version when upgrading the phone.
Upgrade method	USB cable	Normal upgrade Forcible upgrade
	microSD card	Normal upgrade Forcible upgrade

5.2 Hardware Connection

Connect the hardware in the way described in Figure 5-1.

Figure 5-1 Hardware connection

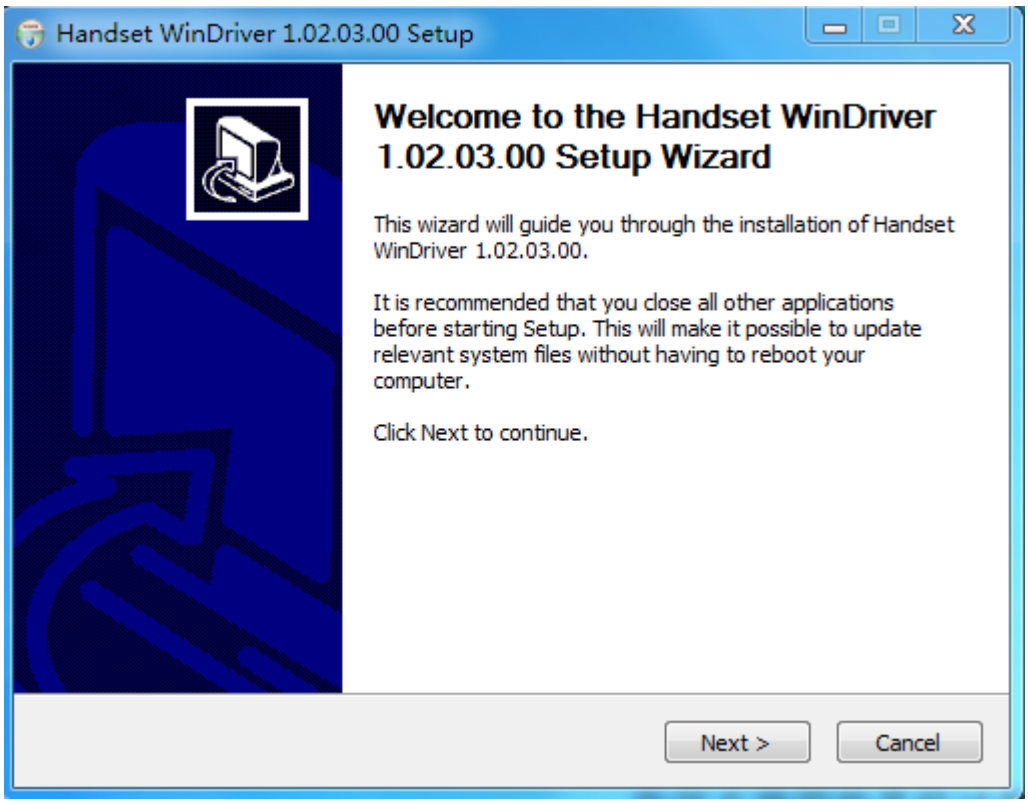


5.3 Upgrade Using the Phone Driver

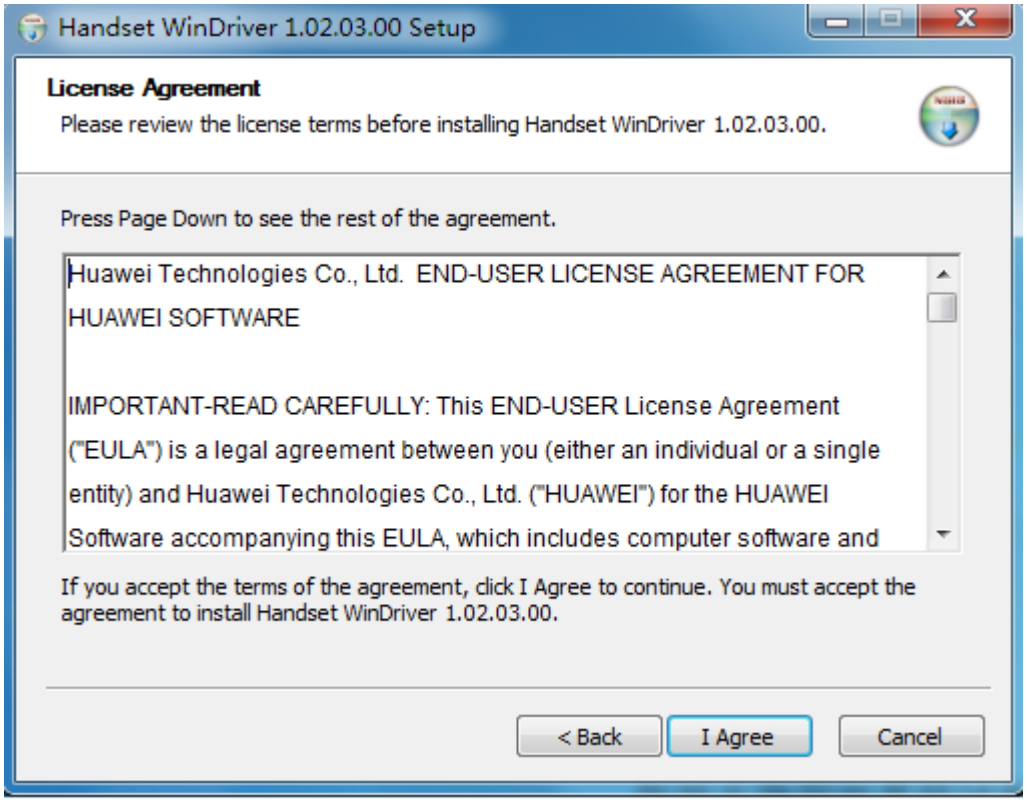
5.3.1 Installing the Phone Driver

To install the phone driver on the computer, perform the following steps:

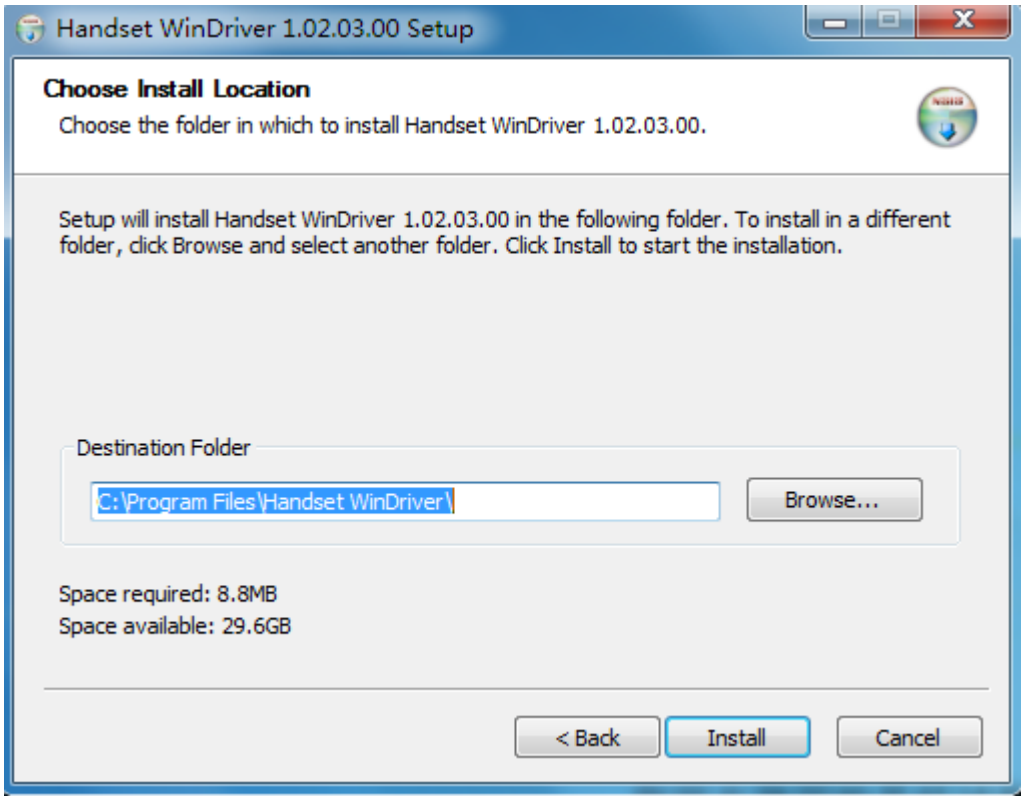
Step 1 Double-click the **Handset Windriver.exe** file, and click **Next** in the displayed dialog box to start the installation.



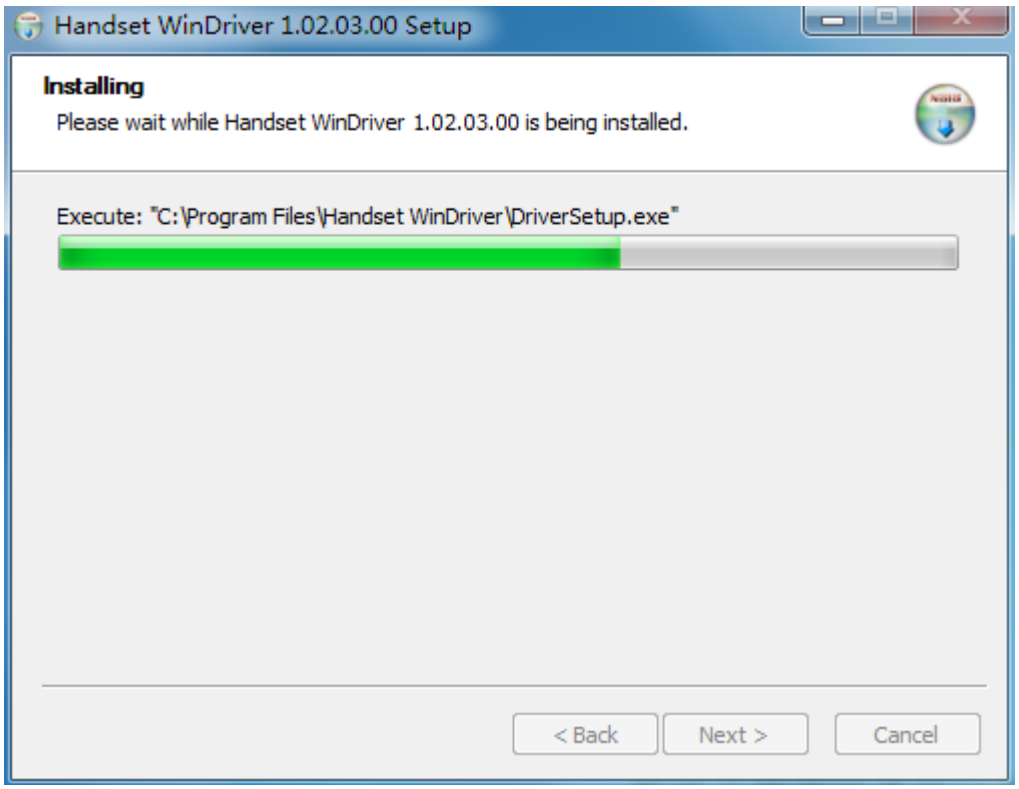
Step 2 Click **I Agree**.



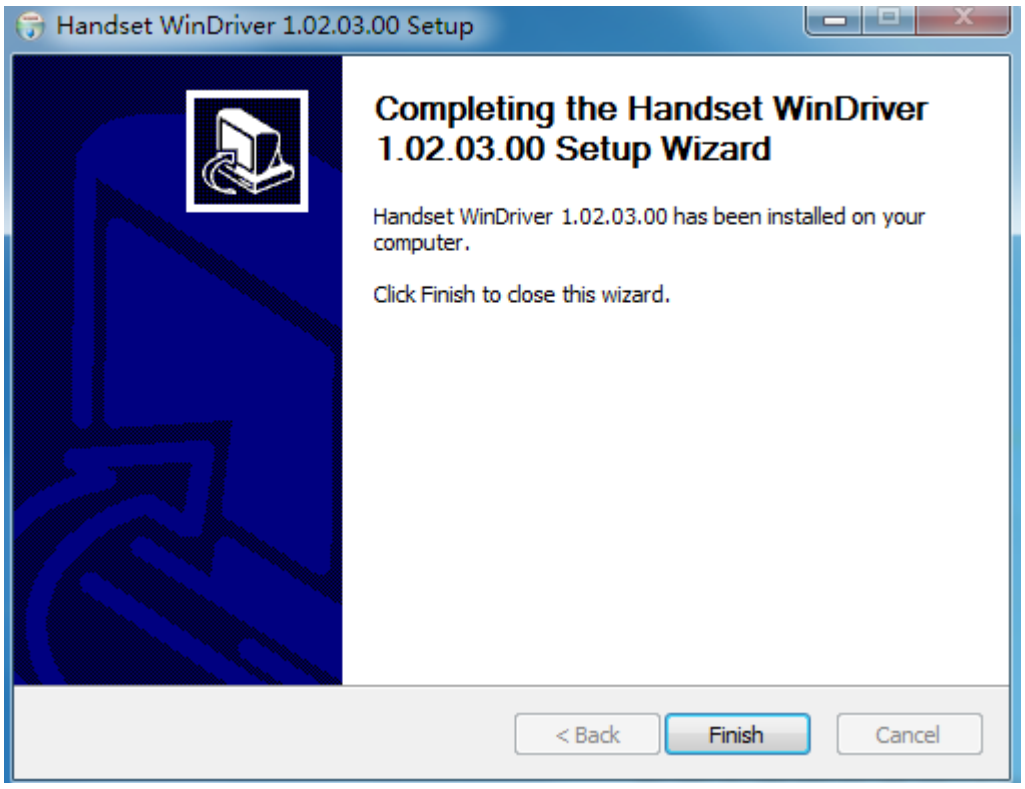
Step 3 Click **Install**.



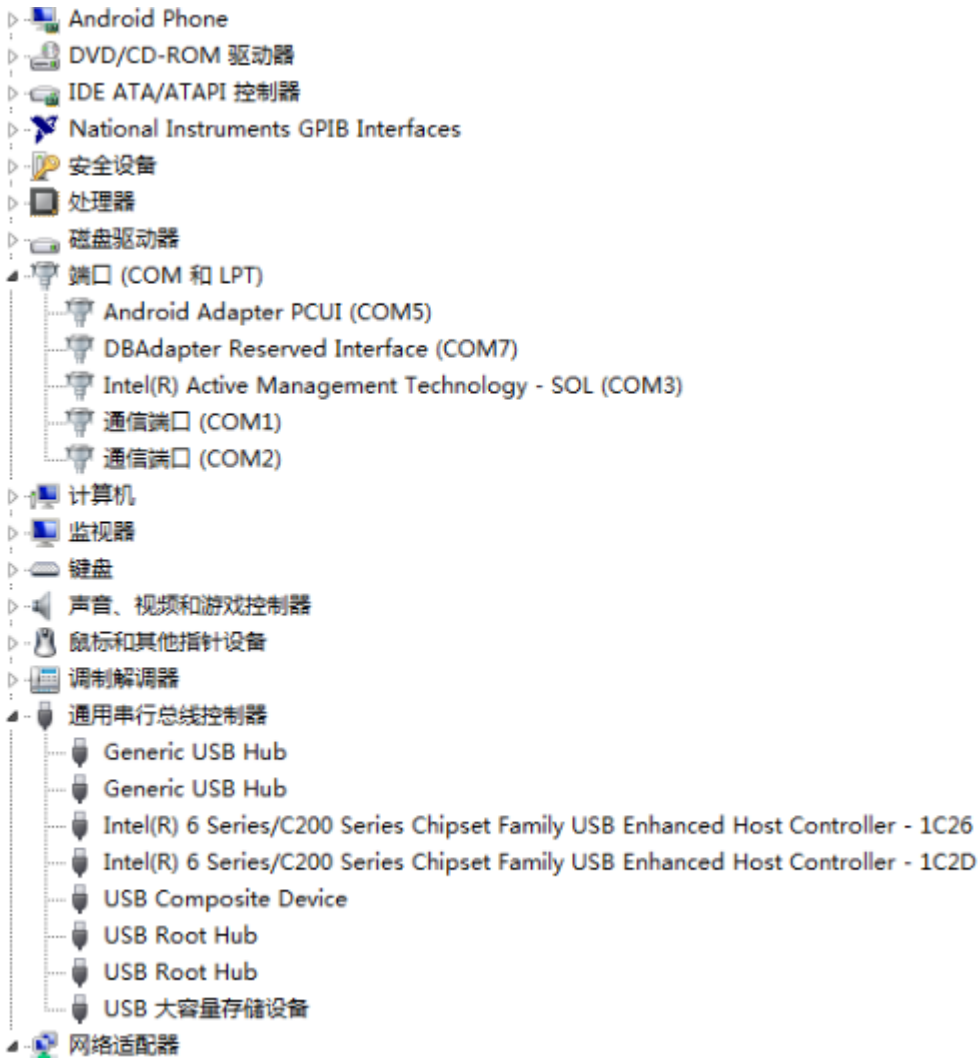
The installation progress is displayed, as shown in the following figure.



Step 4 After the installation is complete, click **Finish**.



After the phone driver is installed, you can view the port information **Android Adapter PCUI (COM5)** in the computer's Device Manager shown in the following figure.



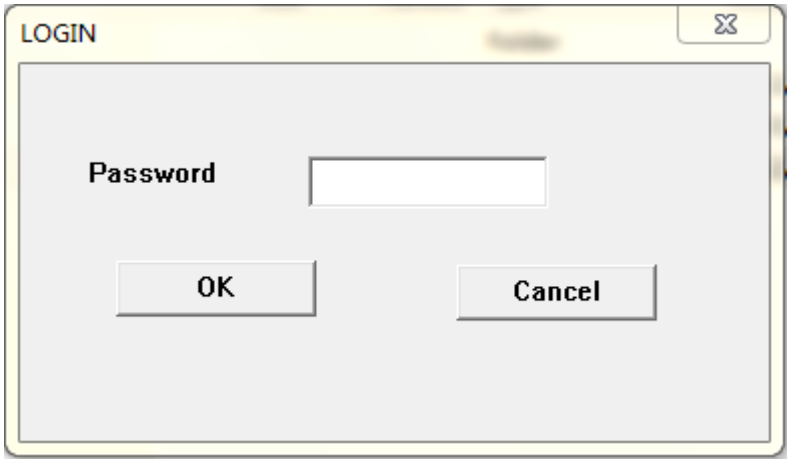
----End

5.3.2 Performing a Normal Upgrade

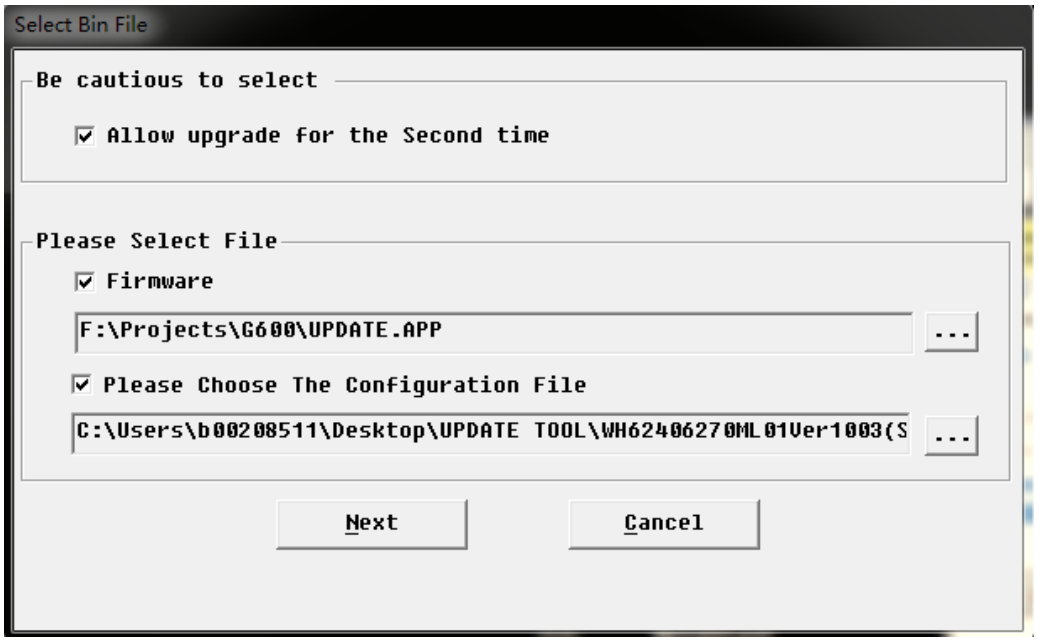
To conduct a normal upgrade, perform the following steps:

Step 1 Power the phone on, and use the USB cable to connect the phone to the computer on which the phone driver and the upgrade tool have been installed.

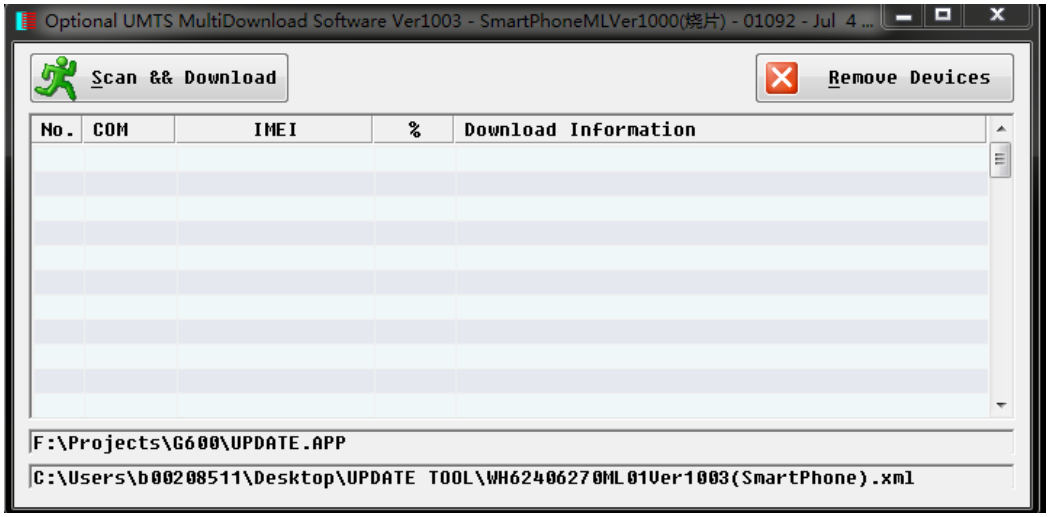
Step 2 Double-click **NewMultiDownloadU** to run the upgrade tool.The following dialog box is displayed.



Step 3 Enter the password **Huawei** and click **OK**. In the displayed dialog box, select **Allow upgrade for the Second time**, **Firmware**, and **Please Choose The Configuration File**, and select the XML configuration file in the upgrade tool's root directory as required. Click **Next**.



Step 4 Click **Scan & Download**.



The upgrade automatically starts. After the upgrade, the phone automatically restarts.

----End

5.3.3 Performing a Forcible Upgrade

If the mobile phone fails to start, use either of the following methods to perform a forcible upgrade:

Approach 1

Step 1 Install the battery to the phone

If the screen is splashing, remove the battery and wait for 5 seconds before installing the battery again.

Step 2 Press and hold the volume up and volume down keys, and press the power key.

The phone will start the forcible upgrade. The specific download process is similar to the project menu download.

----End

Approach 2

Without a battery, press and hold the volume up and volume down keys, and connect the phone to a charger. The phone can also start the forcible upgrade.

NOTE

It is recommended that you upgrade the software using the charger. If the upgrade failure persists, replace the microSD card and try again.

5.4 Troubleshooting Upgrade Failures

Table 5-2 lists the upgrade failures and corresponding solutions.

Table 5-2 Upgrade failures and solutions

Failure	Troubleshooting
(PC) Failed to detect the phone.	• Check that there is no other driver conflicting with the USB driver for the upgrade. • Check that the USB driver has been properly installed. • Check that the USB cable has been properly connected.
Failed to upgrade the phone using the USB cable.	• Check that the USB cable has been properly connected. • Perform the upgrade again.
Failed to upgrade the phone using the microSD card.	• 1. Check that the upgrade file is correct. • 2. Check that the upgrade method is correct. • 3. Check that the microSD card functions properly. • 4. Perform the upgrade again.

6 Maintenance Tools

	Name: constant-temperature heat gun Usage: to heat components
	Name: constant-temperature heat gun Usage: to heat components
	Name: soldering iron Usage: to maintain and solder components
	Name: DC power supply Usage: to supply DC current
	Name: soldering table Usage: to secure the PCBA

	Name: lead-free solder wire Usage: for soldering
	Name: digital multimeter Usage: to measure during repair
	Name: toolkit Usage: to assemble and disassemble components
	Name: electric screwdriver Usage: to fasten and remove screws

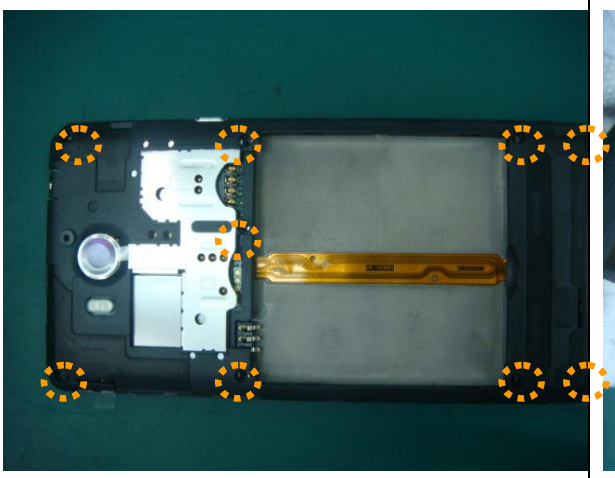
7 Disassembly Procedure

7.1 Disassembling a Bare Phone

For details, see the following figures.

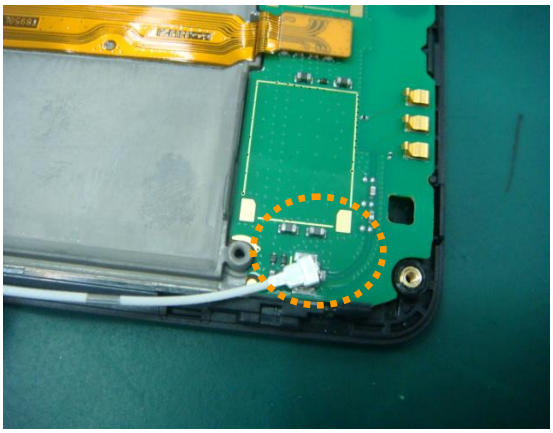
1. Ensure that the ESD wrist strap is properly connected to the ground.

2. Remove battery cover.

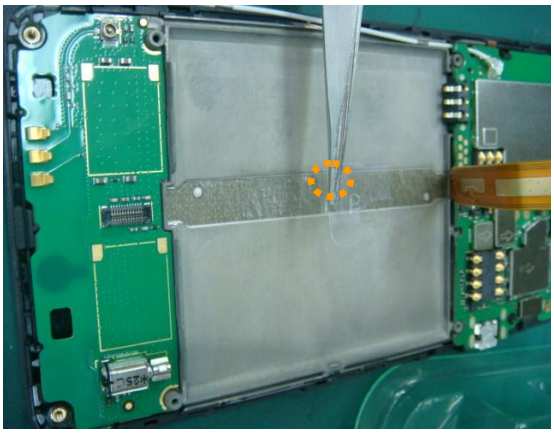


3. Remove the screws from the rear cover.

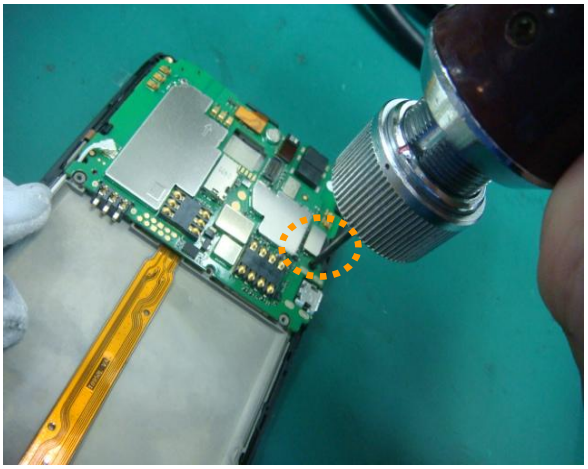
4. Separate the front and rear covers.



