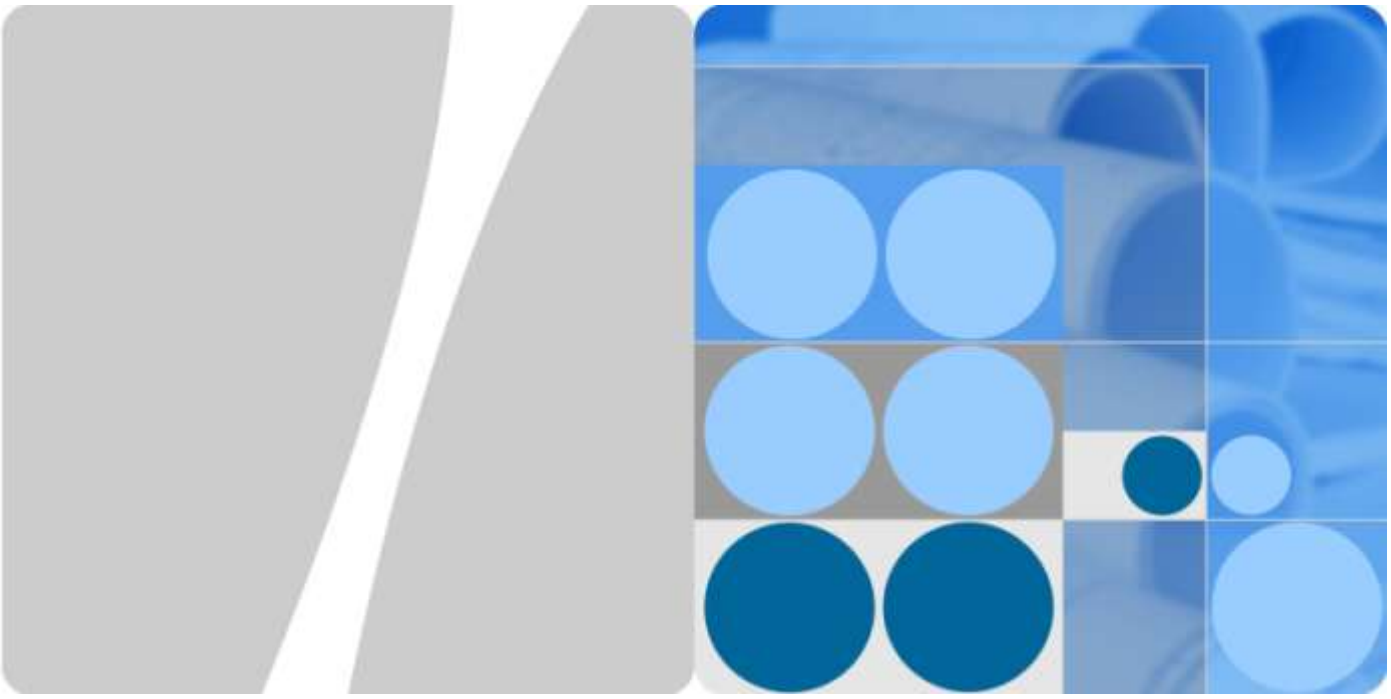

U8655N
Maintenance Manual

Issue 1.0

Date 2012-09-27

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About This Document

Purpose

Prepared by	R&D	**Date**	
Reviewed by	Maintenance support team	**Date**	
Approved by	Service representative	**Date**	

Change History

Date	Version	Change Reason	Revised Section	Description	Author
2012-02-20	V1.0	Released the first issue.			R&D

Contents

1 Product Introduction

1.1 Appearance

1.2 Specifications

Category	Description
Dimensions (H x W x D)	116.9 mm x 61.4 mm x 12.2 mm
Technical standard	U8655N: W2100/W900, GSM850/900/1800/1900

Category		Description
Frequency bands		U8655N: • WCDMA 900MHz: 880–915 MHz (UL), 925–960 MHz (DL)) • WCDMA 2100 MHz: 1920–1980 MHz (UL), 2110–2170 MHz (DL) • GSM 850 MHz: 824–849 MHz (UL), 869–894 MHz (DL) • GSM 900 MHz: 880–915 MHz (UL), 925–960 MHz (DL) • GSM 1800 MHz: 1710–1785 MHz (UL), 1805–1880 MHz (DL) • GSM 1900 MHz: 1850–1910 MHz (UL), 1930–1990 MHz (DL)
Weight		< 125 g with battery
Form factor		Bar
Antenna		Built-in
UIM		SIM, USIM
Charger		5 V, 1000 mA
Battery		Type: Li-ion Capacity: 1250 mAh Standby time: 220–250 hours (network dependent) Talk time: 210 minutes (network dependent)
Display	Resolution	320 x 480 pixels
	Type	TFT LCD
	Color	262K
	Size	3.5 inches
Connectors	Charging port	micro-USB connector
	USB port	micro-USB connector
	microSD card interface	microSD card interface
	Headset jack	3.5 mm (LRGM)
Maximum transmission power	23–33 dBm	
Static sensitivity	≤ 104 dBm	
Temperature	Operating temperature: 0 ℃ to +40 ℃ Storage temperature: –20 ℃ to +50 ℃	
Humidity	Operating humidity: 5% to 95% RH	

2 Applicable Scope and Precautions

2.1 Applicable Scope

This document provides repair instructions for technicians at service centers authorized by Huawei. This maintenance manual is confidential and accessible to authorized service centers (ASCs) and authorized service providers (ASPs) only. While every effort has been made to ensure the accuracy of this document, errors may still exist. If you find any errors or have any suggestions, please contact Huawei's customer service.

2.2 Precautions

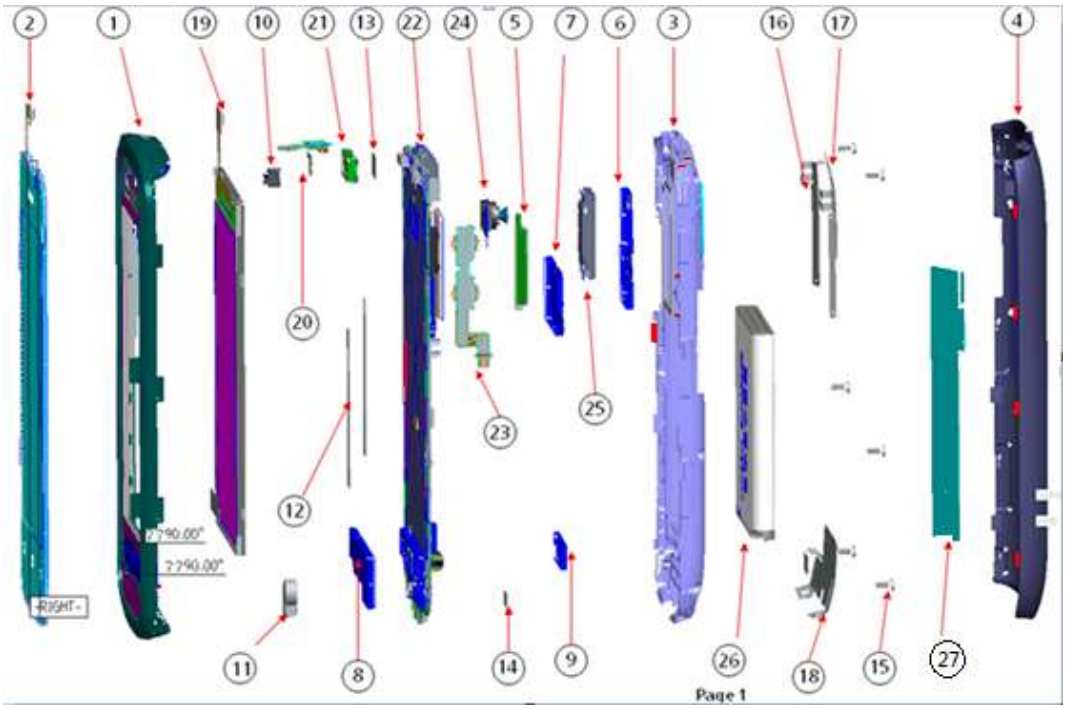
- Only qualified technicians are allowed to perform repair and calibration.
- Perform all operations in electrostatic discharge (ESD) rooms and wear ESD wrist straps throughout the operations.
- Ensure that all components, screws and insulators are properly installed after repair and calibration, and that 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 description and repair information about Huawei's products, please visit http://www.huaweidevice.com/worldwide/technicaIndex.do.

3 Exploded View



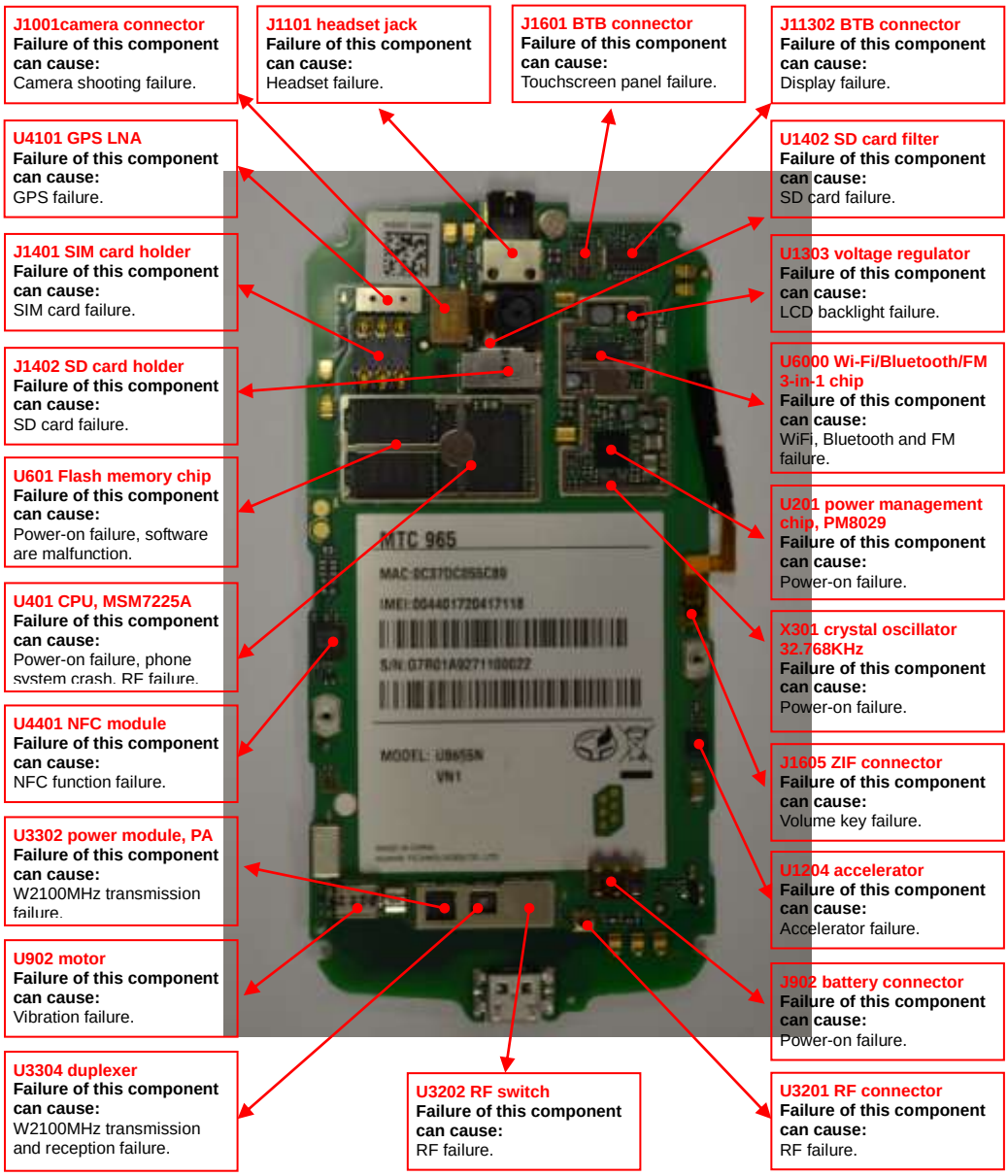
The components listed in the following table are structural parts of the phone, and cannot be used as reference when requesting spare parts.

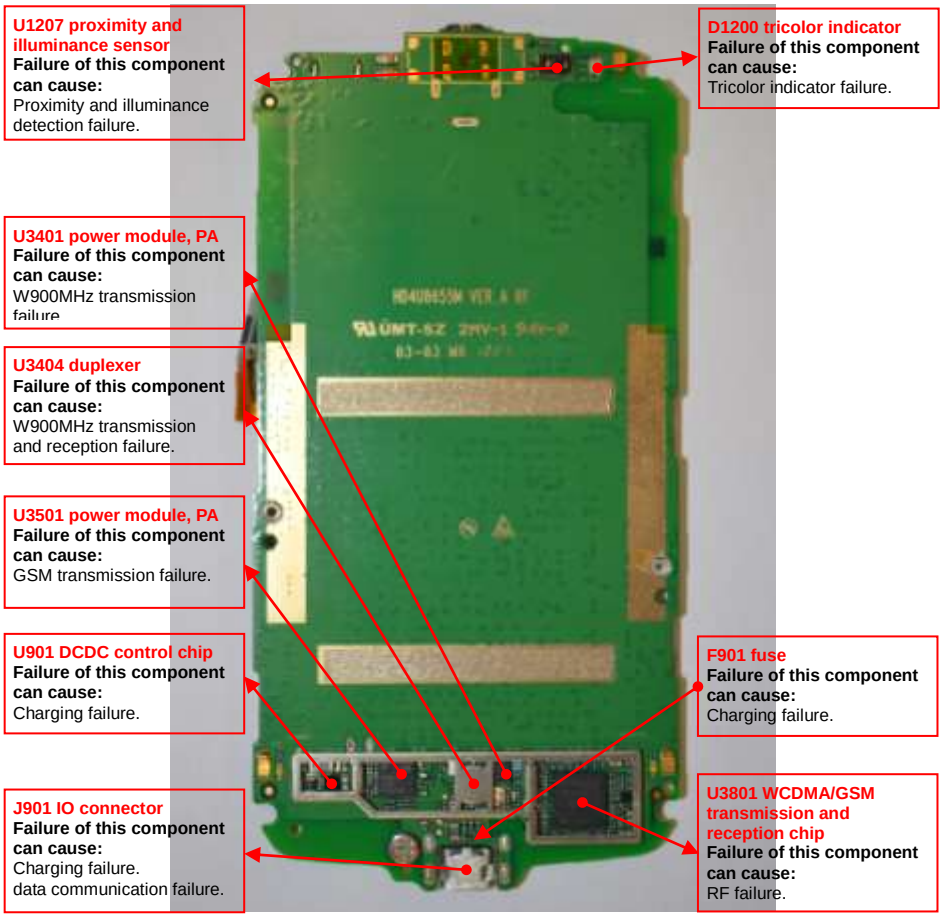
Table 3-1 List of components in the exploded view drawing

No.	Item	Quantity
1	U8655N_Cover A assembly	1
2	Touchscreen panel	1
3	U8655N_Cover B assembly	1
4	U8655N_Battery cover assembly	1
5	U8655N_Volume key	1

No.	Item	Quantity
6	U8655N_Speaker shielding cover	1
7	U8655N_CPU shielding cover	1
8	U8655N_RTR shielding cover	1
9	U8655N_PA shielding cover	1
10	U8655N_Proximity and illuminance sensor sealing sheath	1
11	U8655N_MIC_sheath	1
12	U8655N_LCD_conductive fabric	2
13	U8655N_Headset insulation film	1
14	U8655N_USB_adhesive film	1
15	Screw M1.4*3.5	1
16	Diversity antenna and Wi-Fi antenna	1
17	Bluetooth antenna	1
18	Main antenna	1
19	LCD	1
20	Power key flexible flat cable (FFC)	1
21	Receiver	1
22	PCBA	1
23	Volume key FFC	1
24	Camera	1
25	Speaker	1
26	Battery	1
27	NFC antenna	1

4 Components on the PCBA





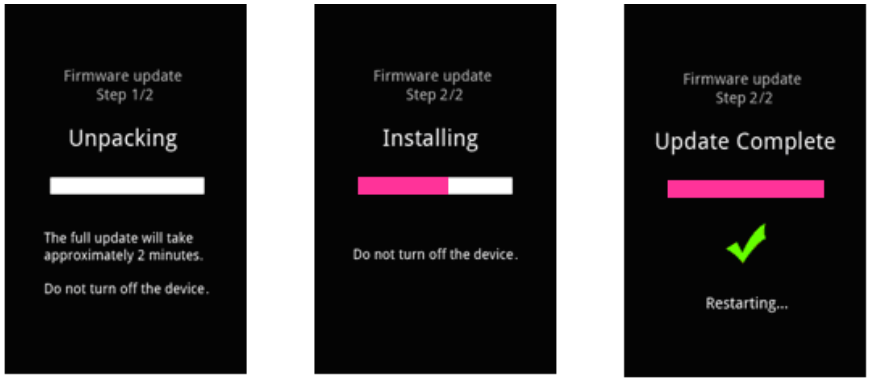
5 Software Upgrade

5.1 Upgrade Preparation

Category	Item	Description
Upgrade environment	Computer	To copy upgrade software
	microSD card	With more than 512 MB free space
	Battery	With at least 30% power remaining
Upgrade file	Main upgrade pack	dload/UPDATE.APP
	Vendor upgrade pack	vendor_XXX_XXX/UPDATE.APP
Upgrade method	Using the microSD card	Normal upgrade
		Forcible upgrade

5.2 Upgrade Procedure

1. Format the microSD card.
2. Create a folder named **dload** in the root directory of the microSD card.
3. Copy the upgrade file to the **dload** folder.
4. Install the microSD card on the phone. Power the phone on, and enter ***#*#2846579#*#*** on the idle screen.
5. Select **SD Upgrade** then **Yes** to start the upgrade.
6. Before the upgrade, NV items backup is performed (if the phone's NV items has not been backed up before). Then the phone restarts and the upgrade starts.
7. The upgrade progress is displayed on the LCD.



Step1 Step2 Step3

8. After the upgrade is completed, the phone restarts and the NV items are restored.
9. After the main upgrade pack is upgraded, upgrade the vendor upgrade pack using the same upgrade method.

If the phone cannot be properly powered on, use one of the following two methods to forcibly upgrade the phone:

- Install the battery on the phone (if the screen is jittering, remove the battery and wait for five seconds before installing the battery again). Press and hold the Volume+ and Volume– keys, and press the Power key. The phone enters the SD forcible upgrade mode in which the upgrade process is similar to the normal upgrade.
- While the phone has no battery installed, press and hold the Volume+ and Volume– keys, and connect the charger to the phone.

  The phone enters the SD forcible upgrade. This method is recommended. If the forcible upgrade still fails, use another microSD card and try forcible upgrade again.

