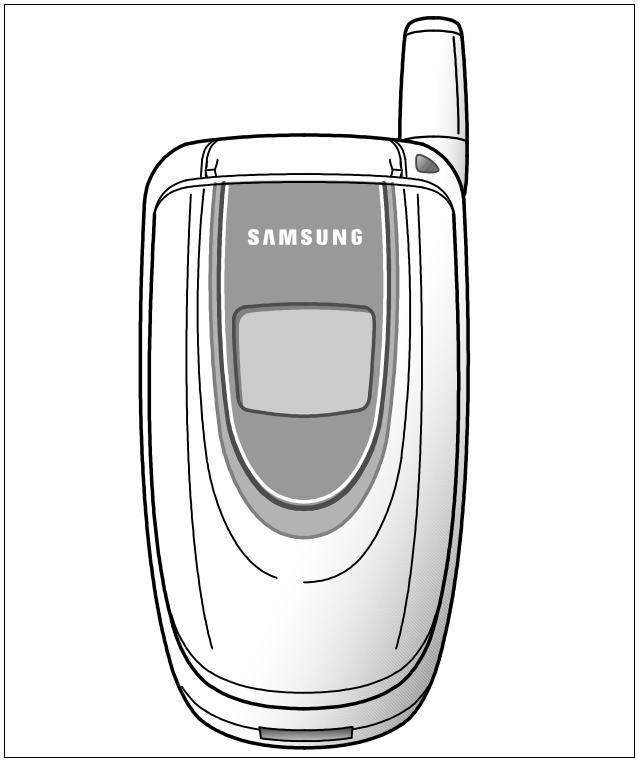
SAMSUNG

GSM TELEPHONE
SGH-E100

SERVICE Manual

GSM TELEPHONE



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BASIC.

1. SGH-E100 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~13dBm	33dBm~5dBm	30dBm~0dBm
Power Class	5pcl ~ 15pcl	5pcl ~ 19pcl	0pcl ~ 15pcl
Sensitivity	-102dBm	-102dBm	-100dBm
TDMA Mux	8	8	8
Cell Radius	35Km	35Km	2Km

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2. GSM TX power class

TX Power control level	GSM900
5	33±2 dBm
6	31±2 dBm
7	29±2 dBm
8	27±2 dBm
9	25±2 dBm
10	23±2 dBm
11	21±2 dBm
12	19±2 dBm
13	17±2 dBm
14	15±2 dBm
15	13±2 dBm
16	11±3 dBm
17	9±3dBm
18	7±3 dBm
19	5±3 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

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2. SGH-E100 Circuit Description

Ⅰ. SGH-E100 RF Circuit Description

1. RX PART

1.1 ASM(MODULE1)

→ Switching Tx, Rx path for GSM900, DCS1800 by logic controlling.

1.2 ASM Control Logic (U206, U208)

→ Truth Table

	VC_1	VC_2
GSM Tx Mode	**H**	**L**
DCS Tx Mode	**L**	**H**
GSM Rx Mode	**L**	**L**
DCS Rx Mode	**L**	**L**

1.3 FILTER

To convert Electromagnetic Field Wave to Acoustic Wave and then pass the specific frequency band.

- GSM FILTER (F100) → For filtering the frequency band between 925 ~ 960 MHz
- DCS FILTER (F102) → For filtering the frequency band 1805 and 1880 MHz.

1.4 TC-VCXO (U101)

To generate the 26MHz reference clock to drive the logic and RF.

After additional process, the reference clock applies to the U100 Rx IQ demodulator and Tx IQ modulator.

The oscillator for RX IQ demodulator and Tx modulator are controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

1.5 UAA3536(U100)

This chip integrates two differential-input LNAs.

The GSM input supports the E-GSM, DCS input supports the DCS1800. The LNA inputs are matched to the 200 ohm differential output SAW filters through eternal LC matching network.

Image-reject mixer downconverts the RF signal to a 100 KHz intermediate frequency(IF) with the RFLO from VOU1810 voltage-controlled oscillator. The RFLO frequency is between 1801 ~ 1921 MHz.

The Mixer output is amplified with an analog programmable gain amplifier(PGA), which is controlled by AGAIN.

The quadrature IF signal is digitized with high resolution A/D converts (ADC).

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2. TX PART

Baseband IQ signal fed into offset PLL, this function is included inside of U100 chip.

UAA3536 chip generates modulator signal which power level is about 1.5dBm and fed into Power Amplifier(U201).

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	-35dBc
		DCS	-35dBc
	400kHz offset 30 kHz bandwidth	GSM	-66dBc
		DCS	-65dBc
	600kHz ~ 1.8MHz offset 30 kHz bandwidth	GSM	-75dBc
		DCS	-68dBc

II. SGH-E100 Baseband Circuit Description

1. PCF50601

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-E100) works by PWM.

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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) and small LCD(B/W). Chip select signals, LCD_MAIN_CS and LCD_SUB_CS, can enable Each LCD. LCD_MAIN_CS signal enables white LED of main LCD and LCD_SUB_CS signal enables the small LCD. "RESET_2V8" signal initiates the Reset process of the LCD.

16-bit data lines(HD(0)~HD(15)) transfers data and commands to LCD.

"SPK_P" and "SPK_N" are used for audio speaker. And "VDD_VIB" from PCF50601 enables the motor.

3. IRDA

This system uses IRDA module, HSDL_3201. This has signals, "IRDA_DOWN"(enable signal), "RXD0"(input data) and "TXD0"(output data). These signals are connected to OM6357.

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 OM6357, KBIO(0:7). These signals compose the matrix. Result of matrix informs the key status to key interface in the OM6357. Power on/off key is separated from the matrix. So power on/off signal is connected with PCF50601 to enable PCF50601. twelve key LED use the "VBAT" supply voltage. "VDD_KEY" signal enables LEDs with current control. "FLIP" informs the status of folder (open or closed) to the OM6357. This uses the hall effect IC, A3212ELH. A magnet under main LCD enables A3212ELH.

5. EMI ESD Filter

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

6. IF Connector

It is 24-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.

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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 OM6357 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 the Hands free kit.

YMU762MA3 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, YMU762MA3 is equipped 32 voices with different tones. 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 YMU762MA3 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.

YMU762 includes a speaker amplifier with high ripple removal rate whose maximum output is 550mW (SPVDD=3.6V). The device is also equipped with conventional function including a vibrator and a circuit for controlling LEDs synchronous with music. For the headphone, it is provided with a stereophonic output terminal.

For the purpose of enabling YMU762MA3 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 YMU762MA3 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 OM6357 enable two memories. They use only one volt supply voltage, VDD3 in the PCF50601. This system uses Samsung's memory, KBB06A300M-T402. It is consisted of 128M bits flash NOR memory and 128M bits flash NAND memory and 32M bits UtRAM. It

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has 16 bit data line, HD[0~15] which is connected to OM6357. It has 23 bit address lines, HA[1~23]. NCSFLASH_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 OM6357 select memory among 2 flash memory and UtRAM.

Reading or writing procedure is processed after HWR_N or HRD_N is enabled. Memories use reset, which is VDD3 delay from PCF50601. HA[22] signal enables lower byte of SRAM and HA[22] signal enables higher byte of SRAM.

10. OM6357

OM6357 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), eripheral 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[1~23], address lines of ARM core and HD[0~15], data lines of ARM core are connected to memory.

NCSRAM, NCSFLASH_NAND 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 Convertor) part receives the status of temperature, battery type and battery voltage.

11. TCO-9141G(26MHz)

This system uses the 26MHz TCXO, TCO-9141G, Toyocom. AFC control signal from OM6357 controls frequency from 26MHz X-tal. The clock output frequency of UAA3536HN is 13MHz. This clock is connected to OM6357, YMU762.

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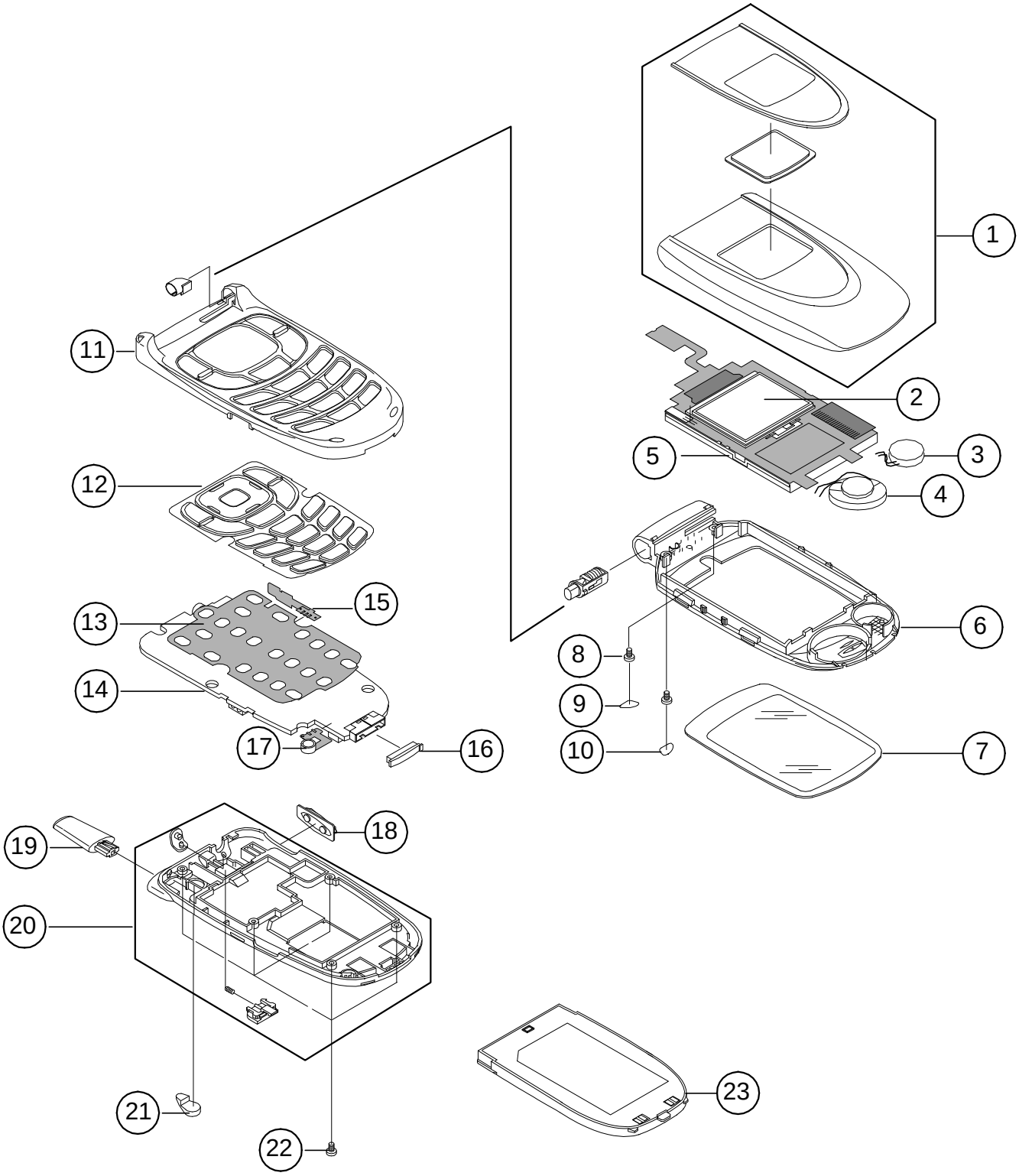
3. SGH-E100 Exploded View and its Parts list

1. Cellular phone Exploded View-1



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2. Cellular phone Parts list

NO	Description	SEC CODE	Remark
1	FOLDER UPPER	GH75-02840A	
2	DUAL LCD	GH07-00346A	
3	MOTOR	3101-001347	
4	SPEAKER	3001-001386	
5	MIAN LCD	GH07-00190A	
6	FOLDER LOWER	GH75-02841A	
7	WINDOW LCD	GH75-02845A	
8	SCREW	6001-001478	
9	SCREW CAP(L)	GH74-01466A	
10	SCREW CAP(R)	GH74-01467A	
11	FRONT COVER	GH75-02842A	
12	KEYPAD	GH75-02844A	
13	DOME SHEET	GH59-00677A	
14	MAIN PBA	GH92-01455A	
15	VOLKEY FPCB	GH59-00678A	
16	IF COVER	GH73-01844A	
17	MIC	GH30-00006A	
18	VOLUME KEY	GH75-02846A	
19	ANTENNA	GH42-00300A	
20	REAR COVER	GH75-02843A	
21	RF COVER	GH73-01843A	
22	SCREW	6001-001478	
23	BATTERY	GH43-00940A	

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3. Test Jig (GH80-01909A)

3-1. RF Test Cable
(GH39-00140A)

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

3-3. Serial Cable

3-4. Power Supply Cable

3-5. DATA CABLE
(GH39-00143B)

3-6. TA
(GH44-00184A)

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4. SGH-E100 MAIN Electrical Parts List

SEC CODE	Design LOC
0406-001167	ZD503
0406-001167	ZD504
0406-001167	ZD505
0406-001167	ZD506
0504-001012	Q401
0504-001060	U206
0504-001060	U207
0504-001060	U208
0505-001423	U509
0505-001423	U518
0506-000107	U406
0506-000107	U517
0601-001647	D451
0601-001647	D452
0601-001647	D453
0601-001647	D454
0601-001647	D455
0601-001647	D456
0601-001647	D458
0601-001647	D459
0601-001647	D507
0601-001647	D508
0601-001647	D509
0601-001647	D512
0601-001647	LED401
0604-001146	U351
0801-002237	U403
0801-002540	U452
0801-002540	U453
0801-002540	U508