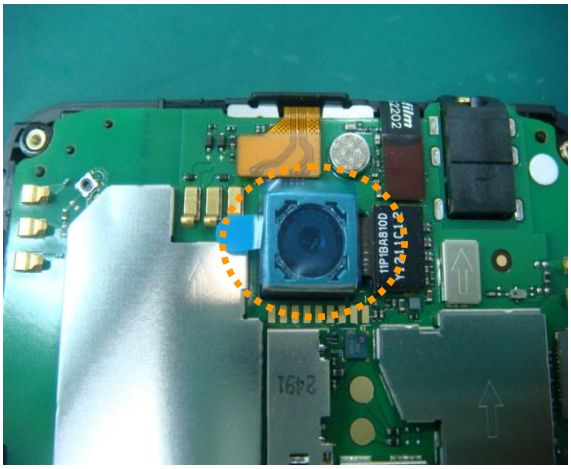
5. Detach the RF cable.



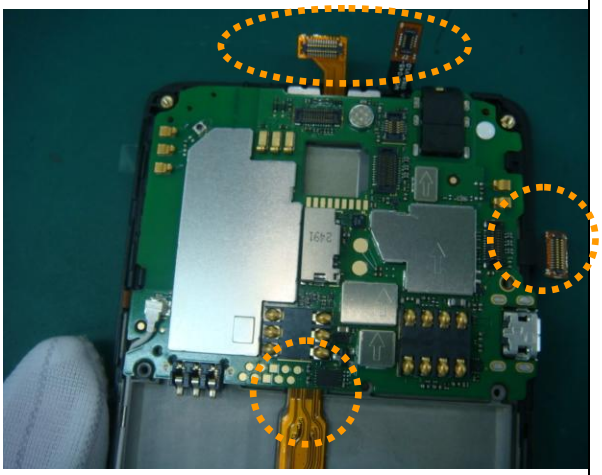
6. Separate the FPC connector from the front cover.



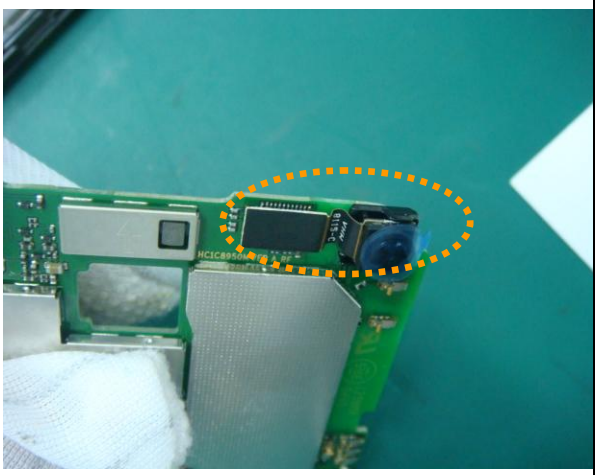
7. Remove the screws from the PCBA and front cover.



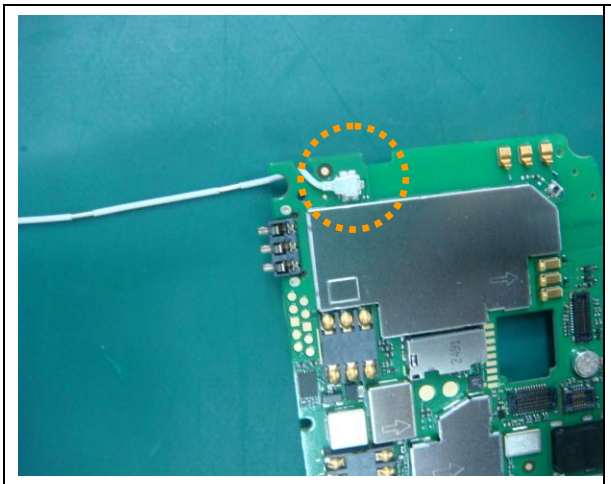
8. Take out the rear camera.



9. Lift the BTB connector. The PCBA and front cover are separated.

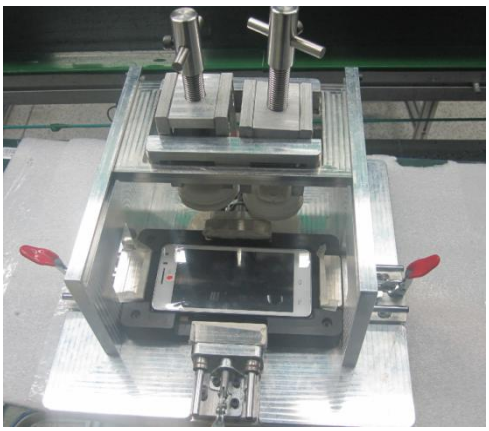
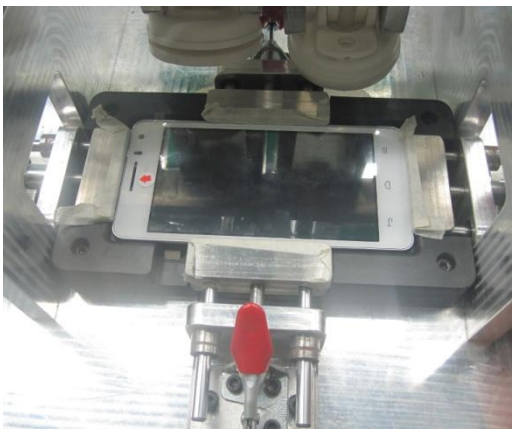
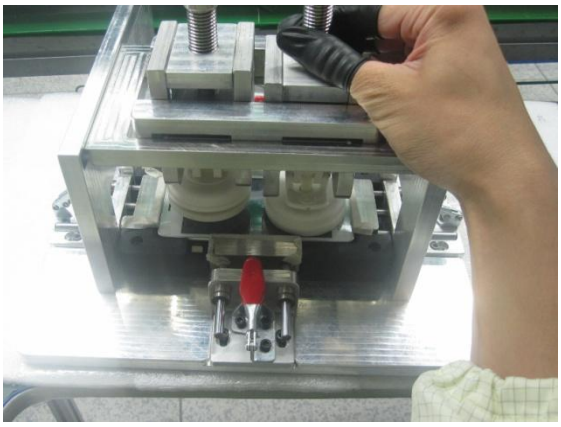
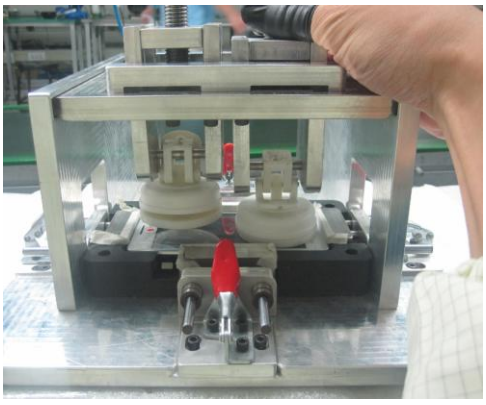


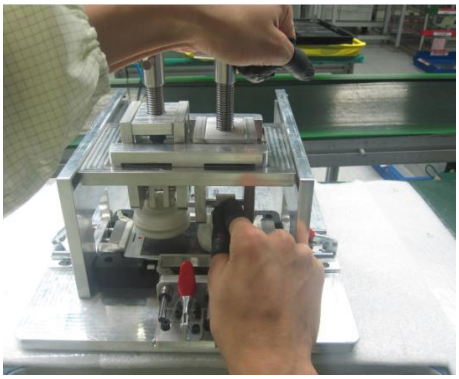
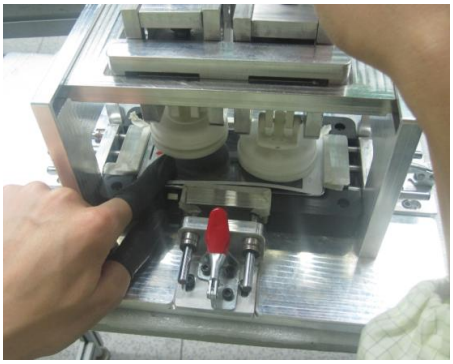
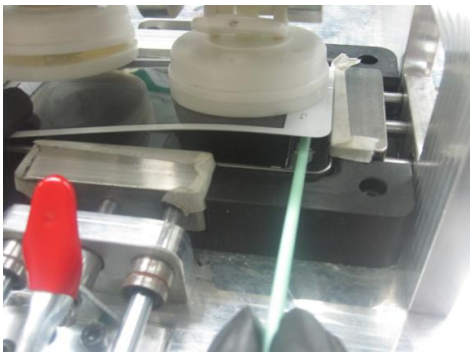
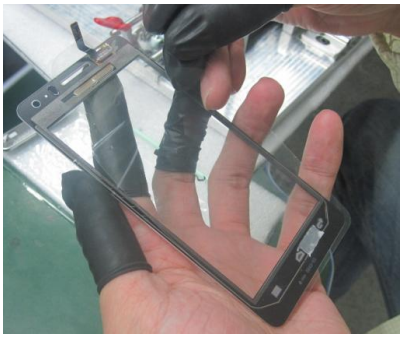
10. Separate the front camera and PCBA.

	
11. Detach the RF cable from the PCBA.	12. Take out the PCBA.

7.2 Disassembling the Touchscreen

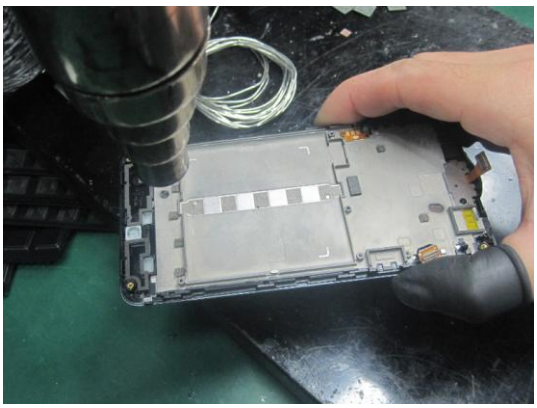
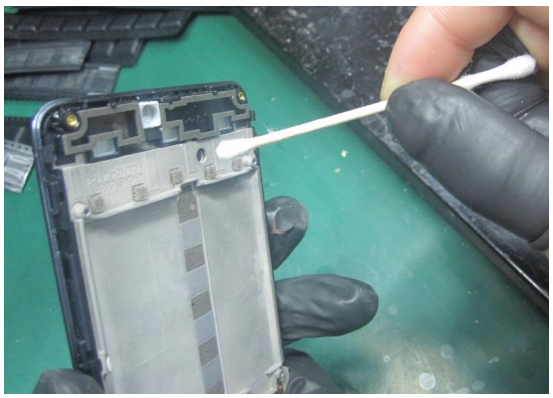
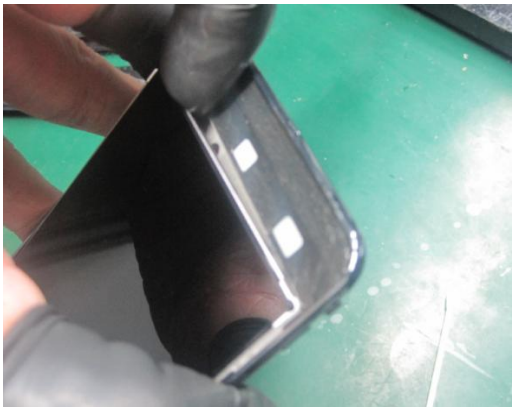
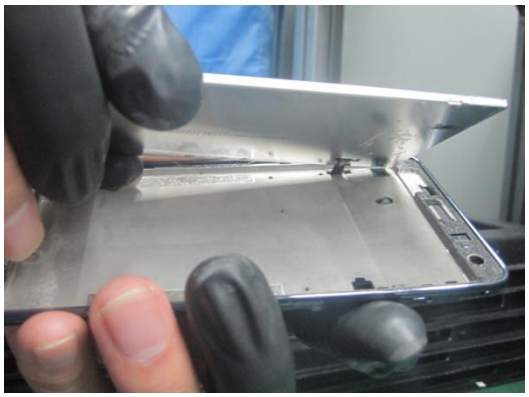
For details, see the following figures.

	
1. Place the front cover assembly to the touchscreen disassembling fixture.	2. Push the four blocks to fix the front cover.
	
3. Move the suckers to the top of the touchscreen.	4. Rotate the knobs to drop the suckers until the

Note that use the sucker for the touchscreen's lower part only.	suckers contact the touchscreen surface closely. Note that use the sucker for the touchscreen's lower part only.
 5. Use your left hand to press the knob and right hand to pull the sucker to stick to the touchscreen surface.	 6. Rotate the knob reversely to raise the sucker. During the process, use your left hand to press the touchscreen's upper part to prevent the touchscreen FPC from being torn due to excessive force generated when sucking the touchscreen.
 7. Keep rotating the knob until the touchscreen's lower part is raised to a certain distance from the front cover. Place a long soft object between the touchscreen and front cover so that they will not stick to each other again. Note that the long soft object must be placed on the adhesive area on the front cover rather than on the LCD.	 8. Lift the sucker and detach it from the touchscreen. Remove the suckers from the front cover assembly. Take out the front cover assembly and remove the long soft object. At the same time, lift the touchscreen's lower part until it is completely separated from the front cover. Ensure that the touchscreen FPC is intact during the process.
 9. Use protective film to cover the touchscreen's inner surface and LCD to protect them against dust, abrasion, and scratches. The touchscreen is now	

disassembled.

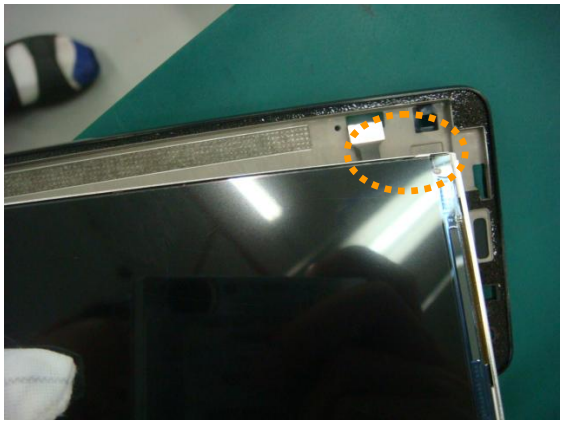
7.3 Disassembling the LCD

 1. Use the heat gun to heat the bottom of the front cover assembly and adhesive area of the LCD with a temperature of 80 ℃.	 2. Use a cotton swab or silicon swab to eject the LCD gently from the hole at the bottom of the front cover assembly. Do not eject the LCD hard. If the LCD cannot be ejected, heat the adhesive area again to undermine its adhesion. Ensure that the no dent occurs on the ejection position of the LCD.
 3. Use a flat ruler-like object to lift the LCD from the bottom of the LCD.	 4. Take out the LCD from an appropriate angle to protect the LCD FPC against any damage. Check that the LCD protective film covers the LCD completely. The LCD is now disassembled.

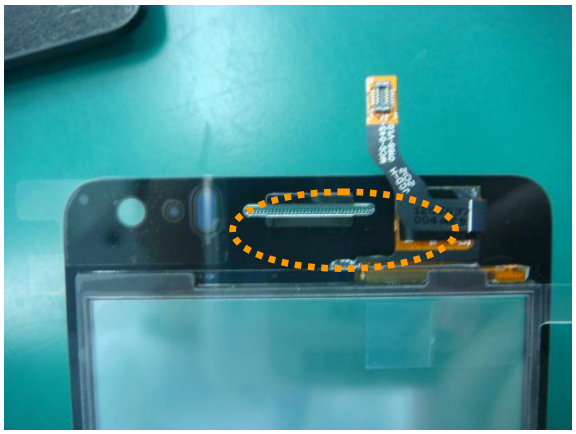
8 Assembly Procedure

The assembly procedure for the U8950 is similar to the C8950D. For details, see the following figures.

1. Ensure that the ESD wrist strap is properly connected to the ground.

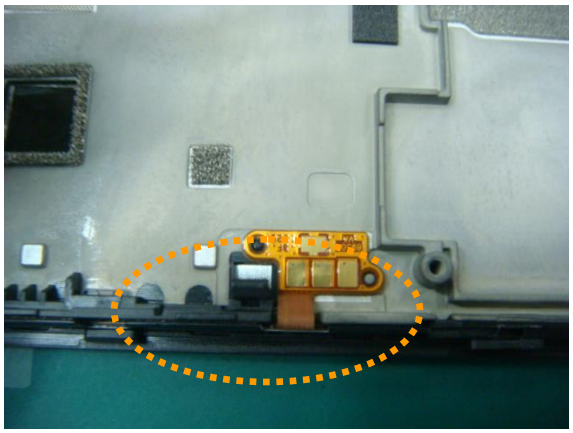


2. Attach the LCD to the front cover. Pay attention to the BTB connector on the FPC.

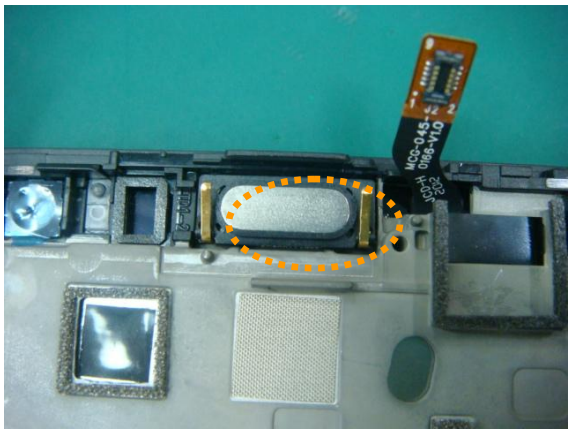


3. Attach the dust-proof net to the touchscreen.

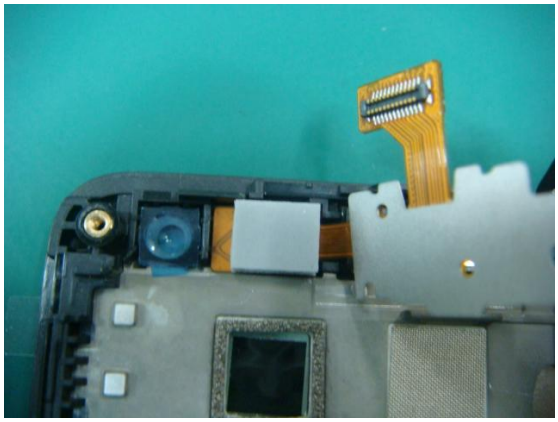
4. Fit the touchscreen and LCD.



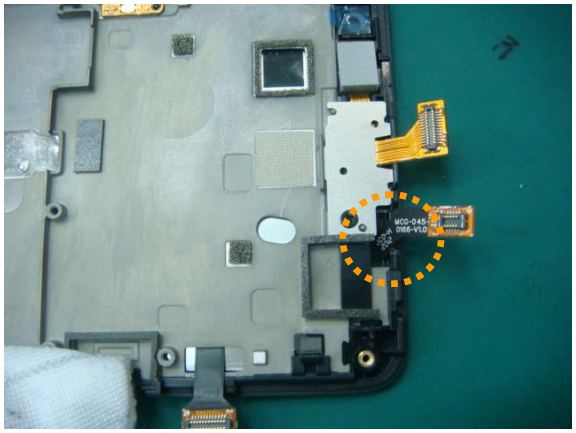
5. Install the power key and volume key FPC to the front cover.



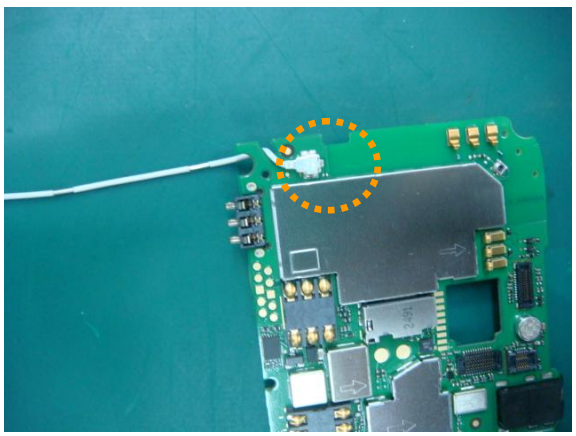
6. Install the receiver to the front cover.



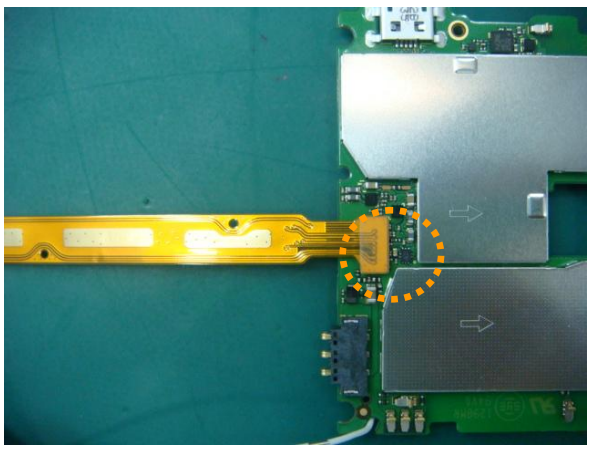
7. Install the tri-color indicator and receiver FPC to the front cover.



8. Secure the screws.

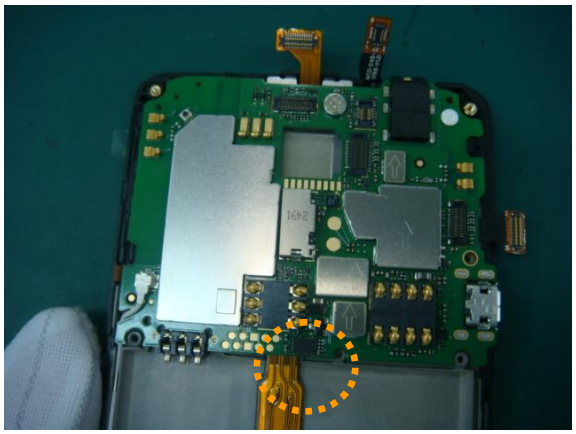


9. Connect the RF cable and PCBA.

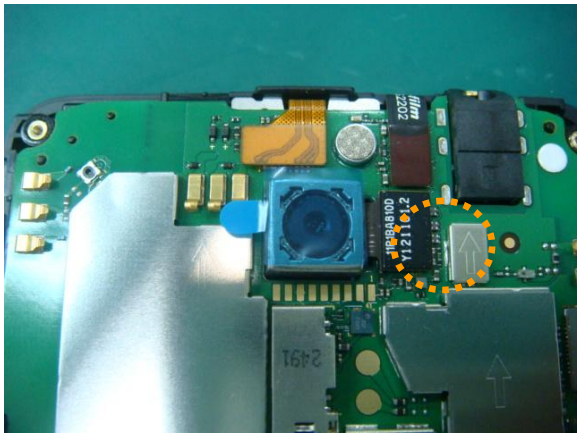


10. Connect the FPC connector and PCBA.

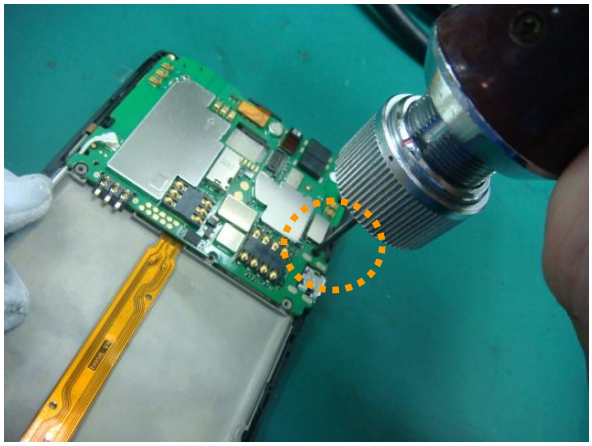
11. Install the front camera to the PCBA.



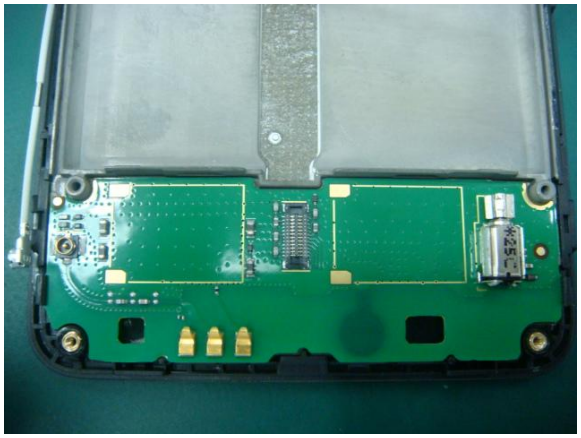
12. Fit the PCBA and front cover and fasten the BTB connector.



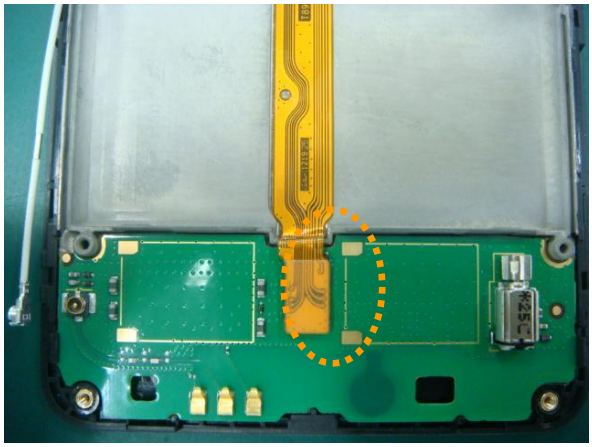
13. Install the rear camera to the PCBA.



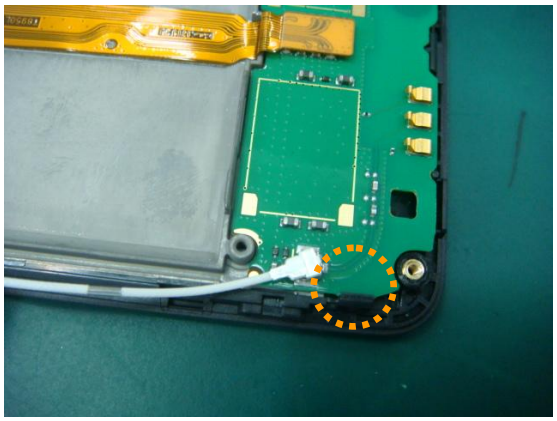
14. Secure the screws on the PCBA and front cover.



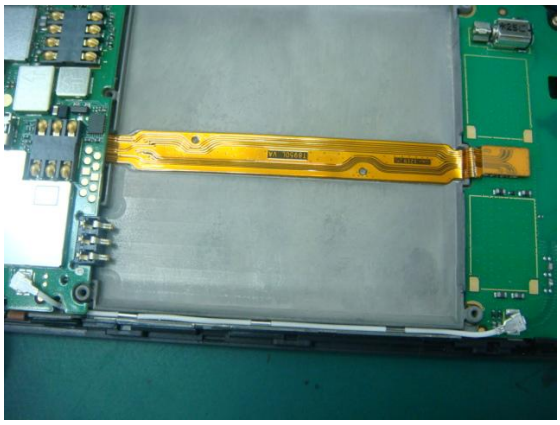
15. Install the antenna board to the front cover.



