

SAMSUNG

GSM TELEPHONE
SGH-E820

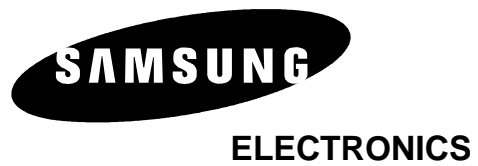
SERVICE *Manual*

GSM TELEPHONE

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BASIC.

1. SGH-E820 Specification

1. GSM General Specification

	GSM900 Phase 1	EGSM 900 Phase 2	DCS1800 Phase 1
Freq. Band[MHz] Uplink/Downlink	890~915 935~960	880~915 925~960	1710~1785 1805~1880
ARFCN range	1~124	0~124 & 975~1023	512~885
Tx/Rx spacing	45MHz	45MHz	95MHz
Mod. Bit rate / Bit Period	270.833kbps 3.692us	270.833kbps 3.692us	270.833kbps 3.692us
Time Slot Period / Frame Period	576.9us 4.615ms	576.9us 4.615ms	576.9us 4.615ms
Modulation	0.3GMSK	0.3GMSK	0.3GMSK
MS Power	33dBm~5dBm	33dBm~5dBm	30dBm~0dBm
Power Class	5pcl ~ 19pcl	5pcl ~ 19pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm
TDMA Mux	8	8	8
Cell Radius	35Km	35Km	2Km

2. GSM TX power class

TX Power control level	GSM900
5	33 ±3 dBm
6	31 ±3 dBm
7	29 ±3 dBm
8	27 ±3 dBm
9	25 ±3 dBm
10	23 ±3 dBm
11	21 ±3 dBm
12	19 ±3 dBm
13	17 ±3 dBm
14	15 ±3 dBm
15	13 ±3 dBm
16	11 ±5 dBm
17	9 ±5 dBm
18	7 ±5 dBm
19	5 ±5 dBm

TX Power control level	DCS1800
0	30 ±3 dBm
1	28 ±3 dBm
2	26 ±3 dBm
3	24 ±3 dBm
4	22 ±3 dBm
5	20 ±3 dBm
6	18 ±3 dBm
7	16 ±3 dBm
8	14 ±3 dBm
9	12 ±4 dBm
10	10 ±4 dBm
11	8 ±4dBm
12	6 ±4 dBm
13	4 ±4 dBm
14	2 ±5 dBm
15	0 ±5 dBm

2. SGH-E820 Circuit Description

1. SGH-E820 RF Circuit Description

1) RX PART

1. ASM(U100) Switching Tx, Rx path for GSM900, DCS1800 by logic controlling.

2. ASM Control Logic (Q100, Q102) Truth Table

	VC1	VC2
GSM Tx Mode	H	L
DCS Tx Mode	L	H
GSM Rx Mode	L	L
DCS Rx Mode	L	L

3. FILTER

Converting electromagnetic field wave to acoustic wave and then pass the specific frequency band.

- GSM FILTER (F101) For filtering the frequency band between 925 and 960 MHz
- DCS FILTER (F102) For filtering the frequency band between 1805 and 1880 MHz.

4. VC-TCXO (OSC101)

This module generates the 26MHz reference clock to drive the logic and RF. After additional process, the reference clock applies to the U102 Rx IQ demodulator and Tx IQ modulator. And then, the oscillator is controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

5. Transceiver (U102)

The receiver front-end which amplifies the GSM, DCS aerial signal, converts the chosen channel down to a low IF signal of 100 kHz. The first stage is composed of symmetrical low noise amplifiers (LNAs). They are matched to 50 ohm. The LNAs are followed by an IQ down mixer. It consists of two mixers in parallel but driven by quadrature out of phase LO signals. The In phase(I) and Quadrature phase(Q) IF signals are low pass filtered to provide protection from high frequency offset interferes. The low IF I and Q signals are then fed into the channel filter. The front-end low IF I and Q outputs enter the integrated bandpass channel filter with provision for five 8 dB gain steps in front of the filter.

2) TX PART

Baseband IQ signal fed into offset PLL, this function is included inside of U102 chip. OSC100 chip generates modulator signal which power level is about 6.5dBm and fed into Power Amplifier(U101). The PA output power and power ramping are well controlled by Auto Power Control circuit. We use offset PLL below table.

Modulation Spectrum	200kHz offset 30 kHz bandwidth	GSM	-36dBm
		DCS	-36dBm
	400kHz offset 30 kHz bandwidth	GSM	-36dBm
		DCS	-36dBm
	600kHz ~ 1.8MHz offset 30 kHz bandwidth	GSM	-51dBm
		DCS	-56dBm

2. Baseband Circuit description of SGH-E820

1. PCF50601 (U400)

1.1. Power Management

Ten low-dropout regulators designed specifically for GSM applications power the terminal and help ensure optimal system performance and long battery life. A programmable boost converter provides support for 1.8V, 3.0V, and 5.0V SIMs, while a self-resetting, electronically fused switch supplies power to external accessories. Ancillary support functions, such as RTC module and High Voltage Charge pump, Clock generator, aid in reducing both board area and system complexity. I2C BUS serial interface provides access to control and configuration registers. This interface gives a microprocessor full control of the PCF50601 and enables system designers to maximize both standby and talk times.

Supervisory functions, including a reset generator, an input voltage monitor, and a temperature sensor, support reliable system design. These functions work together to ensure proper system behavior during start-up or in the event of a fault condition (low microprocessor voltage, insufficient battery energy, or excessive die temperature).

1.2. Backlight Brightness Modulator

The Backlight Brightness Modulator (BBM) contains a programmable Pulse-width modulator (PWM) and FET to modulate the intensity of a series of LED's or to control a DC/DC converter that drives LCD backlight.

This phone (SGH-E820) uses PWM control to contrast the backlight brightness.

1.3. Clock Generator

The Clock Generator (CG) generates all clocks for internal and external usage. The 32768 Hz crystal oscillator provides an accurate low clock frequency for the PCF50601 and other circuitry.

2. LCD Connector

LCD is consisted of main LCD (color 65K TFT LCD).

Chip select signals in the U500, LCD_CS, can enable LCD. BACKLIGHT signal enables white LED of main LCD. These signals are from U400.

16-bit data lines (LD(0)~LD(15)) transfer data and commands to LCD. Data and commands use "RS" signal. If this signal is high, inputs to LCD are commands. If it is low, inputs to LCD are data. The signal which informs the input or output state to LCD, is required. But this system is not necessary this signal. So "L_WR" signal is used to write data or commands to LCD. Power signals for LCD are "LCD_VDD".

3. IRDA

This system uses IRDA module, HSDL_3208, Agilent's. This has signals, "IRDA_DOWN" (enable signal), "RXD0" (input data) and "TXD0" (output data). These signals are connected to OM6359. It uses two power signals. "VDD2" is used for circuit and "VBAT" is used for LED.

4. Key

This is consisted of key interface pins among OM6359, KBIO(0:7). These signals compose the matrix. Result of matrix informs the key status to key interface in the OM6359. Power on/off key is separated from the matrix. So power on/off signal is connected with PCF50601 to enable PCF50601. Key LED is consisted of four white LED for sub key and six white LED for main key. Four white LED for sub key use the 3.3V supply voltage. "SUB_BACKLIGHT_KEY_ON" signal enables 3.3V LDO for sub key backlight. Six white LED use the "VDD_KEY" supply voltage.

OM6359 enables six white LED.

"FLIP" informs the status of slide (open or closed) to the OM6359. This uses the hall effect IC, SH248GSP.

A magnet under main LCD enables SH248GSP.

5. EMI ESD Filter

This system uses the EMI ESD filter, EMIF09 to protect noise from IF CONNECTOR part.

6. IF connector

It is 18-pin connector. They are designed to use VBAT, V_EXT_CHARGE, TXD0, RXD0, RTS0, CTS0, JIG_REC, CHARGER_OK, RXD1, TXD1, AUX_MIC, AUX_SPK and GND. They connected to power supply IC, microprocessor and signal processor IC.

7. Battery Charge Management

A complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries.

If TA connected to phone, "V_EXT_CHARGE" enable charger IC and supply current to battery.

When fault condition caused, "CHG_ON" signal level change low to high and charger IC stop charging process.

8. Audio

EARP_P and EARP_N from OM6359 are connected to the main speaker. AUXSP is connected to the Hands free kit.

MIC_P and MIC_N are connected to the main MIC. And AUX_MIC_P and AUX_MIC_N are connected to earmicrophone.

YMU765_MA5 is a LSI for portable telephone that is capable of playing high quality music by utilizing FM synthesizer and ADPCM decoder that are included in this device.

As a synthesis, YMU765_MA5 is equipped 32 FM voices and 32 Wave Table voices. Since the device is capable of simultaneously generating up to synchronous with the play of the FM synthesizer, various sampled voices can be used as sound effects.

Since the play data of YMU765_MA5 are interpreted at anytime through FIFO, the length of the data(playing period) is not limited, so the device can flexibly support application such as incoming call melody music distribution service. The hardware sequencer built in this device allows playing of the complex music without giving excessive load to the CPU of the portable telephones. Moreover, the registers of the FM synthesizer can be operated directly for real time sound generation, allowing, for example, utilization of various sound effects when using the game software installed in the portable telephone.

YMU765_MA5 includes a speaker amplifier with high ripple removal rate whose maximum output is 580mW (SPVDD=3.6V). The device is also equipped with conventional function including a vibrator.

For the purpose of enabling YMU765_MA5 to demonstrate its full capabilities, Yamaha purpose to use "SMAF:Synthetic music Mobile Application Format" as a data distribution format that is compatible with multimedia. Since the SMAF takes a structure that sets importance on the synchronization between sound and images, various contents can be written into it including incoming call melody with words that can be used for training karaoke, and commercial channel that combines texts, images and sounds, and others. The hardware sequencer of YMU765_MA5 directly interprets and plays blocks relevant to synthesis (playing music and reproducing ADPCM with FM synthesizer) that are included in data distributed in SMAF.

9. Memory

Signals in the OM6359 enable two memories. They use only one volt supply voltage, VDD3 in the PCF50601. This system uses Samsung's memory, KBB06B400M-F402. It is consisted of 128M bits flash NOR memory and 256M bits flash NAND memory and 64M bits SCRAM. It has 16 bit data line, HD[0~15] which is connected to OM6359 and MV317SAQ. It has 26 bit address lines, HA[1~26]. CS_NAND and NCSRAM signals is chip select. Writing process, HWR_N is low and it enables writing process to flash memory and SRAM. During reading process, HRD_N is low and it enables reading process to flash memory and SRAM. Each chip select signals in the OM6359 select memory among 2 flash memory and SCRAM. Reading or writing procedure is processed after HWR_N or HRD_N is enabled. Memories use reset, which is VDD3 delay from PCF50601. HA[25] signal enables lower byte of SRAM and HA[26] signal enables higher byte of SRAM.

10. OM6359

OM6359 is consisted of ARM core and DSP core. It has 8x1Kword on-chip program/data RAM, 55 Kwords on-chip program ROM in the DSP. It has 4K*32bits ROM and 2K*32bits RAM in the ARM core. DSP is consisted of KBS, JTAG, EMI and UART. ARM core is consisted of EMI, PIC(Programmable Interrupt Controller), reset/power/clock unit, DMA controller, TIC(Test Interface Controller), peripheral bridge, PPI, SSI(Synchronous Serial Interface), ACC(Asynchronous communications controllers), timer, ADC, RTC(Real-Time Clock) and keyboard interface. KBIO(0:7), address lines of DSP core and HD[0~15]. HA[1~26], address lines of ARM core and HD[0~15], data lines of ARM core are connected to memory, YMU765, MV317SAQ(Camera DSP Chip).

CS_NAND, NCSRAM, NCSFLASH in the ARM core are connected to each memory. HWR_N and HRD_N control the process of memory. External IRQ(Interrupt ReQuest) signals from each units, such as PMU, need the compatible process. KBIO[0~7] receive the status from key and RXD0/TXD0/irDA_DOWN are used for the communications using IRDA and data link cable(DEBUG_DTR/RTS/TXD/RXD/CTS/DSR).

It has JTAG control pins(TDI/TDO/TCK) for ARM core and DSP core. It receives 13MHz clock in CKI pin from external TCXO. ADC(Analog to Digital Converter) part receives the status of temperature, battery type and battery voltage.

11. VC-TCXO-214C6(26MHz)

This system uses the 26MHz TCXO. AFC control signal forms OM6359 control frequency from 26MHz x-tal. It generates the clock frequency. This clock is connected to UAA3536.

12. Camera DSP(MV317SAQ)

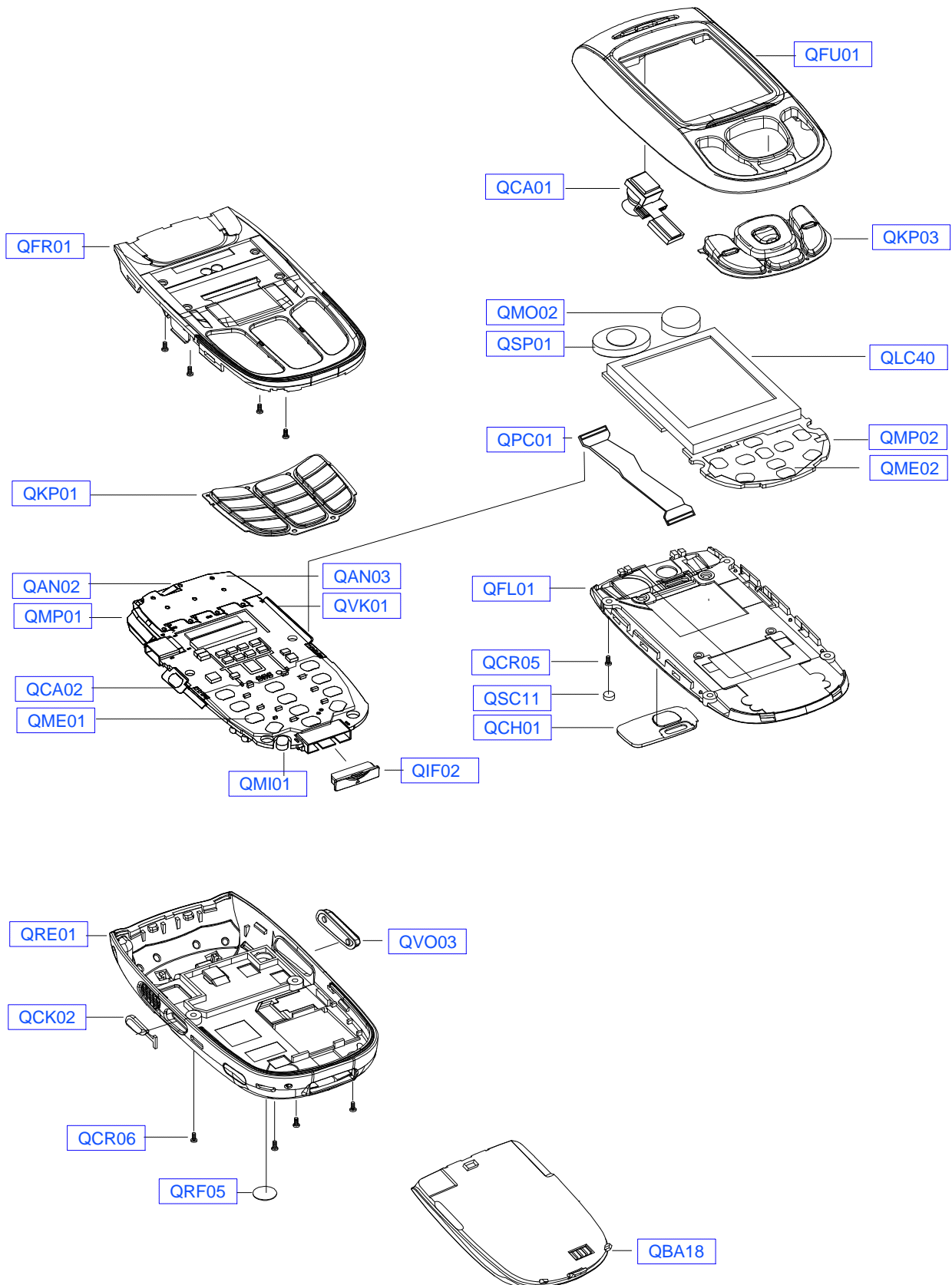
Tiger is an Integrated circuit for mobile phone camera. This structure will allow effectiveness for large data management and significantly reduces main processor will get burden.