SEC CODE	Design LOC
0801-002540	U519
1001-001183	U507
1001-001183	U515
1009-001010	SW200
1109-001280	U401
1201-001954	U201
1202-001036	U502
1203-002764	U405
1204-002161	U402
1205-002257	U300
1205-002276	U504
1205-002327	U100
1404-001221	TH1
1405-001082	D501
1405-001082	D502
1405-001082	D503
1405-001082	D505
1405-001082	D506
1405-001082	V1
2007-000140	R599
2007-000141	R104
2007-000141	R359
2007-000141	R360
2007-000142	R123
2007-000142	R125
2007-000142	R127
2007-000142	R128
2007-000147	R212
2007-000148	R113
2007-000148	R208

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2007-000148	R304
2007-000148	R354
2007-000148	R415
2007-000148	R501
2007-000148	R505
2007-000148	R576
2007-000162	R302
2007-000162	R303
2007-000162	R352
2007-000162	R353
2007-000162	R355
2007-000162	R450
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2007-000162	R539
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2007-000162	R596
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2007-000162	R598
2007-000162	R600
2007-000162	R650
2007-000164	R416
2007-000167	R417
2007-000171	R126

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2007-000566	R106
2007-000566	R107
2007-000566	R414
2007-000758	R412
2007-000775	R124
2007-000775	R404
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2007-000775	R411
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2007-001288	R201
2007-001298	R119
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2007-001305	R115
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2007-001308	R114
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2007-007008	R202

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2007-007009	R593
2007-007100	R301
2007-007142	R118
2007-007148	R116
2007-007311	R105
2007-007314	R211
2007-007334	R515
2007-007480	R516
2007-007528	R117
2007-007528	R420
2007-007981	R514
2007-008117	R122
2007-008117	R419
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2203-000278	C309
2203-000278	C511
2203-000278	C517
2203-000278	C568
2203-000278	C569
2203-000278	C570
2203-000311	C219
2203-000311	C410
2203-000330	C310
2203-000330	C313
2203-000330	C504
2203-000330	C516
2203-000359	C112
2203-000425	C528
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2203-000438	C502
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2203-000812	C107
2203-000812	C108
2203-000812	C210
2203-000854	C106
2203-000854	C146
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2703-001722	L110
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2703-001723	L205
2703-001747	L201
2703-001747	L202
2703-001748	L109
2703-002198	L203
2703-002203	L100
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2703-002208	L107
2801-003747	X1

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2904-001390	F100
2904-001403	F102
2909-001204	MODULE1
3301-001105	L300
3705-001273	CON201
3709-001250	CN301
3710-001816	CN3
3711-005078	CN100
3722-001715	EAR500
4302-001119	BAT100
GH41-00382A	

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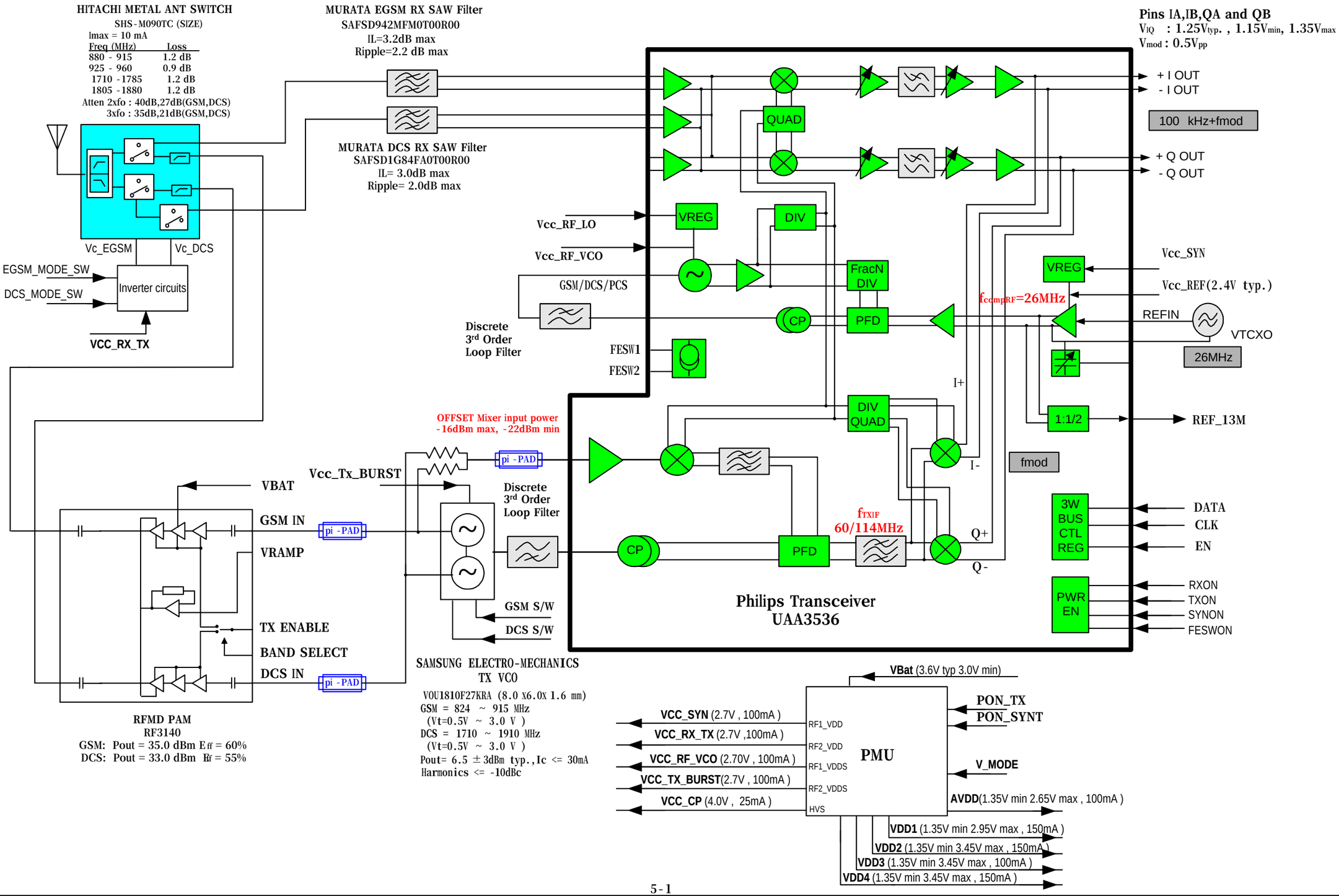
5. SGH-E100 Block Diagrams

1. RF Solution Block Diagram



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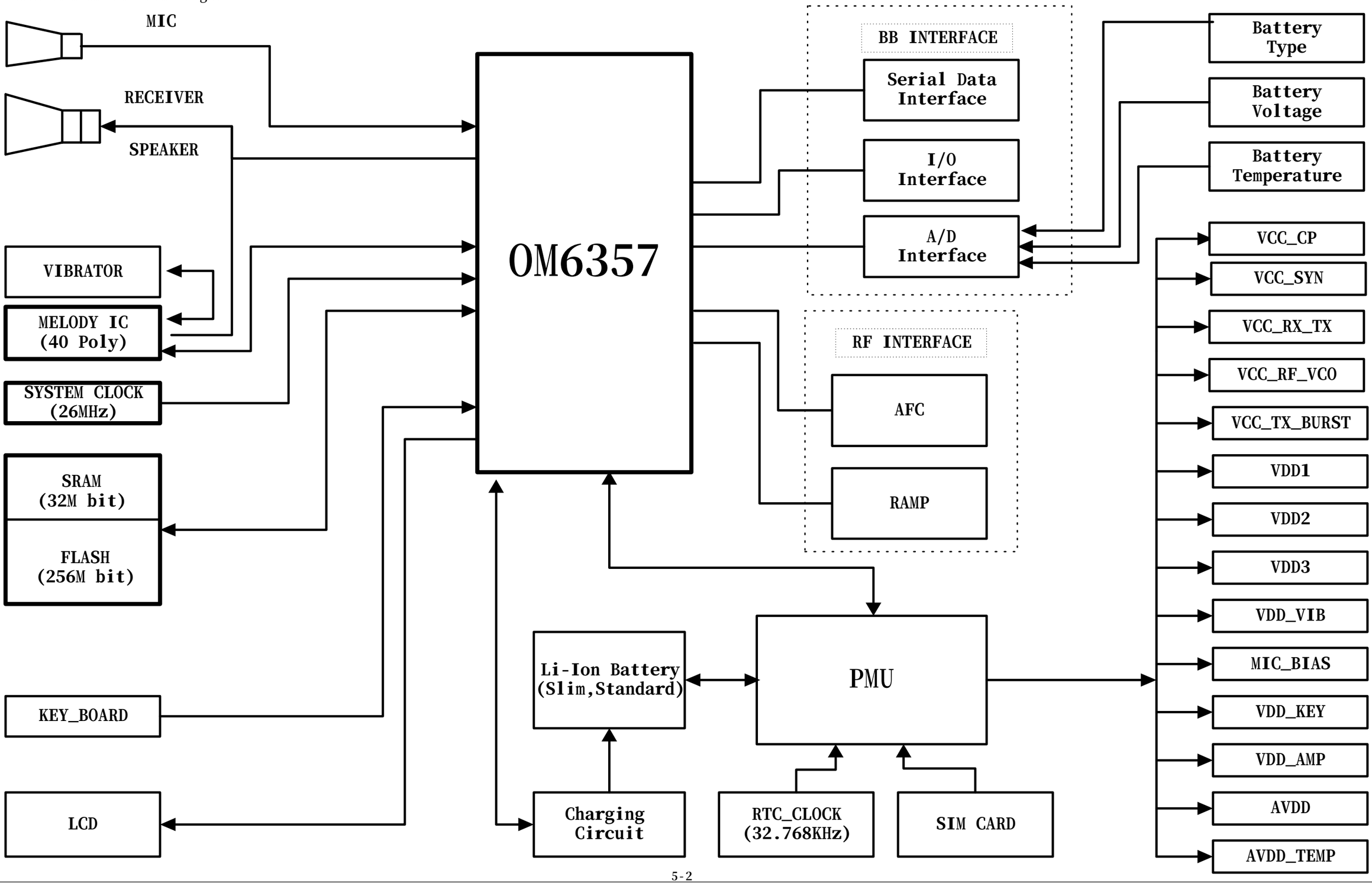
2. Base Band Solution Block Diagram



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6. SGH-E100 PCB Diagrams

1. Main PCB Top Diagram

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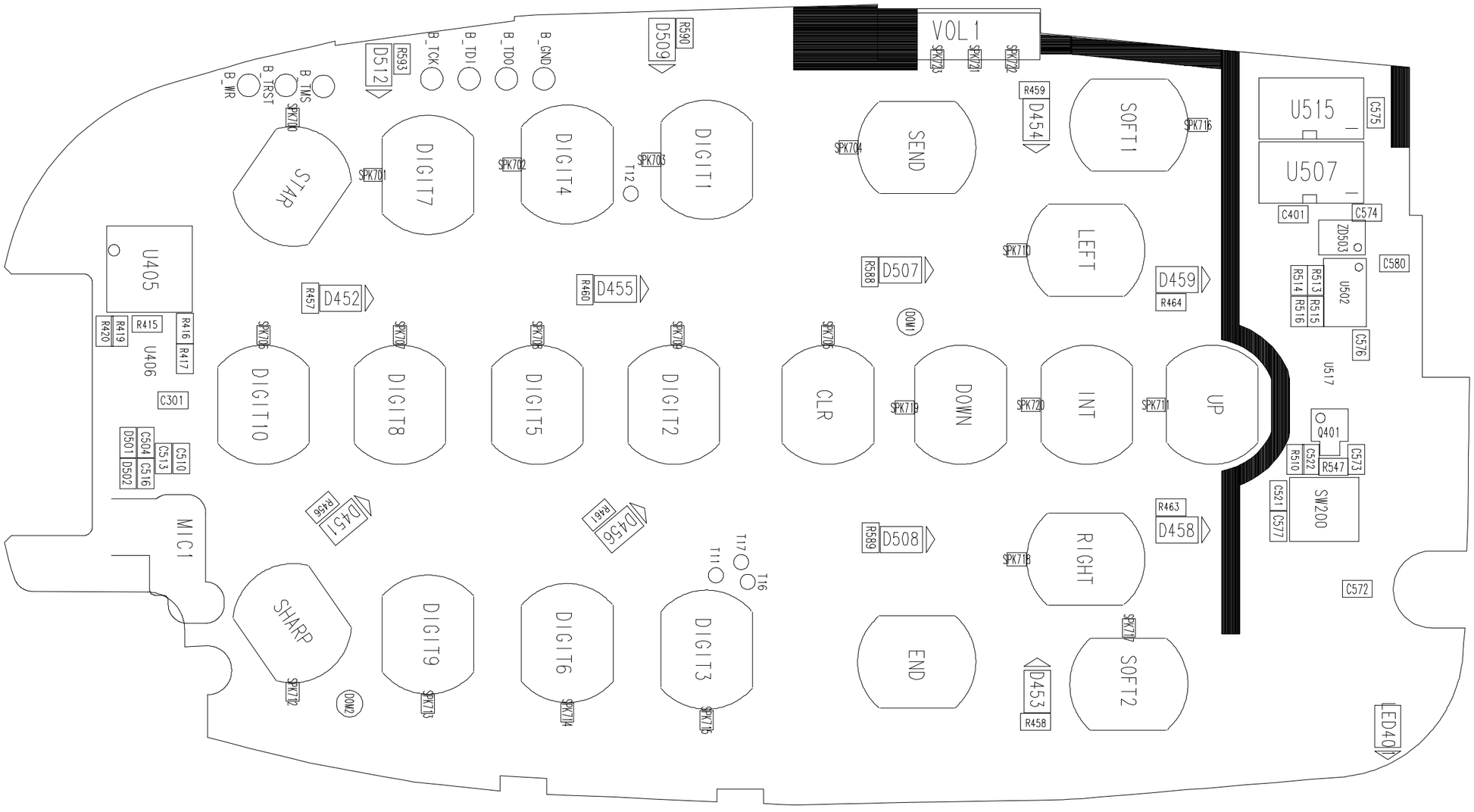
2. Main PCB Bottom Diagram



