



# Service Manual

## MG220



---

# REVISED HISTORY

| DATE | ISSUE | CONTENTS OF CHANGES | S/W VERSION |
|------|-------|---------------------|-------------|
|      |       |                     |             |
|      |       |                     |             |
|      |       |                     |             |

The information in this manual is subject to change without notice and should not be construed as a commitment by LGE Inc. Furthermore, LGE Inc. reserves the right, without notice, to make changes to equipment design as advances in engineering and manufacturing methods warrant.

This manual provides the information necessary to install, program, operate and maintain the MG220.

---

---

# Table of Contents

|                                             |           |                                                                |            |
|---------------------------------------------|-----------|----------------------------------------------------------------|------------|
| <b>1. Introduction .....</b>                | <b>5</b>  | <b>5. DOWNLOAD .....</b>                                       | <b>89</b>  |
| 1.1 Purpose.....                            | 5         | 5.1 Download Setup.....                                        | 89         |
| 1.2 Regulatory Information.....             | 5         | 5.2 Download Procedure .....                                   | 90         |
| 1.3 Abbreviations .....                     | 7         |                                                                |            |
| <b>2. General Performance.....</b>          | <b>9</b>  | <b>6. SERVICE AND CALIBRATION .....</b>                        | <b>97</b>  |
| 2.1 Product Name .....                      | 9         | 6.1 Service S/W .....                                          | 97         |
| 2.2 Supporting Standard .....               | 9         |                                                                |            |
| 2.3 Main Parts: GSM Solution.....           | 9         | <b>7. CIRCUIT DIAGRAM .....</b>                                | <b>99</b>  |
| 2.4 H/W Features.....                       | 10        |                                                                |            |
| 2.5 S/W Features .....                      | 12        | <b>8. PCB LAYOUT .....</b>                                     | <b>107</b> |
| <b>3. H/W Circuit Description.....</b>      | <b>14</b> | <b>9. ENGINEERING MODE.....</b>                                | <b>109</b> |
| 3.1 RF Transceiver General Description..... | 14        |                                                                |            |
| 3.2 Receiver Part .....                     | 14        | <b>10. STANDALONE TEST .....</b>                               | <b>110</b> |
| 3.3 Transmitter Part .....                  | 17        | 10.1 Setting Method .....                                      | 110        |
| 3.4 Digital Baseband (DBB) Processor.....   | 20        |                                                                |            |
| 3.5 Analog Baseband (ABB) Processor.....    | 25        | <b>11. EXPLODED VIEW &amp;<br/>REPLACEMENT PART LIST .....</b> | <b>111</b> |
| <b>4. TROUBLE SHOOTING .....</b>            | <b>45</b> | 11.1 EXPLODED VIEW .....                                       | 111        |
| 4.1 Main Components Placement.....          | 45        | 11.2 Replacement Parts                                         |            |
| 4.2 FPCB Components Placement.....          | 46        | <Mechanic component>.....                                      | 113        |
| 4.3 Baseband Components .....               | 46        | <Main component> .....                                         | 116        |
| 4.4 Main Components (Description) .....     | 47        | 11.3 Accessory .....                                           | 127        |
| 4.5 Power On Trouble .....                  | 48        |                                                                |            |
| 4.6 Charging Trouble .....                  | 49        |                                                                |            |
| 4.7 LCD Display Trouble.....                | 51        |                                                                |            |
| 4.8 Camera Trouble .....                    | 53        |                                                                |            |
| 4.9 Receiver Trouble.....                   | 55        |                                                                |            |
| 4.10 Microphone Trouble .....               | 59        |                                                                |            |
| 4.11 Vibrator Trouble .....                 | 62        |                                                                |            |
| 4.12 Keypad Backlight Trouble .....         | 64        |                                                                |            |
| 4.13 Folder ON/OFF Trouble .....            | 66        |                                                                |            |
| 4.14 SIM Detect Trouble .....               | 68        |                                                                |            |
| 4.15 Earphone Trouble .....                 | 70        |                                                                |            |
| 4.16 RF Rx pass Trouble Shooting.....       | 74        |                                                                |            |
| 4.17 RF Tx pass Trouble Shooting .....      | 81        |                                                                |            |



# 1. Introduction

## 1.1 Purpose

This manual provides the information necessary to repair, calibration, description and download the features of the MG220

## 1.2 Regulatory Information

### A. Security

Toll fraud, the unauthorized use of telecommunications system by an unauthorized part (for example, persons other than your company's employees, agents, subcontractors, or person working on your company's behalf) can result in substantial additional charges you're your telecommunications services. System users are responsible for the security of own system. There are may be risks of toll fraud associated with your telecommunications system. System users are responsible for programming and configuring the equipment to prevent unauthorized use. LGE does not warrant that this product is immune from the above case but will prevent unauthorized use of common-carrier telecommunication service of facilities accessed through or connected to it. LGE will not be responsible for any charges that result from such unauthorized use.

### B. Incidence of Harm

If a telephone company determines that the equipment provided to customer is faulty and possibly causing harm or interruption in service to the telephone network, it should disconnect telephone service until repair can be done. A telephone company may temporarily disconnect service as long as repair is not done.

### C. Changes in Service

A local telephone company may make changes in its communications facilities or procedure. If these changes could reasonably be expected to affect the use of the MG220 or compatibility with the network, the telephone company is required to give advanced written notice to the user, allowing the user to take appropriate steps to maintain telephone service.

### D. Maintenance Limitations

Maintenance limitations on the MG220 must be performed only by the LGE or its authorized agent. The user may not make any changes and/or repairs expect as specifically noted in this manual. Therefore, note that unauthorized alternations or repair may affect the regulatory status of the system and may void any remaining warranty.

## 1. Introduction

---

### E. Notice of Radiated Emissions

The MG220 complies with rules regarding radiation and radio frequency emission as defined by local regulatory agencies. In accordance with these agencies, you may be required to provide information such as the following to the end user.

### F. Pictures

The pictures in this manual are for illustrative purposes only; your actual hardware may look slightly different.

### G. Interference and Attenuation

An MG220 may interfere with sensitive laboratory equipment, medical equipment, etc. Interference from unsuppressed engines or electric motors may cause problems.

### H. Electrostatic Sensitive Devices

#### ATTENTION

Boards, which contain Electrostatic Sensitive Device (ESD), are indicated by the  sign. Following information is ESD handling:

- Service personnel should ground themselves by using a wrist strap when exchange system boards.
- When repairs are made to a system board, they should spread the floor with anti-static mat which is also grounded.
- Use a suitable, grounded soldering iron.
- Keep sensitive parts in these protective packages until these are used.
- When returning system boards or parts like EEPROM to the factory, use the protective package as described.

### 1.3 Abbreviations

For the purposes of this manual, following abbreviations apply:

|        |                                                   |
|--------|---------------------------------------------------|
| VRAMP  | Automatic Power Control                           |
| BB     | Base Band                                         |
| BER    | Bit Error Ratio                                   |
| CC-CV  | Constant Current - Constant Voltage               |
| DAC    | Digital to Analog Converter                       |
| DCS    | Digital Communication System                      |
| dBm    | dB relative to 1 milli watt                       |
| DSP    | Digital Signal Processing                         |
| EEPROM | Electrical Erasable Programmable Read-Only Memory |
| EL     | Electroluminescence                               |
| ESD    | Electrostatic Discharge                           |
| FPCB   | Flexible Printed Circuit Board                    |
| GMSK   | Gaussian Minimum Shift Keying                     |
| GPIO   | General Purpose Interface Bus                     |
| GSM    | Global System for Mobile Communications           |
| IPUI   | International Portable User Identity              |
| IF     | Intermediate Frequency                            |
| LCD    | Liquid Crystal Display                            |
| LDO    | Low Drop Output                                   |
| LED    | Light Emitting Diode                              |
| OPLL   | Offset Phase Locked Loop                          |
| PAM    | Power Amplifier Module                            |

## 1. Introduction

---

|        |                                                            |
|--------|------------------------------------------------------------|
| PCB    | Printed Circuit Board                                      |
| PGA    | Programmable Gain Amplifier                                |
| PLL    | Phase Locked Loop                                          |
| PSTN   | Public Switched Telephone Network                          |
| RF     | Radio Frequency                                            |
| RLR    | Receiving Loudness Rating                                  |
| RMS    | Root Mean Square                                           |
| RTC    | Real Time Clock                                            |
| FEM    | Front End Module                                           |
| SIM    | Subscriber Identity Module                                 |
| SLR    | Sending Loudness Rating                                    |
| SRAM   | Static Random Access Memory                                |
| STMR   | Side Tone Masking Rating                                   |
| TA     | Travel Adapter                                             |
| TDD    | Time Division Duplex                                       |
| TDMA   | Time Division Multiple Access                              |
| UART   | Universal Asynchronous Receiver/Transmitter                |
| VCO    | Voltage Controlled Oscillator                              |
| VCTCXO | Voltage Control Temperature Compensated Crystal Oscillator |
| WAP    | Wireless Application Protocol                              |

## 2. General Performance

### 2.1 Product Name

MG220 : Support GPRS (Class 10)

### 2.2 Supporting Standard

| Item                 | Feature                                                                                                                                                                                                                    | Comment                                                            |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Supporting Standard  | GSM850/ EGSM/ DCS/ PCS Tri-Band<br>Phase 2+<br>SIM Toolkit : Class 1,2,3                                                                                                                                                   | < MG220c ><br>EGSM/ DCS/ PCS<br>< MG220d ><br>GSM850/ DCS/ PCS     |
| Frequency Range      | GSM850 TX : 824 - 849 MHz<br>GSM850 RX : 869 - 894 MHz<br>EGSM TX : 880 - 915MHz<br>EGSM RX : 925 - 960MHz<br>DCS TX : 1710 - 1785 MHz<br>DCS RX : 1805 - 1880 MHz<br>PCS TX : 1850 - 1910 MHz<br>PCS RX : 1930 - 1990 MHz | < MG220c ><br>EGSM/ DCS/ PCS<br><br>< MG220d ><br>GSM850/ DCS/ PCS |
| Application Standard | WAP 2.0 : Yes<br>MMS : Yes<br>JAVA : MIDP v2.0                                                                                                                                                                             |                                                                    |

### 2.3 Main Parts: GSM Solution

|                  |                               |
|------------------|-------------------------------|
|                  | <b>MG220</b>                  |
| Digital Baseband | Calypso-AMR C035(D751992GHH)) |
| Analog Baseband  | IOTA(TWL3025)                 |
| RF Chip          | Aero-2 (SI4210)               |

## 2. General Performance

---

### 2.4 H/W Features

| Item                     | Feature                                                                                      | Comment                                                                                   |
|--------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Form Factor              | Dual LCD Folder                                                                              |                                                                                           |
| Battery                  | Capacity<br>Standard: Li-Ion, 830mAh(Min)                                                    | Cell Size: Standard<br>50(L) x 34(W) x 4.6(H)mm                                           |
|                          | Packing Type: Inner Pack                                                                     |                                                                                           |
| Size                     | Standard: 86 x 45 x 21.5 mm                                                                  | L x W x H                                                                                 |
| Weight                   | 78g                                                                                          | With Battery                                                                              |
| PCB                      | Main PCB : 8Layers, 1t                                                                       |                                                                                           |
| AVG TCVR<br>current (mA) | Max : 290 mA (GSM, Power Level 5)<br>Max : 120 mA (GSM, Power Level 19)                      |                                                                                           |
| Standby Current          | 3.0 mA                                                                                       | @ Paging Period 6                                                                         |
| Standby time             | Up to 300 hours                                                                              | @ Paging Period 6                                                                         |
| Charging time            | Below 3.0 hours                                                                              | @ Power Off /830mAh                                                                       |
| Talk time                | Talk time Min : 3hr 30 min @Power Level 7<br>Min : 6hr @Power Level 12                       | @ 830 mAh                                                                                 |
| RX sensitivity           | GSM 850 : -105 dBm, EGSM : -105 dBm<br>DCS : -105 dBm, PCS : -105 dBm                        |                                                                                           |
| TX output power          | GSM 850 : 32.0 dBm, EGSM : 32.0 dBm<br>DCS : 29 dBm, PCS : 29 dBm                            | Class4 (GSM850, EGSM )<br>Class1 (DCS, PCS)                                               |
| GPRS compatibility       | GPRS Class 10                                                                                |                                                                                           |
| SIM card type            | Plug-In SIM 3V                                                                               |                                                                                           |
| Display                  | -MAIN LCD : 65K Color CSTN (128*128)<br>-Sub : 96*64, Color Filter<br>-Backlight : White LED |                                                                                           |
| Keypad                   | Alphanumeric Key : 12<br>Function Key : 12<br>Side Key : 3<br>Total Number of Keys : 27      | Function Key:<br>4 Key Navigation & OK,<br>F1, F2, SND, END/PWR,<br>Clear, Camera,Gallery |

## 2. General Performance

---

| Item                       | Feature                                                                 | Comment                          |
|----------------------------|-------------------------------------------------------------------------|----------------------------------|
| Antenna                    | Internal Type                                                           | Tri-band                         |
| System connector           | 24 Pin                                                                  |                                  |
| Ear Phone Jack             | 3 Pole ( $\phi$ 2.5mm)                                                  |                                  |
| PC synchronization         | No                                                                      | CDROM                            |
| Memory                     | Flash : 128Mbit / SRAM : 64Mbit                                         | AMD                              |
| Speech coding              | FR, EFR, HR, AMR                                                        |                                  |
| Data & Fax                 | Built in Data & Fax support                                             |                                  |
| Vibrator                   | Built in Vibrator                                                       |                                  |
| MIDI (for Buzzer Function) | 40 Poly                                                                 | Buzzer Function By Using MIDI IC |
| Voice Recording            | Yes                                                                     |                                  |
| Travel Adapter             | Yes                                                                     |                                  |
| Options                    | Ear-Microphone<br>Data Cable<br>Cigarette Lighter Adapter<br>Data Cable |                                  |

## 2. General Performance

---

### 2.5 S/W Features

| Item                 | Feature                              | Comment                   |
|----------------------|--------------------------------------|---------------------------|
| RSSI                 | 0 ~ 5 Levels                         |                           |
| Battery Charging     | 0 ~ 4 Levels                         |                           |
| Key Volume           | 0 ~ 5 Level                          |                           |
| Keypad Volume        | 0~5 level                            |                           |
| Effect sound volume  | 0~5 level                            |                           |
| Ring Volume          | 0~5 level                            |                           |
| Time/Date Display    | Yes                                  |                           |
| Text Input           | T9                                   |                           |
| Multi-language       | Yes                                  |                           |
| Quick Access Mode    | Schedule/Ring Tone/Phonebook<br>GPRS |                           |
| PC Sync              | Schedule/Phonebook/SMS               | MS Scheduler & Outlook    |
| Speed Dial           | Yes (2~9)                            | Voice mail center → 1 key |
| Profile              | Yes                                  |                           |
| CLIP/CLIR            | Yes                                  |                           |
| Phonebook            | 3 Number + 1 Memo + 1 e-mail         | Phone (Up to 255 entries) |
| Last Dial Number     | Yes (20)                             |                           |
| Last Received Number | Yes (20)                             |                           |
| Last Missed Number   | Yes (10)                             |                           |
| Search Number/Name   | Yes                                  |                           |
| Group                | 7 / User Editor                      |                           |
| Fixed Dial Number    | Yes                                  |                           |
| Voice Memo           | 30 secs * 3                          |                           |
| Call Remainder       | Yes                                  |                           |
| Network Selection    | Automatic / Manual                   |                           |

## 2. General Performance

| Item                                | Feature                       | Comment                  |
|-------------------------------------|-------------------------------|--------------------------|
| Mute                                | Yes                           |                          |
| Call Divert                         | Yes                           |                          |
| Call Barring                        | Yes                           |                          |
| Call Charge                         | Yes                           |                          |
| Call Duration                       | Yes                           |                          |
| SMS (EMS)                           | 100                           |                          |
| EMS Send/Receive/Save               | Yes                           | Melody/Picture/Animation |
| MMS                                 | Yes                           |                          |
| WAP Browser                         | WAP 2.0                       |                          |
| Java                                | CLDC 1.1 / MIDP 2.0           |                          |
| Wall Paper                          | Yes                           | Max. 10 preset           |
| Download Melody/<br>Wallpaper (MMS) | Over the WAP                  |                          |
| Long Message                        | Max. 918 Character(6page*153) |                          |
| Cell Broadcast                      | Yes                           |                          |
| Calendar                            | Yes                           |                          |
| Memo                                | 20                            |                          |
| World Clock                         | Yes                           |                          |
| Unit Convert                        | Length/Surface/Volume/Weight  |                          |
| Fax & Data                          | Yes                           |                          |
| SIM Lock                            | Yes                           | Operator Dependent       |
| SIM Toolkit                         | Class 1,2,3                   |                          |
| Phone lock                          | Yes                           |                          |
| Security                            | DRM (Forward-lock only)       |                          |
| CPHS                                | Yes                           |                          |
| IM                                  | Yes                           |                          |

## 3. H/W Circuit Description

## 3. H/W Circuit Description

### 3.1 RF Transceiver General Description

The RF parts consist of a transceiver part, a power amplifier part, a front-end module part, a voltage supply part, and a VC-TCXO part.

The Aeroll transceiver is composed of single RF chipset, Si4210-GM[U501] which is a quad-band GSM/GPRS wireless communications.

This device integrated a receiver based on a low IF (200KHz) architecture and a transmitter based on modulation loop architecture. The transceiver employed a 3 wire serial interface to allow an external system controller to write the control registers for dividers, receive path gain, power down setting, and other controls.

### 3.2 Receiver Part

The receiver part uses a low-IF receiver architecture that allows for the on-chip integration of the channel selection filters, eliminating the external RF image reject filters and the IF SAW filter required in conventional super-heterodyne architecture. The Si4210-GM[U501] integrates four differential input LNAs that are matched to the 200 Ohm balanced-output SAW filters through external LC matching networks. A quadrature image-rejection mixer downconverts the RF signal to a 200kHz intermediate frequency (IF) with the RFLO from the frequency synthesizer. The mixer output is amplified with an analog programmable gain amplifier (PGA) and quadrature IF signal is digitized with high resolution A/D converters (ADCs).