In hence, Tiger will allow the user to be able to display to LCD direct without burdening the main processor. It also allows to have various kinds of display size on the LCD and snapshot for Jpeg. Digital effect will also be executed on real time base resulting Tiger as being a video co-processor in the mobile platform.

Also, an i80 type processor's 16bit parallel interface of Tiger makes it available for the CPU to interchange the data with Tiger. As the additional 8Mbit is usable except 2Mbit buffer embedded in Tiger, the diverse UI data processing which is not a burden to the CPU is available. JPEG encoder and decoder are baseline ISO/IEC 10918-1 JPEG compliance (DCT-based). JPEG decoder supports YUV444, YUV422, YUV420 and YUV411 format standard JPEG image.

3. SGH-E820 Exploded View and its Parts list

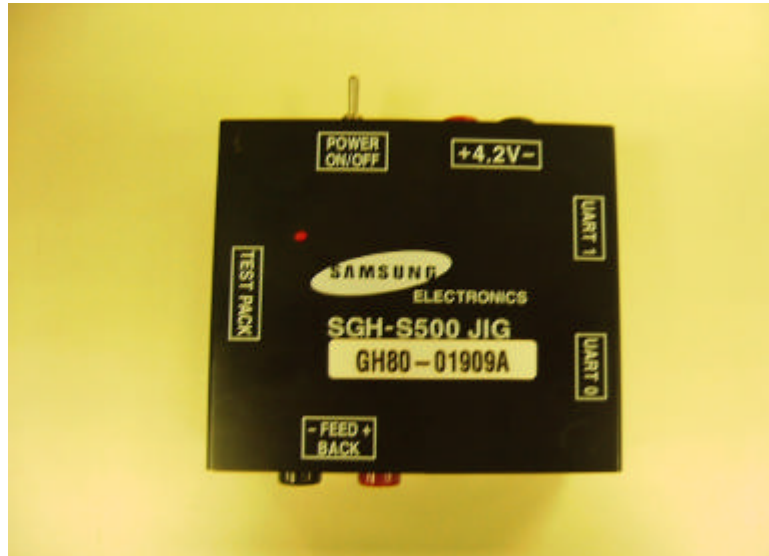
1. Cellular phone Exploded View - 1



2. Cellular phone Parts list

Location NO.		Description	SEC CODE	Remark
QFU01		SLIDE UPPER ASSY	GH75-04451A	
QCA01		CAMERA	GH59-01307A	
QKP03		SUB KEYPAD ASSY	GH75-04454A	
QMO02		MOTOR	3101-001384	
QSP01		SPEAKER	3001-001528	
QLC40		LCD	GH07-00531A	
QPC01		PCB	GH41-00554A	
QMP02		SUB PBA	GH92-01808A	
QME02		METAL DOME SHEET	GH59-01312A	
QFL01		SLIDE LOWER ASSY	GH75-04453A	
QCR05		SCREW	6001-001478	
QSC11		LOWER SCREW CAP	GH73-03014A	
QCH01		CAMERA DUMMY ASSY	GH75-04881A	
QFR01		FRONT COVER	GH75-04450A	
QKP01		MAIN KEYPAD	GH75-04455A	
QAN02		ANTENNA ASSY	GH42-00396A	
QAN03		ANTENNA GND PLATE	GH42-00396B	
QVK01		UNIT SIDE KEY	GH59-01308A	
QMP01		MAIN PBA	GH92-01807A	
QCA02		UNIT CAMERA KEY	GH59-01313A	
QME01		METAL DOME SHEET	GH59-01310A	
QMI01		MICROPHONE ASSY	GH30-00105A	
QIF02		I/F COVER	GH72-13421A	
QRF05		R/F CAP	GH74-08062A	
QRE01		REAR COVER ASSY	GH75-04456A	
QVO03		VOLKEY	GH72-13120A	
QCK02		CAMERA KEY	GH72-13121A	
QCR06		SCREW	6001-001155	
QBA18		BATTERY	GH43-01328A	

3. Test Jig (GH80-01909A)



3-1. RF Test Cable
(GH39-00283A)



3-2. Test Cable
(GH39-00217A)



3-3. Serial Cable



3-4. Power Supply Cable



3-5. DATA CABLE
(GH39-00219A)



3-6. TA
(GH44-00482A)



4. SGH-E820 MAIN Electrical Parts List

MAIN			
SEC CODE	Design LOC		
0403-001387	ZD300	1405-001093	TH302
0403-001427	ZD202	1405-001082	V200
0406-001150	ZD302	2007-000138	R127
0406-001121	ZD201	2007-000140	R131
0406-001194	ZD301	2007-000140	R132
0406-001194	ZD303	2007-000140	R201
0406-001150	ZD304	2007-000140	R203
0504-001134	Q201	2007-000140	R214
0505-001332	Q202	2007-000140	R223
0504-001151	Q100	2007-000140	R226
0504-001151	Q101	2007-000140	R311
0504-001151	Q102	2007-000141	R104
0601-001819	D300	2007-000141	R228
0601-001819	D301	2007-000141	R229
0601-001819	D302	2007-000142	R123
0601-001819	D303	2007-000144	R106
0601-001819	D304	2007-000148	R112
0601-001819	D305	2007-000148	R124
0604-001261	U503	2007-000148	R202
0801-002237	U303	2007-000148	R207
0801-002882	U203	2007-000148	R225
0801-002882	U300	2007-000148	R400
0801-002882	U301	2007-000151	R401
1001-001248	U200	2007-000157	R231
1001-001253	U202	2007-000162	R100
1009-001018	U306	2007-000162	R101
1109-001299	U302	2007-000162	R102
1201-002075	U101	2007-000162	R208
1202-001068	U201	2007-000162	R210
1203-001895	U501	2007-000162	R221
1203-001917	U206	2007-000162	R222
1203-002980	U204	2007-000162	R232
1204-002138	U304	2007-000162	R300
1205-002327	U102	2007-000162	R301
1205-002350	U400	2007-000162	R303
1404-001221	TH201	2007-000162	R304
1405-001093	TH300	2007-000162	R305
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		2007-000162	R307
		2007-000162	R308

2007-000162	R325
2007-000162	R331
2007-000170	R500
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2007-000172	R309
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2007-000174	R204
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2007-000636	R236
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2007-000775	R328
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2007-001284	R219
2007-001284	R220
2007-001288	R108
2007-001288	R114
2007-000138	R127
2007-001308	R110
2007-001308	R111
2007-001308	R116
2007-001308	R117
2007-001308	R125
2007-001313	R322
2007-001325	R326
2007-001329	R105
2007-001339	R238
2007-001339	R239
2007-002796	R200
2007-002796	R205
2007-002796	R217
2007-002796	R227

2007-007001	R224
2007-007014	R321
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2007-007107	R211
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2007-007132	R329
2007-007136	R327
2007-007142	R215
2007-007142	R218
2007-007148	R103
2007-007311	R113
2007-007311	R324
2007-007314	R126
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2007-007334	R234
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2007-007573	R206
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2007-007588	R235
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2007-007699	R119
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2703-002204	L105
2703-002205	L115
2703-002208	L104
2703-002208	L106
2703-002281	L108
2703-002281	L111
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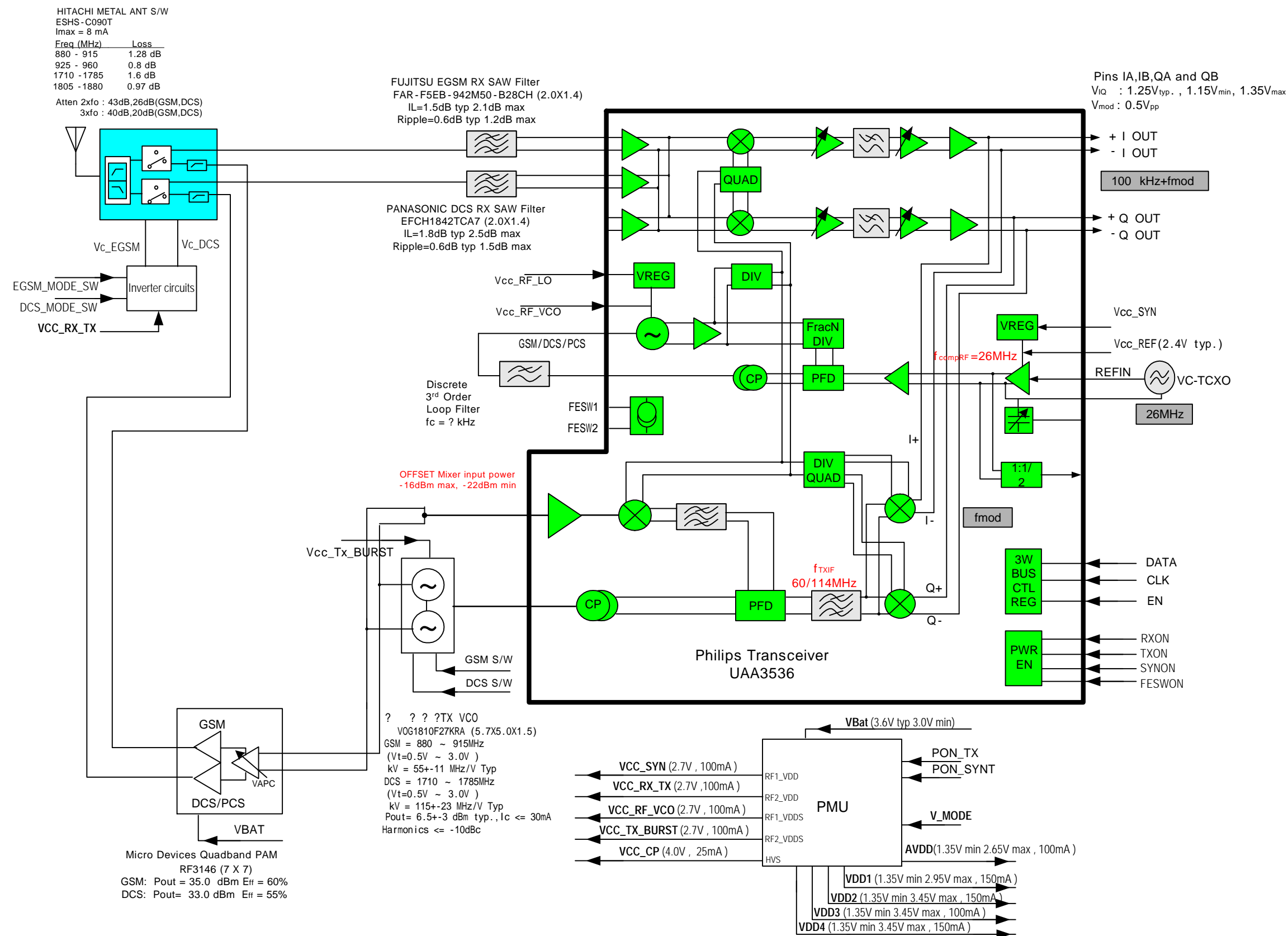
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2904-001469	F101
2904-001513	F100
2904-001514	F102
2909-001246	U100
3301-001105	L400
3708-001853	U502
3709-001244	CN400
3711-005664	BAT301
3710-001994	CN301
3722-002181	CN200
4302-001130	BAT400
GH13-00020A	U500
3705-001347	CN100
1205-002558	U205
0406-001203	ZD502
0406-001203	ZD505
0406-001203	ZD506
0406-001203	ZD507
0406-001203	ZD508
0406-001203	ZD509
0406-001203	ZD510
0406-001203	ZD511
0406-001203	ZD512
0406-001203	ZD513
0504-001100	U305

SUB	
SEC CODE	Design LOC
0402-001617	D608
0402-001617	D609
0403-001446	ZD600
0601-001819	D600
0601-001819	D601
0601-001819	D602
0601-001819	D603
1003-001440	Q600
1203-001895	U603
1203-001917	U600
1203-002862	U604
1203-003328	U601
1209-001555	U602
1405-001082	V600
1405-001093	TH600
2007-000140	R614
2007-000143	R611
2007-000143	R612
2007-000148	R600
2007-000148	R601
2007-000162	R613
2007-000165	R609
2007-000171	R608
2007-000174	R602
2007-000174	R603
2007-000174	R604
2007-000174	R605
2007-003001	R607
2007-007009	R606
2007-007193	R610
2203-000679	C608
2203-001652	C600
2203-005061	C607
2203-005065	C603
2203-005065	C606
2203-005065	C609
2203-005065	C610
2203-005065	C611

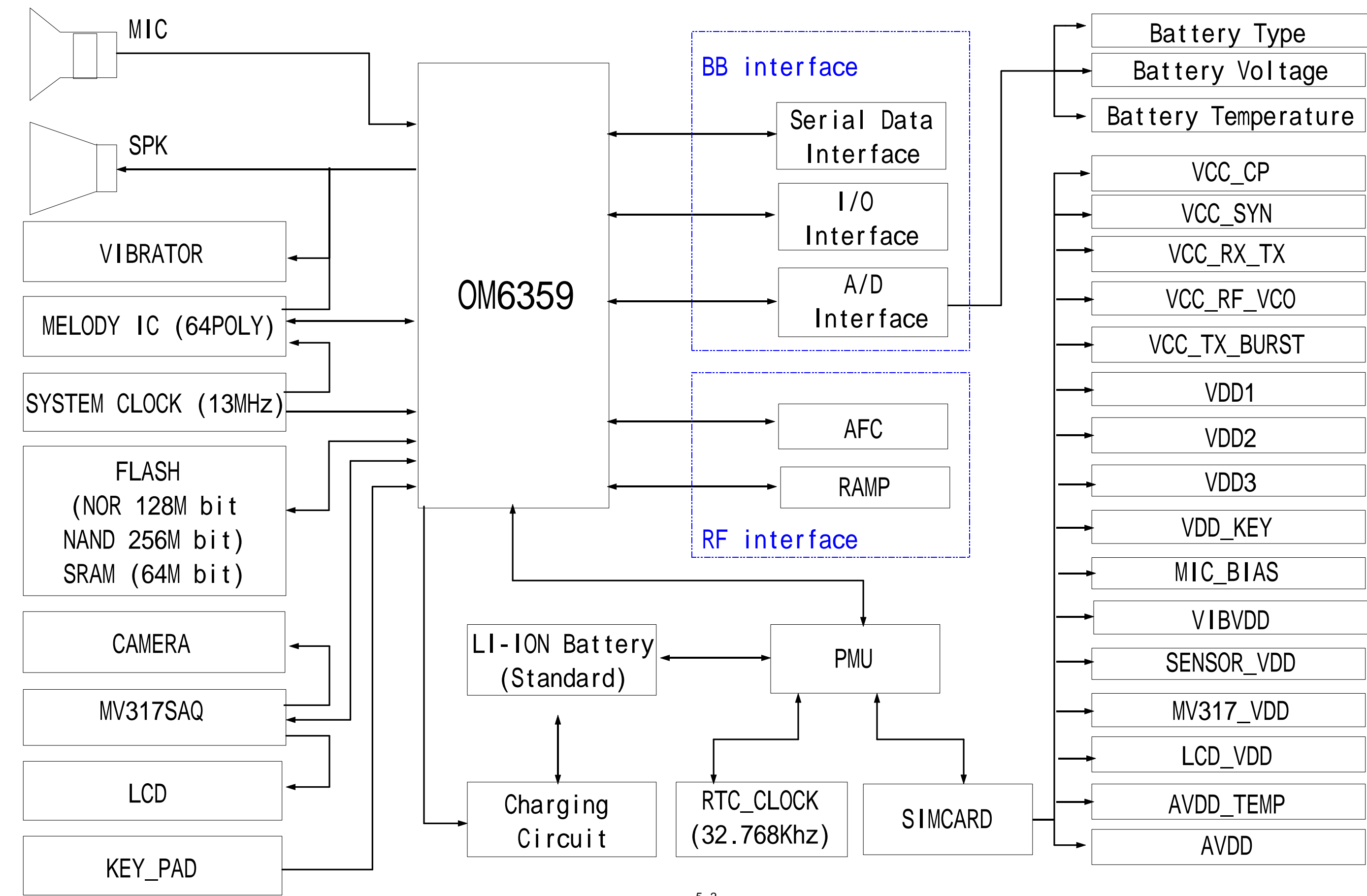
2203-005065	C613
2203-005065	C614
2203-005482	C601
2203-005482	C602
2203-005482	C612
2203-005840	C616
2404-001086	C605
2404-001101	C604
2703-002714	L600
3708-001853	CN601
3708-001890	CN600
4715-001077	D610
3711-005661	CN602