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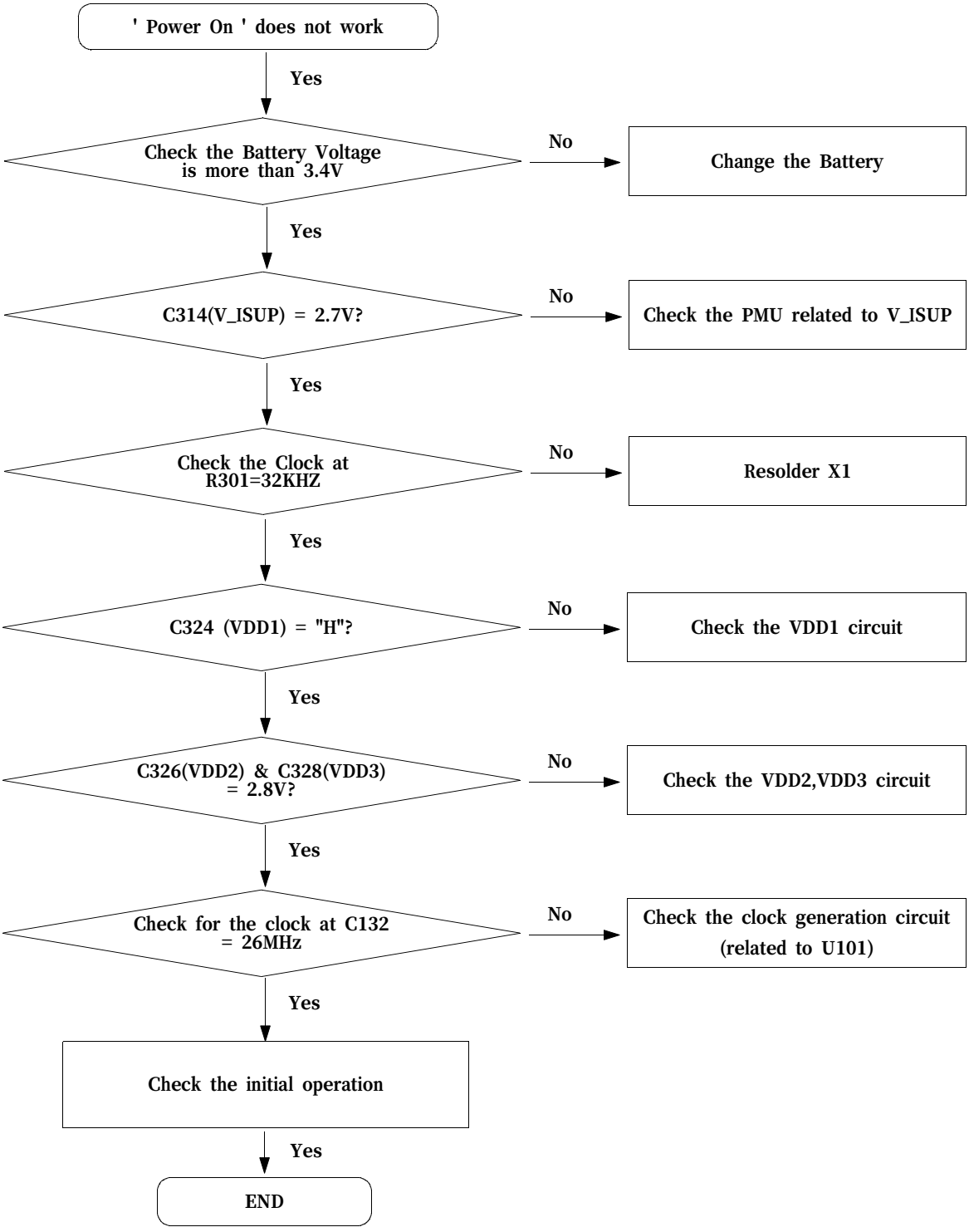
7. SGH-E100 Flow Chart of Troubleshooting

1. Power On



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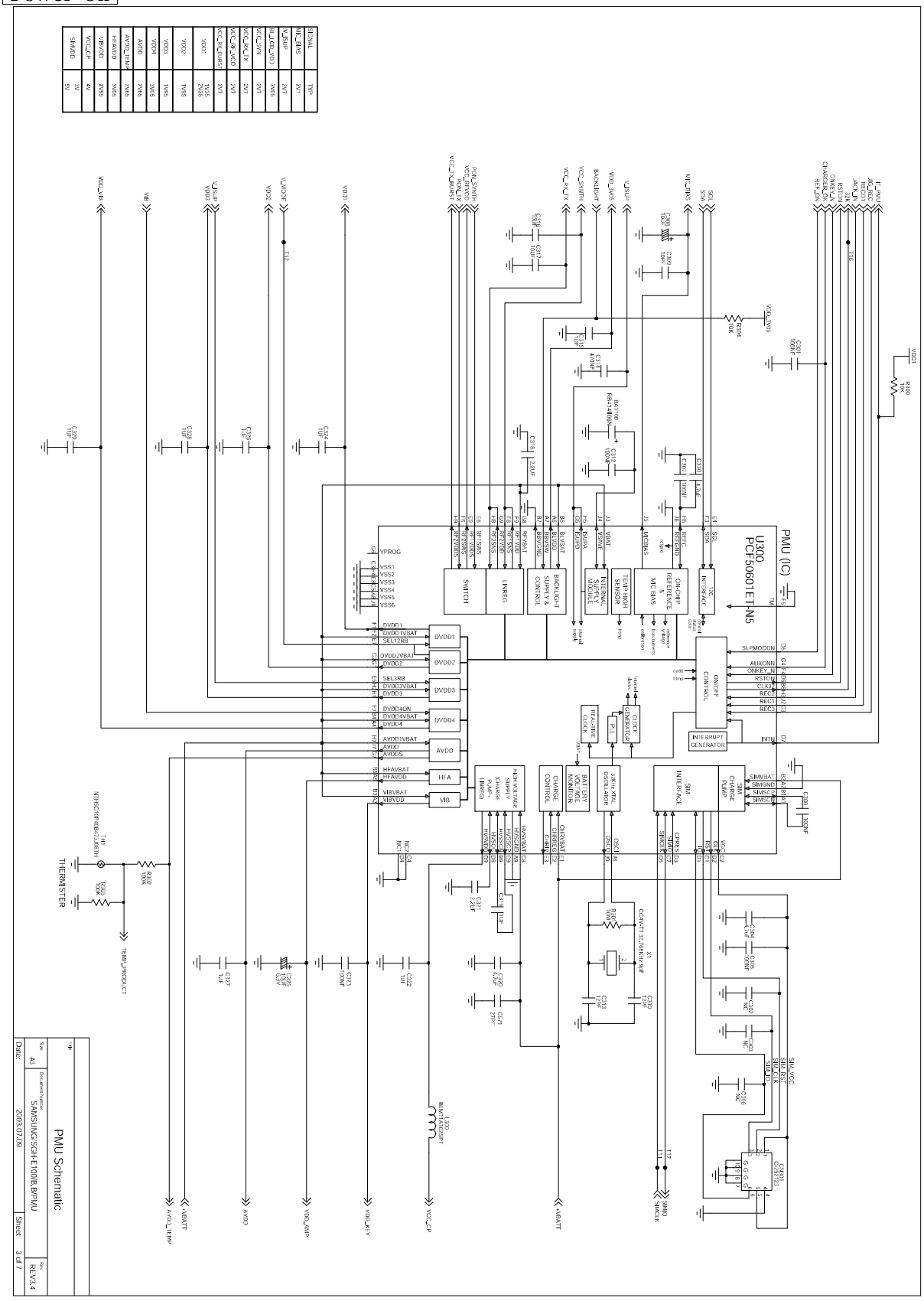
Power On



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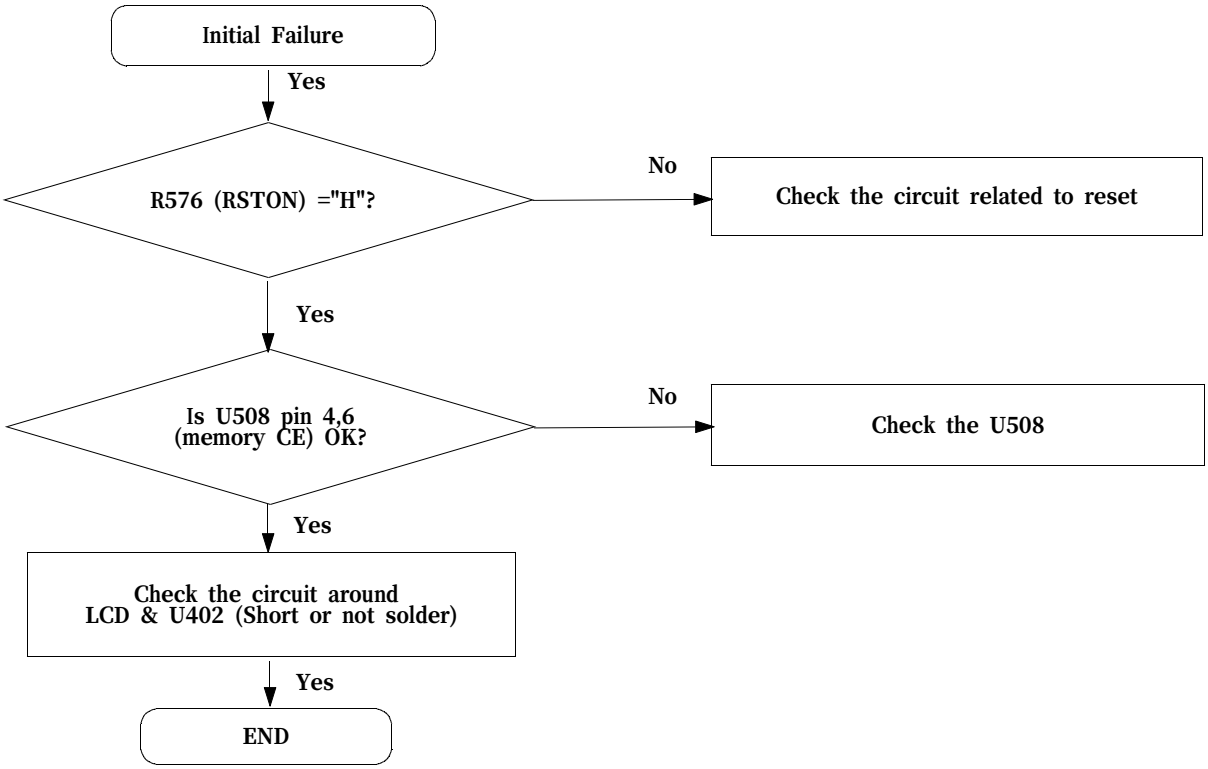
2. Initial



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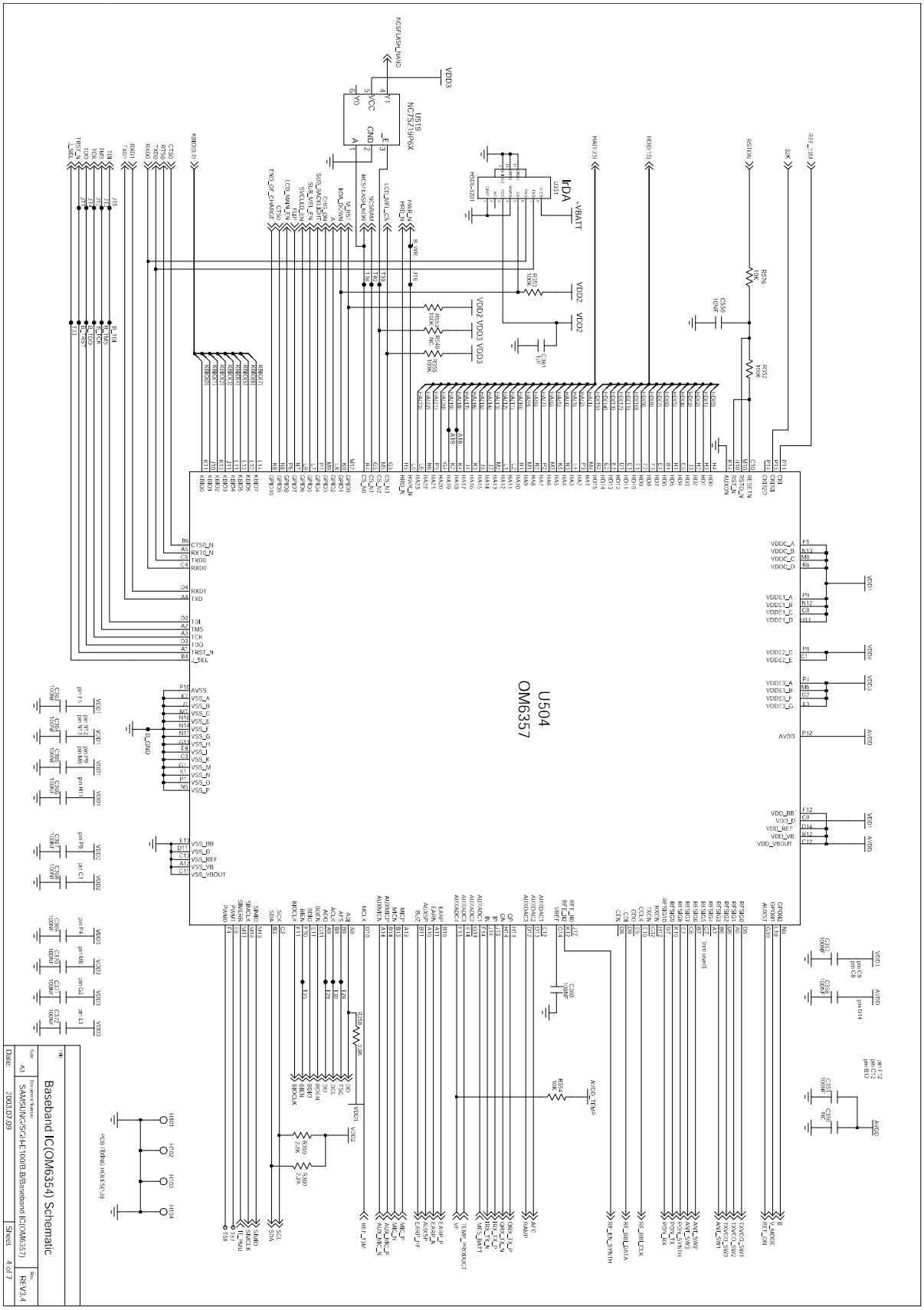
Initial