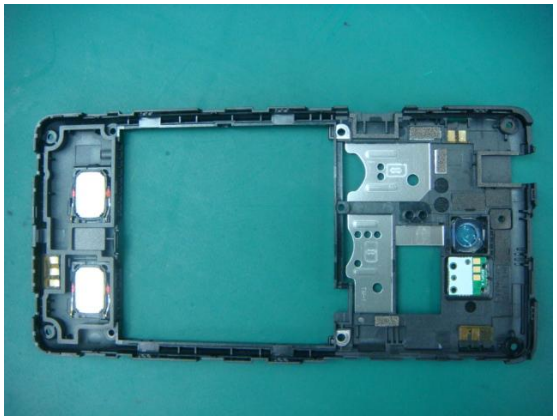
16. Attach the FPC connector to the front cover.



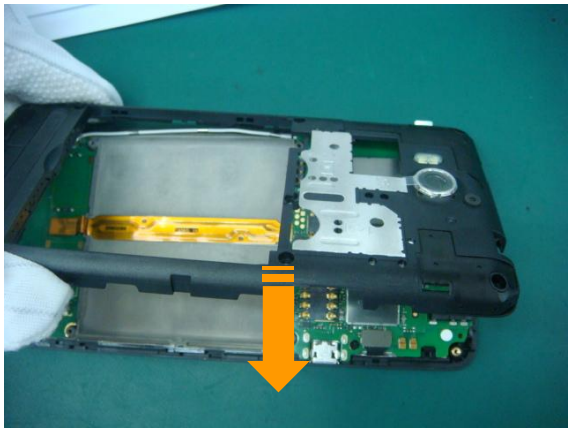
17. Attach the RF cable to the antenna board.



18. Effect diagram after the preceding components are installed



19. Install the speaker to the rear cover.



20. Fit the front and rear covers and secure the screws.

21. The phone is now assembled.

9 Maintenance Records During Verification

9.1 Maintenance Records on Each Stage

Stage	Station of Fault	Faulty Item	Symptom	Solution
V3	Board upgrade	The upgrade failed at 4%.	The data was lost.	The board was formatted and reloaded and the test then passed.
V3	Loading	Poor loading	The flash chip was poorly soldered.	The software was reloaded and no interface was detected. The test passed after the flash chip was heated and re-soldered.
V3	Loading	Poor loading	The data was lost.	The board was formatted and reloaded and the test then passed.
V3	CT	MMI06A vibrator malfunction	The vibrator was faulty.	The faulty product was retained, as required by the R&D department, for analysis by the vendor.
V3	MMI	MMI06A vibrator malfunction	The FPC and BTB connector were not fit in place.	The BTB connector was refitted.
V3	MMI	MMI06A vibrator malfunction	The FPC BTB connecting to the antenna board was bridged, resulting in the grounding of VIB_DRV_N. The vibrator started vibrating once the battery was loaded.	The vibrator was re-soldered.
V3	MMI	MMI05C touchscreen malfunction	The chip on the touchscreen was damaged.	The touchscreen was replaced.

Stage	Station of Fault	Faulty Item	Symptom	Solution
V3	MMI	MMI05C touchscreen malfunction	The design software was faulty (resulting in occasional errors of the touchscreen).	It indicated an issue of probability requiring further analysis by the R&D department.
V3	MMI	MMI05B rear camera malfunction	The camera is faulty after being re-installed at the first time, and the faulty is cleared after several times of re-installation.	The faulty can be cleared after several times of re-installation of the camera.
V3	MMI	MMI05A front camera malfunction After the front camera test was complete, the startup screen was displayed.	The test software was faulty.	It required further analysis.
V3	MMI	MMI05A front camera malfunction	The problem was confirmed by the R&D as one caused by software.	The problem was retained as it occurred for analysis by the R&D department.
V3	MMI	MMI04F flash malfunction	The J1001 shrapnel was mis-mounted during the SMT.	Re-solder J1001.
V3	MMI	MMI04C touch key backlight malfunction	The BTB connector on the antenna board was poorly soldered.	The BTB connector was re-soldered.
V3	MMI	MMI02A SIM card detection failure	The airplane mode was enabled, resulting in detection failure of the SIM card.	The airplane mode was disabled.
V3	CT	MMI01F abnormal display	Approximately eight capacitors were missed during the SMT.	The problem was retained as it occurred and the capacitors were to be mounted when they are available.
V3	MMI	MMI01F abnormal display	The phone was in factory mode.	The mode was set using the SDK.
V3	MMI	MMI01F abnormal display	The product software was faulty.	It required further analysis by the R&D department.

Stage	Station of Fault	Faulty Item	Symptom	Solution
V3	MMI	MMI01F abnormal display	The software was poorly loaded.	The test was performed again after the software was eliminated.
V3	MMI	MMI01E display malfunction	The LCD BTB connector on the main PCBA was poorly soldered.	The BTB connector was re-soldered.
V3	MMI	MMI01D automatic restart or power-off	The side key FPC was short-circuited, resulting in automatic startup (or turn-off).	The side key FPC was to be replaced.
V3	MMI	MMI01B startup failure	The side key FPC was broken, resulting in startup failure after the power key was pressed.	The side key FPC was to be replaced.
V3	MMI	MMI01B startup failure	The board clip on the front cover was broken, resulting in poor contact between the board and startup shrapnel on the front cover.	The front cover was to be replaced.
V3	MMI	MMI01B startup failure	The startup shrapnel on the main PBCA failed to contact the FPC.	The startup shrapnel and FPC were re-assembled.
V3	CT	CT20001Y	The test equipment was unstable.	No current leakage was detected when tested using a multimeter. The test equipment was replaced and the test then passed.
V3	CT	CT200011	The flash chip was open soldered.	The test was performed again and no interface was detected yet. However, it passed after the flash chip was re-soldered.
V3	CT	CT 200011	The resistor R3802 had a side effect. The software was not programmed properly.	The test failed after the resistor was re-soldered and passed after the software was re-programmed.
V3	BT	BT367329 BER	A mis-test occurred.	The test was performed again.

Stage	Station of Fault	Faulty Item	Symptom	Solution
V3	BT	BT use 3in1-chip-erro rr	The CT test was missed.	The test passed when testing the CT before the BT.
V3	Loading	B01 uploading failure	The CPU was short-circuited.	The main board current is about 338 mA, and the CPU got heated. Replace the CPU.
V3	Loading	B01 uploading failure	The flash chip was poorly soldered.	The software was reloaded and no interface was detected. The flash chip was re-soldered and the test then passed.
V3	CT	26201N	The unit U3401 was translocated.	The unit U3401 was re-soldered.
V3	CT	26201N	The unit U3401 was poorly soldered and did not perform amplification when tested using W-CDMA.	The unit U3401 was re-soldered.
V3	CT	26201N	The unit U3402 was poorly soldered and proved to attenuate signals by 10 dBm when tested using W-CDMA.	The unit U3402 was re-soldered.
V3	CT	262010	During a manual test, RF signal output was detected and closed after a while.	The faulty product was retained for further analysis by the R&D department.
V4	Loading	The loading failed at 82%.	The loading program was faulty.	The program was eliminated and reloaded and the test then passed.
V4	MMI	NFC function failure	NFC function is faulty.	The phone was restarted and the NFC function was enabled and the test then passed.
V4	MMI	MMI08B compass malfunction	The chip U1205 was damaged due to external impact, resulting in the failure of compass function test.	After confirmation by the R&D department, the problem of broken solder beads was cleared by heating and re-soldering the chip. It was determined that the chip was damaged. To solve the problem, replace the chip.
V4	MMI	MMI07A FM malfunction	A mis-test occurred.	The test passed when it was performed twice more.

Stage	Station of Fault	Faulty Item	Symptom	Solution
V4	MMI	MMI06E headset malfunction	The tester inserted the headset when testing the secondary microphone loopback, resulting a mis-test.	After confirmation by the tester, the headset was inserted on the correct stage and the test then passed.
V4	MMI	MMI06C receiver malfunction	The receiver FPC was faulty. An open circuit occurred at the contact of the pin and BTB connector.	After confirmation by the R&D department, the FPC was replaced and the test then passed.
V4	MMI	MMI06C receiver malfunction	The receiver FPC was faulty.	The FPC was replaced and the test then passed.
V4	MMI	MMI06B speaker malfunction	Two speakers were missed during the pre-assembling, resulting in the failure of speaker test.	After confirmation by the product line and PE, the speakers were installed and the test then passed.
V4	MMI	MMI04D proximity light malfunction	The test was stuck in the state of proximity for long. It might be caused by poor transparency due to dirty protective film on the touchscreen.	The touchscreen protective film was removed and the test then passed.
V4	MMI	MMI03A key malfunction	The structural design flaw caused separation of the key shrapnel and functional contact point. The clip on the left did not work well and lost effect after disassembly for once.	No contact trace was found on the key shrapnel's pin after the disassembly. After confirmation by the R&D, hardware, and structure departments, the PCBA was assembled and secured again and the test then passed.
V4	MMI	MMI03A key malfunction	The functional contact point of the volume down key was smudged.	The functional contact point was cleaned using alcohol and the test then passed.

Stage	Station of Fault	Faulty Item	Symptom	Solution
V4	MMI	MMI02A SIM card detection failure	The SIM card was worn, resulting in probabilistic poor contact.	The SIM card voltage, clocks, reset signals, and signal lines were all proved normal. The SIM card was removed and inserted again and the test then passed. However, failure was detected during multiple tests with a low probability. The SIM card for test was found of several abrasions. It was recommended that this card be replaced.
VN1	MMI	MMI09A interface malfunction	The interface J903 connecting to the antenna board was poor soldered and could be easily tilted.	The interface was re-soldered and the test then passed.
VN1	Assembly	The shielding cover could not be installed.	The shielding cover was over-glued or the silica gel dispensing line was defective, resulting in overflow of the glue from the holes on the shielding cover to the gaps. The assembly was then hindered.	A photo was taken to confirm with the PE. The overflow of glue was heated using the heat gun and then cleaned using a pair of nippers.
VN1	Loading	No Android Adapter PCUI interface after the loading	VPH_PWR, VREG_S2, and U401 were short-circuited.	The PMU chip and relevant capacitors were removed and the chip U401 was determined to cause a short circuit. The chip U1002 was short-circuited during the SMT.
pPMU	Loading	No Android Adapter PCUI interface after the loading	The resistance of VPH_PWR was 0 ohm. The chip U1002 was short-circuited.	The problem was proved to result from short circuits of U1002 and U1402 and reported to the R&D department for further analysis.
VN1	Loading	No Android Adapter PCUI interface after the loading	The resistance of VPH_PWR was 0 ohm. The chip U1002 was short-circuited. Bridging occurred during the SMT.	After U1002's shielding cover was removed, the solder points of VPH_PWR were found bridged, resulting in a short circuit. This problem was reported to process personnel for further analysis.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	Loading	No Android Adapter PCUI interface after the loading	The voltage VPH_PWR was short-circuited due to malfunction of U201.	The voltage VREG_S1 was also short-circuited. After the inductor L201 was disconnected, the end close to U201 was found short-circuited. After the test using the x-ray, no bridging was found. It was determined that the chip was faulty and the chip was retained, as required by the hardware department, for further analysis.
VN1	Assembly	SIM card slot fault	The incoming material of the SIM card slot was faulty.	The SIM card slot applied for had not been available yet and needed to be waited for.
VN1	PT	PT: H00031	The photo storage chip U1002 was bridged, resulting in current leakage.	U1002 was re-soldered.
VN1	PT	PT: H00001: POWER ON FAIL	The product software design was defective. It took too long to start up, resulting in the failure determined by the test program.	The normal startup time must not exceed 60s. The initiation of sensor failed, resulting in the delay of I2C read and write.
VN1	PT	PT: H00001: POWER ON FAIL	The startup was slow. After the startup, the Android screen was displayed for 90s to 150s. This was determined as a software problem.	The faulty product was retained for further analysis by the R&D department.
VN1	PT	PT: H00001: POWER ON FAIL	It took too long to start up, resulting in the failure determined by the test program.	It took too long to start up, resulting in the failure determined by the test program.
VN1	PT	PT: H00001: POWER ON FAIL	It took too long to start up, resulting in the failure determined by the test program.	The normal startup time must not exceed 60s. The initiation of sensor failed, resulting in the delay of I2C read and write.
VN1	PT	PT: H00001: POWER ON FAIL	The equipment settings were incorrect.	The parameters were reset and the test then passed.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	PT	PT: H00001 (no port)	The phone could be powered on using the battery but not through the USB port. The USB chip was poorly soldered, resulting in the port detection failure.	The USB port was re-soldered.
VN1	MT	MT500033: GPS TEST FAIL	The test equipment was faulty.	The test equipment was re-commissioned.
VN1	MT	MT500001: open com port fail	The USB interface on the main PCBA was loose. Two pins were poorly soldered, resulting in the startup failure through the USB port.	The USB interface was re-soldered and the test then passed.
VN1	MT	MT500001 (power on)	The barcode format was incorrect in the property settings.	The barcode format was reset and the test then passed.
VN1	MT	MT 568214	The test value was a critical one.	The test position was changed and the test then passed.
VN1	MMI	MMI09D	U4401 was poorly soldered.	The NFC_TX signal could not be detected using an oscillator and remained undetectable after U4401 was re-soldered. It was preliminarily determined that the NFC_TX signal was grounded.
VN1	MMI	MMI07B Bluetooth malfunction	A mis-test occurred.	The test was performed again and Bluetooth devices were found.
VN1	MMI	MMI07A FM malfunction	A mis-test occurred. No more failure occurred during the multiple tests.	The test was performed again.
VN1	MMI	MMI06F abnormal sound	The pin of the vibrator on the antenna board was poorly soldered.	The abnormal sound persisted when the vibrator was powered directly. The antenna board was replaced and the test then passed. To solve the problem, re-solder the vibrator.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	MMI	MMI06F abnormal sound	The vibrator was faulty.	The abnormal sound persisted when the vibrator was powered directly. The antenna board was replaced and the test then passed. It was confirmed that the incoming material of the vibrator was faulty.
VN1	MMI2	MMI06F abnormal sound	The test headset was in poor contact.	The headset was replaced and the test then passed.
VN1	MMI	MMI06C receiver malfunction	The sound chamber under the receiver was blocked by a lay of adhesive paper, resulting in low volume.	The adhesive paper was removed and the volume became normal.
VN1	MMI	MMI06C receiver malfunction	The receiver was blocked by the protective film.	The protective film was adjusted and the volume became normal.
VN1	MMI	MMI06C receiver malfunction	The receiver contact shrapnel was inversely installed.	The receiver was re-installed.
VN1	MMI	MMI06B speaker malfunction	The speaker was reversely installed during the pre-processing of the rear cover.	The speaker was re-installed.
VN1	MMI	MMI06B speaker malfunction	The foam object from the white package was introduced during the pre-installation.	The foam object from the white package was removed and the test then passed.
VN1	MMI	MMI06B speaker malfunction	The incoming material of the main FPC was faulty.	When the FPC was replaced, the test passed. The problem was retained as it occurred.
VN1	MMI	MMI06A vibrator malfunction	The incoming material of the vibrator was faulty.	The faulty product was retained for further analysis by the R&D department.
VN1	MMI	MMI06A vibrator malfunction	The incoming material of the vibrator was faulty.	The abnormal sound persisted when the vibrator was powered directly. The board was replaced and the test then passed. It was confirmed that the incoming material of the vibrator was faulty.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	MMI	MMI06A vibrator malfunction	The incoming material of the main FPC was faulty.	The main FPC was replaced and the test then passed.
VN1	MMI	MMI05C touchscreen malfunction	The incoming material of the touchscreen was faulty.	When the touchscreen was replaced, the test passed. The problem was retained as it occurred.
VN1	MMI	MMI05C touchscreen malfunction	The touchscreen FPC was damaged.	The touchscreen FPC was photographed and to be replaced.
VN1	MMI	MMI05B rear camera malfunction	The BTB connector of the rear camera was loose.	The BTB connector was refitted and the test then passed.
VN1	MMI	MMI05A front camera malfunction (black screen)	The incoming material of the front camera was faulty.	The front camera was replaced.
VN1	MMI	MMI05A front camera malfunction	The chip U1231 was damaged.	The material replacement was unavailable and to be applied for.
VN1	MMI	MMI05A front camera malfunction	The incoming material of the front camera was faulty.	The front camera was replaced and the test then passed.
VN1	MMI	MMI05A front camera malfunction	The mis-test was cleared by performing the test again. When the front camera was replaced, the test passed. It was determined that the incoming material of the front camera was faulty.	The front camera was replaced.
VN1	MMI	MMI04F flash malfunction	No FLASH_LED+ output was detected. It was determined that the chip U1002 was faulty.	After confirmation by the hardware department and reference to the bridging of U1002, it was determined that U1002 was short-circuited. The problem was retained as it occurred for further analysis.
VN1	MMI	MMI04F flash malfunction	The flash was faulty.	The flash FPC was replaced.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	MMI	MMI04D proximity light malfunction	The proximity light cover was reversely installed.	The proximity light cover was re-installed.
VN1	MMI	MMI04C touch key backlight malfunction	The incoming material of U1303 was faulty.	The problem of LCD incoming material was cleared by replacing the PCBA. It was determined by testing the voltage that the incoming material of U1303 was faulty. However, the problem was not verified because the product was off line.
VN1	MMI	MMI04C touch key backlight malfunction	The FPC on the antenna board was not properly fit.	The FPC on the antenna board was properly fit and the test then passed.
VN1	MMI	MMI04A tri-color indicator malfunction (light leakage)	The incoming material of proximity light foam was faulty. The foam was covered by a layer of PET, through which the light was leaked.	The PET on the foam was removed.
VN1	MMI	MMI04A tri-color indicator malfunction	R1201 was poorly soldered, resulting in the missing blue light.	R1201 was re-soldered.
VN1	MMI	MMI04A tri-color indicator malfunction	The light-guiding pole blocked partial light from the light hole.	The light-guiding pole was hot-melted to the front cover and could not be repaired. To solve the problem, replace the front cover.
VN1	MMI	MMI04A tri-color indicator malfunction	A layer of double-sided adhesive on the proximity light foam reflected the light of the tri-color indicator.	The double-sided adhesive was removed and the tri-color indicator was re-installed.
VN1	MMI	MMI03A key malfunction	The side keys malfunctioned. The incoming material of the PCBA shrapnel was deformed, resulting the open circuit on the side keys.	The shrapnel was replaced and the test then passed.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	MMI	MMI03A key malfunction	The shrapnel of the volume up key was deformed and could not contact the volume key FPC.	The shrapnel of the volume up key was adjusted.
VN1	MMI	MMI02C microSD card detection failure	The microSD card was faulty.	The microSD card was replaced and the test then passed.
VN1	MMI	MMI02C microSD card detection failure	The microSD card slot was poorly soldered.	The third pin of the microSD card was not soldered using sufficient solder had no resistance. The problem was retained as it occurred for solder-printing analysis by the R&D and process departments.
VN1	MMI	MMI02C microSD card detection failure	The microSD card slot was poorly soldered and no 1.7 V voltage output was detected on the pin.	The microSD card slot was not re-soldered since the CPU was right on the front and heating the slot was risky.
VN1	MMI	MMI02C microSD card detection failure	The Dat0 signal of the microSD card slot's 7th pin was 42 ohm (normally it should be 4 Mohms). It was determined that the filter U1402 was short-circuited.	It was determined according to the batch number of this task order that the filter U1402 was short-circuited. The problem was retained as it occurred for further analysis by the process department since the board had been through the silica gel dispensing.
VN1	MMI	MMI02A	The SIM card is defective.	Replace the SIM card.
VN1	MMI	MMI02A	1 pin of the SIM card holder was missing.	Take a photo of the card holder and give feedback to the vendor.
VN1	MMI	MMI02A	No reset signals on the SRST pin.	Replace the pin.
VN1	MMI	MMI01F	LCD defects	Keep the defective LCD and conduct further analysis.
VN1	MMI	MMI01F	LCD defects	Keep the defective LCD and conduct further analysis.
VN1	MMI	MMI01F	LCD defects	Keep the defective LCD and conduct further analysis.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	MMI	MMI01F	The color of the lower half of the LCD was slightly yellow in the whitescreen test. LCD defects.	Keep the defective LCD and conduct further analysis.
VN1	MMI	MMI01F	Incoming defective LCD	Keep the defective LCD and conduct further analysis.
VN1	MMI	MMI01F	The signals on MIPI_DSI_LANE2_P were abnormal. It was concluded that the U401 was defective.	Keep the board and conduct further analysis.
VN1	MMI	MMI01E	LCD FPC was cracked during the transportation.	Keep the LCD and wait for confirmation.
VN1	MMI	MMI01E	The boost circuit failed to generate a 20 V voltage. The U1303 was found faulty.	Keep the component and conduct further analysis.
VN1	MMI	MMI01E	Defective U1303	Replace U1303.
VN1	MMI	MMI01E	D1302 was reversed.	Re-solder R1.
VN1	MMI	MMI01D	The grounding pin is deviated to connect to the power-on pin.	Replace the grounding pin using the discard board and test again.
VN1	MMI	MMI01C	The volume down spring was deformed.	Adjust the spring position.
VN1	MMI	MMI01C	The phone failed to access the system view due to the software loopholes.	Use the volume up and power key to drive the phone into forcible upgrade mode, and restart the phone.
VN1	MMI	MMI01B	The battery support was poorly soldered.	Re-solder the battery support.
VN1	CT	CT26401N	VBAT is short-circuited.	After the test, U1002 was found short-circled. The board process department was informed to conduct further analysis.
VN1	CT	CT260013	Thermistor calibration faulty	Keep the sample and conduct further analysis.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	CT	CT22301F	GSM malfunction	U1002 and U2101 were found short-circuited. Replace the two components.
VN1	CT	CT 22601F	U3501 was poorly soldered.	Re-solder U3501.
VN1	CT	CT200011	BC failure	Perform BC again.
VN1	Assembly	C1311	The C1311 is bumped.	Re-solder C1311.
VN1	BT	BT347121	Modulation spectrum failed. U3302 was poorly soldered.	Clear the tin balls, re-solder U3302, and perform CT and BT again.
VN1	BT	BT323115	The GSM850 transmission frequency is low and unstable.	Replace U3501, conduct the CT and BT again, and test the phone.
VN1	BT	BT300003	A voltage gap of 0.042 V existed in the battery voltage test.	Keep the sample and conduct further analysis.
VN1	BT	BT300003	A voltage gap of 0.05 V existed in the battery voltage test.	Keep the sample and conduct further analysis.
VN1	Upload	B03A	VREG_S4 output nothing, and U1002 and U1402 were short-circuited.	Replace U1002 and U1402 in order to locate the problem.
VN1	Upload	B03A	VREG_S4 output nothing, and U1002 and U1402 were short-circuited.	U1002 and U1402 were found connected. Report this problem to R&D for further analysis.
VN1	Upload	B03A	VREG_S4 output nothing, VREG_S3 voltage was 2.3 V, all voltages were not stable, and U1002 and U1402 were short-circuited.	Replace U1002 and U1402 in order to locate the problem.
VN1	Upload	B03A	VREG_S4 output nothing.	U1002 and U1402 were found connected. Report this problem to R&D for further analysis.

Stage	Station of Fault	Faulty Item	Symptom	Solution
VN1	Upload	B03A	REG_S4 output nothing, all voltages were not stable, and U1002 and U1402 were short-circuited	U1002 and U1402 were found connected. Report this problem to R&D for further analysis.
VN1	Upload	Upload fails	U3801 was short-circuited, and VREG_S4 output nothing.	U3801 was found defective, which is reported to R&D for further analysis.
VN1	Upload	Upload fails	No port was found.	The VREG_S3 voltage was 3.6 V, and VREG_S4 output nothing. It is determined that U201 is faulty. Keep the sample for further analysis.
VN1	MT	568214	The coaxial cable was poorly connected to the sub-board.	Check with the production line and R&D first, re-connect the cable to the sub-board, and test again.
VN1	BT	300031	C3502 has a current leakage of 1.5 mA.	Remove C3502 and test again.

10 Principles and Failure Analysis

The U8950 is a bar-type W-CDMA mobile phone independently developed by Huawei. It uses the MSM8225+PM8029 chip solution provided by Qualcomm.

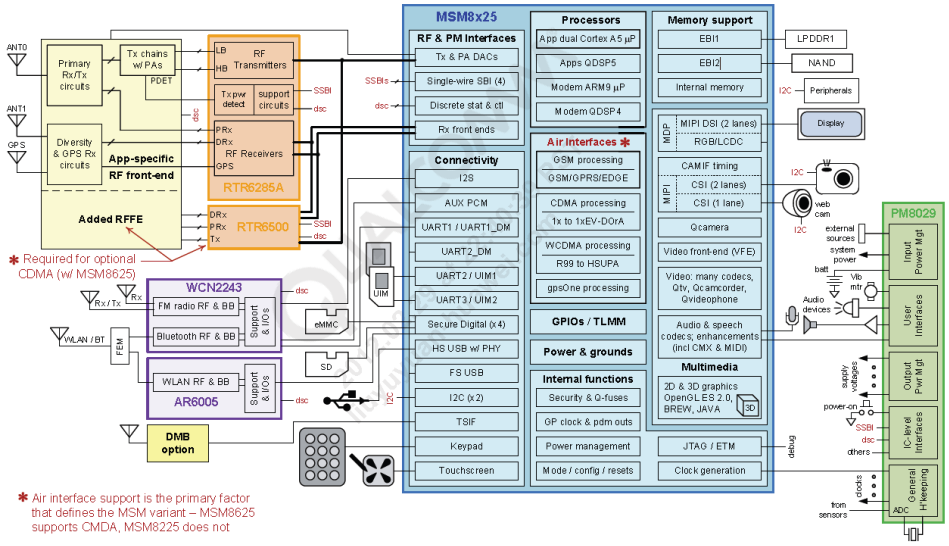


Figure 1-1 MSM8x25 functional block diagram and example application

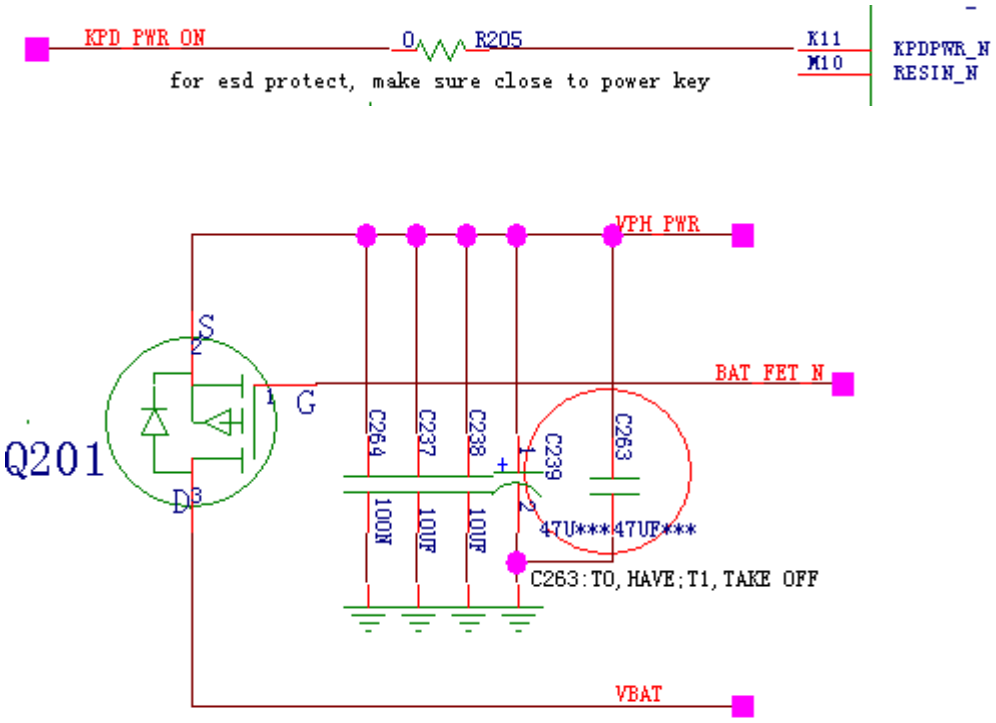
The PCBA incorporates MSM8225, PM8029, and RF units. The LCD connects to the PCBA by means of FPC; the receiver and speaker connect to the PCBA using shrapnel and FPC; the microphone and vibrator are soldered to the PCBA; the RF antenna connects to the PCBA using shrapnel. All the preceding units plus the covers and battery comprise a finished mobile phone. Besides the basic voice and message functions, the U8950 also provides two storage methods for contacts and messages: on the UIM card or internal storage of the mobile phone. The U8950 supports storage on the microSD card. It also supports the FM radio and recording function.