5. SGH-E820 Block Diagrams

1. RF Solution Block Diagram

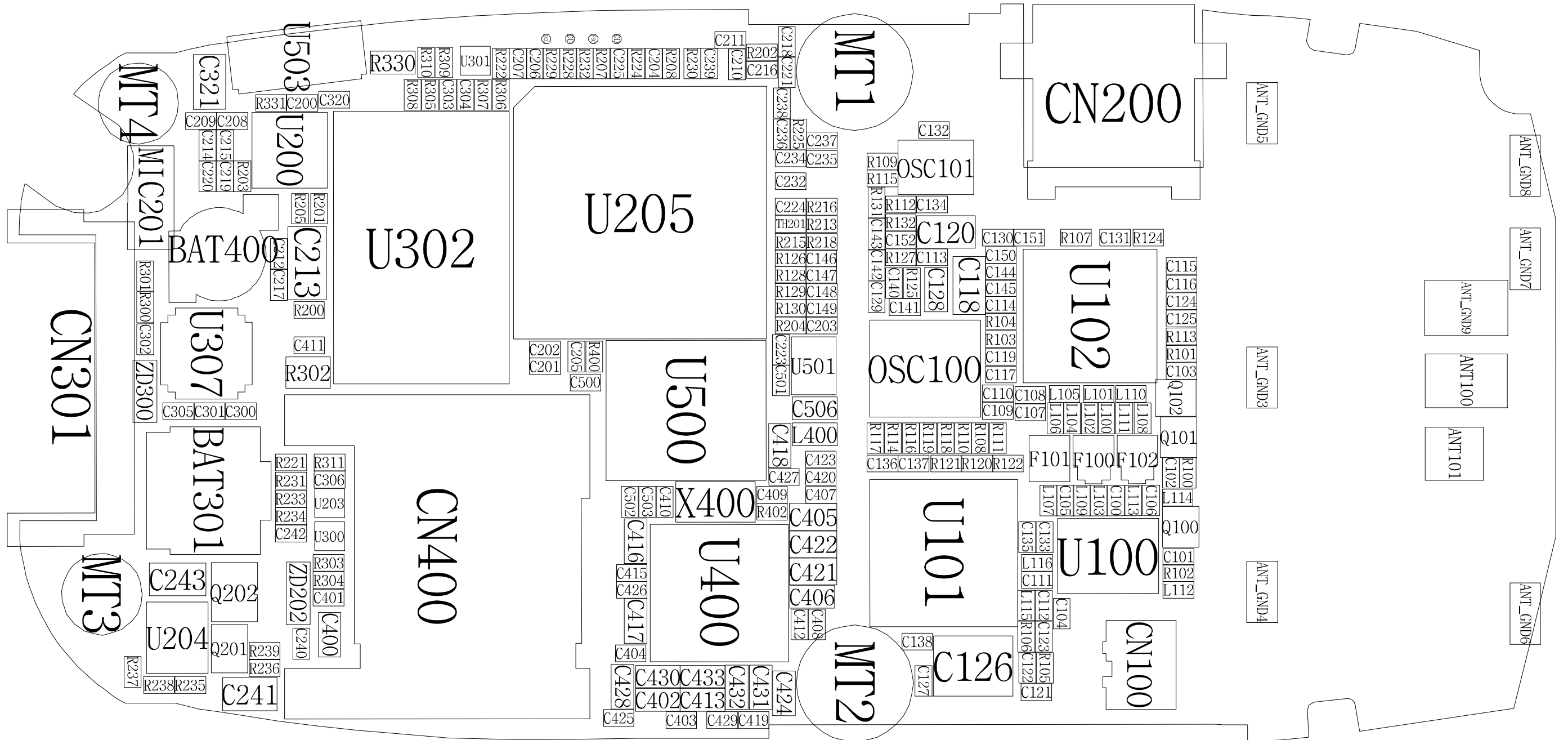


2. Base Band Solution Block Diagram

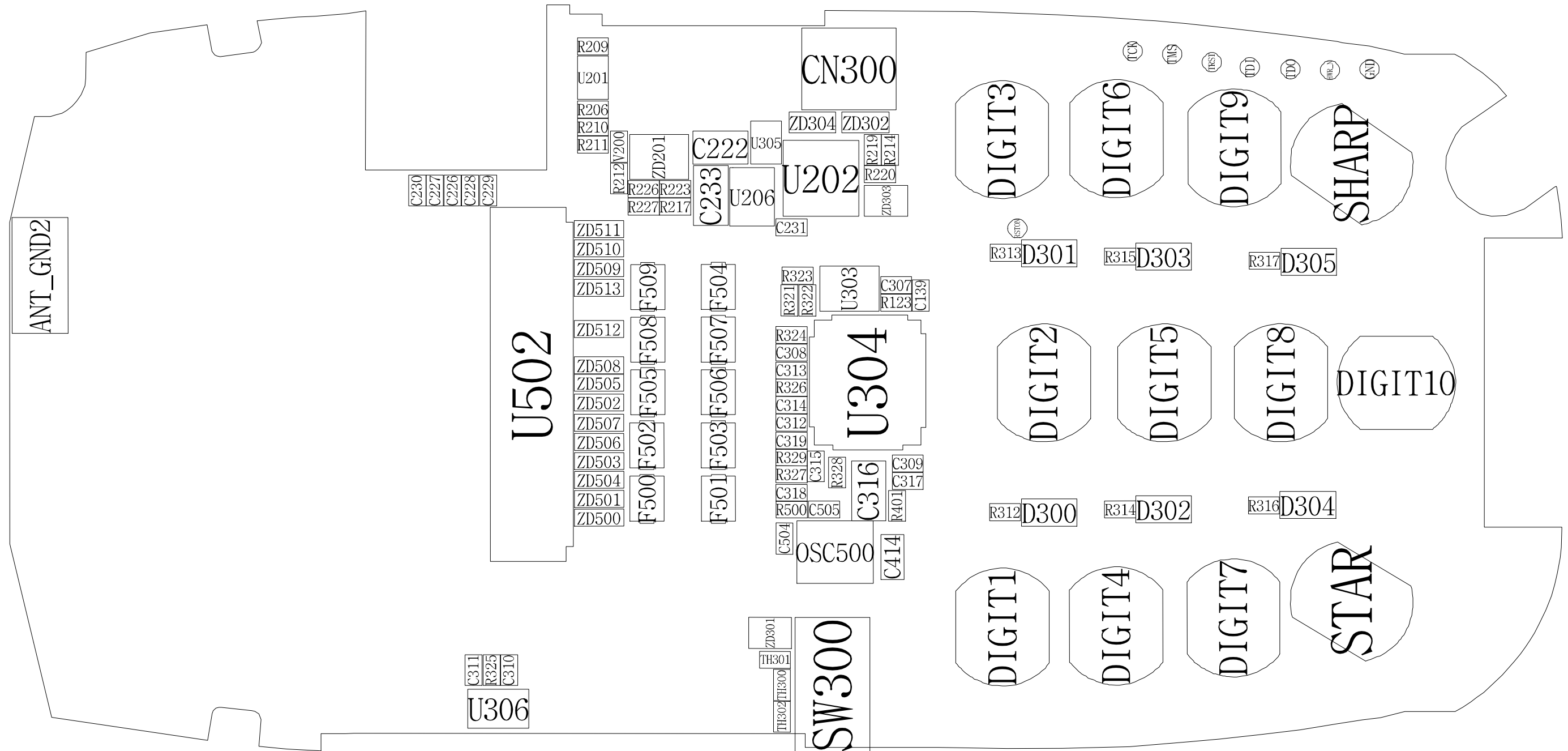


6. SGH-E820 PCB Diagrams

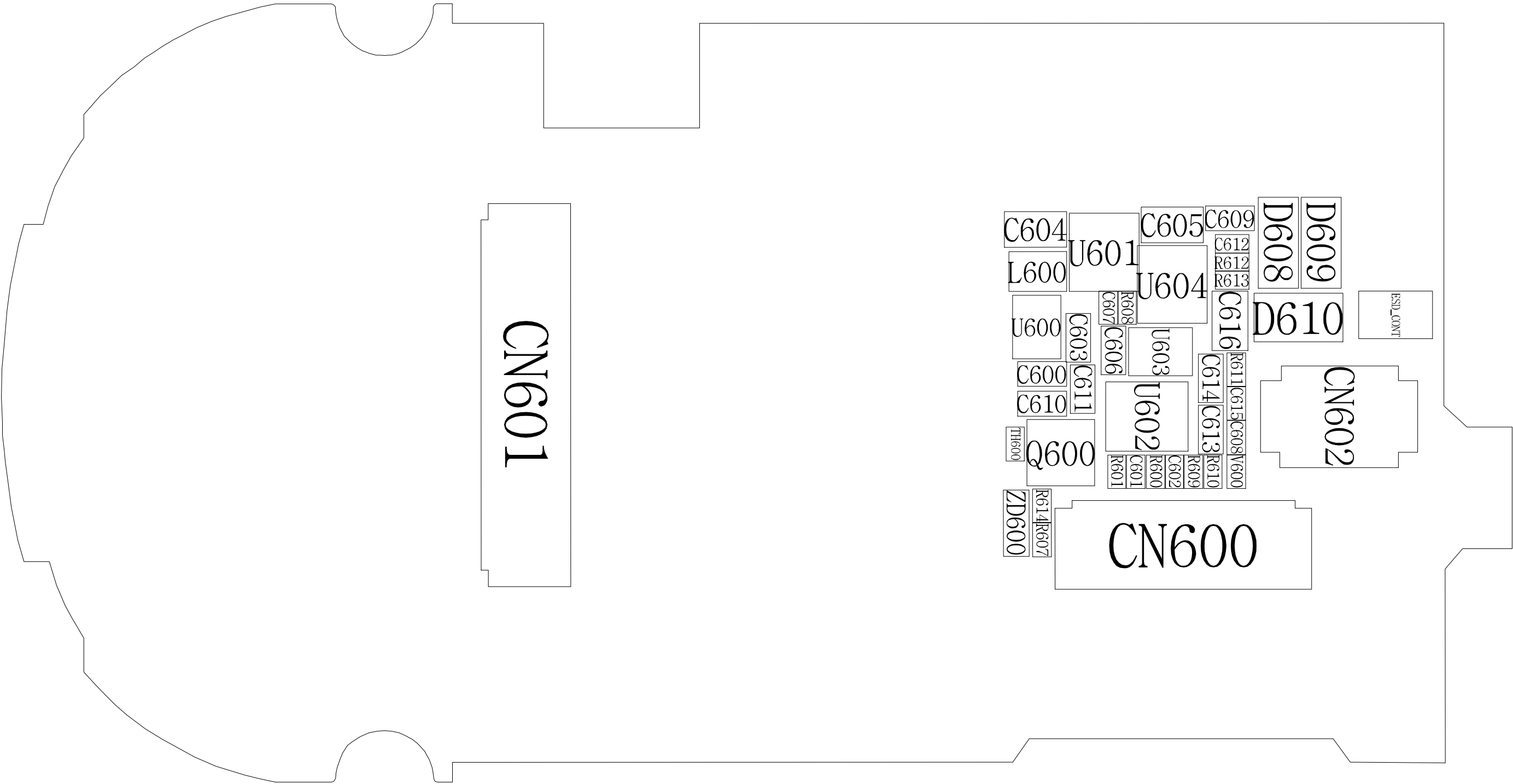
1. Main PCB Top Diagram



2. Main PCB Bottom Diagram