6 Maintenance Tools

	Name: constant-temperature hot air blower gun Usage: to heat components
	Name: constant-temperature heat gun Usage: to heat components
	Name: soldering iron Usage: to solder components
	Name: DC regulated power supply Usage: to supply DC power
	Name: soldering table Usage: to secure the main PCBA

	Name: lead-free solder wire Usage: 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

U8655N before disassembly

1. Wear an ESD wrist strap, and ensure that the strap is grounded properly.

2. Remove the battery cover: Press the upper part of the battery cover and push it towards the bottom.

3. Remove the battery.

4. Remove the six screws from cover B.

5. Use the disassembly tab to release the latch in the upper right corner.

6. Use the disassembly tab to release the latch in the upper left corner.

7. Use a cover opener to release the latches between cover A and cover B.

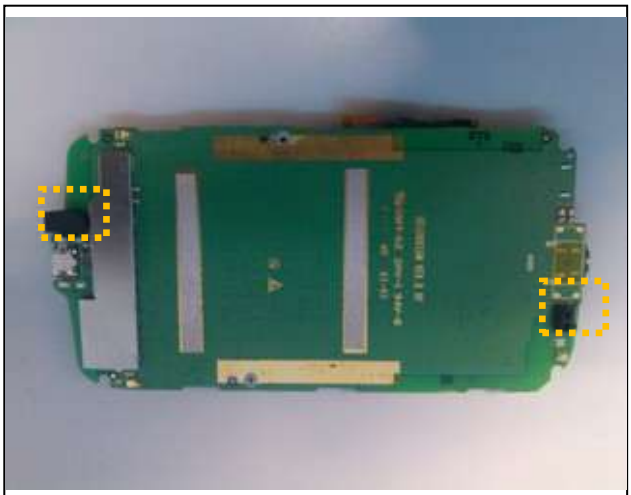
8. Remove the volume key.

9. Release the volume key FPC.

10. Disconnect the BTB connector cable between the touchscreen panel and the LCD.

11. Release the two latches in the PCBA.

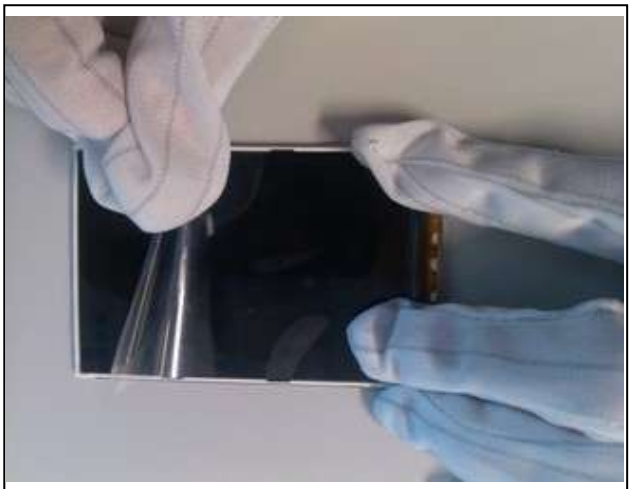
12. Remove the PCBA.



13. Remove the proximity and illuminance sensor sheath and the microphone sheath.

14. Release the BTB connector, and remove the camera. Release the ZIF connector, and remove the volume key FPC.

15. Release the LCD latches, and remove the LCD.



16. Apply a protective film on the LCD.

17. Apply a protective film on the inner side of the touchscreen panel.

18. Remove the Power key FPC.

19. Remove the receiver.

20. Remove the speaker.

21. The phone is now disassembled.

8 Assembly Procedure

U8655N before assembly

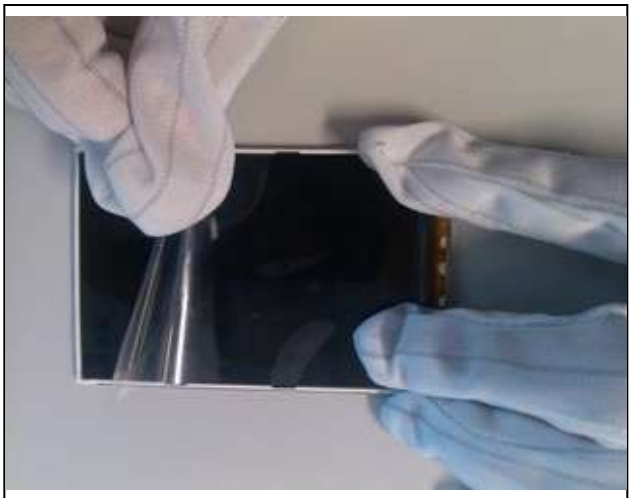
1. Wear an ESD wrist strap, and ensure that the strap is grounded properly.

2. Install the camera on the PCBA, and snap the BTB connector in place. Install the volume key FPC into the ZIF connector, and attach the adhesive film.

3. Install the receiver.

4. Install the Power key FPC.

5. Remove the protective film from the touchscreen panel.



6. Remove the protective film from the LCD.

7. Install the LCD. Ensure that the two latches are snapped in place and that the LCD is even.

8. Install the PCBA: Insert the USB port into cover A, and then snap the PCBA downward in place.

9. Gently press the PCBA to close the latches to secure the PCBA.

10. Snap the LCD's BTB connector and then the touchscreen panel's BTB connector in place.

11. Install the volume key: Attach the volume key FPC to the metal piece on cover A, and then install the volume key.

12. Install the speaker.

13. Install cover B: Snap cover B's bottom, and press its top.

14. Install the six screws into cover B.

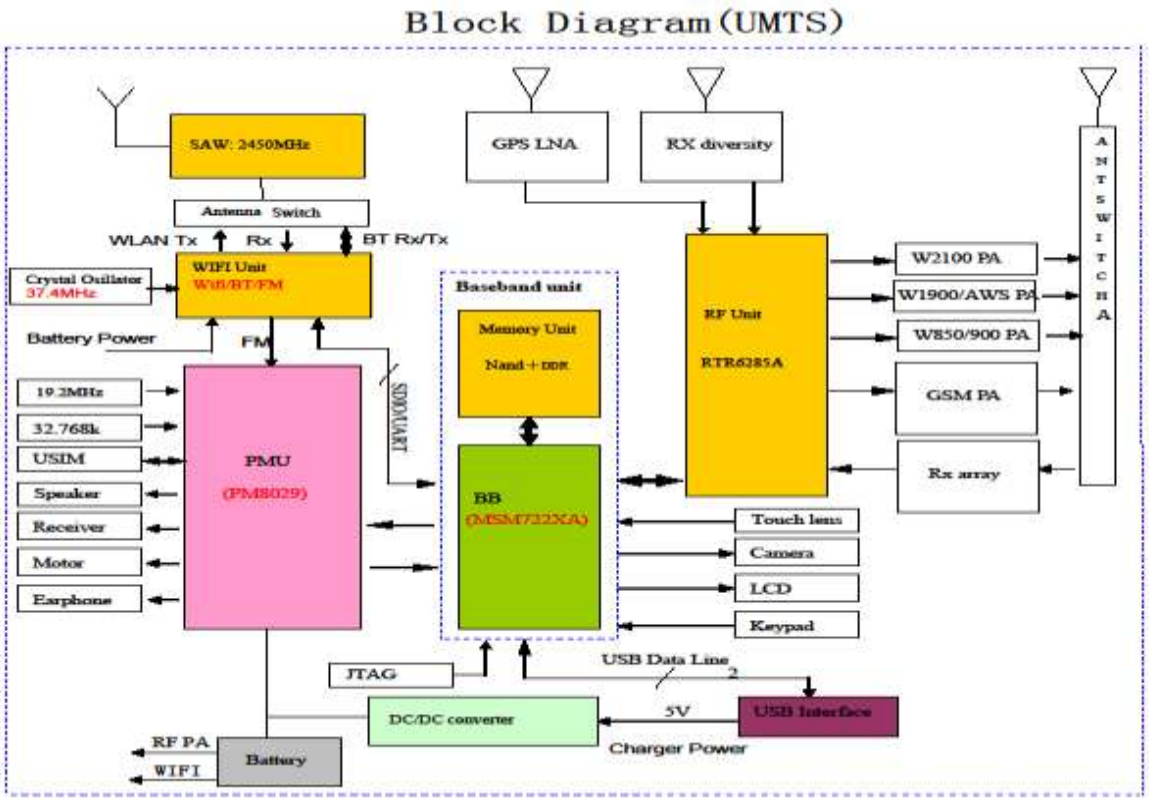
15. Install the battery: Insert it into the battery compartment bottom first.

16. Install the battery cover.

17. The phone is now assembled.

9 Principles and Failure Analysis

9.1 Block Diagram



The MSM7X2XA (the U8655N uses the MSM7225A) is the baseband signal processing chip, mainly responsible for processing the input and output of IMGE, VIDEO, AUDIO, MEMEO SUPPORT, RF INTERFACES, and CONECTIVITY signals. The baseband chip provides keypad, LCD, SD card, Wi-Fi, Bluetooth, camera, and microphone interfaces.

The PM8029 is mainly responsible for:

Detecting the connection and disconnection of the external power supply.

Supplying power to the phone.

Providing analog multi-channel switch, real-time clock circuit, TCXO clock circuit, motor driver circuit, and speaker driver circuit.

The RTR6285A is the RF signal processing chip, responsible for converting UMTS/GSM uplink/downlink RF signals and using I/Q signals to exchange data with the baseband chip.

9.1.1 Function Description of the PCBA

The PCBA can be divided into four sub-systems: baseband, RF, power supply, and user interfaces. The following table describes the subsystems' modules and units, as well as their functions.

Table 9-1 PCBA subsystems' modules, units, and functions

Subsystem	Module	Unit	Function
Baseband subsystem	MSM7225A	Modem subsystem	The modem subsystem includes the ARM11 processor, modem DSP, modem AHB bus, interruption controller, and sleep controller. The ARM9 is a 400 MHz modem processor, responsible for modulation and demodulation of WCDMA, GPS, and GSM signals.
		Application subsystem	The subsystem includes ARM A5 processor, application DSP, and dedicated data mover. The A5 processor has a clock rate of 800 MHz, supporting function modules such as the microSD card, EBI2, UART/USIM, I2C, GPIO, and clock modules.
		User interface processing unit	Provides camera, PCM, broadband codec, vocoder, RF, HKADC, LCD, SD card, USB, UART, USIM card, SBI, GPIO, JTAG/ETM, and keypad interfaces.
		Multimedia and game engine	The multimedia and game engine is an MPEG/JPEG hardware engine providing Java acceleration and MP3/MMS/MIDI/VR processing functions.
	PM8029	Power supply voltage monitoring	Lists objects being monitored, such as the external power supply input, Li-ion battery, and charger.
		Temperature monitoring	Monitors the battery temperature.
	NAND flash memory	File system support	Stores applications and NV items. Capacity: 4 GB.
	DDR1 RAM	Random access memory	Provide storage space for running applications. Capacity: 2 GB.
RF subsystem	WCDMA, and GSM/DCS signal transmission and reception	AFC circuit, APC circuit, AGC circuit	Performs the RF function of WCDMA signal reception and transmission. Mainly includes the RTR6285A RF chip and the peripheral circuit.

Subsystem	Module	Unit	Function
	GPS	GPS reception	Receives and processes GPS signals. Mainly includes the RTR6285A chip and the peripheral circuit.
	Bluetooth interface	Bluetooth/Wi-Fi/FM 3-in-1 module	Performs baseband functions for Bluetooth, Wi-Fi and FM signals. Transmits and receives Bluetooth, Wi-Fi and FM signals. Mainly includes the Bluetooth/Wi-Fi/FM module and its peripheral circuit.
	Wi-Fi interface	Same as the Bluetooth interface	Same as the Bluetooth interface
	Oscillator and frequency synthesizer	Crystal oscillators	Generates highly accurate VCTCXO frequency for the 19.2 MHz local reference clock. The RTR6285A has a built-in local oscillator (LO) providing clock frequency for transmitting and receiving WCDMA and GPS signals.
	Antenna	External antenna, internal interface component, antenna protection	The phone uses internal antennas for wireless communication, supporting WCDMA high and low frequency bands. The antennas are the main antenna, GPS antenna, diversity antenna, Wi-Fi/Bluetooth antenna, FM antenna (headset) and NFC antenna.
	Coupler	Power coupler	Couples part of the power output from the WCDMA power amplifier to the RTR6285A for power monitoring.
User interface subsystem	UART interface		MSM7225A subsystem's UART1 interface for Bluetooth.
	USB interface	Driver, protection circuit, output interface component	The peripheral circuit, protection circuit and interface connectors of the USB interface in the MSM7225A subsystem. It is the major data service channel for the engineering sample, and can be used to debug and test devices during R&D.
	USIM card interface	Power supply, protection circuit, USIM card holder	Mainly includes the USIM card holder and related connection circuits.
	Keypad and backlight	Keypad driver circuit, external keypad, backlight LED control circuit	Supports GPIO for keypad scanning. Provides backlight LED. When a key is pressed, the backlight is on. Works in conjunction with PM8029 to provide the keypad backlight brightness adjustment function.
	Color LCD and backlight	LCD driver, interface mode, and backlight control	The phone's LCD with 256K colors. The brightness of the LCD backlight can be adjusted by users.

Subsystem	Module	Unit	Function
	Speaker	Driver mode, connection mode, speaker component	Plays polyphonic ringtones for incoming calls. The maximum power of the speaker is 500 mW. It has good frequency response for playing 20–20000 Hz ringtones. It can also play monophonic MP3 audio files.
	Receiver	Driver mode, connection mode, receiver component	Emits sound during a call.
	Microphone	Interface circuit, connection mode, microphone component	The phone has two built-in microphones to eliminate the environmental noise.
	Earphone	Earphone, headset interface circuit, microphone interface circuit	The phone provides a headset jack to output music playback audio or voice during a call. The microphone on the headset cable can pick sound and input it into the phone. TheU8655N supports only the LRGM headsets.
	Vibration motor interface	Driver mode, connection mode, motor	When there is an incoming call, the motor can vibrate notify the user of the call.
	NFC	I2C interface control	Performs proximity sensing function.
	Proximity and illuminance sensor	I2C interface control	Senses the intensity of environmental light for adjusting the LCD and keypad backlight brightness. Detects the distance between the phone and the user's skin and turns the LCD and touchscreen panel off when the distance is smaller than the specified value.
	Accelerometer	I2C interface control	Senses acceleration to help implement game functions.
	Battery	Li-ion battery	3.7 V/1250 mAh (the battery must be certified and comply with relevant safety regulations).
Power supply subsystem	External power supply (travel charger)	Adapter, and interface component	The charger meets the requirements of China, Europe, the USA, and Australia. Charger specifications: 90–240 V, 45–55 Hz, AC input. The model differs with different markets. The output voltage of the charger is 5±0.25 V.The charger must be CE and CCC certified. The charger's output current must be able to charge the battery and supply power to the phone for normal operation at the same time.

Subsystem	Module	Unit	Function
	Power distribution network and power management function	Power distribution network	Includes filter networks and PCB traces for the power supply.
	PM8029 enhanced function	Battery management, charging circuit, charging mode, and charging protection	Manages battery charging and discharging, provides overcharging and over-discharging protection, and charges the capacitor that supplies power to maintain the real-time clock (RTC).
		Board circuit power management (power-on/off analysis)	Mainly controls the low-dropout (LDO) regulator power supply to flexibly manage power supply. Based on the service status and the requirements of the interface power supply specifications and power-saving analysis, the board software manages the power supplies to the units on the board to reduce power consumption.
		RTC	The built-in RTC circuit uses a sleep clock of 32.768 kHz to provide precise time.
		HKADC	Contains 8 MPP interfaces. Analog-to-digital conversion can be implemented inside the PM8029.
		TCXO driver	The PM8029 has a built-in TCXO driver providing two analog signal output channels and two digital signal output channels.
		UVLO	Provides the Undervoltage-Lockout (UVLO) function. When the input voltage is lower than the threshold for a specific period of time, the phone powers off.
		Over temperature protection	When the on-chip junction temperature exceeds 150 ℃, the phone powers off.
		Internal driver circuit	Provides one vibration motor driver and one speaker driver.
		Interrupt management	The built-in interrupt manager handles related interrupt signals.
		USB driver	Supports USB 2.0; does not support USB OTG.

9.2 Baseband Unit

9.2.1 Power-on Management Circuits

On the U8655N, most power supplies are provided by the power management chip PM8029.

The PM8029 provides two types (switched-mode power supply and LDO regulators) of programmable voltage regulators with a total of 24 output channels.

The follow table lists the voltage regulator parameters.

Table 9-2 Voltage regulator specifications

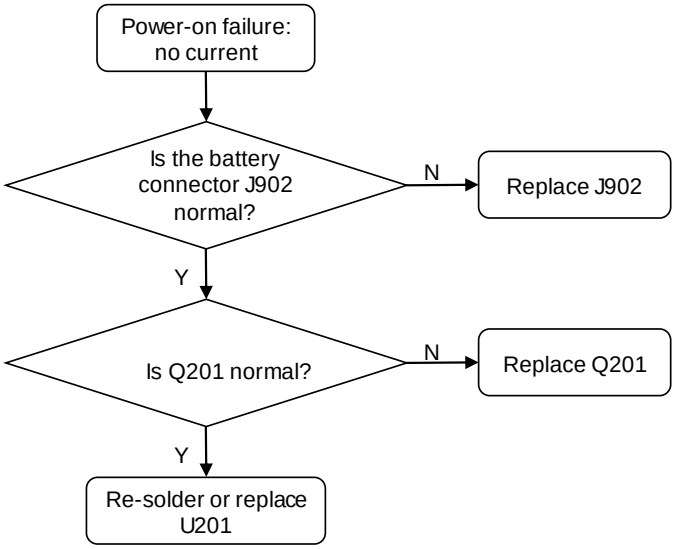
Type/name [1]	Default conditions [5] OPT_1 = GND	Operating range	Intended use [6]
SMPS – Buck			
S1 (1.2 A)	On, 1.100 V	0.750 to 1.500 V	Processor core
S2 (1.2 A)	On, 1.100 V	0.750 to 1.500 V	Application processor
S3 (800 mA)	On, 1.800 V	0.750 to 3.050 V	Digital pads and EBI
S4 (350 mA)	Off, 2.350 V	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) [4]	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 3.300 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

Troubleshooting Process

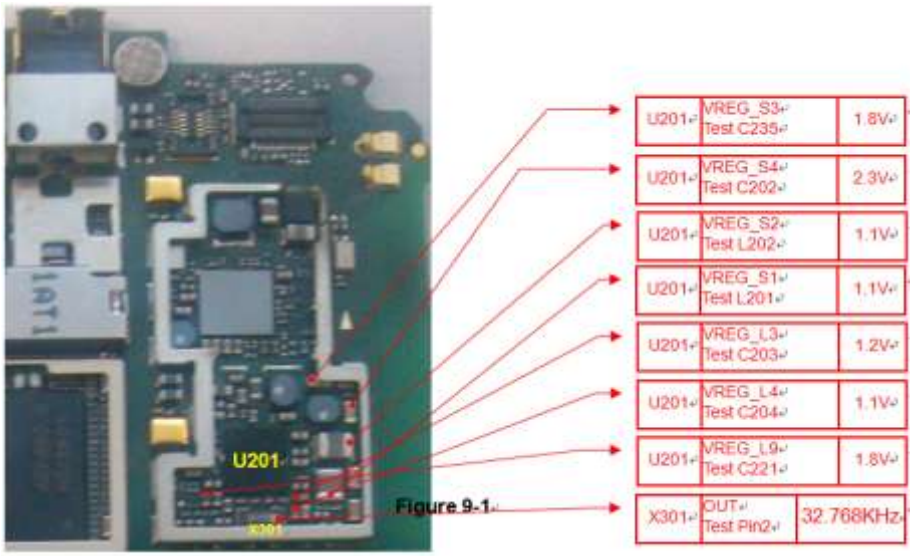
To troubleshoot the power-on failure, firstly check whether the I/O connector (battery connector) is damaged. If the I/O connector (battery connector) is not damaged, use a DC regulated power supply to supply power to the phone, and test the phone's current.