The Si4210-GM[] downconverts the ADC output to baseband with a digital 200kHz quadrature LO signal. Digital decimation and IIR filters perform digital filtering , and remove blocking and reference interference signals. After filtering, the digital output is scaled with digital PGA, which is controlled with the DGAIN[5:0] bits in register 20h. The amplified digital output signal go through with DACs that drive a differential analog signal onto the RXIP,RXIN,RXQP and RXQN pins to interface to standard analog ADC input baseband ICs.

|                 | Antenna Bar Number | Rx Power (dBm) |
|-----------------|--------------------|----------------|
| Antenna Display | 5 → 4              | -85dBm±2dBm    |
|                 | 4 → 3              | -90dBm±2dBm    |
|                 | 3 → 2              | -95dBm±2dBm    |
|                 | 2 → 1              | -100dBm±2dBm   |
|                 | 1 → 0              | -105dBm±2dBm   |

Table 3-1. Antenna Display

### 3. H/W Circuit Description

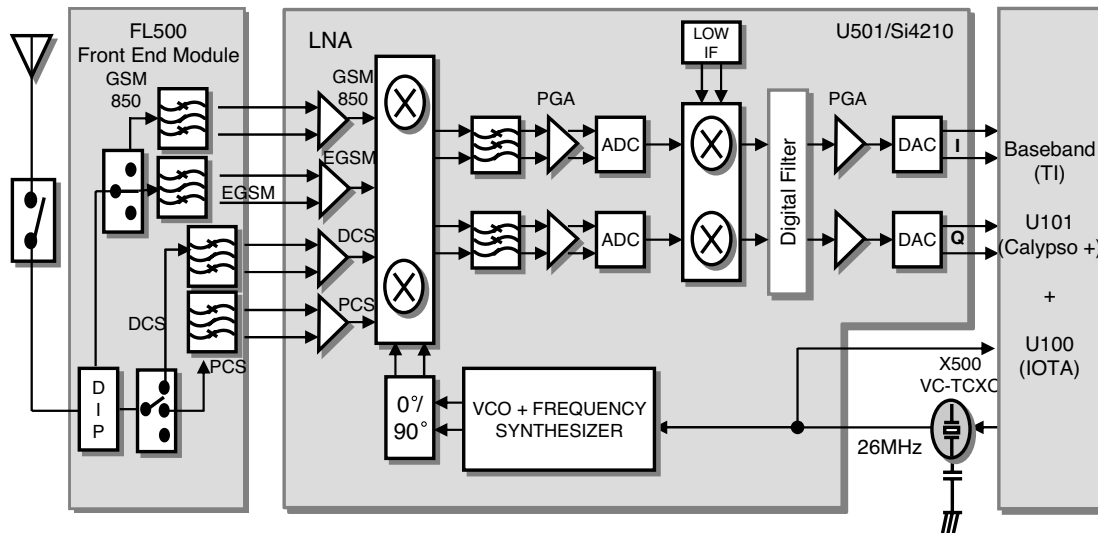


Figure 1. RF Receiver Block

#### 3.2.1. RF Front End

RF front end consists of Front End Module(FL500), quad band LNAs integrated in transceiver(U501). The Received RF signals (GSM-850 869MHz ~ 894MHz, EGSM 880 MHz ~ 960MHz, DCS 1710 MHz ~ 1880 MHz, PCS 1930MHz ~ 1990MHz) are fed into the antenna or mobile switch. An antenna matching circuit is between the antenna and the mobile switch. The Front End Module(FL500) is used for control the Rx and TX paths. And the input signals ANT\_SW1 and ANT\_SW2 of a FL500 are directly connected to baseband controller to switch either TX or RX path on. Front End Module(FL500) is an antenna switch module for Quad band phone. The logic and current is given below Table 3-2.

|                        | ANT_SW1(PIN 15) | ANT_SW1 2(PIN 14) | Current  |
|------------------------|-----------------|-------------------|----------|
| <b>GSM 850/EGSM RX</b> | 0 V             | 0 V               | < 0.1 mA |
| <b>DCS/PCS RX</b>      | 2.5~3.0 V       | 0 V               | < 0.1 mA |
| <b>GSM-850/EGSM TX</b> | 0 V             | 2.5~3.0 V         | < 0.1 mA |
| <b>DCS/PCS TX</b>      | 2.5~3.0 V       | 2.5~3.0 V         | < 0.1 mA |

Table 3-2. The Logic and Current

### 3. H/W Circuit Description

#### 3.2.2. Synthesizer

The Aero II transceiver integrates two complete PLLs including VCOs, varactors, resonators, loop filters, reference and VCO dividers, and phase detectors. The RF PLL uses two multiplexed VCOs. The RF1 VCO is used for receive mode, and the RF2 VCO is used for transmit mode. The IF PLL is used only during transmit mode. All VCO tuning inductors are also integrated. The IF and RF output frequencies are set by programming the N-Divider registers, NRF1, NRF2 and NIF. Programming the N-Divider register for either RF1 or RF2 automatically selects the proper VCO.

Transmit modes should always use  $f_0 = 200\text{kHz}$ . The IF and RF output frequencies are set by programming the N-Divider registers and also programmed via 3-wire interface with external system controller.

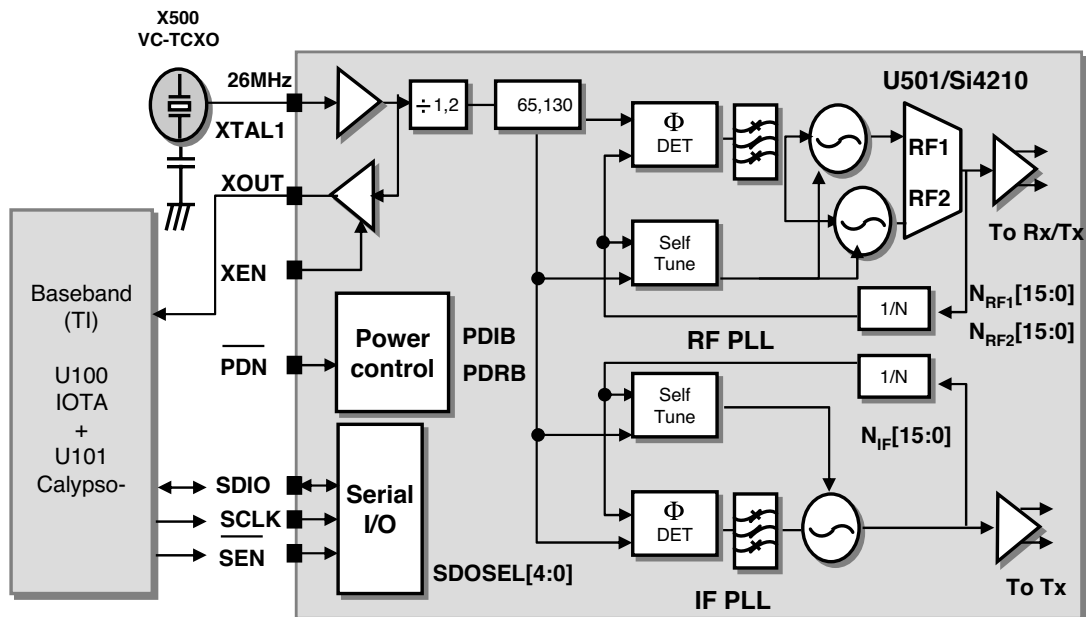


Figure 2. Synthesizer Block

### 3.3 Transmitter Part

The Transmitter part contains the transmitter parts of Si4210-GM[U501], Power Amp Module[U501] and Front End Module[FL500]. The transmit section of Si4210-GM[U501] consists of an I/Q base band up\_converter, an offset phase-locked loop(OPLL) and two output buffers that can drive external power amplifiers(PA).

The RF GMSK outputs from the transmit VCO are fed directly to the RF power amplifiers. The peak output power and the profile of the transmitted burst are controlled by means of incorporated power control circuits inside of PA and DAC output from the Base band Controller. The PA outputs pass to the antenna connector via Front End Module.

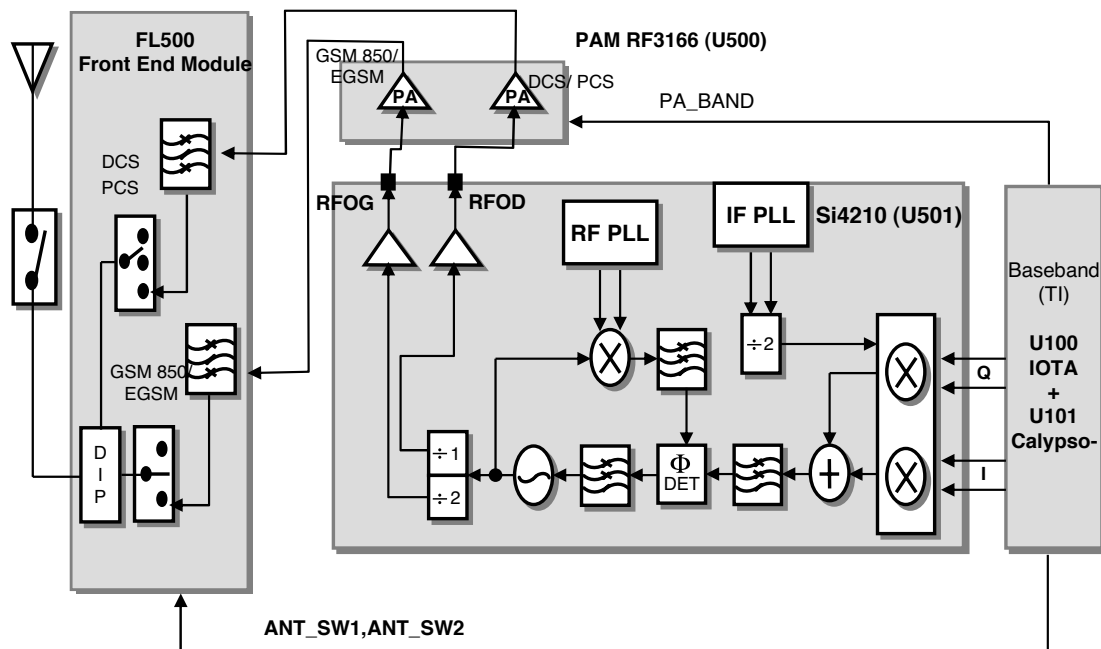


Figure 3. RF Transmit Block

### 3. H/W Circuit Description

#### 3.3.1. Power Amplifier

The RF3166 [U500] is a quad-band EGSM/ GSM850/ DCS/ PCS power amplifier module that incorporates an indirect closed loop method of power control. The indirect closed loop is fully self-contained and it does not require loop optimization. It can be driven directly from the DAC output in the baseband circuit. On-board power control provides over 37 dB of control range with an analog voltage input (Vramp). Efficiency is 60% at GSM and 55% at DCS/PCS.

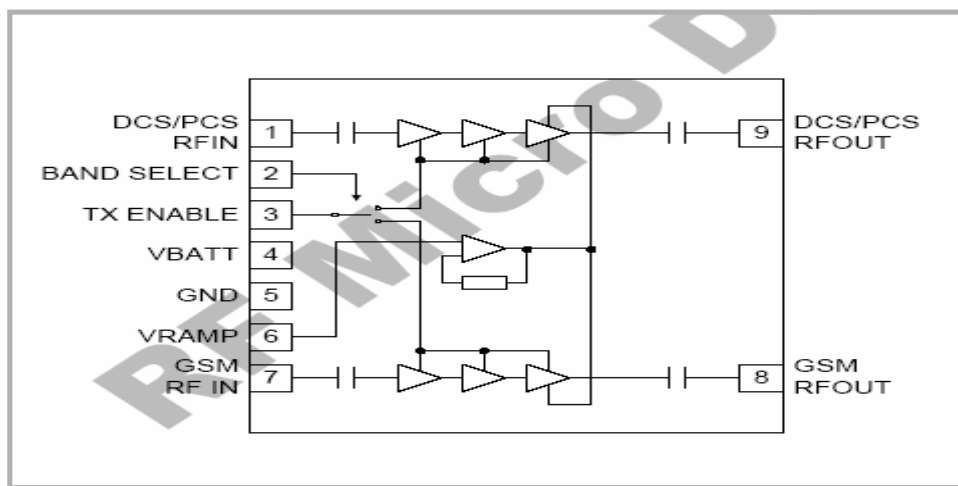


Figure 4. Functional Block Diagram

#### 3.3.2. 26MHz Clock

The 26 MHz clock consists of a TCXO (Temperature Compensated Crystal Oscillator) which oscillates at a frequency of 26 MHz. It is used within the Si4210 RF Main Chip, BB Analog chip-set (IOTA), Digital chip-set (Calypso).

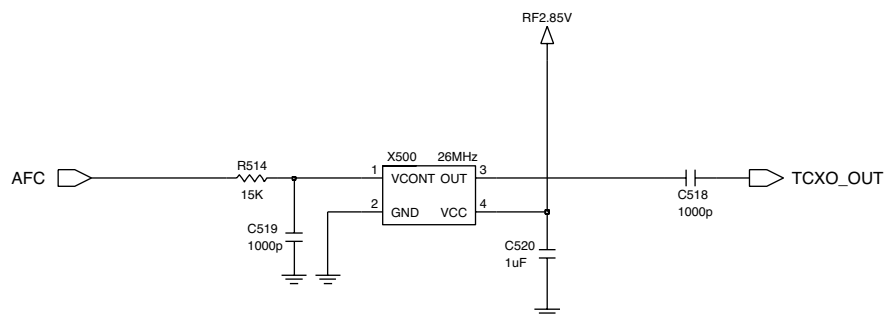


Figure 5. VC-TCXO Circuit

### 3.3.3. Power Supplies and Control Signals

An external regulator(U502) is used to provide DC power to RF part. Every RF component except power amp module uses this external regulator.

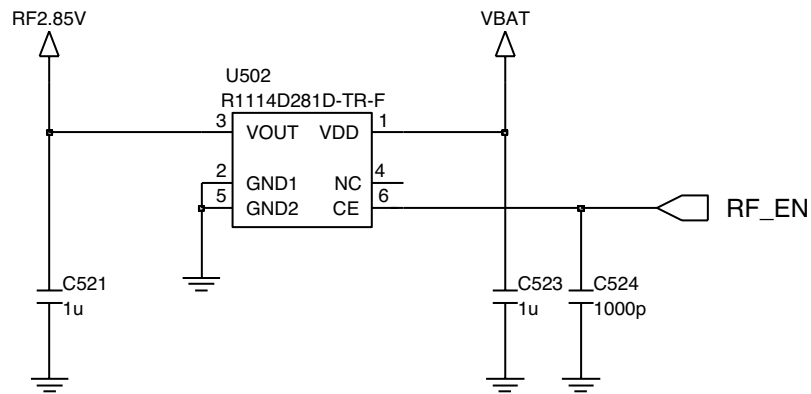


Figure 6 External regulator Circuit

### 3. H/W Circuit Description

#### 3.4 Digital Baseband (DBB) Processor

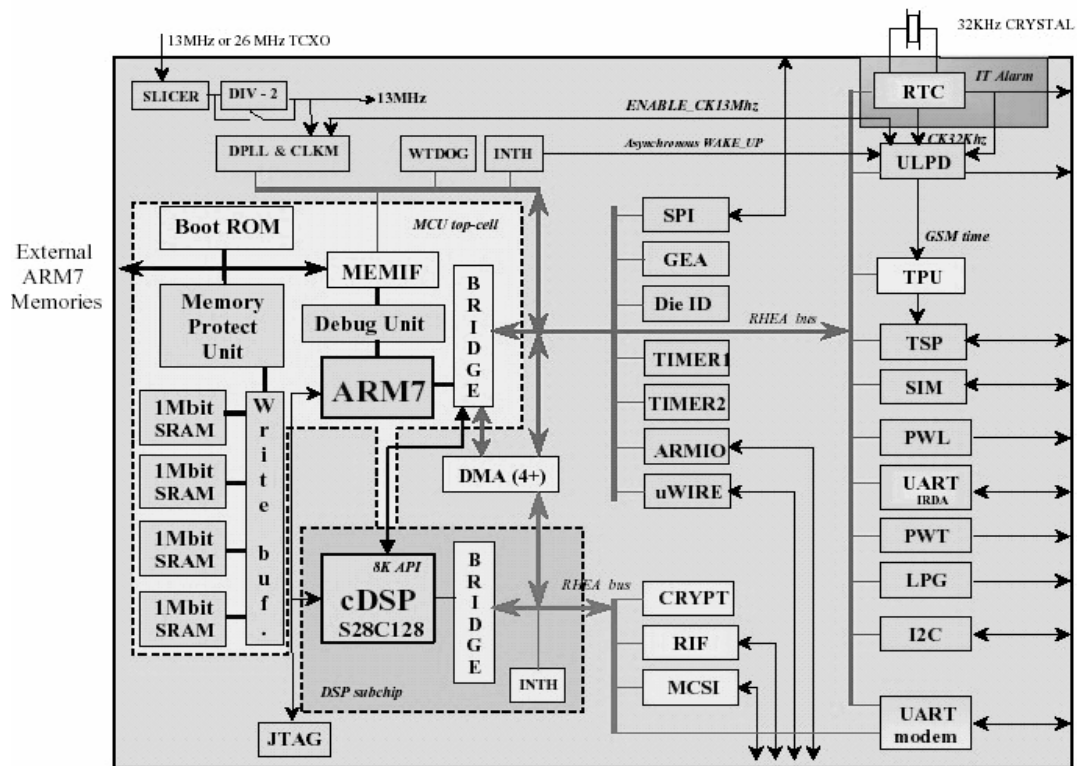


Figure 7. Top level block diagram of the Calypso

##### 3.4.1. General Description

CALYPSO is a chip implementing the digital base-band processes of a GSM/GPRS mobile phone. This chip combines a DSP sub-chip (LEAD2 CPU) with its program and data memories, a Micro-Controller core with emulation facilities (ARM7TDMIE), internal 8Kb of Boot ROM memory, 4M bit SRAM memory, a clock squarer cell, several compiled single-port or 2-ports RAM and CMOS gates. The chip will fully support the Full-Rate, Enhanced Full-Rate and Half-Rate speech coding. CALYPSO implements all features for the structural test of the logic (full-SCAN, BIST, PMT, JTAG boundary-SCAN).

### 3.4.2. Block Description

CALYPSO architecture is based on two processor cores ARM7 and DSP using the generic RHEA bus standard as interface with their associated application peripherals.

CALYPSO is composed from the following blocks:

- ARM7TDMI : ARM7TDMI CPU core
- DSP sub chip
- ARM peripherals

General purpose peripherals

- ARM Memory Interface for external RAM, Flash or ROM
- 4 Mbit Static RAM with write-buffer

Application peripherals

- ARM General purposes I/O with keyboard interface and two PWM modulation signals
- UART 16C750 interface (UART\_IRDA) with
  - IRDA control capabilities (SIR)
  - Software flow control (UART mode).
- UART 16C750 interface (UART\_MODEM) with
  - Hardware flow protocol (DCD, CTS/RTS)
  - Auto baud function
- SIM Interface.
- TPU(Time Processing Unit) : Processing for GSM time base
- TSP(Time Serial Port) : GSM data interface with RF and ABB

Memory Interface : External/Internal Memory Interface

nCS0 : FLASH1, 16bit access, 3 wait state

nCS1 : FLASH2, 16bit access, 3 wait state

nCS2 : Ext SRAM, 16bit access, 3 wait state

nCS3 : Main LCD(16bit access), OEL(8bit access) addressing, 3 wait state

nCS4 : MIDI(8bit access), USB(8bit access) addressing, 3 wait state

nCS6 : Int SRAM, 32bit access, 0 wait state

- Calypso is internally 39MHz machine (25ns machine cycle), so it requires 3 wait-state for 80ns access( $25 \times 4 = 100$  ns).

