

**SAMSUNG**

# GSM TELEPHONE

## SGH-E330

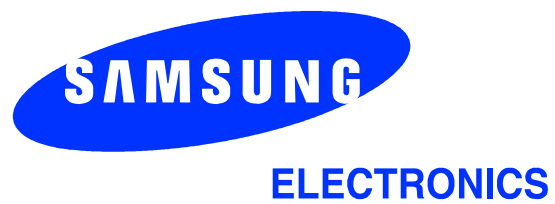
# ***SERVICE*** *Manual*

### GSM TELEPHONE



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# 1. SGH-E330 Specification

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## 1. GSM General Specification

|                                    | GSM900<br>Phase 1      | EGSM 900<br>Phase 2    | DCS1800<br>Phase 1     |
|------------------------------------|------------------------|------------------------|------------------------|
| Freq. Band[MHz]<br>Uplink/Downlink | 890~915<br>935~960     | 880~915<br>925~960     | 1710~1785<br>1805~1880 |
| ARFCN range                        | 1~124                  | 0~124 &<br>975~1023    | 512~885                |
| Tx/Rx spacing                      | 45MHz                  | 45MHz                  | 95MHz                  |
| Mod. Bit rate<br>/ Bit Period      | 270.833kbps<br>3.692us | 270.833kbps<br>3.692us | 270.833kbps<br>3.692us |
| Time Slot Period<br>/ Frame Period | 576.9us<br>4.615ms     | 576.9us<br>4.615ms     | 576.9us<br>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**

| <b>TX Power<br/>control level</b> | <b>GSM900</b> |
|-----------------------------------|---------------|
| 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      |

| <b>TX Power<br/>control level</b> | <b>DCS1800</b> |
|-----------------------------------|----------------|
| 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-E330 Circuit Description

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### 1. SGH-E330 RF Circuit Description

#### 1) RX PART

1. ASM(U103) Switching Tx, Rx path for GSM900, DCS1800 by logic controlling.

2. ASM Control Logic (U103) 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

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

#### 4. VC-TCXO (OSC100)

This module generates 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. And then, the oscillator is controlled by serial data to select channel and use fast lock mode for GPRS high class operation.

#### 5. Transceiver (U100)

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 stages are 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 U100 chip. OSC101 chip generates modulator signal which power level is about 6.5dBm and fed into Power Amplifier(U102). 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<br>30 kHz bandwidth          | GSM | -35dBc |
|                     |                                            | DCS | -35dBc |
|                     | 400kHz offset<br>30 kHz bandwidth          | GSM | -66dBc |
|                     |                                            | DCS | -65dBc |
|                     | 600kHz ~ 1.8MHz offset<br>30 kHz bandwidth | GSM | -75dBc |
|                     |                                            | DCS | -68dBc |

## 2. Baseband Circuit description of SGH-E330

### 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.

But, this phone (SGH-E330) uses UFB LCD. UFB LCD controls backlight brightness by contrast setting.

So "BL\_VDD" voltage is always high value when phone is in active mode. When phone is in dimming mode "BL\_VDD" goes to about 10% duty PWM.

#### 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 UFB LCD) and sub LCD (color 65K UFB LCD).

Chip select signals LCD\_MAIN\_CS and LCD\_SUB\_CS, can enable Each LCD. BACKLIGHT signal enables white LED of main LCD. "RESET\_2V8" signal initiates the reset process of the LCD.

16-bit data lines (LD(0)~LD(15)) transfers data and commands to LCD through bypass capacitor. 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 state of LCD is whether input or output, is required. But in this system, there is no input state from LCD. So only "L\_WR" signal is used to indicate write data or command to LCD. Power signals for LCD are "VBAT" and "VDD2".

"M\_SCL", "M\_SCA", "PCLK", "FVALID", "LVALID" and "STANDBY" signals are all related to camera working.

"CAMERA\_FLASH\_SUPPLY" is voltage supply to flash led, and "SVC\_LED" is signal for service led when the signal is low led is on and vice versa. "SPK\_P" and "SPK\_N" are used for audio speaker containing voice or melody. And "VDD\_VIB" from PCF50601 enables the motor.

### 3. 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. Fifteen key LEDs are use the "VBAT" as supply voltage. "VDD\_KEY" signal enables LEDs. "FLIP" informs the status of folder (open or closed) to the OM6359. This uses the hall effect IC, SH248CSP. A magnet under main LCD enables SH248CSP.

#### 4. EMI ESD Filter

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

#### 5. IF connetor

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.

#### 6. Battery Charge Management

A complete constant-current/constant-voltage linear charger is used 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.

#### 7. 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 the Hands free kit.

YMU762C 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, YMU762C 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 YMU762C 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.

YMU762C 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 YMU762C 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 YMU762C directly interprets and plays blocks relevant to synthesis (playing music and reproducing ADPCM with FM synthesizer) that are included in data distributed in SMAF.

## 8. 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, KBB06A500M-T402. It is consisted of 128M bits flash NOR memory and 128M bits flash NAND memory and 64M bits SCRAM. It has 16 bit data line, HD[0~15] which is connected to OM6359 and MV317S. It has 26 bit address lines, HA[1~26]. CS\_NAND and NCSRAM signals are 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.

## 9. 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, YMU762C. MV317S(Camera DSP Chip) controls the communication between ARM core and DSP core.

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 are used for the communication using 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.

## 10. TOH2600DGI4KRA(26MHz)

This system uses the 26MHz TCXO, TOH2600DGI4KRA, SEM. AFC control signal from OM6359 controls frequency from 26MHz x-tal. The clock output frequency of UAA3536 is 13MHz. This clock is connected to OM6359, YMU762C.

## 11. Camera DSP(MV317S)

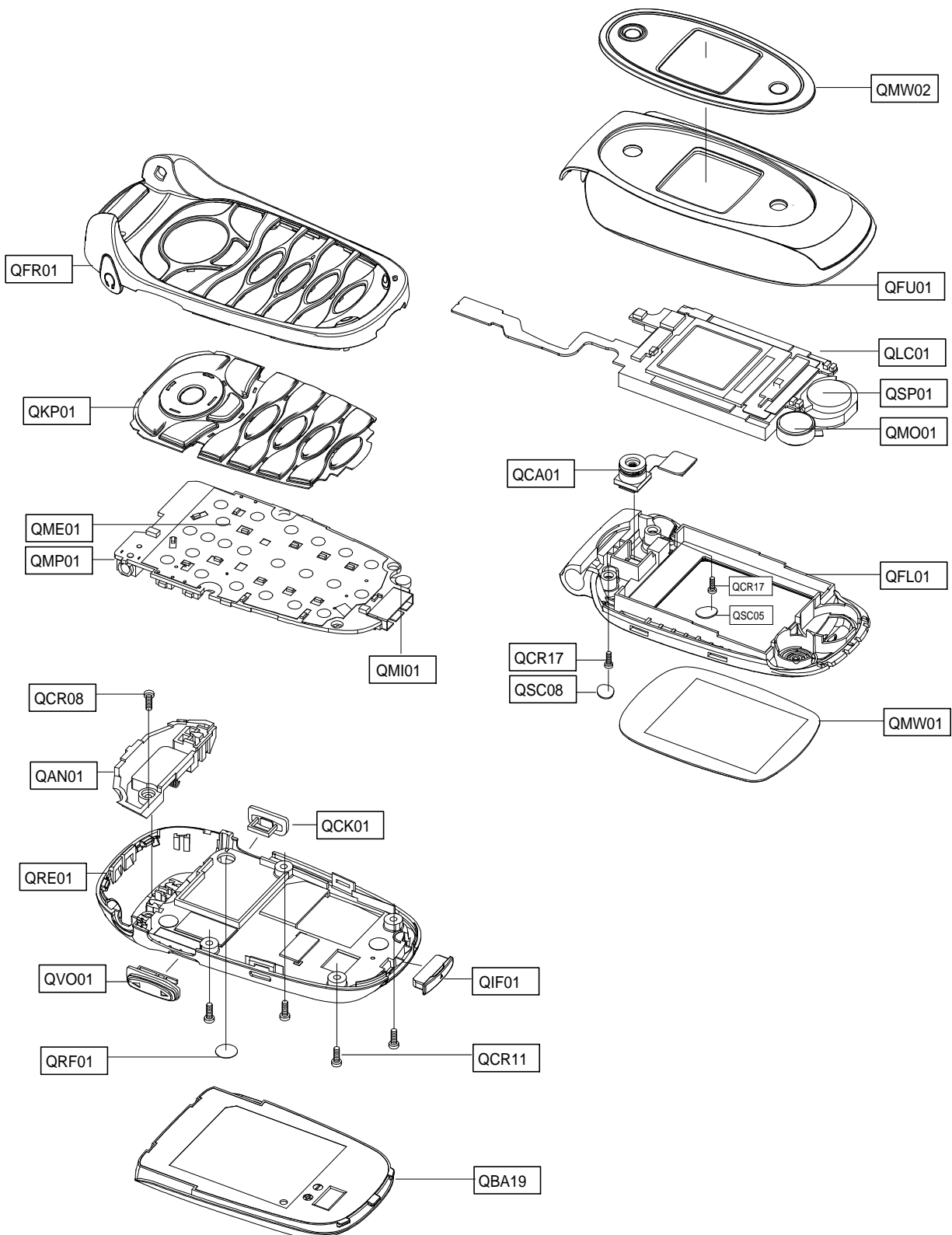
Tiger is an Integrated circuit for mobile phone camera. This structure will allow effectiveness for large data management and significantly reduces main processor will get burden.

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-E330 Exploded View and its Parts list

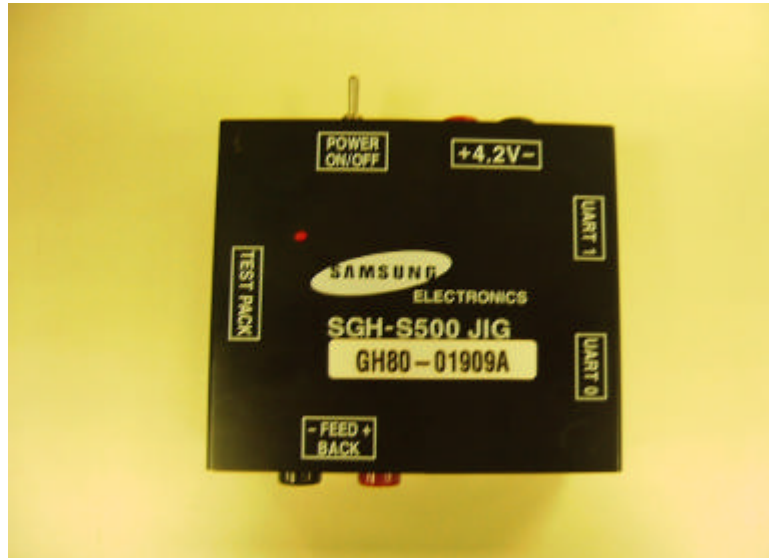
#### 1. Cellular phone Exploded View - 1



## 2. Cellular phone Parts list

| Location NO. |  | Description     | SEC CODE    | Remark |
|--------------|--|-----------------|-------------|--------|
| QMW02        |  | SUB WINDOW      | GH75-04905A |        |
| QFU01        |  | FOLDER UPPER    | GH75-04615A |        |
| QSP01        |  | SPEAKER         | 3001-001598 |        |
| QM001        |  | MOTOR DC        | 3101-001401 |        |
| QLC01        |  | LCD             | GH07-00593A |        |
| QCA01        |  | UNIT CAMERA     | GH59-01472A |        |
| QCR17        |  | SCREW           | 6001-001639 |        |
| QSC05        |  | SCREW SHEET R   | GH74-08872A |        |
| QSC08        |  | SCREW SHEET L   | GH74-08873A |        |
| QFL01        |  | FOLDER LOWER    | GH75-04618A |        |
| QMW01        |  | MAIN WINDOW LCD | GH75-04904A |        |
| QFR01        |  | FRONT COVER     | GH75-04616A |        |
| QKP01        |  | KEKPAD          | GH75-04619A |        |
| QMP01        |  | PBA MAIN        | GH92-01844A |        |
| QMI01        |  | MICROPHONE ASSY | GH30-00130A |        |
| QME01        |  | UNIT METAL DOM  | GH59-01547A |        |
| QCR08        |  | SCREW           | 6001-001456 |        |
| QAN01        |  | ANTENNA         | GH42-00454A |        |
| QRE01        |  | REAR COVER      | GH75-04617A |        |
| QCR11        |  | SCREW           | 6001-001654 |        |
| QV001        |  | VOLUME KEY      | GH72-13531A |        |
| QCK01        |  | CAMERA KEY      | GH72-13532A |        |
| QIF01        |  | IF COVER        | GH72-13534A |        |
| QRF01        |  | RF SHEET        | GH74-09328A |        |
| QBA19        |  | BATTERY         | GH43-01398A |        |