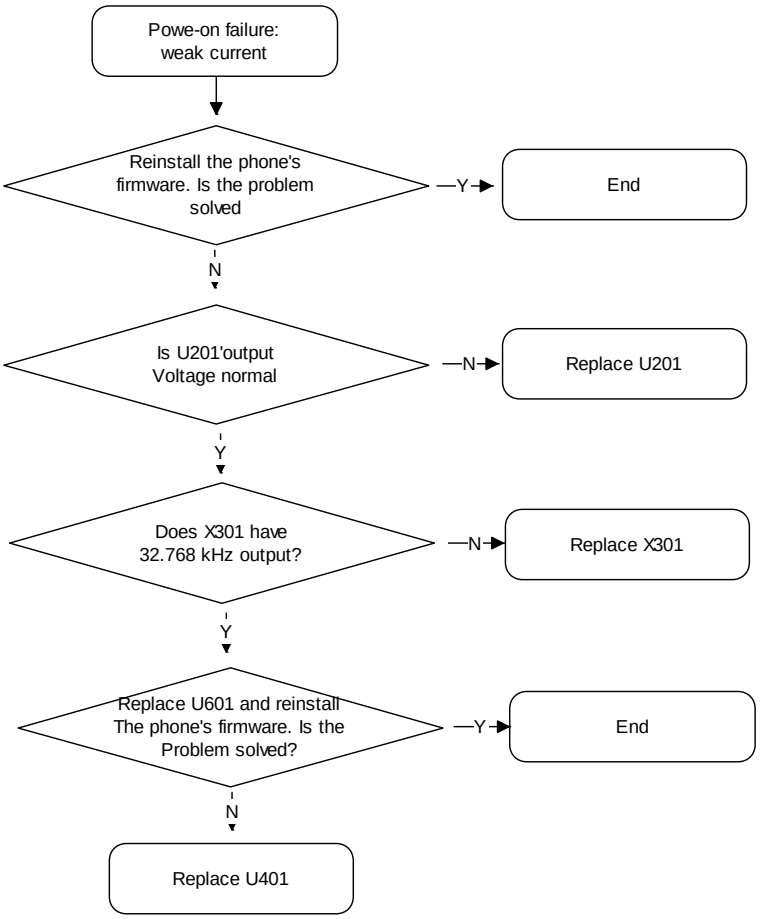
The power-on failure may be caused by any of the following conditions:

- No current



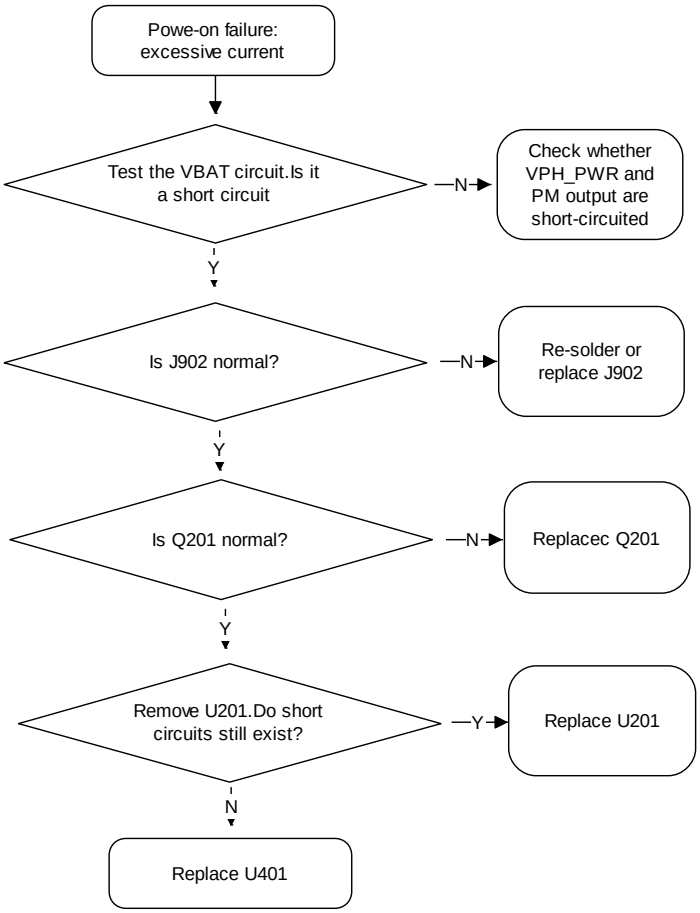
- Weak current



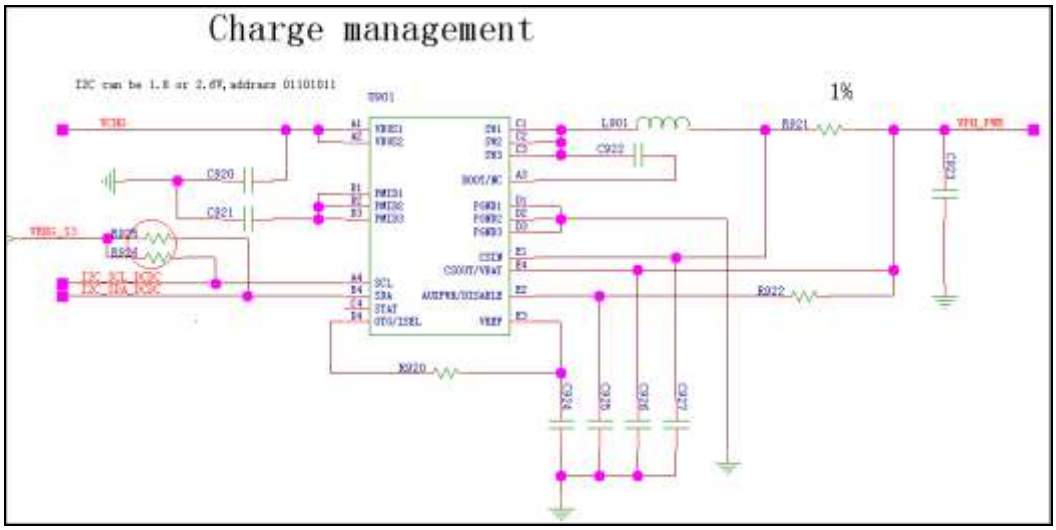


- Excessive current

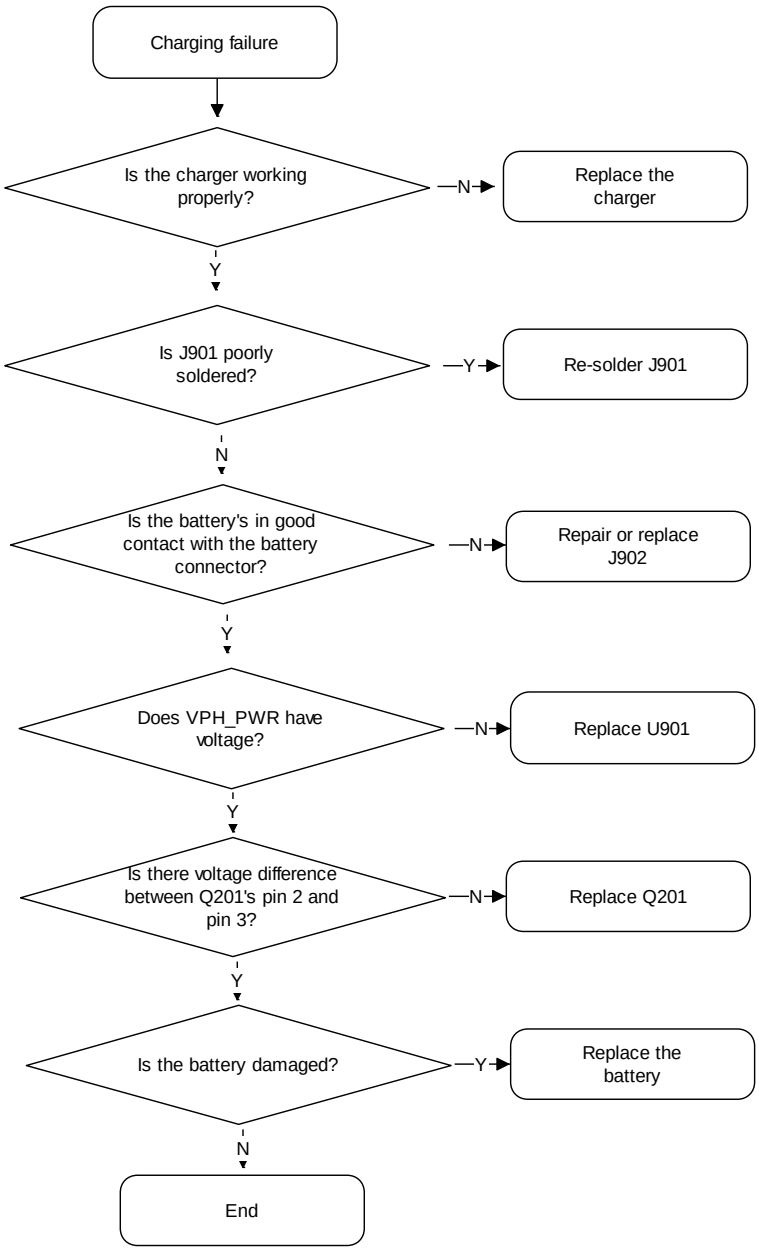
Excessive current is caused by short circuits. When excessive current occurs, to prevent damage to components, do not connect the charger to the phone. Power-on failure due to excessive current is usually the result of short-circuited VBAT circuit.



9.2.2 Charging Management Circuits



Troubleshooting Charging Failure



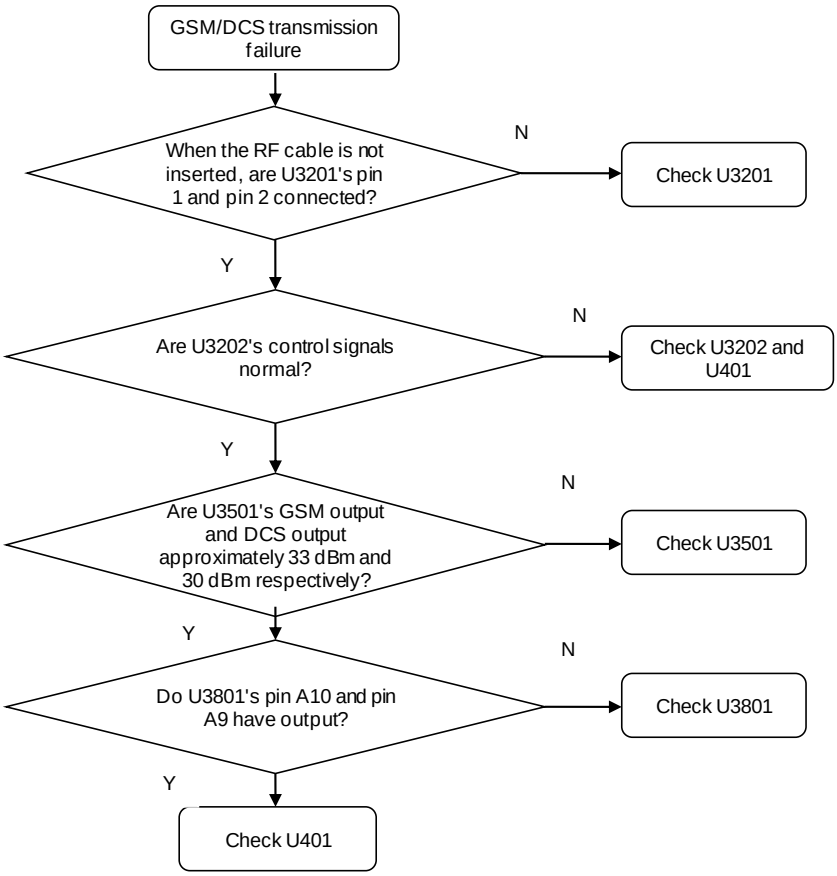
9.3 RF Unit

9.3.1 RF Failure

Troubleshooting Transmission Failure

- GSM/DCS transmission failure

Before starting the following process, make sure that the USIM card and the antenna are well connected.



NOTE

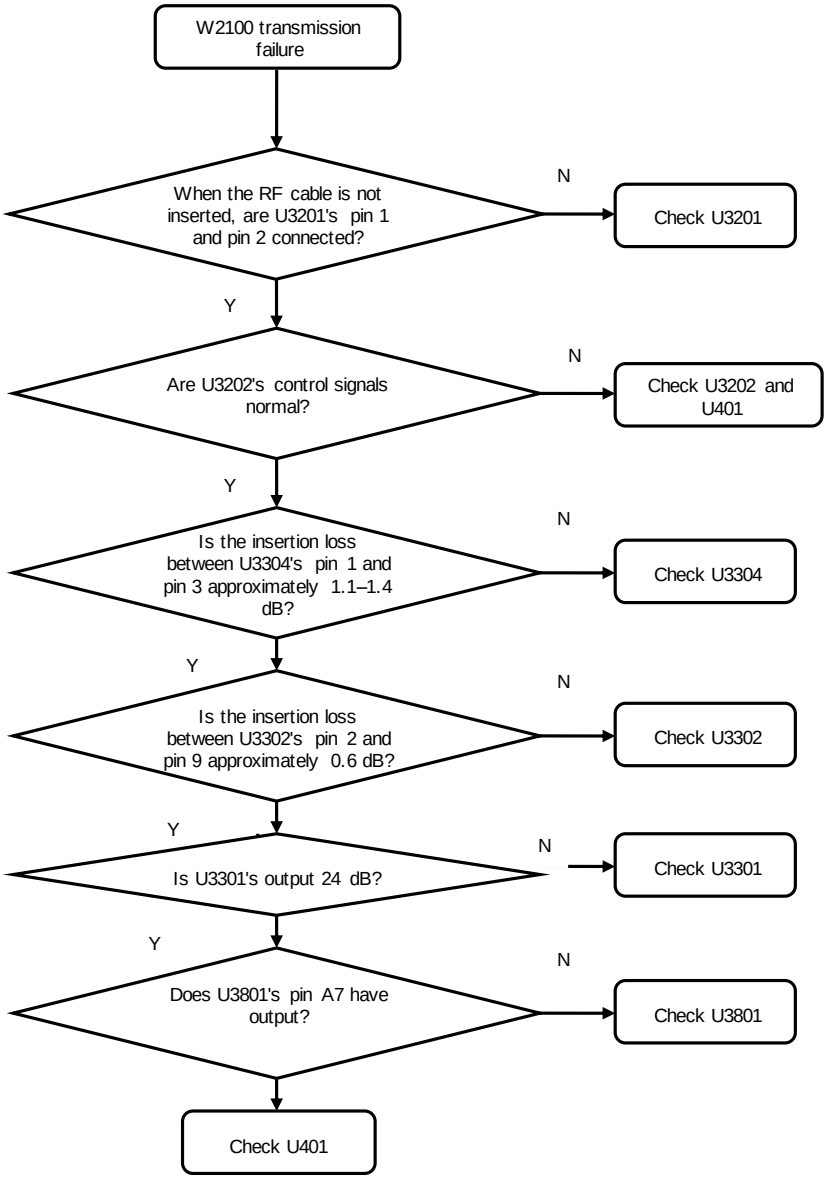
- The following tables describe the working status of the GSM/DCS power amplifier U3501.

GSM_PA_EN	PA
H	ON
L	OFF

GSM_PA_BAND	MODE
L	GSM850/900
H	DCS1800/1900

- H: voltage higher than 1.3 V. L: voltage lower than 0.5 V.
- WCDMA transmission failure (use W2100 as an example)

Before starting the following process, make sure that the USIM card and the antenna are well connected.



NOTE

- The following tables describe the working status of the WCDMA power amplifier.

PA_ON	PA
H	ON
L	OFF

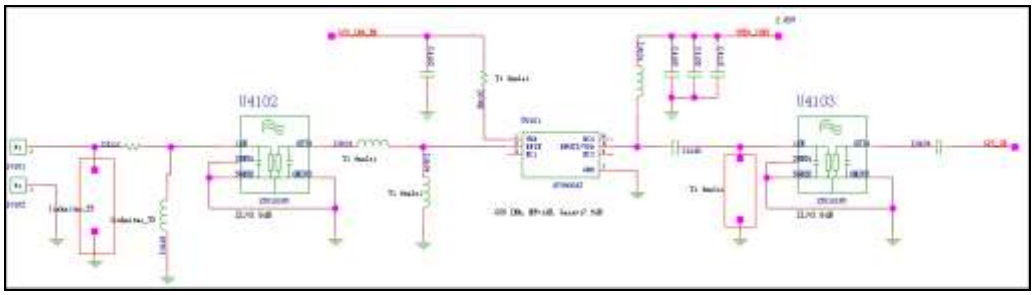
PA_R	PA_R1	MODE
L	L	HI Power
L	H	MI Power

H	H	LO Power

- H: 1.3–1.8 V. L: < 0.5 V.

9.3.2 GPS

The GPS channel consists of filter U4102, filter U4103 and LNA U4101. GPS signals are sent to the RTR6285A's input interface after going through the filters and LNA. The following figure shows the circuit.



9.3.3 Wi-Fi/Bluetooth/FM Module

The U8655N uses a Wi-Fi/Bluetooth/FM 3-in-1 module (Broadcom's BCM4330).

The Bluetooth and Wi-Fi functions share one antenna and one SP3T RF switch.

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

MSM7225A	Signal	Definition
GPIO_44	UART1_CTS_N	The "ready to receive" signal from the host (the MSM7225A) to the slave (the BCM4330).
GPIO_43	UART1_RFR_N	The "clear to send" signal sent from the slave to the host.
GPIO_46	UART1_TX	Transmission signal
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_83	BT_WAKES_MSM	Waking up the Bluetooth

The MSM7225A provides SDIO3 interfaces that are directly connected with the Wi-Fi module's SDIO signal output. The following table describes the signals' definitions.

MSM7225A	Signal	Function
GPIO_64	SDC2_DATA3	Data
GPIO_65	SDC2_DATA2	
GPIO_66	SDC2_DATA1	
GPIO_67	SDC2_DATA0	
GPIO_62	SDC2_CLK	Clock
GPIO_63	SDC2_CMD	Control signal

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

BCM4330	Network	MSM7225A	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

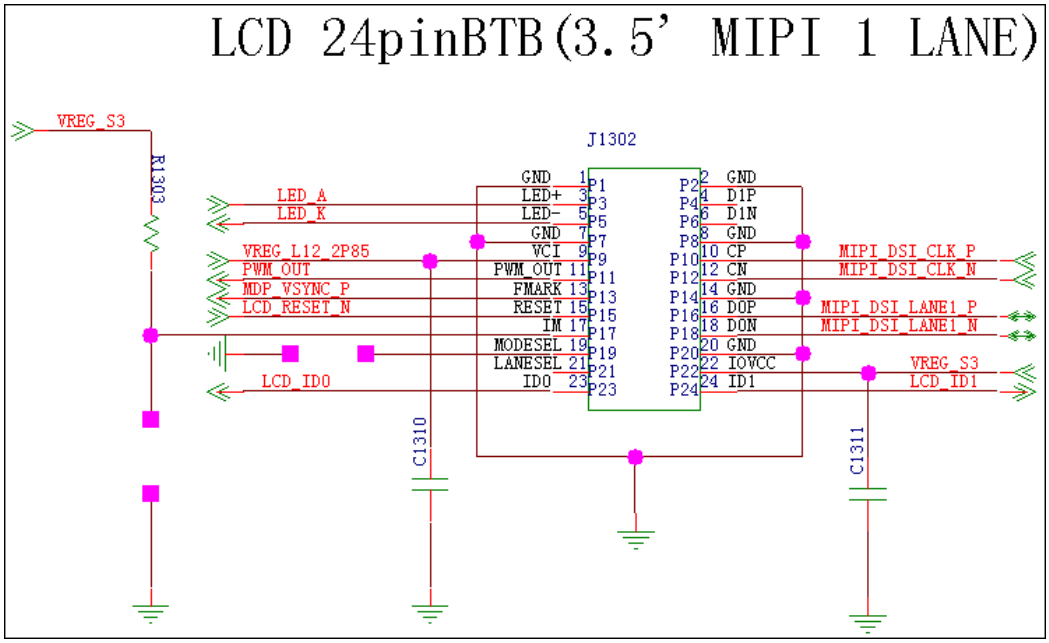
9.4 Peripheral Circuits

9.4.1 Display

The MSM7225A uses MIPI interfaces to send instructions and data to the LCD. The U8655N's LCD uses MIPI interfaces, supporting a 60 Hz refresh rate, and requiring only one pair of differential clock signals and one pair of differential signals. The LCD also supports frame synchronization, using the MDP_VSYNC signals (GPIO_097) as data transmission synchronization signals to avoid screen tearing.