### 3. H/W Circuit Description

---

#### 3.4.3. RF Interface (TPU, TSP Block)

Calypso uses this interface to control IOTA\_CS(ABB Processor) and AERO(RF Processor) with GSM Time Base

| TSP (Time Serial Port) |                    |                                   |
|------------------------|--------------------|-----------------------------------|
| Resource               | Interconnection    | Description                       |
| TSPDO                  | ABB & RF main Chip | Control Data                      |
| TSPDI/IO(4)            | GPIO4              |                                   |
| TSPEN0                 | ABB                | ABB Control Data Enable Signal    |
| TSPEN1                 | STROBE             | STROBE Control Data Enable Signal |
| TSPCLKX                | CLK                | CLK Control Data Enable Signal    |
| TPU (Parallel Port)    |                    |                                   |
| TSPACT0                | _PDNB              | RF main Chip Reset Signal         |
| TSPACT1                | PA_ON              | Power Amp ON signal               |
| TSPACT2                | PA_BAND            | Power Amp band-selection signal   |
| TSPACT3                | ANT_SW1            | FEM control signal                |
| TSPACT4                | ANT_SW2            | FEM control signal                |

**Table 3-4. RF Interface Spec.**

### 3.4.4. SIM Interface

SIM interface scheme is shown in (Figure 8).

SIM\_IO, SIM\_CLK, SIM\_RST ports are used to communicate DBB with ABB and the Charge Pump in ABB enables 1.8V/3V SIM operation.

#### SIM Interface

- SIM\_CLK** SIM card reference clock
- SIM\_RST** SIM card async/sync reset
- SIM\_IO** SIM card bidirectional data line
- SIM\_PWCTRL** SIM card power activation
- SIM\_CD** SIM card presence detection

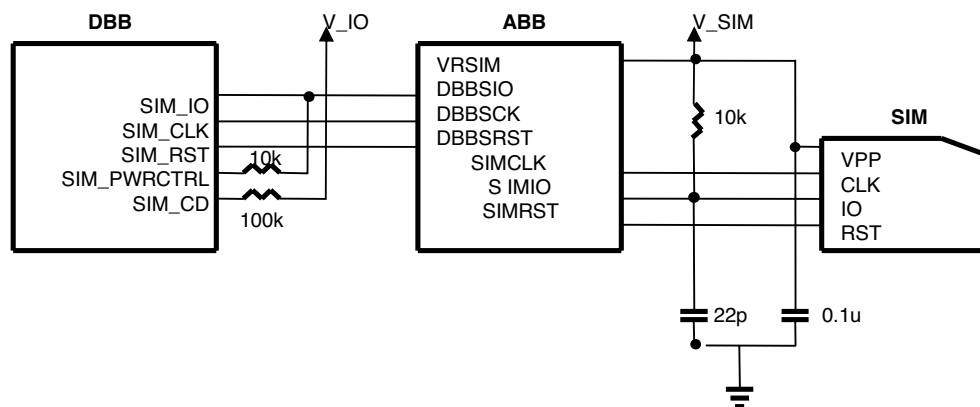


Figure 8. SIM Interface

### 3.4.5. UART Interface

MG220 has two UART Drivers as follow :

**UART : Hardware Flow Control / Fax & Data Modem**

### 3. H/W Circuit Description

---

| UART MODEM (UART1) |      |                 |
|--------------------|------|-----------------|
| Resource           | Name | Description     |
| TX_MODEM           | TXD  | Transmit Data   |
| RX_MODEM           | RXD  | Receive Data    |
| CTS_MODEM          | CTS  | Clear To Send   |
| RTS_MODEM          | RTS  | Request To Send |
| GPIO 3             | DSR  | Data Set Ready  |

**Table 3-5. UART Interface spec.**

### 3.4.6. GPIO Map

In total 16 allowable resources, MG220 is using 13 resources except 3 resources dedicated to SIM and Memory. MG220 GPIO (General Purpose Input/Output) Map, describing application, I/O state, and enable level, is shown in below table.

| I/O #    | Application   | I/O | Resource State | Inactive State    | Active State        |
|----------|---------------|-----|----------------|-------------------|---------------------|
| I/O (0)  | FOLDER        | O   | GPIO           | LOW (CLOSE)       | HIGH (OPEN)         |
| I/O (1)  | MELODY_INT    | I   | GPIO           | HIGH              | LOW                 |
| I/O (2)  | SPK_PHN_EN    | O   | GPIO           | LOW (MIDI sound)  | HIGH (SPK phone)    |
| I/O (3)  | DSR (Note 1)  | I   | GPIO           | HIGH              | LOW                 |
| I/O (4)  | LCD_BACKLIGHT | O   | GPIO           | LOW (LCD B/L Off) | HIGH (SET/ B/L On)  |
| I/O (5)  | SIM_PWCTL     | O   | SIM            |                   |                     |
| I/O (6)  | BCLKX         | O   | GPIO           | LOW               | HIGH (@ PWR on)     |
| I/O (7)  | LCD_RESET     | O   | GPIO           | HIGH              | LOW (Reset)         |
| I/O (8)  | LCD_ID        | I   | GPIO           | LOW (Hye LCD)     | HIGH (SII LCD)      |
| I/O (9)  | CAM_INT       | I   | GPIO           | HIGH (IDLE)       | LOW (INTERRUPT)     |
| I/O (10) | CHARGE_LED    | O   | GPIO           | LOW (Red LED on)  | HIGH (Green LED on) |
| I/O (11) | RCV_SPK_SEL   | O   | GPIO           | LOW (RCV SEL)     | HIGH (SPK SEL)      |
| I/O (12) | IFMODE        | O   | GPIO           | LOW (8Bit)        | HIGH (16bit)        |
| I/O (13) | Not used      |     | GPIO           |                   |                     |
| I/O (14) | NBHE          | O   | MEMORY         |                   |                     |
| I/O (15) | NBLE          | O   | MEMORY         |                   |                     |

Table 3-6. GPIO Map Table

## 3.5 Analog Baseband (ABB) Processor

### 3.5.1. General Description

IOTA is Analog Baseband (ABB) Chip supports GSM850, EGSM, DCS1800, PCS1900, GPRS Class 10 with Digital Basband Chip (Calypso).

IOTA processes GSM modulation/demodulation and power management operations.

#### Block Description

- Audio Signal Processing & Interface
- Baseband in-phase(I), quadrature(Q) Signal Processing
- Auxiliary RF converters
- Five-channel analog-to-digital converters (ADC)

### 3. H/W Circuit Description

- Six Low-dropout (LDO), linear voltage regulators targeted core, general I/O, memory I/O, SIM I/O
- High voltage (20V) Li-Ion or Ni-MH battery charging control
- Voltage detectors (with power-off delay)
- Voice Codec

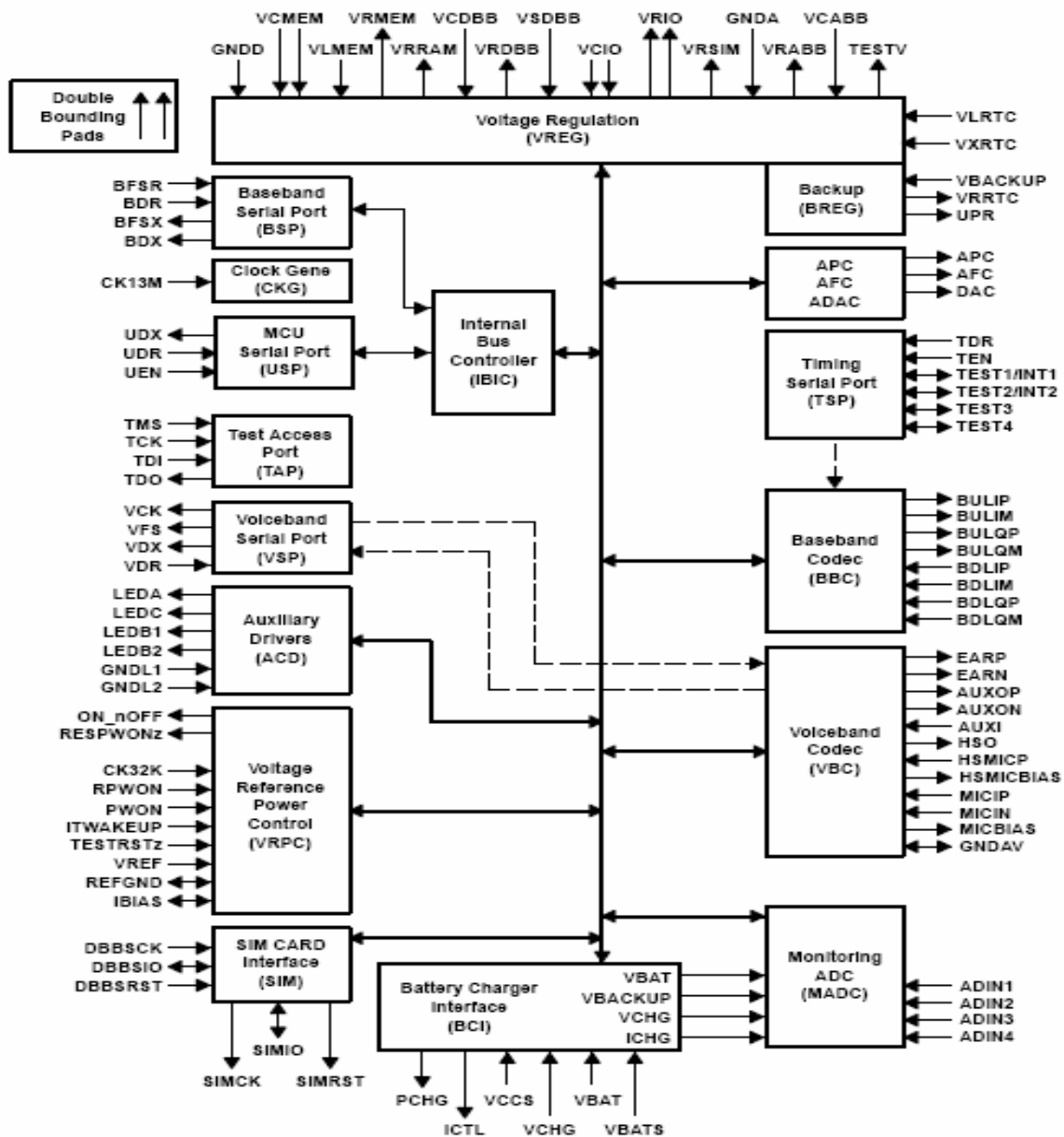


Figure 9. Top level block diagram of the IOTA(TWL3025)

### 3.5.2. Audio Signal Processing & Interface

The audio codec consists of a voice codec dedicated to the GSM application and an audio stereo line. The voice codec circuitry processes analog audio components in the voice uplink (VUL) path and applies this signal to the voice signal interface for eventual baseband modulation. In the voice downlink (VDL) path, the codec circuitry changes voice component data received from the voice serial interface (VSP) into analog audio. The voice codec supports an 8-/16-kHz sampling frequency. The stereo audio path converts audio component data received from the I2S serial interface into analog audio. The following paragraphs describe these uplink/downlink and audio stereo functions in more detail.

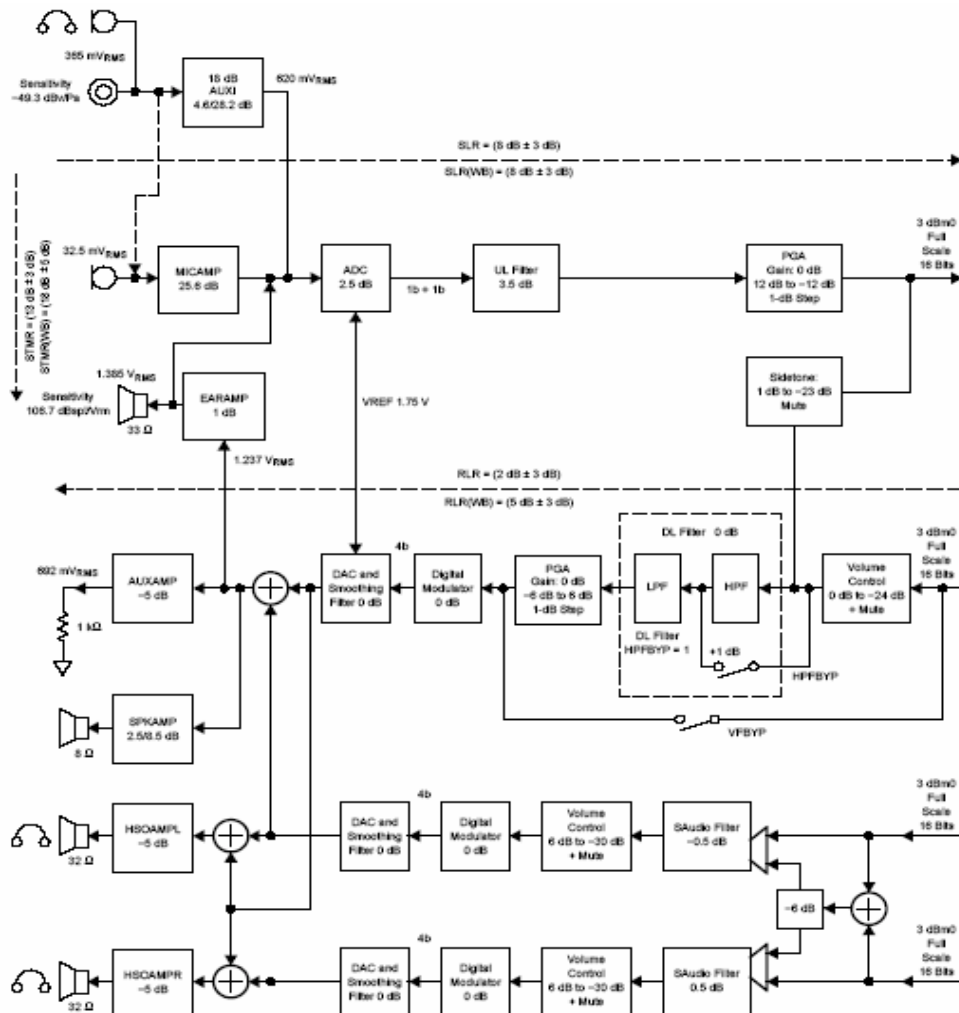


Figure 10. Audio Interface Block Diagram

### 3. H/W Circuit Description

#### 3.5.3. Audio uplink processing

The VUL path includes two input stages. The first stage is a microphone amplifier, compatible with electric microphones containing an FET buffer with open drain output. The microphone amplifier has a gain of typically 25.6 dB and a bias generator provides an external voltage of 2.0 V to 2.5 V to bias the microphone (MICBIAS terminal). The auxiliary audio input can be used as an alternative source for higher level of speech signals. This stage performs single-ended-to-differential conversion and provides a programmable gain of 4.6 dB or 28.2 dB. The input of the auxiliary audio stage and the microphone biasing voltage can also be available on the headset microphone terminals (HSMIC and HSMICBIAS). When the auxiliary audio input is used, the microphone input is disabled and powered down. The auxiliary audio input and the headset microphone gain stage can't be active at the same time. The auxiliary audio input and the headset microphone input can be used as differential inputs of the microphone amplifier, the microphone input terminals are then set to a high impedance state and a biasing voltage can be available on the HSMICBIAS or MICBIAS terminal. The resulting fully differential signal is fed to the analog-to-digital converter (ADC) which is determined by the value of the internal voltage reference. The analog-to-digital conversion is performed by a third-order  $\Sigma$ - $\Delta$  modulator with a sampling rate of 1 MHz/2 MHz.

Output of the ADC is fed to a speech digital filter, which performs the decimation down to 8 kHz/16 kHz and band-limits the signal with both low-pass and high-pass transfer functions. Programmable gain can be set digitally from 12 dB to +12 dB in 1-dB steps and is programmed with bits 40 (VULPG(4:0)) of the voiceband uplink register (see Section 5.3.10.4). The speech samples are then transmitted to the DSP via the VSP at a rate of 8 kHz/16 kHz. Programmable functions of the VUL path, power-up, input selection, and gain are controlled using the BSP or the USP serial interfaces. The VUL path can be powered down using bit 0 (VULON) of the power down register

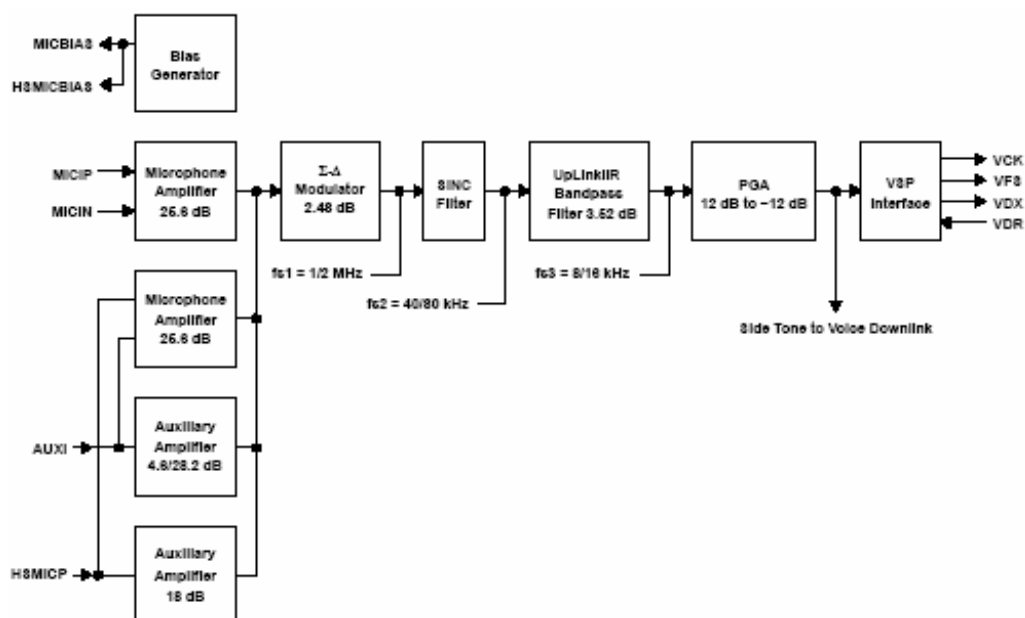


Figure 11. Uplink Path

### 3.5.4. Audio downlink processing

The VDL path receives speech samples at the rate of 8 kHz/16 kHz from the DSP via the VSP and converts them to analog signals to drive the external speech transducer. The digital speech coming from the DSP is first fed to a speech digital filter that has two functions. The first function interpolates the input signal and increases the sampling rate from 8 kHz/16 kHz up to 40 kHz/80 kHz to allow the digital-to-analog conversion to be performed by an over-sampling digital modulator. The second function band-limits the speech signal with both low-pass and high-pass transfer functions. The filter and PGA gain can be bypassed by programming bit 9 (VFBYP) in the voiceband control register 1 (see Section 5.3.10.1). The highpass of the speech downlink filter can be bypassed using bit 3 (HPFBYP) of the audio control register. The interpolated and band-limited signal is fed into a second order  $\Sigma$ - $\Delta$  digital modulator sampled at 1MHz or 2 MHz to generate a 4-bit (9-level) over-sampled signal. This signal is then passed through a dynamic element matching block and then to a 4-bit digital-to-analog converter (DAC). Due to the over-sampling conversion, the analog signal obtained at the output of the 4-bit DAC is mixed with a high frequency noise. Because a 4-bit digital output is used, a first-order RC filter (included in the output stage) is enough to filter this noise. The volume control and the programmable gain are performed in the TX digital filter. Volume control is performed in steps of 6 dB from 0 dB to 24 dB. In the mute state, attenuation is higher than 40 dB. A fine adjustment of gain is possible from 6 dB to +6 dB in 1-dB steps to calibrate the system depending on the earphone characteristics. This configuration is programmed with the voiceband control register.