### 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-E330 MAIN Electrical Parts List

| SEC Code    | Design LOC |
|-------------|------------|
| 0403-001387 | ZD502      |
| 0403-001427 | ZD501      |
| 0404-001089 | ZD500      |
| 0406-001194 | ZD600      |
| 0406-001194 | ZD601      |
| 0406-001194 | ZD700      |
| 0406-001194 | ZD701      |
| 0406-001201 | D700       |
| 0406-001201 | D701       |
| 0504-001012 | Q500       |
| 0504-001012 | Q600       |
| 0505-001423 | U701       |
| 0506-000107 | Q700       |
| 0601-001790 | LED700     |
| 0601-001790 | LED701     |
| 0601-001790 | LED702     |
| 0601-001790 | LED703     |
| 0601-001790 | LED704     |
| 0601-001790 | LED705     |
| 0601-001790 | LED706     |
| 0601-001790 | LED707     |
| 0601-001790 | LED708     |
| 0601-001790 | LED709     |
| 0601-001790 | LED710     |
| 0601-001790 | LED711     |
| 0601-001790 | LED712     |
| 0601-001790 | LED713     |
| 0601-001790 | LED714     |
| 0801-002237 | U300       |
| 0801-002882 | U201       |
| 0801-002882 | U304       |
| 0801-002882 | U306       |
| 1001-001253 | U603       |
| 1009-001018 | SW600      |
| 1109-001316 | U302       |
| 1201-002174 | U102       |
| 1202-001036 | U610       |
| 1203-003459 | U702       |
| 1203-003483 | U501       |

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| 1203-003486 | U502       |
| 1204-002161 | U301       |
| 1205-002327 | U100       |
| 1205-002350 | U400       |
| 1205-002607 | U200       |
| 1404-001221 | TH200      |
| 1405-001082 | V600       |
| 1405-001082 | V601       |
| 1405-001082 | V602       |
| 1405-001082 | V603       |
| 1405-001082 | V604       |
| 1405-001082 | V605       |
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| 2007-000153 | R304       |

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| 2007-001288 | R124       |
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| 2203-000836 | C107       |
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| 2203-000995 | C602       |
| 2203-001101 | C110       |
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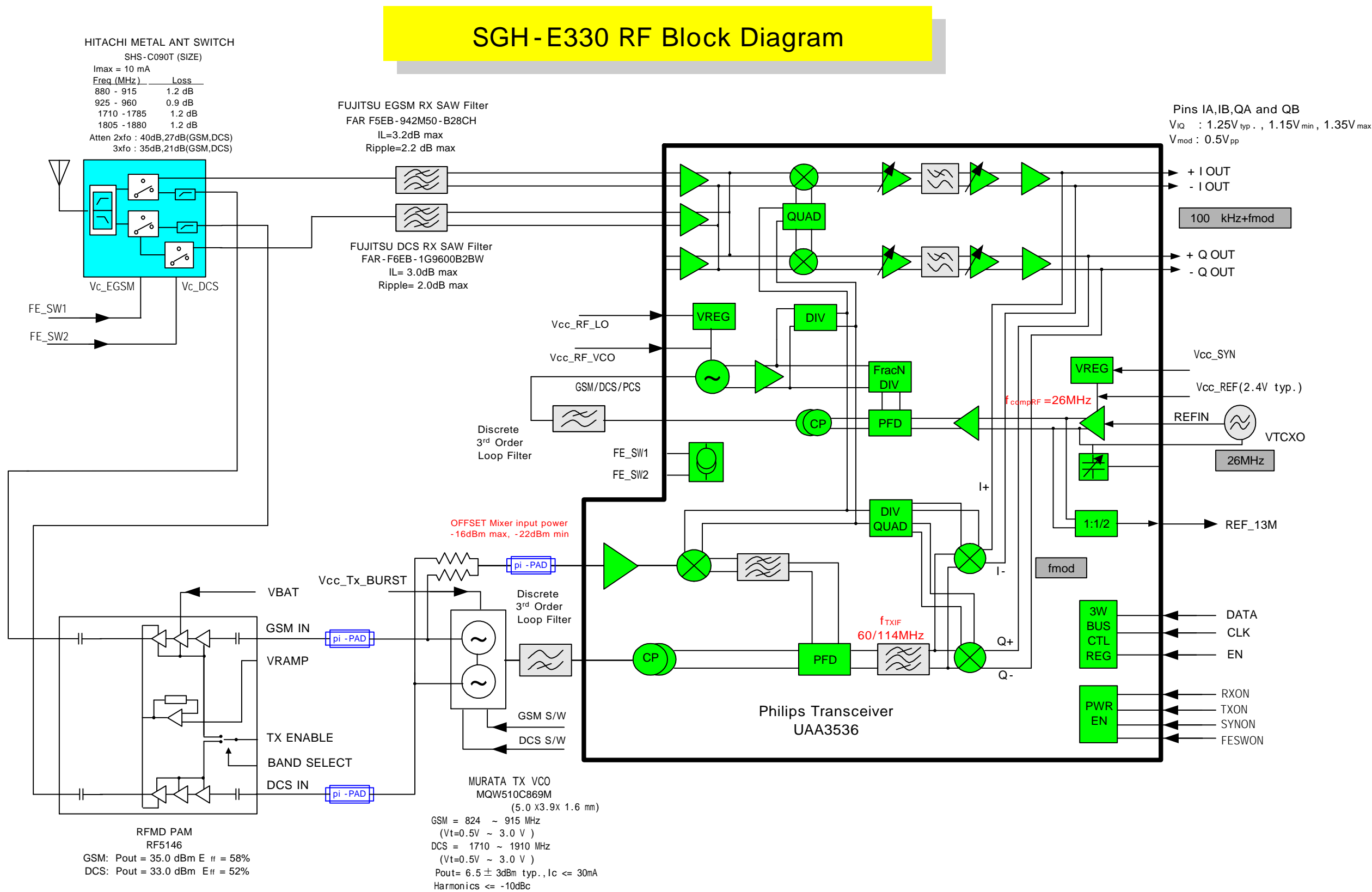
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| 2703-001722 | L103       |
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| 2703-002779 | L500       |
| 2801-004285 | OSC300     |
| 2801-004339 | X400       |
| 2806-001329 | OSC101     |
| 2809-001281 | OSC100     |
| 2901-001246 | U500       |
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| 2901-001286 | F702       |
| 2901-001286 | F703       |
| 2901-001286 | F704       |
| 2901-001286 | F705       |
| 2904-001469 | F100       |
| 2904-001470 | F102       |
| 2904-001480 | F101       |
| 2909-001246 | U103       |
| 3301-001729 | L620       |
| 3404-001152 | SW300      |

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| 3404-001152 | SW700      |
| 3404-001152 | SW701      |
| 3705-001355 | CON100     |
| 3709-001273 | CN400      |
| 3710-001994 | CN500      |
| 3711-005067 | CN501      |
| 3711-005551 | HDC700     |
| 3722-002249 | EAR600     |
| 4302-001119 | BAT400     |
| GH13-00020A | U303       |
| GH41-00627A |            |