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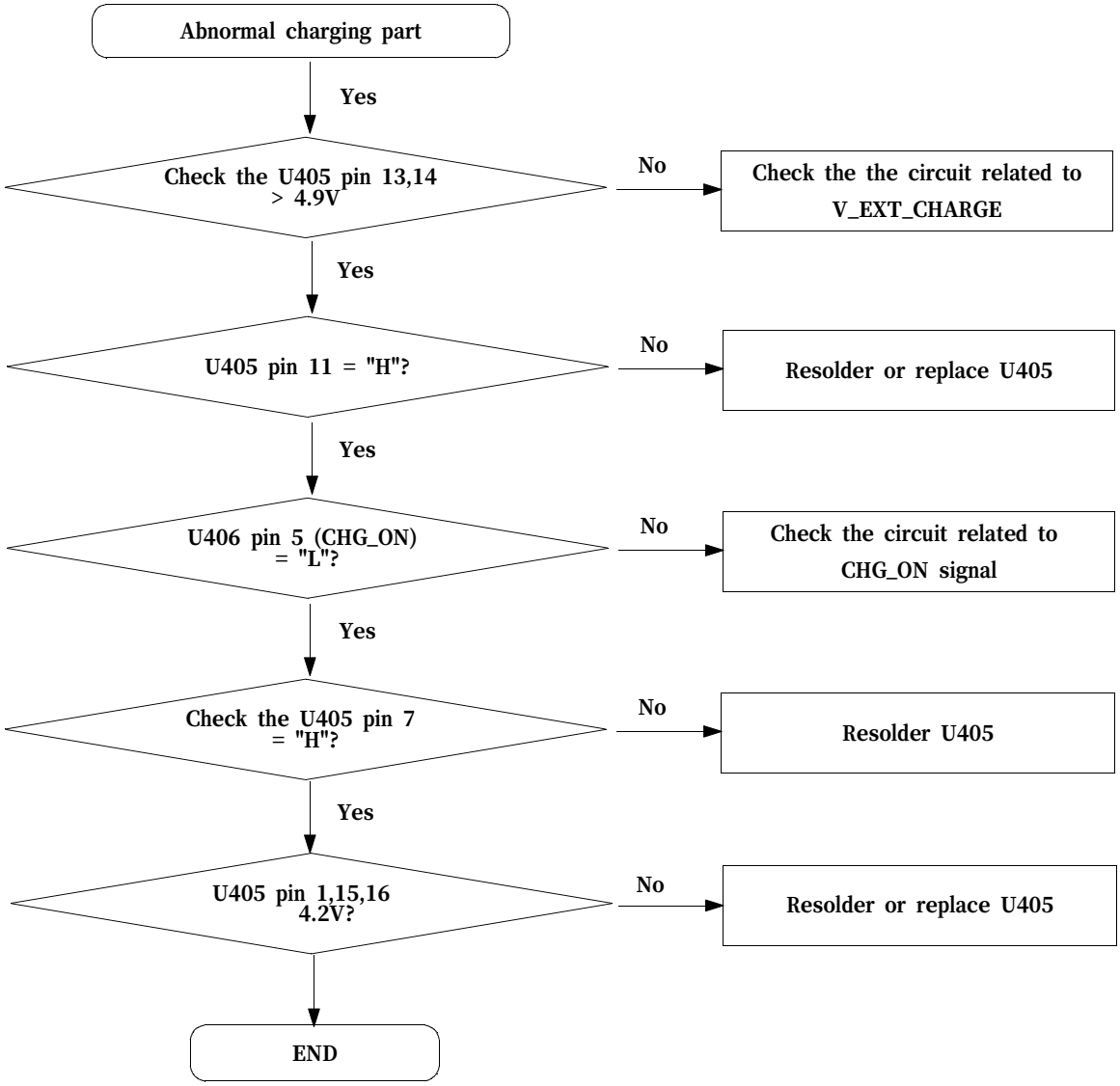
3. Charging Part



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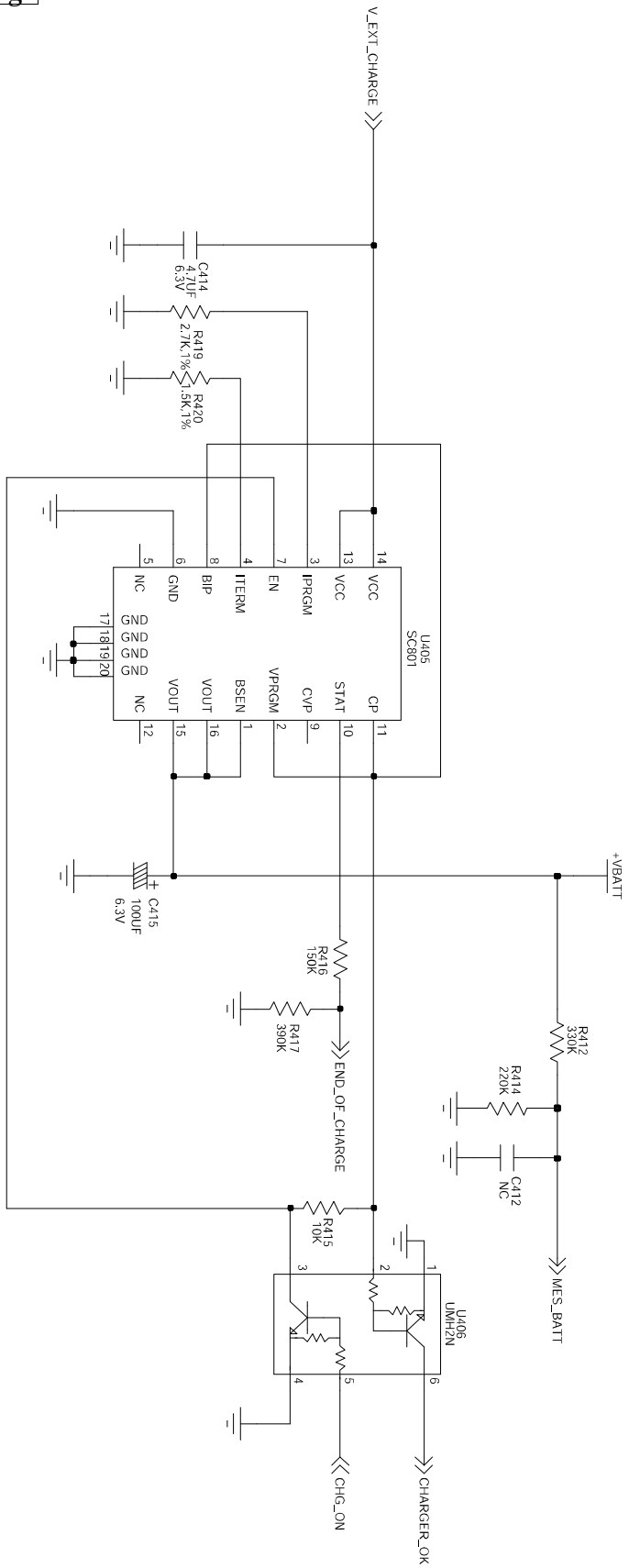
Charging

Charging Circuit



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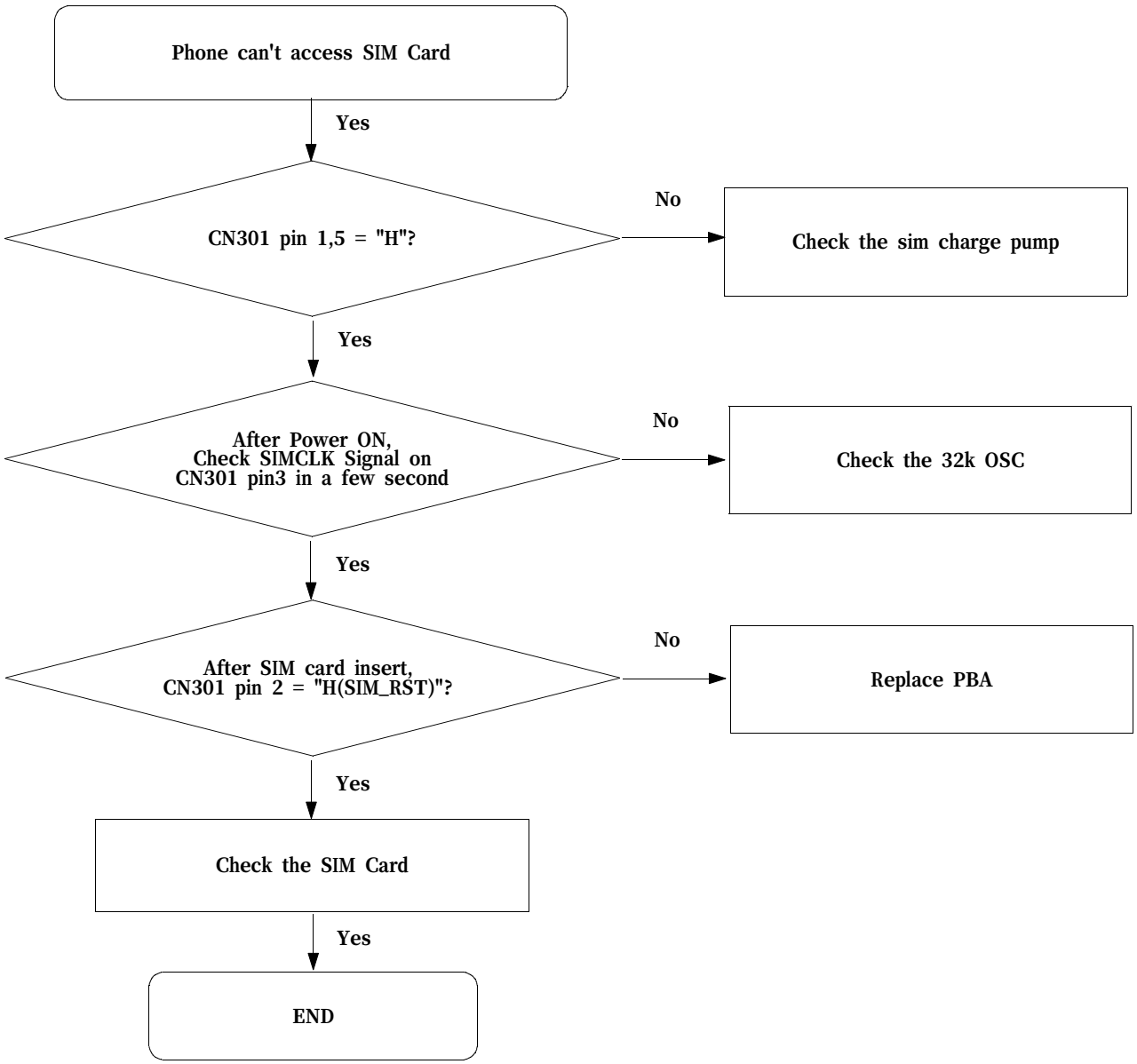
4. Sim Part