3. Sub PCB Top Diagram

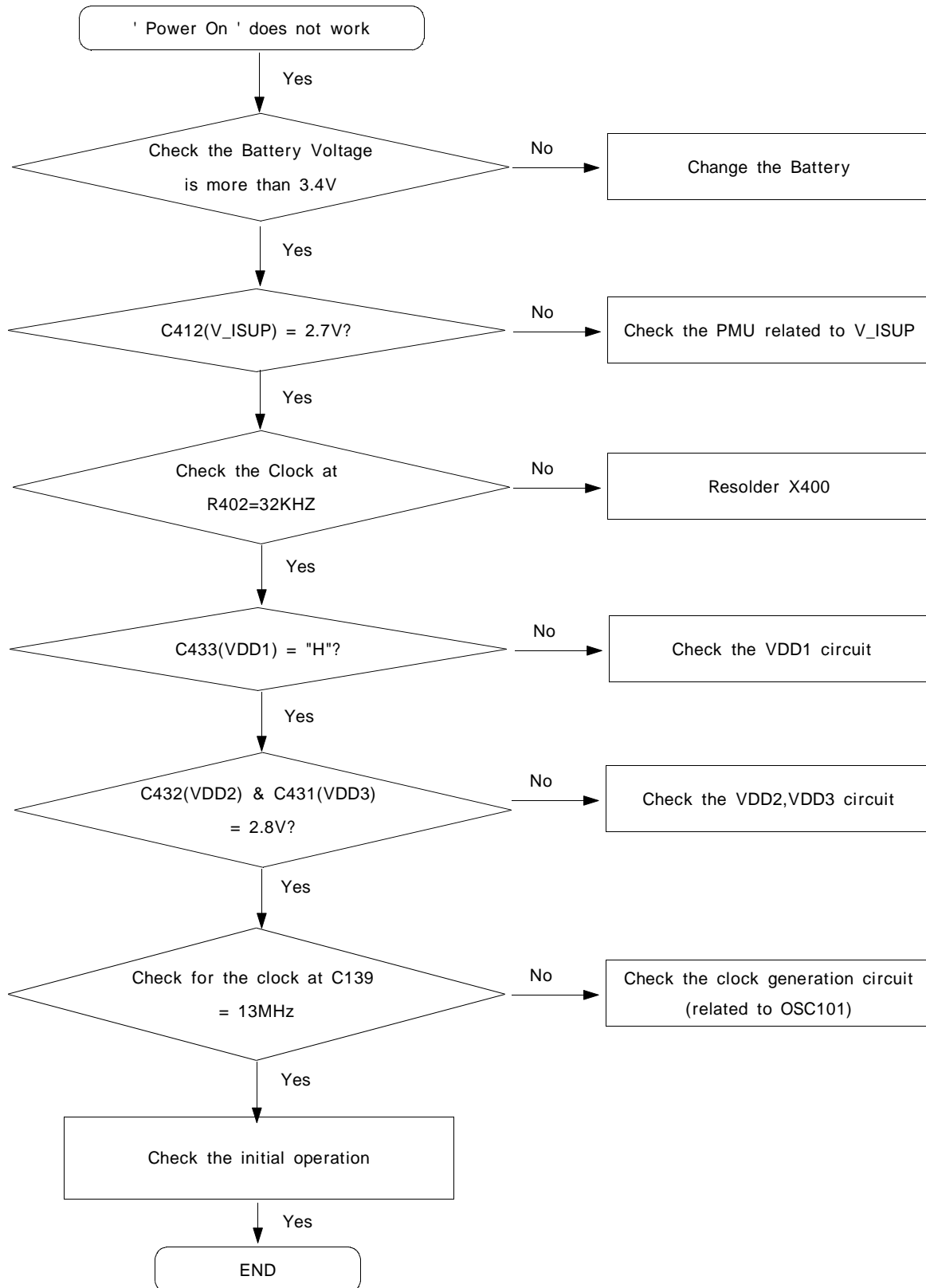


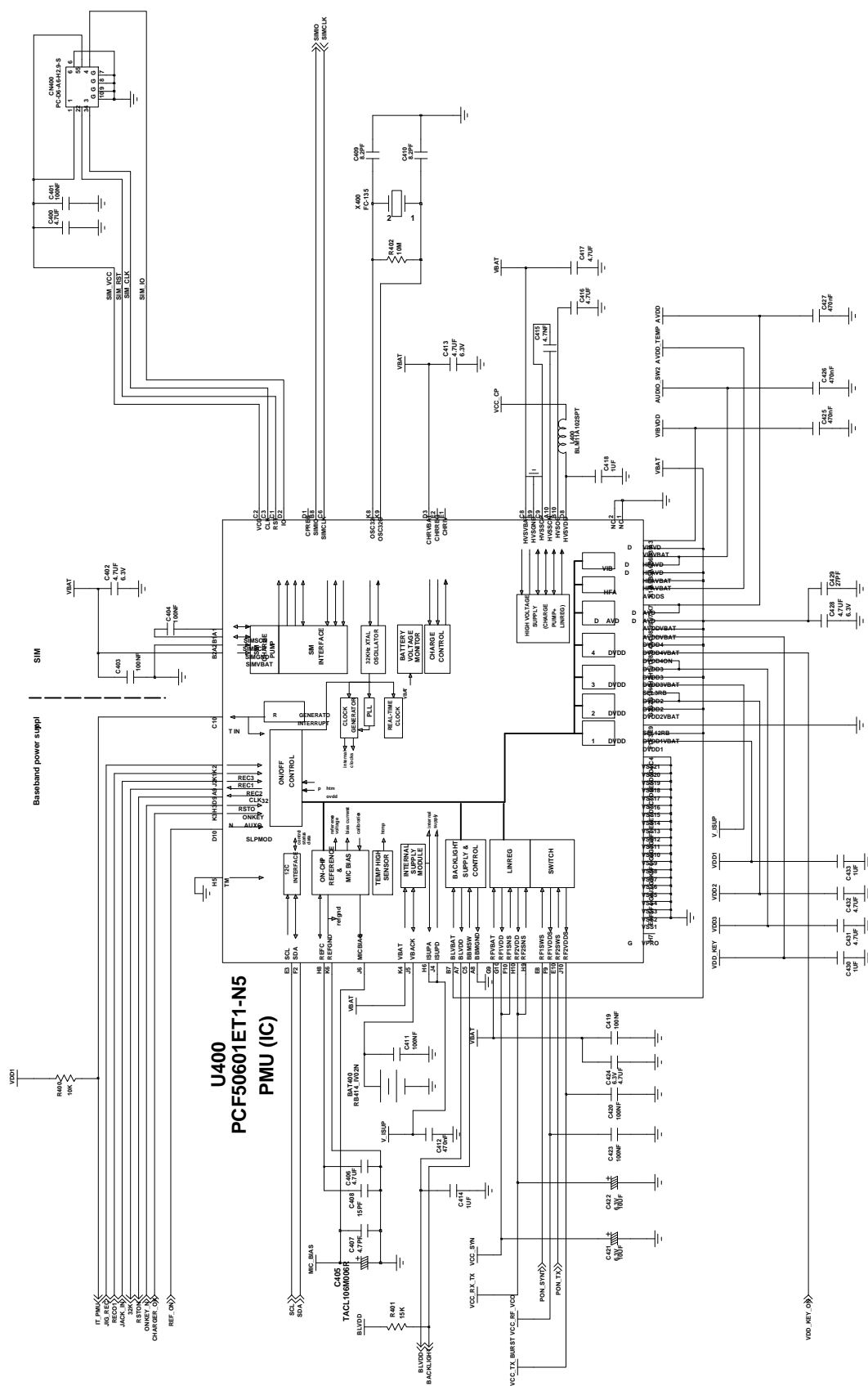
4. Sub PCB Bottom Diagram



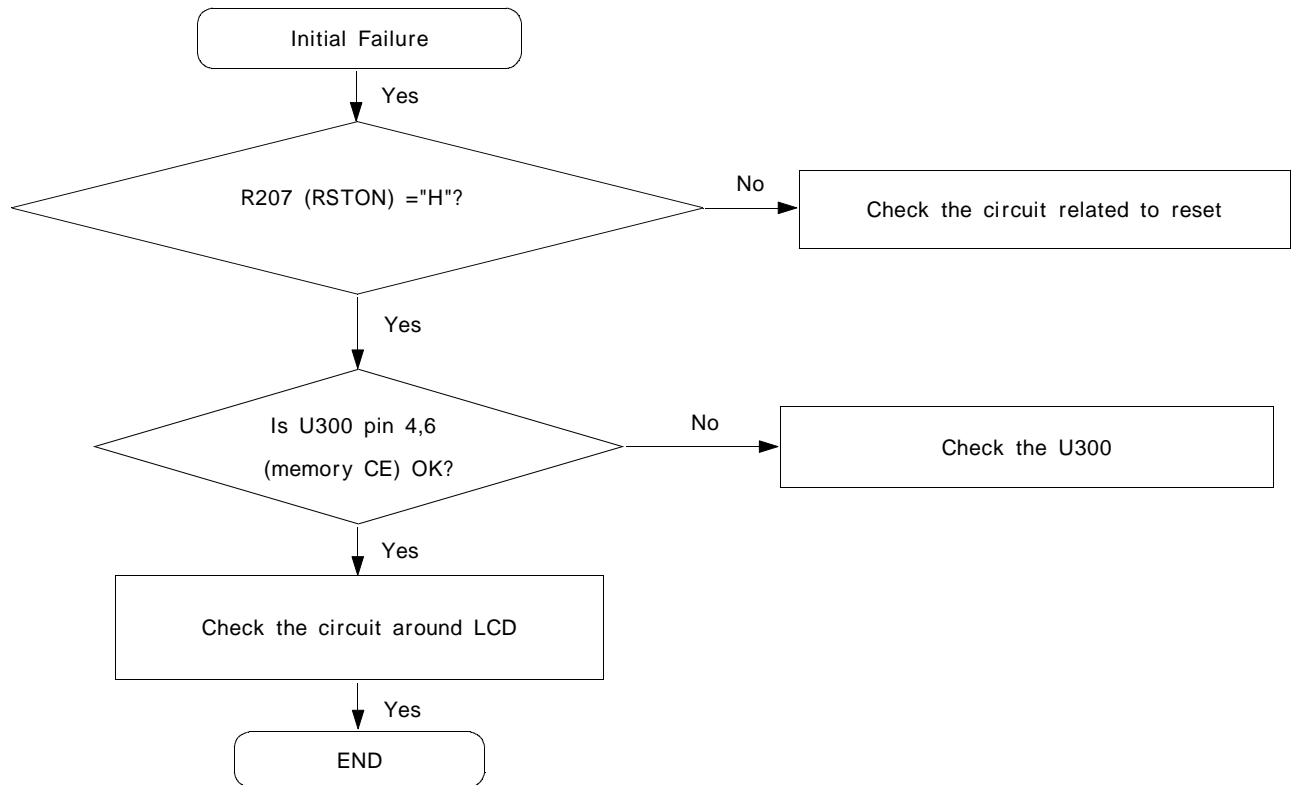
7. SGH-E820 Flow Chart of Troubleshooting

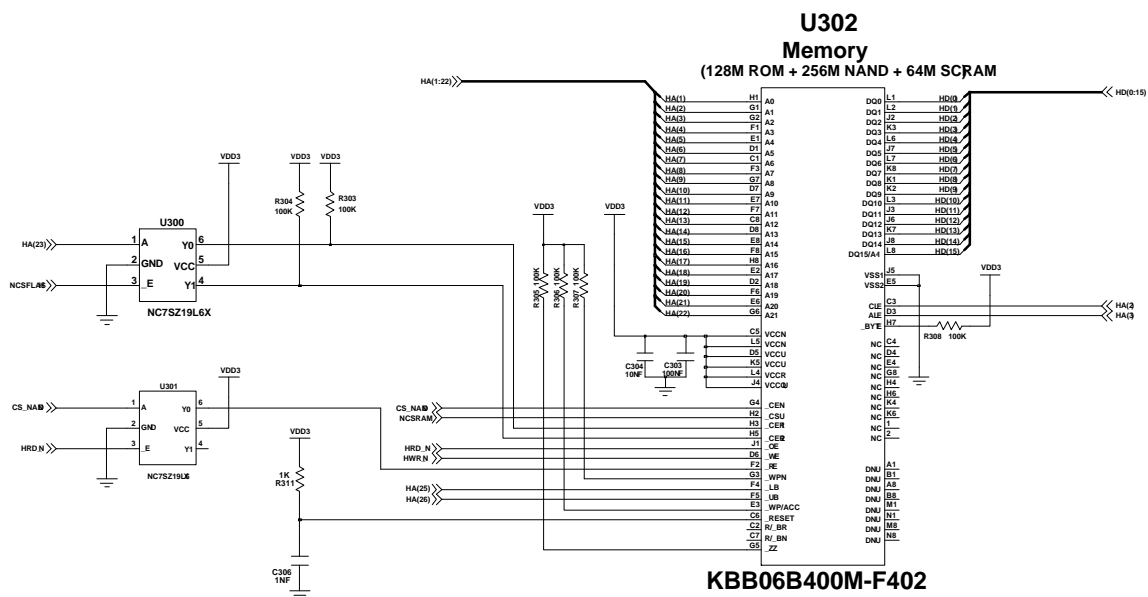
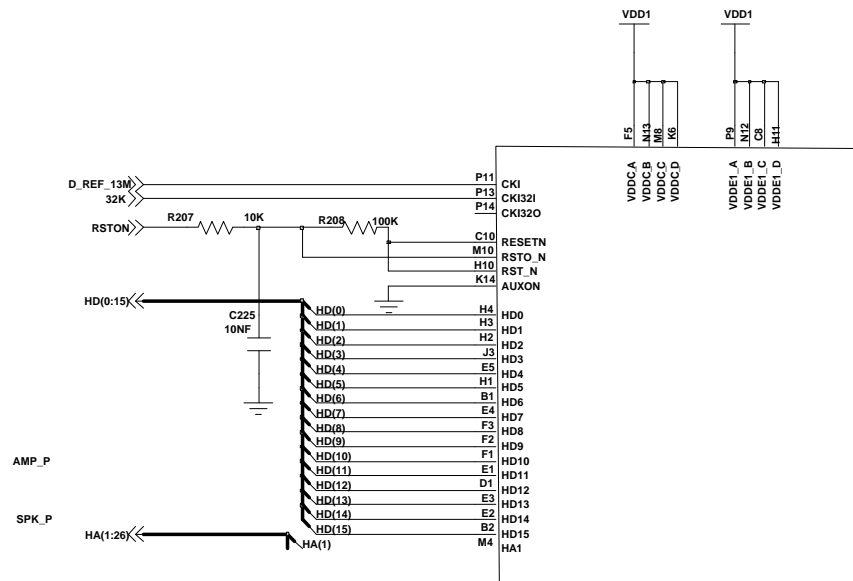
1. Power On