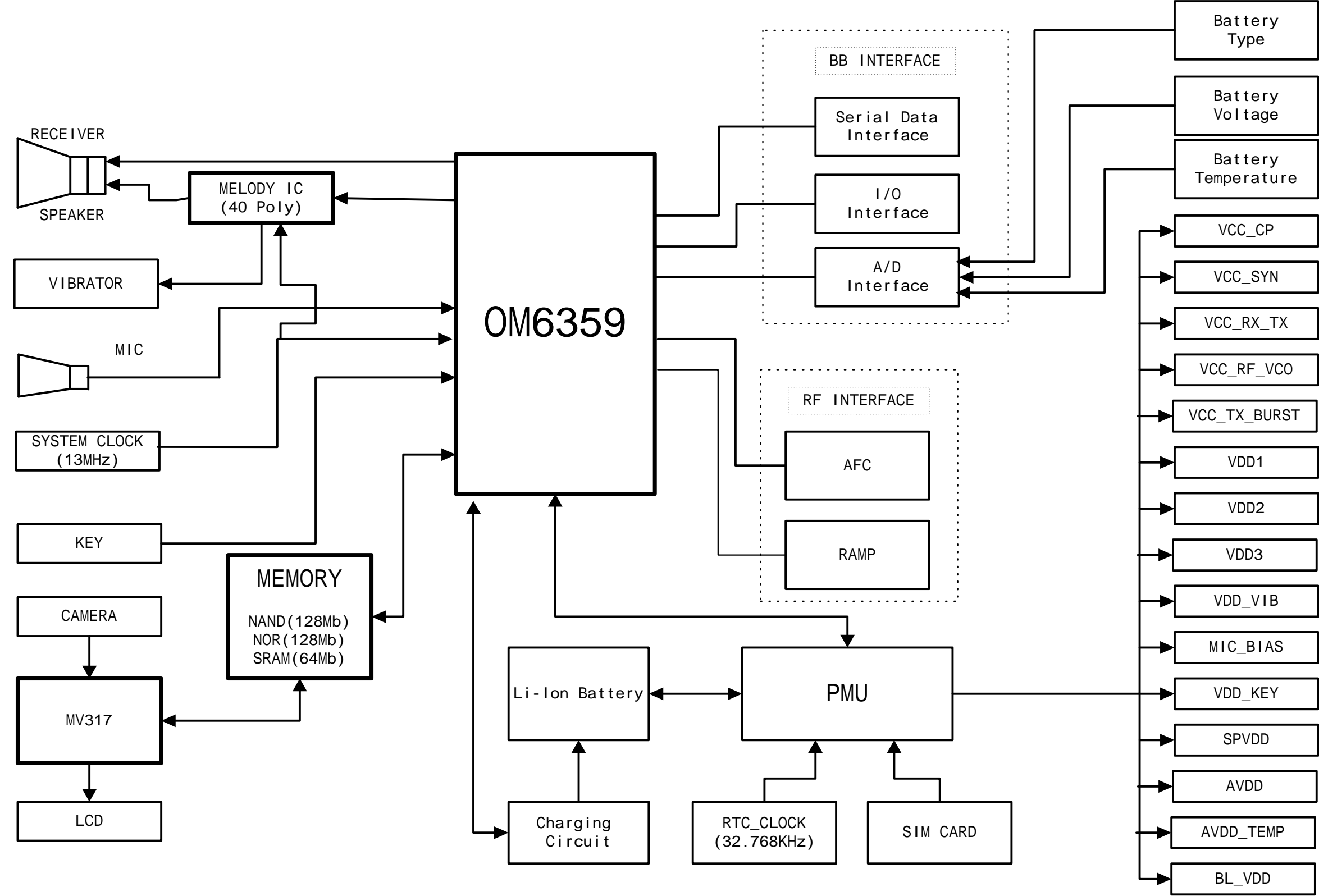


5. SGH-E330 Block Diagrams

1. RF Solution Block Diagram



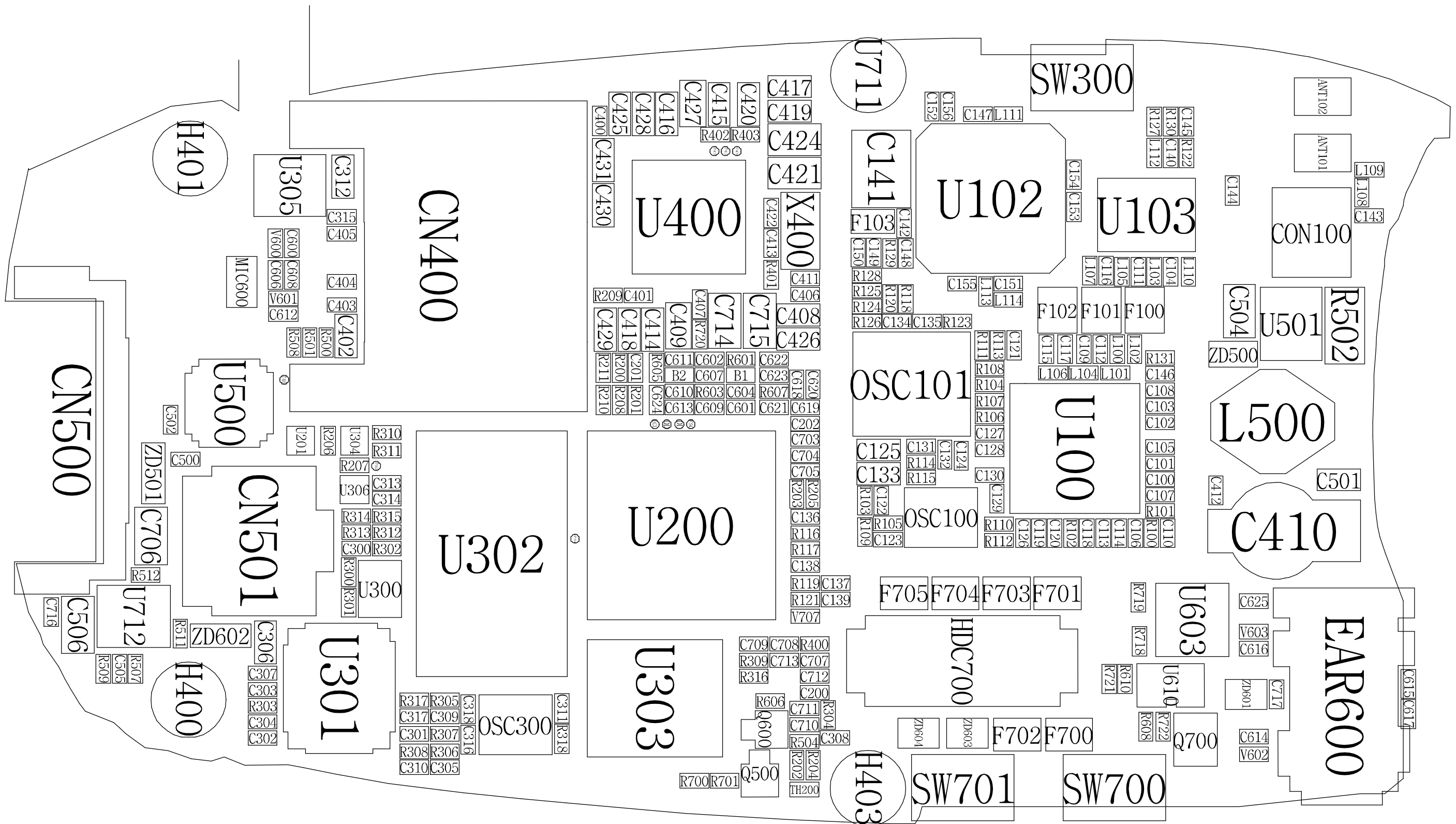
2. Base Band Solution Block Diagram



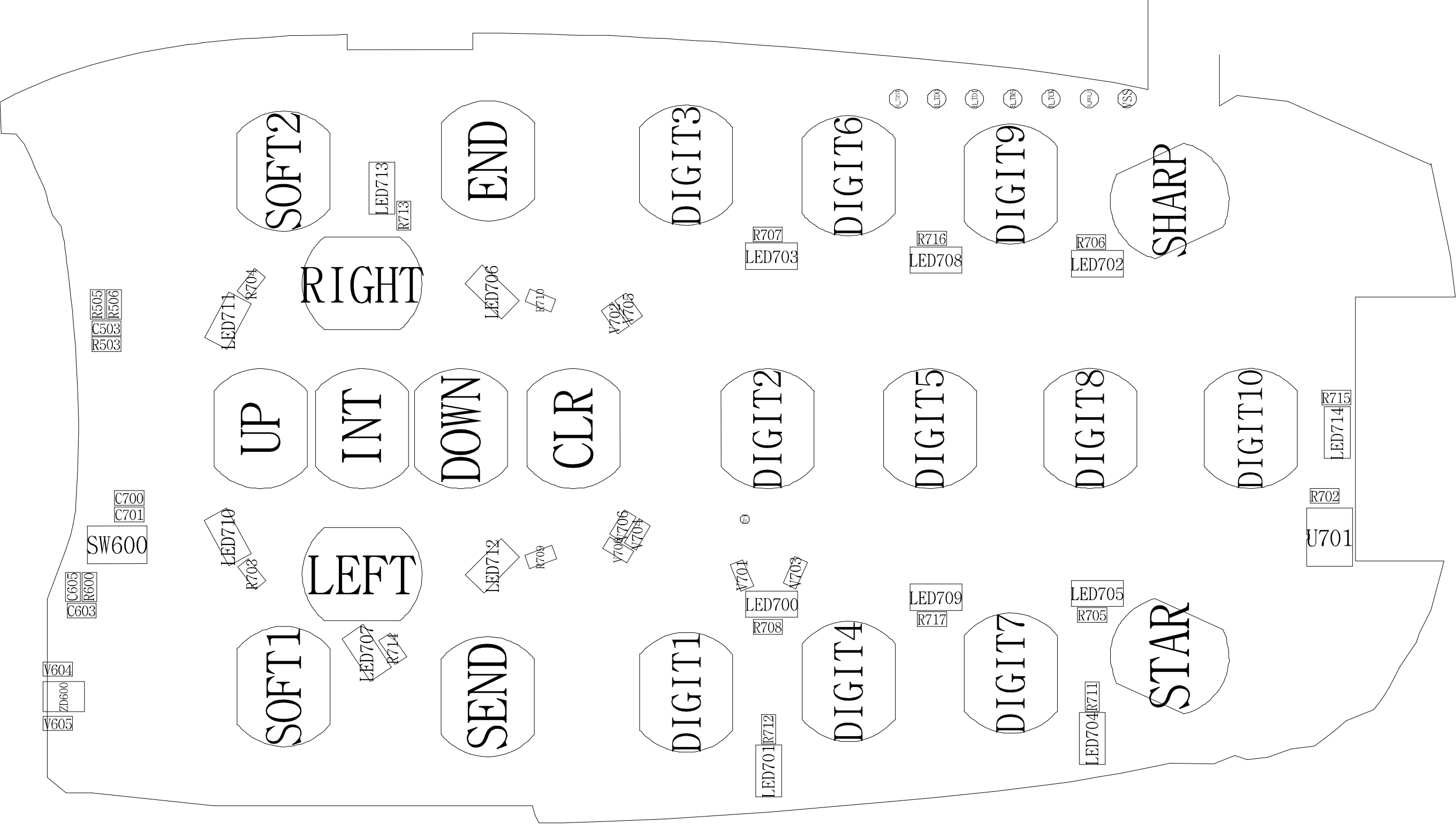
BB Block Diagram of SGH-E330

## 6. SGH-E330 PCB Diagrams

## 1. Main PCB Top Diagram

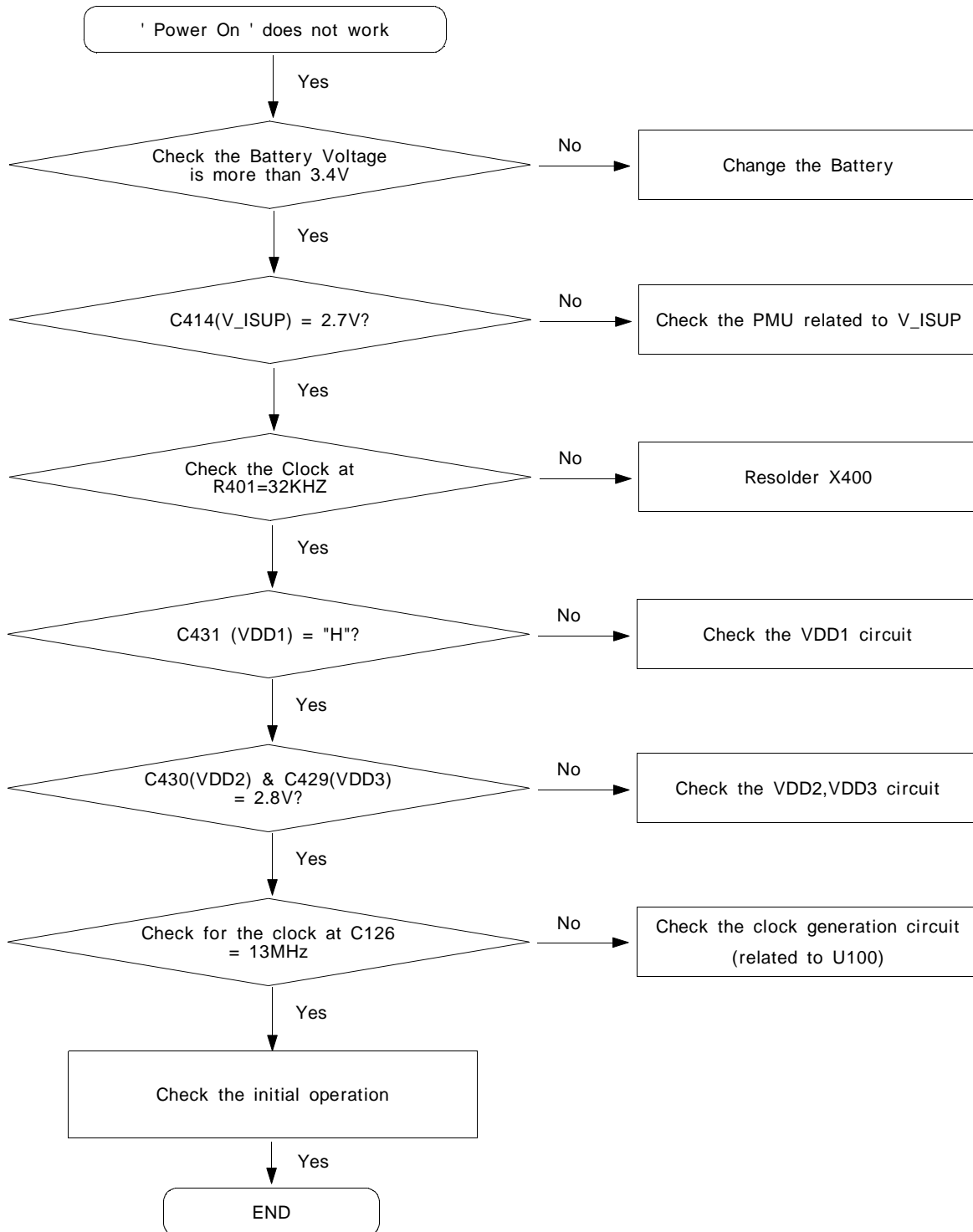


2. Main PCB Bottom Diagram



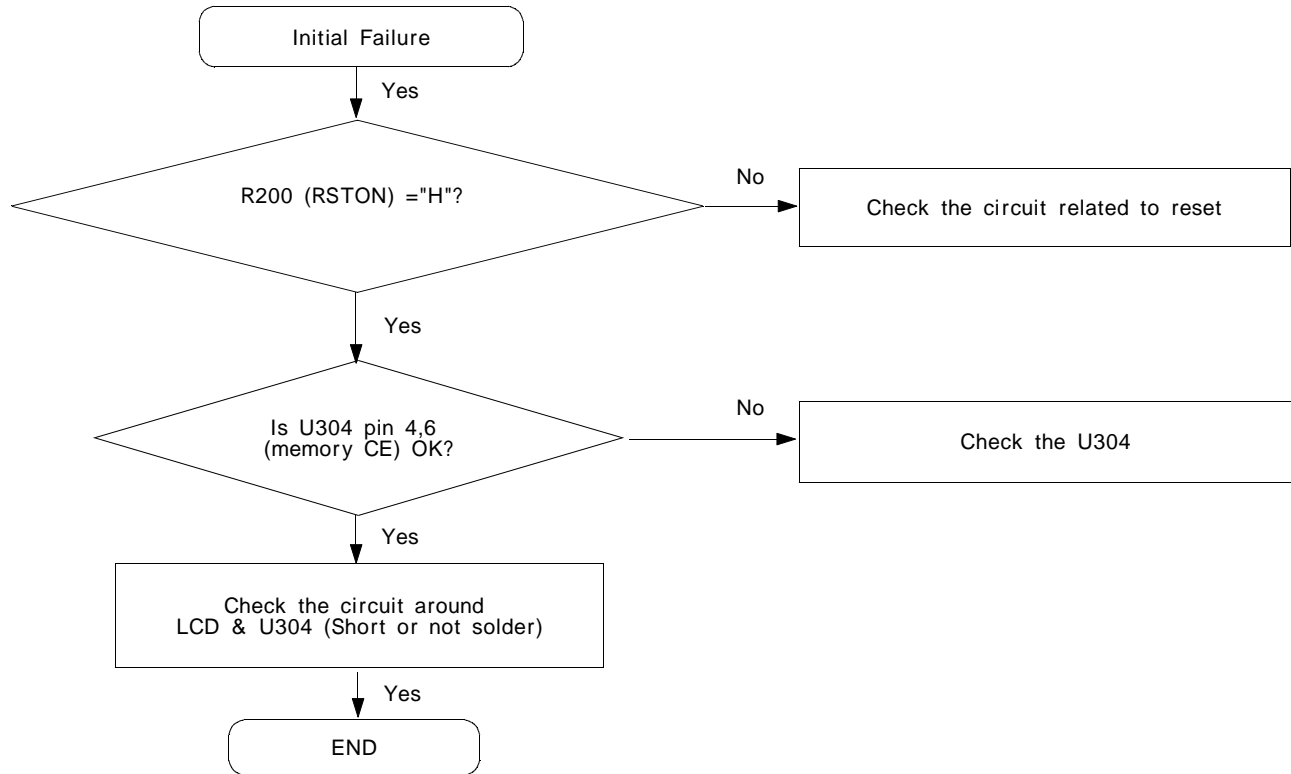
## 7. SGH-E330 Flow Chart of Troubleshooting