- Resolution: HVGA (480 x 320 pixels)
- Color: 256K colors

The following figure shows the connections between the MSM7225A and the LCD.

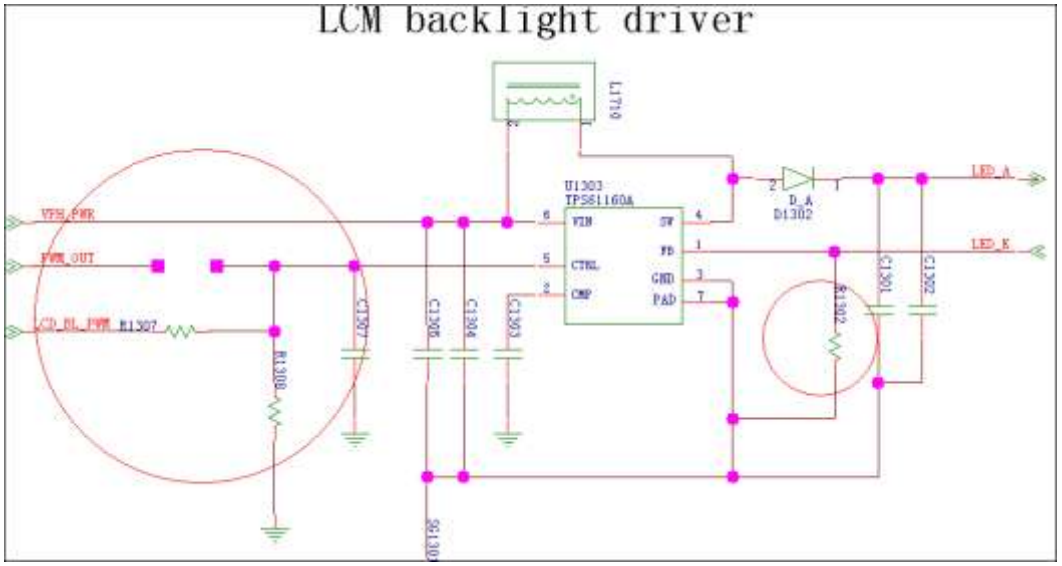


The following table describes the signal definitions.

Category	Description	Name in the Circuit Network	MSM7225A GPIO/PM8029 MPP
Power supply	Digital power supply input	VREG_S3	VREG_S3 (PM8029)
	Analog power input	VREG_L12_2P85	VREG_L12_2P85 (PM8029)
Data	MIPI data	MIPI_DSI_LANE1_P	MIPI_DSI_LANE1_P
	MIPI data	MIPI_DSI_LANE1_N	MIPI_DSI_LANE1_N
Synchronization signal	Frame synchronization clock	MDP_VSYNC_P	GPIO97
Clock signal	MIPI clock	MIPI_DSI_CLK_P	MIPI_DSI_CLK_P
	MIPI clock	MIPI_DSI_CLK_N	MIPI_DSI_CLK_N
Control signal	Reset signal	LCD_RESET_N	GPIO129
Identification signal	LCD model identification	LCD_ID0	GPIO9 (PM8029)
	LCD model identification	LCD_ID1	GPIO10 (PM8029)

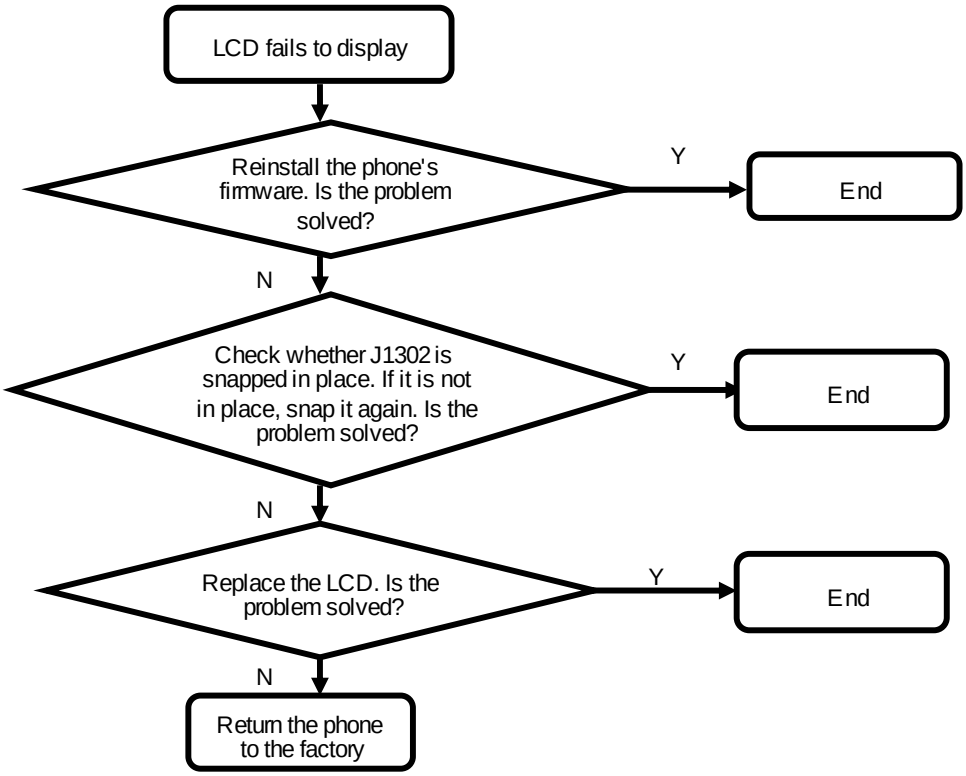
U8655N's LCD backlight control:

The U8655N uses a 3.5-inch LCD whose backlight is provided by six LEDs connected in series. The backlight LEDs are controlled by the backlight driver chip TPS61160A. The ground resistance of the driver chip pin FB is set to 10 Ω, providing up to 20 mA current to the LEDs (duty:100%). The backlight brightness (driver output current) is controlled by the PWM signal.



Backlight signals	The anode of the backlight LED	LED_A	The anode of the backlight LED
	The cathode of the backlight LED	LED_K	The cathode of the backlight LED
	Brightness control signals from the LCD	PWM_OUT	Reserved
	Brightness control signals from the phone's main chip	LCD_BL_PWM	GPIO1 (PM8029)

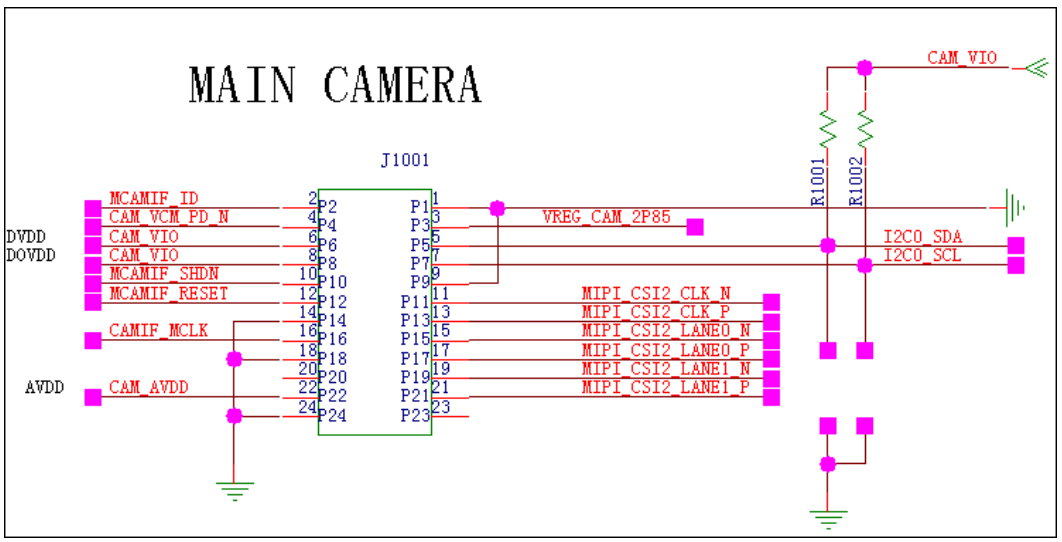
Troubling Display Failure



9.4.2 Camera

The U8655N uses a 3.2-megapixel full-frame camera.

The 3.2-megapixel full-frame camera uses a 24-pin BTB connector and is controlled by the I2C bus. The data is transmitted in MIPI mode.

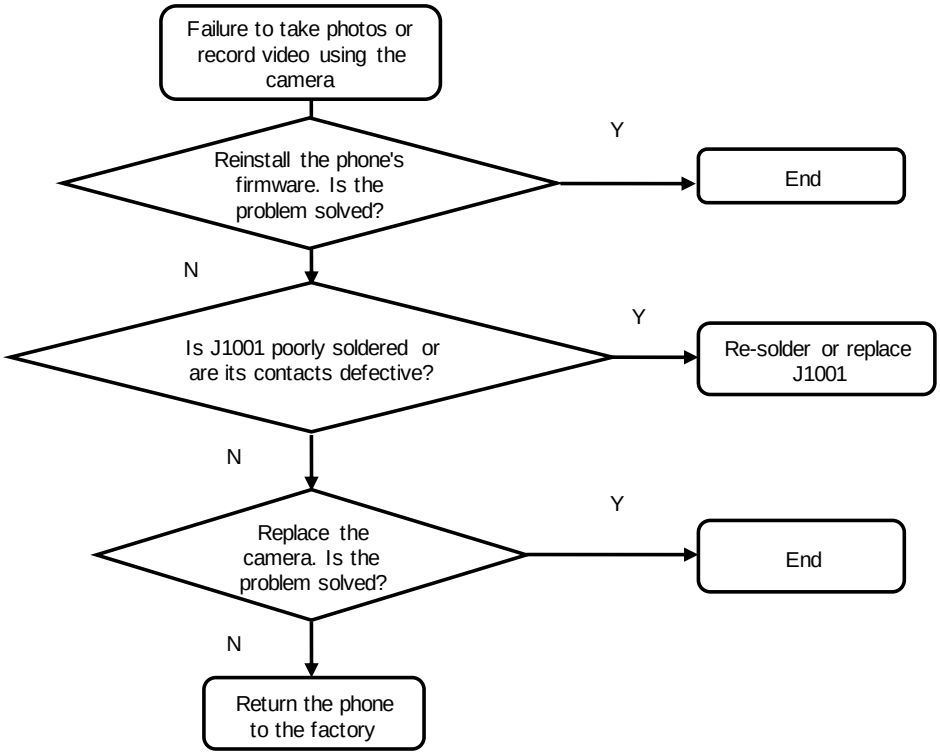


Signal Name	Pin	Voltage	Description
CAM_VIO	VREG_S3	1.8	Controlled by the power supply switch.
CAM_VIO	VREG_S3	1.8	Controlled by the power supply switch.
VREG_CAM_2P85	VREG_L17(PM8029)	2.85	Power supply to the camera autofocus motor
CAM_AVDD	VREG_L17(PM8029)	2.85	
CAMIF_MCLK	GPIO_015(MSM7225A)	1.8	Camera reference clock
MCAMIF_SHDN	GPIO_119(MSM7225A)	1.8	Camera shutdown signal
CAM_VCM_PD_N	GPIO_07(MSM7225A)	1.8	Camera autofocus motor control signal
I2C0_SCL	GPIO_060(MSM7225A)	1.8	I2C control signal
I2C0_SDA	GPIO_061(MSM7225A)	1.8	
MCAMIF_RESET	GPIO_049(MSM7225A)	1.8	Reset signal
MCAMIF_ID	GPIO_9(MSM7225A)	1.8	Module supplier identification
MIPI_CSI2_CLK_P	MIPI_CSI2_CLK_P		MIPI clock
MIPI_CSI2_CLK_N	MIPI_CSI2_CLK_N		MIPI clock
MIPI_CSI2_LANE1_P	MIPI_CSI2_LANE1_P		Data communication signal
MIPI_CSI2_LANE1_N	MIPI_CSI2_LANE1_N		Data communication signal
MIPI_CSI2_LANE0_P	MIPI_CSI2_LANE0_P		Data communication signal
MIPI_CSI2_LANE0_N	MIPI_CSI2_LANE0_N		Data communication signal

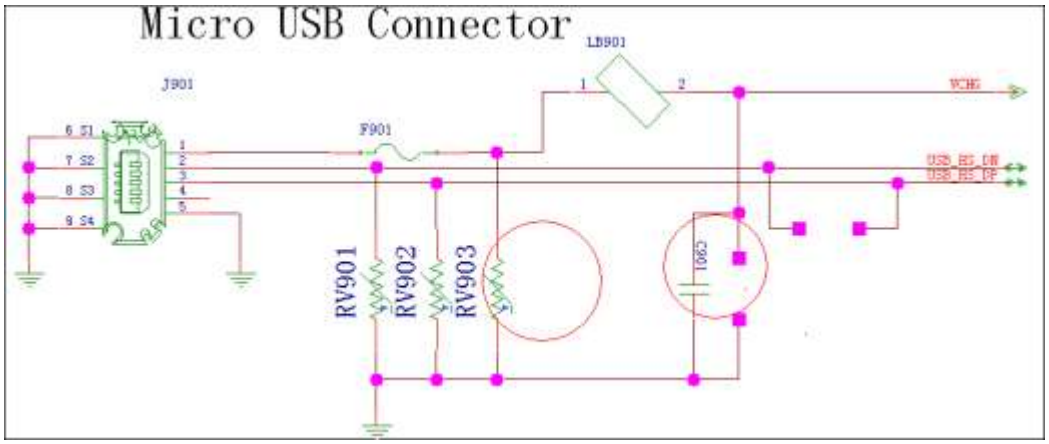
NOTE

The camera interface circuit is designed for compatibility with multiple types of cameras. The U8655N uses a 3.2-megapixel full-frame camera, so the CAM_VCM_PD_N and VREG_CAM_2P85 lines are not used.

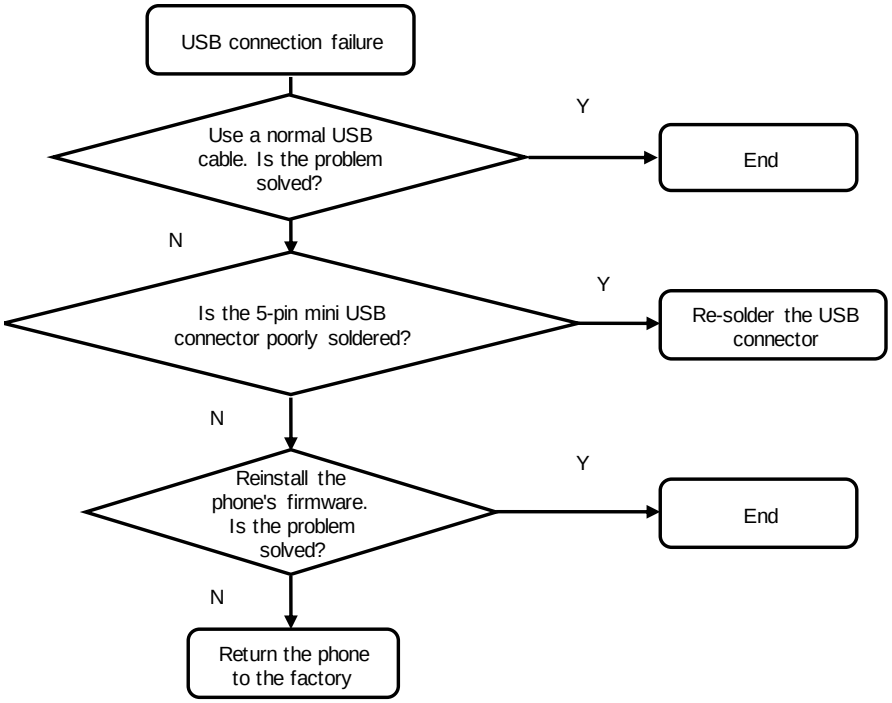
Troubleshooting Camera Failure



9.4.3 USB



Troubleshooting USB Connection Failure



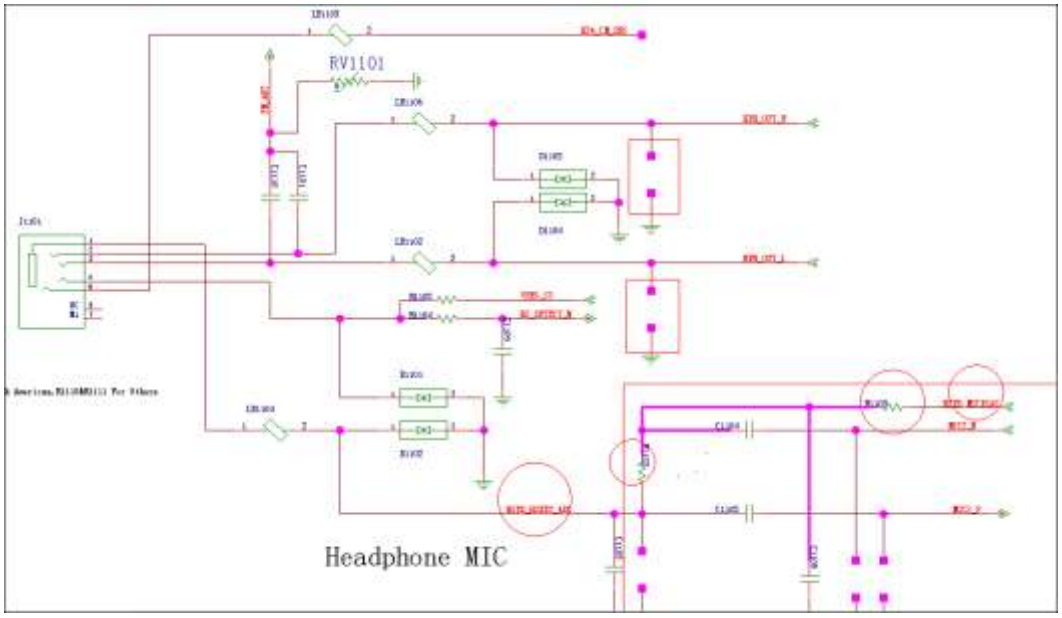
9.4.4 Headset Jack

The headset jack is a 3.5-mm headset jack. When the headset jack has no headset inserted, the headset jack's pin 3 and pin 4 are open, and the headset detection voltage is at high level. After a headset is inserted, pin 3 and pin 4 are closed, and the headset detection voltage is at low level, indicating the insertion of a headset. The HS_DETECT (GPIO86) pin is used to detect the headset insertion.