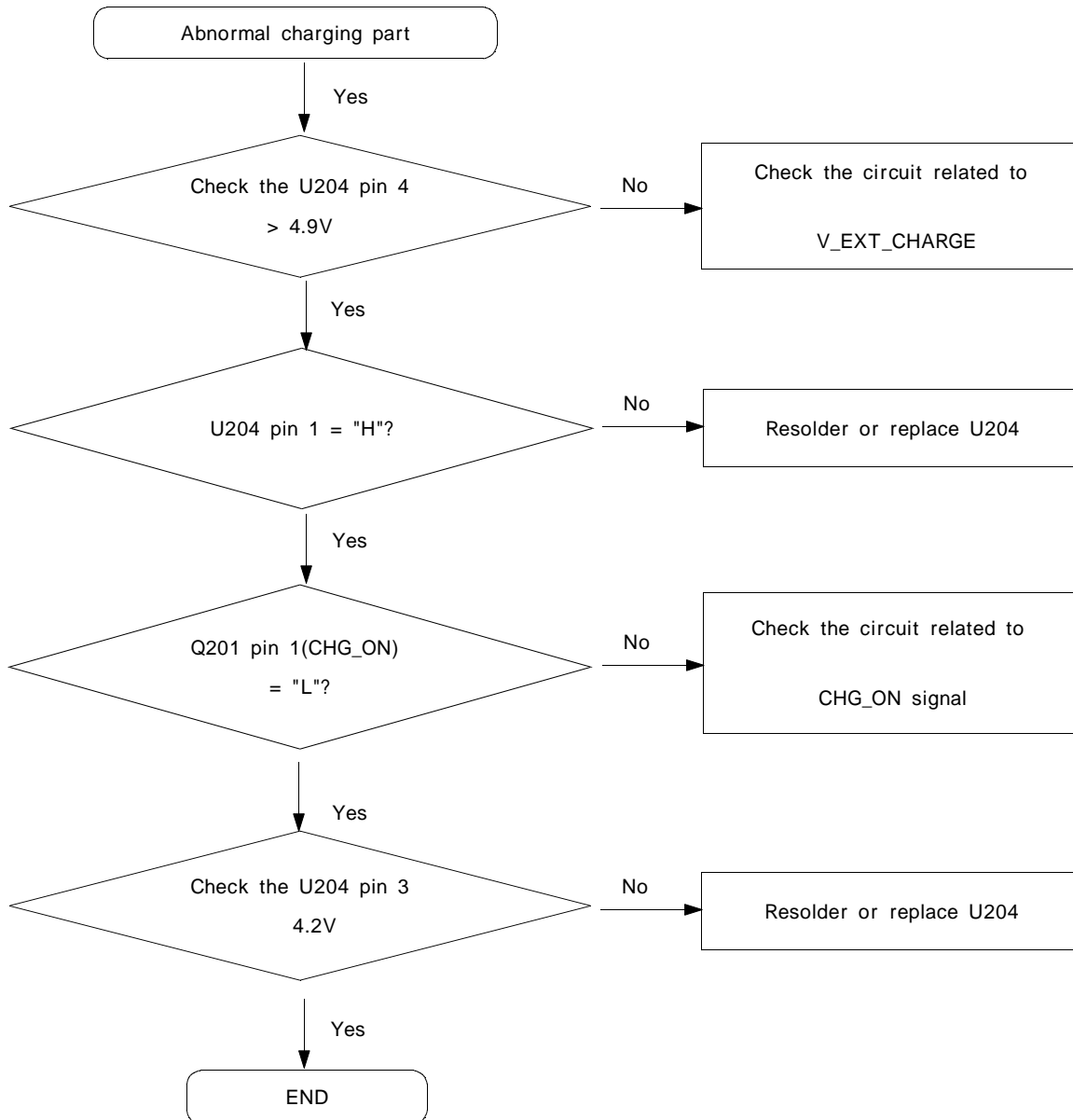


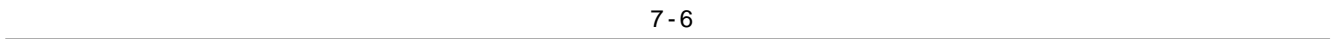
2. Initial



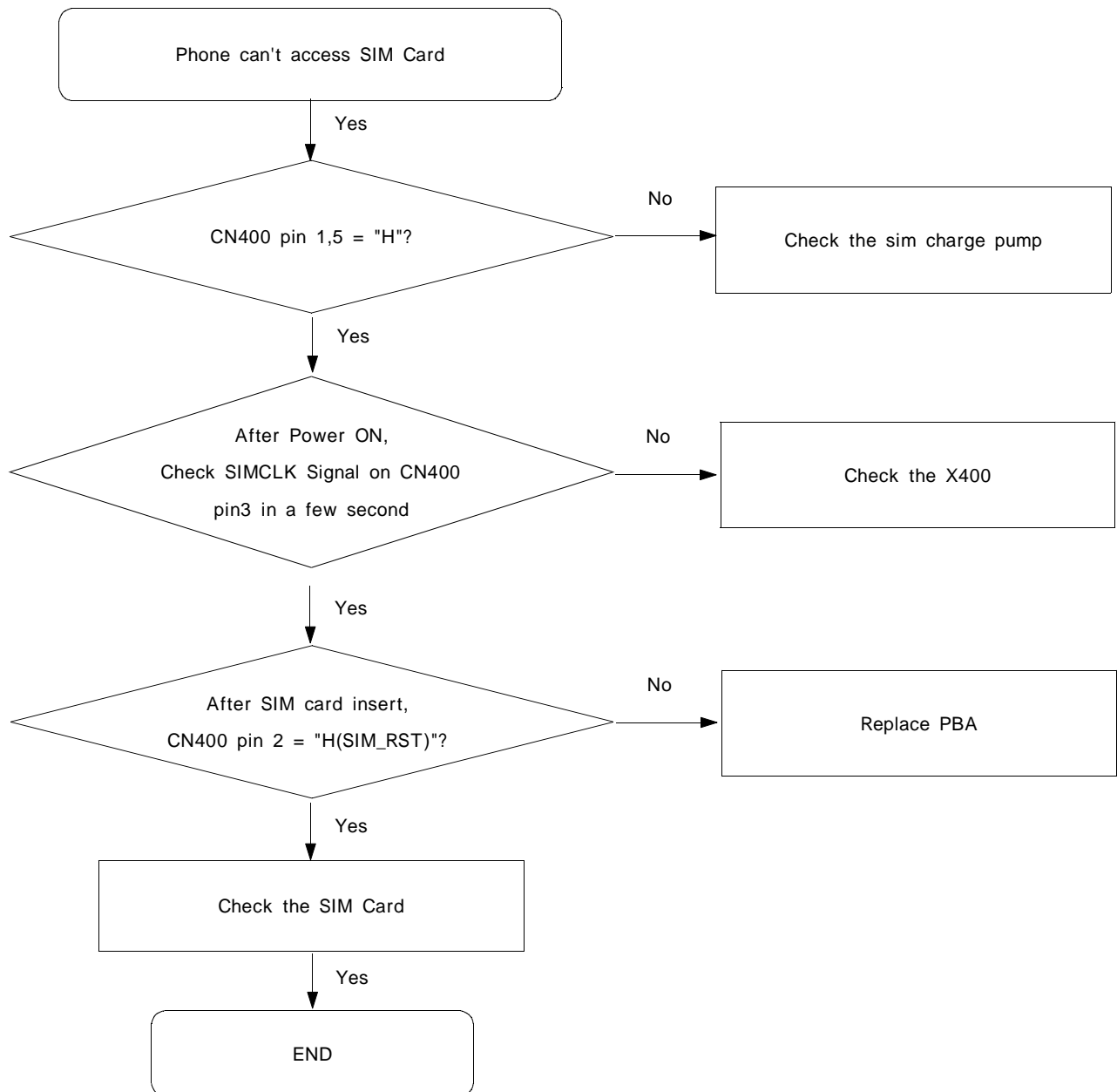


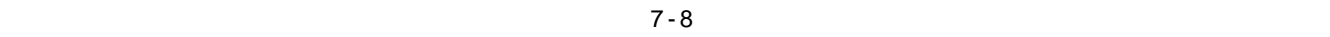
3. Charging Part



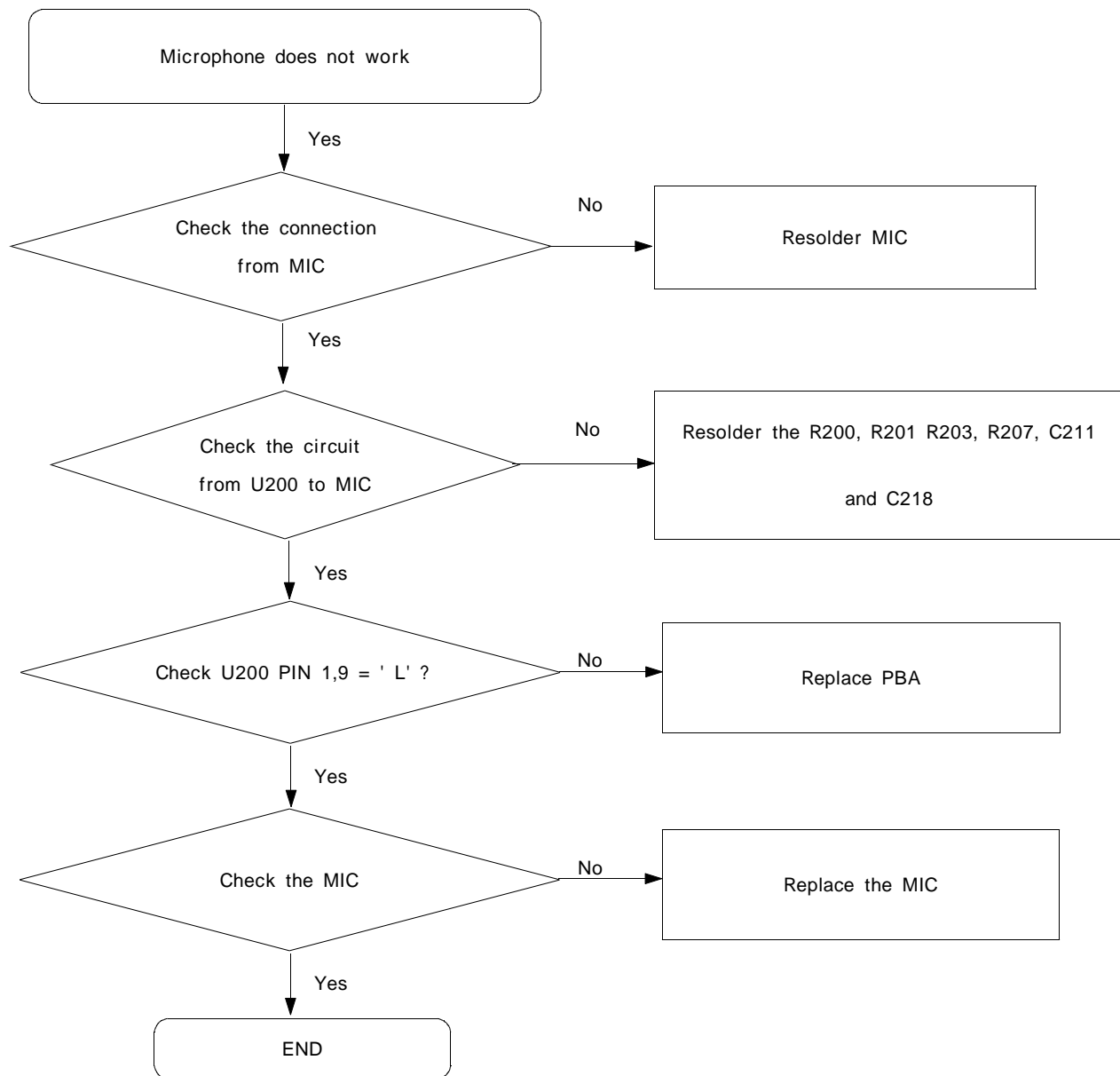


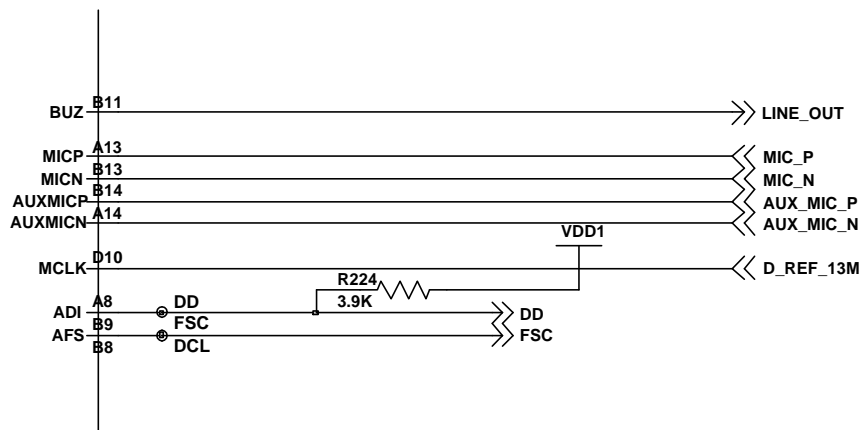
4. Sim Part



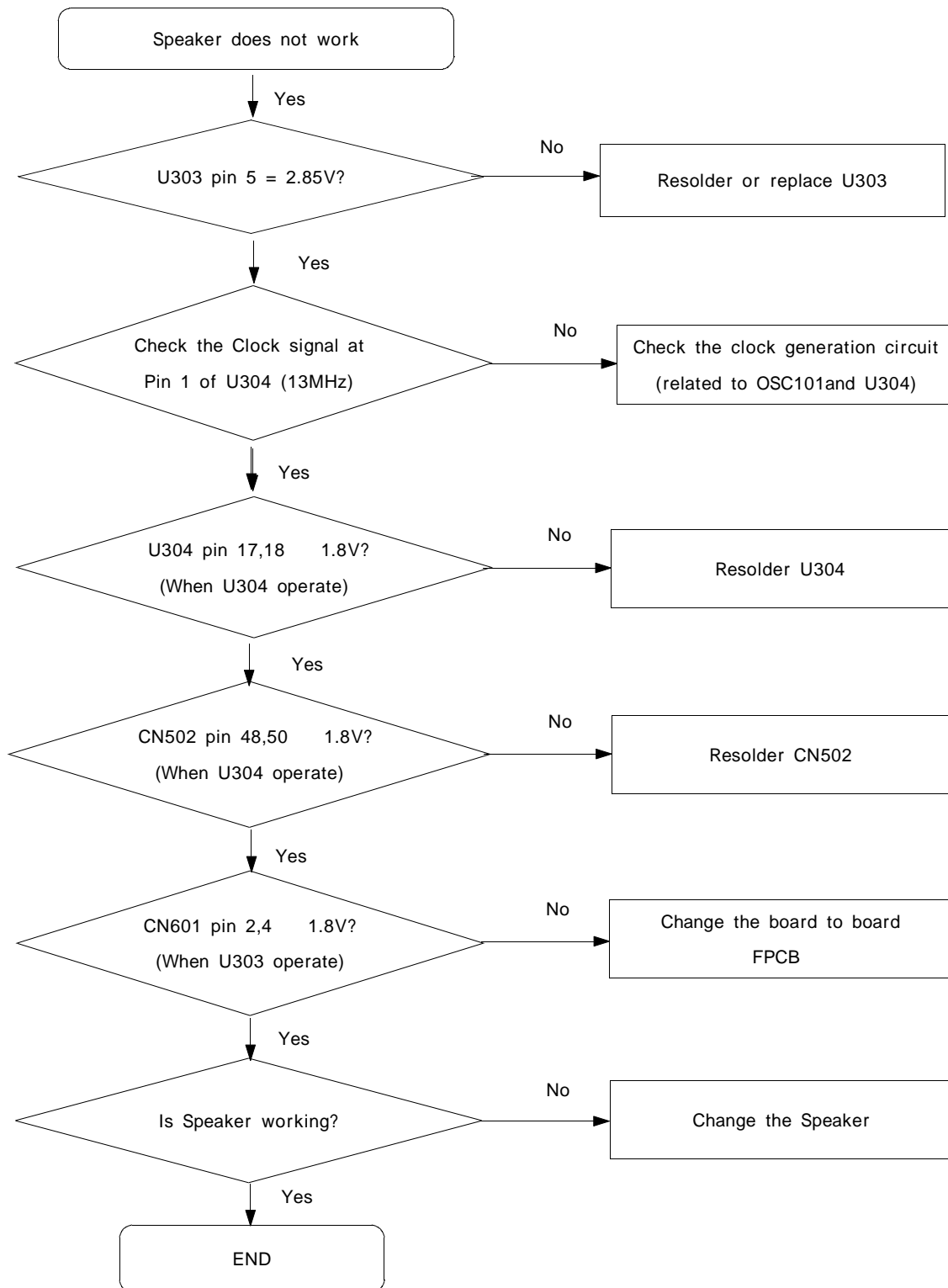


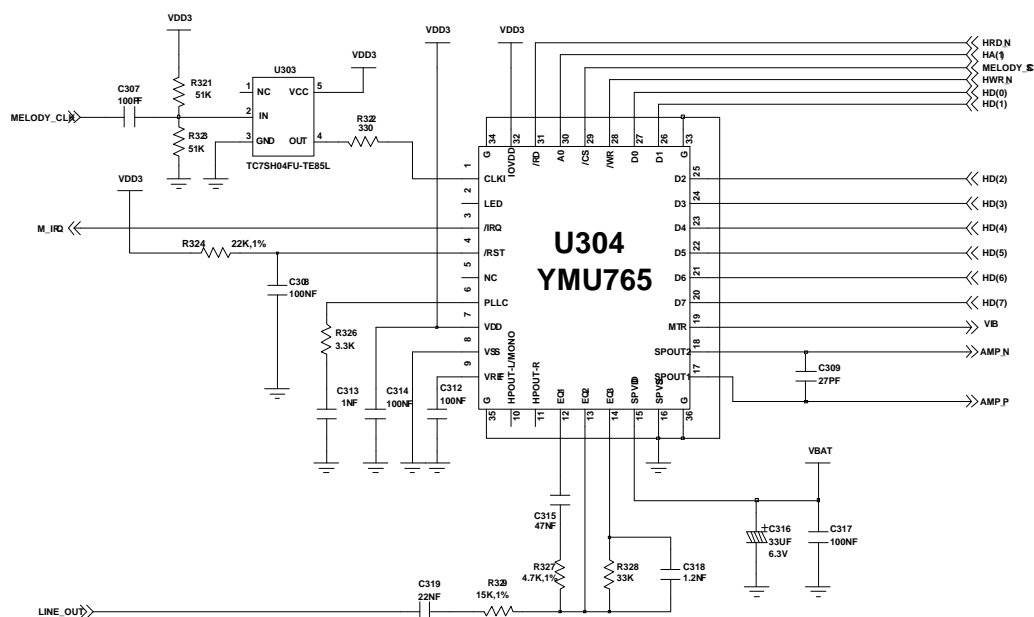
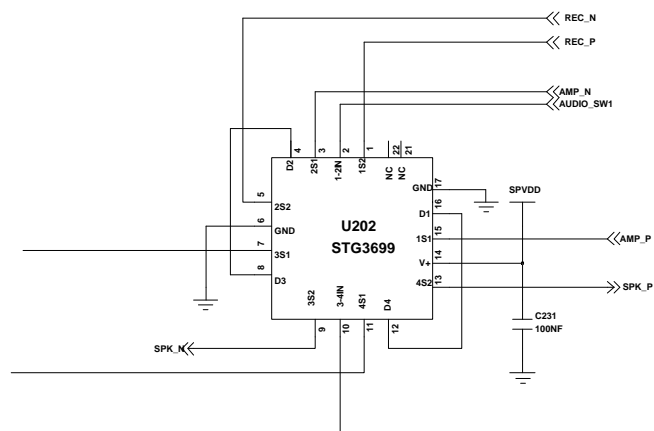
5. Microphone Part