### 1. Power On

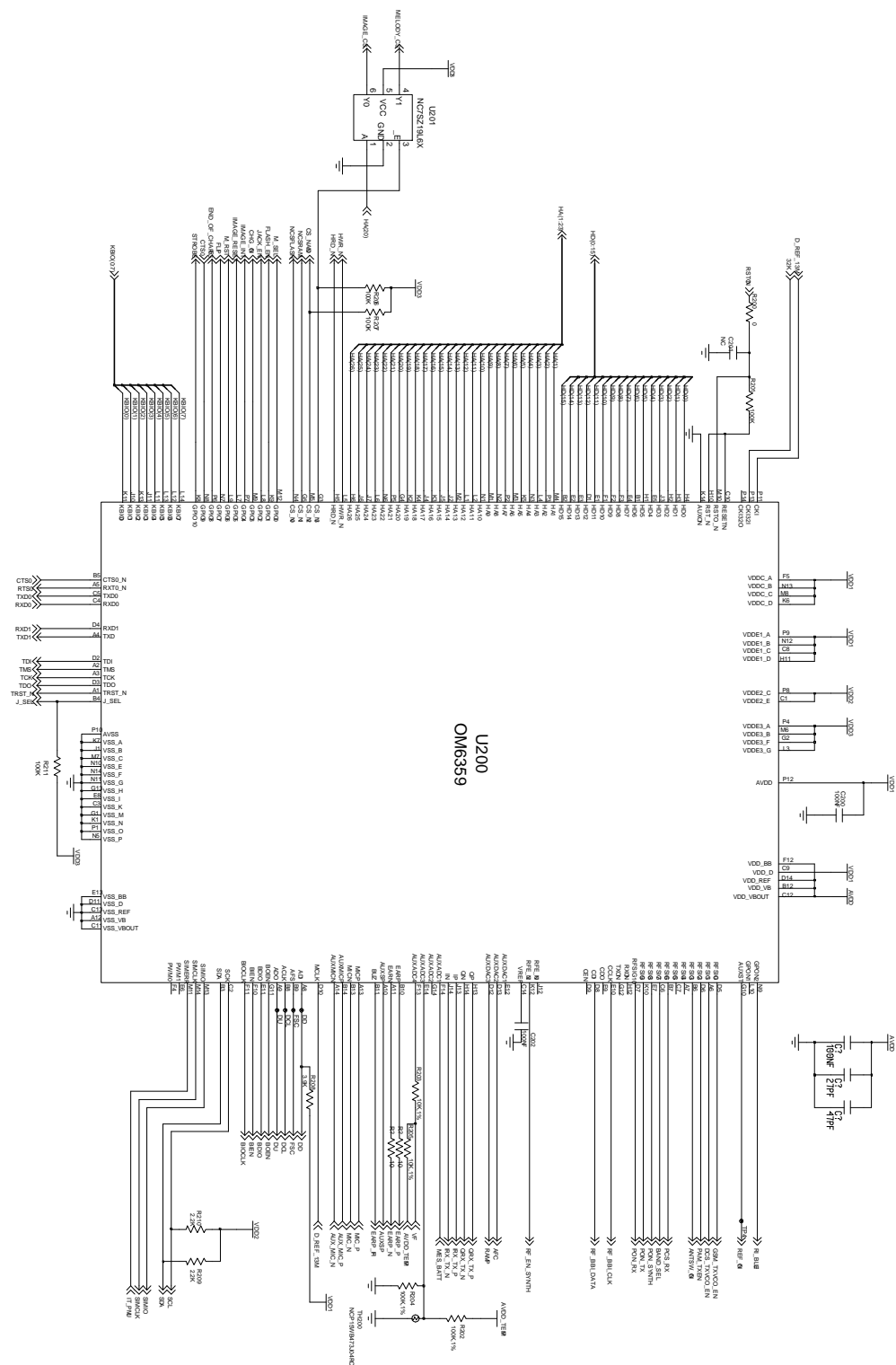




## 2. Initial

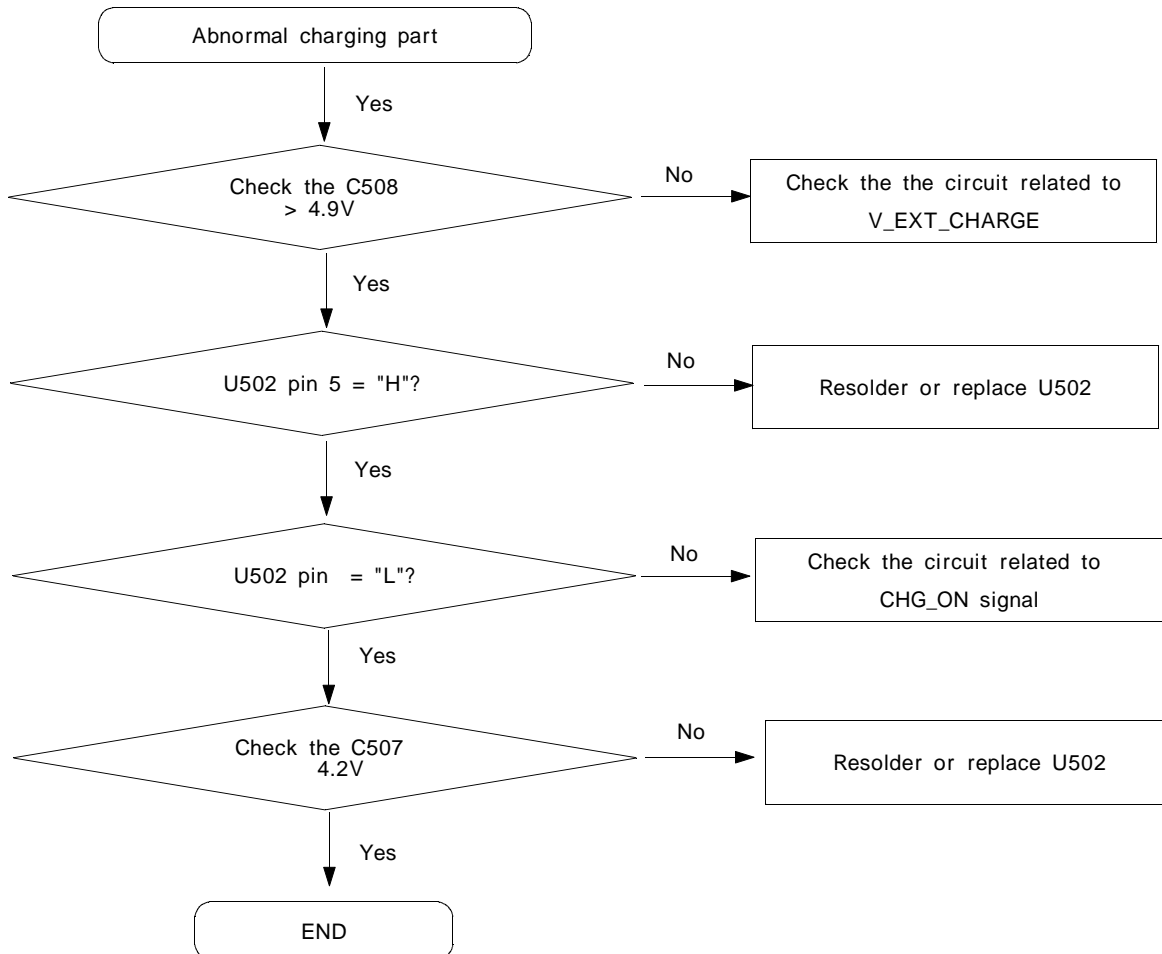


Initial

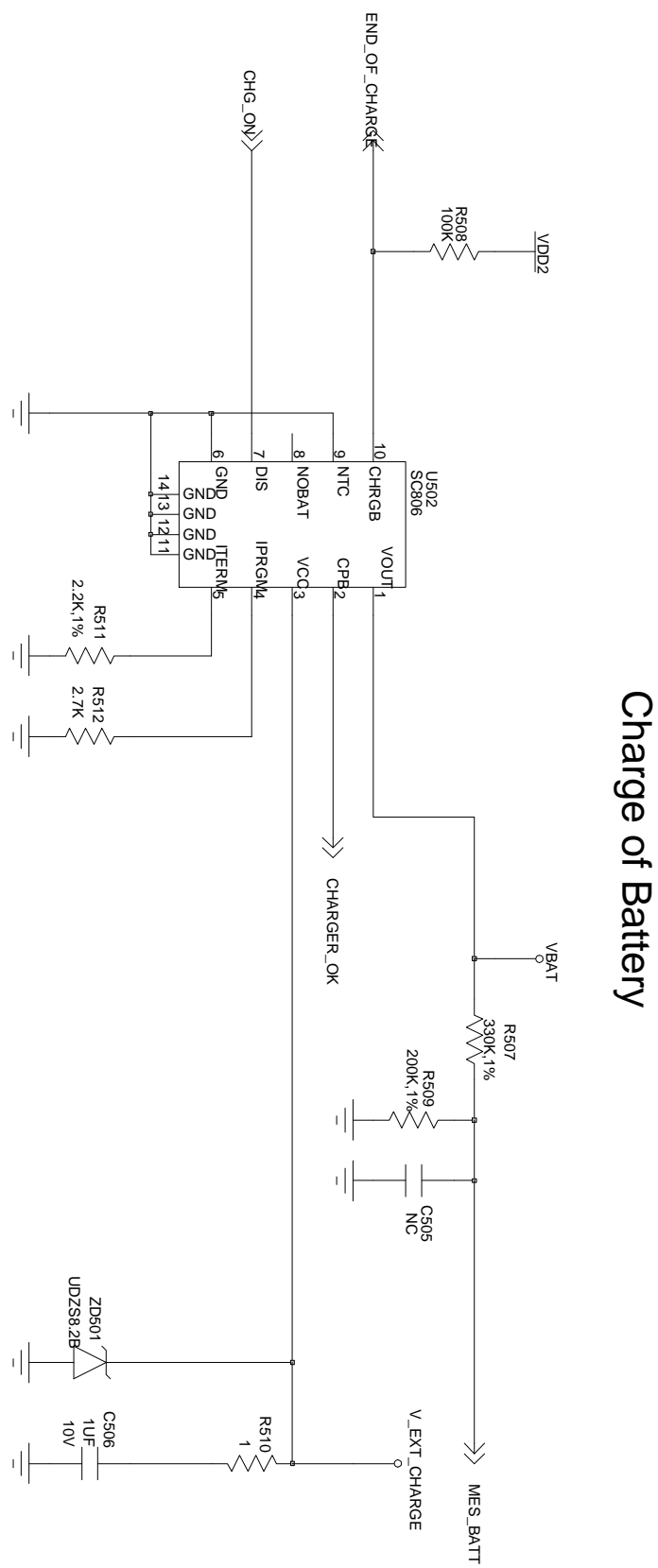




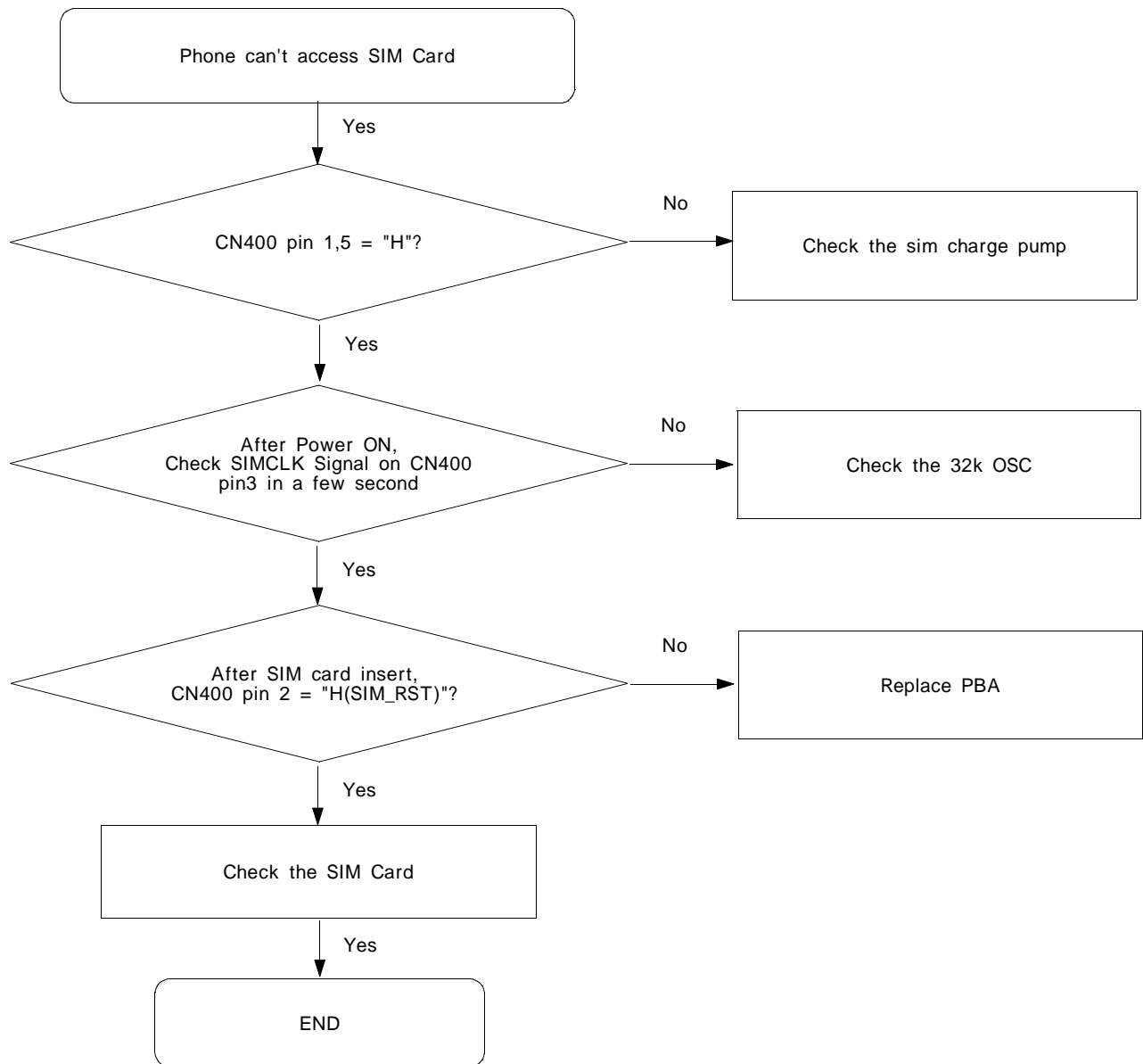
### 3. Charging Part



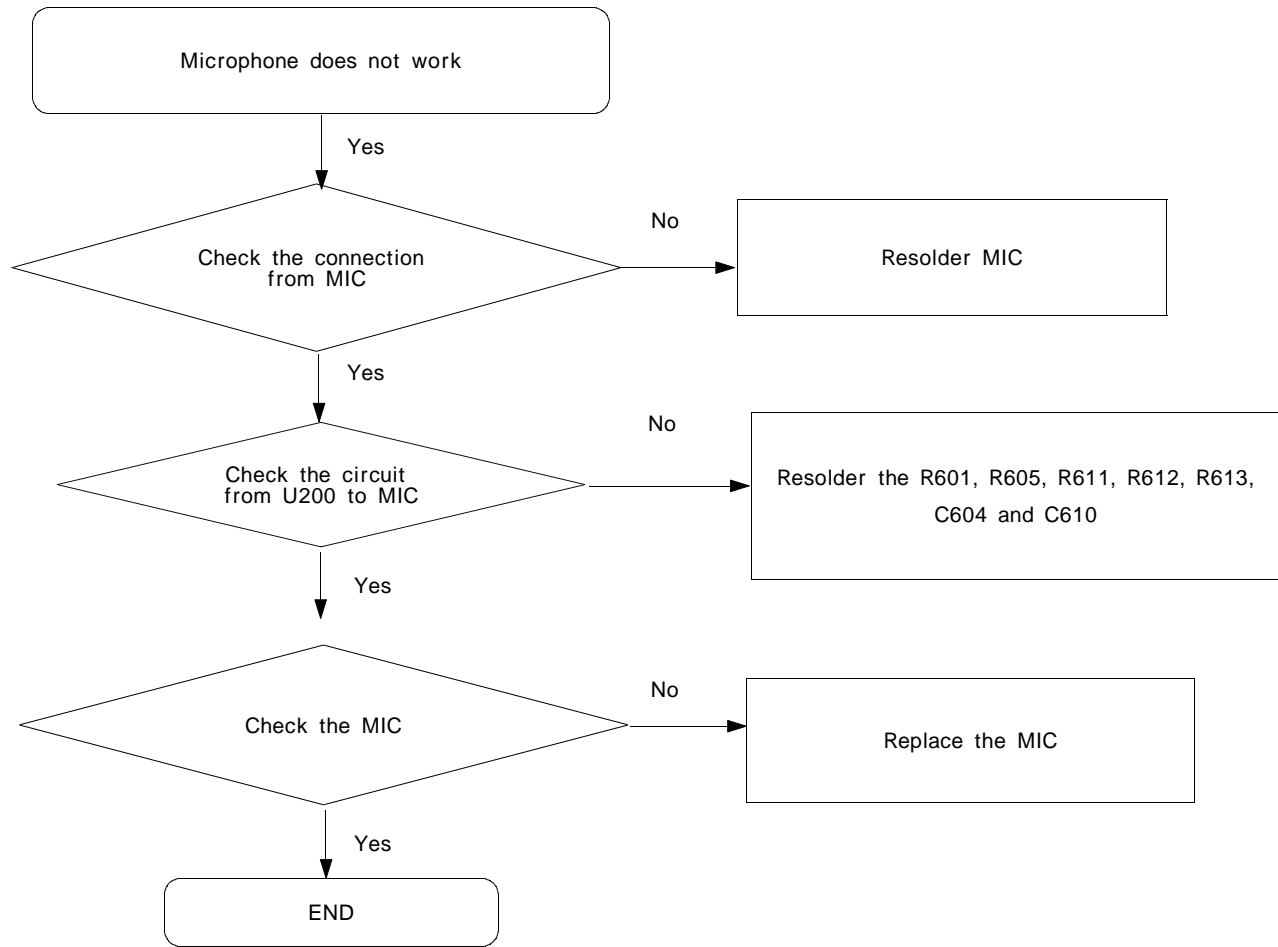