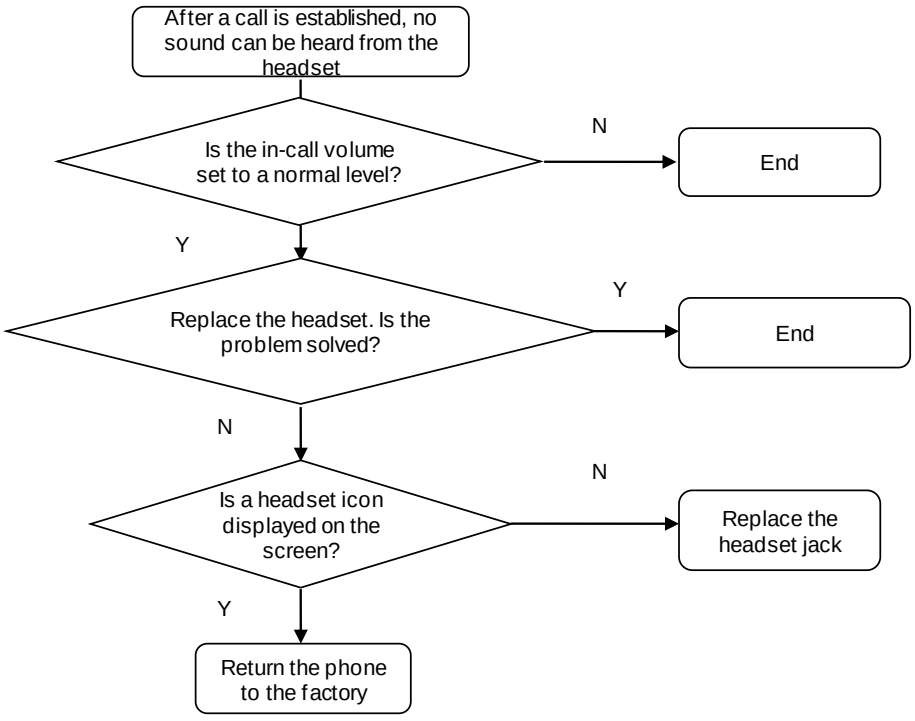
The HSED_MICBIAS (PM8029/HSED_BIAS1) supplies power to the headset microphone. The HSED_HSKEY_ADC (PM8029 MPP5) is used to detect the headset button press.

NOTE

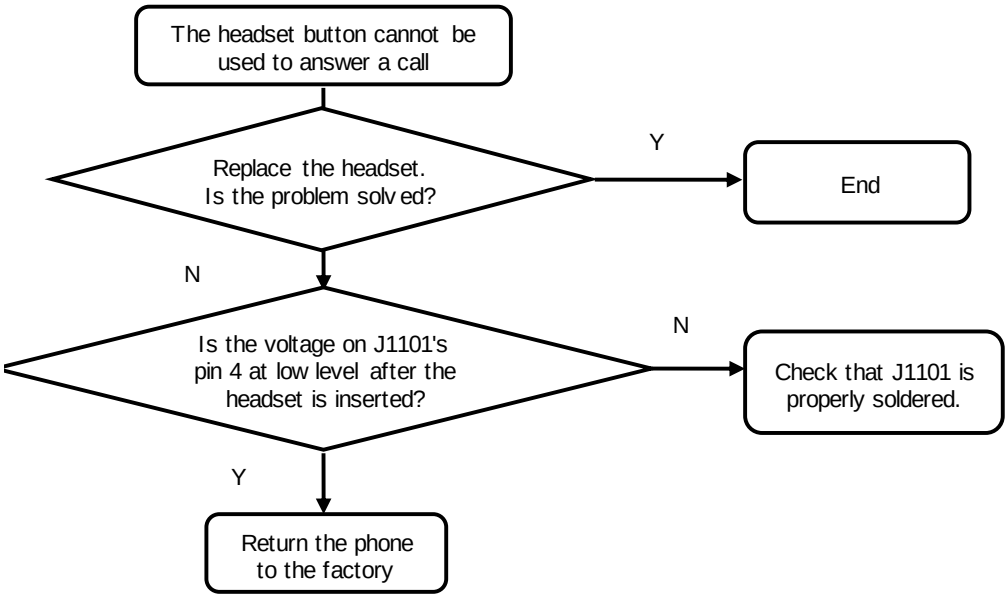
The U8655N supports only LRGM headsets, and does not support LRMG headsets.



- No sound comes from the headset during a call



- The headset button cannot be used to answer a call

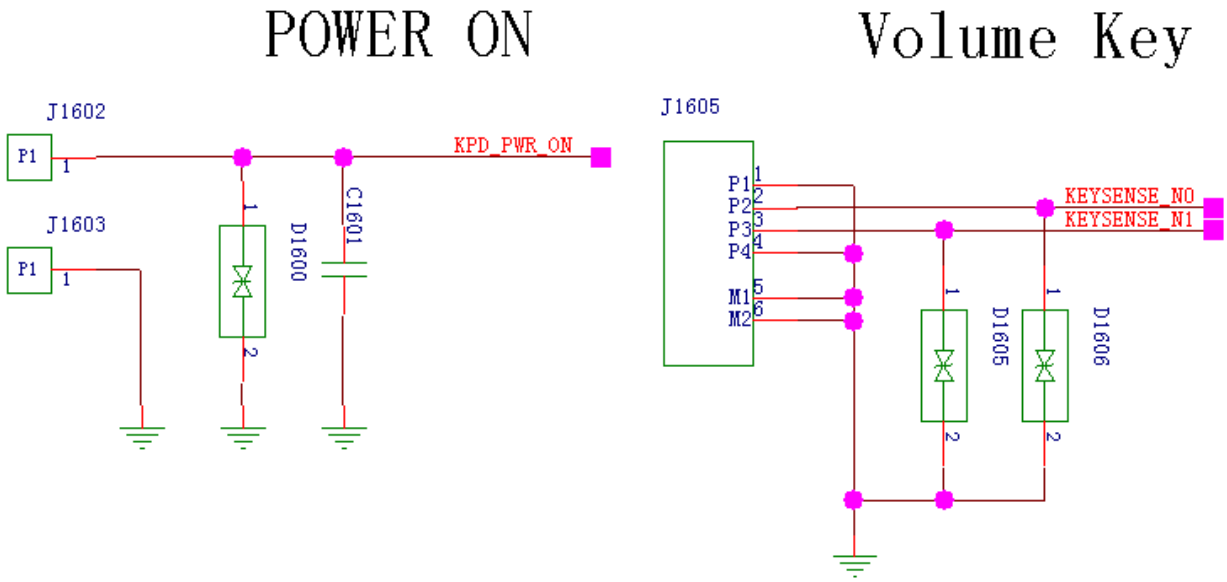


9.4.5 Keys

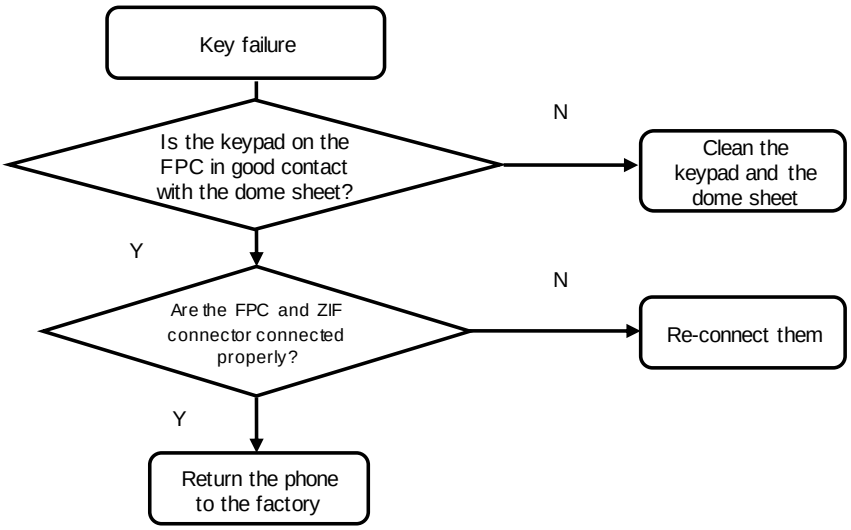
The U8655N has six keys, three of which are the Menu, Home and Back keys on the touchscreen panel.

The MSM7225A's GPIO_42 and GPIO_41 pins are connected to the volume up and down keys. The side key FPC is connected to the PCBA via the ZIF connector J1605.

The Power key press is detected by the PM8029's KPD_PWR_ON pin. The Power key FPC is connected to the PCBA using press-fit contacts.



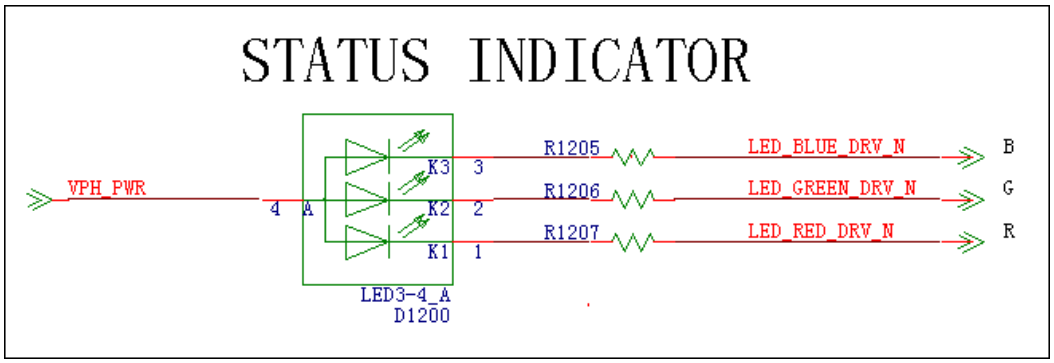
Troubleshooting Key Failure



9.4.6 Status Indicator and Touch Key Backlight Circuits

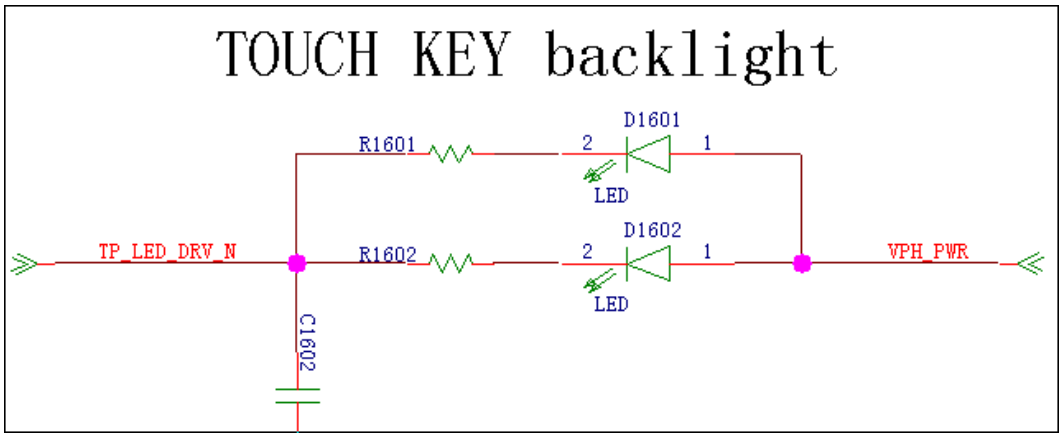
The U8655N's status indicator (tricolor indicator) provides red, green and blue light sources that are driven by the PM8029's three LED drivers.

Light Source	Driver Pin (PM8029)	Description
Red	LED_RED_DRV_N (MPP3)	Adjusted using electric current
Green	LED_GREEN_DRV_N (MPP5)	Adjusted using electric current
Blue	LED_BLUE_DRV_N (MPP8)	Adjusted using electric current

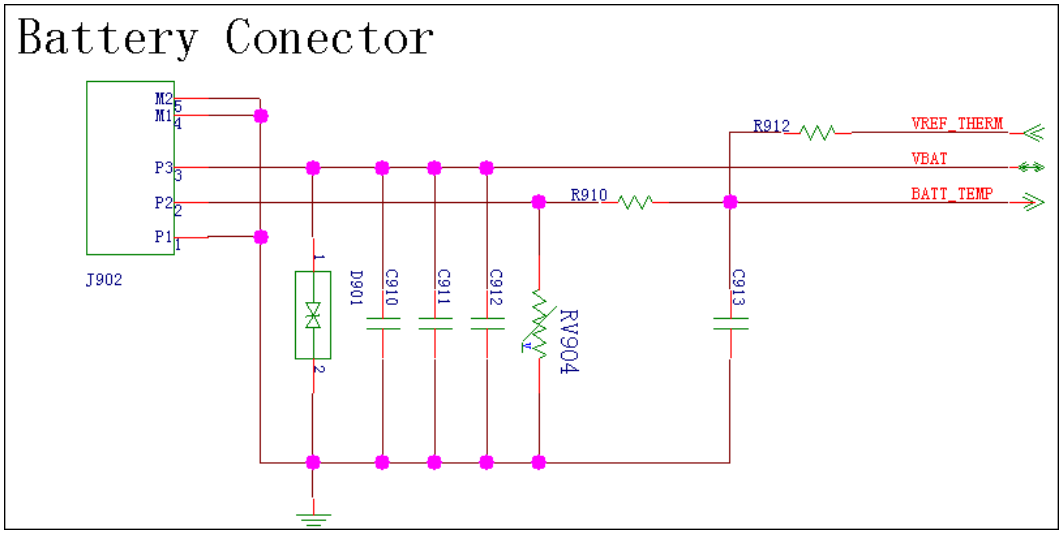


The KYPD_DRV_N (PM8029) is used to adjust the brightness of the keypad's backlight, and VPH_PWR is used to supply power to the backlight LEDs. The keypad backlight is provided by two white LEDs. The light from the LEDs are transmitted to the key area using a light guide film.

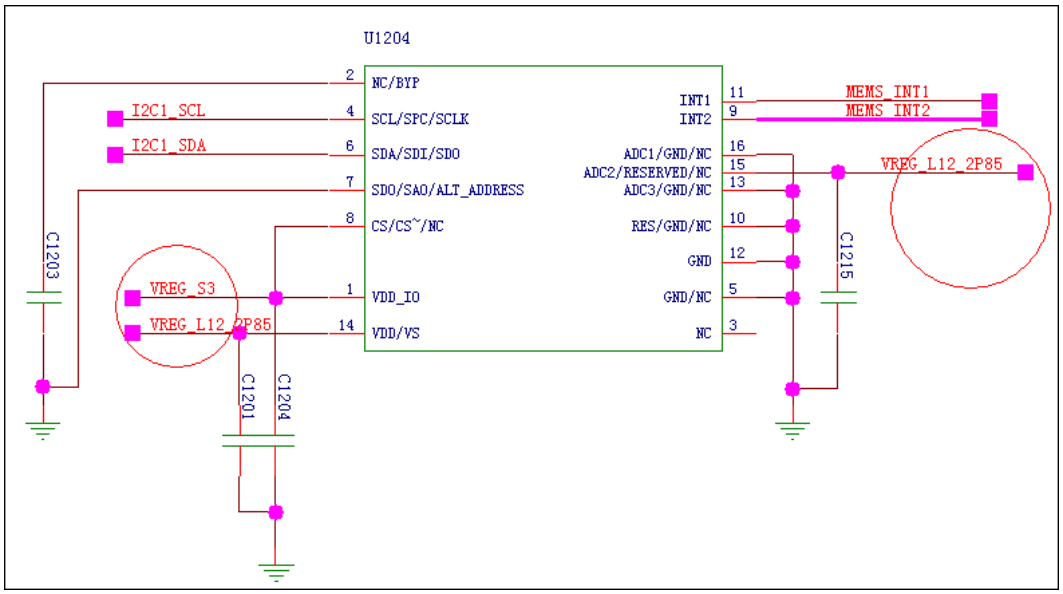
Keypad Backlight Driver		
VPH_PWR	Power supply	Backlight power supply
KPD_DRV_N	Backlight driver pin	When this pin's voltage is at low level, the two backlight LEDs turns on.



9.4.7 Battery Connector



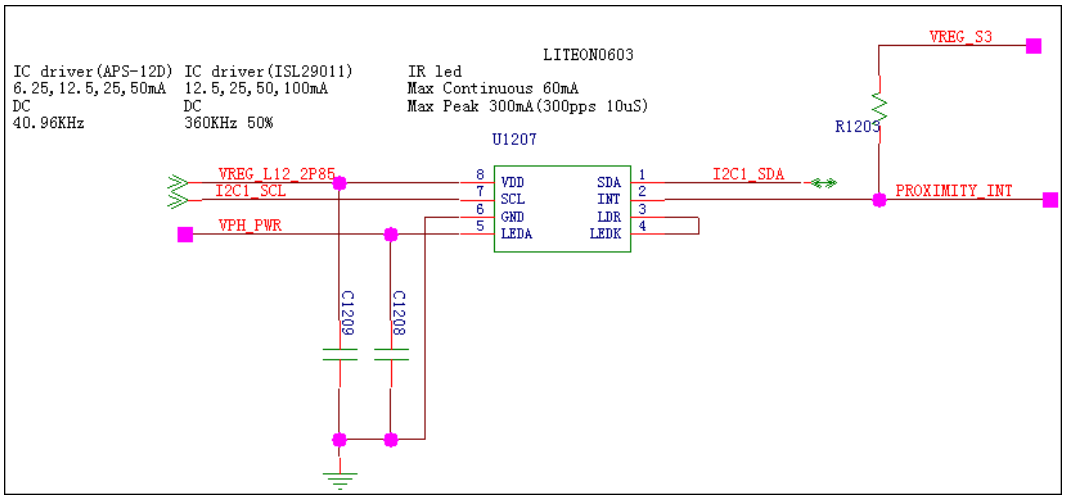
9.4.8 Accelerometer



Component	Network	MSM7225A Pin	Description
SCL	I2C1_SCL	GPIO_131	I2C bus
SDA	I2C1_SDA	GPIO_132	
INT1	MEMS_INT1	GPIO_28	Accelerometer interrupt
INT2	MEMS_INT2	GPIO_111	Accelerometer interrupt signal (sleep)

9.4.9 Proximity and Illuminance Sensor

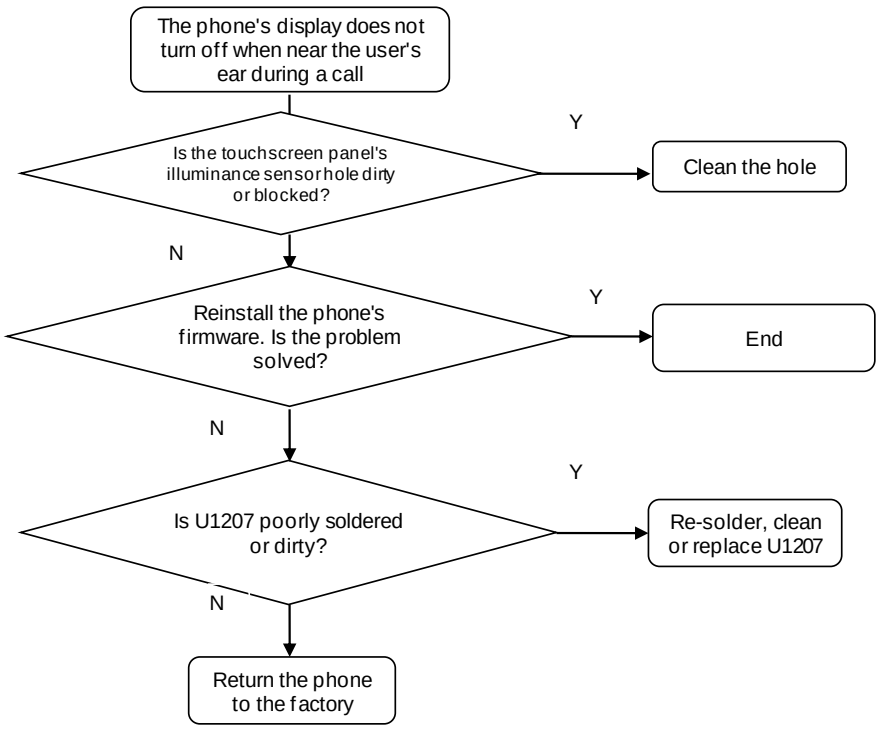
The U8655N has a proximity and illuminance sensor. The following figure shows the sensor circuit.