The earphone amplifier provides a full differential signal on the terminals EARP and EARN, and an auxiliary output amplifier provides a single signal on terminals AUXO. The 8- $\Omega$  speaker amplifier provides a differential signal on the SPKP and SPKN terminals. The VDL path can be powered down by bit 1 (VDLON) of the power down register

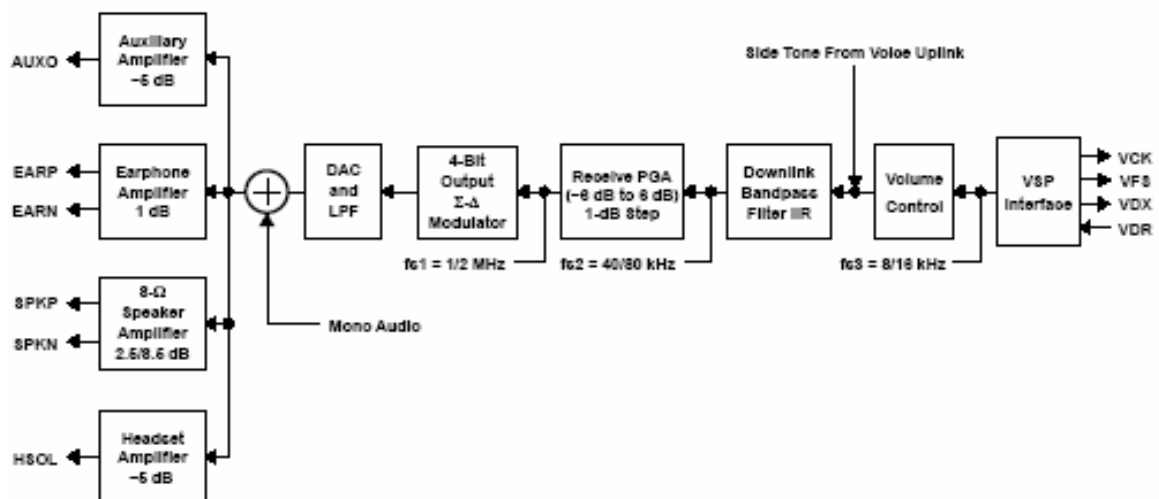


Figure 12. Downlink Path

### 3. H/W Circuit Description

#### 3.5.5. Baseband Codec (BBC)

Baseband codec is composed of baseband uplink path (BUL) and baseband downlink path (BDL). BUL makes GMSK (Gaussian Minimum Shift Keying) modulated signal which has In-phase (I) component and quadrature (Q) component with burst data from DBB. This modulated signal is transmitted through RF section via air. BDL process is opposite procedure of BUL. Namely, it performs GMSK demodulation with input analog I&Q signal from RF section, and then transmit it to DSP of DBB chip with 270.833kHz data rate through BSP.

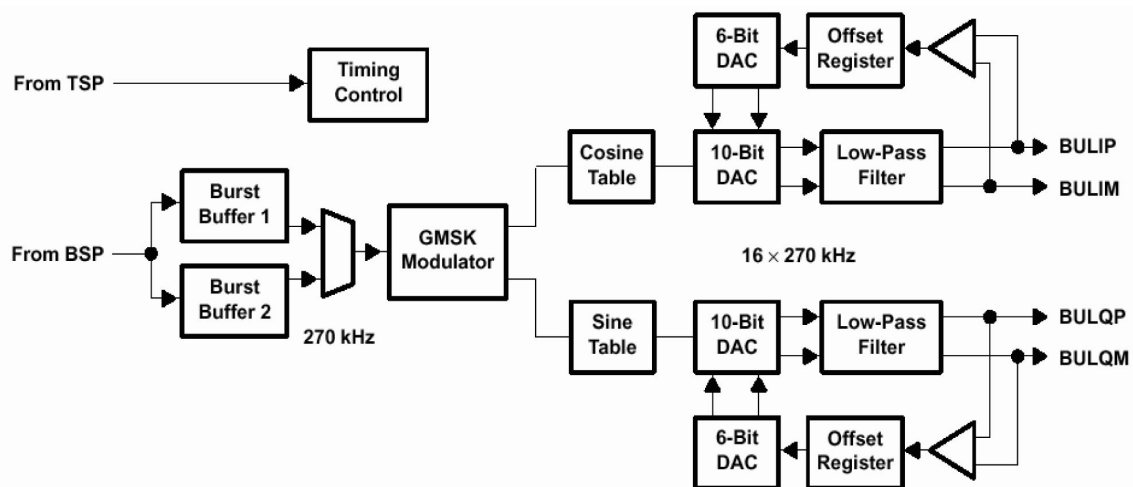
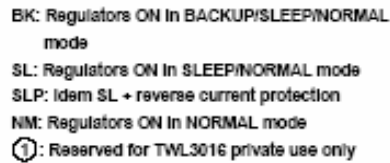


Figure 13. Baseband Codec Block Diagram

#### 3.5.6. Voltage Regulation (VREG)

There are 7 LDO (Low Drop Output) regulators in ABB chip. The output of these 7 LDOs are as following table. (Figure14) shows the power supply related blocks of DBB/ABB and their interfaces in MG220.



### Figure 14. Power Supply Scheme

### 3. H/W Circuit Description

---

|       | Output Voltage | Usage                    |
|-------|----------------|--------------------------|
| VRDBB | 1.5V           | Digital Core of DBB      |
| VRIO  | 2.8V           | Peripheral devices       |
| VRMEM | 2.8V           | External memory          |
| VRRAM | 2.8V           | LCD & peripheral devices |
| VRABB | 2.8V           | Analog Block of ABB      |
| VRSIM | 2.85V          | SIM card driver          |
| VRRTC | 1.5V           | RTC & 32kHz-crystal      |

**Table 3-7. LDO Output Table**

#### 3.5.7. ADC Channels

ABB ADC block is composed of 4 internal ADC (Analog to Digital Converter) channels and 4 external ADC channel. This block operates charging process and other related process by reading battery voltage and other analog values.

| ADC 8 Channels |             |                     |
|----------------|-------------|---------------------|
| Resource       | Name        | Description         |
| VCHG           | VCHG        | Charging Management |
| VBAT           | VBAT        |                     |
| ICHG           | ICHG        |                     |
| VBACKUP        | VBACKUP     | Backup Battery      |
| ADCIN1         | ADIC1       | PCB_Revision        |
| ADCIN2         | BATT_TEMP   | Battery Detect      |
| ADCIN3         | TEMPSENSE   | Temperature Sensing |
| ADCIN4         | HOOK_DETECT | HOOK_DETECT         |

**Table 3-8. ADC Channel Spec.**

### 3.5.8. Charging

Charging block in ABB processes charging operation by using VBAT, ICHG value through ADC channel. Battery Block Indication and SPEC of MG220 is as follow.



**Figure 15. Battery Block Indication**

1. Charging method: CC-CV
2. Charger detect voltage: about 5.2V
3. Charging time: 3h under
4. Icon stop current: 100mA
5. Charging current: 500mA
6. CV voltage: 4.2V
7. Cutoff current: 100mA
8. Full charge indication current (icon stop current) : 100mA
9. Recharge voltage: 4.16V
10. Low battery alarm
  - a. Idle: 3.62V
  - b. Dedicated: 3.50V
11. Low battery alarm interval :
  - a. Idle: 3min
  - b. Dedicated: 1min
12. Power-off voltage without TA : 3.35V  
Power-off voltage with TA : 2.80V
13. Charging temperature ADC range
  - a. ~ -5°C : small charging operation.
  - b. -5°C ~ 50°C : charging.
  - c. 50°C ~ : small charging operation.

## 3. H/W Circuit Description

---

### 3.5.9. Switch On/Off

MG220 Power State : Defined 4cases as follow

- Power-ON : mobile is powered by main battery or backup battery.
- Power-OFF : mobile isn't any battery.
- Switch-ON : mobile is powered and waken up from switch-off state.
- Switch-OFF : mobile is powered to maintain only the permanent function (ULPD).

To enter into Switch-ON state, one of following 4 condition is satisfied.

- **PWR-ON** : pushed after a debouncing time of 30ms.
- **ON\_REMOTE** : After debouncing, when a falling edge is detected on RPWON pin.
- **IT\_WAKE\_UP** : When a rising edge is detected on RTC\_ALARM pin.
- **CHARGER\_IC** : When a charger voltage is above VBAT+0.4V on VCHG.

### 3.5.10. Memories

MG220 using 128Mbit Flash + 64Mbit SRAM with 16 bit parallel data bus thru ADD01 ~ ADD22.

### 3.5.11. Display & FPCB Interface

LCD module include:

- MAIN LCD: 128\*128, 65,000 Color STN LCD
- SUB LCD: 96\*64, Mono
- LCD Backlight: White LED illumination

Camera module include:

- Camera : 0.3M Pixel ( VGA Camera )

MAIN BOARD AND FPCB is connected by 40pin connector. FPCB have two connectors , both connectors have 40pins. FPCB and MAIN BOARD is connected by 40 pin connector. LCD module is connect by 40pin connector .

### 3. H/W Circuit Description

#### Connector Interface Spec.

| Pin # | WS         |  | Description                  |
|-------|------------|--|------------------------------|
| 1     | GND        |  | Ground                       |
| 2     | L_D(0)     |  | LCD Data                     |
| 3     | L_D(1)     |  | LCD Data                     |
| 4     | L_D(2)     |  | LCD Data                     |
| 5     | L_D(3)     |  | LCD Data                     |
| 6     | L_D(4)     |  | LCD Data                     |
| 7     | L_D(5)     |  | LCD Data                     |
| 8     | L_D(6)     |  | LCD Data                     |
| 9     | L_D(7)     |  | LCD Data                     |
| 10    | LCD_RESET  |  | Reset                        |
| 11    | LCD_ID     |  | LCD ID detect                |
| 12    | L_MAIN_CS  |  | MAIN LCD Chip select         |
| 13    | L_SUB_CS   |  | SUB LCD Chip select          |
| 14    | L_WR       |  | LCD Write                    |
| 15    | L_A(1)     |  | LCD Address                  |
| 16    | IFMODE     |  | Interface mode setting       |
| 17    | 2V85_CAM   |  | Camera IC Power (2.8V)       |
| 18    | C_PWR_DVDD |  | Camera Sensor Digital Power  |
| 19    | VIB        |  | Vibrator                     |
| 20    | GND        |  | Ground                       |
| 21    | C_PWR_AVDD |  | Camera Sensor Analog Power   |
| 22    | C_PWDN     |  | Camera Sensor Power Down Pin |
| 23    | C_MCLK     |  | Camera Sensor MCLK           |
| 24    | C_PCLK     |  | Camera Sensor PCLK           |
| 25    | C_HS       |  | Camera Sensor HS             |
| 26    | C_VS       |  | Camera Sensor VS             |
| 27    | C_SDA      |  | Camera Sensor SDA            |
| 28    | C_SCK      |  | Camera Sensor SCK            |
| 29    | C_RST      |  | Camera Sensor Reset          |
| 30    | GND        |  | Ground                       |
| 31    | GND        |  | Ground                       |
| 32    | C_CD7      |  | Camera Sensor Data           |
| 33    | C_CD6      |  | Camera Sensor Data           |
| 34    | C_CD5      |  | Camera Sensor Data           |
| 35    | C_CD4      |  | Camera Sensor Data           |
| 36    | C_CD3      |  | Camera Sensor Data           |
| 37    | C_CD2      |  | Camera Sensor Data           |
| 38    | C_CD1      |  | Camera Sensor Data           |
| 39    | C_CD0      |  | Camera Sensor Data           |
| 40    | GND        |  | Ground                       |
| 41    | VBACKUP    |  | Back Up Battery              |
| 42    | GND        |  | Ground                       |
| 43    | GND        |  | Ground                       |
| 44    | SPK_RCV_P  |  | Speaker Positive line        |
| 45    | SPK_RCV_N  |  | Speaker Negative line        |
| 46    | GND        |  | Ground                       |
| 47    | GND        |  | Ground                       |

Table 3-9. Connector Interface Spec.

### 3. H/W Circuit Description

#### 3.5.12. Keypad Switching & Scanning

Table 3-10. Keypad Map

|      | KBC0 | KBC1  | KBC2  | KBC3   | KBC4     |
|------|------|-------|-------|--------|----------|
| KBR0 | LEFT | RIGHT | UP    | DOWN   | OK       |
| KBR1 | 1    | 2     | 3     | SUTTER | CLEAR    |
| KBR2 | 4    | 5     | 6     | F1     | VOL_UP   |
| KBR3 | 7    | 8     | 9     | F2     | VOL_DOWN |
| KBR4 | STAR | 0     | SHARP | SEND   | F3       |

DBB supports 25 Key Map and Switch-ON Key is connected directly to ABB as (Figure16 ).

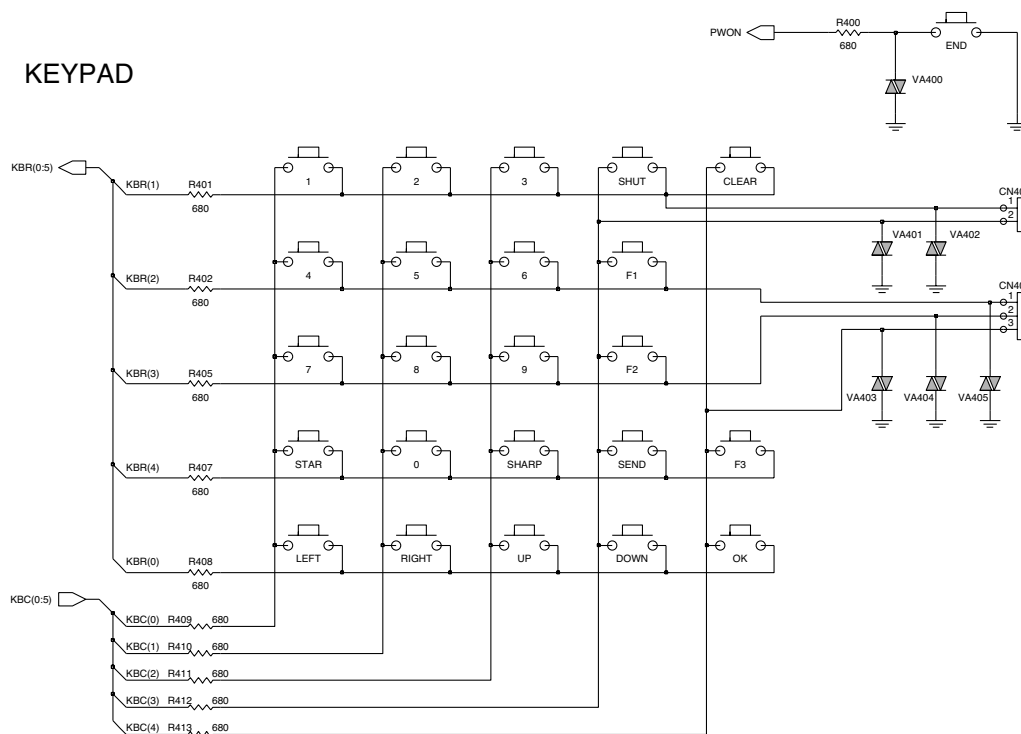


Figure 16. Keypad Scanning Scheme

### 3.5.13. Keypad back-light Illumination

There are 14 Deep Blue LEDs in Main Board for Keypad Backlight . Keypad Back-light is driven by 'LEDB' line from IOTA .

#### KEY BACKLIGHT

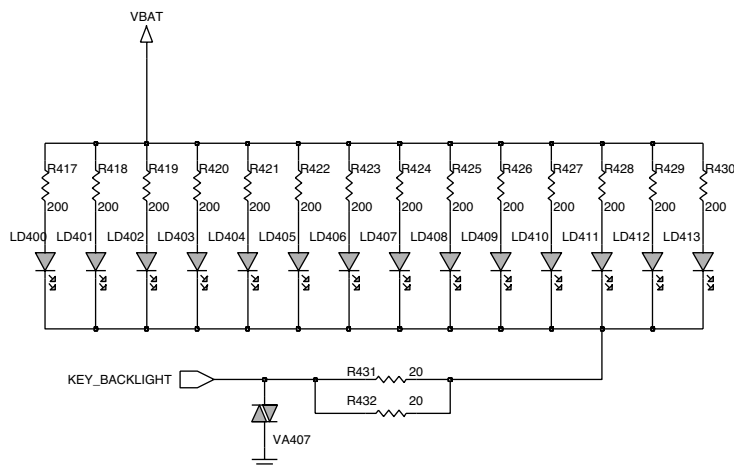


Figure 17. Keypad Back-light Scheme

### 3.5.14. LCD Illumination

There are 3 LEDs in the LCD module for LCD backlighting. MLED1, MLED2 and MLED3 are connected charge pump driver ic via FPCB.