Charging



#### 4. Sim Part

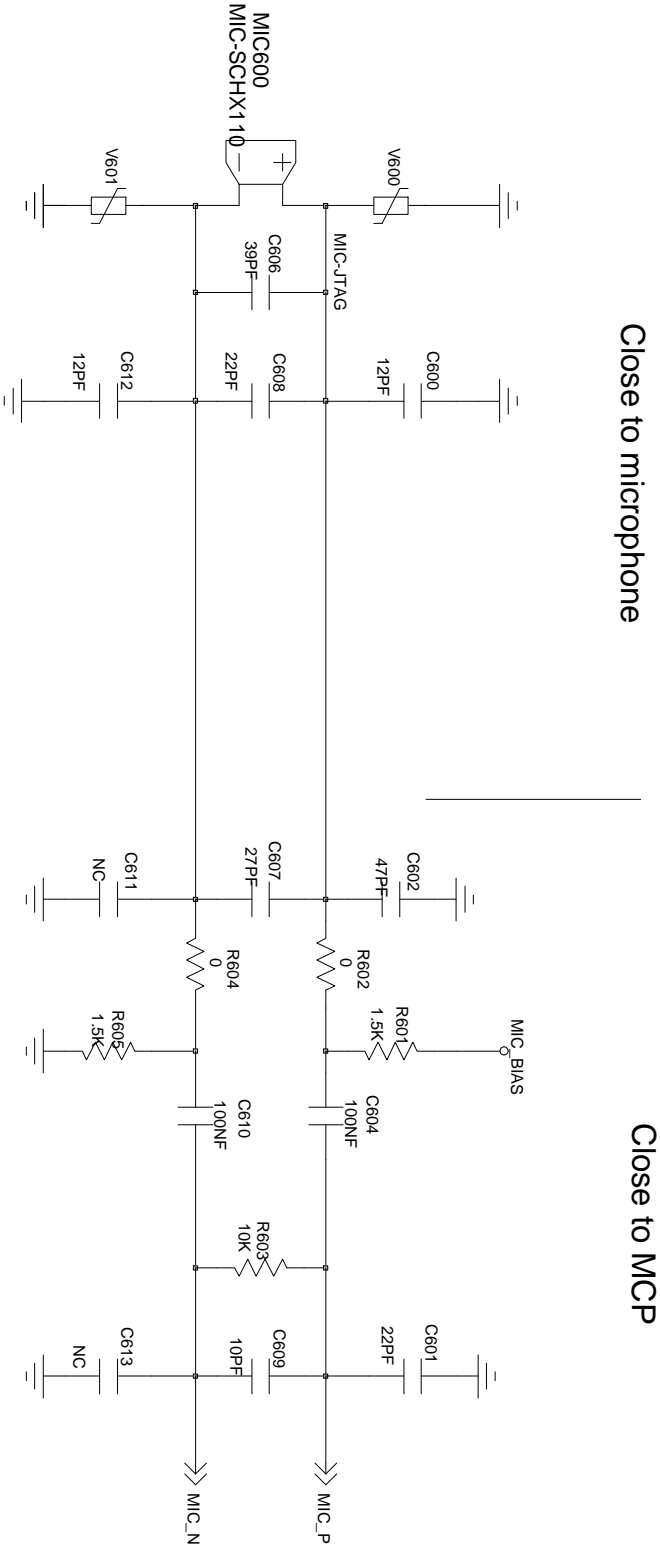


## 5. Microphone Part

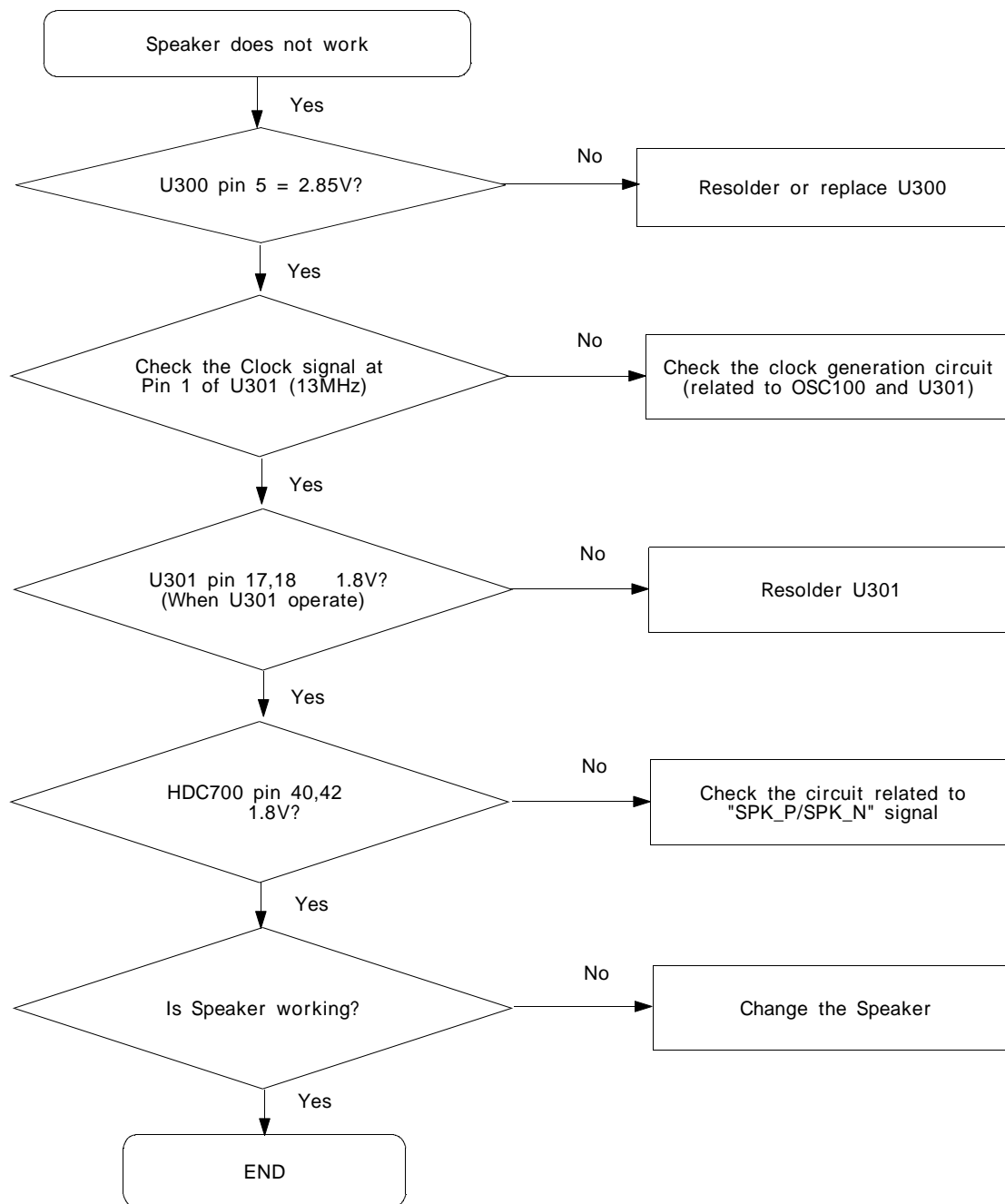


Microphone

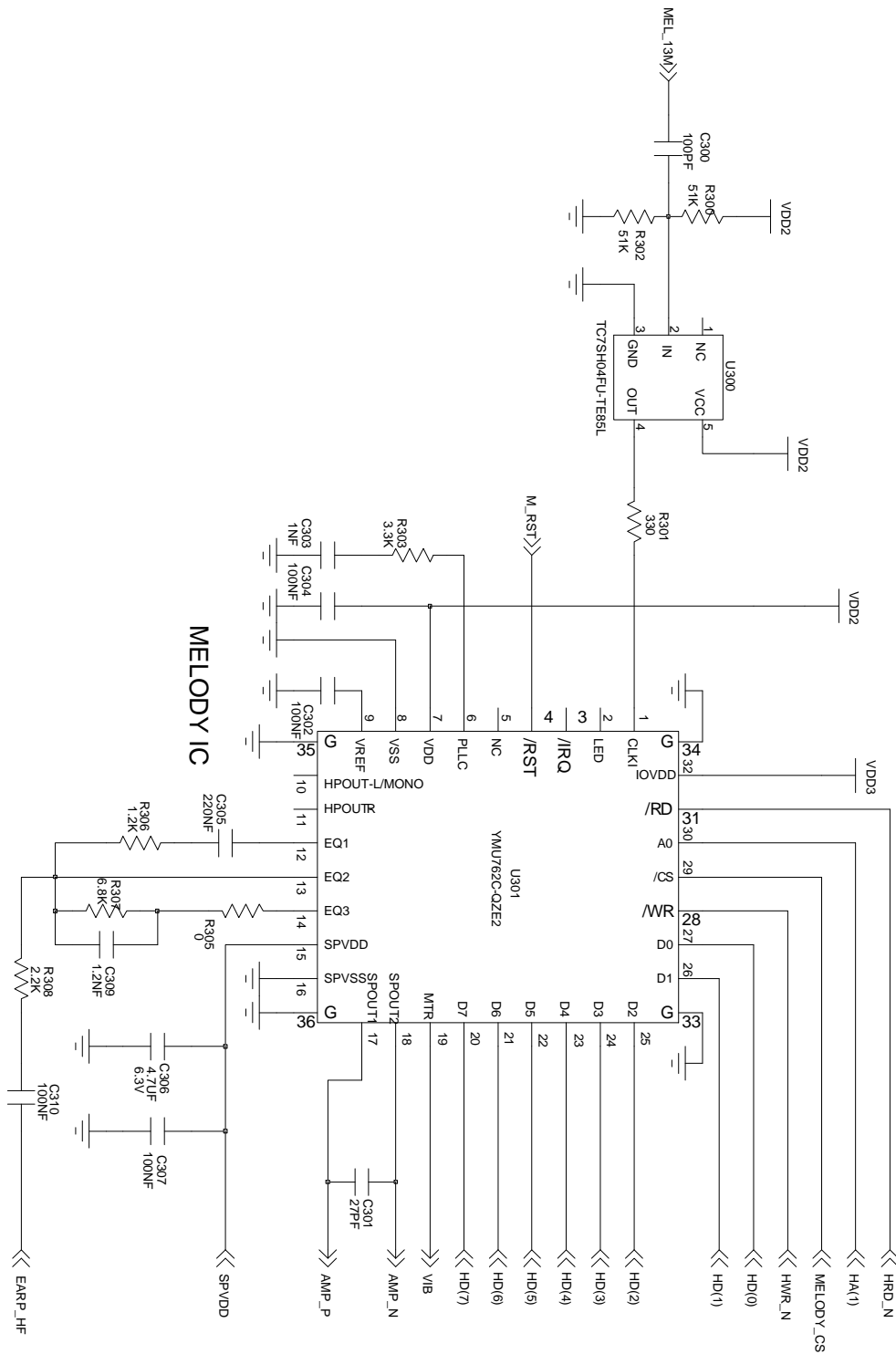
MICROPHONE



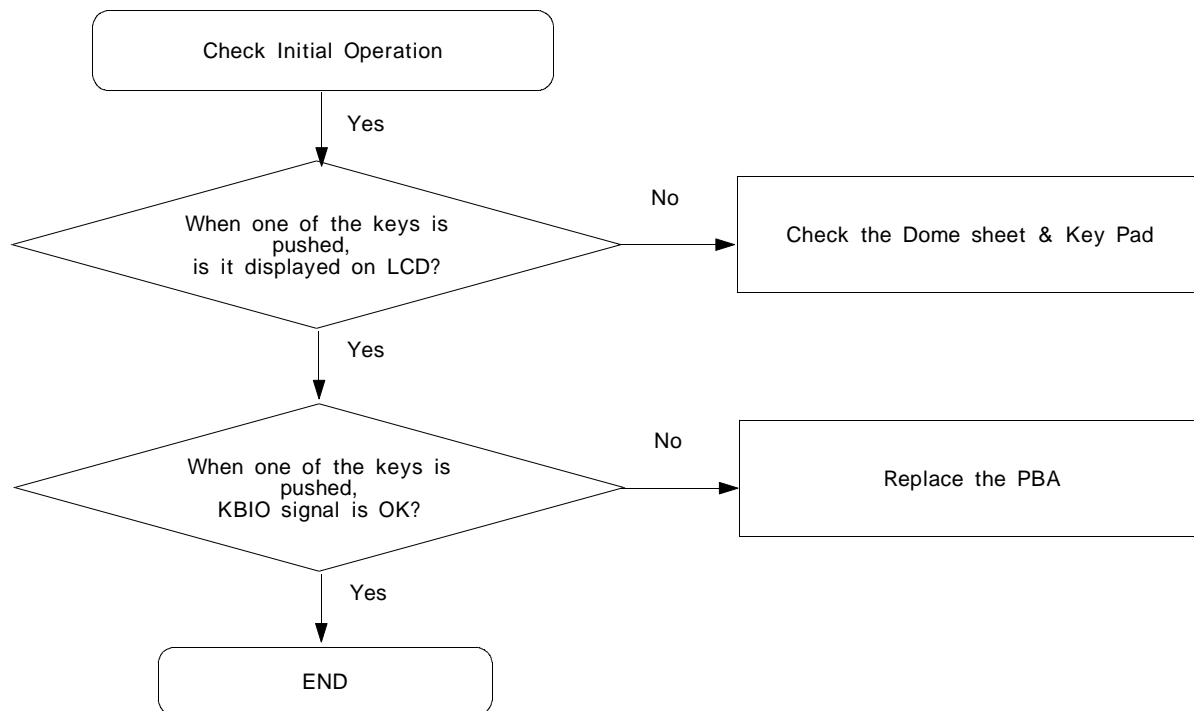
## 6. Speaker Part(Melody)