The U8950 uses a color TFT LCD with a resolution of 800 x 480 pixels. It provides a micro-USB charging port and UIM card slot and supports polyphonic ringtones, vibration, and FM functions. The RF antenna is built-in. The battery capacity is 1930 mAh, with a standby time of 420 to 440 hours (dependent on the actual network) and a talk time of six to eight hours (dependent on the actual network).

10.1 Baseband Unit

10.1.1 Startup Management Circuits

Circuit Block Diagram



Working Principle

The U8950 uses an independent power management chip PM8029, with the startup principle controlled using Qualcomm codes. During the startup process, the PM8029 power management chip converts the main power supply voltage (VHP_PWR) to various voltages listed in the following table.

Type/name [1]	Default conditions [5] OPT_1 = GND	Operating range	Intended use [6]
SMPS – Buck			
S1 (1.2 A)	On, 1.100 V	0.750 to 3.050 V	Processor core
S2 (1.2 A)	On, 1.100 V	0.750 to 3.050 V	Application processor
S3 (800 mA)	On, 1.800 V	0.750 to 3.050 V	Digital pads and EBI
S4 (800 mA)	Off, 2.350 V	0.750 to 3.050 V	High-voltage RF circuits
Linear – 300 mA			
L1 (PMOS)	Off, 2.100 V	1.500 to 3.050 V	RF front-end circuits
L2 (PMOS)	Off, 2.100 V	1.500 to 3.050 V	RF front-end circuits
L7 (PMOS) [6]	On, 2.600 V	1.500 to 3.050 V	RF analog circuits and headphone amp
L12(PMOS)	On, 2.850 V	1.500 to 3.050 V	Camera, LCD, and touch screen circuits
L13 (PMOS)	Off, 2.850 V	1.500 to 3.050 V	Secure digital circuits
L17 (PMOS)	Off, 3.000 V	1.500 to 3.050 V	Wireless connectivity circuits
Linear – 150 mA			
L3 (NMOS)	On, 1.200 V	0.750 to 1.525 V	MIPI DSI circuits
L4 (NMOS)	On, 1.100 V	0.750 to 1.525 V	Digital PLLs
L5 (NMOS)	Off, 1.300 V	0.750 to 1.525 V	Wireless connectivity circuits
L6 (NMOS)	Off, 1.200 V	0.750 to 1.525 V	Wireless connectivity circuits
L9 (PMOS)	On, 1.800 V	1.500 to 3.050 V	TCXO_OUT_D0 buffer, low V USB circuits, MIPI CSI
L10 (PMOS)	On, 3.000 V	1.500 to 3.050 V	eMMC
L14 (PMOS)	On, 3.075 V	1.500 to 3.400 V	High voltage USB circuits
L15 (PMOS)	Off, 1.800 V	1.500 to 3.050 V	USIM2/UICC2 circuits
L16 (PMOS)	Off, 1.800 V	1.500 to 3.050 V	USIM1/UICC1 circuits
L18 (PMOS)	Off, 2.700 V	1.500 to 3.050 V	RF analog circuits
L19 (PMOS)	Off, 1.200 V	1.200 to 3.050 V	Wireless connectivity circuits
Linear – 50 mA			
L8 (PMOS) [2, 3]	On, 2.850 V	1.500 to 3.050 V	VCTCXO circuits and buffers and D flip-flop
L11 (PMOS) [3]	On, 1.800 V	1.500 to 3.050 V	TCXO_OUT_D1 buffer, AMUX, and XO ADC circuits
NCP (200 mA) [4]	Off, -1.800 V	-1.700 to -1.900 V	Headphone circuits

1. Each current listed in this table is its regulator's rated value – the current at which the regulator meets all its performance specifications. Higher currents are allowed, but higher input voltages may be required and some performance characteristics may become degraded. The pass transistor technology is included in this column for all linear regulators (NMOS or PMOS).
2. VREG_L8 powers the VCTCXO circuits. At powerup, the TCXO circuits are under SBI control and will turn on after all the other default-on registers.
3. VREG_L8 and VREG_L11 regulators power key internal circuits and must be left on and set at their default values.
4. VREG_L7 must always be on when the VREG_NCP is in use.
5. All regulators have default output voltage settings, even if they default to an off condition. Some default conditions depend upon the application, and can be set using the optional hardware configuration pin (OPT_1).
6. Intended use of the regulators may vary from application to application. The intended use shown in this table is based upon MSM7x27A application, where OPT_1 is connected to ground.

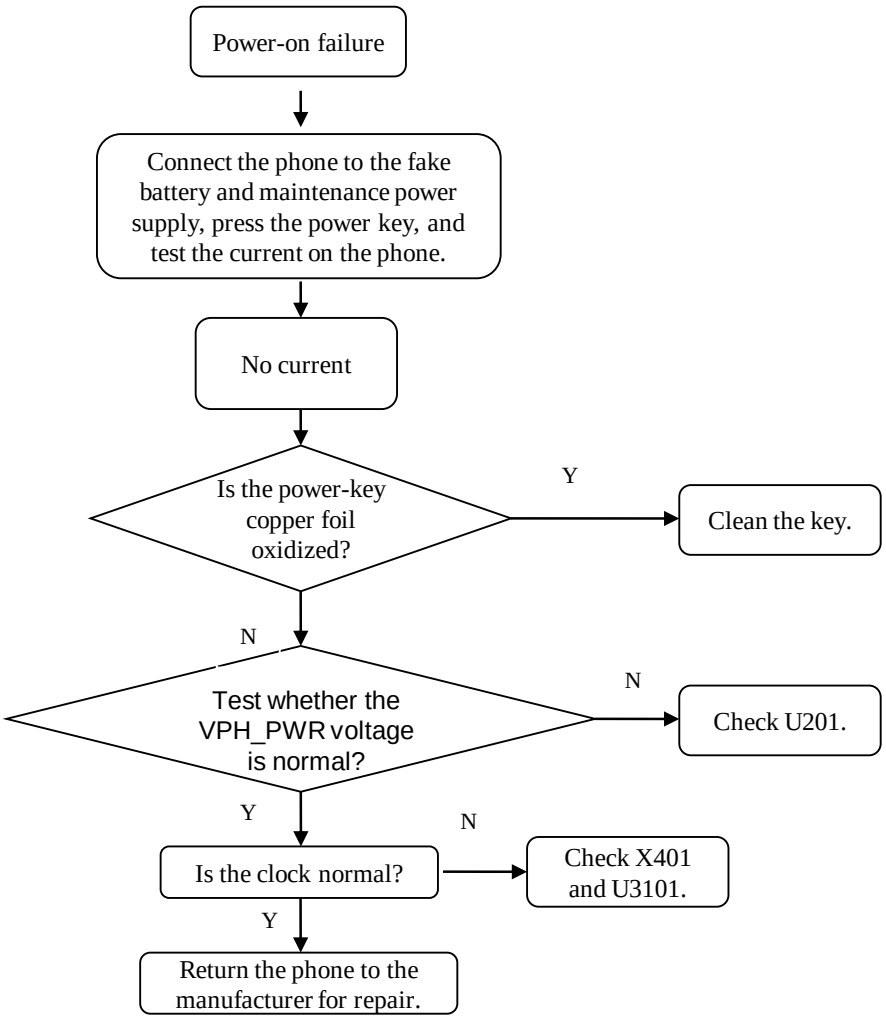
Troubleshooting Process

The startup failure has three types: no current, weak current, or excessive current. Most of startup failures are caused by power supply exceptions. Troubleshoot the faults as follows:

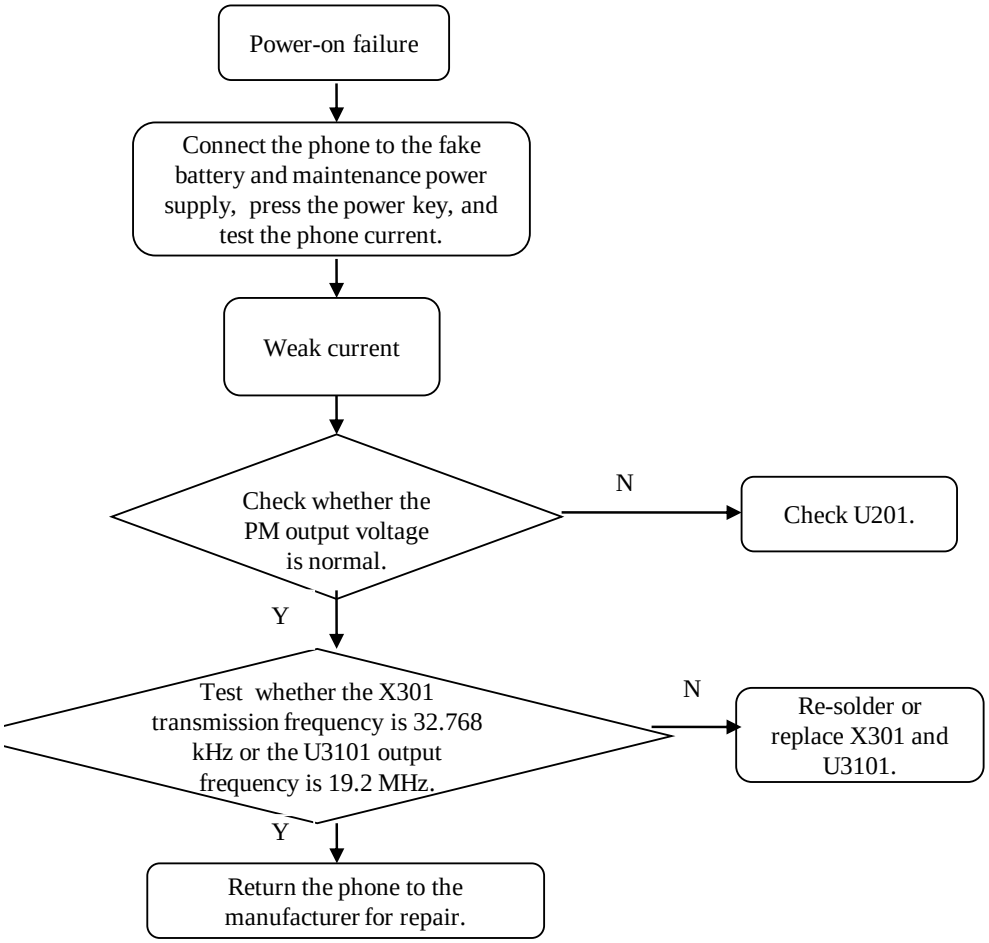
- No current: Power the mobile phone using DC and press and hold the power key. The current is displayed as 0 mA to 5 mA.
- Weak current: Power the mobile phone using DC and press and hold the power key. The current is displayed as 5 mA to 100 mA.
- Excessive current: Power the mobile phone using DC and press and hold the power key. The current is displayed as over 300 mA.

If the U8950 fails to start, locate the fault by checking the startup current when the U8950 is powered using DC.

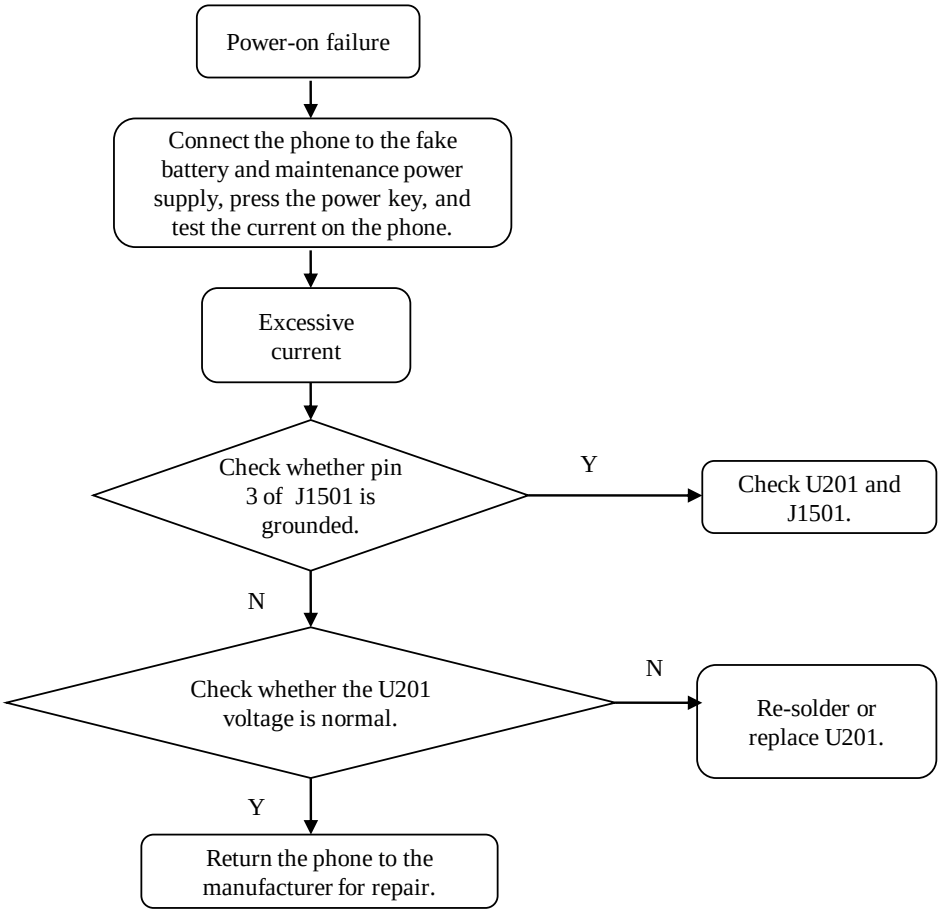
1. No current failure troubleshooting



2. Weak current failure troubleshooting

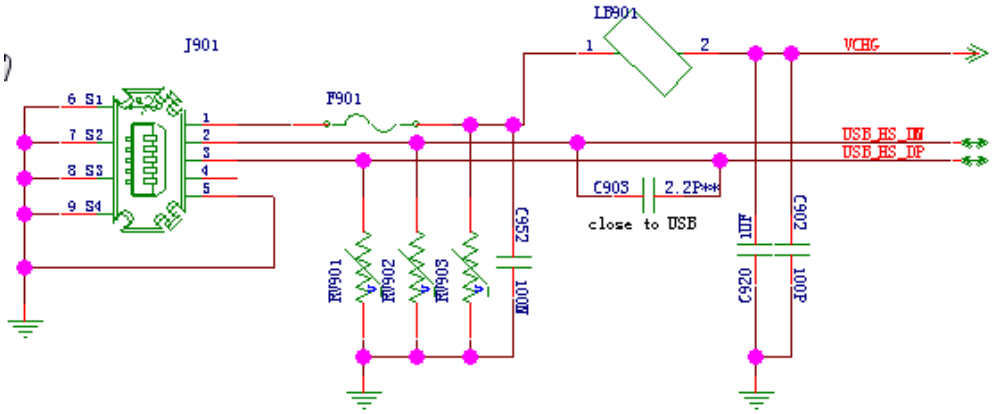


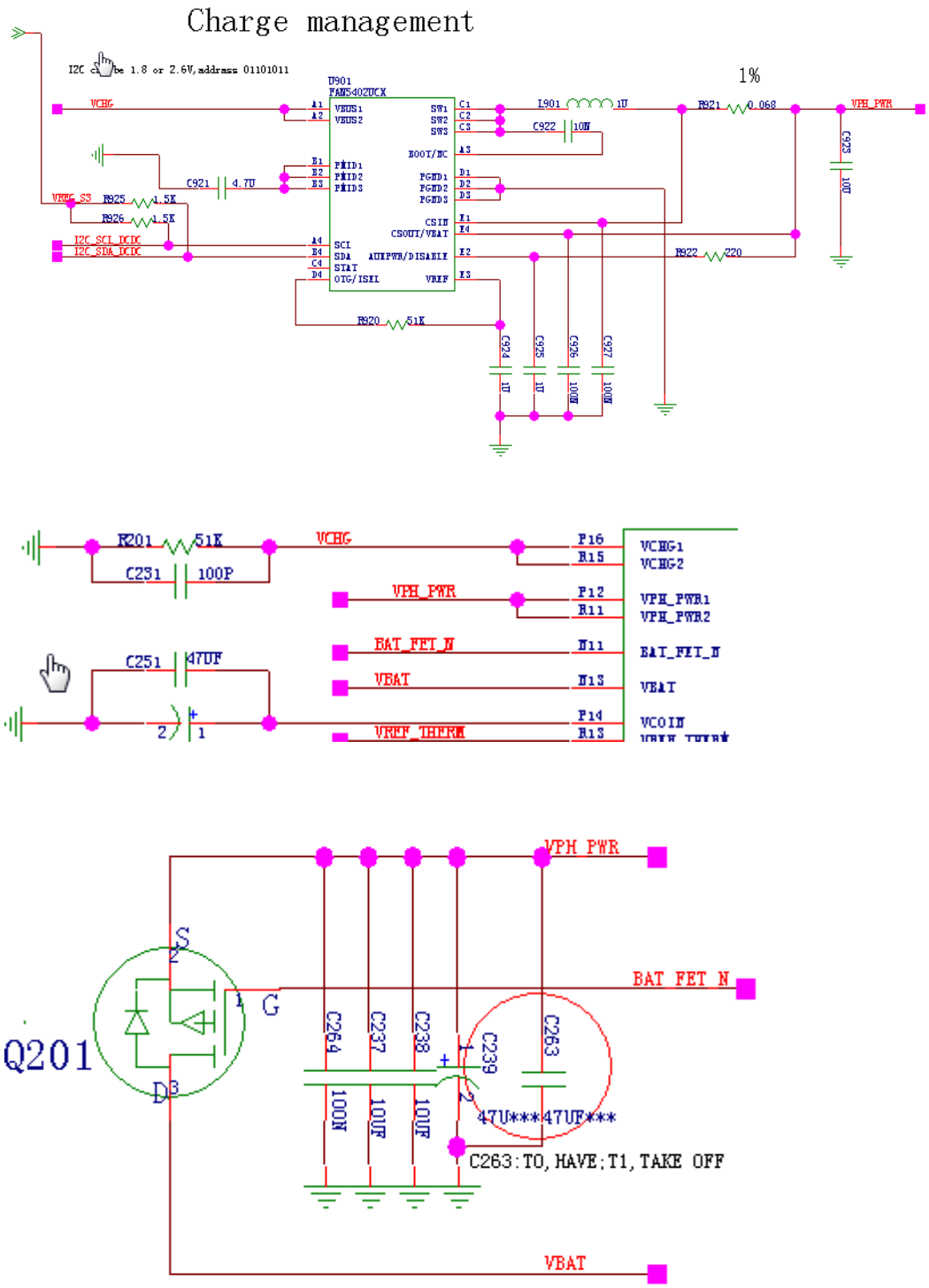
3. Excessive current failure troubleshooting



10.1.2 Charging Management Circuits

Circuit Block Diagram





Working Principle

The PM8029 chip integrates a charging solution, which supports three charging states: trickle charging, constant current charging, and constant voltage charging. The three charging methods adopt the same route: VEXT_DC > VCHG > VPH_PWR > Q201, and pin 3 > VBAT.

The dedicated power chip FAN5402UCX is used to charge the U8095 with a current of 1 A. I2C is used for communication and control with two interfaces GPIO13 (I2C_SCL_DCDC) and GPIO98 (I2C_SDA_DCDC) respectively. This charging management chip (BQ24152) sources the power from VCHAG in the USB interface and is controlled by I2C. The BQ24152 chip outputs VPH_PWR to supply power to the PM and battery.

Figure 10-1 shows the functional blocks of the BQ24152 chip.

Figure 10-1 Charging chip's functional block diagram

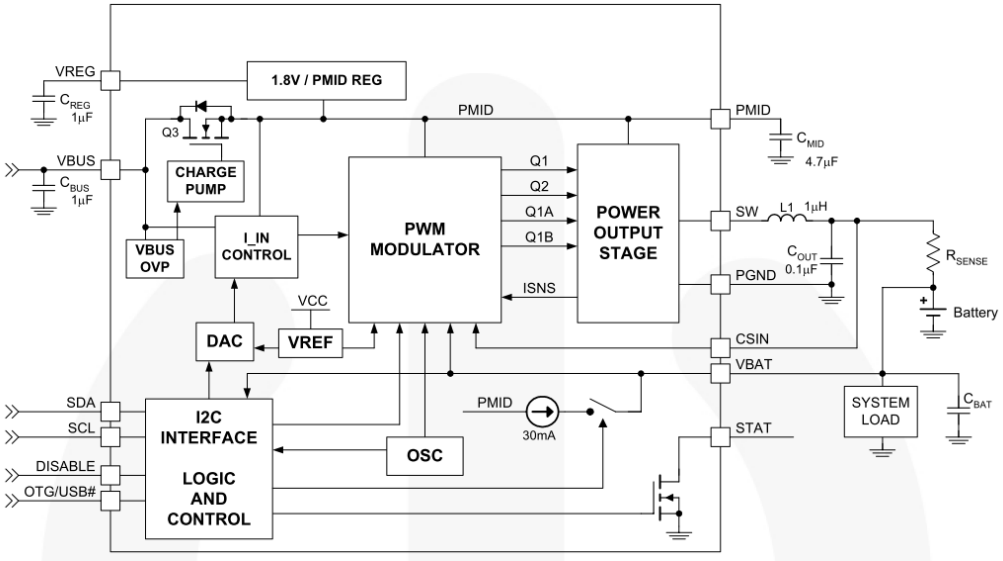
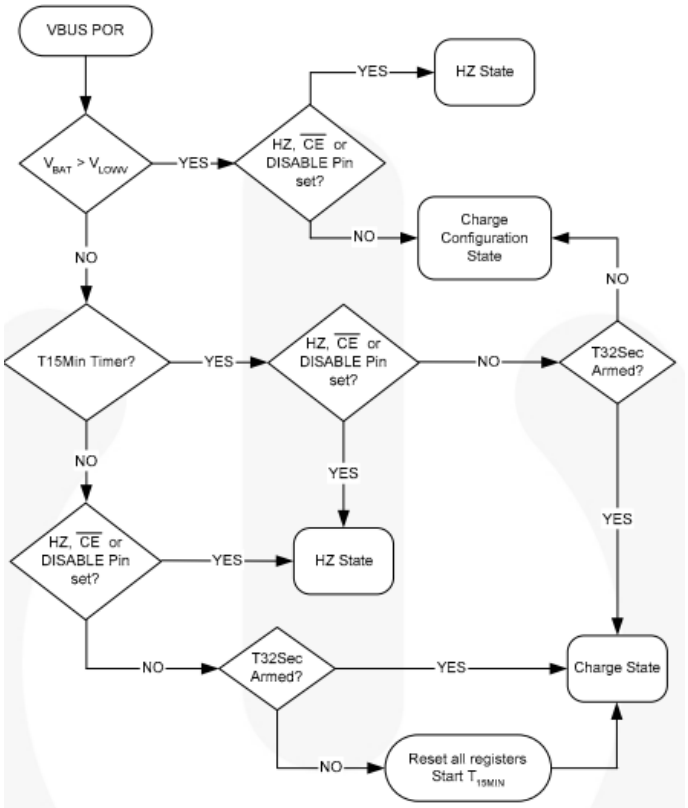
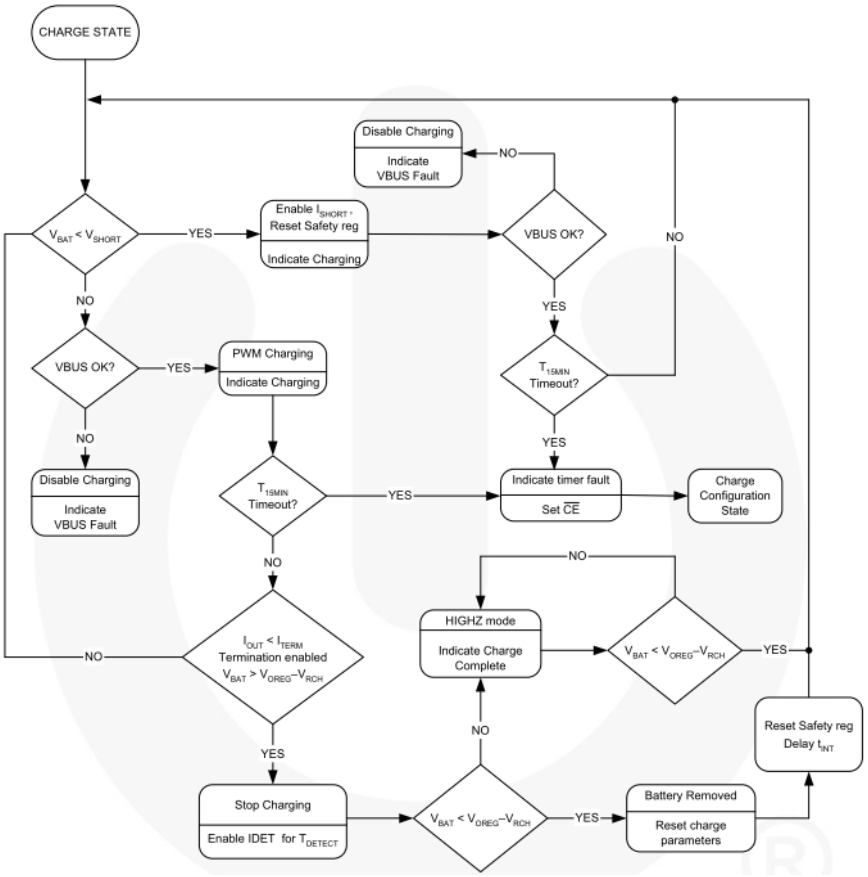


Figure 10-2 shows the charging flowchart.

Figure 10-2 Block diagram of the charging circuit





The BQ24152 chip can work in three modes: charging mode, boost mode, and high impedance mode. In charging mode, the BQ24152 chip starts the charging process normally. Boost mode is USB-OTG mode. In high impedance mode, the BQ24152 chip does not charge the mobile phone and switches to standby mode.

Power the mobile phone using an external power supply (charger or USB), check whether the voltage is higher than VuvloPM and whether VAUXPWR < VLOWV (whether the battery voltage is lower than the maximum battery voltage). If the battery voltage is the highest one, do not charge the mobile phone; otherwise, perform the charging.

Interpretation of the voltages and currents:

V (SHORT): voltage in the beginning of constant current charging after the trickle charging ends

V (OREG): voltage in the beginning of constant voltage charging after the constant current charging ends

IO (CHARGE): current during the constant current charging

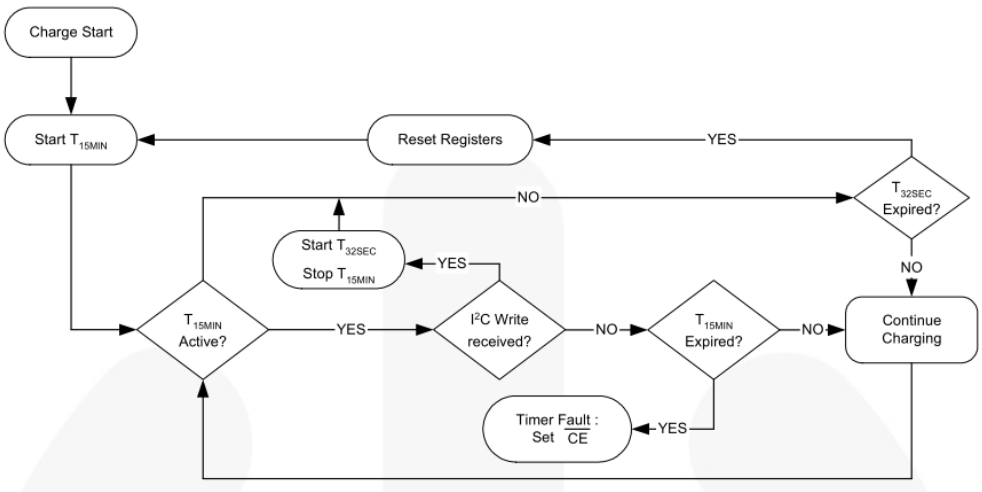
I (IN_LIMIT): limit current during the constant current charging, alternative by IO (CHARGE)

I (SHORT): current during the trickle charging

V(RCH): charging voltage

The chip uses the pin CSOUT to monitor the main voltage. When battery voltage < V (SHORT), the trickle charging starts. When V (SHORT) < battery voltage < V (OREG), the constant current charging starts. When the battery voltage is approximately equal to V (OREG), the constant voltage charging starts. When the charging current is less than a certain value while the voltage is higher than V (RCH), the charging ends. The chip has two built-in timers to save the CPU resources: 15 minutes and 32 seconds. When no I2C control is available, the 15-minute timer is automatically enabled to start charging using loaded parameters. When I2C control is available, the 32-second timer is enabled. Figure 10-3 shows the timers' working flowchart.