#### CHARGE PUMP

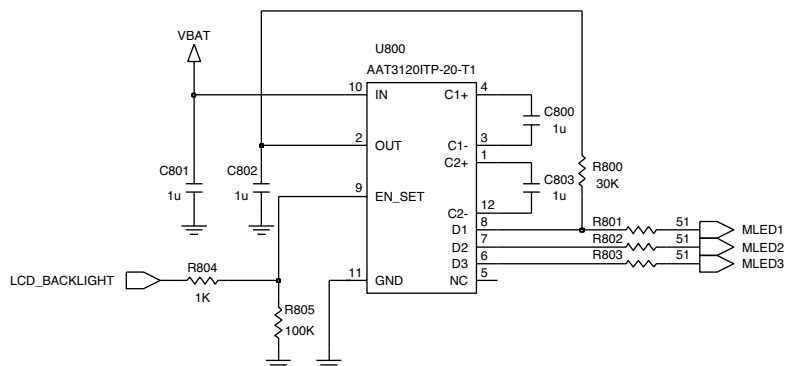


Figure 18. LCD Back-light Scheme

### 3. H/W Circuit Description

#### 3.5.15. Audio Circuit

##### Microphone circuits

#### MICROPHONE

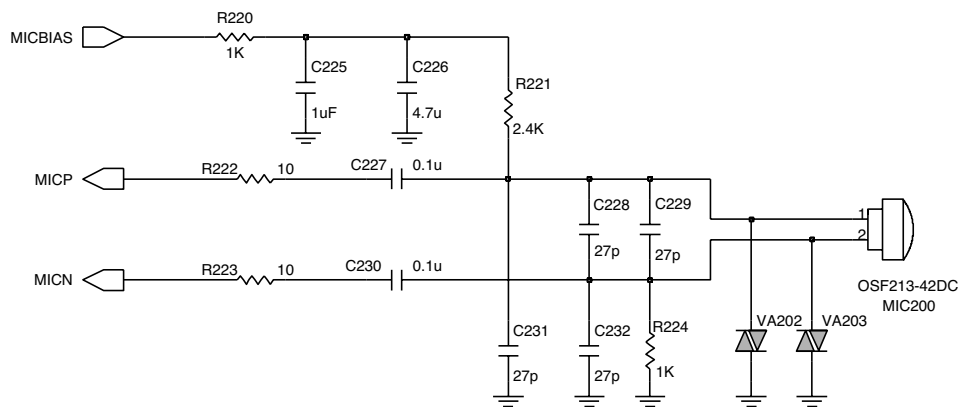
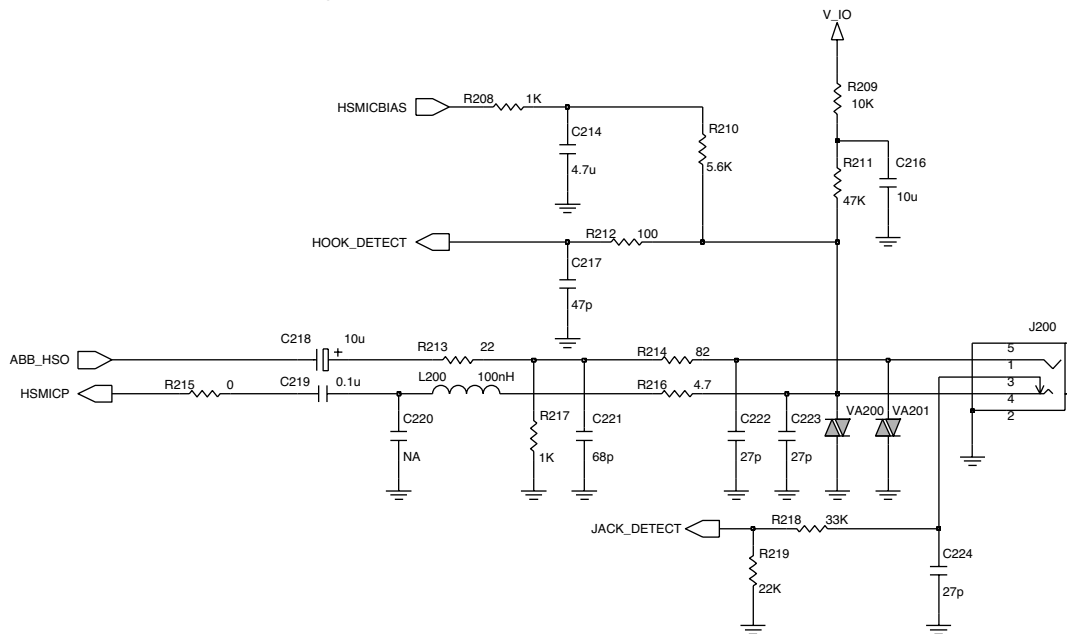


Figure 19. Microphone system

When a call is established, MICBIAS signal goes up to '2.5V' in the MG220. IOTA(ABB) provides both 2.0V and 2.5V for MICBIAS to circuit designer. VA202, VA203 are employed to enhance ESD immunity. Main Mic Circuit is same Upper MIC

#### Head set Jack Interface

##### Ear jack



**Figure 20. Ear-Jack interface**

When ear-mic set or head set plug is inserted into the receptacle, JACK\_DETECT signal which is input of ADIN1 in ABB changes from 'H' to 'L'. If hook button is pushed for a second to make a call, then HOOK\_DETECT signal which is input of ADIN4 in ABB goes from 'H' to 'L'. Two signal is separate by the level of ADIN4 input port. If the level of ADIN4 is 0.00V ~ 0.14V, the pin means 'hook-detect' signal set, and If the level of ADIN1 is 0.14V ~ 1.60V, the pin mean 'jack-detect' signal set. Also call end has same mechanism by pushing hook button on the Ear- microphone strap. Ordinarily detection of pushing hook button is established by signal de-bouncing for about 20ms.

### 3. H/W Circuit Description

#### MIDI SOUND circuit description

##### 40 POLY MELODY CHIP

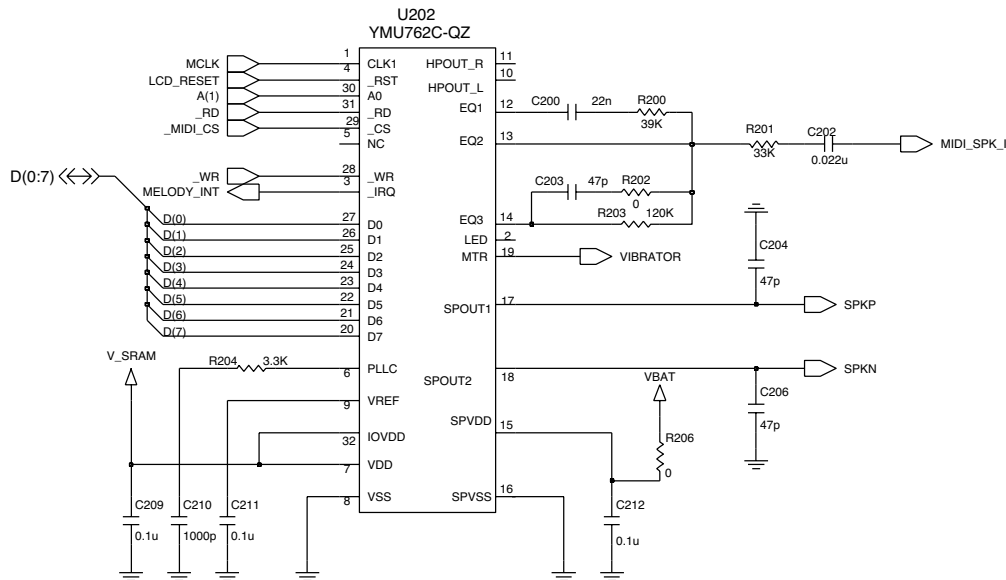


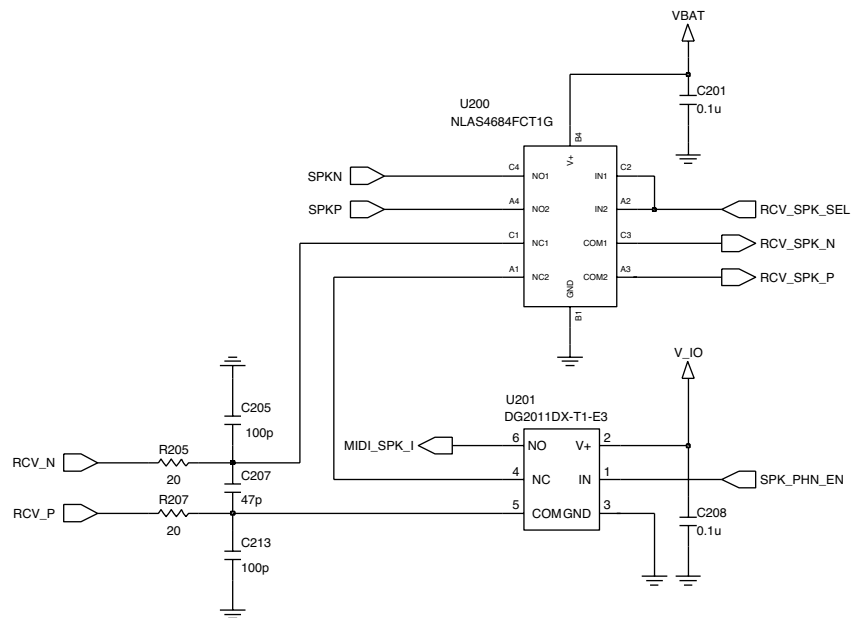
Figure 21. MIDI sound Circuit

The YM762 has features as described below.

- Simultaneous generation of up to 40 tones:
- Voice Synthesis function by HV Synthesizer.
- Time Fluctuation Low-pass Filter function by AL Synthesizer.
- ADPCM/PCM stream playback.
- Default voices for FM and Wave Table synthesizer are in a ROM, and voice registration to SRAM is possible.
- Digital Audio Input function. (Valid only for slave mode.)
- Digital Audio Output function. (Fixed to  $F_s=48$  kHz. Valid only for master mode.)
- Speaker Amplifier and Equalizer circuit are integrated.
- Stereo head phone amplifier and bus boost circuit are integrated.
- External output amplifier is integrated.
- PLL is integrated. Master clock input up to 27 MHz is available. TCXO available
- 16-bit stereo D/A converter is integrated.

#### Receiver and Speaker circuit

#### COMMON MODE SPEAKER DISTRIBUTOR



**Figure 22. Receiver and Speaker Circuit**

A single analog switch is employed to support both voice and speaker phone mode with RCV\_P. In the speaker phone mode the SPK\_PHN\_EN port sets 'H', then the RCV\_P will be connected with MIDI sound path(NO) and operate as loud speaker. The other case, the SPK\_PHN\_EN port will remain 'L' state and RCV\_P will be connected with receiver path RCV\_SPK\_P(NC2)on dual analog switch.

### 3. H/W Circuit Description

#### 3.5.16. Camera Circuit

Under camera action mode, MV3018SAQ wholly controls LCD by itself to execute camera functions, while, under bypass mode, MV3018SAQ lets all LCD driver-related signals bypass it, as if it does not exist at all in the system.

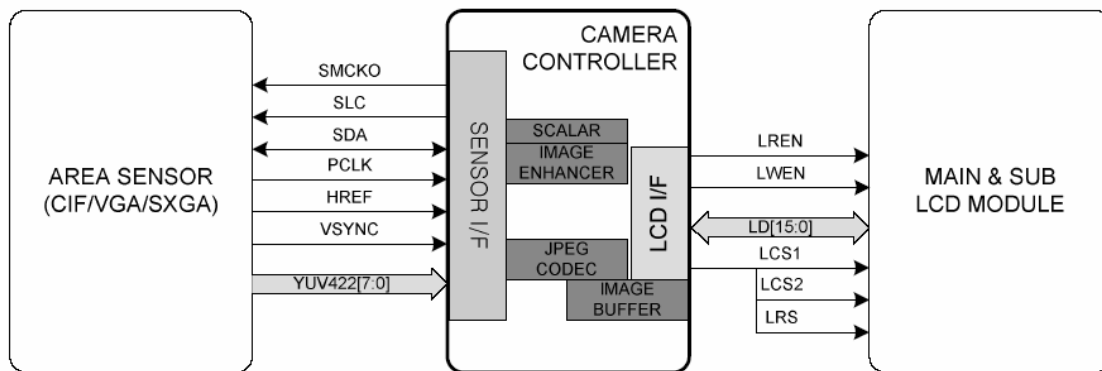


Figure 23. Camera Circuit Block Diagram

General description of MV3018SAQ Camera chipset.

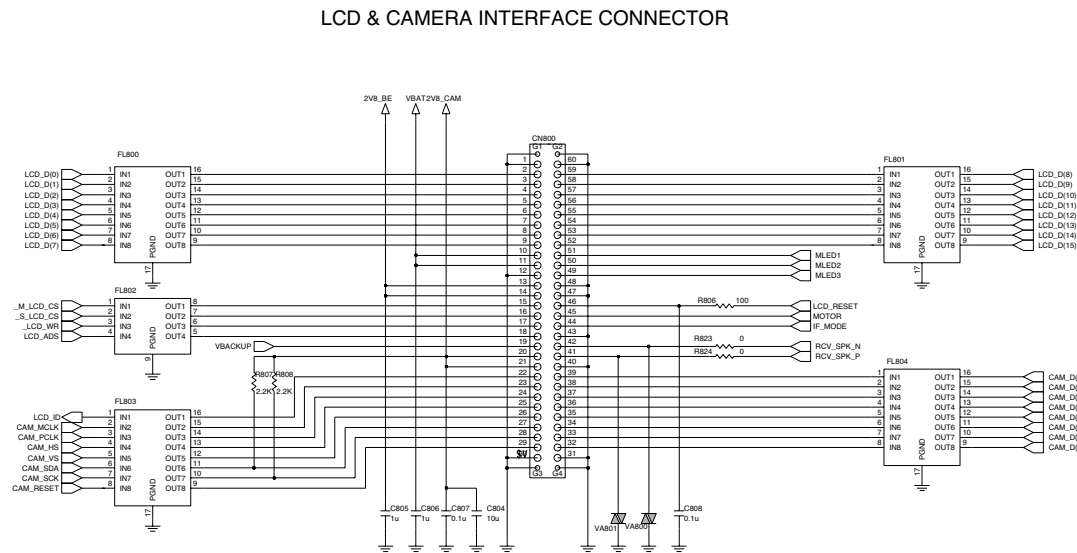
- External Clock Source Up to 24 MHz
- Support Standard SRAM Interface (6bit Address & 16bit Data) for CPU Interface
- 1 Mbit SRAM
- Support LCD Signal By-pass Mode
- Support three General Port IO
- 8 x 8 81pin CABGA Package



### 0.3M Pixel Camera use 2.8V



### 3. H/W Circuit Description



**Figure 26. LCD Connection thru Camera chip**

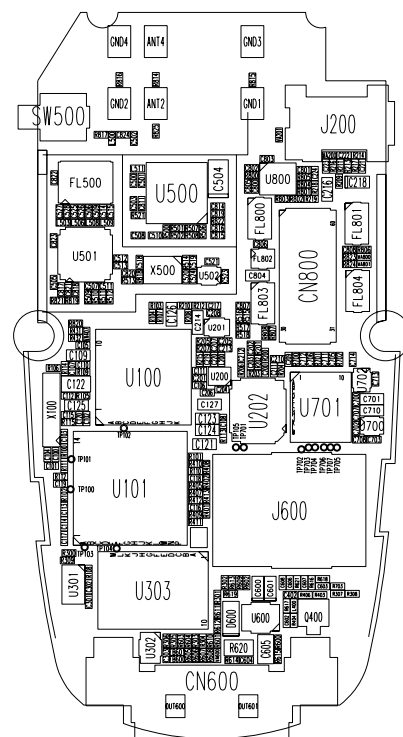
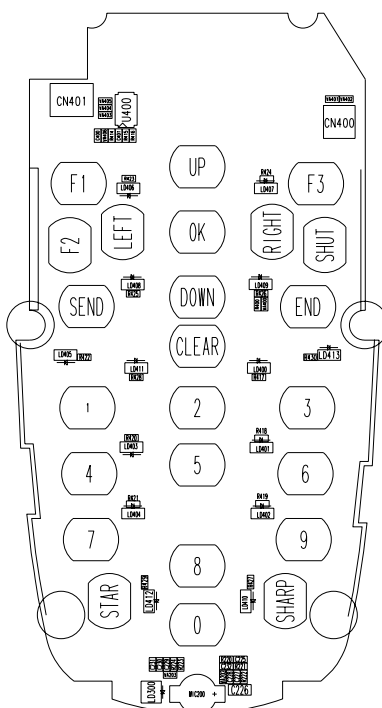
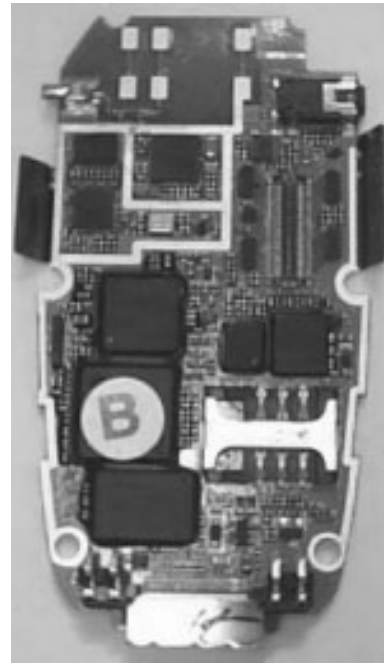
#### 3.5.18 CMOS Image Sensor

General description of CIS Camera Module

- VGA resolution
- 5.04mm x 5.04mm active square pixel
- 1/4.5 inch optical format
- Bayer RGB color filter array
- Micro-lens for high sensitivity
- Low Power Operation : Voltage Range : 2.6V - 3.0V
- Max Frame rate : 30 frame/s at 25Mhz Master Clock (VGA)
- Package Types : CLCC 40LD, COB(Chip-on-Board), COF(Chip-on-Flex)
- 10-bit Digital Image Signal Data Bus
- Low Fixed Pattern Noise by Correlated Double Sampling
- Controllable full function through standard IIC bus
- External Power Down
- Programmable Power Down mode
- Auto Black level compensation
- Flexible exposure time control
- Strobe Control Signal generation for frame capture mode
- Programmable Video Windowing
- Integrated 10bit Analog to Digital Conversion
- Programmable Frame Rate up to 30frame/sec