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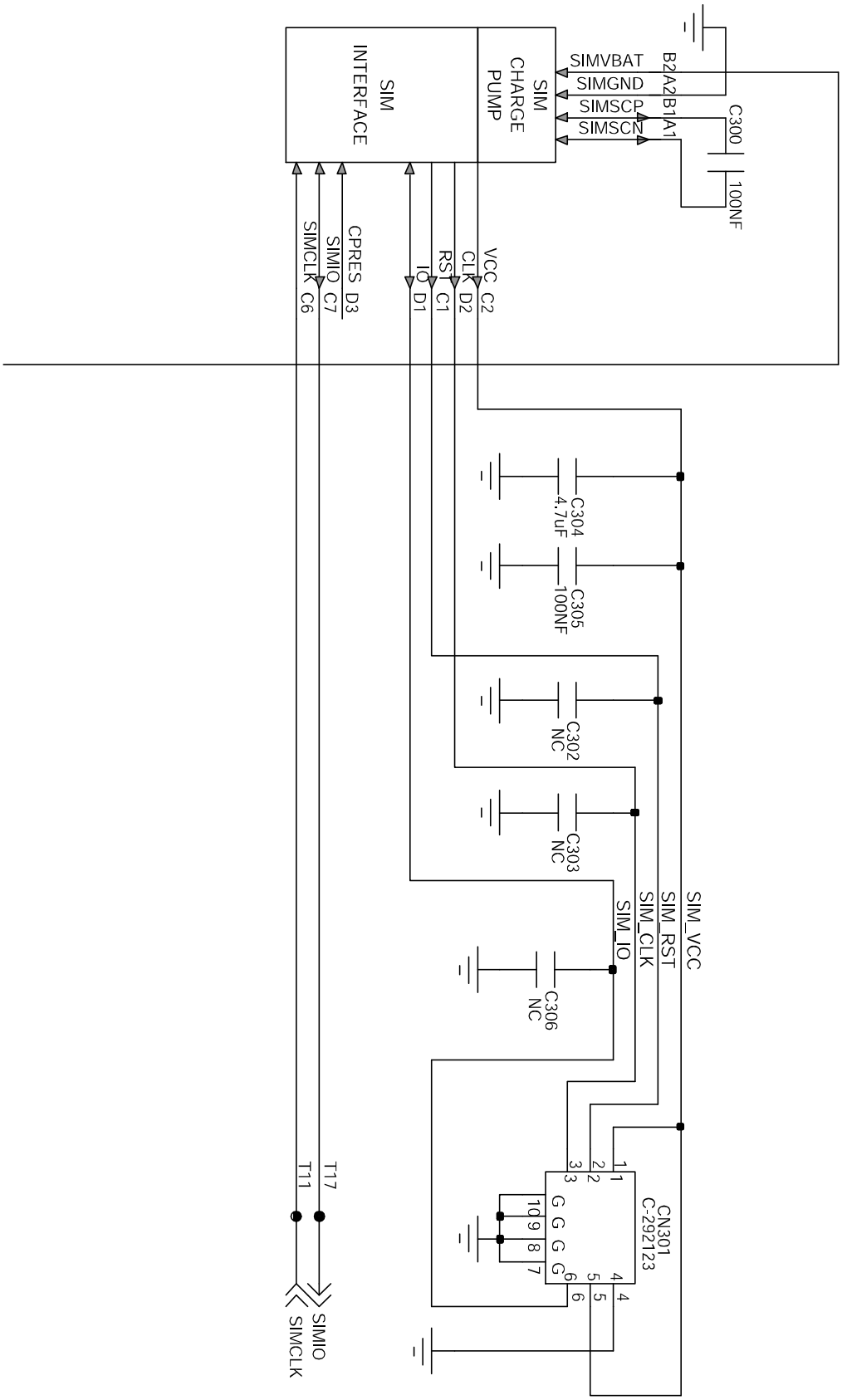
SIM



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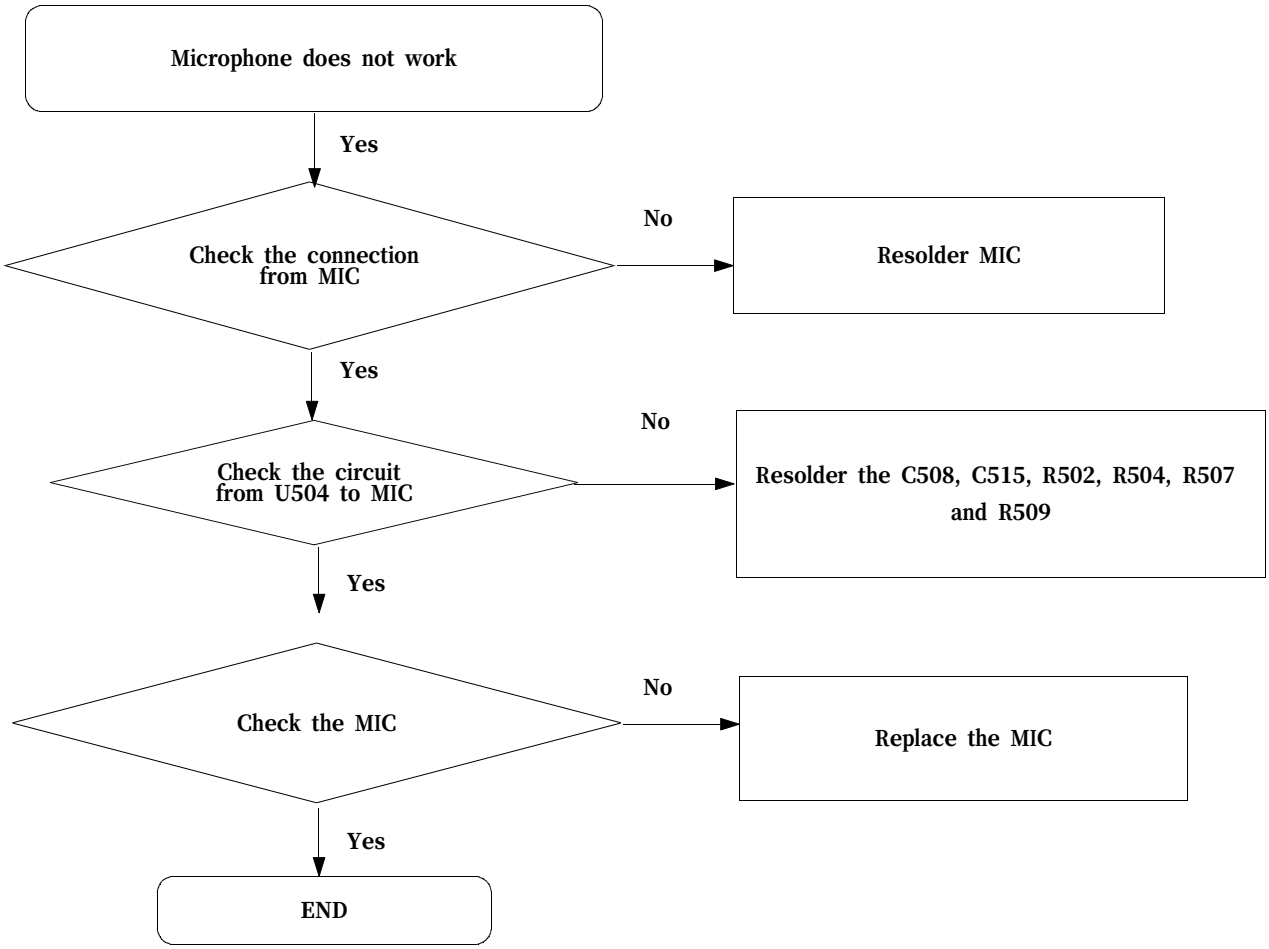
5. Microphone Part



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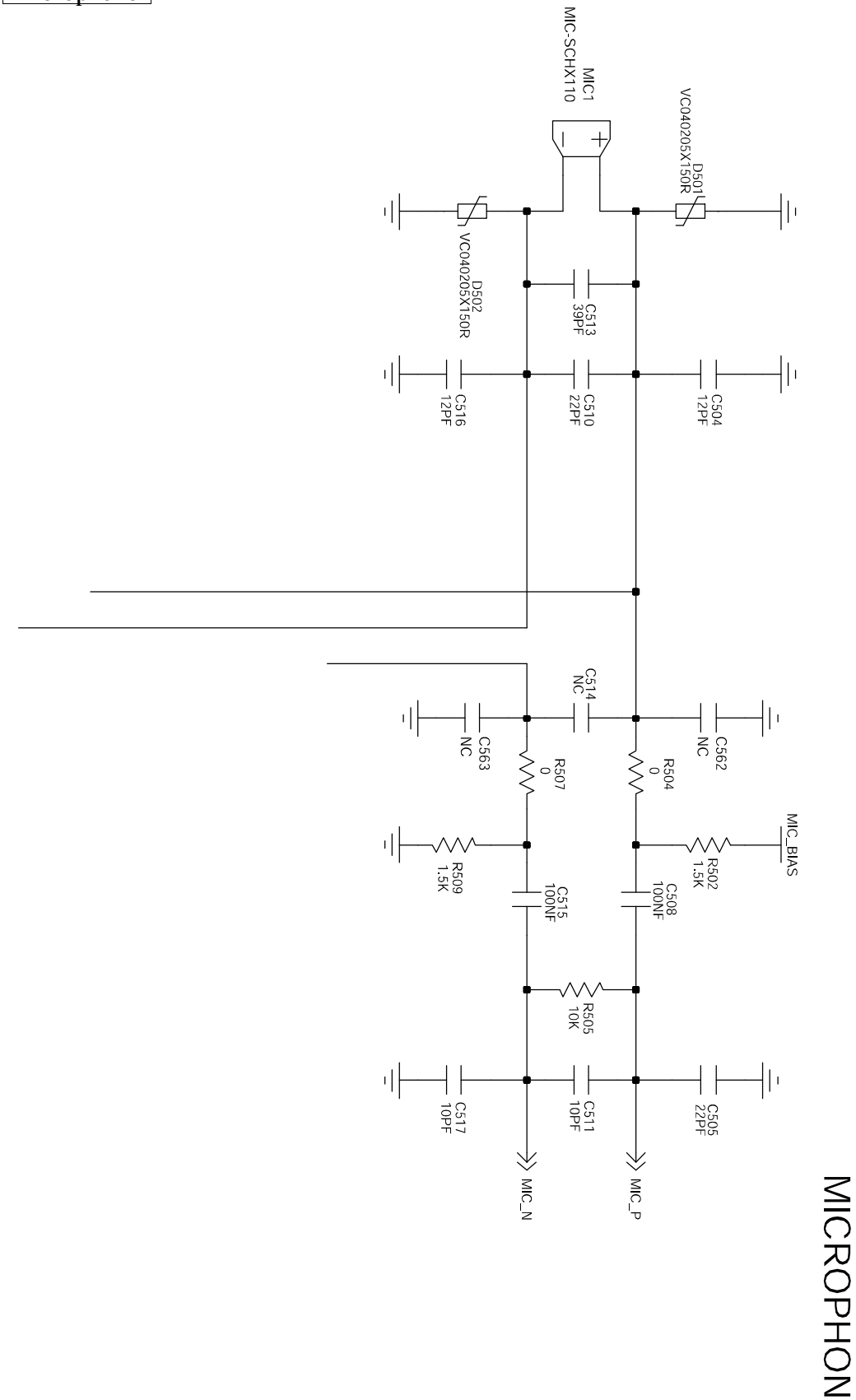
Microphone



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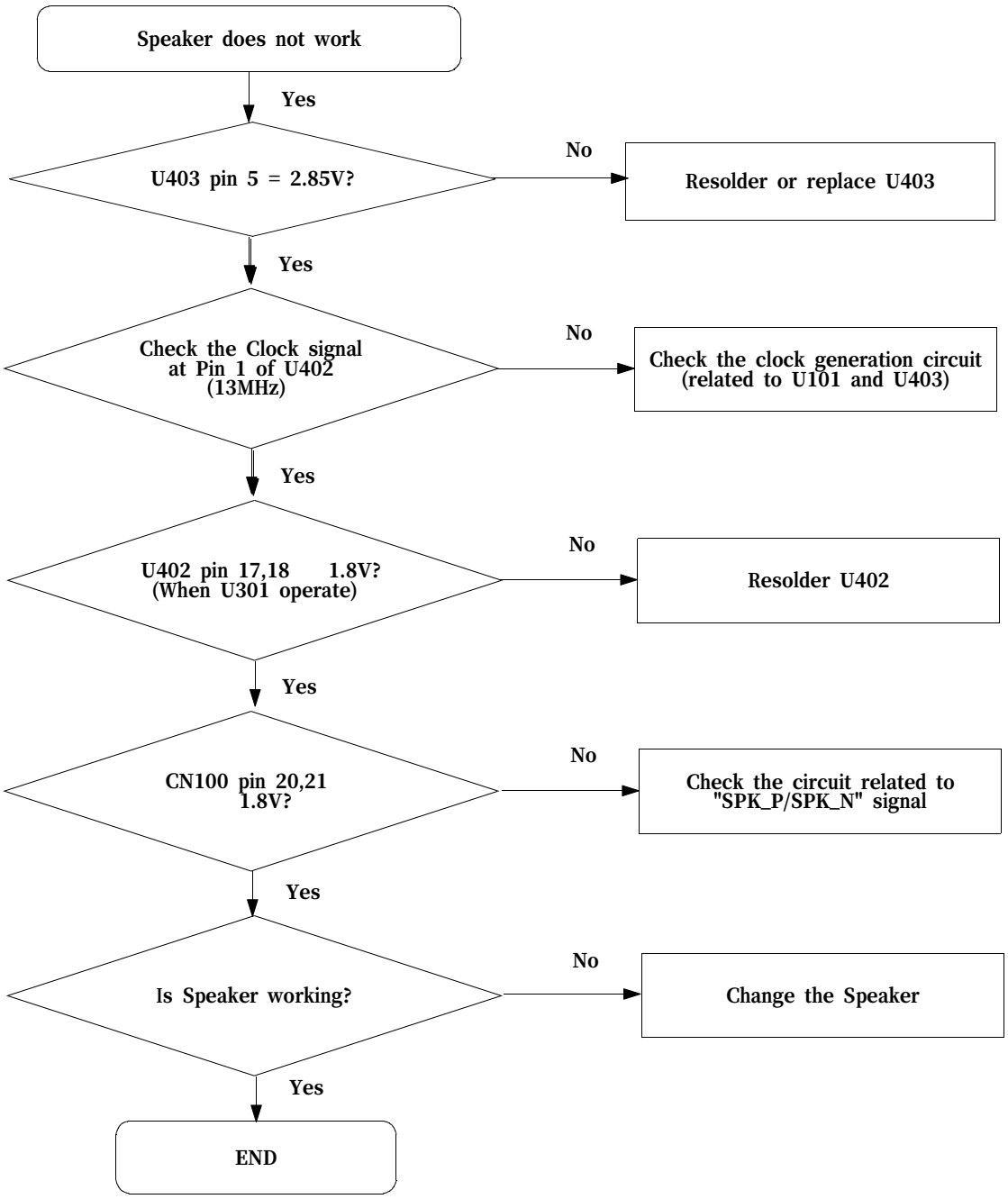
6. Speaker Part(Melody)