Figure 10-3 BQ24152 timers' working flowchart during charging



In actual circuits, the hardware raises the OTG to approximately 1.4 V and limits the maximum current in the beginning of charging to 500 mA. After the charging process is detected, this limitation is removed using software. FAN5402UCX is capable of detecting its own temperature. When TJ reaches the temperature threshold TCF, the current is reduced to end the charging. When TJ is lower than the temperature threshold TCF by 10 degrees, the charging starts again. When the charging voltage VBUS is lower than the sleep charging voltage (VAUXPWR+Vslp), FAN5402UCX enters sleep mode to save the power. FAN5402UCX is also capable of continuously detecting the charging voltage VBUS. When VBUS is lower than the threshold VIN (min), the charging stops and waits for a TINT to re-consider charging.

FAN5402UCX has the following features:

- Charging over-voltage protection
- Battery over-voltage protection
- Battery presence detection
- Start-up without battery

Troubleshooting Process

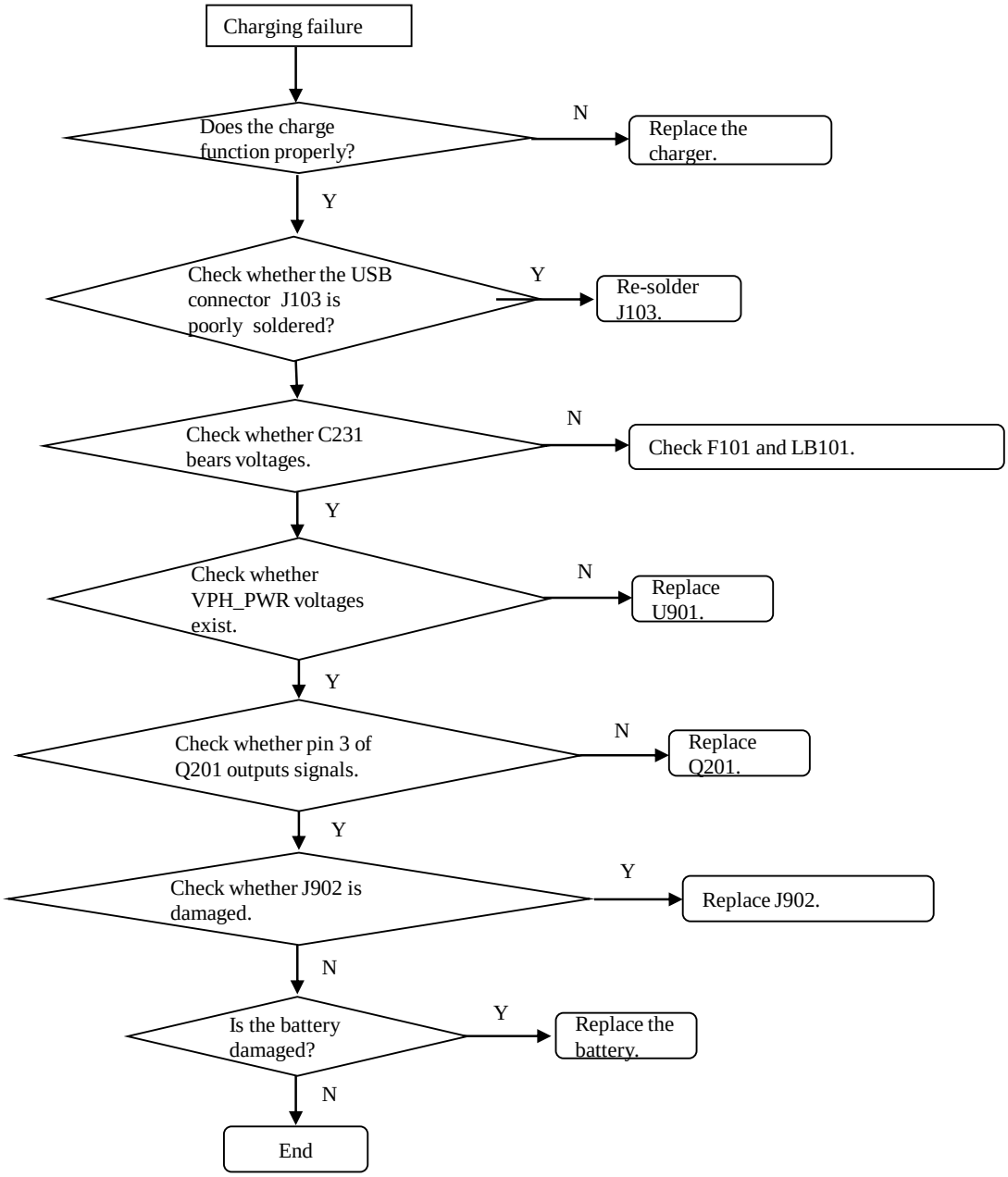
There are two types of common charging failures:

- The phone has no response after a charger is connected to it.
- The phone displays an animated icon indicating that it is charging, but actually, the battery is not charged.

For a mobile phone that fails to be charged, check that the I/O connector is not damaged.

The charging indicator is not displayed when the phone is connected to the charger.

A charging indicator is displayed after the charger is connected to the phone but the phone cannot be charged.

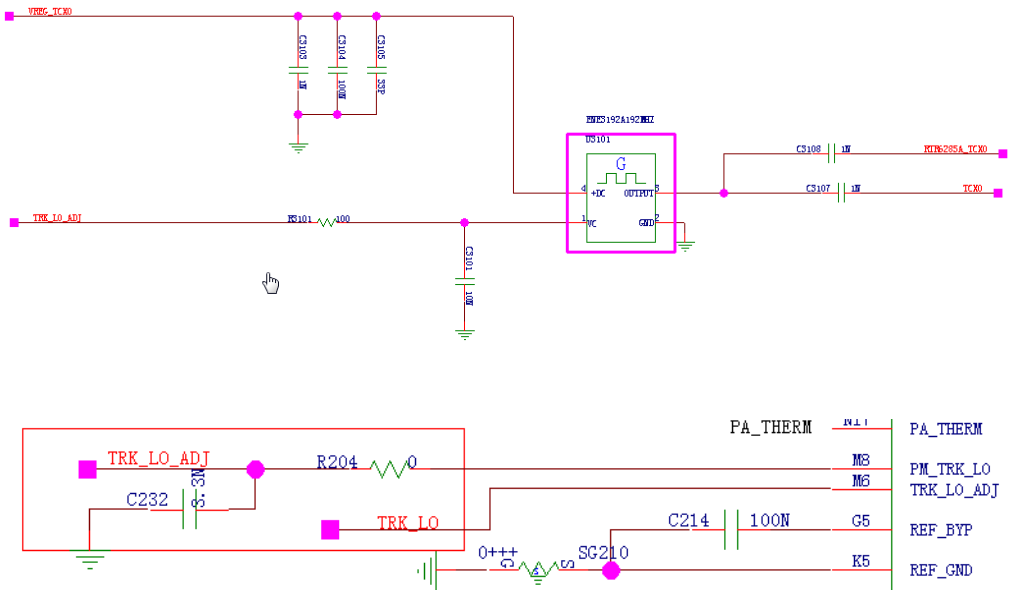

Charging failure
Does the charge function properly?
N
Replace the charger.
Y
Check whether the USB connector J103 is poorly soldered?
Y
Re-solder J103.
Check whether C231 bears voltages.
N
Check F101 and LB101.
Y
Check whether VPH_PWR voltages exist.
N
Replace U901.
Y
Check whether pin 3 of Q201 outputs signals.
N
Replace Q201.
Y
Check whether J902 is damaged.
Y
Replace J902.
N
Is the battery damaged?
Y
Replace the battery.
N
End

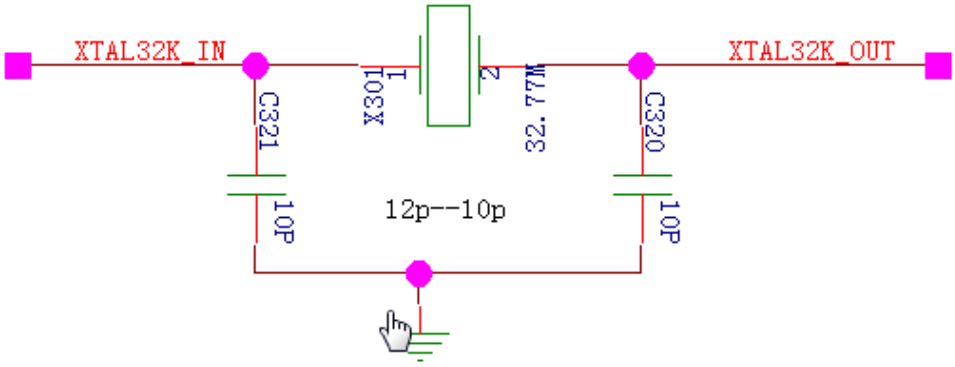
Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
VEXT_DC	Charging current input from a charger	
VCHG	Input of the external USB power supply and the charging chip	0–5 V
I2C_SCL_DCDC	Charge control signal	None
I2C_SDA_DCDC	Charge control signal	None
VPH_PWR	Primary power supply to the power module	Voltage range: 0–4.2 V
BAT_FET_N	Control signal of the MOS (Q201)	
VBAT	Battery voltage	Battery voltage, range: 0–4.2 V
USB_HS_DP	Positive electrode input of USB differential data bus	None
USB_HS_DN	Negative electrode input of USB differential data bus	None

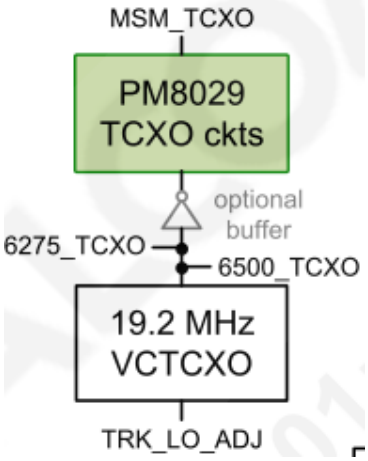
10.1.3 Clock Circuit

Circuit Block Diagram





Working Principle



In the above figure, the 19.2 MHz clock outputs to the PM8029 and RTR6285A. The TPK_LO_ADJ controls the clock output precision. The TPK_LO_ADJ has two filtering circuits: from R204 to C232 and from R3101 to C3101, which outputs to the main chip through the PM8029 as the system main clock.

The 32.768 kHz oscillator signal outputs to the PM8029 and is provided to the system.

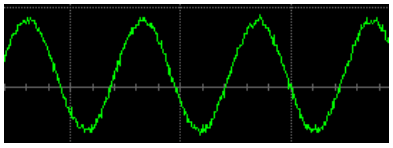
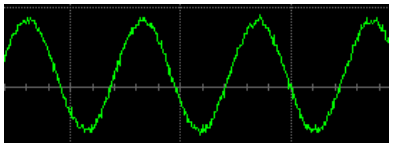
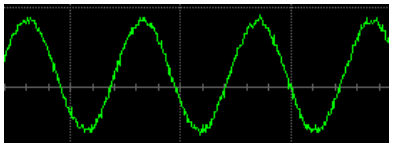
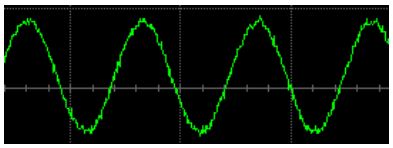
Troubleshooting Process

Failures:

The phone cannot be powered on or frequently freezes. Check whether 32.768 kHz, X301, and U3101 have no output, and whether the output is stable.

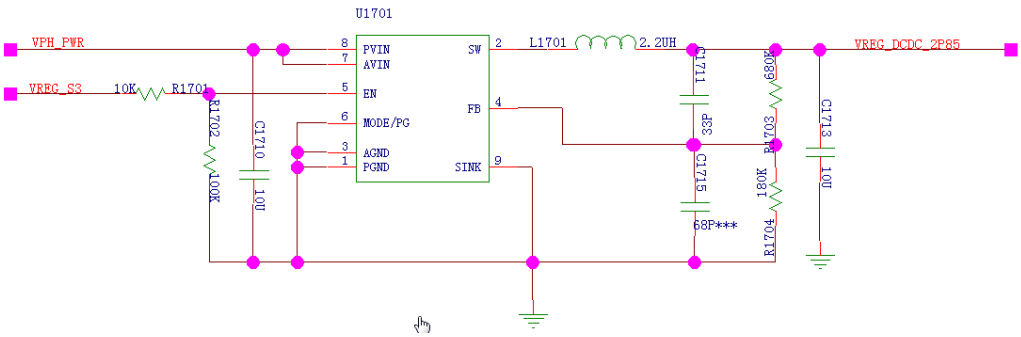
Solution: Replace X301 or U3101. If the problem persists, replace PM8029.

Circuit Diagram Symbols in this Section

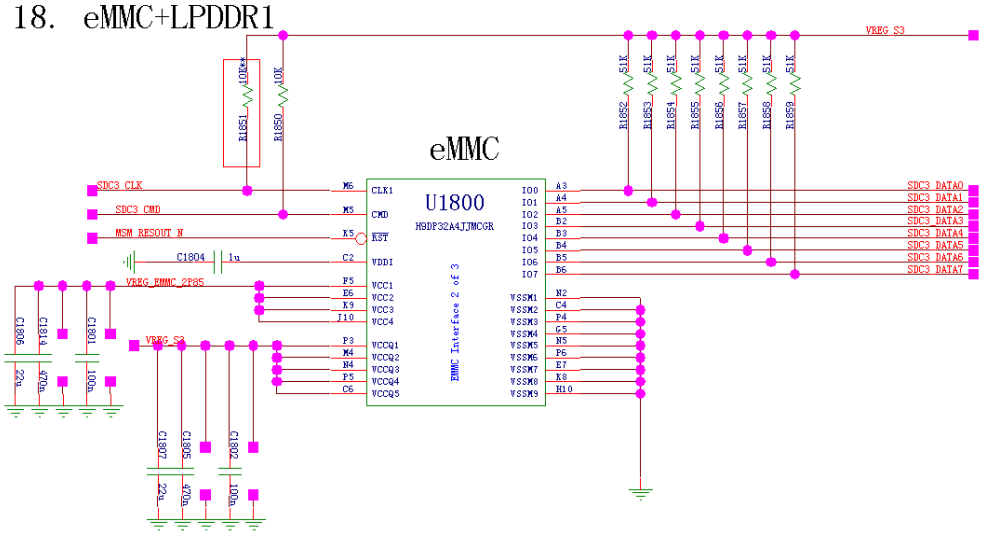
Signal Name	Function	Test Reference Value or Oscillogram
XTAL32K _OUT	Output from the 32.768 kHz main clock	
XTAL32K_IN	Input from the 32.768 kHz main clock	
VREG_TCXO	19.2 MHz oscillator power supply	2.9 V
TRK_LO_ADJ	Control signal of the 19.2 MHz output frequency	None
RTR6285_TCX O	19.2 MHz clock output	
TCXO	19.2 MHz clock output	

10.1.4 Flash Memory Circuit

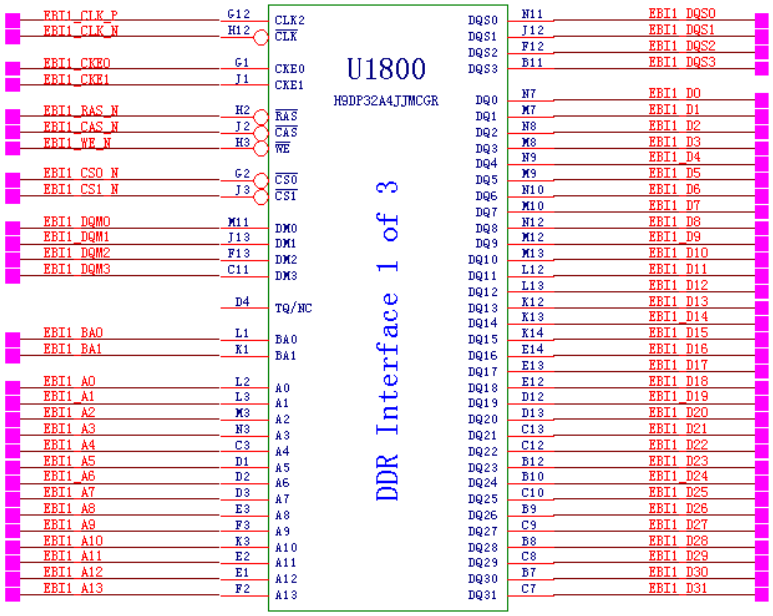
Circuit Block Diagram

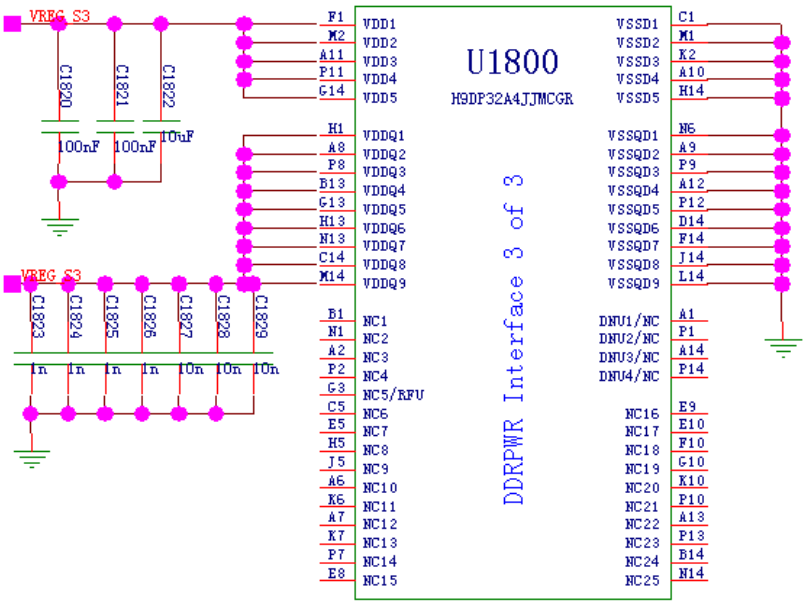


18. eMMC+LPDDR1



LPDDR1

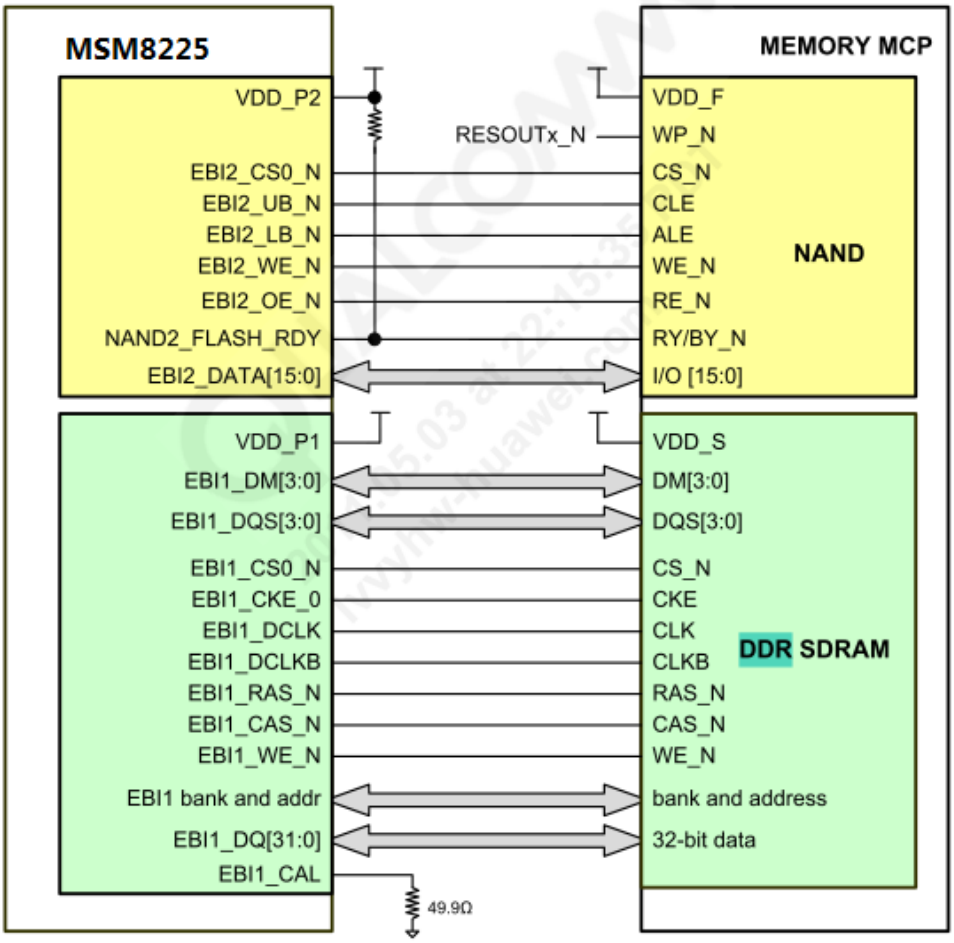




Working Principle

The MSM7227A is able to visit the LPDDR2 through two high-speed buses EBI1. The LPDDR2 is connected to the MSM8255-0 in PoP (Package-on-package) mode. Meanwhile, the MSM7227A can also visit the external storage eMMC through a low-speed bus (EBI2), as shown in the following Figure 10-4.

Figure 10-4 U8950 memory port analysis



The EMMC adopts 8-bit data cable for data transmission, and the U8950 adopts 4 GB EMMC.

Troubleshooting Process

Failure symptom: The phone cannot be powered on, or the startup current is less than 100 mA.

Solution: Upgrade or reinstall the phone's firmware, and check whether the VREG_DCDC_2P85 voltage and peripheral components of the flash memory are normal. If the problem persists, replace U1700.

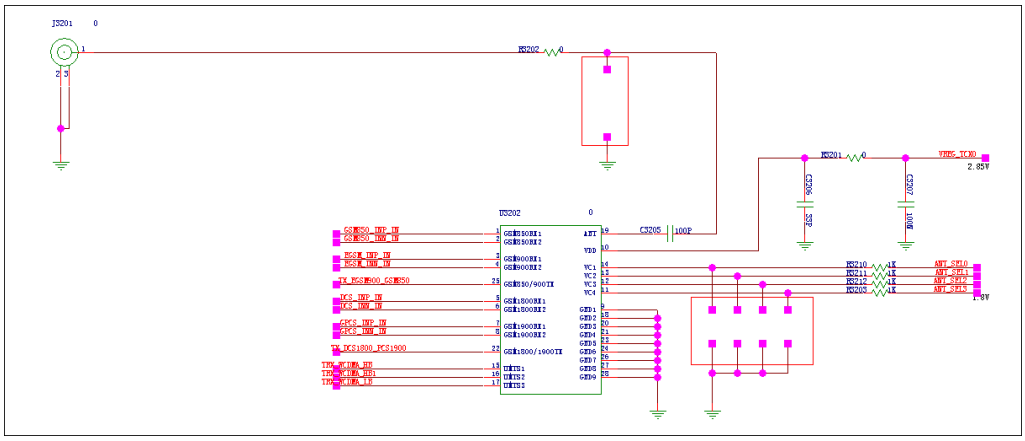
Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
SDC3_DATA3	Data line	
SDC3_DATA2	Data line	

Signal Name	Function	Test Reference Value or Oscillogram
SDC3_DATA1	Data line	
SDC3_DATA0	Data line	
SDC3_DATA7	Data line	
SDC3_DATA6	Data line	
SDC3_DATA5	Data line	
SDC3_DATA4	Data line	
SDC3_CLK	Clock	
SDC3_CMD	Command	
VREG_DCDC_2P85	Flash power	2.9 V
VREG_S3	Power supply	2.9 V
MSM_RESOUT_N	Reset signal	
VPH_PWR	2.85 V system power supply, which supplies power to the DC/DC chip.	