## Speaker

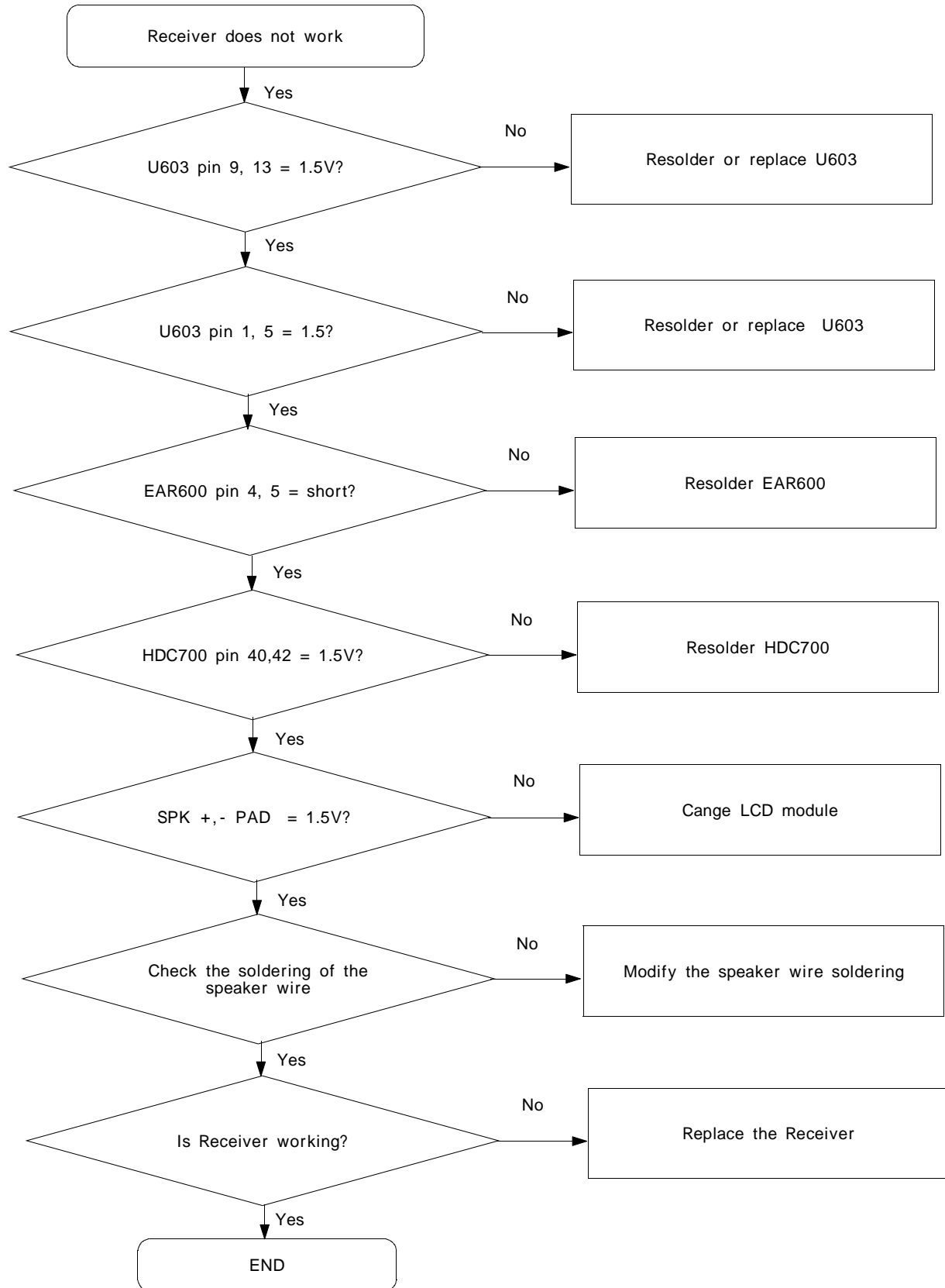


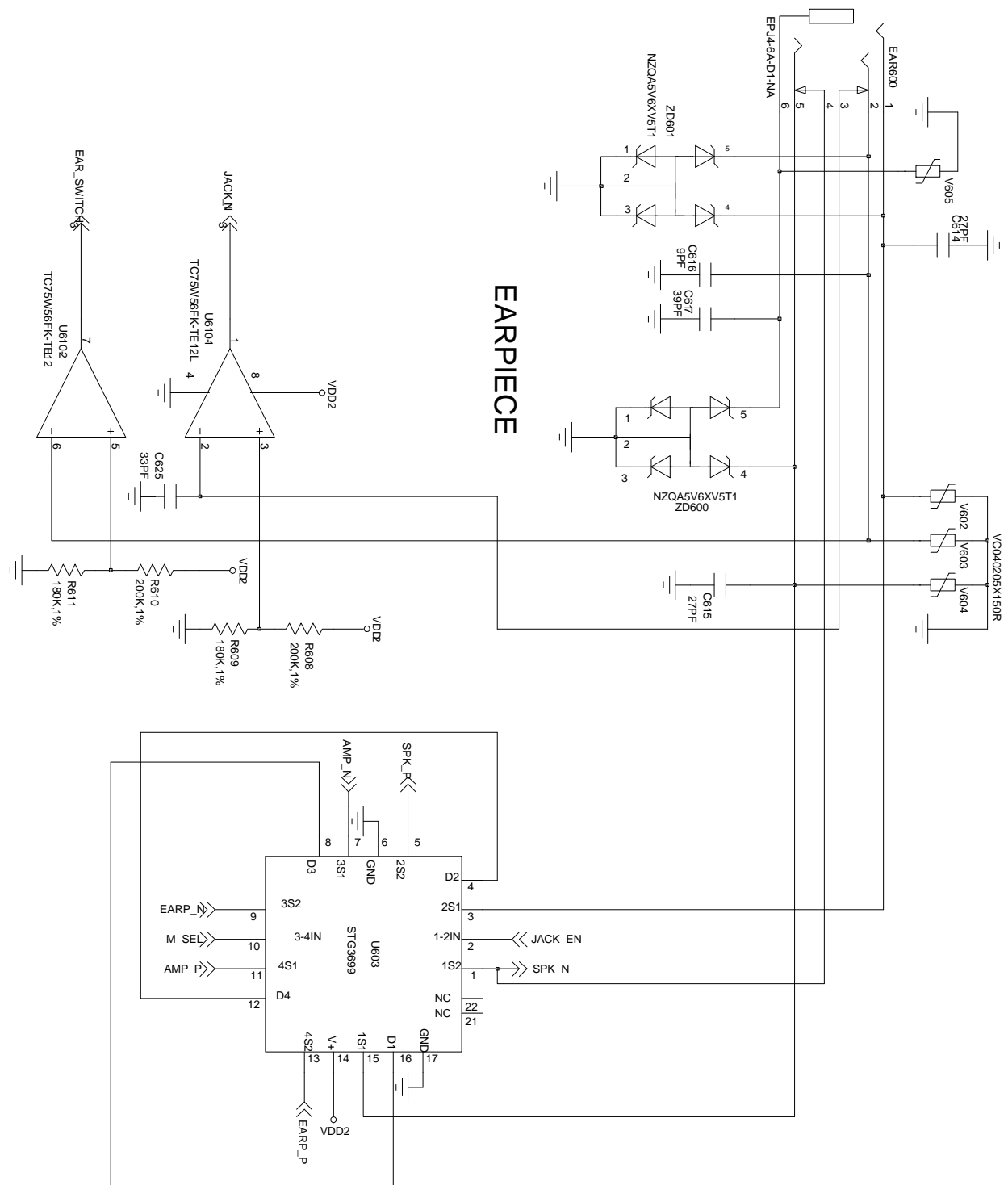
## 7. Key Data Input



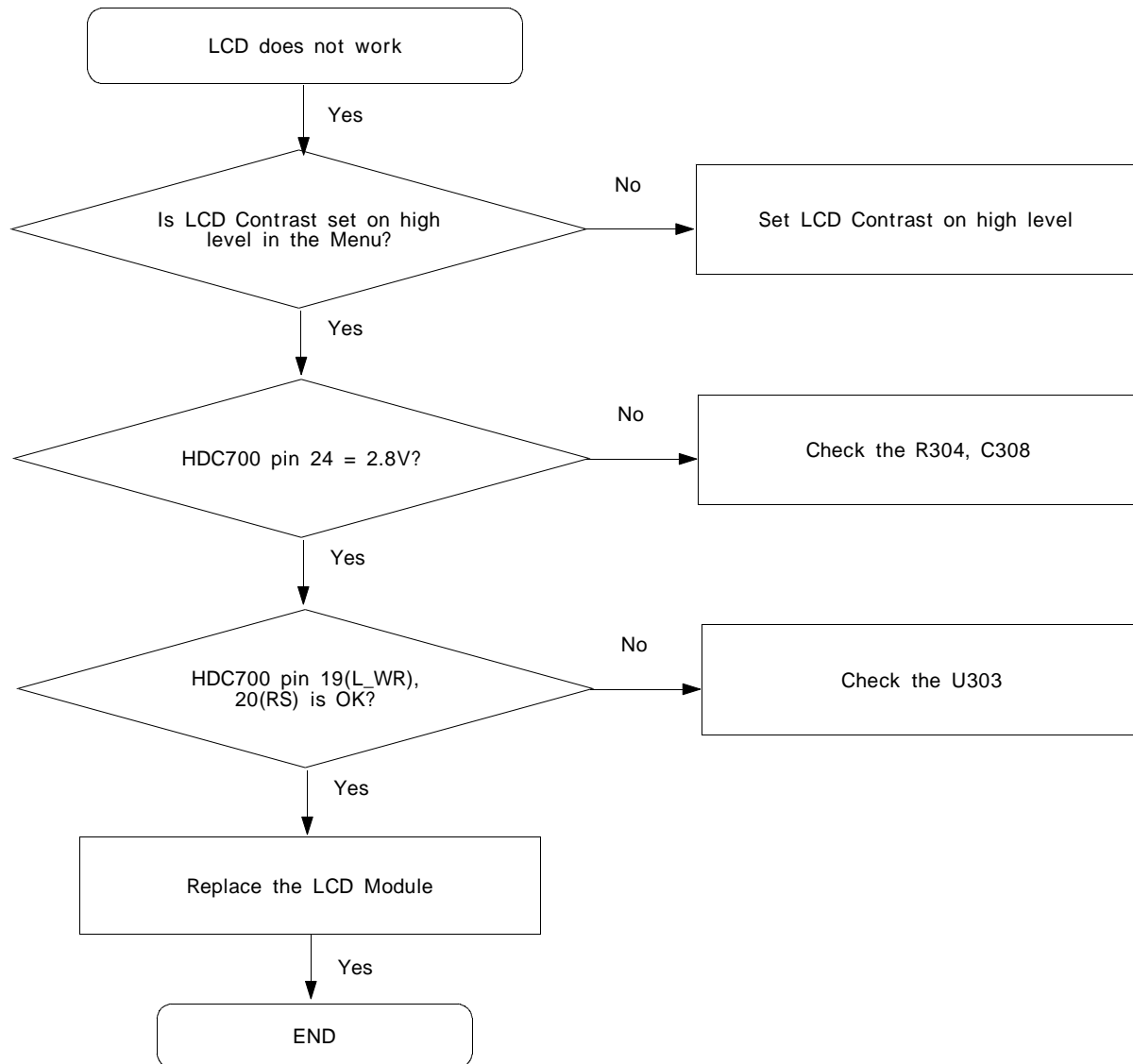


## 8. Receiver Part

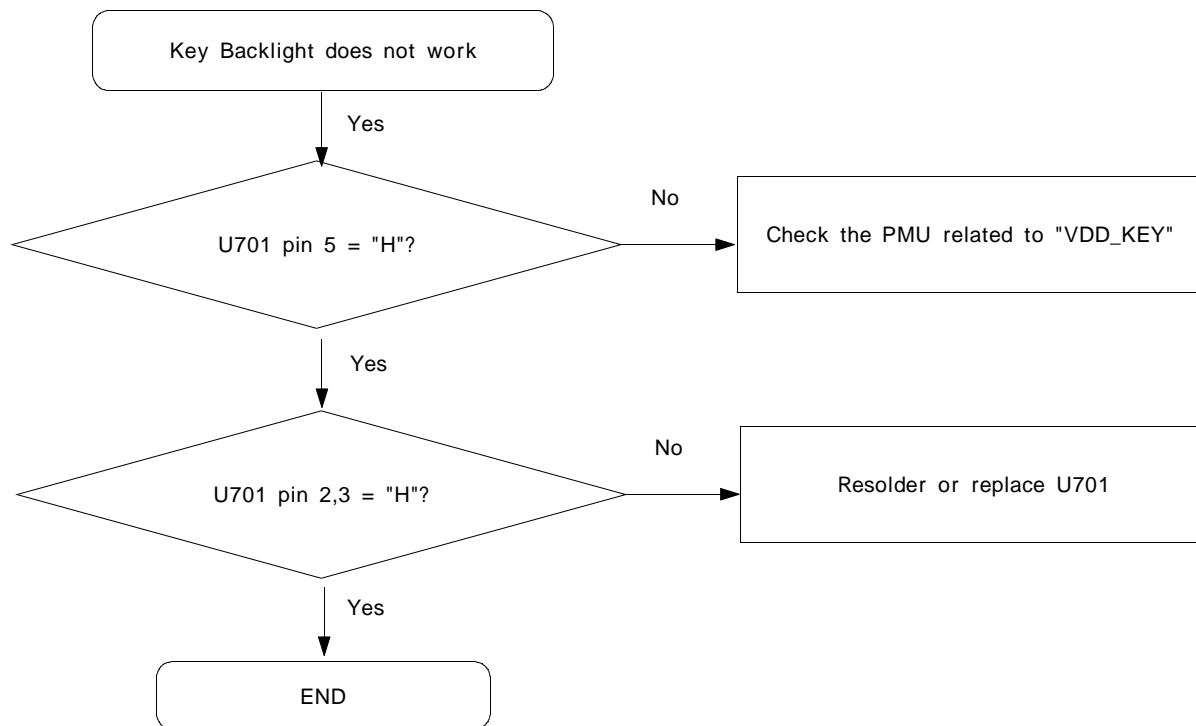