## 4. TROUBLE SHOOTING

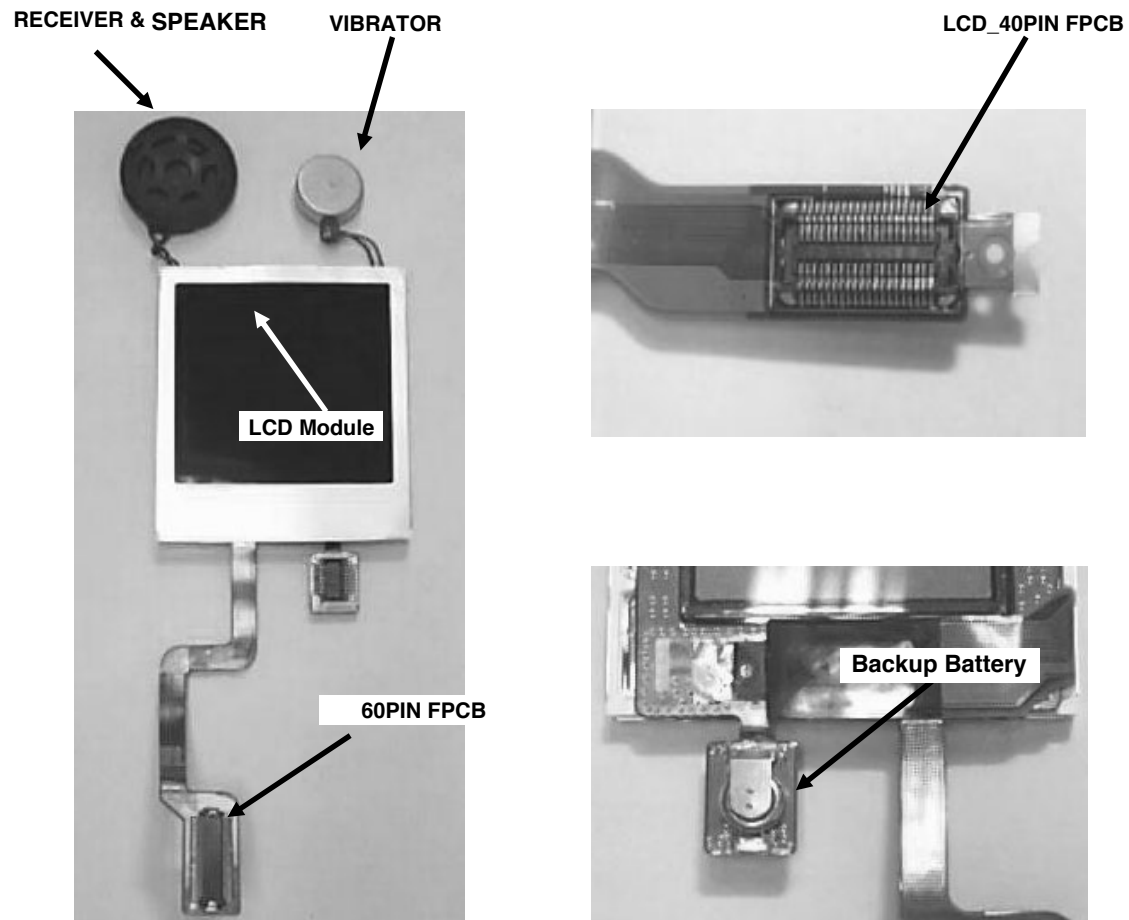
### 4.1 Main Components Placement



## 4. TROUBLE SHOOTING

---

### 4.2 FPCB Components Placement



### 4.3 Baseband Components



## 4. TROUBLE SHOOTING

---

### 4.4 Main Components (Description)

#### MAIN

|       |                                   |        |                            |
|-------|-----------------------------------|--------|----------------------------|
| U400  | Folder Switch                     | MIC200 | Microphone                 |
| CN800 | LCD connector                     | J200   | Ear-Mic jack               |
| U400  | LCD Back Light LED charge pump    | CN600  | IO connector               |
| SW500 | RF Mobile switch                  | U501   | RF Trnaceiver              |
| FL500 | Quad FEM                          | U500   | Power Amplifier Module     |
| U303  | Memory(Flash 128Mbit/SRAM 64Mbit) | U100   | Analog Base Band (IOTA)    |
| X500  | XTAL 26MHz                        | X100   | XTAL 32.768KHz             |
| U202  | MIDI chip(40poly)                 | U101   | Digital Base Band(Calypso) |
| U200  | DUAL SPDT ANALOG SWITCHES         |        |                            |
| J600  | SIM Connector                     |        |                            |
| U303  | Memory(Flash 128Mbit/SRAM 64Mbit) |        |                            |

#### UPPER

|      |                  |     |                          |
|------|------------------|-----|--------------------------|
| SPK  | Speaker/Receiver | CN1 | LCD 40Pin connect        |
| VIB  | Vibrator         | CN2 | Camera 20Pin connect     |
| RCV  | Receiver         | CN3 | Main_Upper 60pin Connect |
| BAT1 | Backup Battery   |     |                          |

## 4. TROUBLE SHOOTING

---

### 4.5 Power On Trouble

#### 4.5.1 Power On Sequence

##### Connecting Battery

- Power-On Key Detection
- PWON signal goes to ABB and then ABB reset DBB by ON\_OFF signal
- ON\_OFF turn low(1.5V) to HIGH(2.8V) and it resets Calypso

#### 4.5.2 Check Points

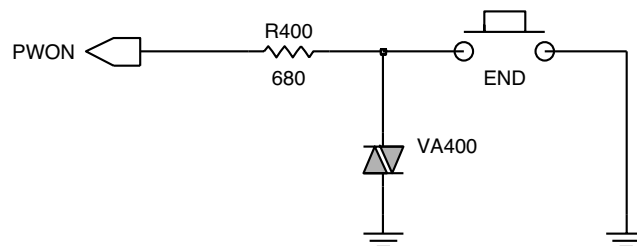
- Battery Voltage
- Power-On Key Detection (PWON signal)
- Outputs of LDOs

#### 4.5.3 Trouble Shooting Setup

- Connect PIF-UNION to the phone
- Set the TI-remote switch PIF-UNION off

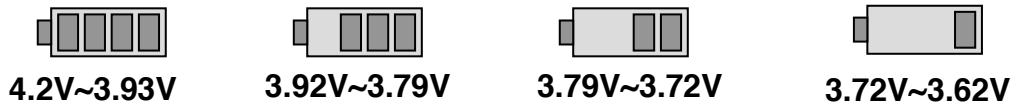
#### 4.5.4 Trouble Shooting Procedure

- Check Battery voltage
- END\_KEY Dome Switch condition
- Check the output voltages of all LDOs



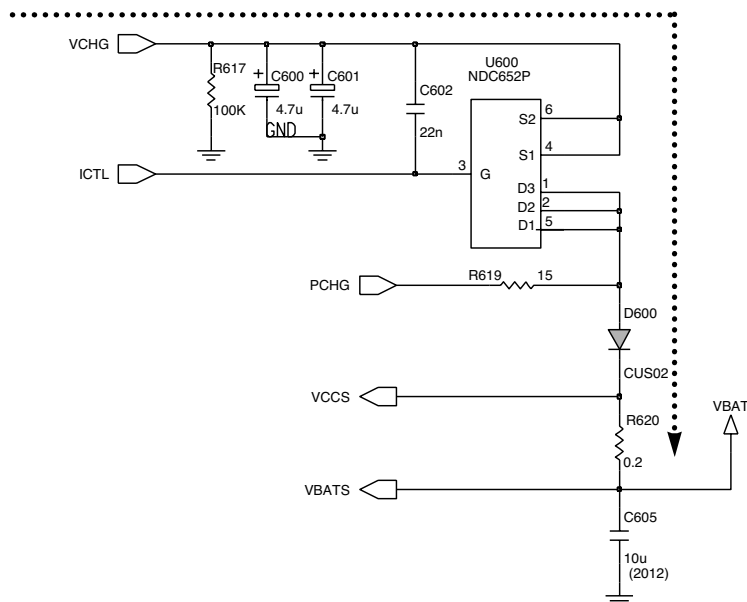
### 4.6 Charging Trouble

- Charging method : CC-CV
- Charger detect voltage : about 5.2V
- Charging time : 3h under
- Charging current : 500mA
- Cutoff current : 100mA
- Low battery alarm
  - Idle : 3.60V
  - Dedicated : 3.50V
- Switch-off voltage : 3.35V
- Charging temperature ADC range
  - $\sim -20^{\circ}\text{C}$  : small charging operation.
  - $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$  : charging.
  - $60^{\circ}\text{C} \sim$  : not charging operation small charging operation.



#### Block Diagram

#### CHARGING BLOCK Charging Current



## 4. TROUBLE SHOOTING

---

### Charging Procedure

- Connecting TA & Charger Detection
- Control the charging Current by ABB
- Charging Current flows into the Battery

### Check Points

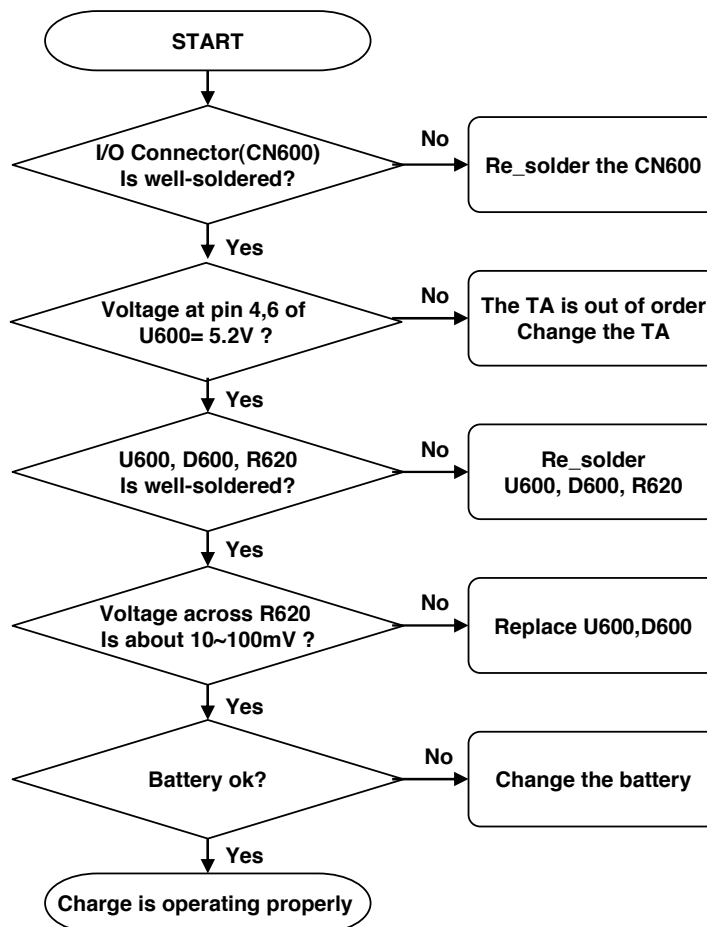
- Connection of TA
- Charging Current Path
- Battery

### Trouble Shooting Setup

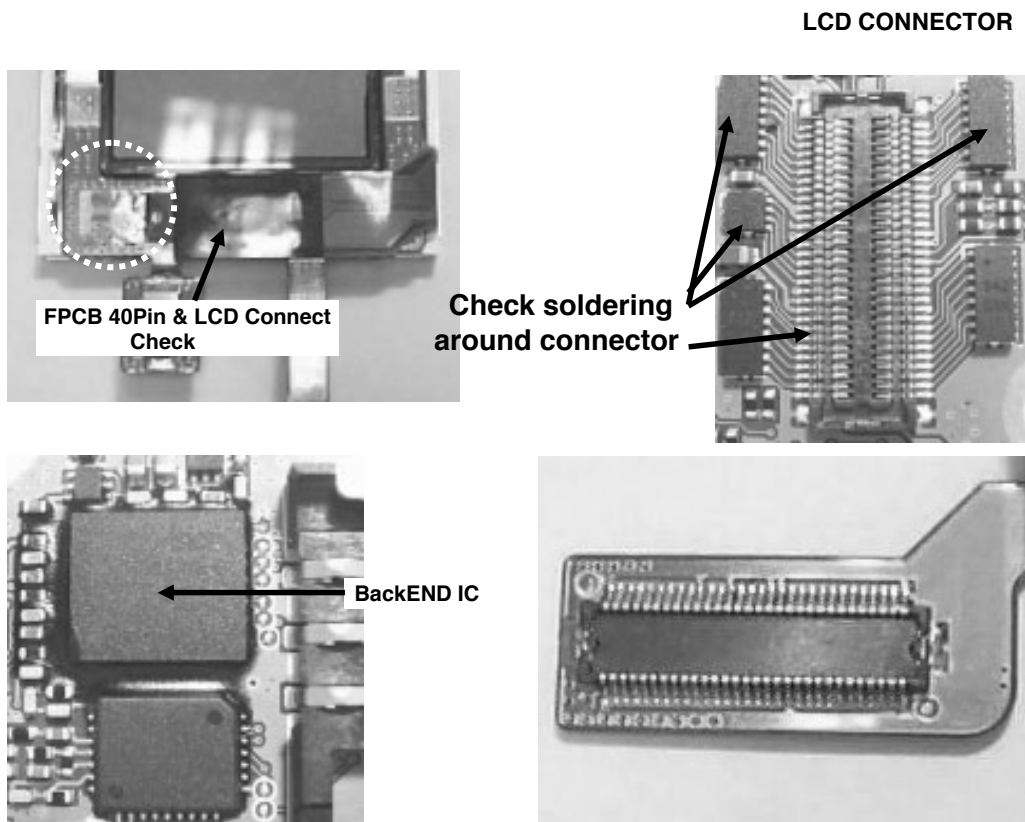
- Connect Battery & TA to the handset.

### Trouble Shooting Procedure

- Check the charger connector.
- Check the charging current path.
- Check the battery



### 4.7 LCD Display Trouble



#### LCD Control Signals From Main Board

- MLED , L\_MAIN\_CS, L\_SUB\_CS ,LCD\_RESET, L\_WR, LCD\_ID
- L\_A(1), L\_D(0)~L\_D(15), IFMODE

#### Check Points

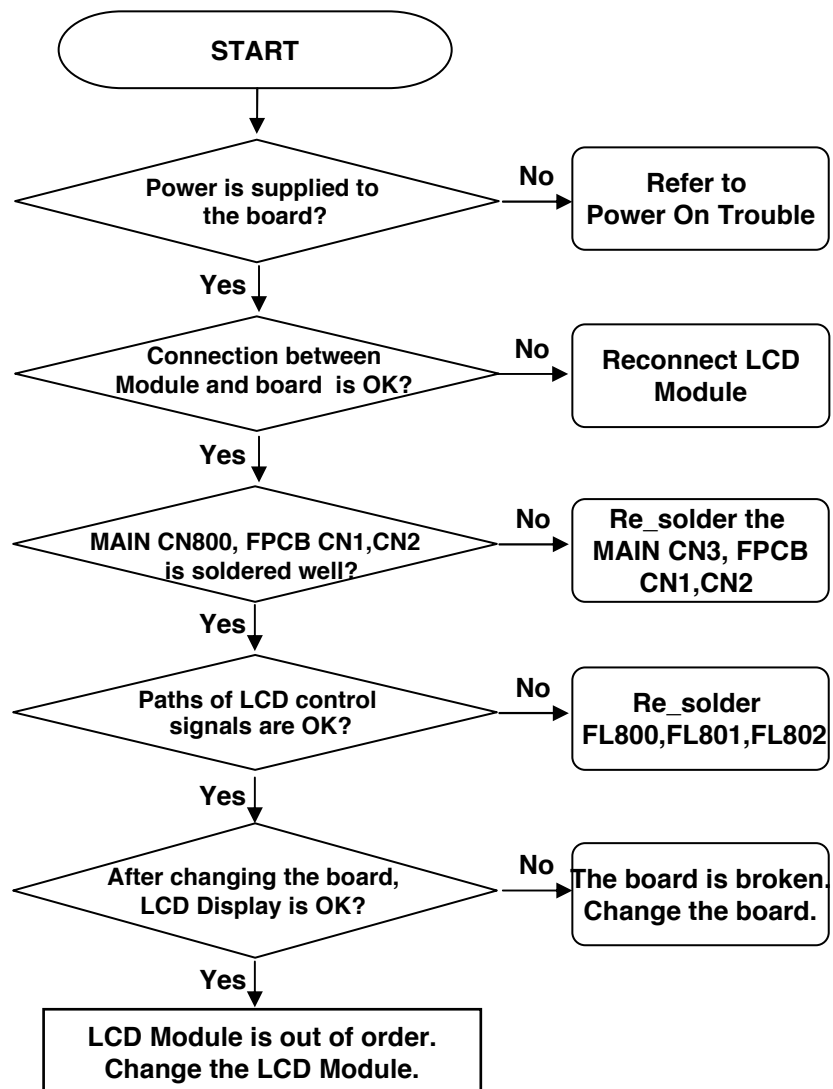
- The Assembly status of the LCD Module.
- The Soldering of connectors
- The FPCB which connects the LCD module with the main board.
- BackEND IC Soldering

#### Trouble Shooting Setup

- Connect PIF, and power on

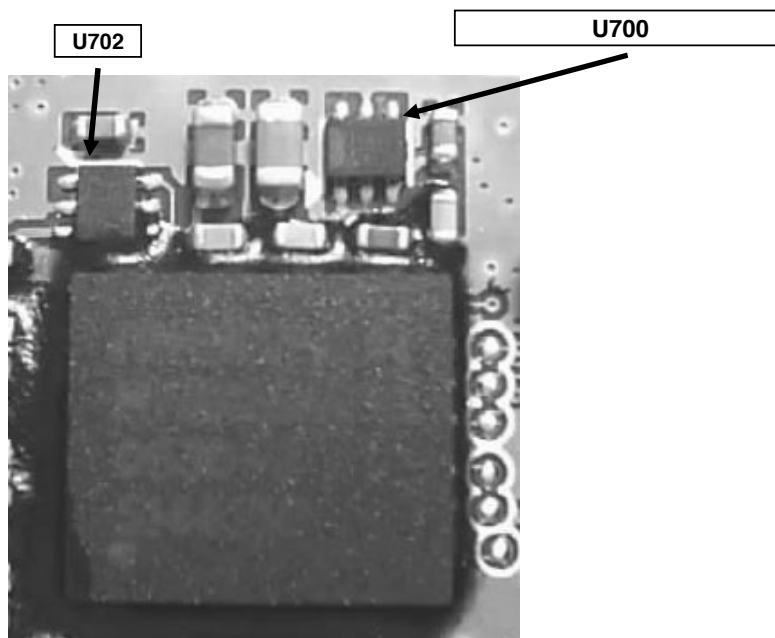
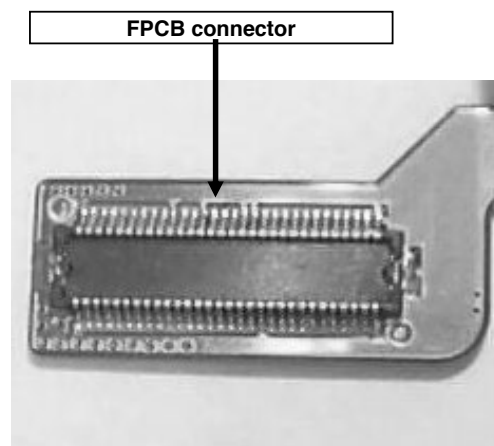
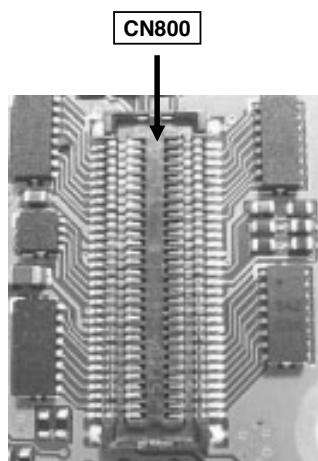
## 4. TROUBLE SHOOTING