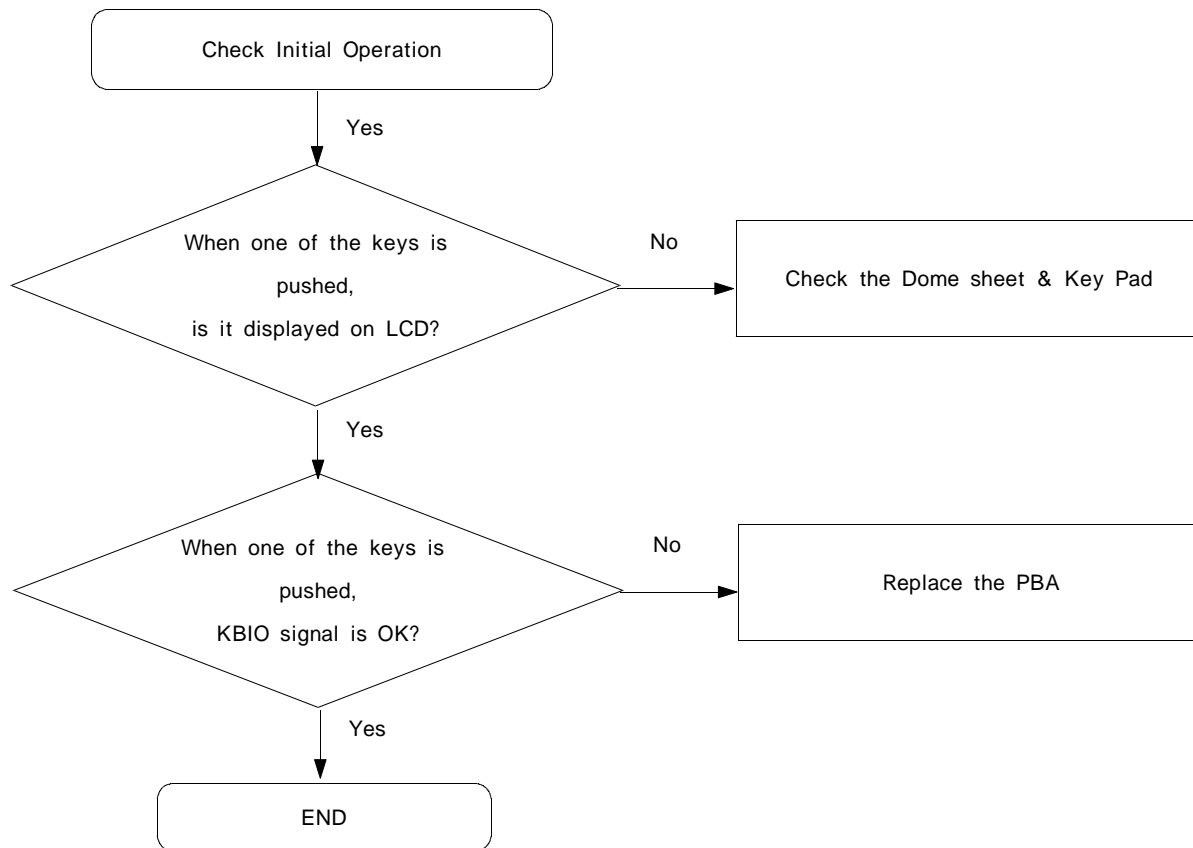


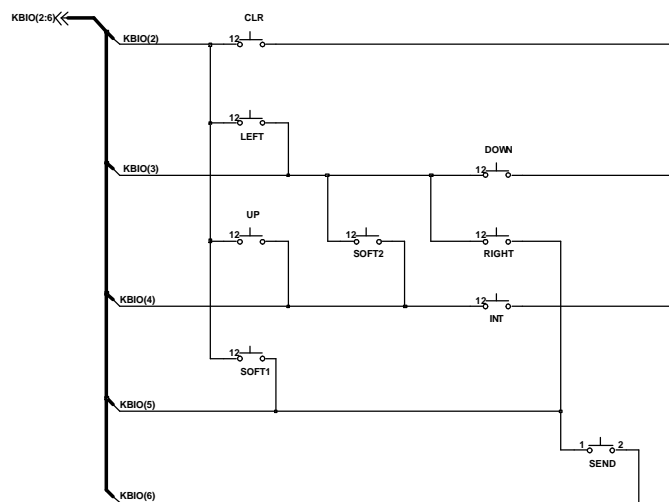
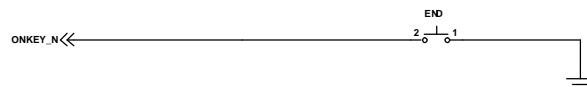
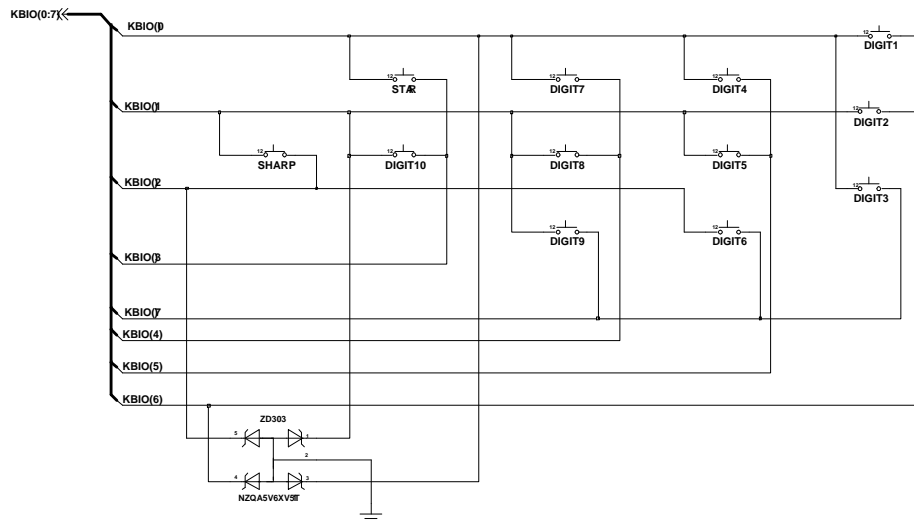
6. Speaker Part(Melody)



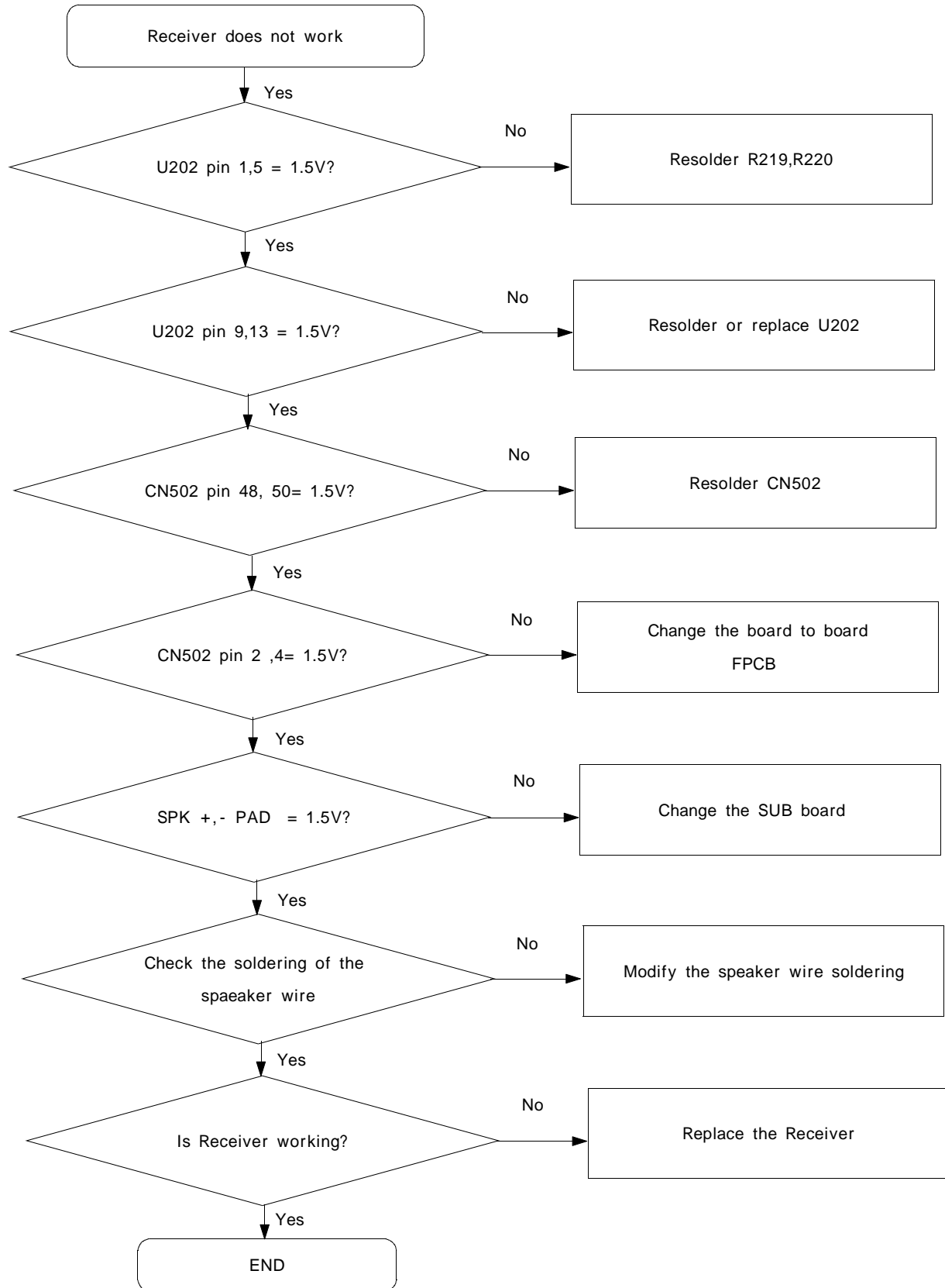


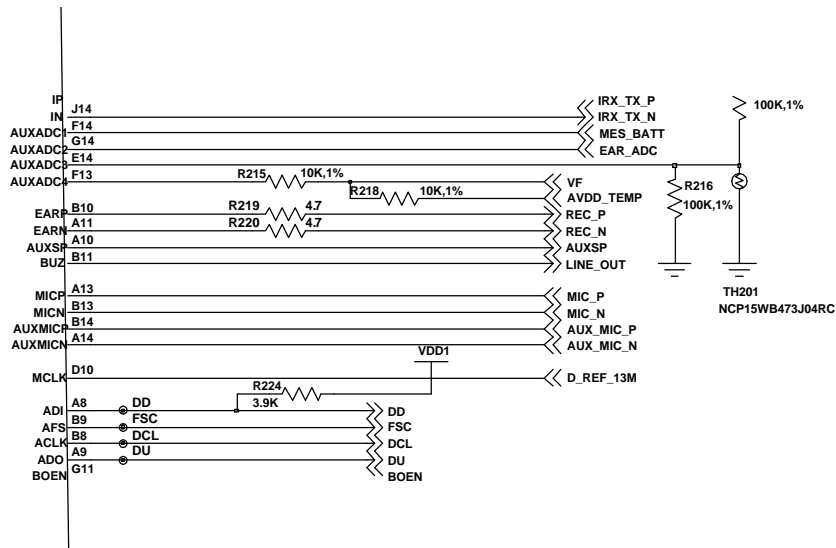
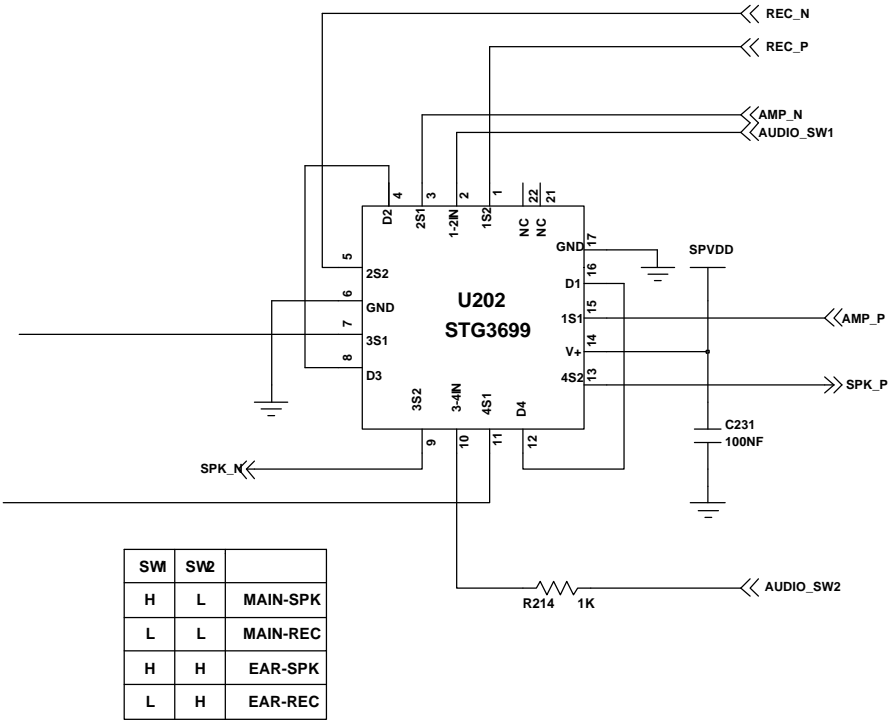
7. Key Data Input