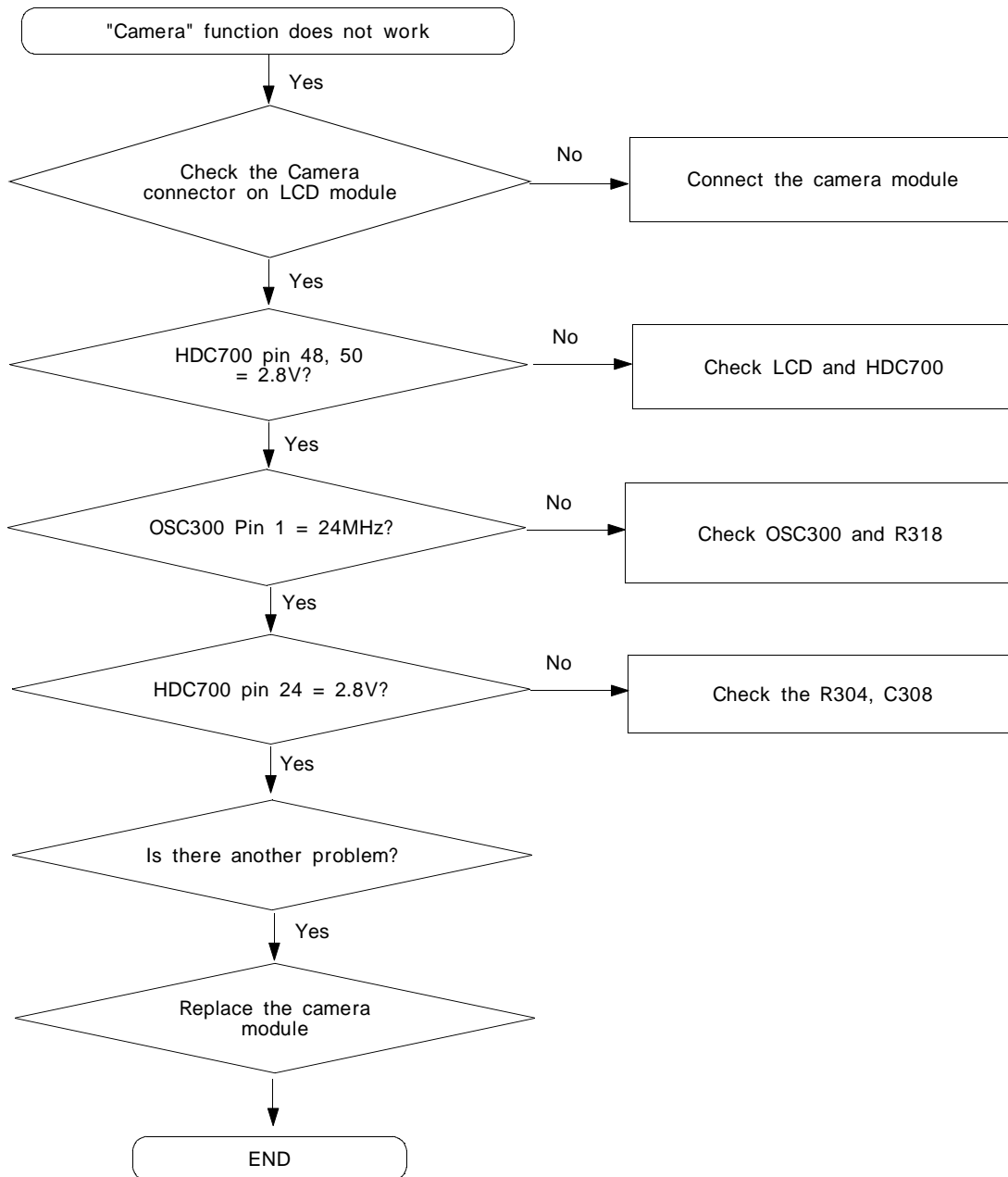
## 9. LCD Part

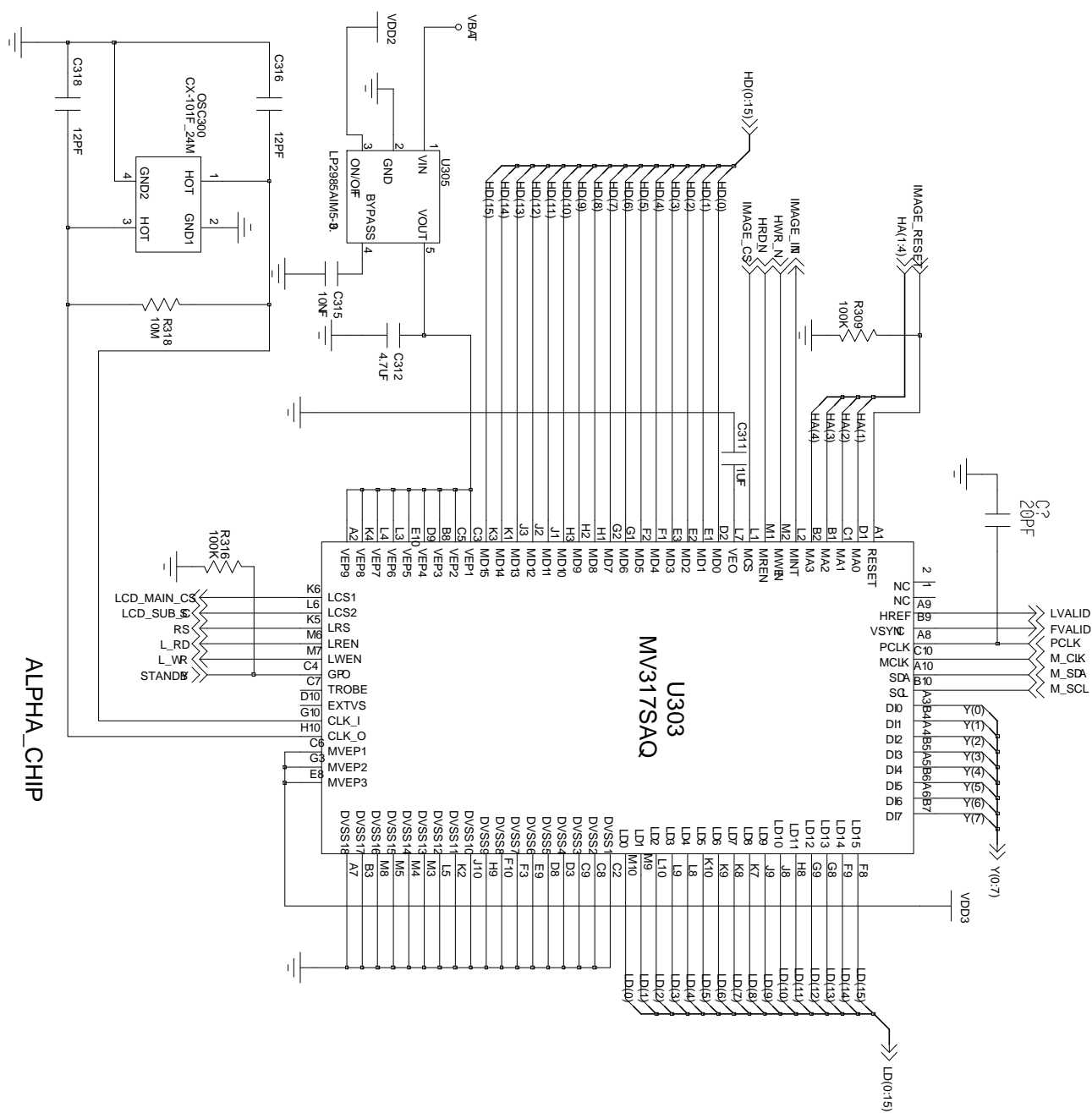


## 10. Key Back Light

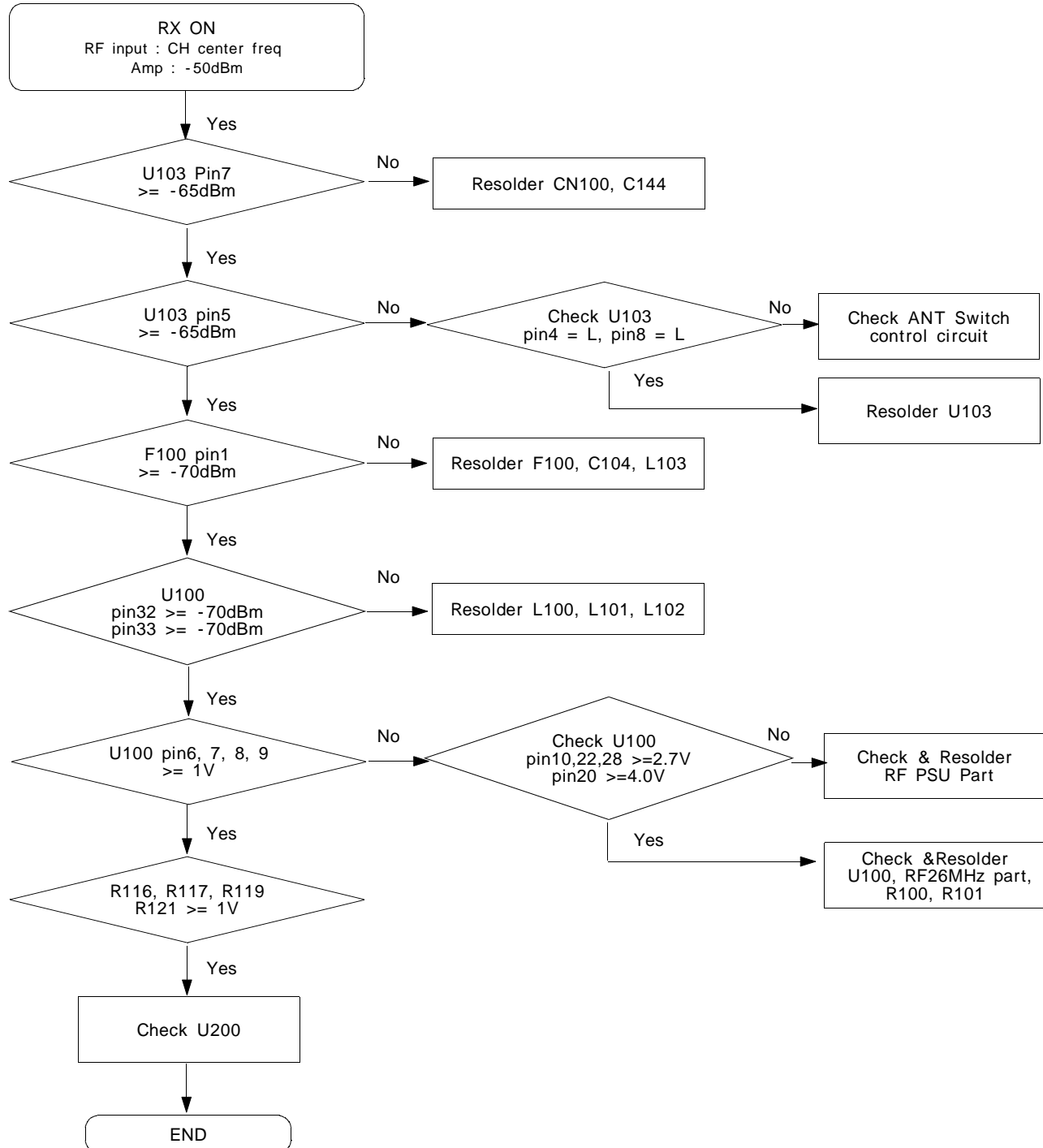


## 11. Camera part

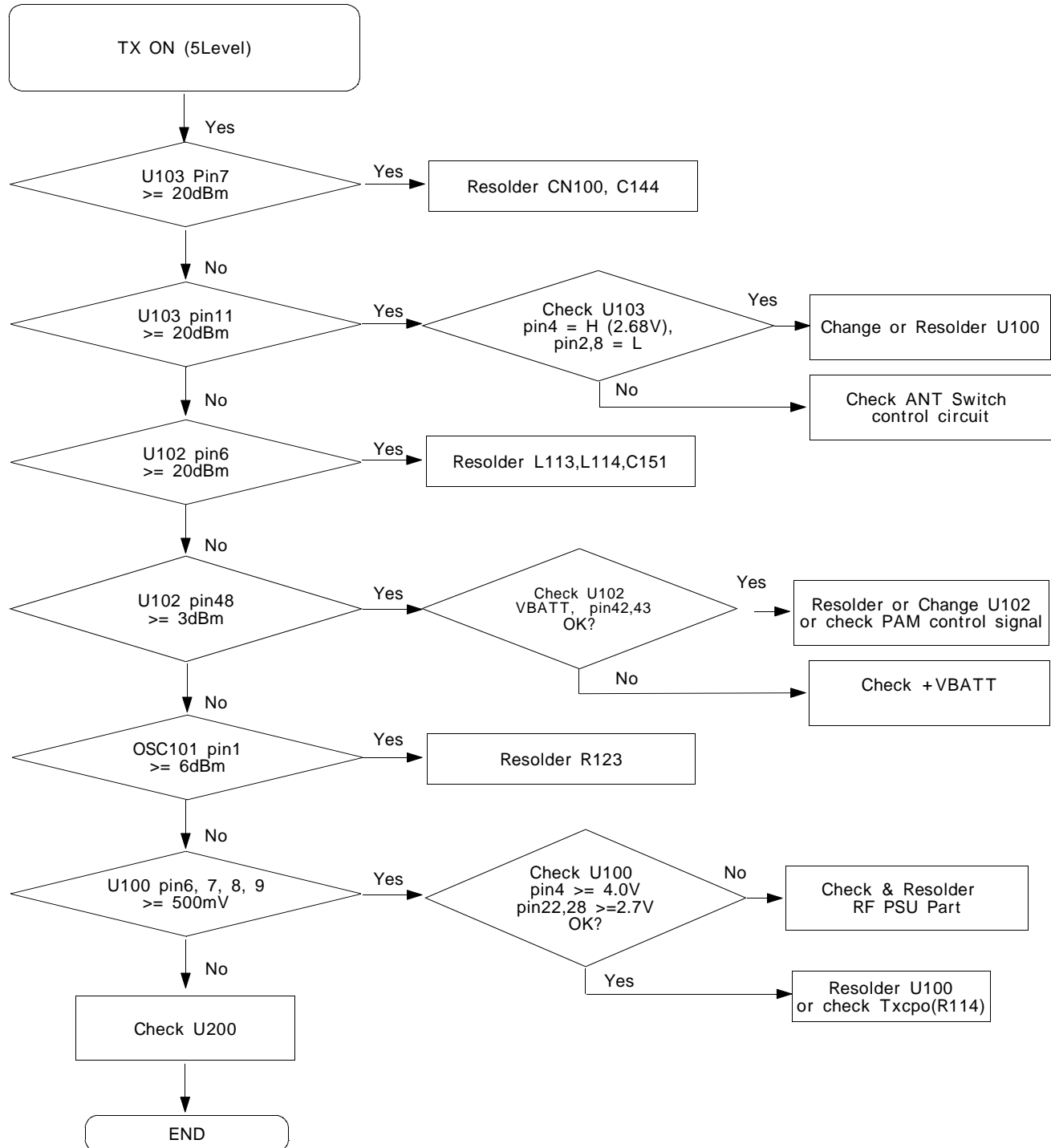