10.2 RF Unit

Circuit Block Diagram

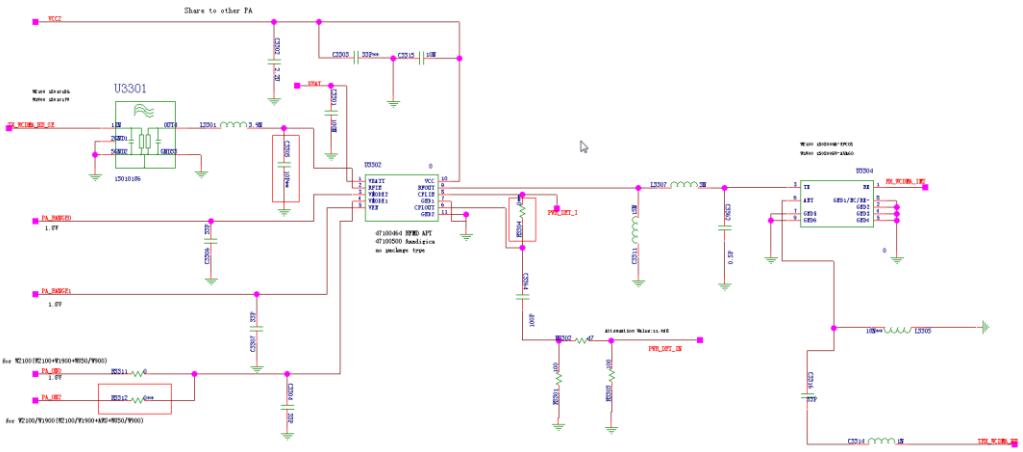


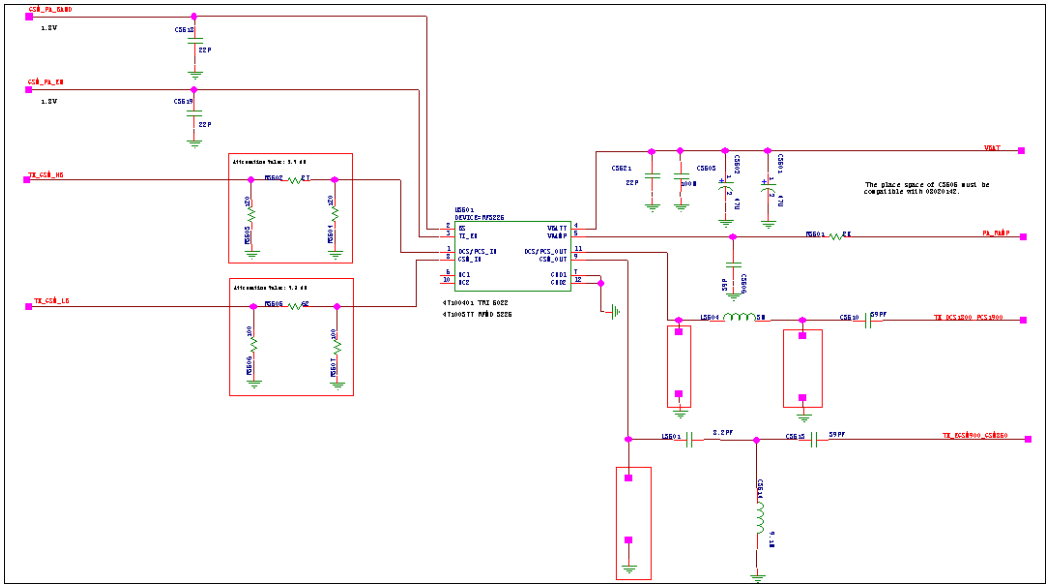
Working Principle

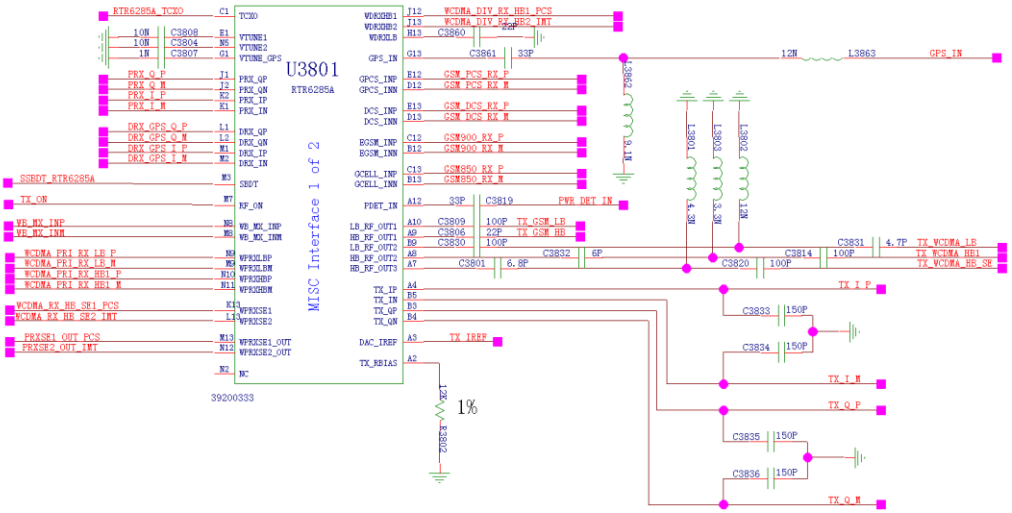
The RF antenna switch model of the main antenna is 47140032. Table 10-1 lists the control logic of 47140032 RF antenna switch. 47140032 RF antenna switch control logic

Frequency Band		ANT_SEL0 (GPIO75)	ANT_SEL1 (GPIO74)	ANT_SEL2 (GPIO73)	ANT_SEL3 (GPIO72)
GSM 850/900	TX	1	1	0	0
GSM 1800/1900	TX	1	0	0	0
GSM 850	RX	0	1	1	0
GSM 900	RX	0	1	0	0
GSM 1800	RX	0	0	1	0
GSM 1900	RX	0	0	0	0
WCDMA2100	TX/RX	1	0	1	0
WCDMA1900	TX/RX	1	0	1	1
WCDMA850/900	TX/RX	1	1	1	0

10.2.1 Power Amplifier

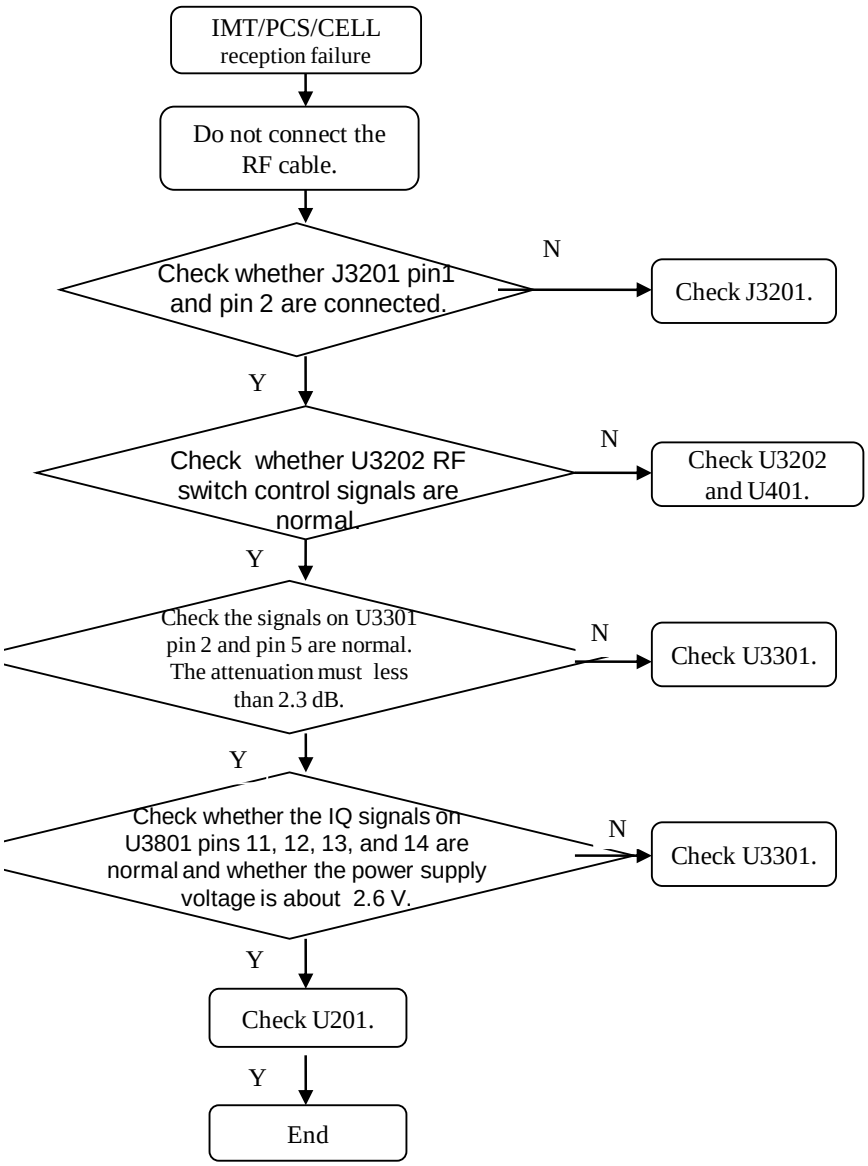






10.2.2 Troubleshooting Process

No-reception failure troubleshooting process for IMT/PCS/CELL is shown in the following.



NOTE

Check the control signals of U3202 switch using a multimeter or oscilloscope. The truth table for control signals is as follows:

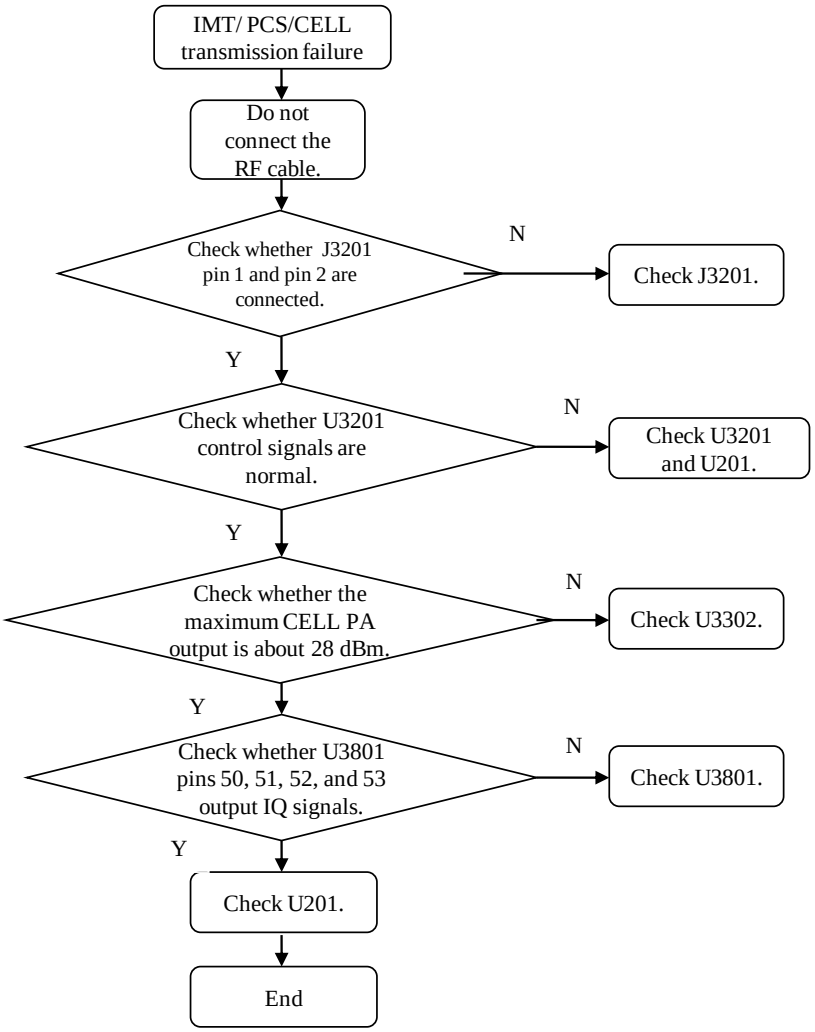
	TRX_IMT	TRX_PCS	TRX_CELL
ANT0	√	/	/
ANT1	/	√	/
ANT2	/	/	√

In W1900, just replace the U3304 detection with U4104 detection.

In GSM, just replace the U3304 detection with U3404 detection.

No-transmission failure troubleshooting process for IMT/PCS/CELL is shown in the following.

Ensure that the SIM card and the antenna are well connected. Then, troubleshoot the fault according to the following procedure.



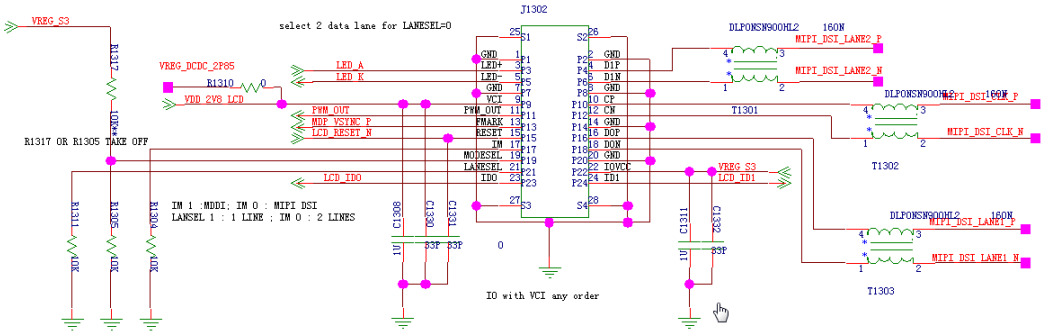
In W900, just replace the U3302 detection with U3402 detection.

In W900, just replace the U3302 detection with U3401 detection.

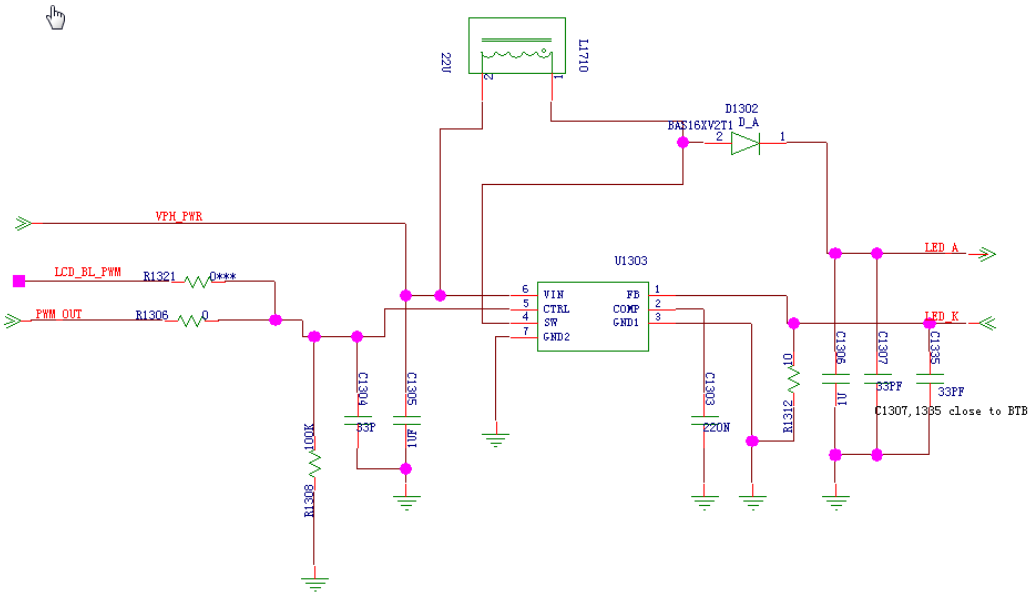
10.3 Peripheral Circuits

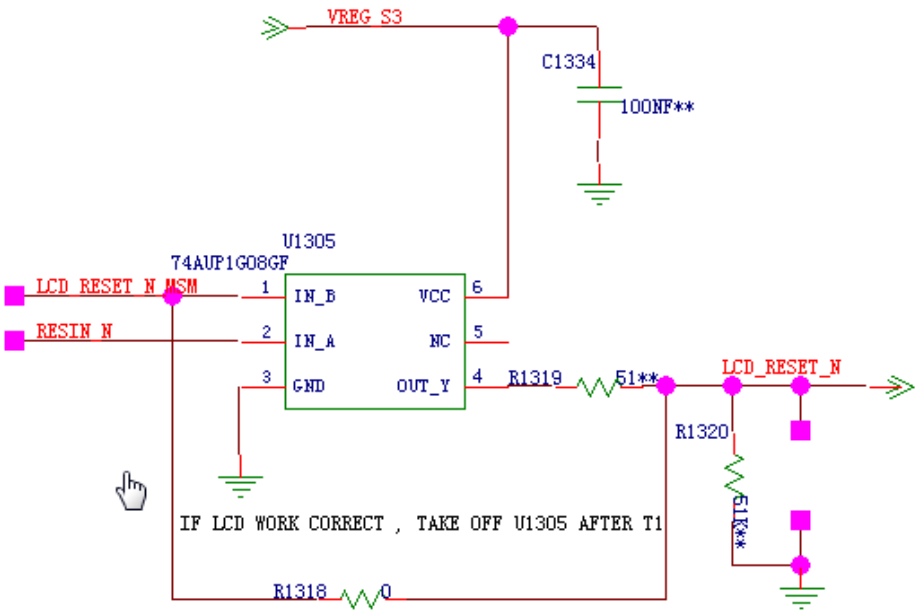
10.3.1 Display

Circuit Block Diagram



LCM backlight driver





Working Principle

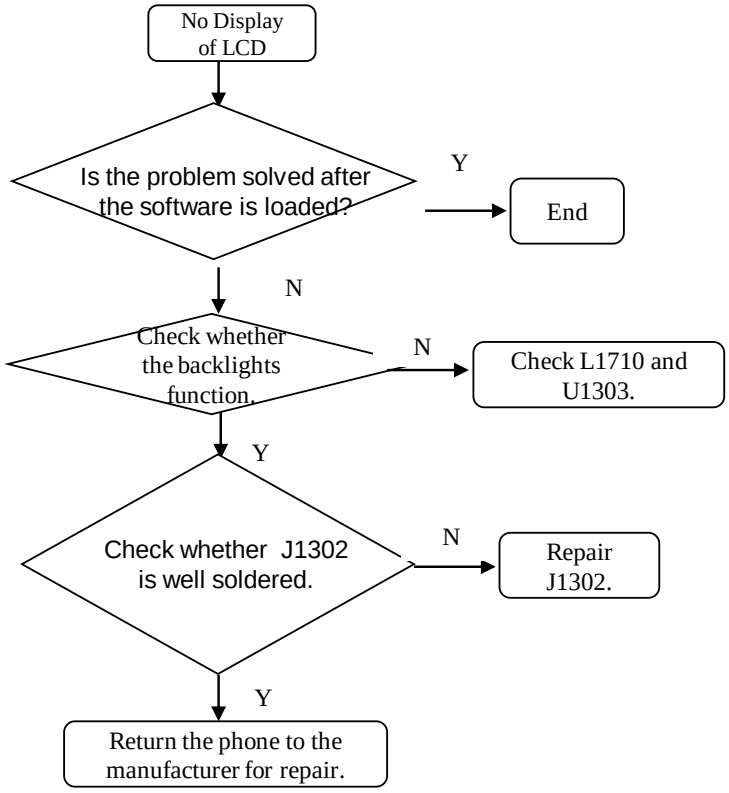
The U8950 uses the TFT 4.5-inch LCD that supports 540 x 960 pixels.

The U8950 LCD employs the MIPI interface. It requires only two pairs of low voltage differential signal (LVDS) cables and a pair of power cables, and supports 60 Hz refreshment rate. With frame synchronization function, the LCD uses MDP_VSYNC of GPIO_030 as the data transmission synchronization signal to avoid LCD breakage.

Troubleshooting Process

Fault symptom: The phone can be powered on, but its LCD is blank.

Solution: Check the LCD.

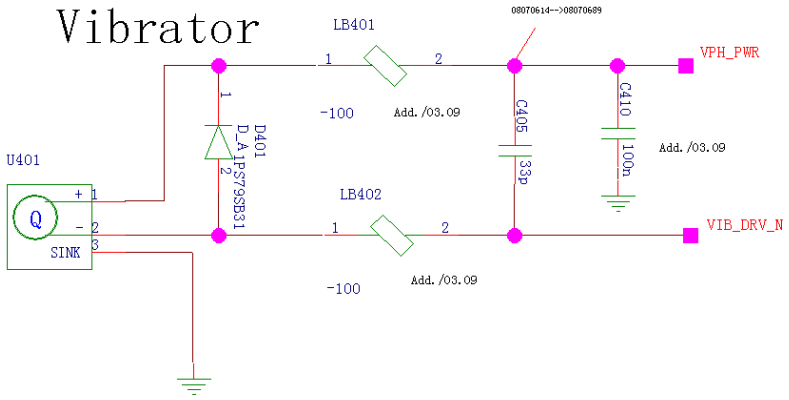


Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
VREG_L12_2P85	LCD analog voltage, 2.8 V	2.85 V
VREG_S3	I/O connector digit voltage	1.8 V
MIPI_DSI_LANE2_P	Differential signals +	1.8 V
MIPI_DSI_LANE2_N	Differential signals –	1.8 V
MIPI_DSI_LANE1_P	Differential signals +	1.8 V
MIPI_DSI_LANE1_P	Differential signals –	1.8 V
LCD_RST_N	LCD power-on reset signal	1.8 V
MDP_VSYNC_P	Vertical sync (VSYNC) signal	1.8 V
LCD_ID0	Supplier ID	1.8 V
LCD_ID1	Supplier ID	1.8 V
MIPI_DSI_CLK_P	Clock differential signal +	1.8 V
MIPI_DSI_CLK_N	Clock differential signal –	1.8 V

10.3.2 Vibration

Circuit Block Diagram



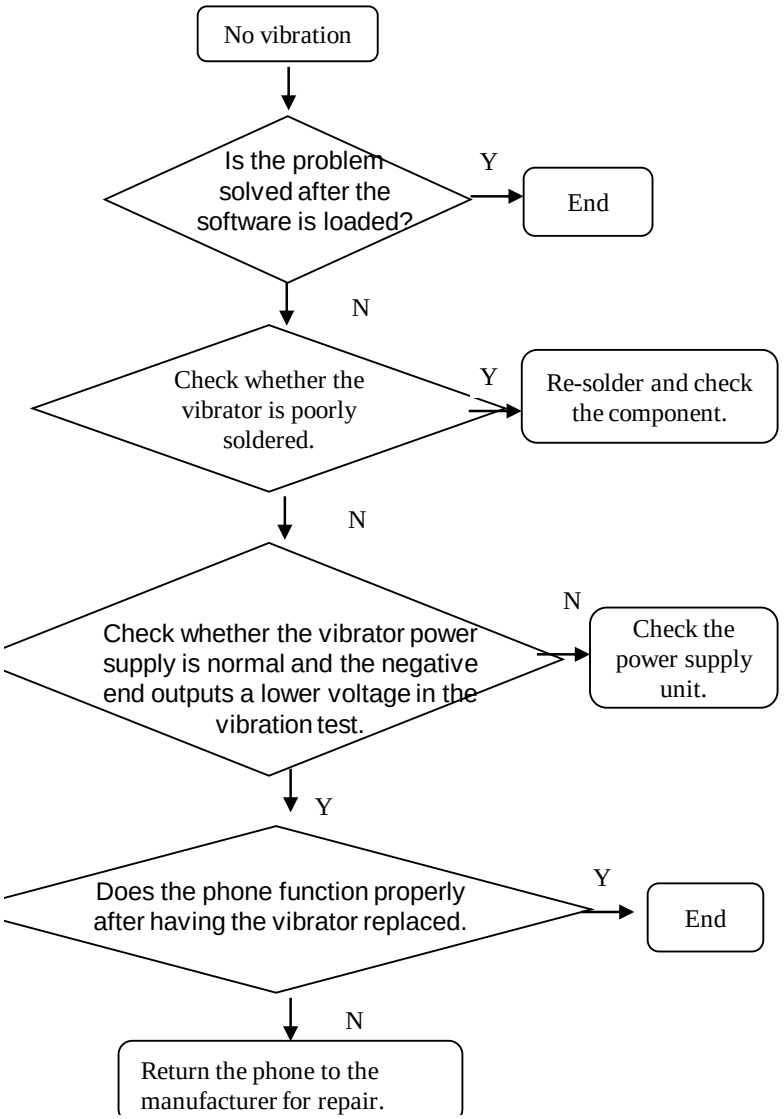
Working Principle

The PM8029's VIB_DRV_N pin functions as the drive pin for the vibrator, which locates on the main board. When the motor is not vibrating, VPH_PWR and VIB_DRV_N are both at high level.

Troubleshooting Process

Failure: The vibrator fails to vibrate.

Solution:

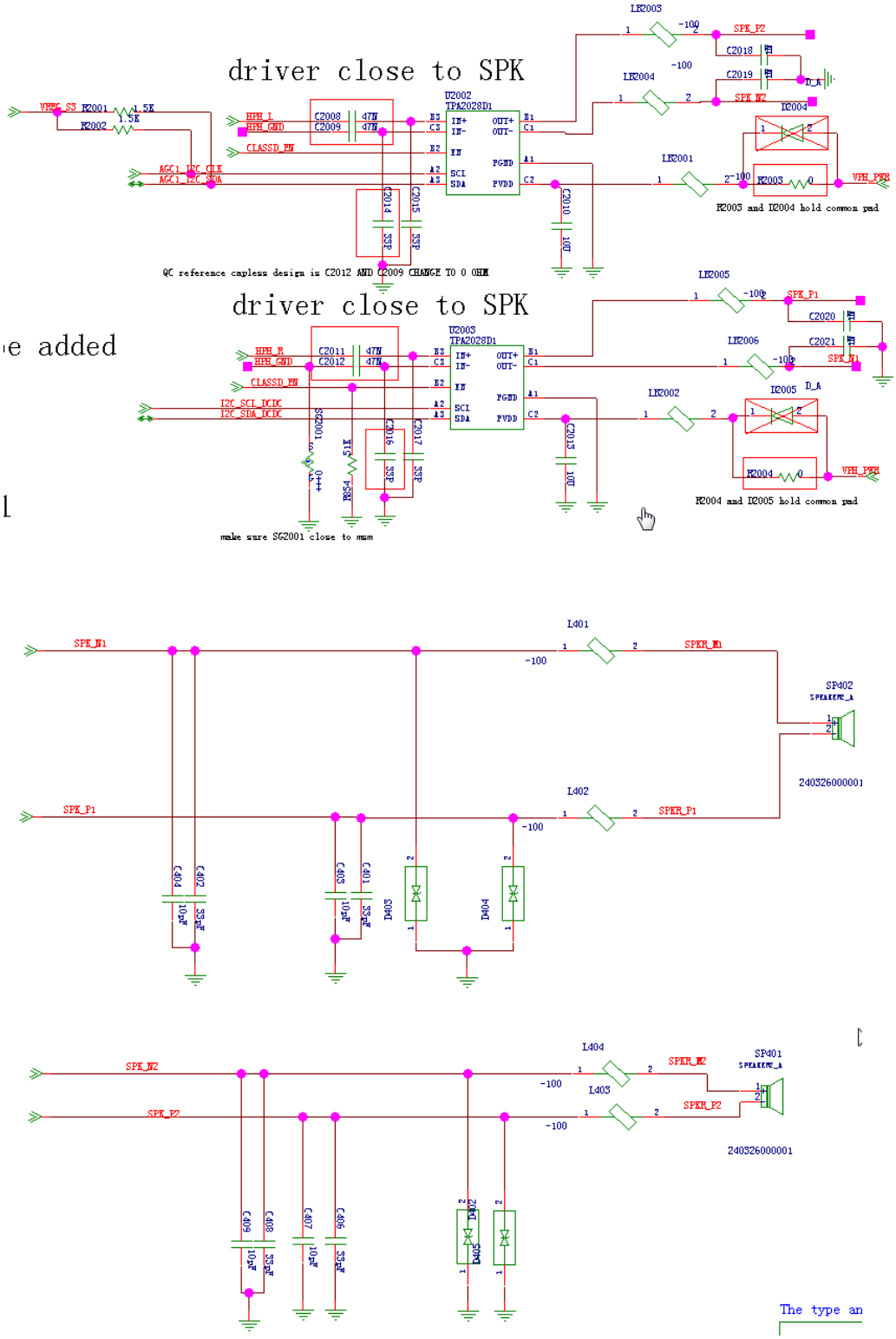


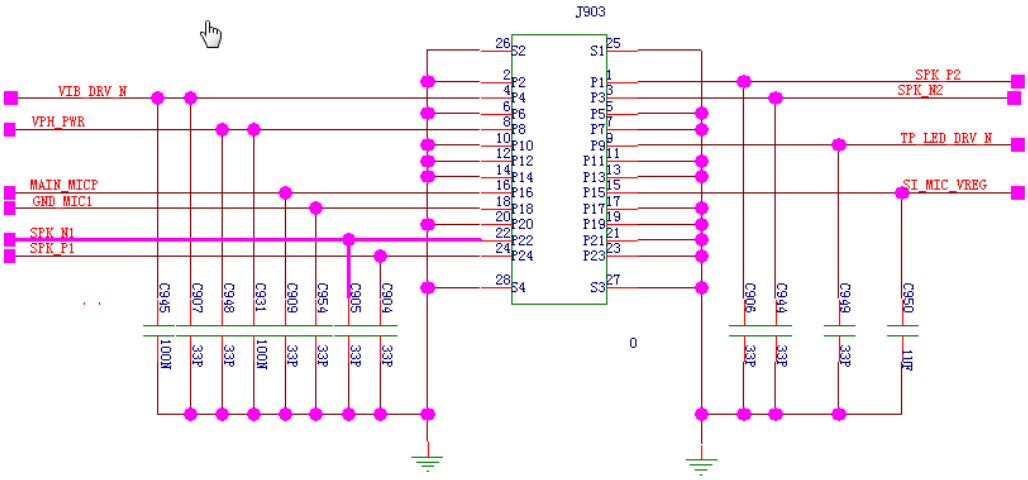
Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
VPH_PWR	Main power supply, supplying power to the motor	None
VIB_DRV_N	Motor drive signal pin, connected to the motor's negative electrode	None