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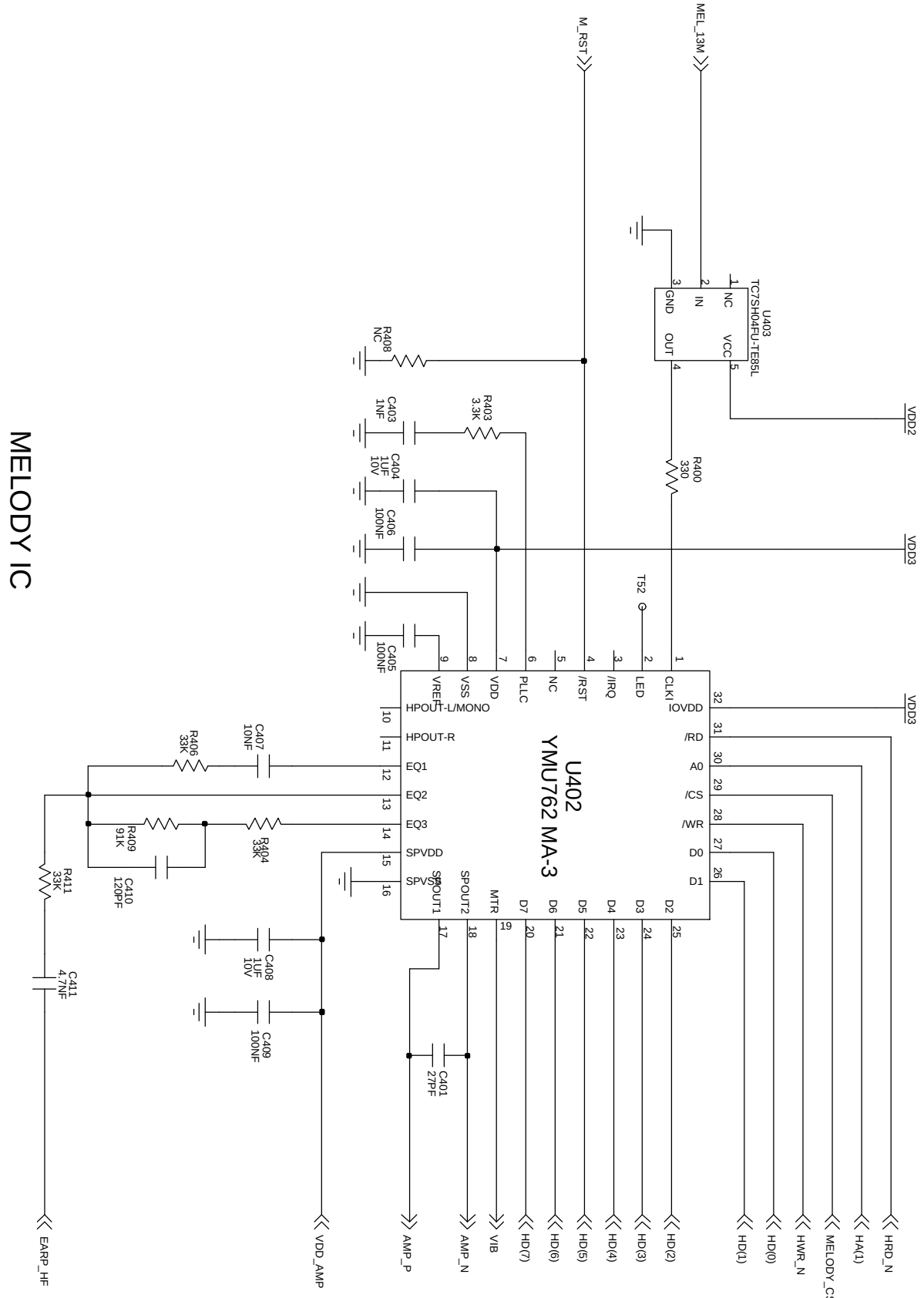
Speaker



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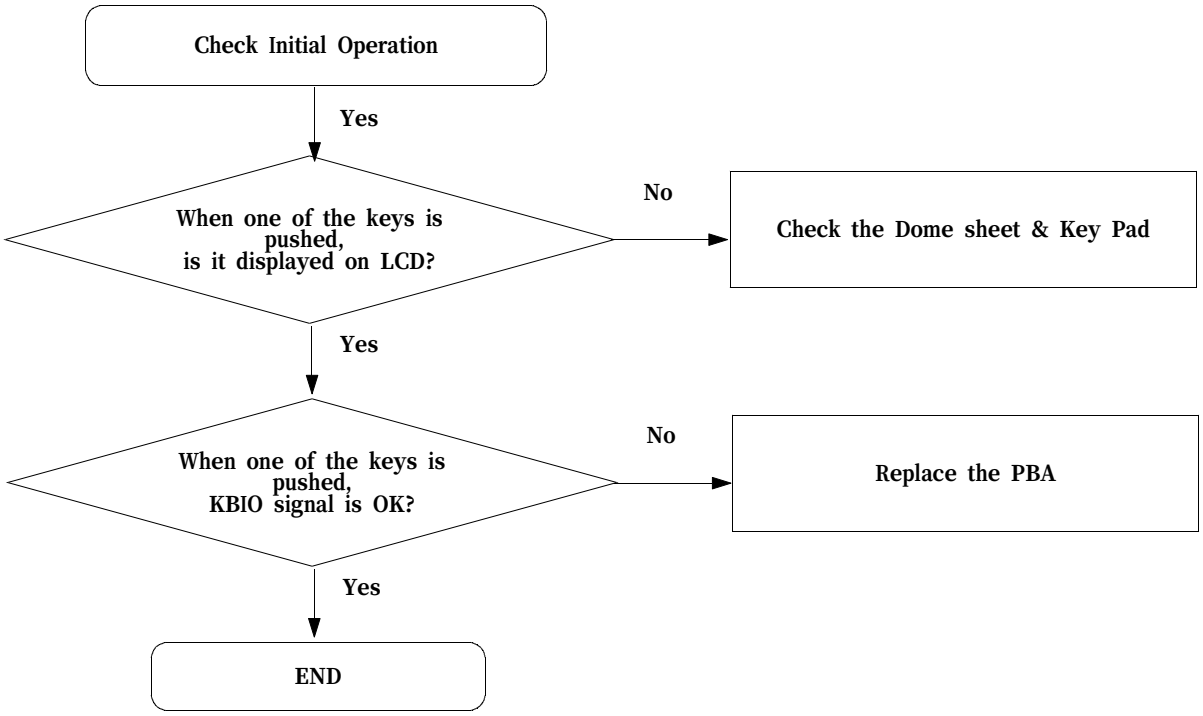
7. Key Data Input



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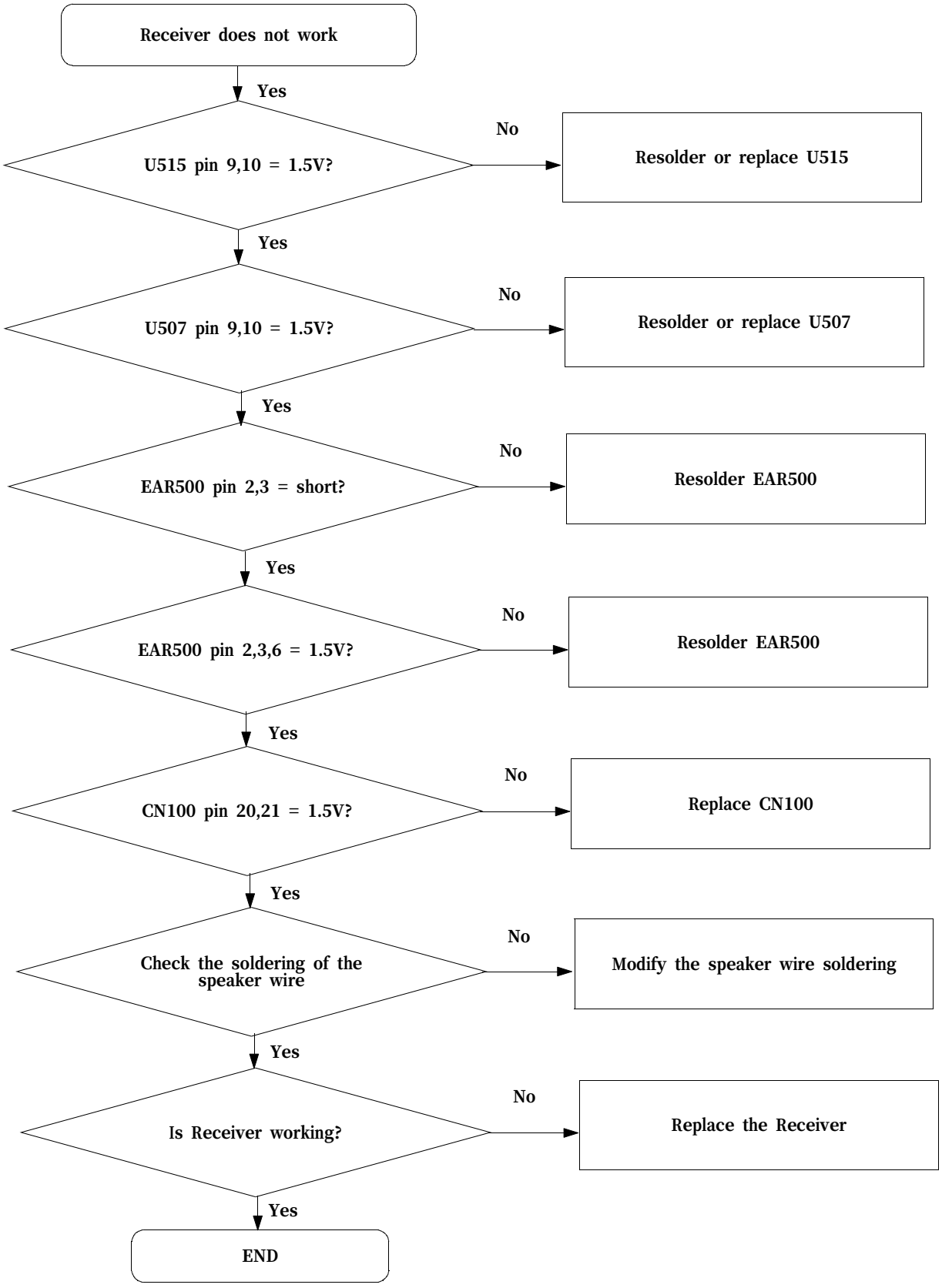
8. Receiver Part



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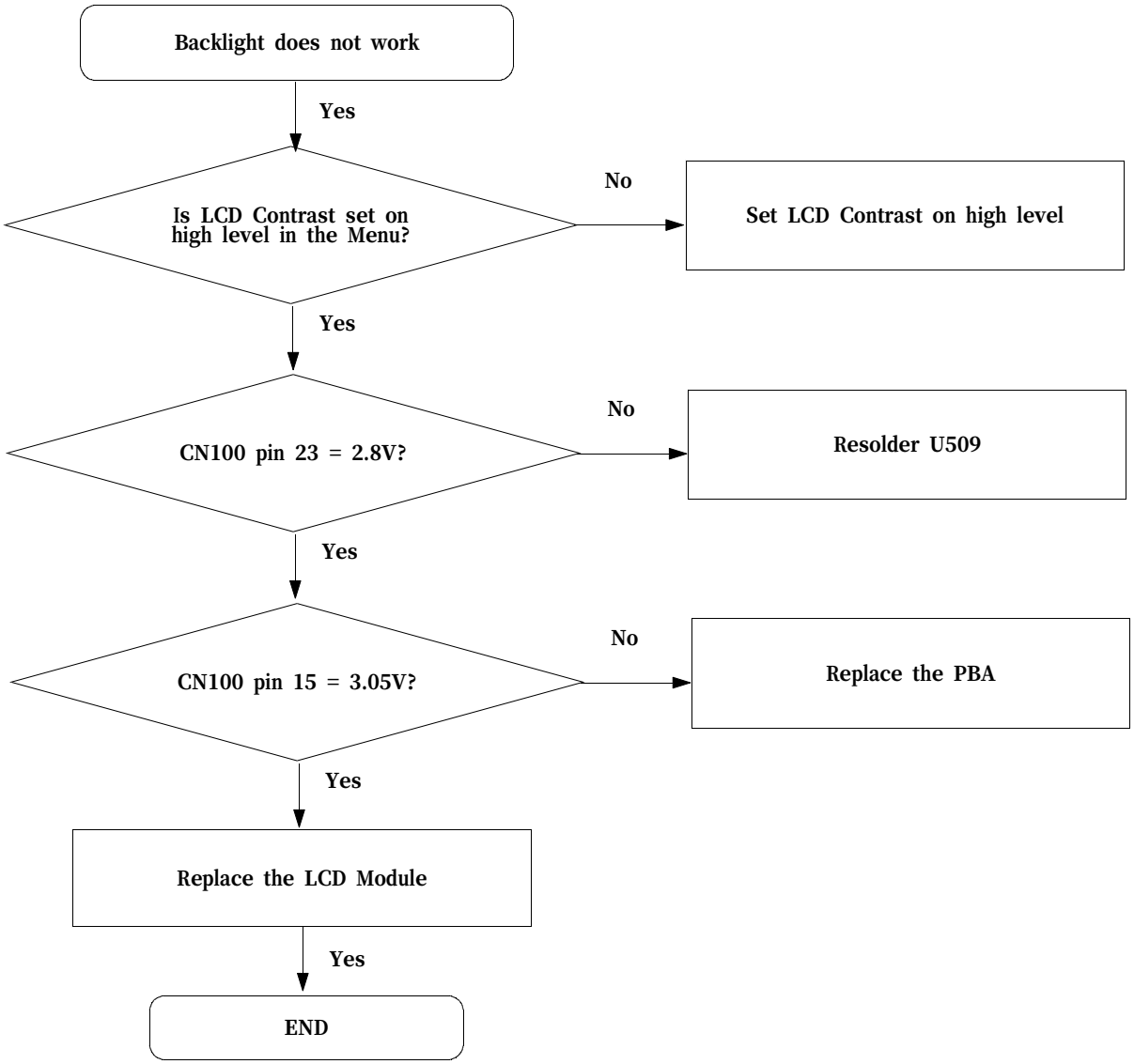
9. Back Light (for Color Main LCD)