## 12. GSM Receiver

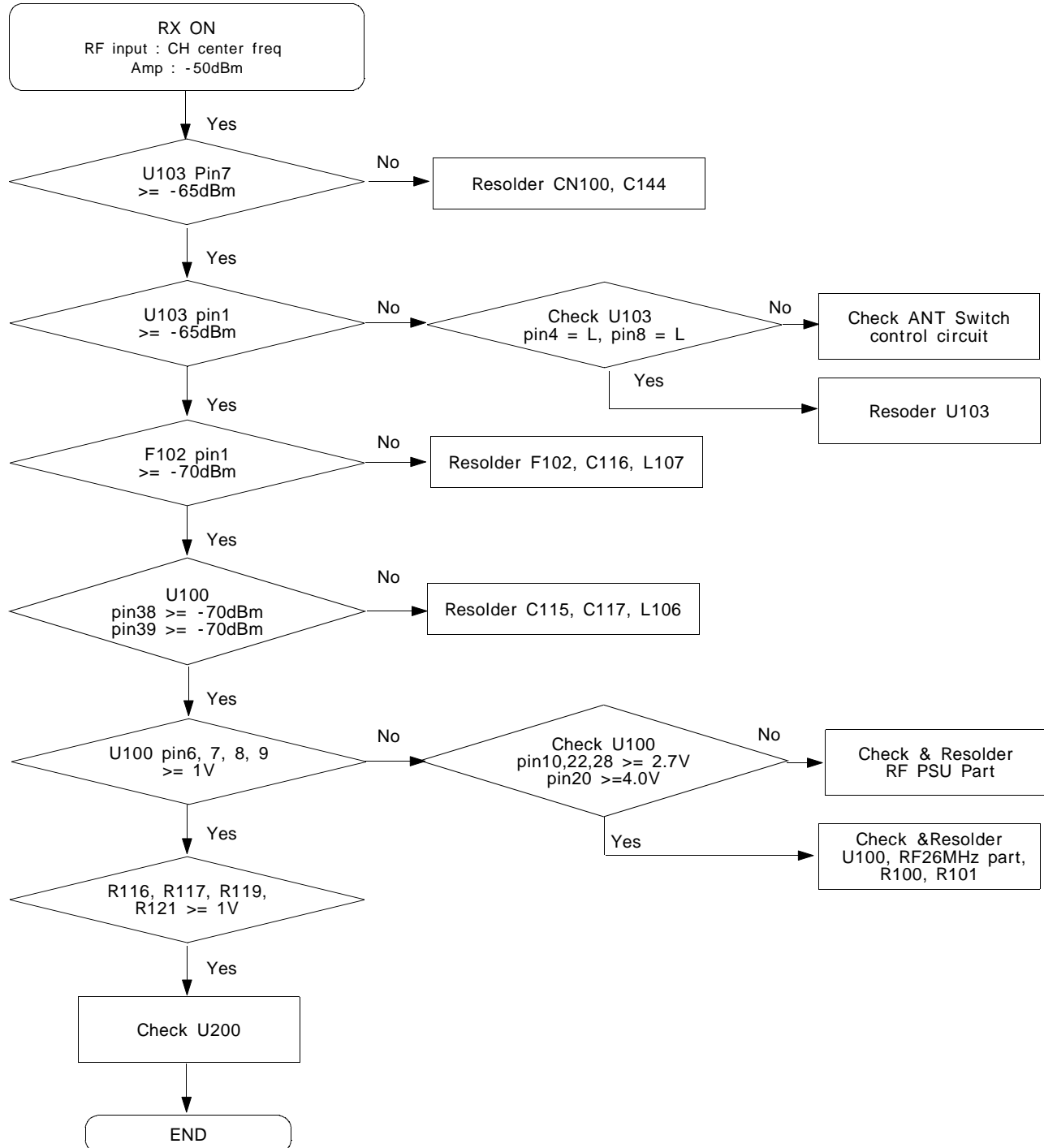


### 13. GSM Transmitter

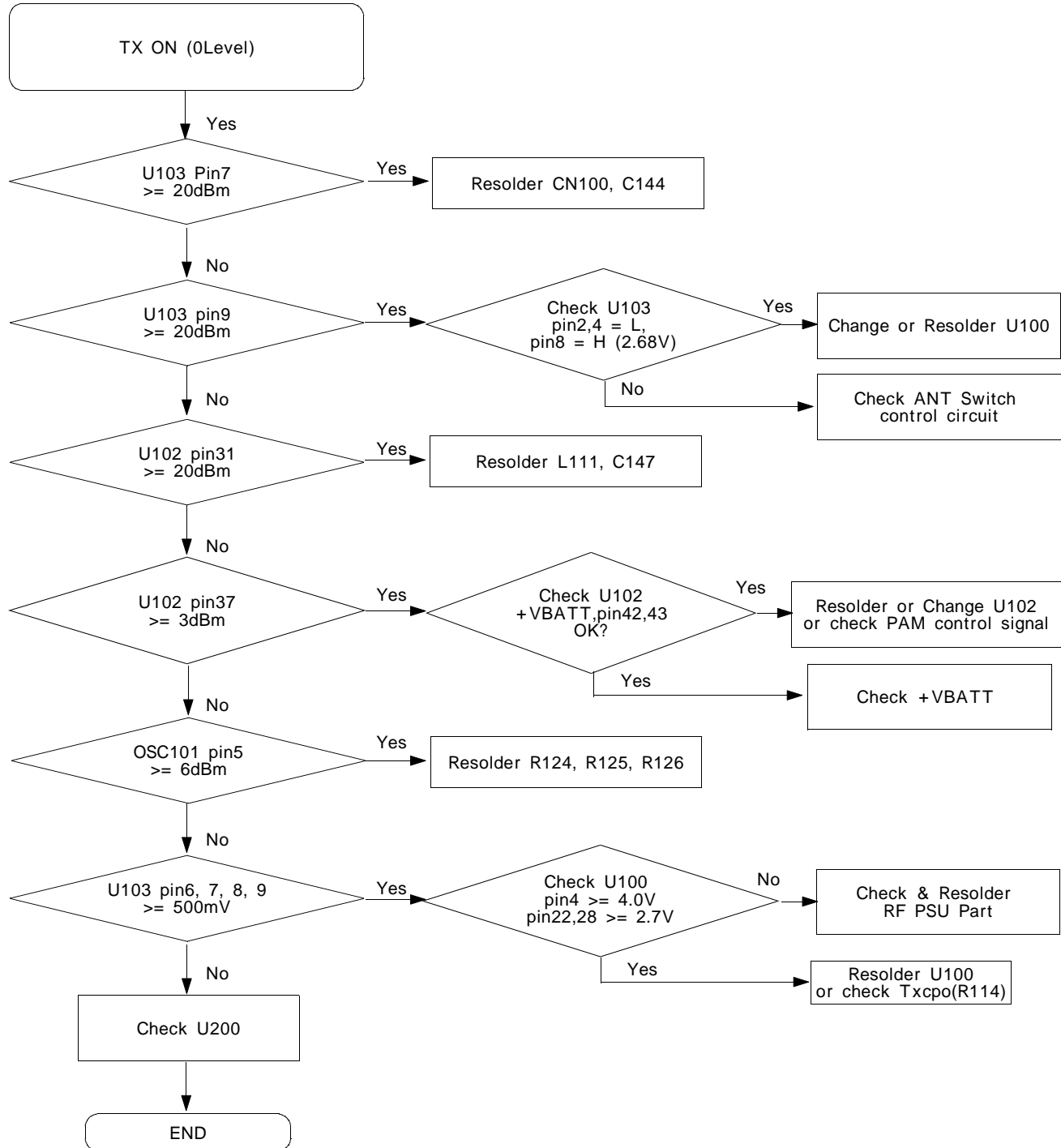




## 14. DCS Receiver



## 15. DCS Transmitter





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