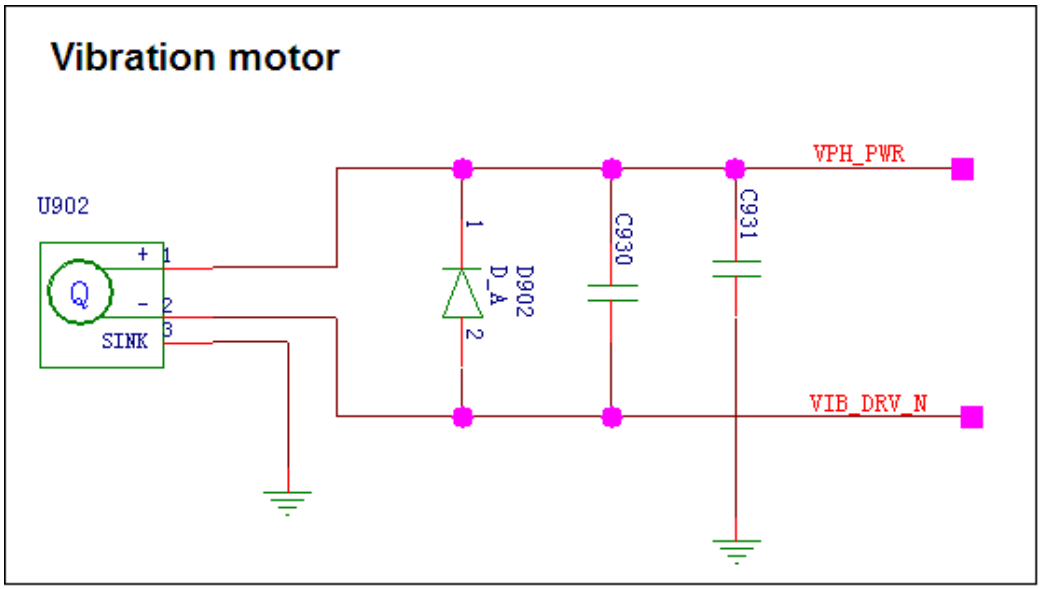
Component Pin	Network	MSM7225A-0 Pin	Description
SCL	I2C1_SCL	GPIO_131	I2C bus
SDA	I2C1_SDA	GPIO_132	
INT	PRO_INT	GPIO_17	3-in-1 interrupt signal

Functions

- Detect the intensity of environmental light.
- Detect the proximity of objects.

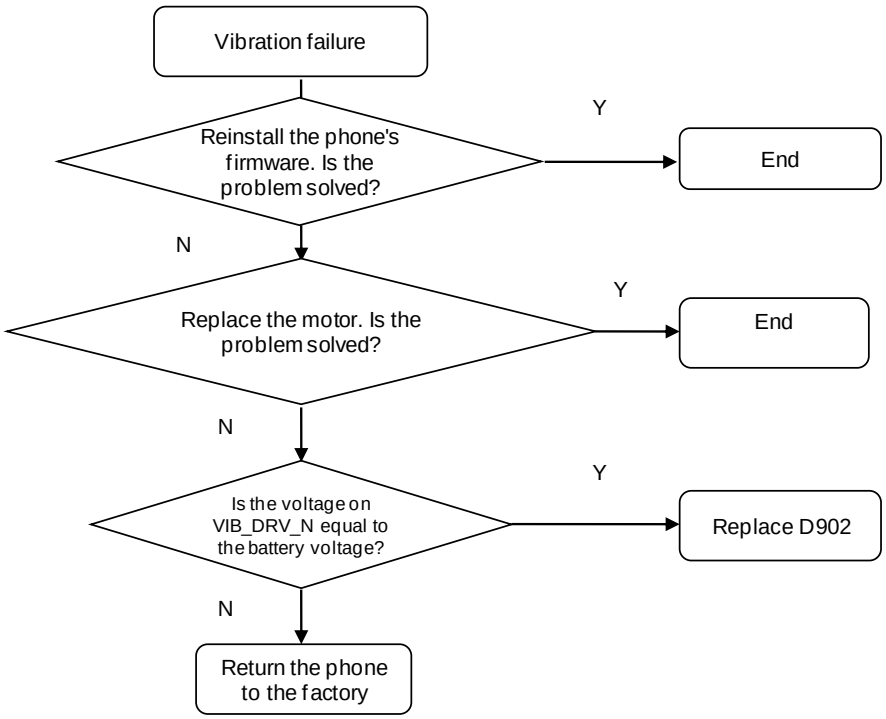


9.4.10 Vibration Motor



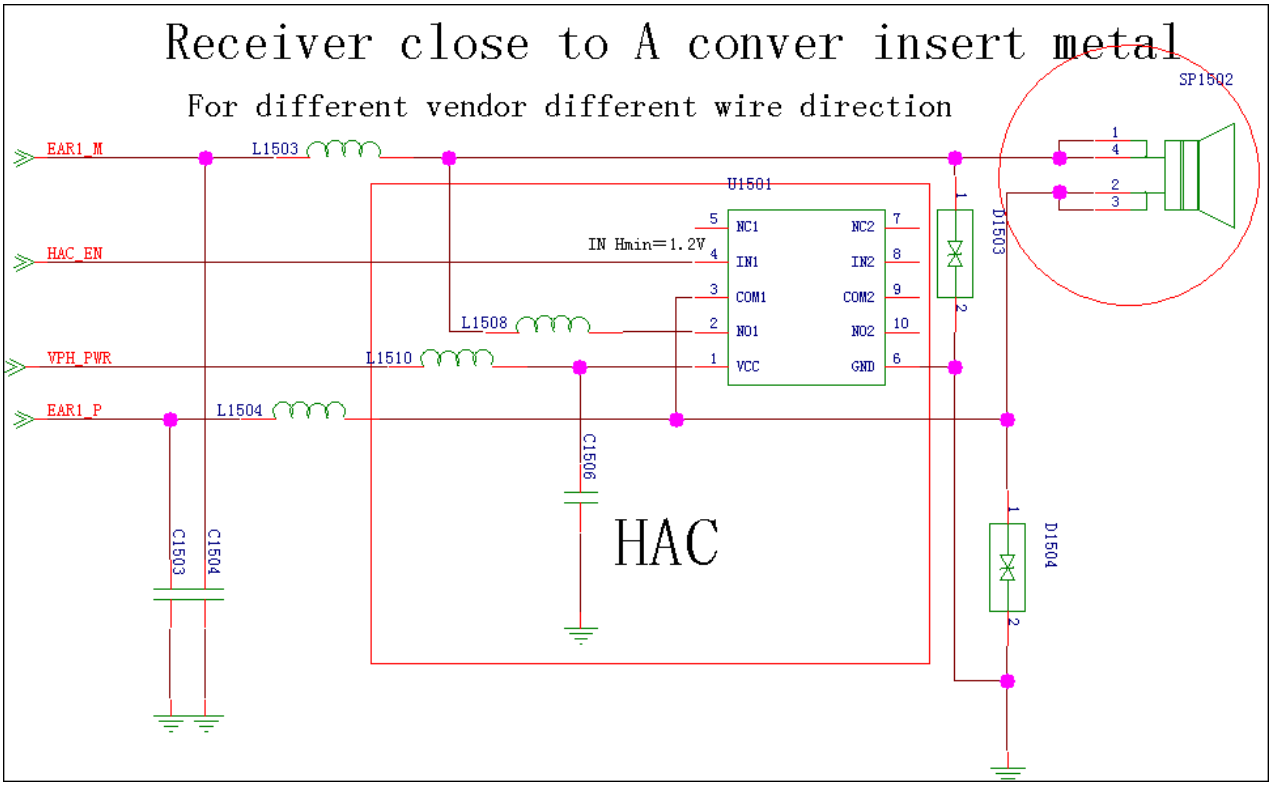
The motor driver current is controlled by PM VIB_DRV_N.

Troubleshooting Vibration Failure



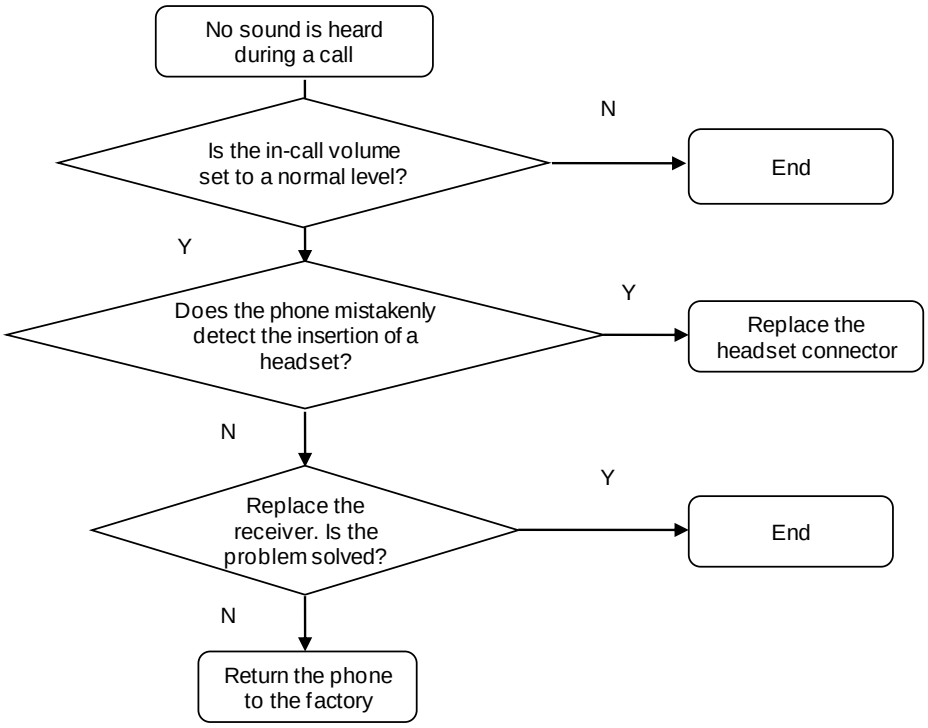
9.4.11 Receiver

The receiver receives differential earphone output from the MSM chip. The following figure shows the circuit.

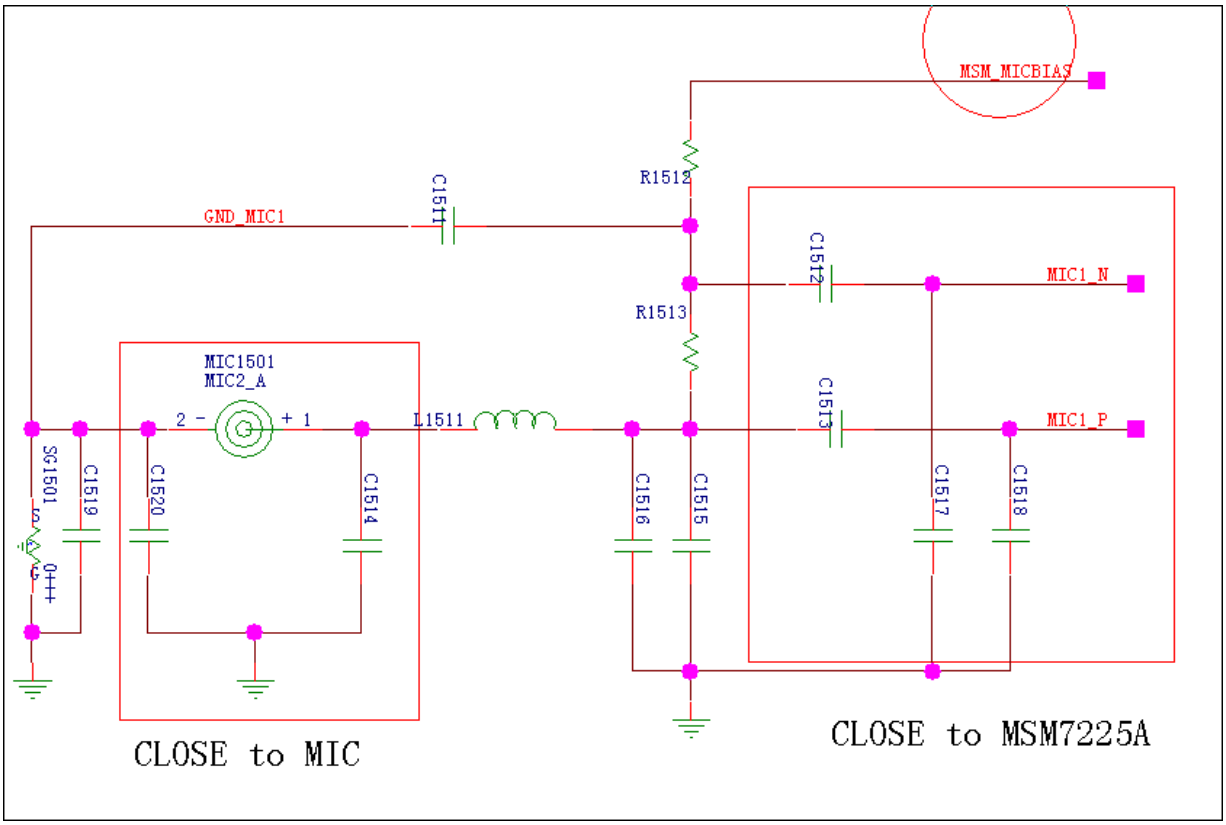


The MSM chip's EARI output signal is connected to the receiver. Bypass capacitors are added to the signal traces. The circuit shown in the previous figure is designed for compatibility. L1508, L1510 and U1501 are reserved for the HAC function and are not soldered on the U8655N. D1503 and D1504 are the ESD protection components on the receiver.

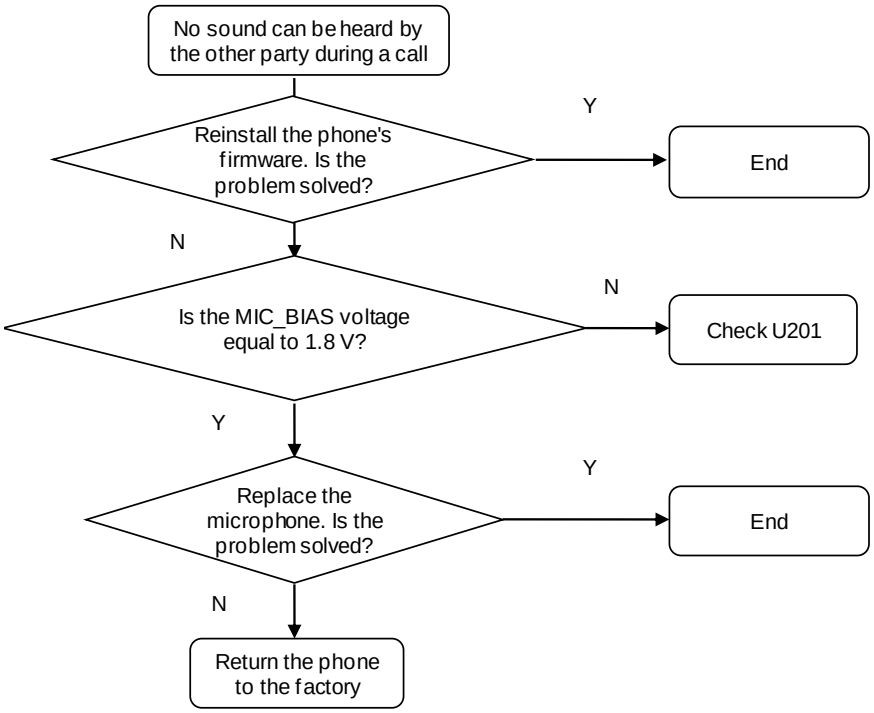
Troubleshooting the Failure that No Sound Can Be Heard During a Call



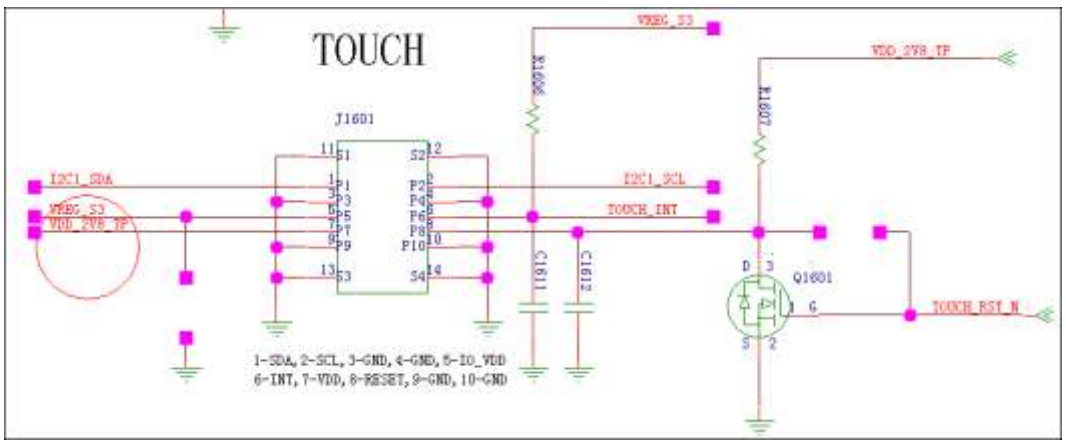
9.4.12 Microphone



Troubleshooting the Failure that No Sound Can Be Heard by the Other Party During a Call



9.4.13 Touchscreen Panel



The U8655N's 3.5-inch capacitive touchscreen panel has a touch key area containing three touch keys. The backlight LEDs for the three touch keys are located on the PCBA. A light guide film is used to guide light from the LEDs to the touch key area.

The following table describes the interfaces between the touchscreen panel, MSM7225A and PM8029.

Touchscreen Panel Interface	Pin	Description
VDD_2V8_TP	VREG_L12_2P85 (PM8029)	Touchscreen panel analog power supply, 2.85 V
VREG_S3	VREG_S3 (PM8029)	Touchscreen panel digital power supply and I/O connector power supply, 1.8 V
TOUCH_INT	GPIO_82 (MSM7225A)	Touchscreen panel interrupt signal
I2C1_SCL	GPIO_131 (MSM7225A)	Touchscreen panel's I2C clock
I2C1_SDA	GPIO_132 (MSM7225A)	Touchscreen panel's I2C data
TOUCH_RST_N	GPIO_96 (MSM7225A)	Touchscreen panel reset signal

9.4.14 SIM Card

The MSM7225A is not compatible with the SIM card interface. The PM8029's MPP pins are used to convert voltage levels of the signals for communication between the MSM7225A and the SIM card.