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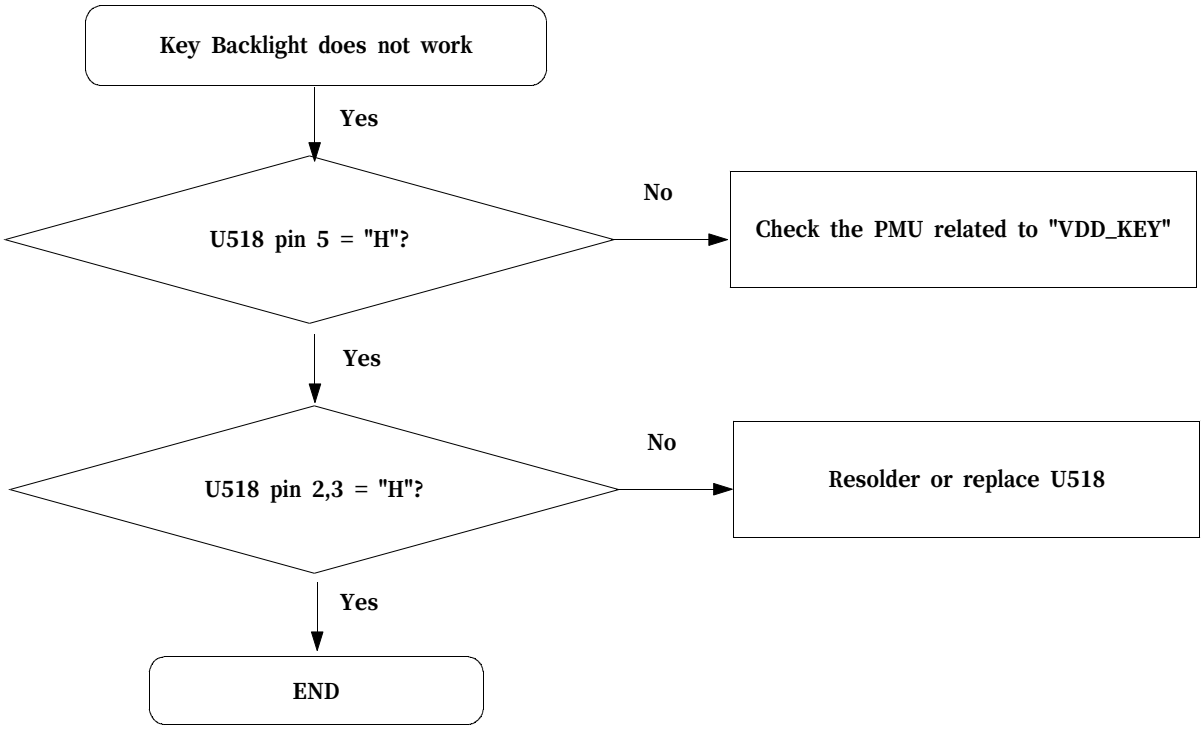
10. Key Back Light



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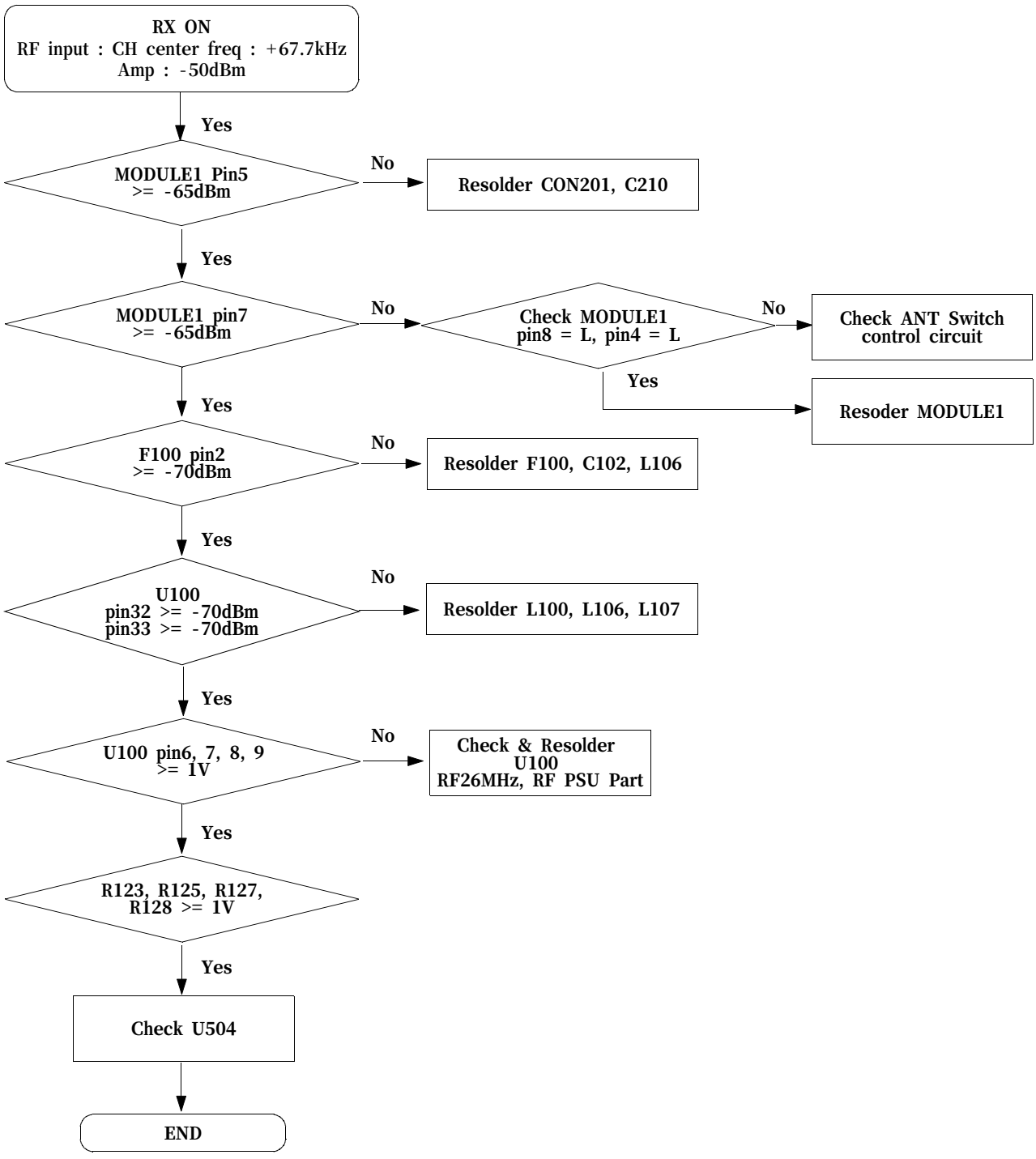
11. GSM Receiver



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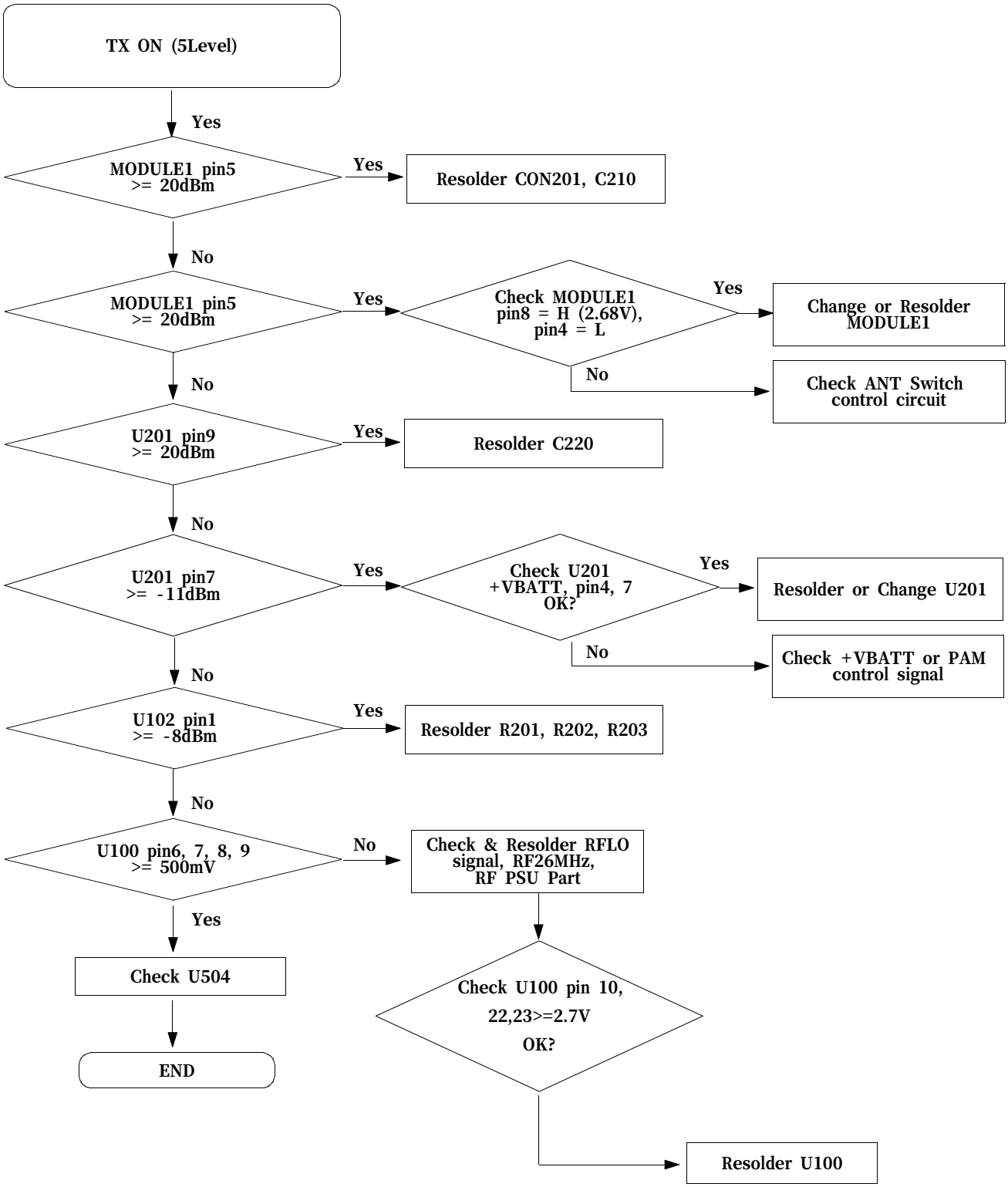
12. GSM Transmitter