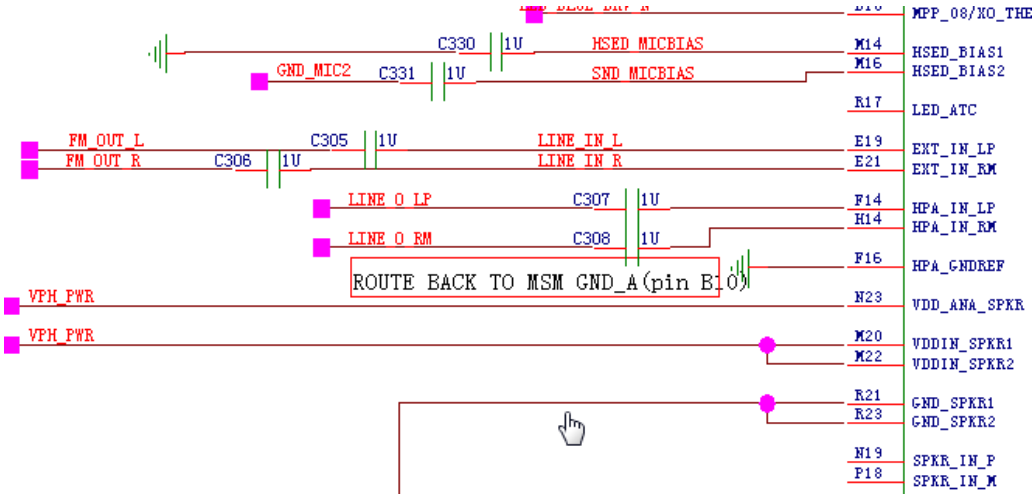
10.3.3 Receiver and Speaker

Circuit Block Diagram





Working Principle



For different vendor different wire direction

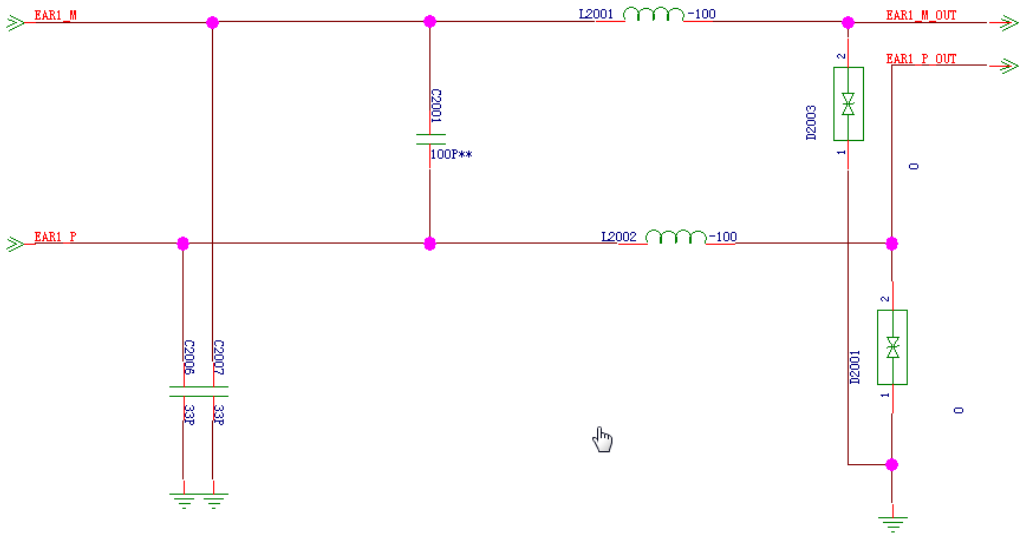
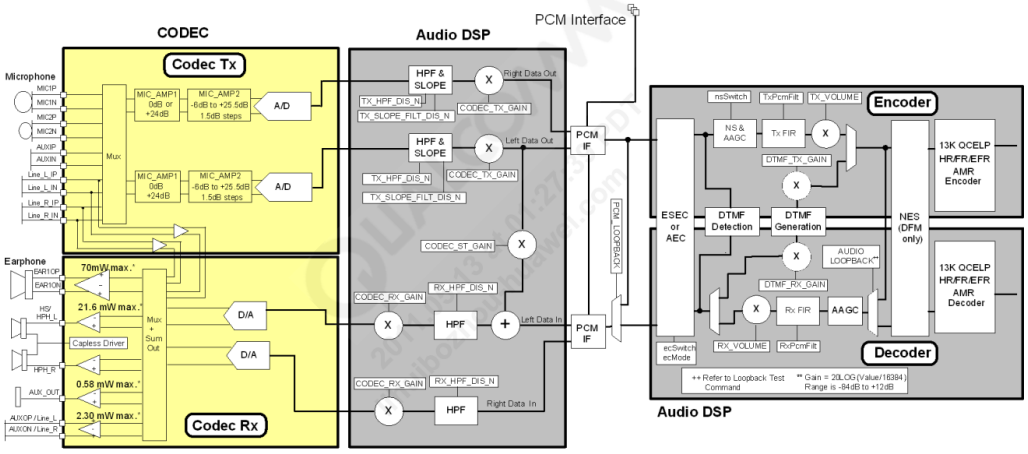


Figure 10-5 Internal structure of the audio processing unit



The U8185 provides three types of audio output:

Receiver output: Signals are output by the CPU.

Speaker output: Signals are output by the PM8029 to the PA and to the speaker.

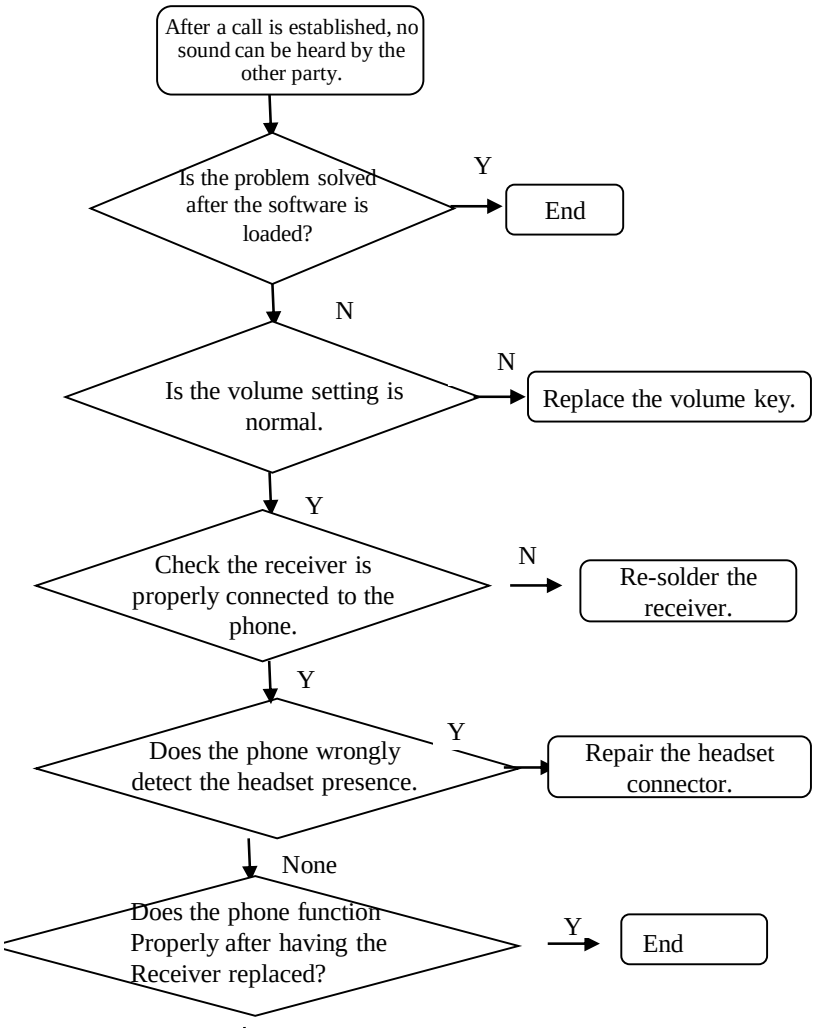
Headset output: The U8185 is designed with a stereo headset.

Signal Name	Function	Test Reference Value or Oscillogram
EAR1_M_OUT	Output to the receiver	None
EAR1_P_OUT	Output to the receiver	None
SPK_P1	Output by the PM8029 to the PA and then the speaker	None
SPK_N1	Output by the PM8029 to the PA and then the speaker	None
SPK_P2	Output by the PM8029 to the PA and then the speaker	None
SPK_N2	Output by the PM8029 to the PA and then the speaker	None

Troubleshooting Process

Failure: After a call is established, no sound can be heard by the other party.

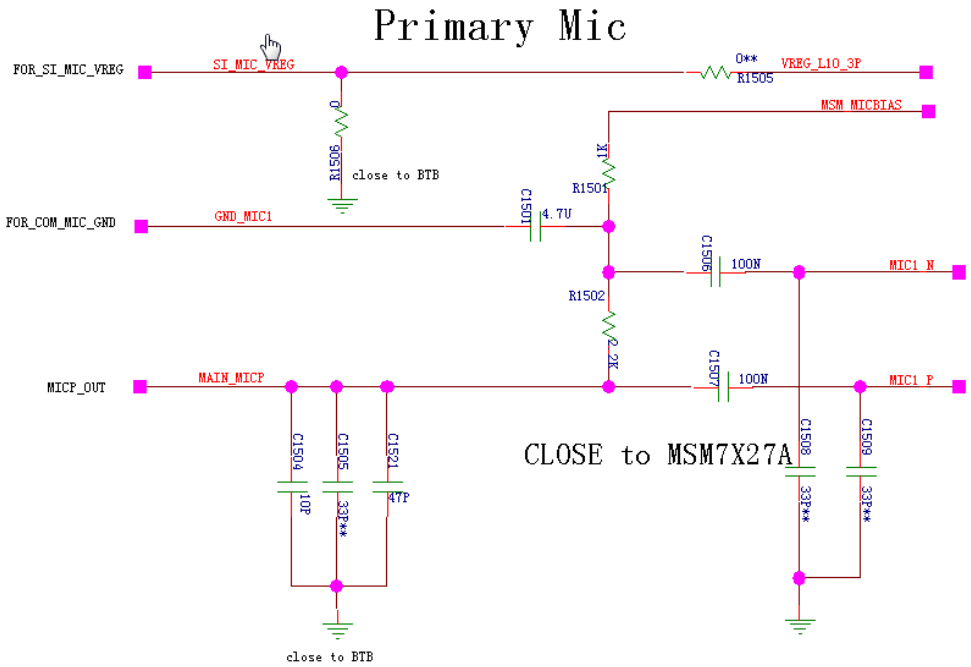
Solution:

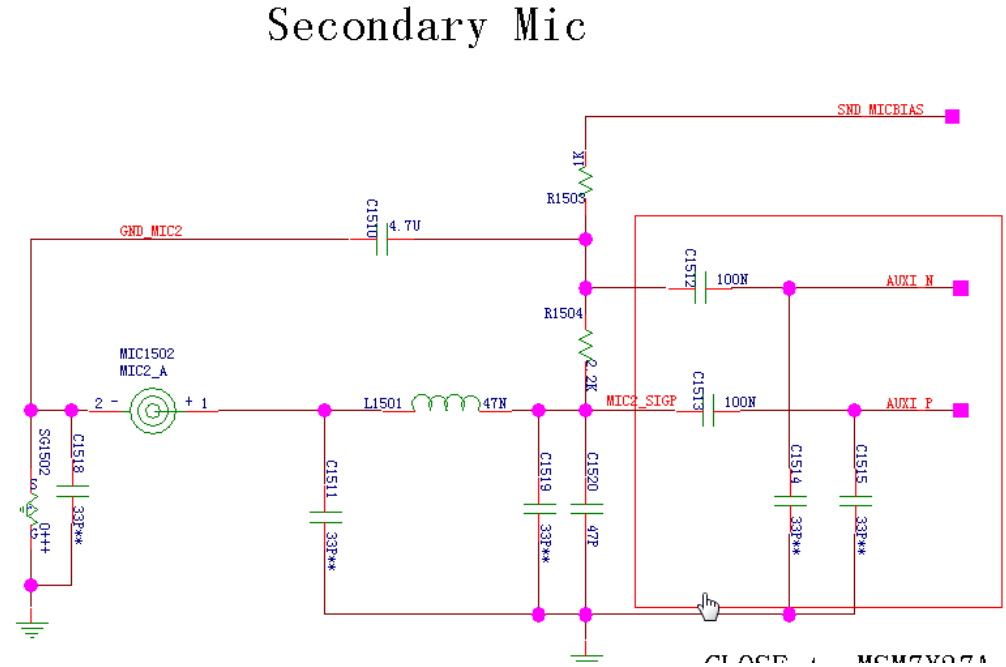


10.3.4 Microphone

Circuit Block Diagram

Primary handset microphone





Working Principle

The U8950 board provides the primary and secondary microphones for collecting different voice signals. The U8950 processes the collected voice signals to filter environmental noises. The U8950 adopts the following power supplies:

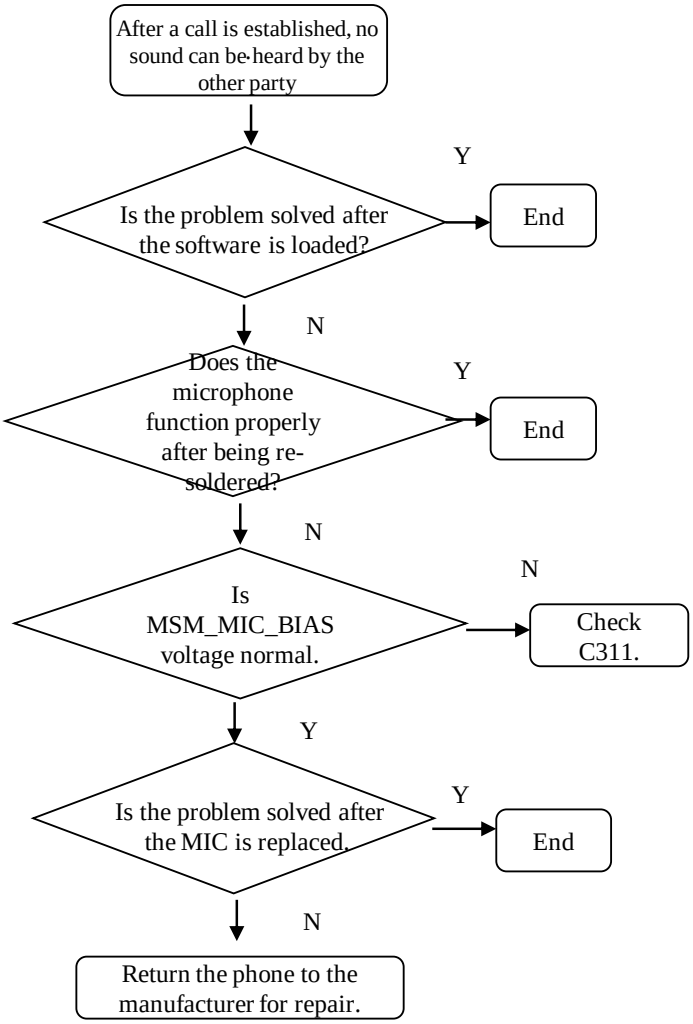
- HSED_MICBIAS: headset microphone PM8029 HSED_BIAS1
- SND_MICBIAS: secondary microphone PM8029 HSED_BIAS2

- MSM_MICBIAS: Primary microphone 7227A MIC_BIAS

Troubleshooting Process

Failure: No sound is picked up or transmitted during a call.

Solution:



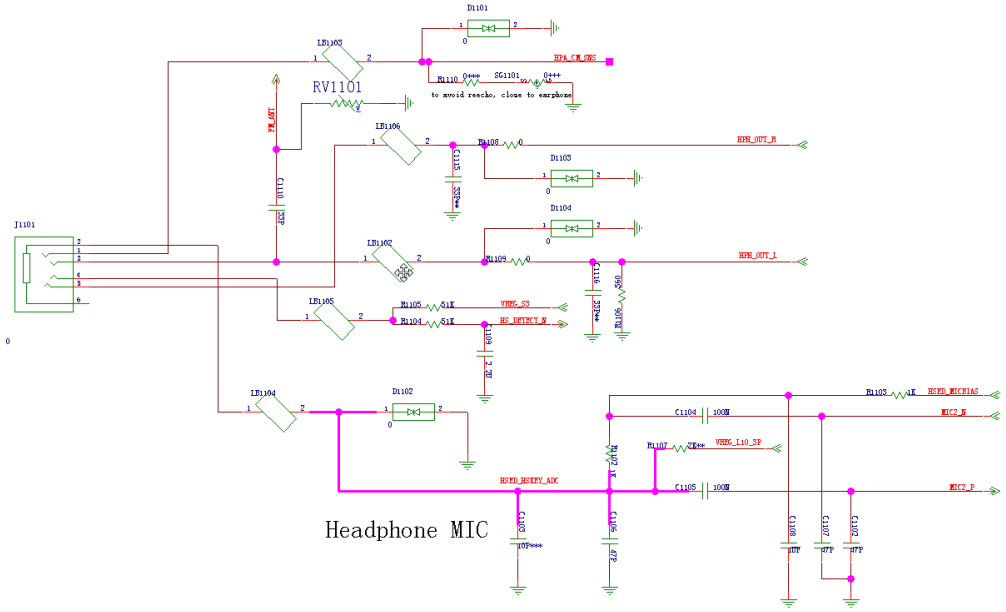
Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
MIC1_P	Primary microphone input	None

MIC1_N	Primary microphone input	None
AUXI_P	Secondary microphone input	None
AUXI_N	Secondary microphone input	None
MSM_MICBIAS	Bias voltage of the primary microphone	None
MICBIAS_SI	Bias voltage of the secondary microphone	None

10.3.5 Headset

Circuit Block Diagram



Working Principle

The earphone connect status is identified according to the HS_DETECT_N (GPIO_026).

Before connecting the headphone, HS_DETECT_N is pulled up to high level by VREG_S3.

After connecting the headphone, HS_DETECT_N is dropped down to low level.

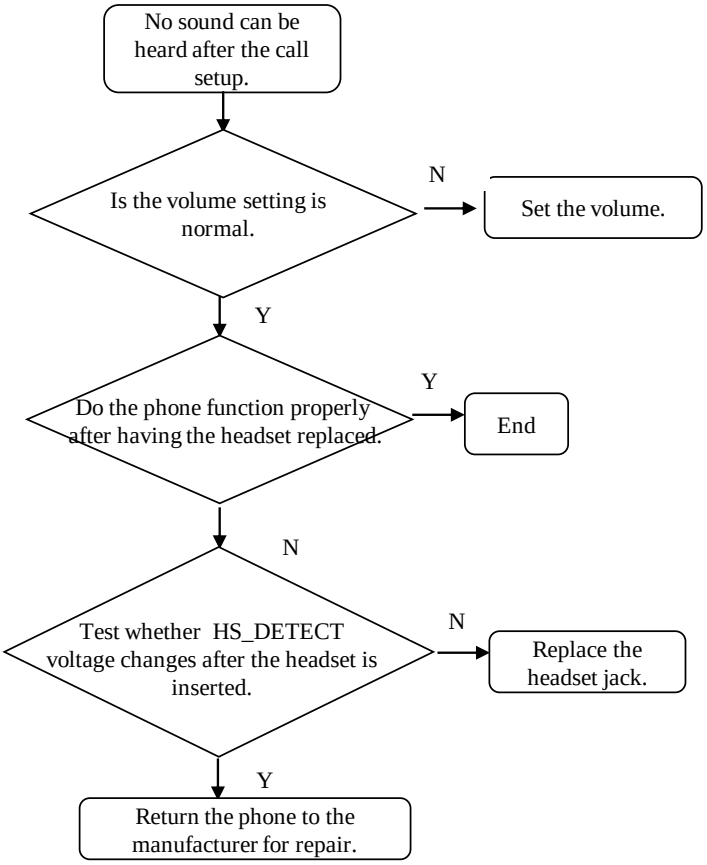
The headphone MIC is supplied with power by MIC_BIAS1 (PM8029/HSED_BIAS1), and it is used for headphone answer detection.

U8950’s headphone is compatible with two line sequences. The iphone's headphone line sequence is compatible by default. The pull-up voltage is L10 3V.

Troubleshooting Process

Failure: No sound can be heard from the headphone.

Solution: Replace the headset or the headset connector.



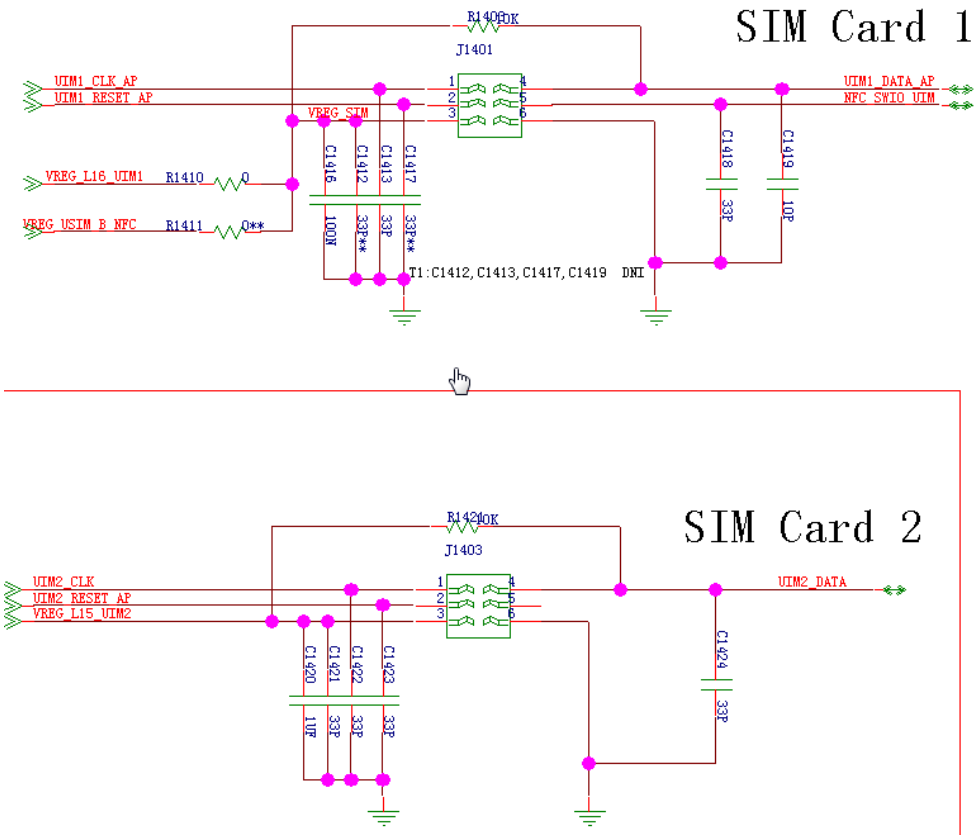
Circuit Diagram Symbols in this Section

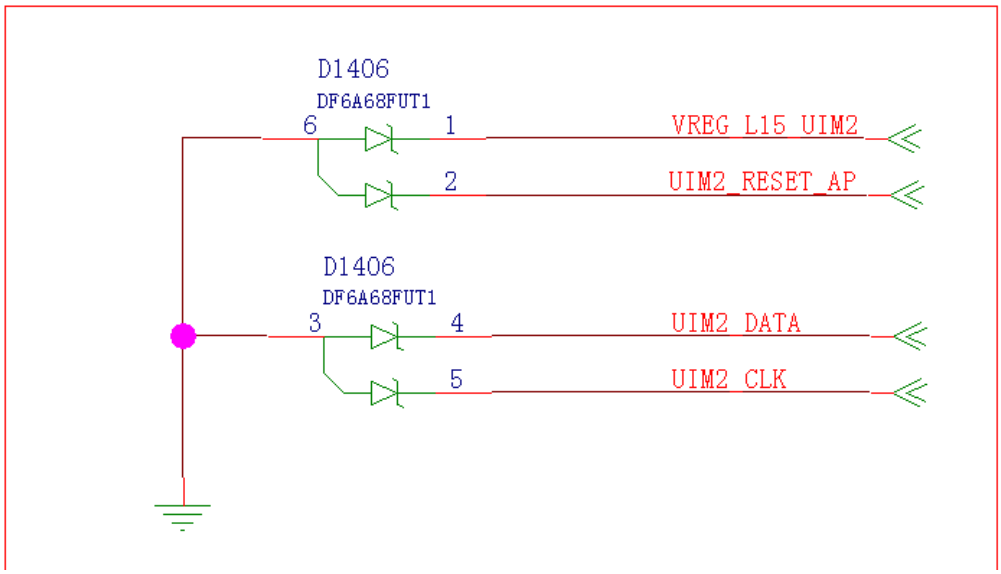
Signal Name	Function	Test Reference Value or Oscillogram
FM_ANT	FM antenna	None
HPH_OUT_L	Stereo headset output	None
HPH_OUT_R	Stereo headset output	None
HSED_MICBIAS	Headset microphone bias voltage	Voltage signal
MIC2_P	Input from the headset microphone	None
MIC2_N	Input from the headset microphone	None

Signal Name	Function	Test Reference Value or Oscillogram
HSED_HSKEY_ADC	Headset microphone test	Voltage change
HS_DETECT	Headset insertion detection	Voltage change
GND_MIC3	Grounding signal of the headset microphone	None

10.3.6 SIM Card

Circuit Block Diagram



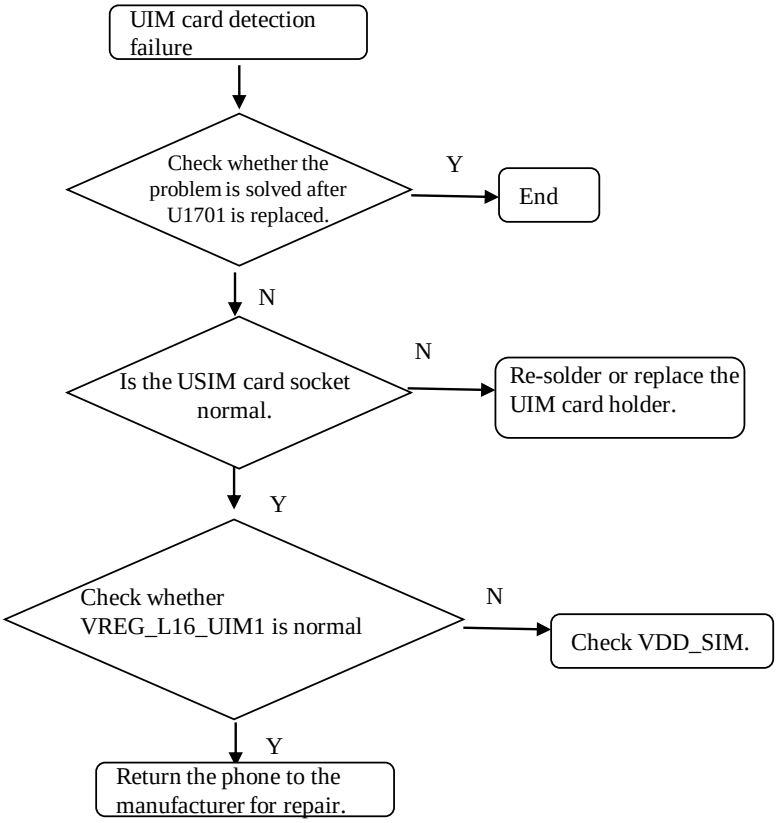


The U8950 SIM card interface is controlled by the input and output signals provided by the PM8029.

Troubleshooting Process

Failure: The USIM card cannot be detected.

Solution: Verify that the UIM card slot is normal.



Circuit Diagram Symbols in this Section

The PM8029's MPP pin converts the level for connecting to the SIM card.

The voltage of VREG_L16_UIM1 can be set to 1.5–3.05 V. The USIM interface's operating voltage is usually 1.8 V or 3.0 V. The following table describes the voltage level conversion interface of the PM8029.