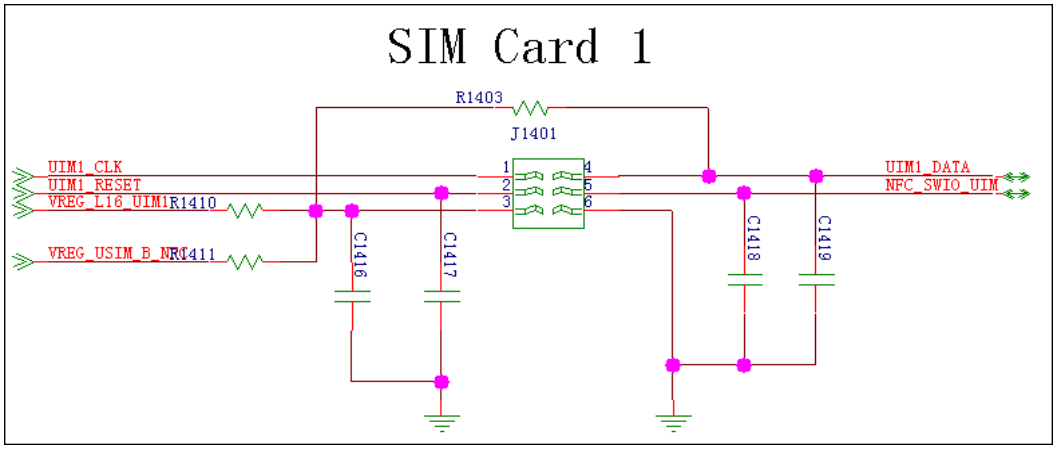
The voltage of VREG_L16_UIM1 can be set to 1.5–3.05 V. The USIM interface's operating voltage is usually 1.8 V or 3.0 V. The following table describes the voltage level conversion interface of the PM8029.

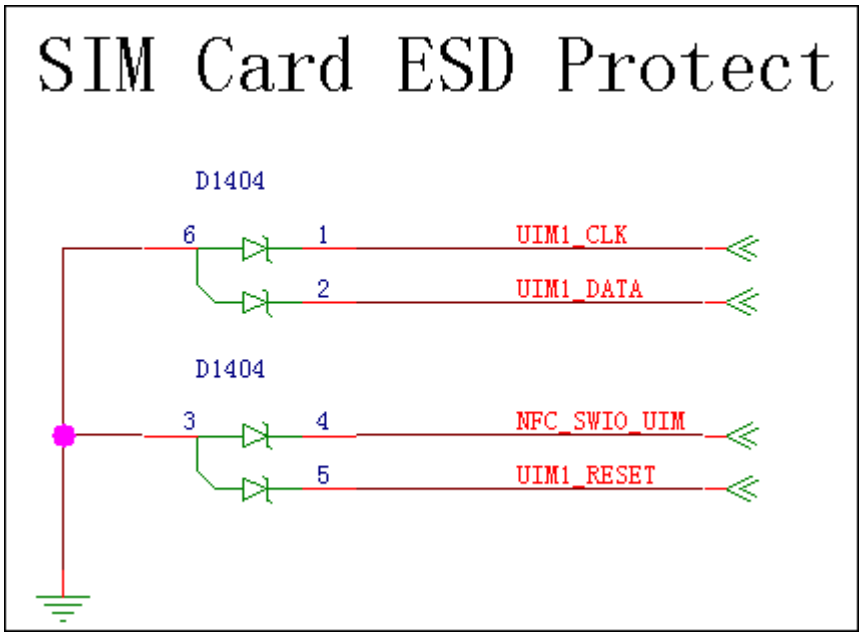
<table>
<tr><th>Signal for Interfacing with the MSM</th><th>Voltage Level</th><th>Signal for Interfacing with the USIM Card</th><th>Voltage Level</th></tr>
<tr><td></td><td rowspan="3">VREG_S3</td><td>UIM1_RESET</td><td rowspan="3">VREG_L16_UIM1
(configured by the phone's firmware)</td></tr>
<tr><td>UIM1_MSM_CLK</td><td>UIM1_CLK</td></tr>
<tr><td>UIM1_MSM_DATA</td><td>UIM1_DATA</td></tr>
</table>

NOTE

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

USIM card circuit

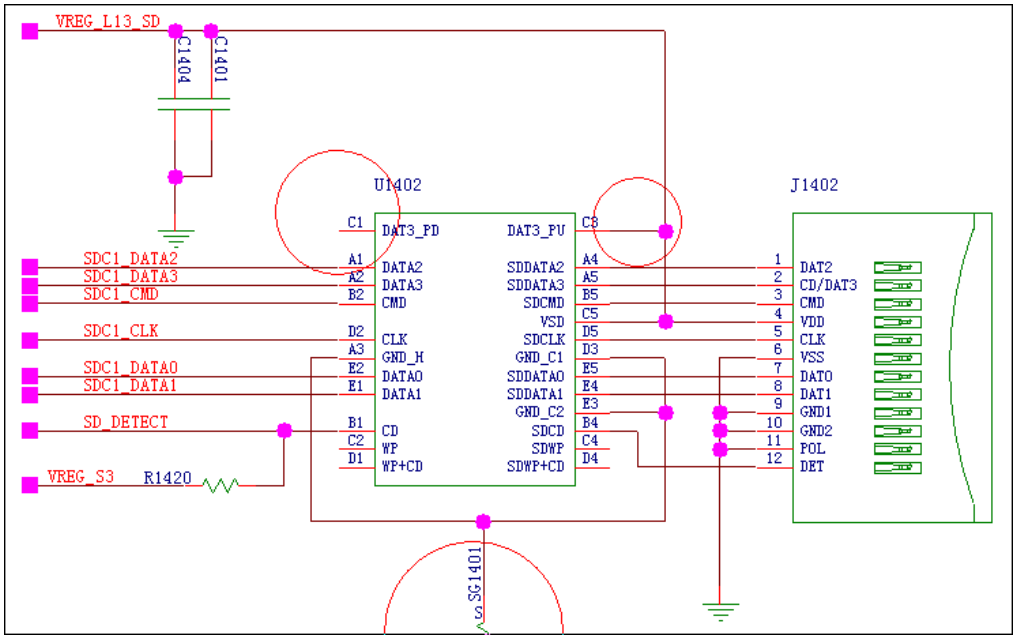




9.4.15 microSD Card

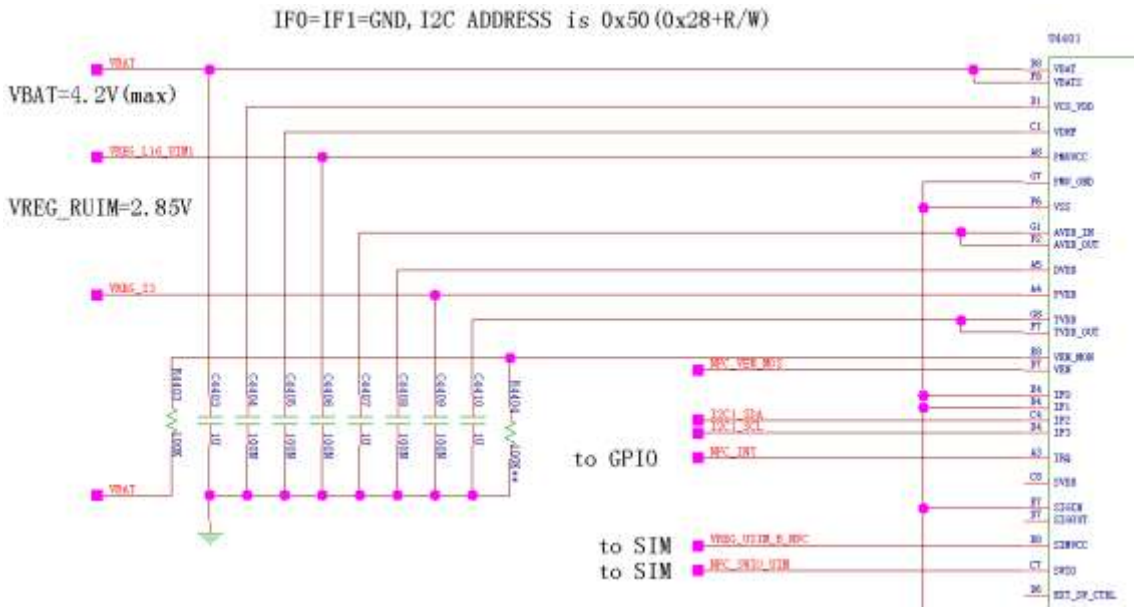
The microSD card connector's SD_DETECT pin is used to detect the insertion of a microSD card. When a microSD card is inserted, the pin is grounded and its voltage is at low level. When no microSD is inserted, its voltage is at high level. The U1402 is an EMI and ESD protection component for the microSD card.

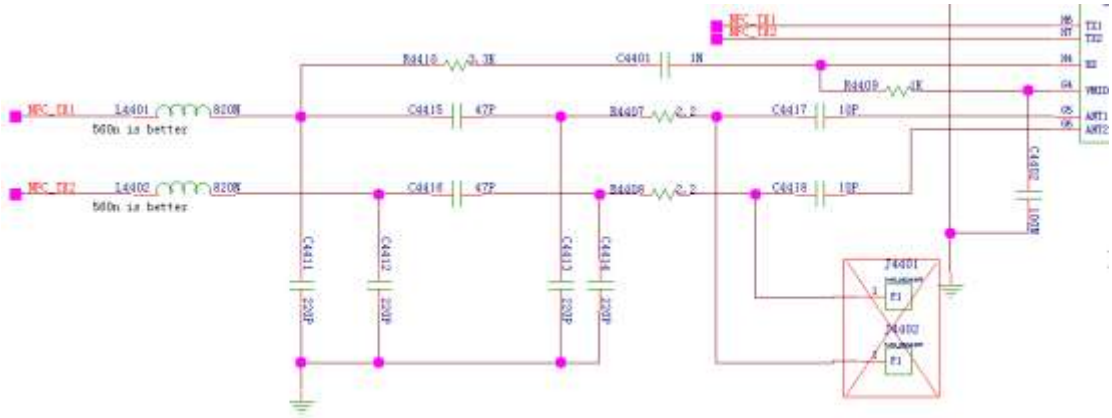
The following figure shows the circuit.

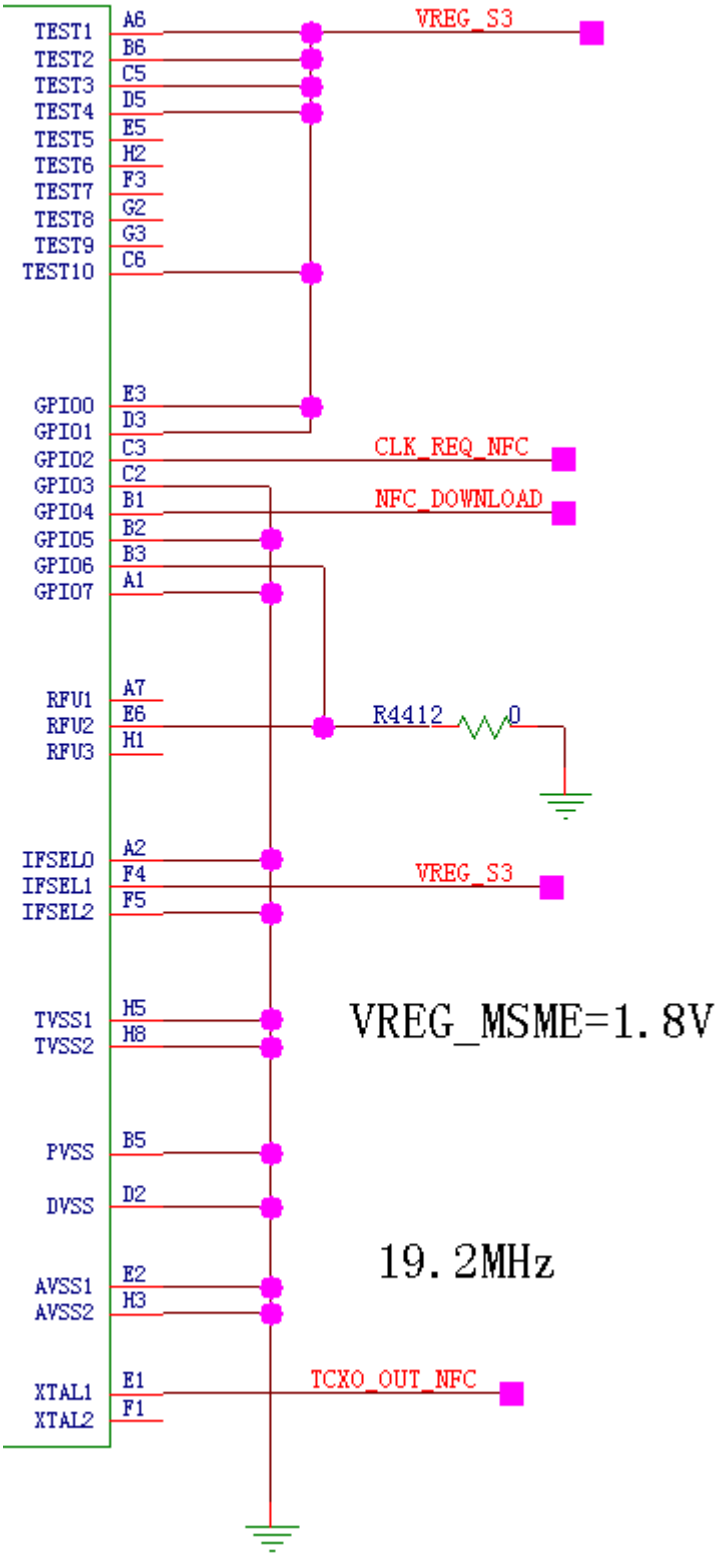


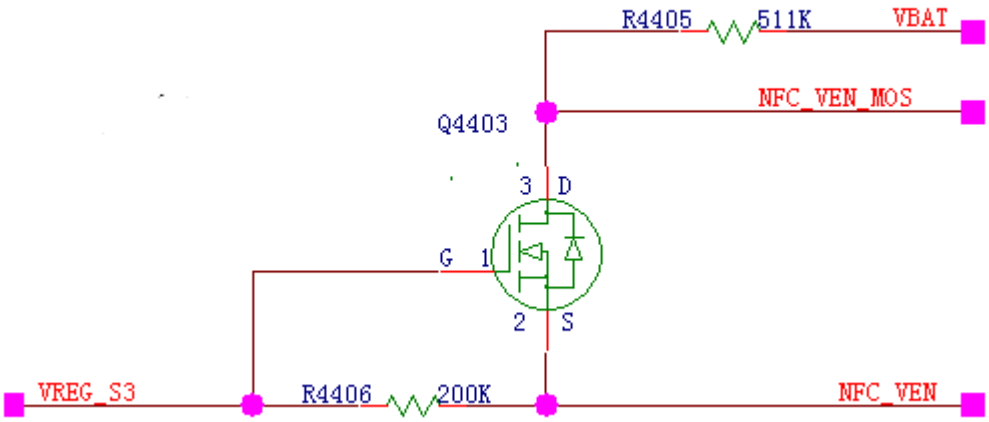
9.4.16 NFC

U8655N supports NFC module function, and uses NFC control chip of NXP to receive and process signal. when use NFC function normally, the battery cover must be covered because of built-in antenna. the signal NFC_VEN_MOS which is the reset signal of NFC module is controlled by NFC_VEN signal, this module uses a clock of 19.2MHz to ensure module work properly.

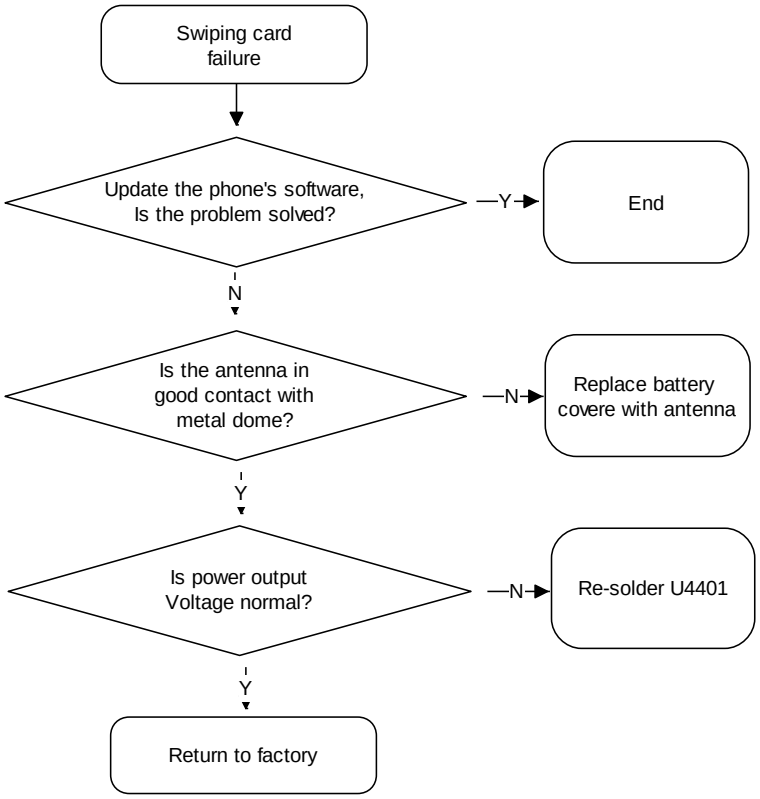








Troubleshooting the Failure of NFC swiping



Signal name	Description	Voltage or Waveform
NFC_VEN_MOS	NFC chip reset signal	The same voltage of battery

Signal name	Description	Voltage or Waveform
NFC_VEN	The reset signal from CPU	1.8V
NFC_TX1	Contactless Transmitter output1	-
NFC_TX2	Contactless Transmitter output2	-
VBAT	Battery power	Battery voltage 3.6V-4.2V
VREG_S3	power	1.8V
TCXO_OUT_NFC	Clock signal	19.2MHz

10 Solder Points on the PCB and BGA Chip

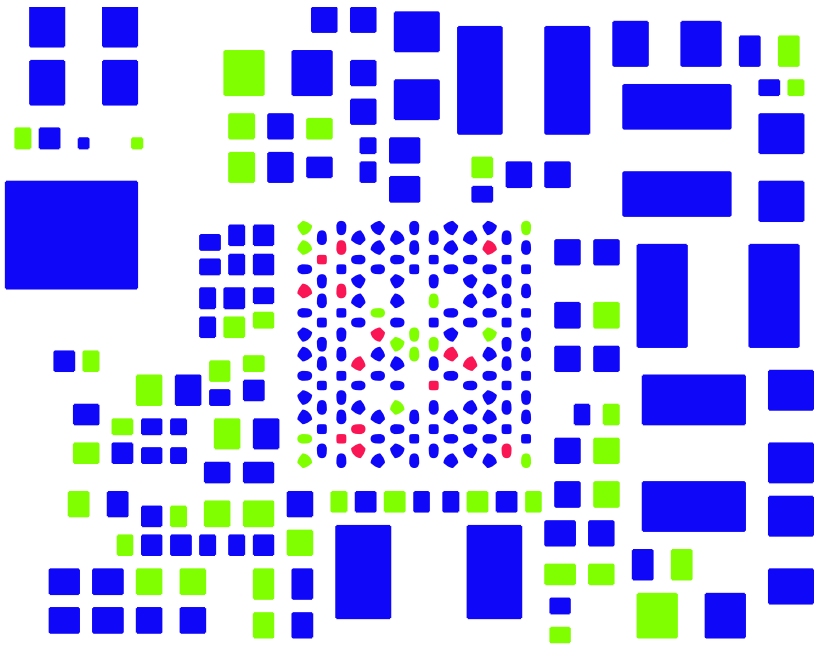
Red (R: 255, G: 0, B: 0) : Vacant point

Green (R: 0, G: 255, B: 0) : Ground point

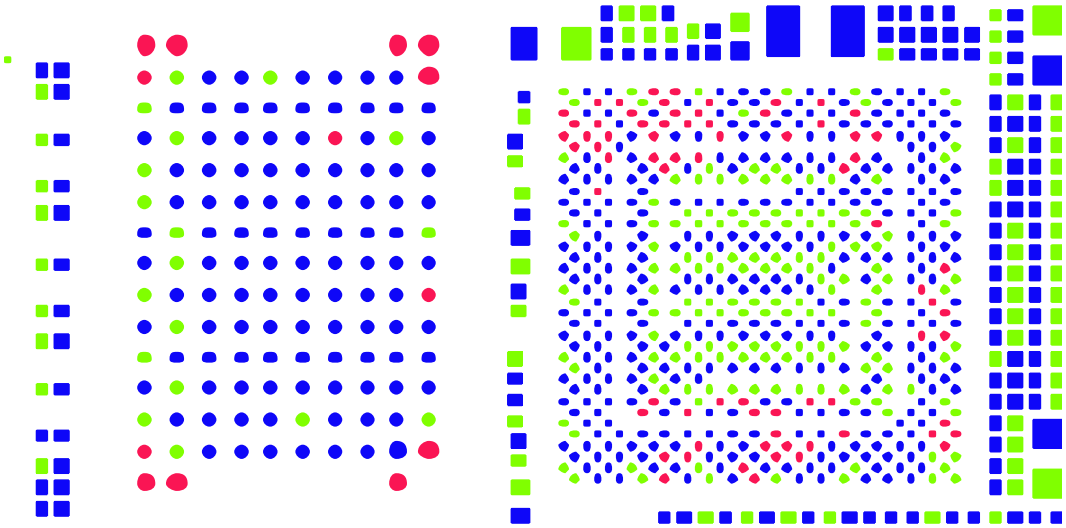
Blue (R: 0, G: 0, B: 255) : Solder point