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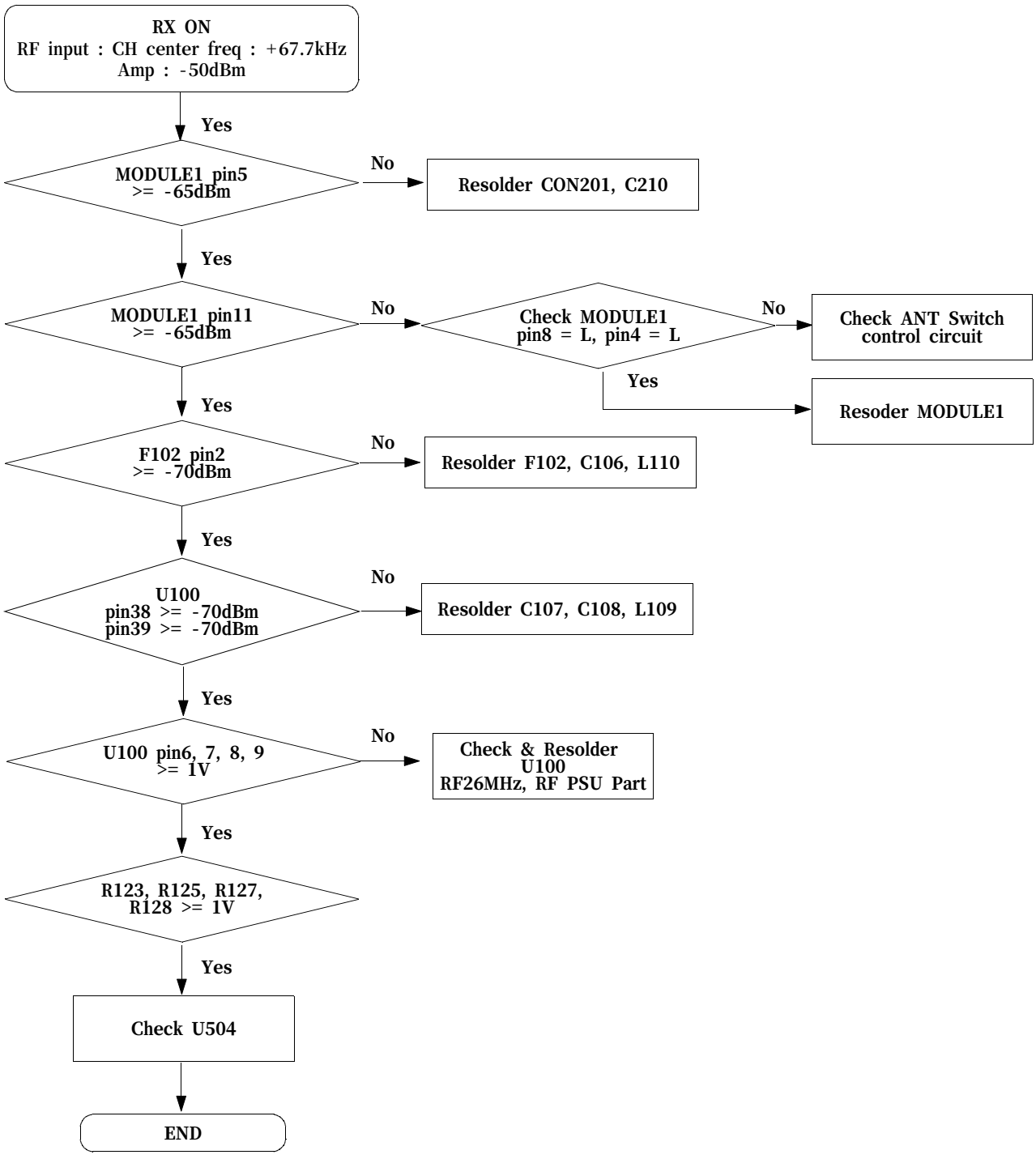
13. DCS Receiver



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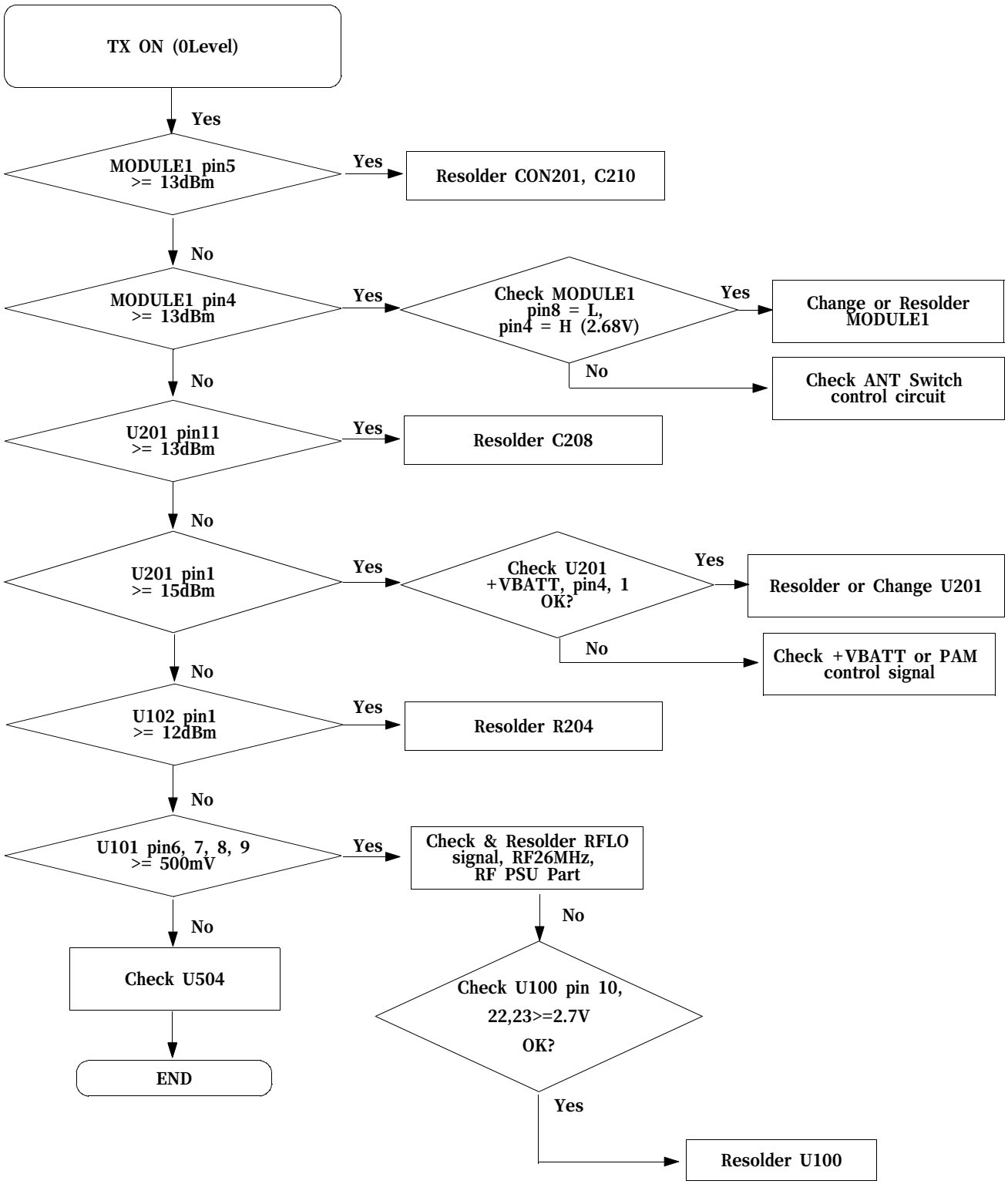
14. DCS Transmitter



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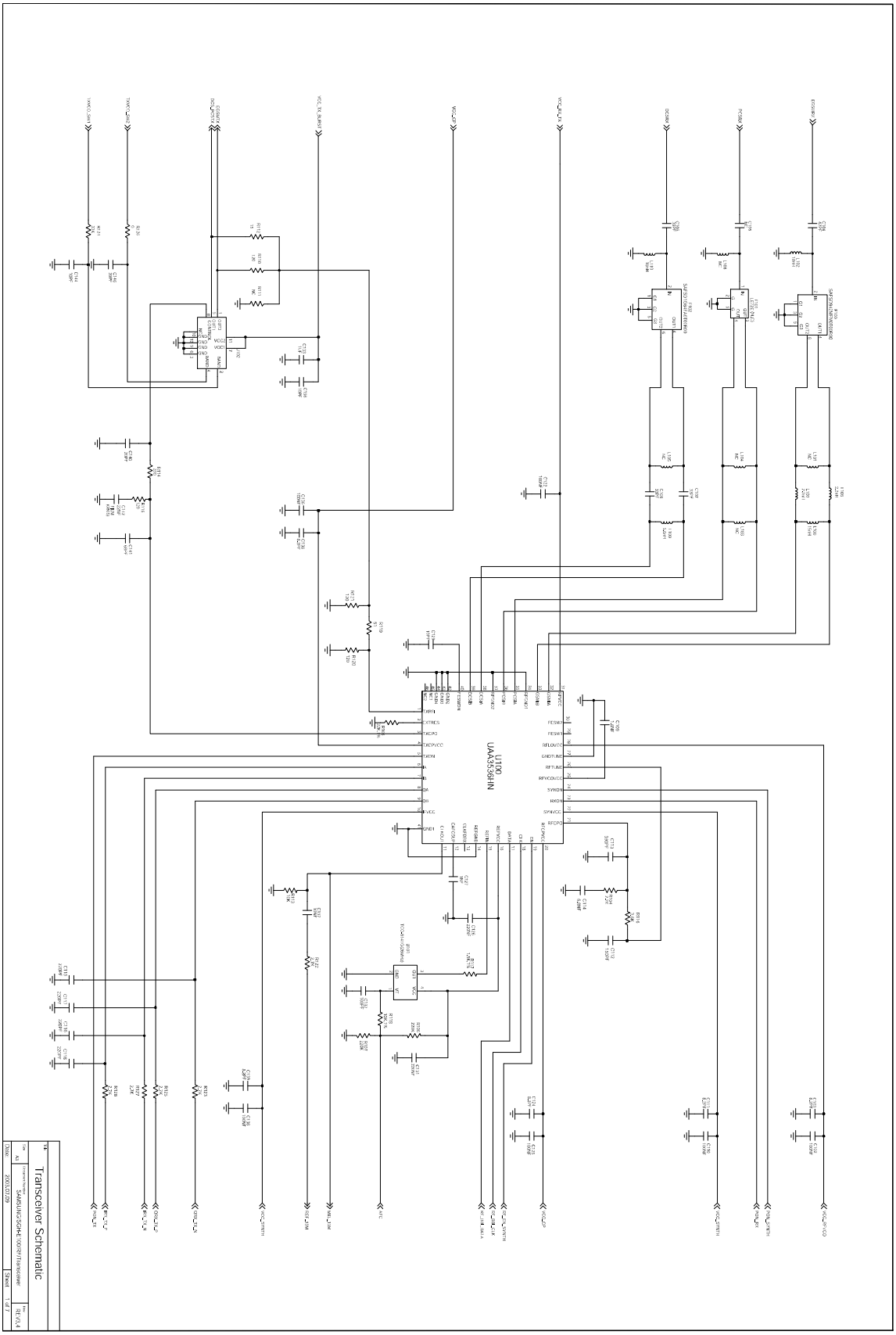
Transmitter



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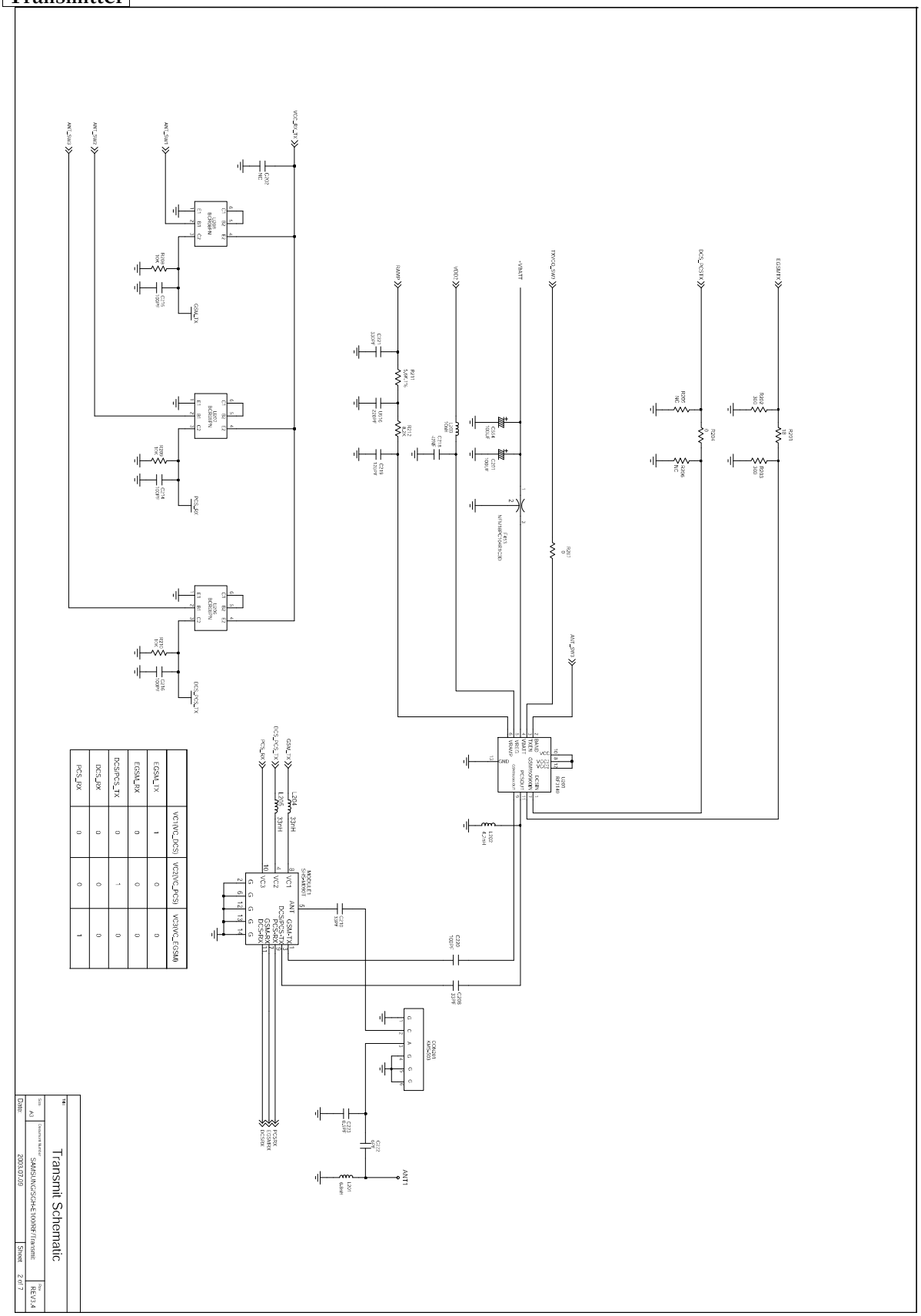
Transmitter



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