---



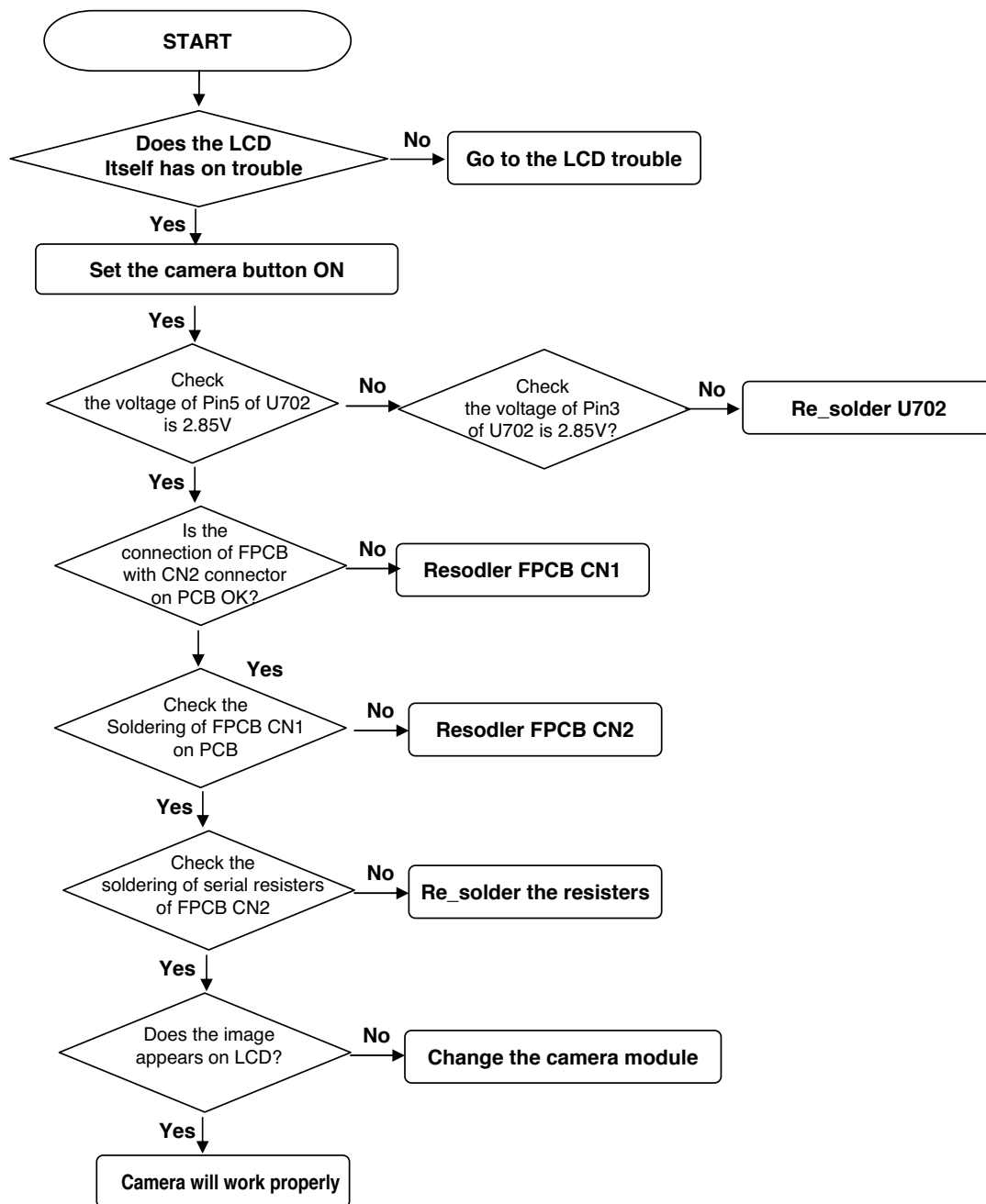
### 4.8 Camera Trouble

SETTING : Connect PIF, and remote switch ON at PIF



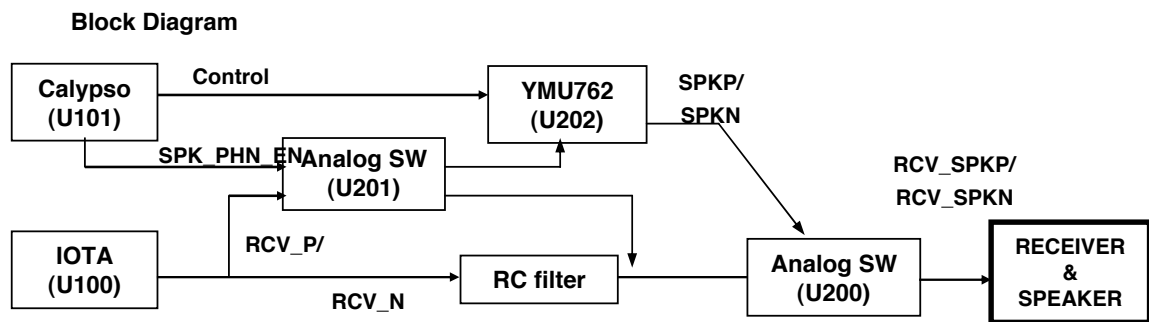
## 4. TROUBLE SHOOTING

---



### 4.9 Receiver Trouble

#### Block Diagram



#### Melody Generation

- U202(YMU762,MIDI) is controlled by DBB.
- U202 generates 40poly MIDI sound and it is delivered to the speaker

#### Signals to the receiver

- RCV\_N, RCV\_P From ABB
- RCV\_N, RCV\_P are delivered to Receiver

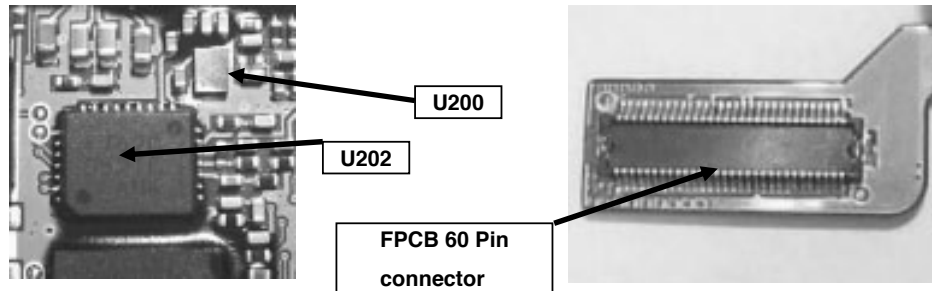
#### Check Points

- Audio signals from ABB
- Audio signals to the receiver
- Audio signal path
- Check the sound level to the speaker.
- Soldering of connectors, speaker and receiver
- Speaker
- Receiver

## 4. TROUBLE SHOOTING

---

### Speaker Part



### Receiver Part



### Receiver Trouble Shooting Setup

- Initialize GSM MS test equipment.
- Connect PIF-UNION and power on.
- Make a test call to 112.
- Set audio part at test equipment as PRBS or continuous wave, not echo.
- Set the audio volume max.

### Trouble shooting Procedure

- Check the audio signal levels at each point.
- Check the soldering of the connector.
- Check the soldering of the receiver.
- Check the receiver.
- Check receiver cable states.

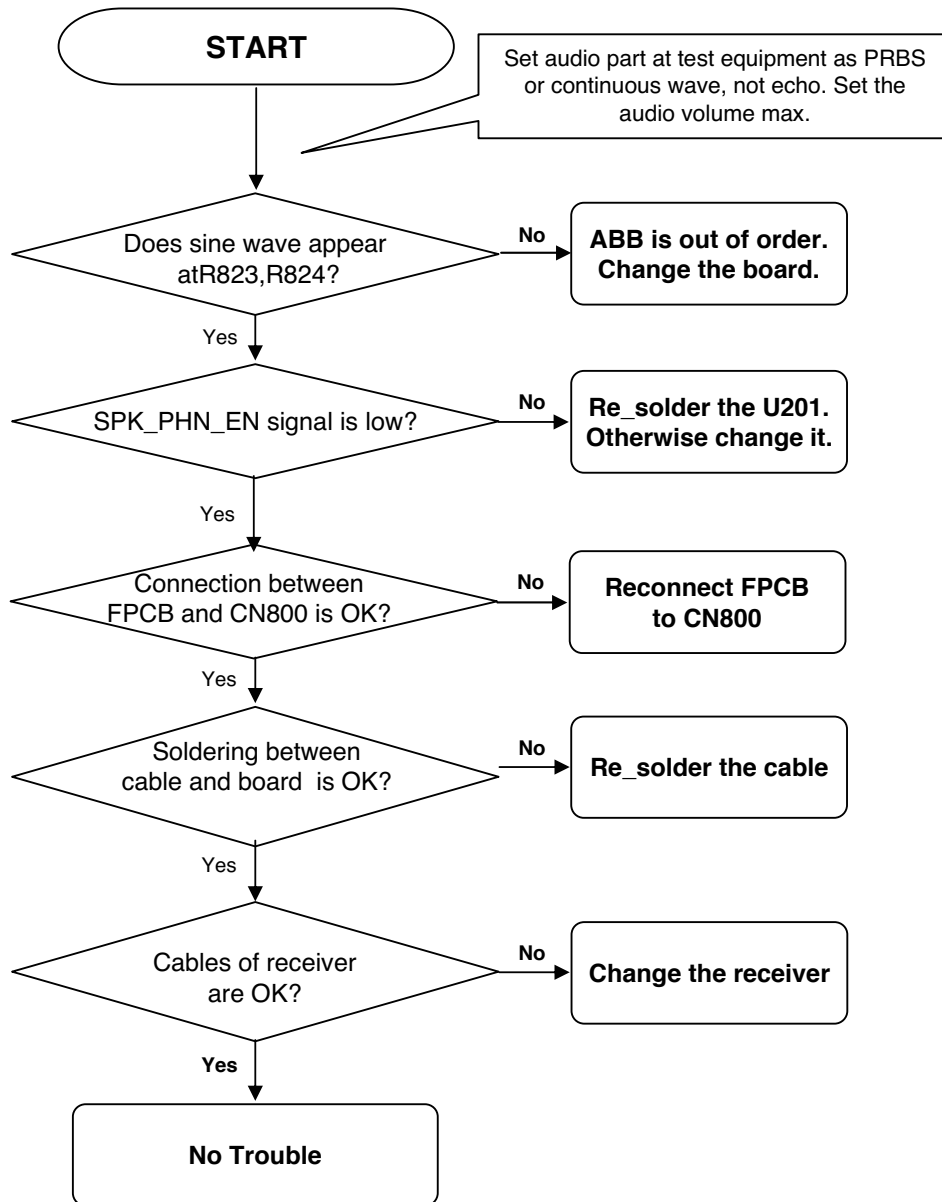
### Speaker Trouble Shooting Setup

- Connect PIF to the phone, and power on.
- Enter the engineering mode, and go to menu "Baseband → Alert → Ring"

### Trouble Shooting Procedure

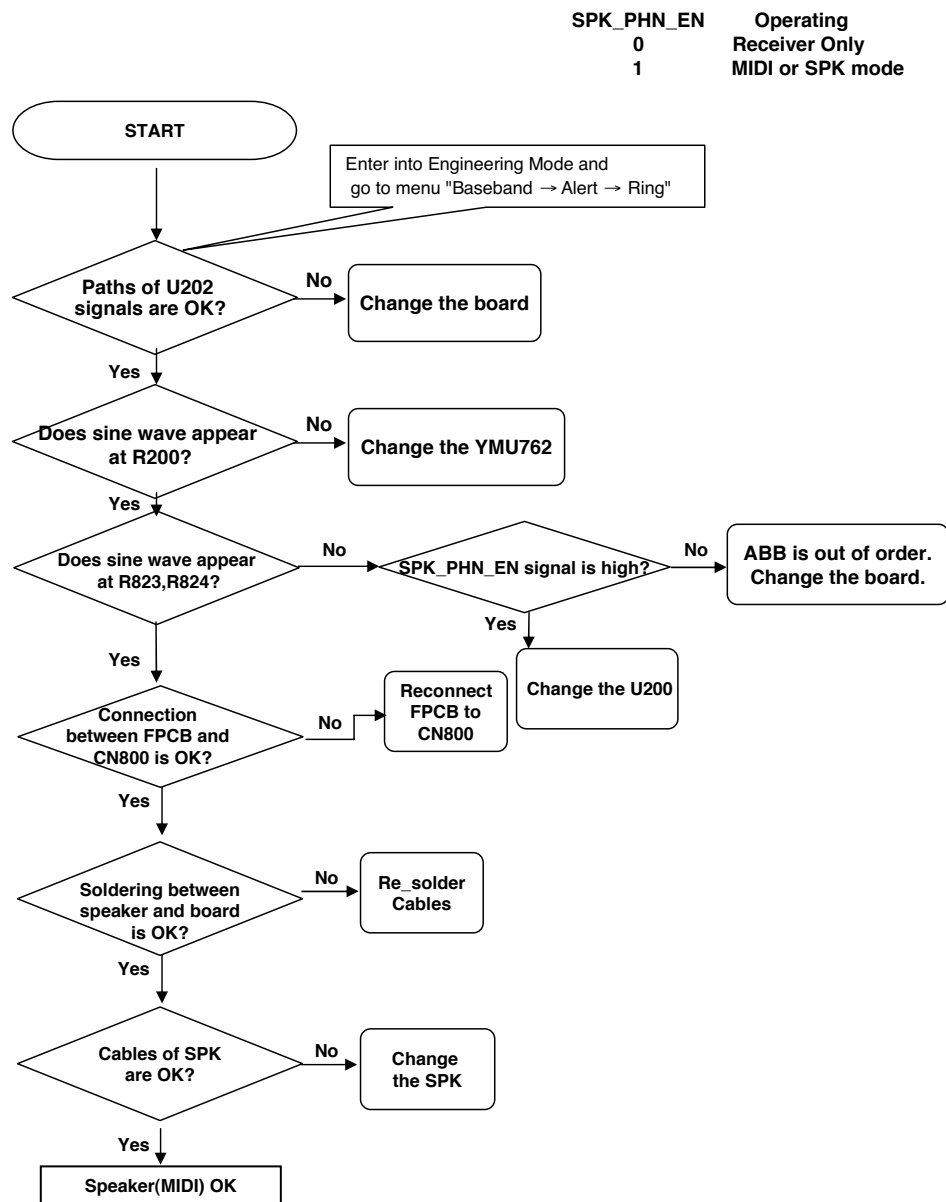
- Check the voltage levels of power supplies.
- Check all sound path.
- Check the sound level to the speaker.
- Check the speaker and the soldering.

### 4.9.1. Receiver Trouble



## 4. TROUBLE SHOOTING

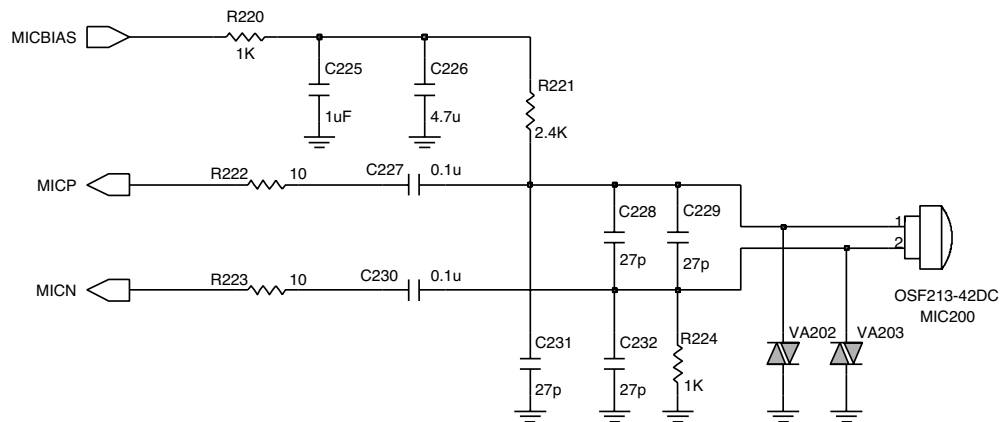
### 4.9.2. Speaker(MIDI) Trouble



### 4.10 Microphone Trouble

#### Circuit Diagram

#### MICROPHONE



## 4. TROUBLE SHOOTING

### Microphone Signal Flow

- MIC is enable by MICBIAS
- MICBIAS, MICP, MICN signals to ABB

### Check Points

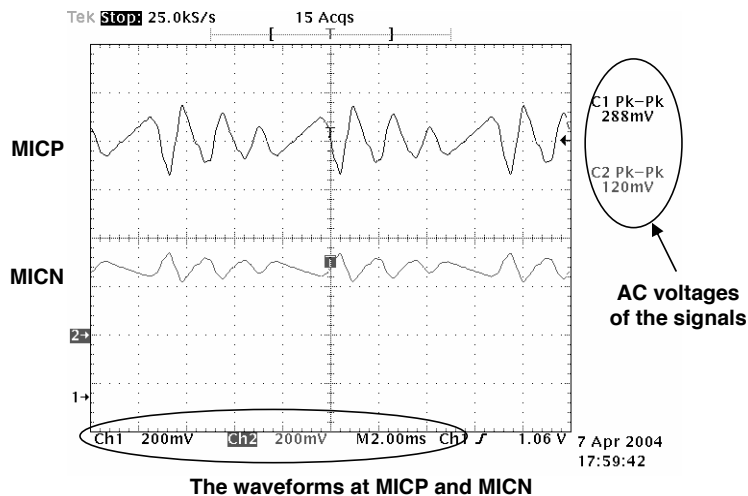
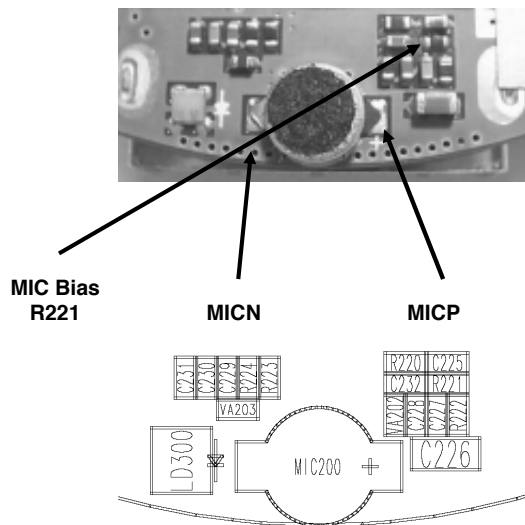
- Microphone bias
- Audio signal level of the microphone
- Soldering of components