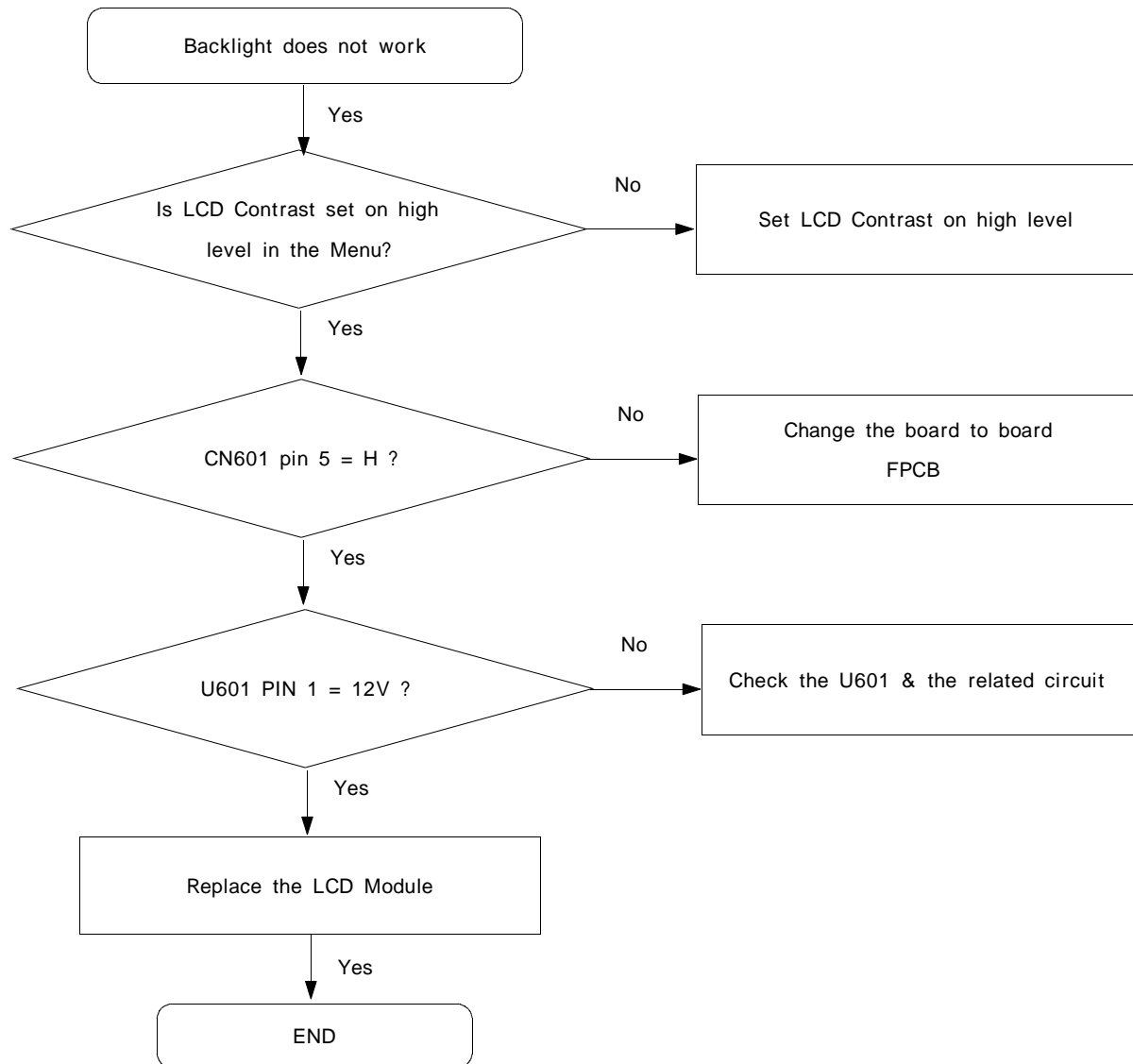


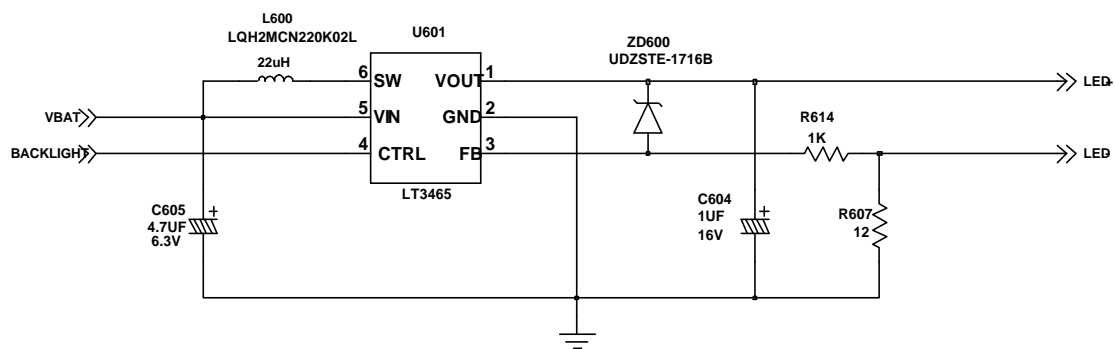


8. Receiver Part



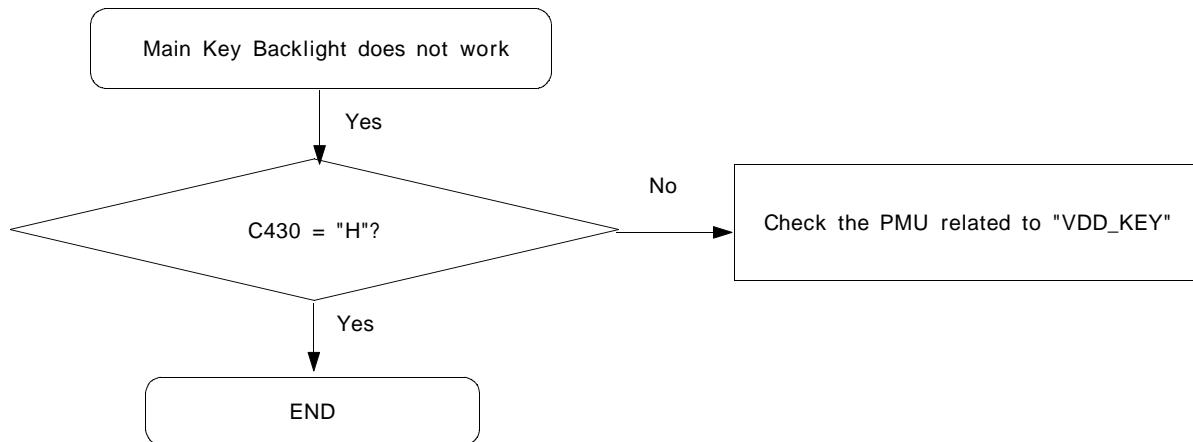


9. Back Light (for Color Main LCD)

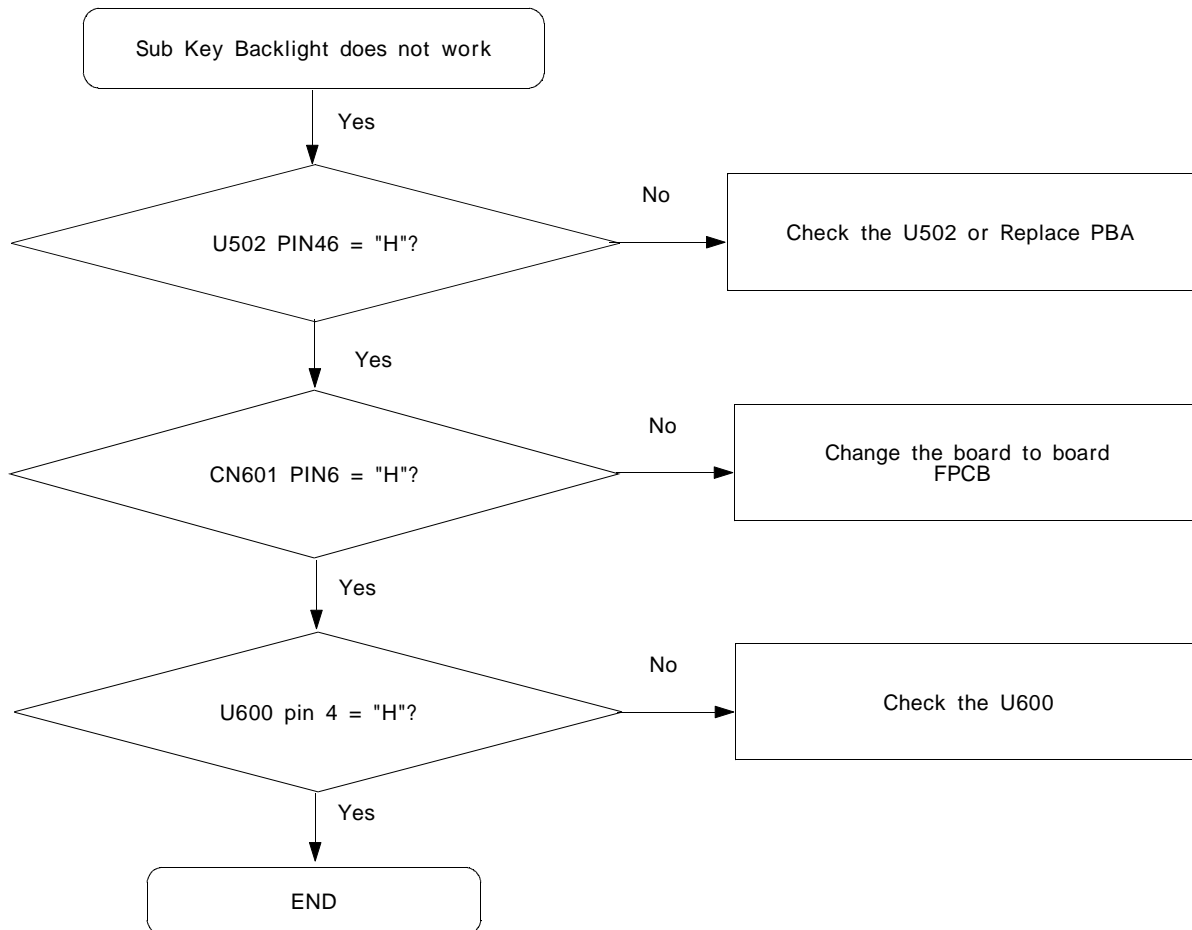


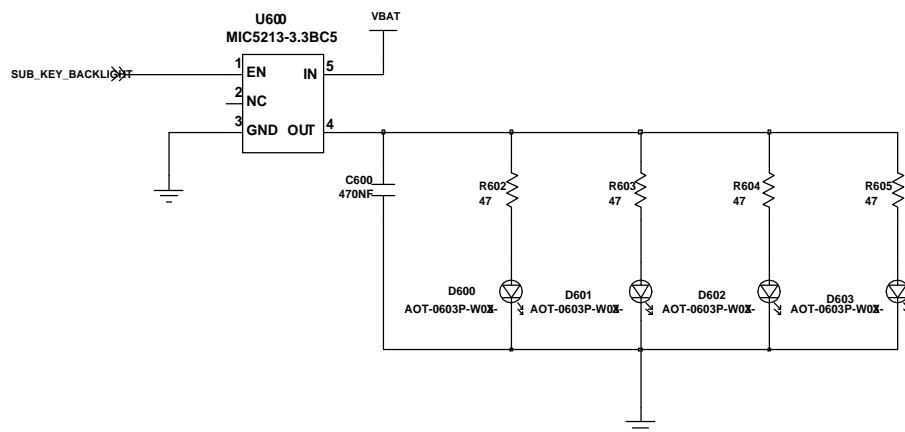
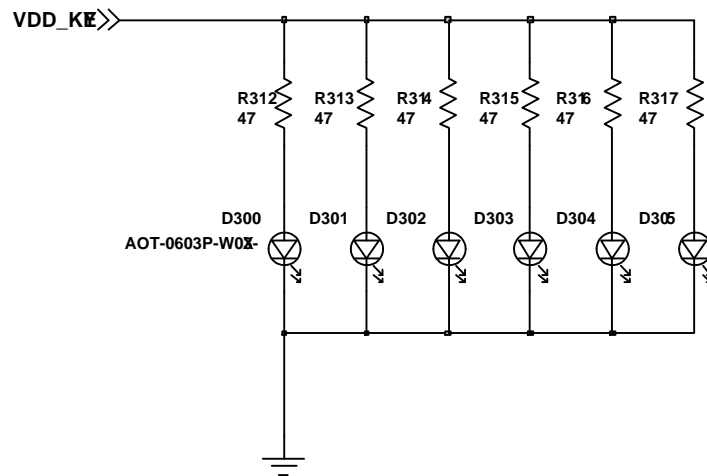
10. Key Back Light

1. Main Key Part

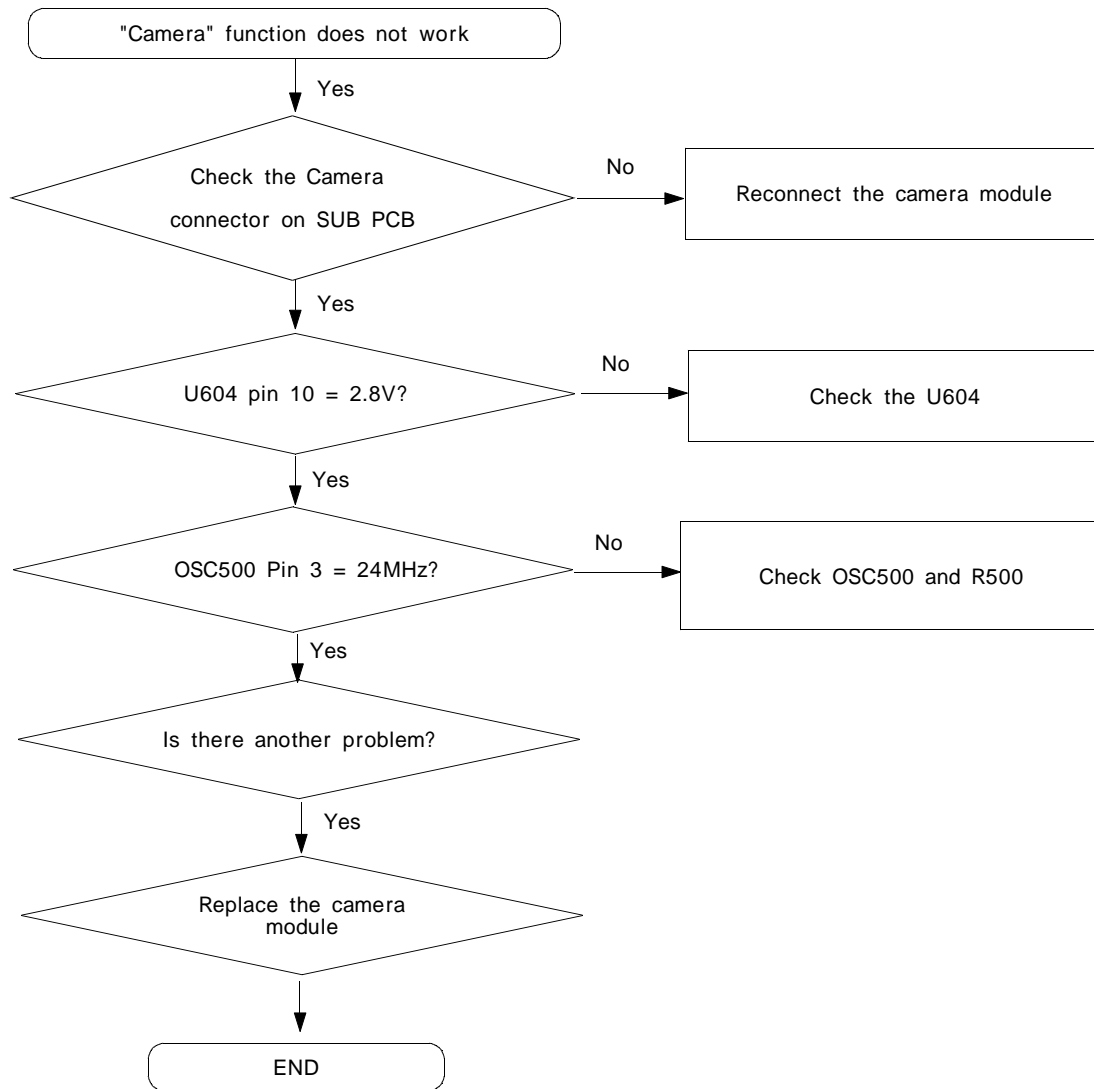


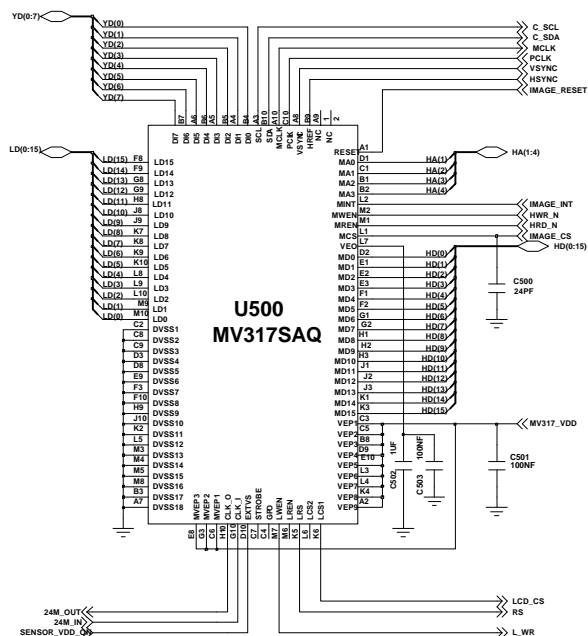
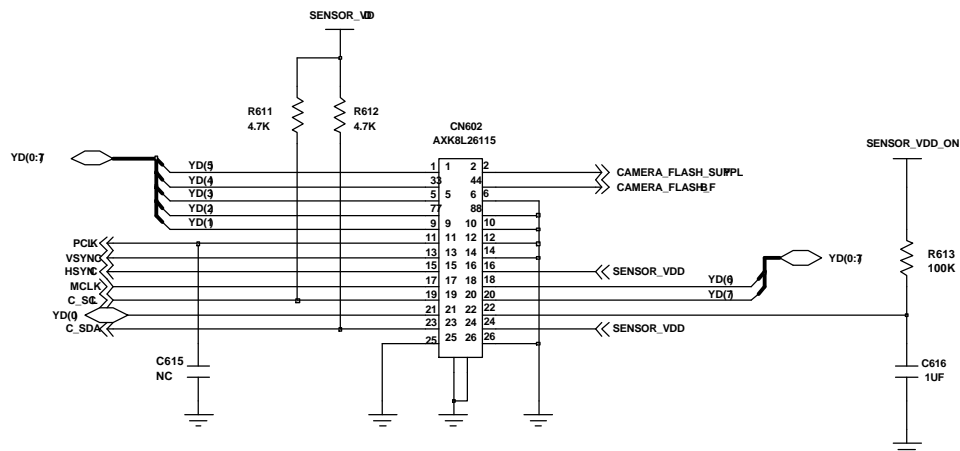
2. Sub Key Part