Magnified views of sections:

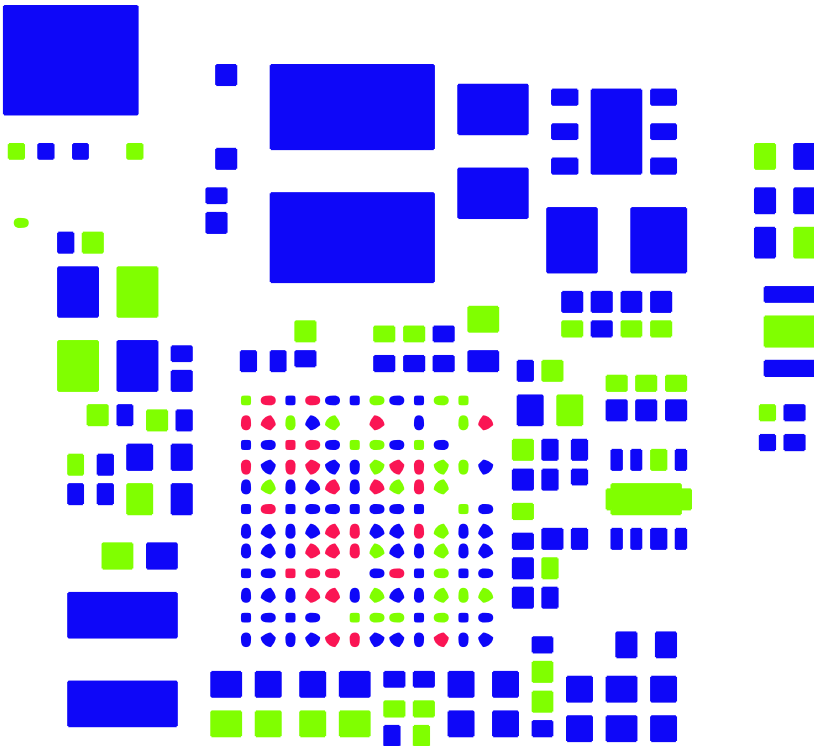
PM section



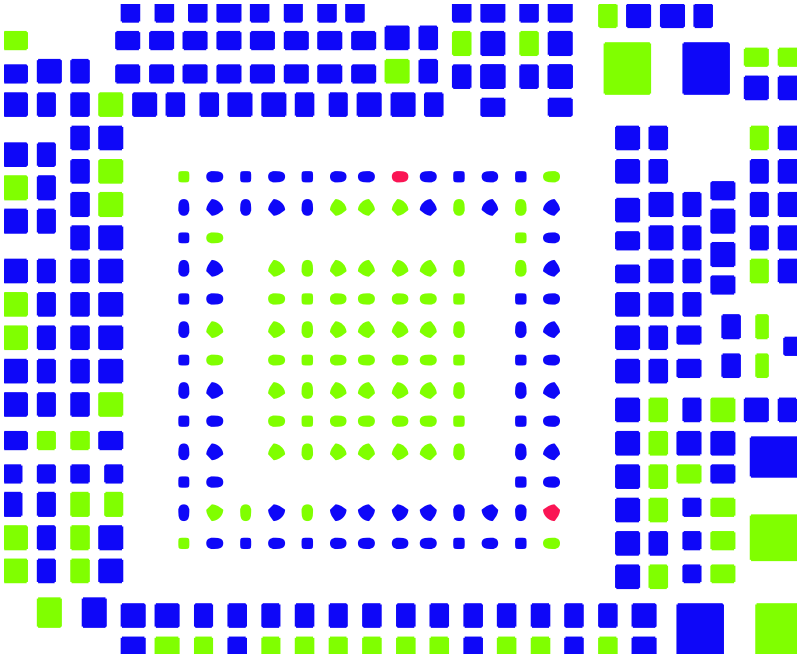
MSM7225A+NAND MCP section



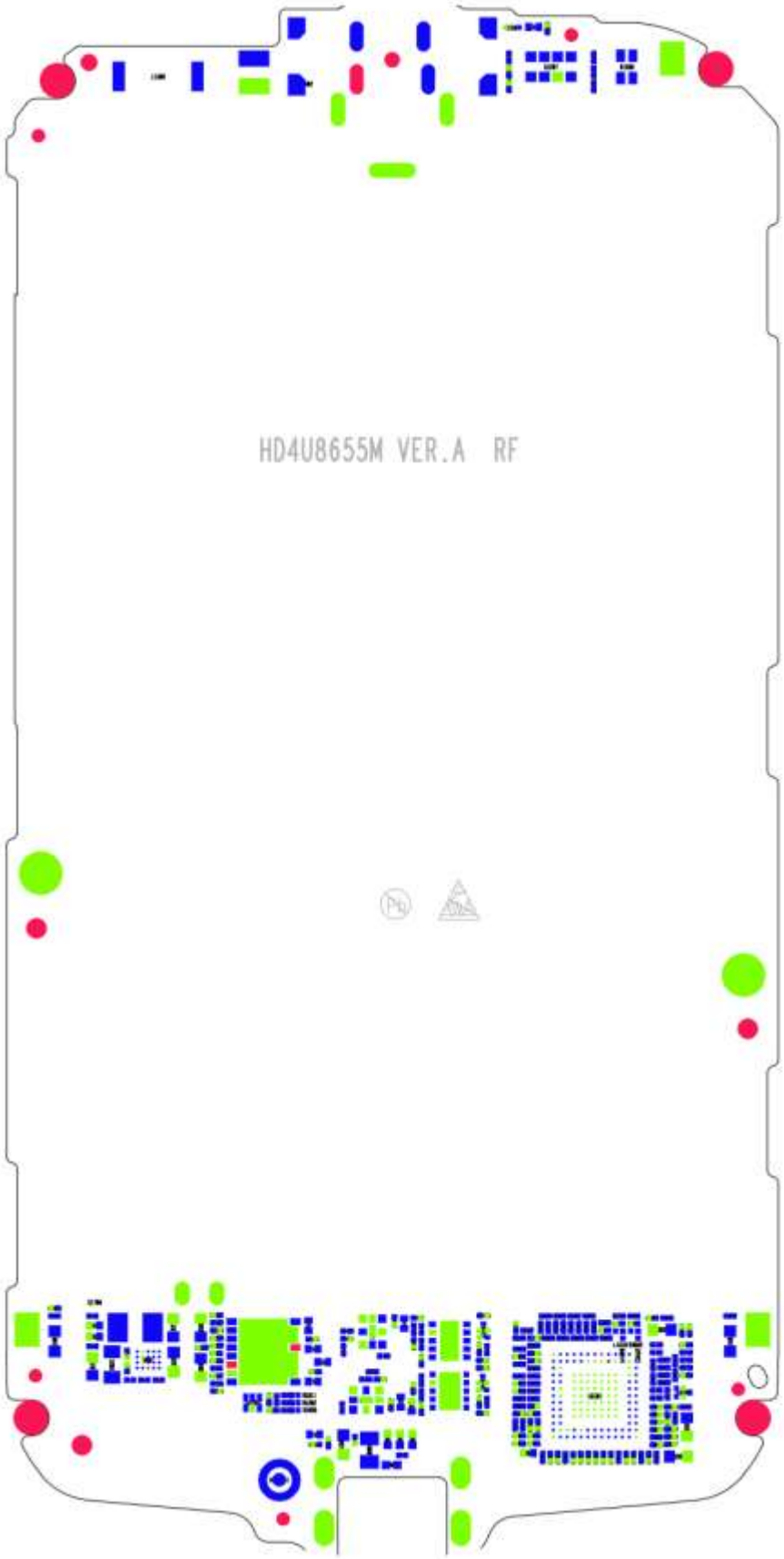
Wi-Fi/Bluetooth/FM section

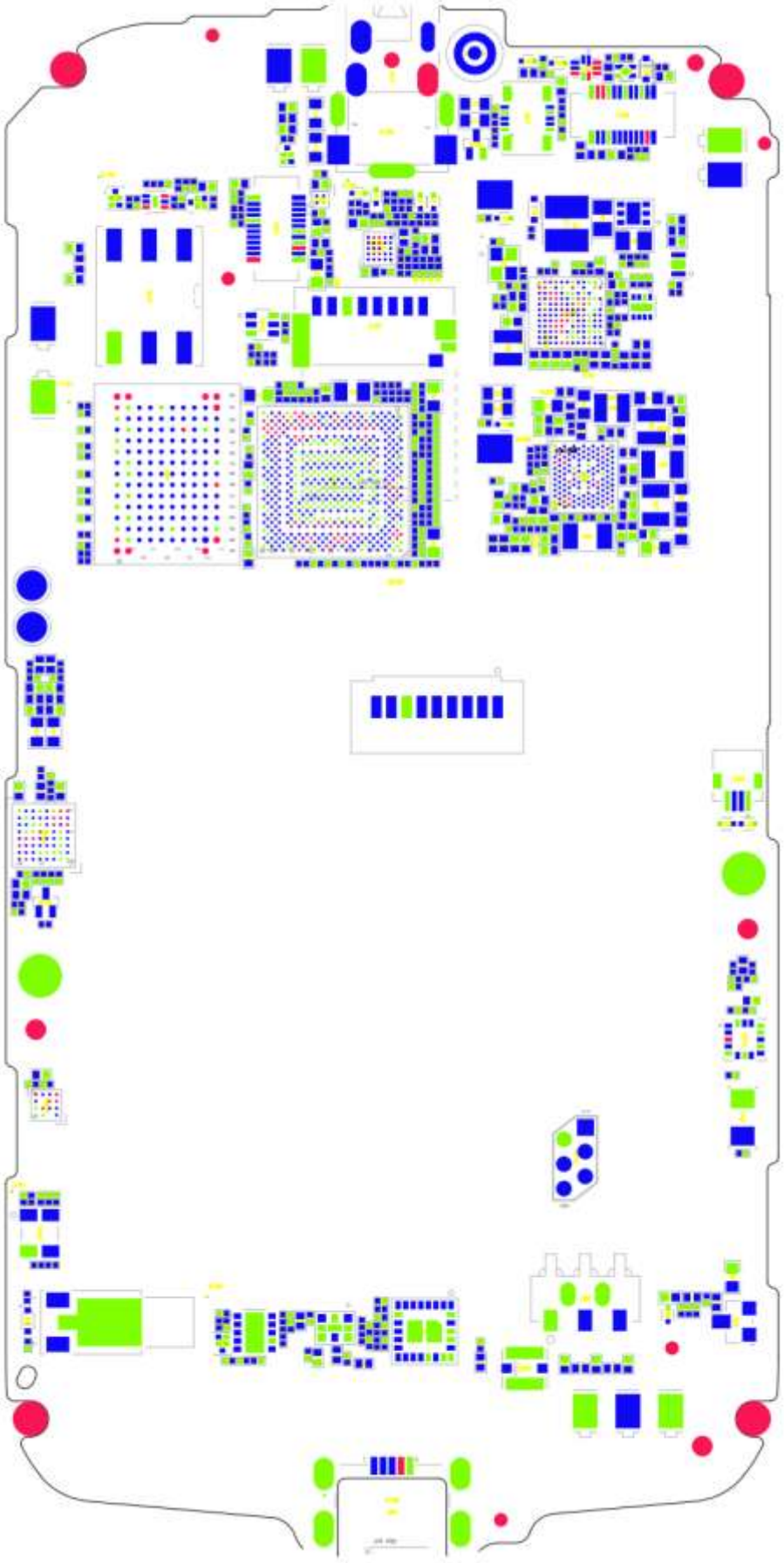


RTR8285A section



Complete PCB view:





11 Functional Tests

11.1 MMI Test

On the Home, enter ***#*#2846579#*#*** to enter the MMI test mode. Press the Volume– key to start a test. Touch the Menu key on the touchscreen panel to skip the current test and go to the next step. Touch the Back key to return to the previous test.

NOTE

- When no battery is installed or the battery voltage is low, the phone will indicate that the battery is low and the MMI test cannot be started.
- During a test, if you touch the Menu key on the touchscreen panel, the test will be skipped and marked as a failed test.

No.	Category	Item	Test Method
1	SD card test	microSD card test	Automatically test the microSD card functions. If a microSD card is found and is available, the test passes. Otherwise, the test fails. If this test passes, the next test automatically starts.
2	SIM card test	SIM card test	Automatically test whether the SIM card can be recognized. If the SIM card cannot be recognized, a message will be displayed, indicating that this test fails. If this test passes, the next test automatically starts.
3	Battery test	Battery test	Automatically test whether the battery is in place and whether its power is sufficient. If this test fails, a message will be displayed. If this test passes, the next test automatically starts.
4	Keypad test	Keys	Press or touch all the keys. When a key is pressed or touched, the color of the corresponding key displayed on the screen will change (from white to blue, or from blue to white). After all keys are tested, press the Volume– key to start the next test.
5	LCD test	White screen	The LCD displays a white screen. Press the Volume– key to start the next test.

No.	Category	Item	Test Method
		Black screen	The LCD displays a black screen. Press the Volume– key to start the next test.
		Red and blue bars	The LCD displays red and blue bars. Press the Volume– key to start the next test.
6	LCD backlight and status indicator test	LCD backlight and status indicator	If the LCD backlight repeatedly turns on and off, the LCD backlight is normal. The status indicator is normal if its color repeatedly changes in the sequence of red, green and blue. Press the Volume– key to start the next test.
7	Keypad LED test	Keypad backlight LEDs	If the keypad backlight repeatedly turns on and off, the backlight LEDs are normal. Press the Volume– key to start the next test.
8	Camera test	Camera test	Automatically test the camera. The phone's camera is turned on, and the LCD displays the preview. Check the image quality visually and test the camera's response speed to determine the camera's performance. Press the Volume– key to start the next test.
9	Touch screen test	Touch screen panel	There are three vertical gridlines which are composed of a group of squares, one is in middle, the other are on edge, Place your figure on the touch screen panel, and slide your figure sweep each square along the gridline. The areas near the route that your figure passes should turn red. it will fail if the finger sweeps outside of these squares. Press the Volume– key to start the next test.
10	Approach test	The proximity and illuminance sensor's proximity detection function	Place the light shielding plate approximately 4 mm above the light hole. If a phone icon is displayed nearby the portrait, the function is normal. If this test passes, the next test automatically starts.
11	Environmental light test	The proximity and illuminance sensor's function to sense environmental light	Check whether the environmental light sensing data is detected: Use your hand to block the light hole, the light sensing number will decrease approximately 10 if the illuminance sensor functions properly. If this test passes, the next test automatically starts.
12	Vibration test	Vibration motor	The motor will vibrate intermittently. Check whether the vibration (including the vibration sound) is normal. Press the Volume– key to start the next test.
13	Speaker test	Speaker test	Automatically test the speaker. (Do not insert the headset.) If the speaker emits sound during the test, it is normal. Press the Volume– key to start the next test.

No.	Category	Item	Test Method
14	Mobile phone mic loopback test	Main microphone (located near the USB port)	Do not insert the headset. Touch the Record button. Speak to the main microphone, and then touch the Play button. If the main microphone is normal, you can hear the voice recording from the receiver. Press the Volume– key to start the next test.
15	Mobile phone loopback test	Secondary microphone (located above the camera at the phone's rear)	Do not insert the headset. Touch the Record button. Speak to the secondary microphone, and then touch the Play button. If the secondary microphone is normal, you can hear the voice recording from the receiver. Press the Volume– key to start the next test.
16	Dual MIC test	Main and secondary microphones	Do not insert the headset. Touch the Record button. Speak to the phone as you do during a call, and then touch the Play button. If the main and secondary microphones are normal, you can hear the voice recording from the receiver. Press the Volume– key to start the next test.
17	Mobile phone Headset loopback test	Headset	Insert the headset. Touch the Record button. Speak to the headset microphone, and then touch the Play button. If the headset is normal, you can hear the voice recording from the headset's earphones. Keep the headset inserted. Press the Volume– key to start the next test.
18	FM test	FM test	The testing software will detect whether a headset is inserted. If no headset is inserted, a message requesting a headset to be inserted will be displayed. After a headset is inserted, the phone will search for and play an FM channel. Three frequencies (88 MHz, 98 MHz and 107 MHz) will be tested. The 88 MHZ frequency will be tested first. To test the next frequency, touch **Next Channel**. Remove the headset. Press the Volume– key to start the next test.
19	Headset Wire control test	Headset button test	Insert the headset. The IN icon will turn green. Press the headset button, and the round dot will become smaller. Remove the headset, and the OUT icon will turn green. Press the Volume– key to start the next test.
20	Bluetooth test	Bluetooth test	Automatically test the Bluetooth functions. During the test, the phone will search for Bluetooth devices, and display the MAC addresses of the Bluetooth devices that have been found. (Note: This test requires another device with Bluetooth enabled.) Press the Volume– key to start the next test.

No.	Category	Item	Test Method
21	Gravity sensor test	Accelerometer	The LCD displays the current acceleration in the X, Y and Z axes. Place the phone in a position where the angles between the X, Y and Z axes are 45 °. If the acceleration in the X, Y and Z axes is equal to each other, the phone passes this test. If this test passes, the next test automatically starts.
22	WiFi test	Wi-Fi test	Automatically test the Wi-Fi functions. During the test, the phone will search for nearby hotspots, and display the MAC addresses of the hotspots that have been found. (Note: This test requires an active hotspot in the testing environment.) Press the Volume– key to start the next test.
23	Display test	Displaying test results	Display the MMI test results. Failed test items will be listed.

11.2 Voice Call Test

1. Install a UIM card and a battery on the phone.
2. Press the Power key to power the phone on.
3. Check whether the signal strength displayed on the LCD is normal (given that the network is normal).
4. Make a call to a fixed-line phone, and check the voice quality during the call.
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 service site for repair.