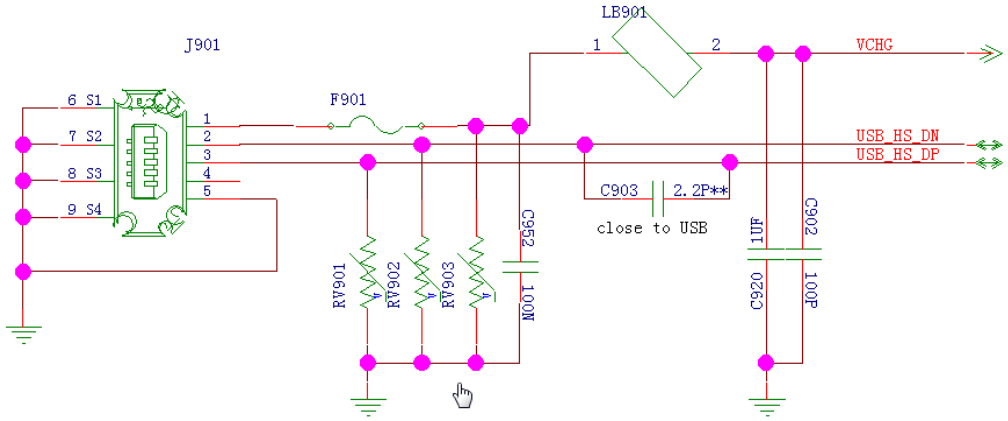
Signal for Interfacing with the MSM	Voltage Level	Signal for Interfacing with the USIM Card	Voltage Level
	VREG_S3	UIM1_RESET_AP	VREG_L16_UIM1 (configured by the phone's firmware)
UIM1_MSM_CLK		UIM1_CLK_AP	
UIM1_MSM_DATA		UIM1_DATA_AP	

NOTE

Transient-voltage-suppression (TVS) diodes are added to the circuit to provide ESD and surge protection, because SIM card operations are frequent.

10.3.7 I/O Connector

Circuit Block Diagram



Working Principle

When connected to the I/O connector (USB connector), a charger provides the VCHG charging voltage to charge the battery.

When the phone is connected to a computer using a USB cable, USB_HS_DN and USB_HS_DP are used for communication (for upgrading the phone's firmware, reading information from the phone and so on) between the phone and the computer.

Troubleshooting Process

Failure: The phone cannot be charged or detected by a computer.

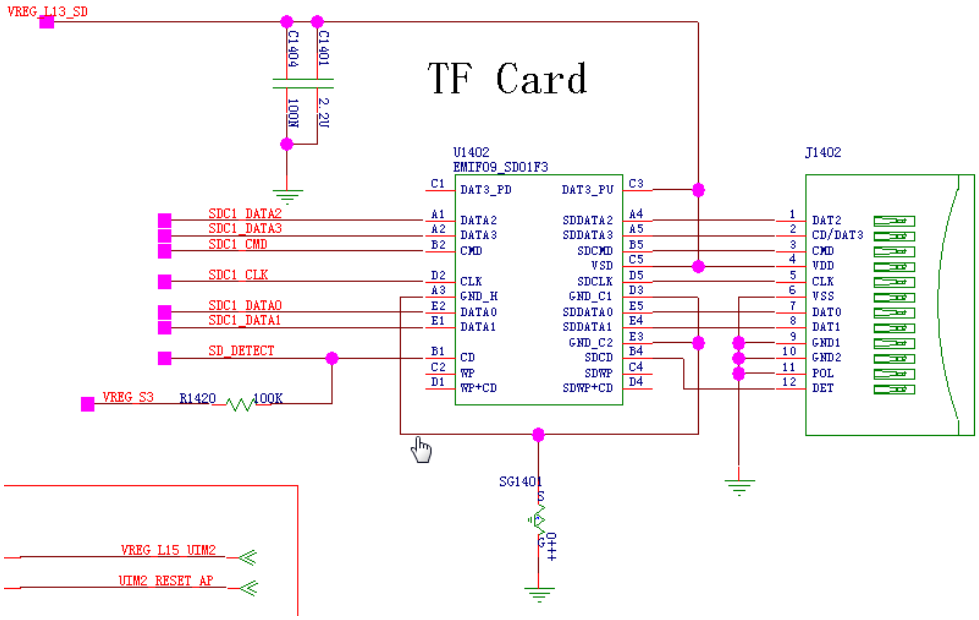
Solution: Clean, re-solder, or replace the USB connector.

Circuit Diagram Symbols in this Section

Signal Name	Function	Test Reference Value or Oscillogram
VCHG	Charging current input	High level, 5 V
USB_DM	Digital signal	None
USB_DP	Digital signal	None

10.3.8 microSD Card Connector

Circuit Block Diagram



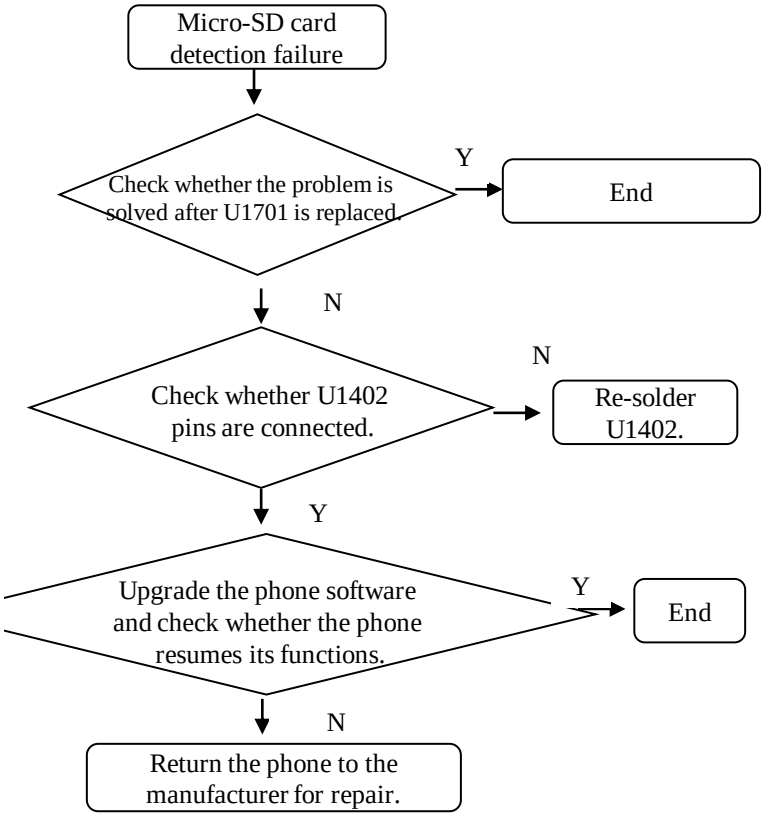
Working Principle

The U1402 is added to provide the ESD protection and EMI filtering.

Troubleshooting Process

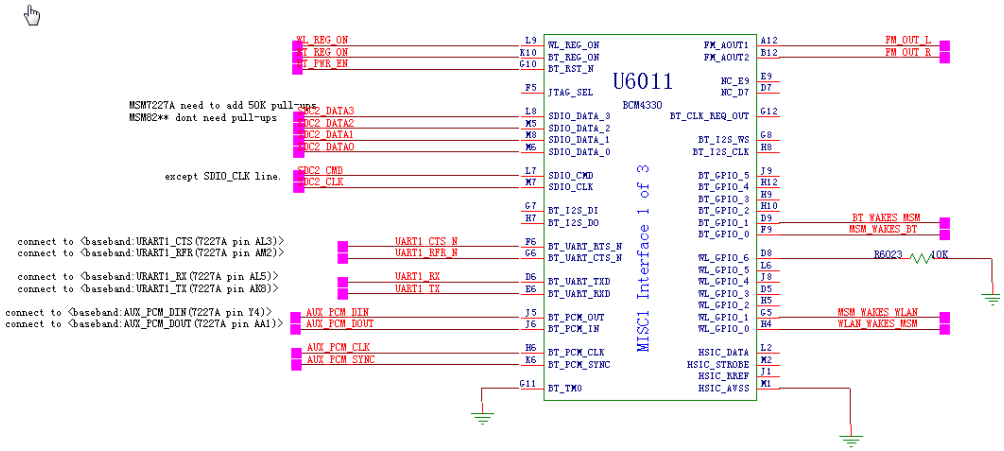
Failure: The microSD card cannot be detected or read.

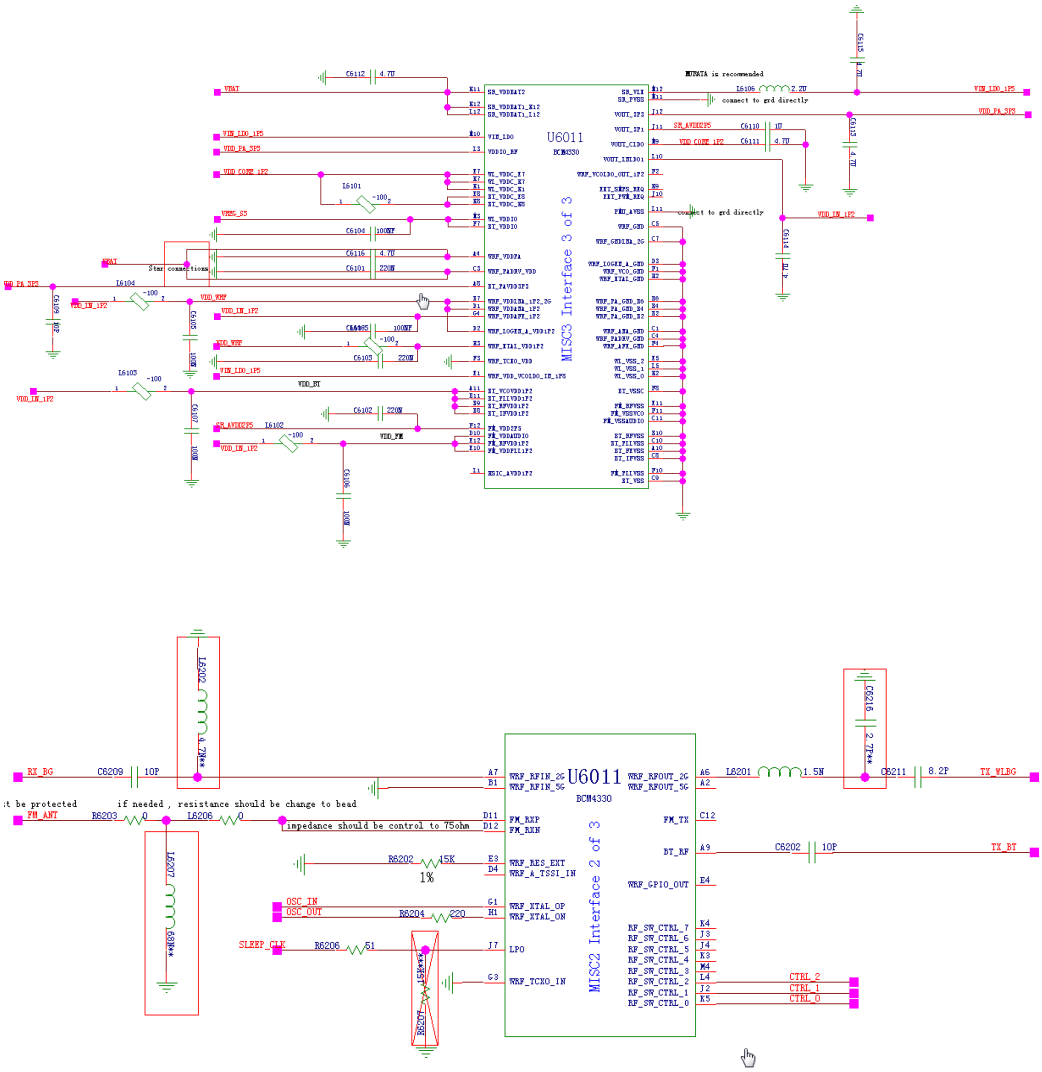
Solution:



10.3.9 FM and Bluetooth

Circuit Block Diagram





Working Principle

The U8950 uses Qualcomm BCM4330 to provide the Bluetooth, FM, and WLAN functions.

Bluetooth adopts an independent antenna, and the FM adopts the left- and right-audio channels as the antenna.

The MSM7225A provides PCM and UART interfaces that are connected to the Bluetooth module's PCM and UART signals. The following table describes the signals' definitions.

MSM8225A	Signal Line	Definition
GPIO_44	UART1_CTS_N	The ready to receive information sent to the Slave by the Host
GPIO_43	UART1_RFR_N	The clear to send information sent to the Host by the Slave
GPIO_46	UART1_TX	Transmission signal

MSM8225 A	Signal Line	Definition
GPIO_45	UART1_RX	Reception signal
GPIO_69	AUX_PCM_DIN	PCM input
GPIO_68	AUX_PCM_DOUT	PCM output
GPIO_70	AUX_PCM_SYNC	PCM synchronization
GPIO_71	AUX_PCM_CLK	PCM clock
GPIO_107	MSM_WAKES_BT:	Waking up the host
GPIO_27	BT_WAKES_MSM:	Waking up the Bluetooth

The PM8029 provides audio input interfaces that are directly connected to the FM module's left and right channels. The following table describes the signals' definitions.

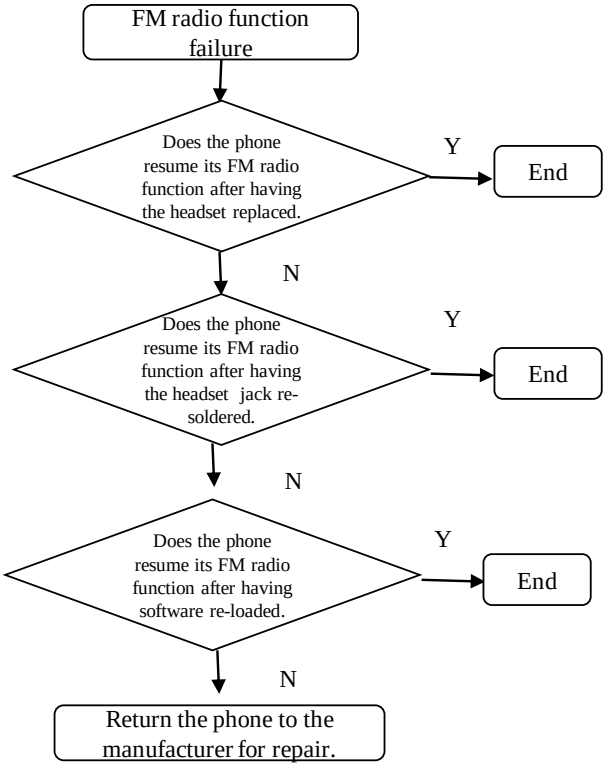
BCM4330	Network	MSM8225	Description
FM_RXP	FM_ANT		FM antenna (headset)
FM_RXN			
FM_VDD2P5	SR_AVDD2P5		
FM_AOUT1	FM_OUT_L	PM8029 LINE_IN_LP	FM OUTPUT
FM_AOUT2	FM_OUT_R	PM8029 LINE_IN_RM	FM OUTPUT

Troubleshooting Process

Failure: The FM function fails to work properly.

Solution: Solution: If signals can be received but not sound is heard, check the headset line.

- No FM signal
- No sound for FM radio


FM radio function failure
Does the phone resume its FM radio function after having the headset replaced.
Y
End
N
Does the phone resume its FM radio function after having the headset jack re-soldered.
Y
End
N
Does the phone resume its FM radio function after having software re-loaded.
Y
End
N
Return the phone to the manufacturer for repair.

11 Solder Points on the PCB and BGA Chips

Figure 11-1and Figure 11-2 show the solder points on the PCB and BGA chips.

Figure 11-1 Top surface

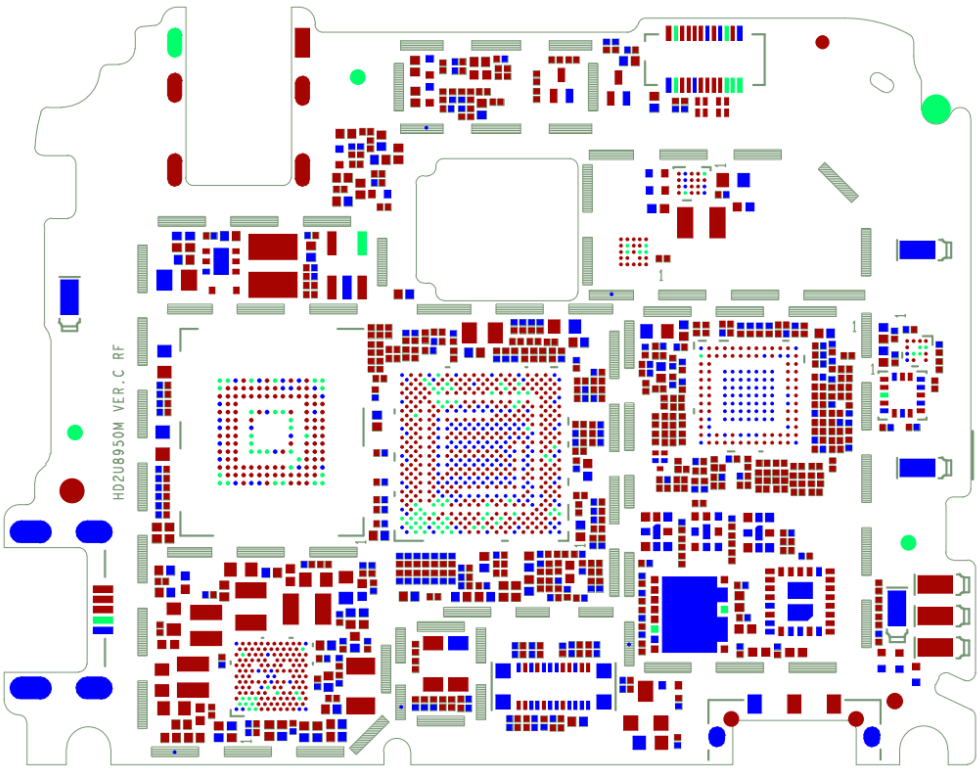
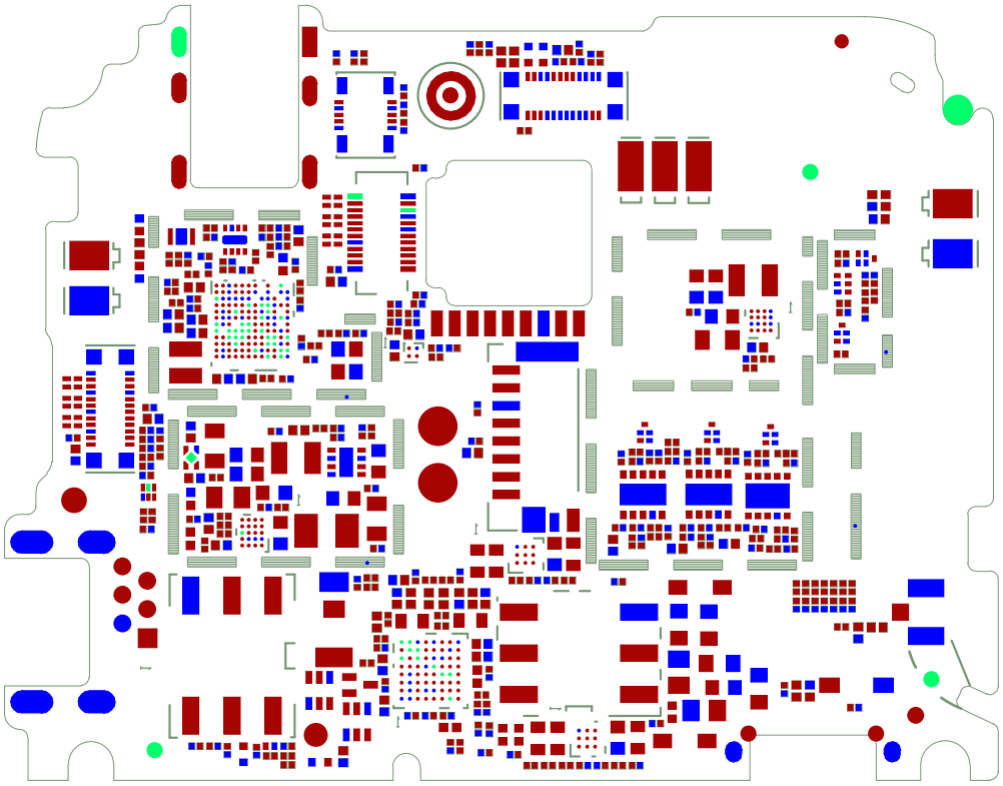


Figure 11-2 Bottom surface



NOTE

- The blank, grounding, and solder points must be clearly marked.
- Colors used for the solder points figures must be distinguished, and the color indication must be explained.
- In the above figures: Spots in red are signal pins, spots in blue are grounding pins, and spots in green are suspended pins.

Attachment:

Figure 11-3 Top-side silkscreen diagram

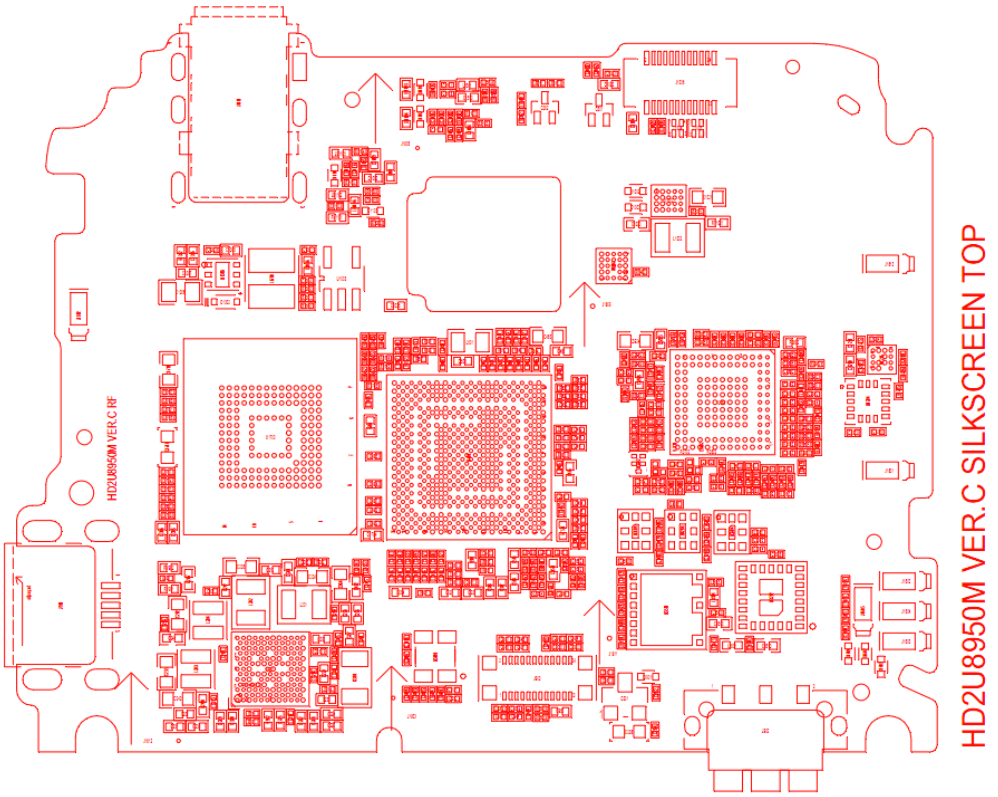
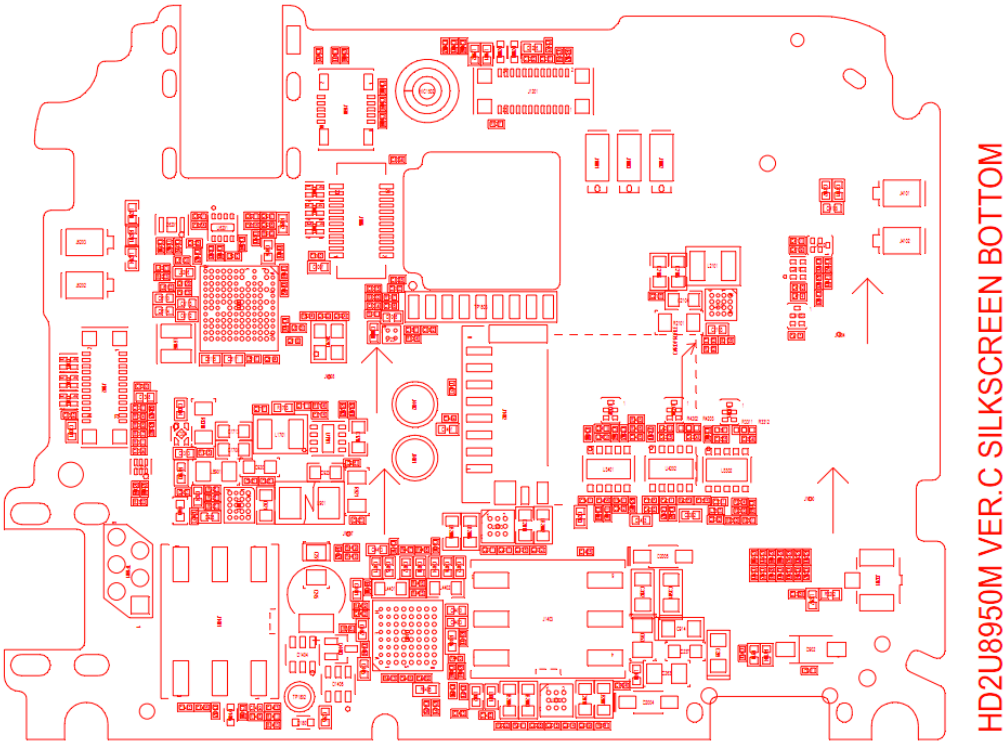


Figure 11-4 Bottom side silkscreen diagram



Attachment:

12 Functional Tests

12.1 Keys

12.2 MMI Test

After the phone is correctly powered on, enter ***#*#2846579#*#*** using the keypad and then press the send key to enter the MMI test. Then select **MMITEST** and press the volume down key to start the MMI test. You can touch the menu key to cancel the current test, the volume down key to enter the next test, the back key to return to the previous test, and the home page key to exit the text and switch to the desktop. You must complete each test one by one. After all tests are complete, a list is generated to indicate the test result.

The tests defined for keys are as follows:

Board test: The phone directly proceeds to the next test if the board test is successful.

microSD card test: The message "**No microSD card**" is displayed if the microSD card is not inserted. You can press the volume down key to proceed to the next test.

Keypad test: You must touch keys as instructed and can press the volume down key to proceed to the next test.

LCD display test: Run the whitescreen, blackscreen, RGB-color, LCD backlight, and LED light tests one by one using the volume down key, and check that the LCD displays properly.

Keypad LED test: Check whether the keypad light blinks.

Camera test: Check whether the preview function is normal and press the volume up key to check whether the flash light operates properly.

Touchscreen test: Touch the black spot area as instructed.

Approaching light test: Shield the approaching light window to check for changes on the display. Vibrator test: Check whether the vibrator vibrates properly and whether noises occur.

Speaker test: Play an audio clip to check whether the speaker operates properly.

Mobile phone microphone loopback test: Record and play an audio clip as instructed and check whether the playback is normal.

Mobile phone headset loopback test: Record and play an audio clip as instructed and check whether the playback is normal.

FM test: Insert the headset and operate as instructed.

Headset wire control test: Insert and remove the headset and microphone to check whether the headset and microphone operate properly.

Bluetooth test: Enable Bluetooth on other devices and check whether the mobile phone can search other devices successfully.

Gravity sensor test: Adjust the mobile phone direction to check whether the data of each sensor axis can be obtained.

Wi-Fi test: Check whether Wi-Fi networks exist.

Failed tests are displayed on the LCD. You can re-test the failed items separately.

12.3 Voice Call Test

Step 1 Install a USIM card and a battery on the phone.

Step 2 Press and hold the Power key to power the phone on.

Step 3 Check that the signal strength displayed on the LCD is normal.

Step 4 Make a call to a fixed-line phone, and check the voice quality during the call.

Step 5 If no problems are found during the test, finish the voice call test. If any problems are found, troubleshoot the phone or send it to an advanced repair center for maintenance.

----End