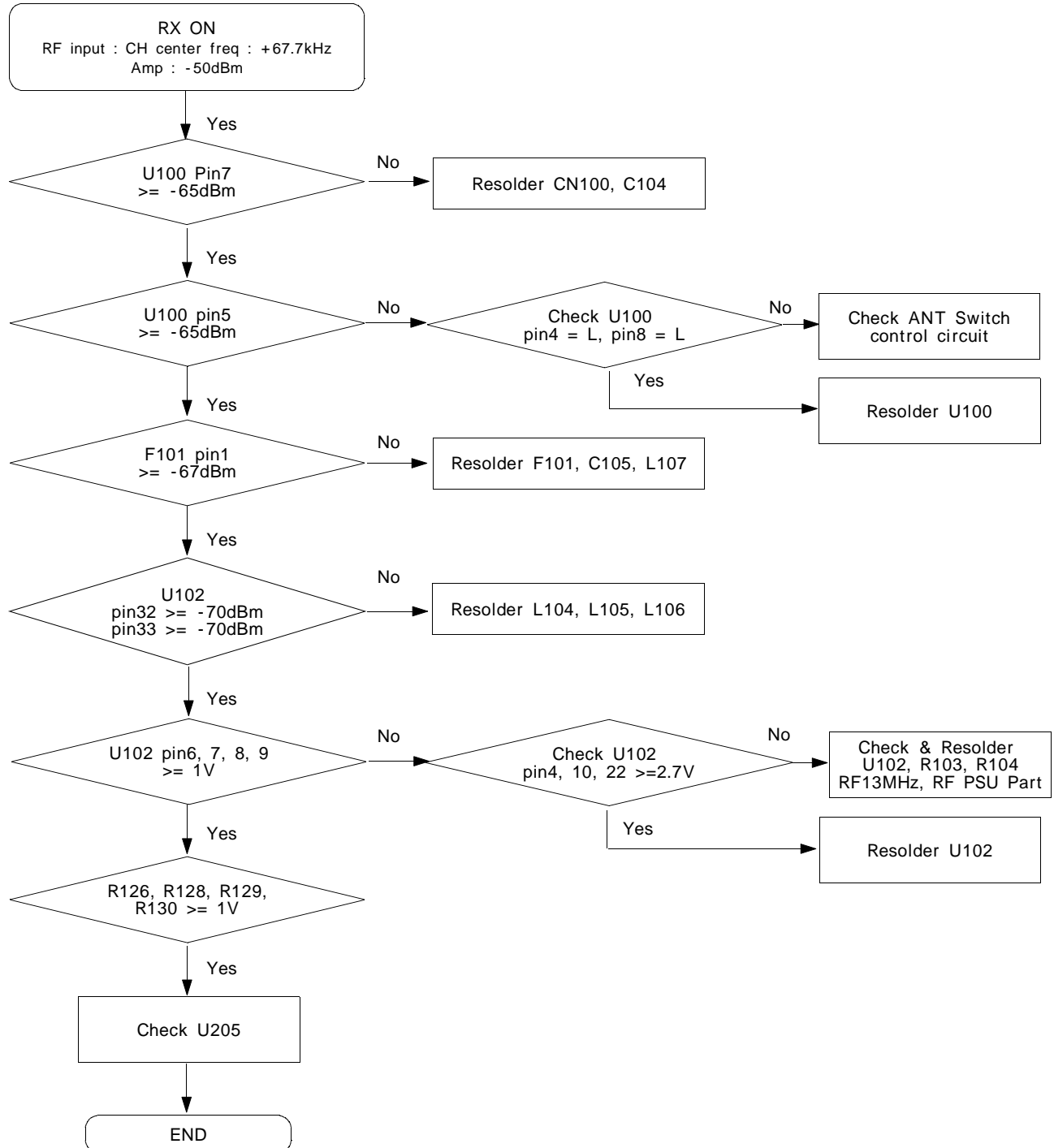


11. Camera part

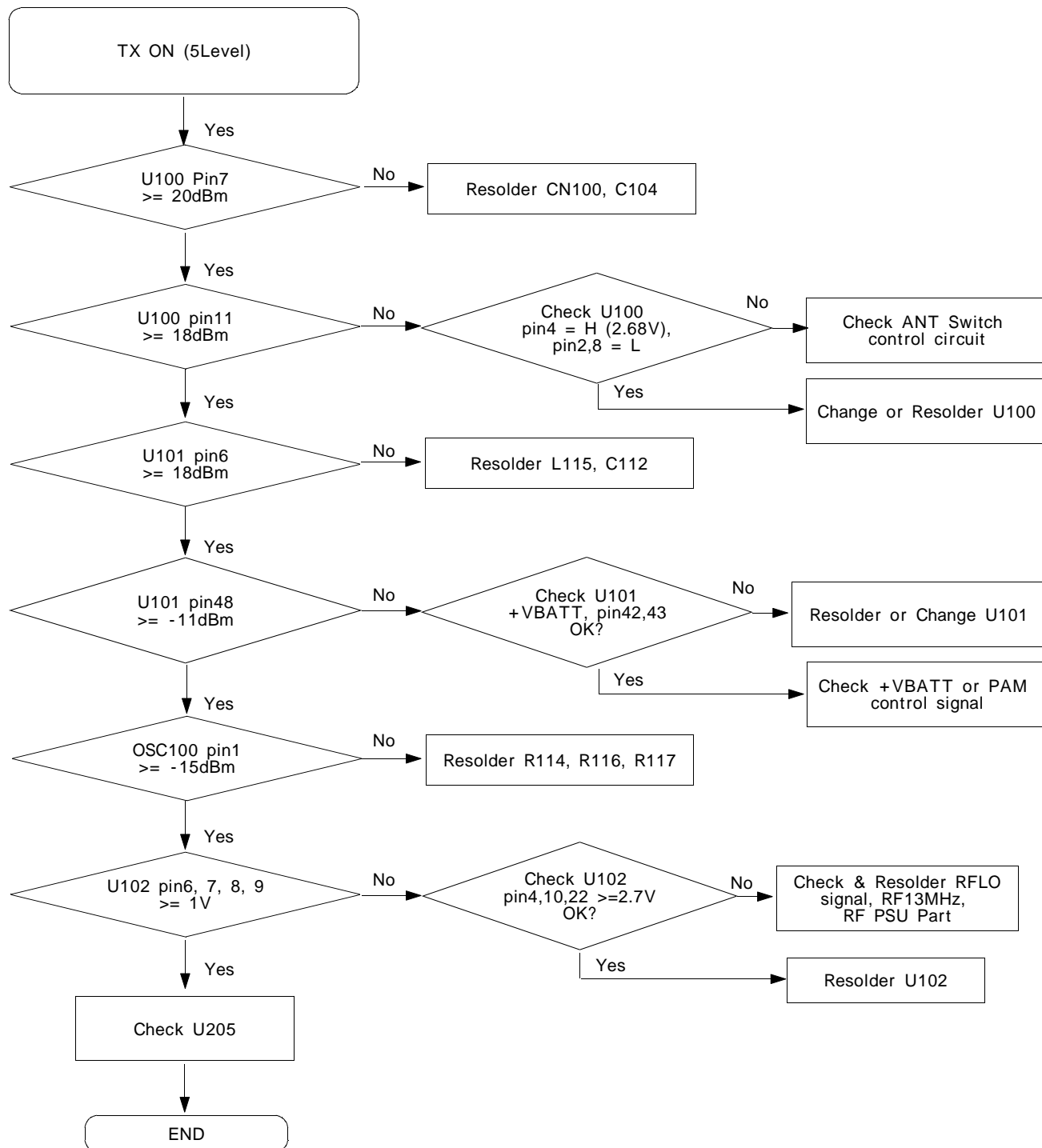




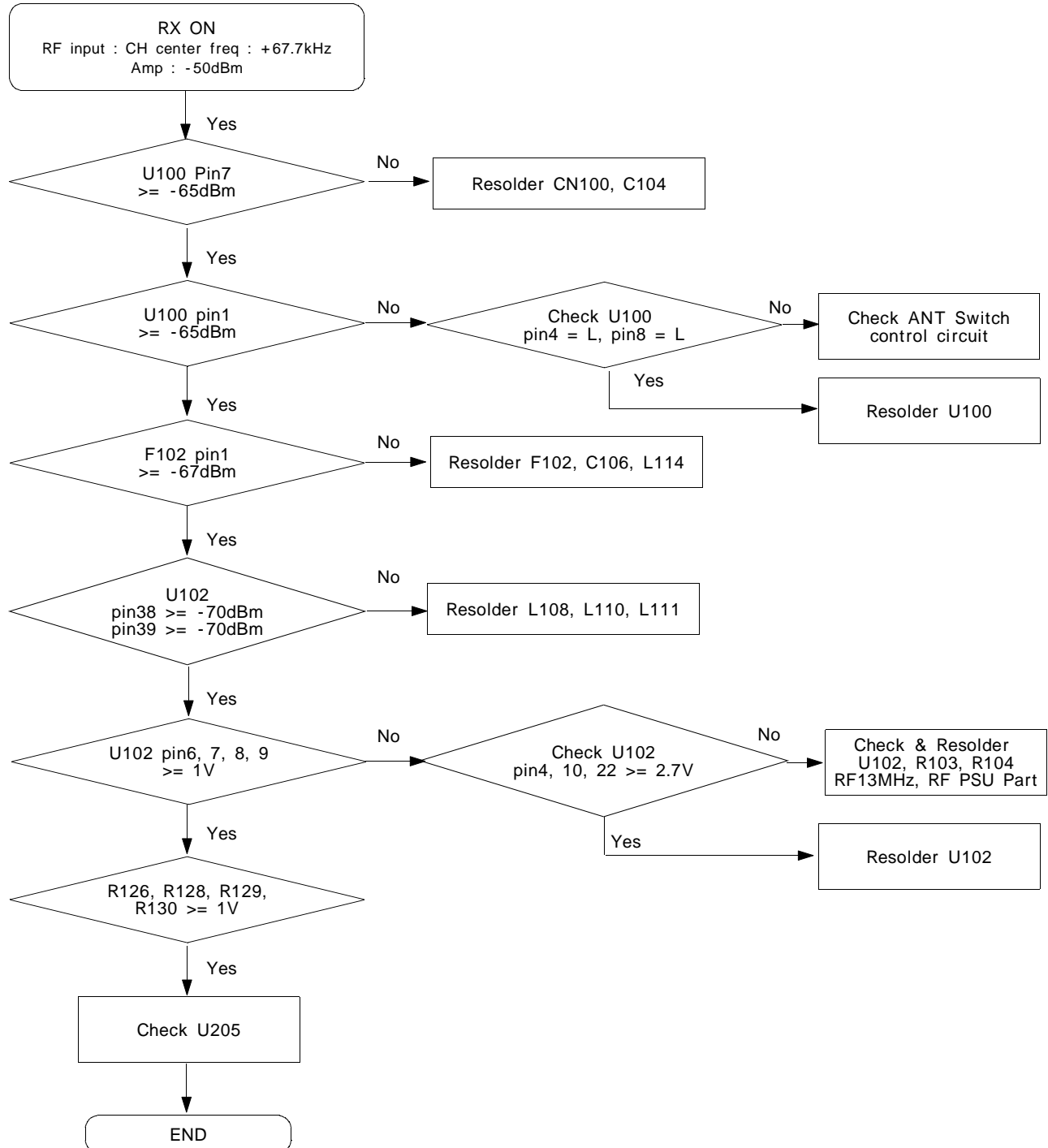
12. GSM Receiver

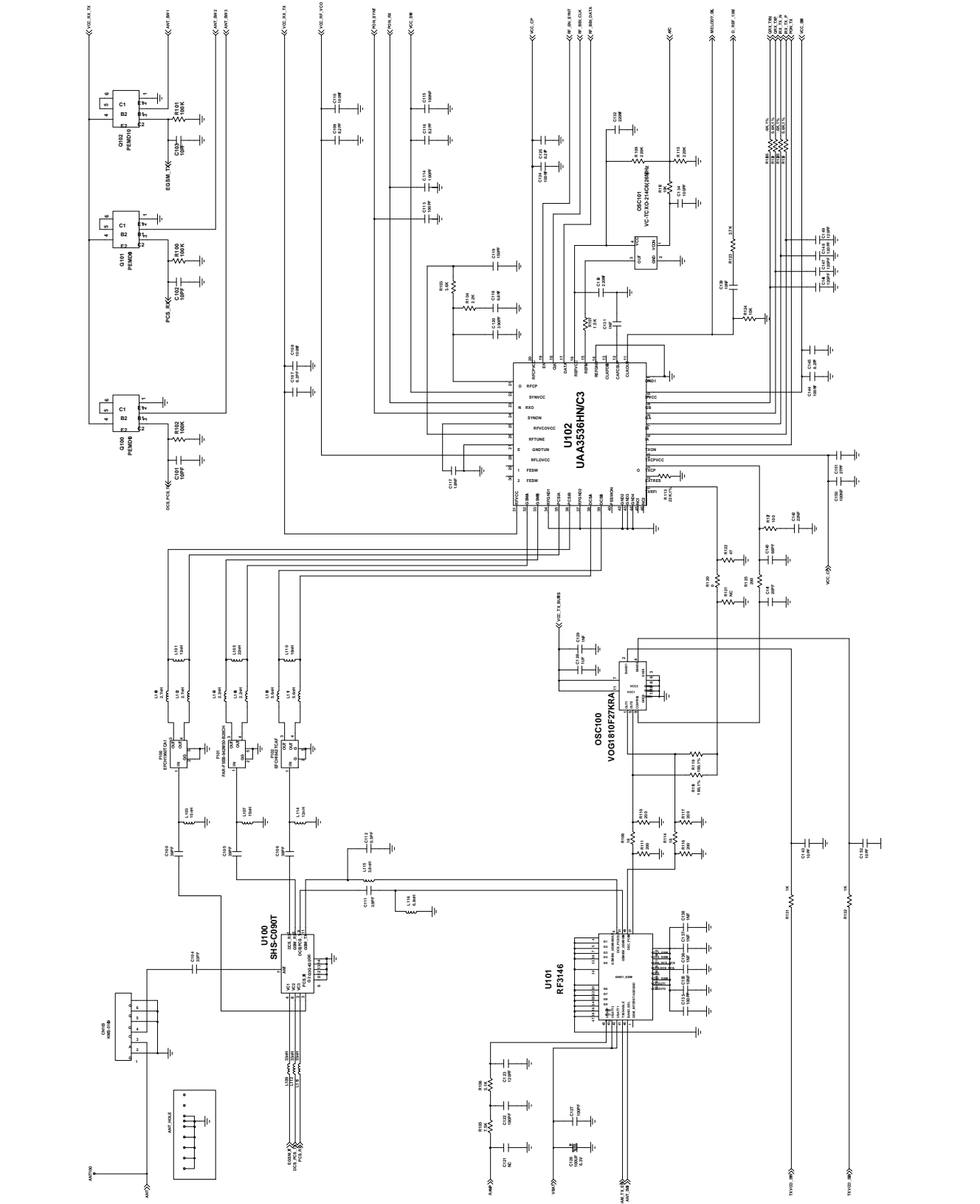


13. GSM Transmitter



14. DCS Receiver





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