### Trouble Shooting Setup

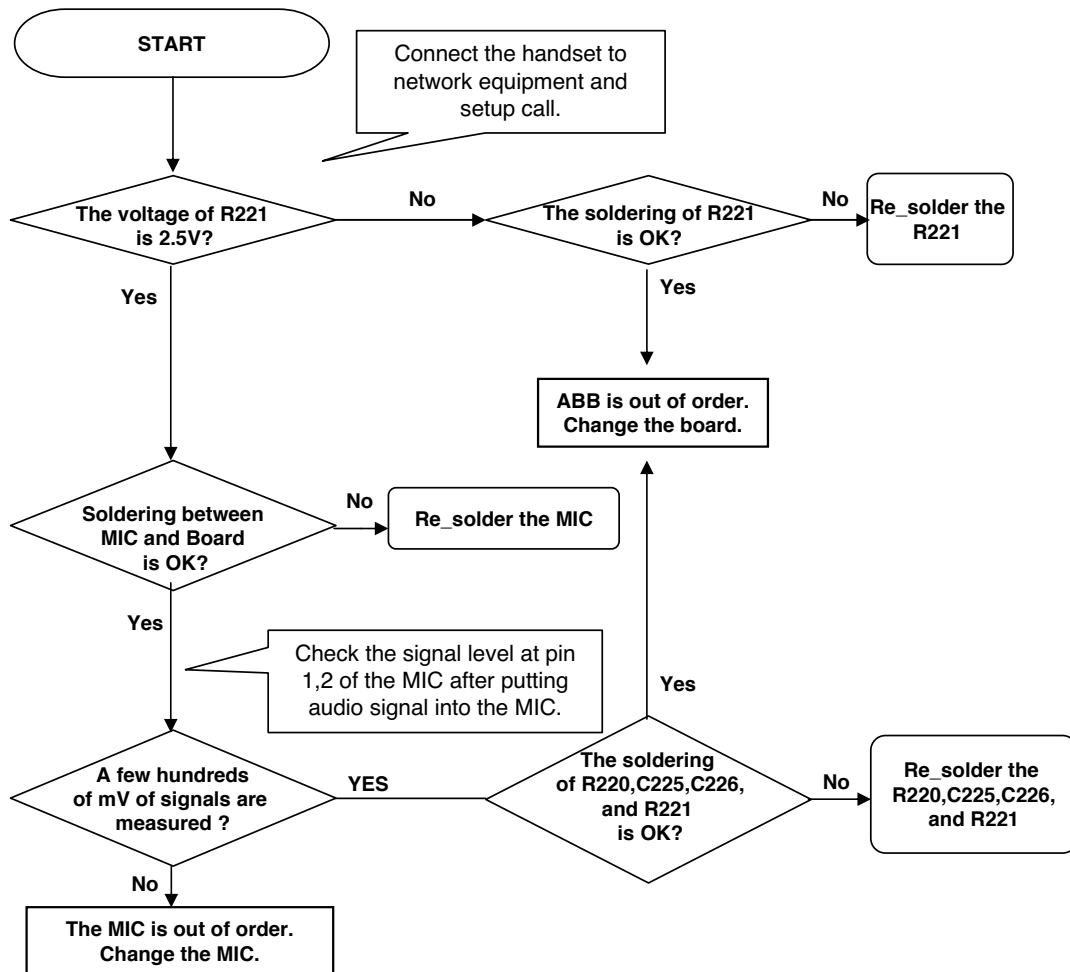
- Initialize GSM MS test equipment.
- Connect PIF-UNION to the phone, and power on.
- Make a test call to Any number.
- Make a sound in front of the microphone

### Trouble Shooting Procedure

- Check the bias of the microphone.
- Check the audio signal path.
- Check the soldering.
- Check the microphone.
- Check the operation of FPCB



## 4. TROUBLE SHOOTING

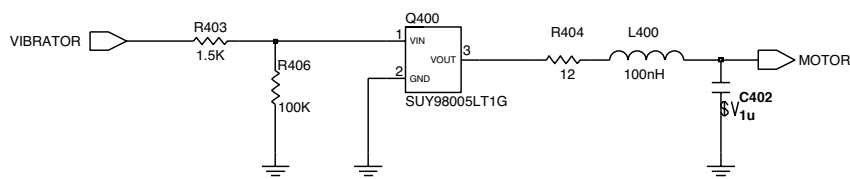


## 4. TROUBLE SHOOTING

### 4.11 Vibrator Trouble

#### Block Diagram

#### VIBRATOR



#### Vibrator Operation

- Vibrator is controlled by DBB GPIO
- When vibrator signal is high, vibrator is enabled

#### Check Points

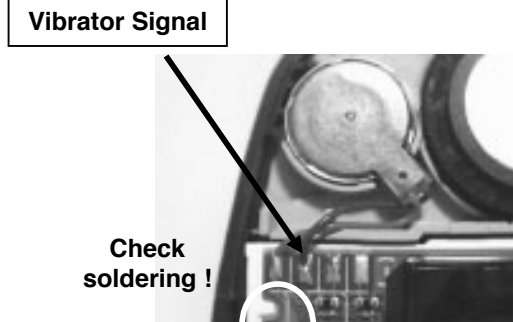
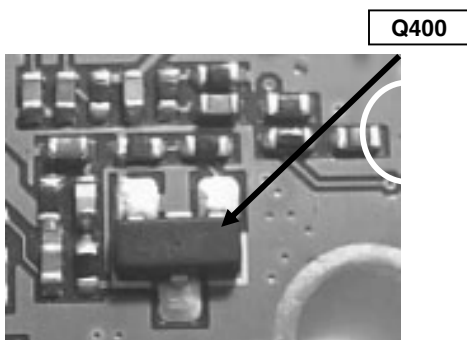
- VCC lines (VBAT) of Q400
- Vibrator signal path
- The connection between the main board and vibrator module
- The soldering of socket
- The Vibrator (t=2.7mm)

#### Trouble Shooting Setup

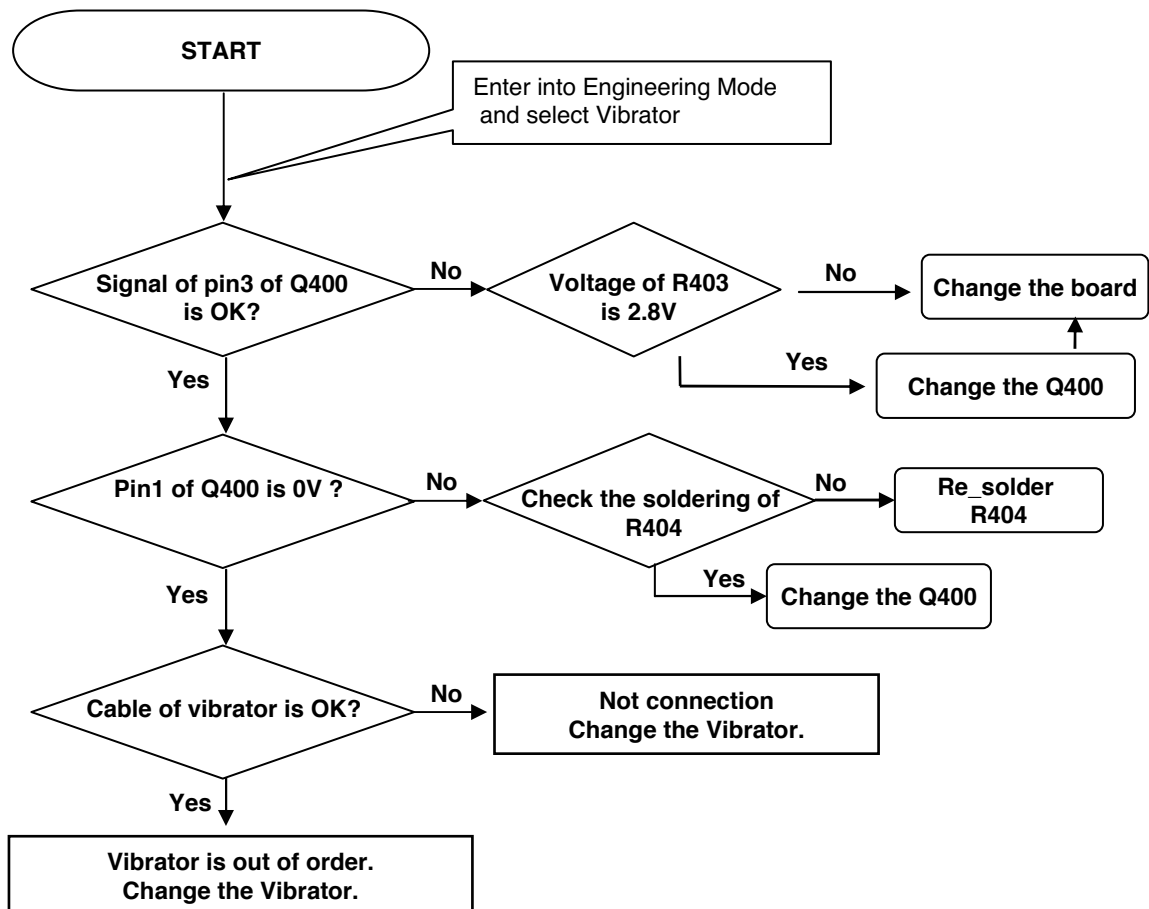
- Connect PIF to the phone, and power on.
- Enter the engineering mode.
- Go to menu "Baseband → Alert → Vibrator"

#### Trouble Shooting Procedure

- Check vibrator signal
- Check soldering of components
- Check connection of cable-to-socket



## 4. TROUBLE SHOOTING

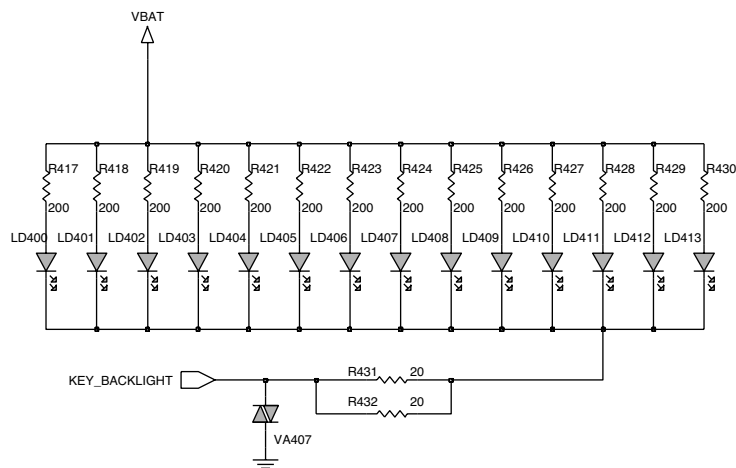


## 4. TROUBLE SHOOTING

### 4.12 Keypad Backlight Trouble

#### Block Diagram

##### KEY BACKLIGHT



#### Backlight Operation

- The keypad LED backlight is controlled with LEDB signal.
- Keypad\_Main signal from DBB.
- The LEDs are forward biased and turned on.

#### Trouble Shooting Setup

- Connect PIF-UNION to the phone, and power on.
- Enter the engineering mode.
- Go to menu. "Baseband → LED → Backlight → Keypad on"

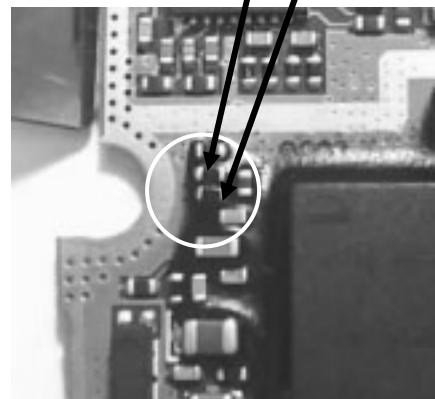
#### Trouble Shooting Procedure

- Check the soldering of components
- Check the LEDB signal
- Check LEDs

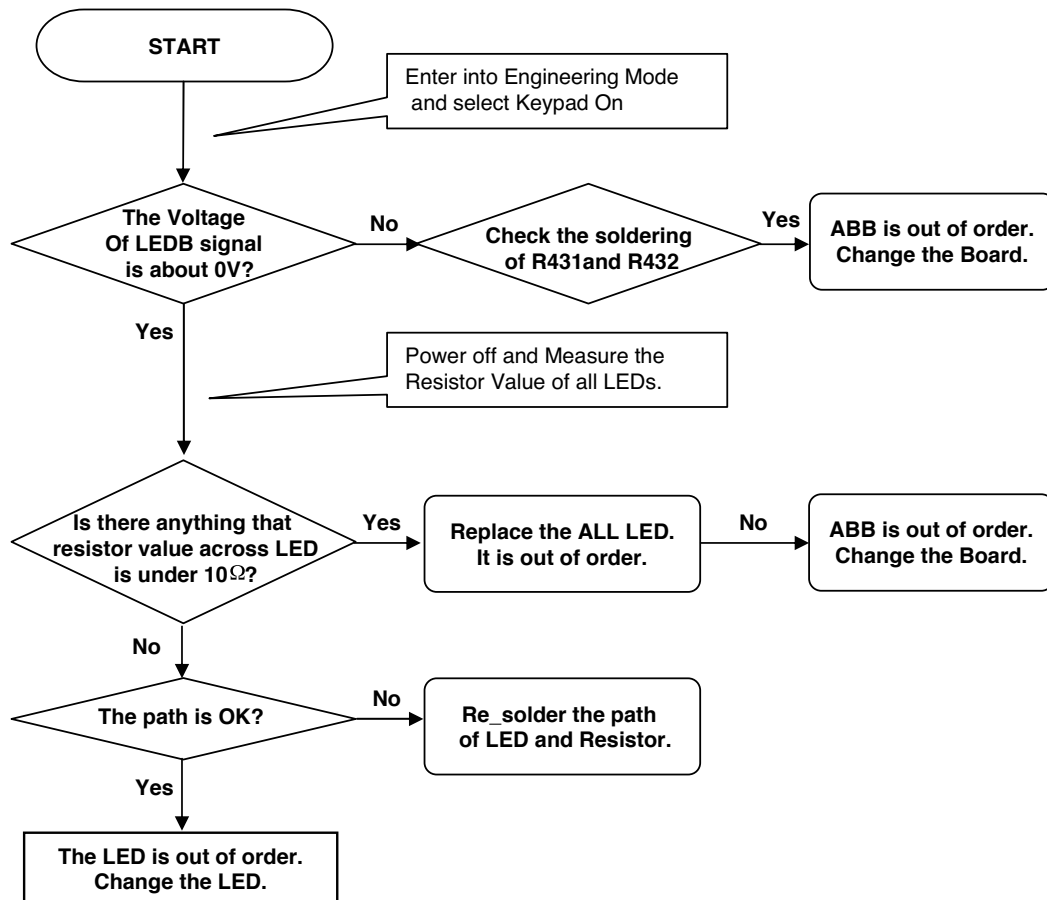
#### Check Points

- LEDB signal
- LEDs

Check  
KEY\_LED signal  
R431,R432



## 4. TROUBLE SHOOTING



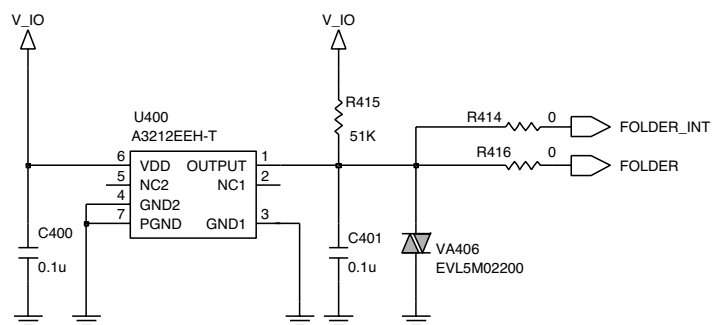
## 4. TROUBLE SHOOTING

---

### 4.13 Folder ON/OFF Trouble

#### Block Diagram

#### FOLDER SWITCH



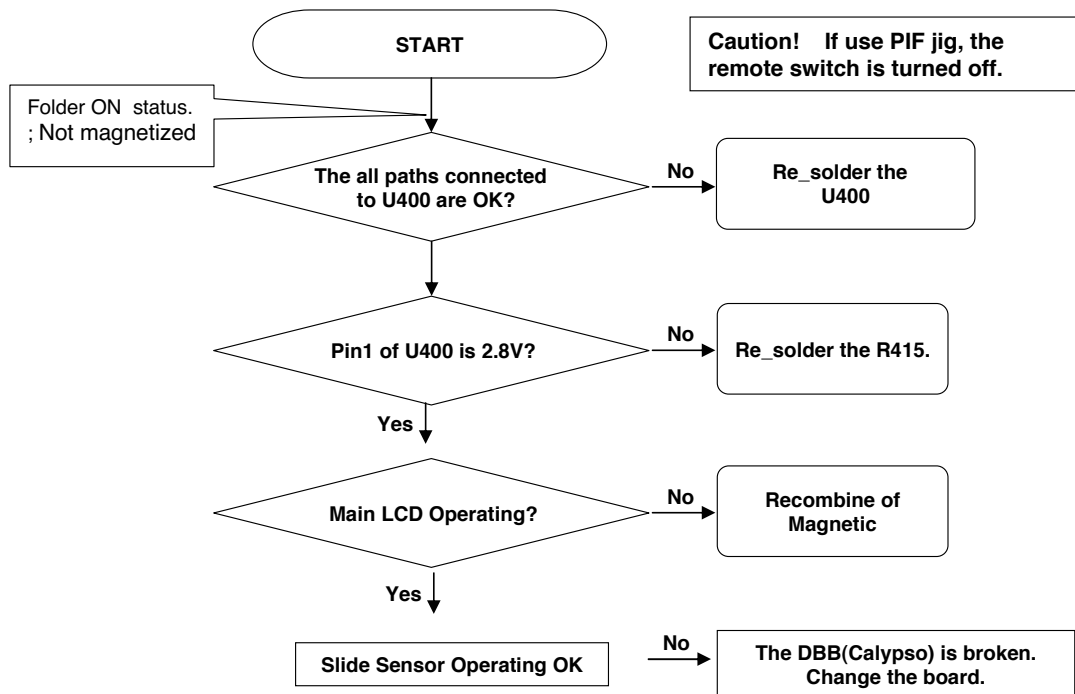
#### Slide Operation

- There is a magnet to detect the Slide status, up or down.
- If a magnet is close to the Folder Switch(U400), the voltage at pin1 of U400 goes to 0V. Otherwise, V\_IO.
- This Folder signal is delivered to DBB, and the status of Folder is reported.

#### Slide Signal Status

- L : Down (Magnetized)
- H : Up (Not magnetized)

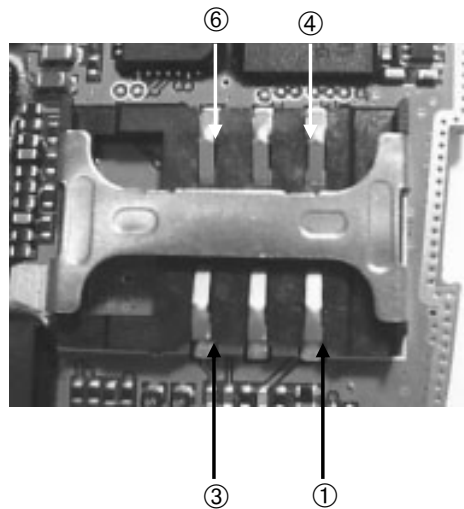
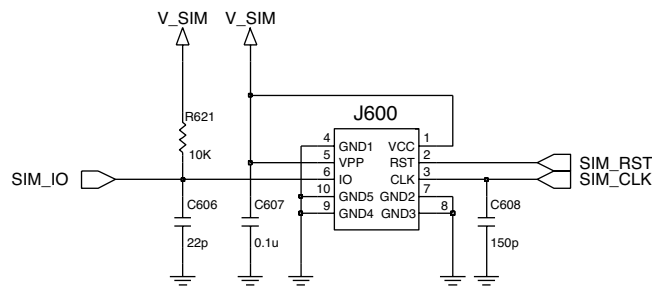
## 4. TROUBLE SHOOTING



## 4. TROUBLE SHOOTING

### 4.14 SIM Detect Trouble

#### SIM CONNECTOR



#### Connection between SIM and DBB

- SIM\_CLK, SIM\_IO, SIM\_RST

#### Check Points

- Contact between SIM and socket
  - Soldering of SIM socket

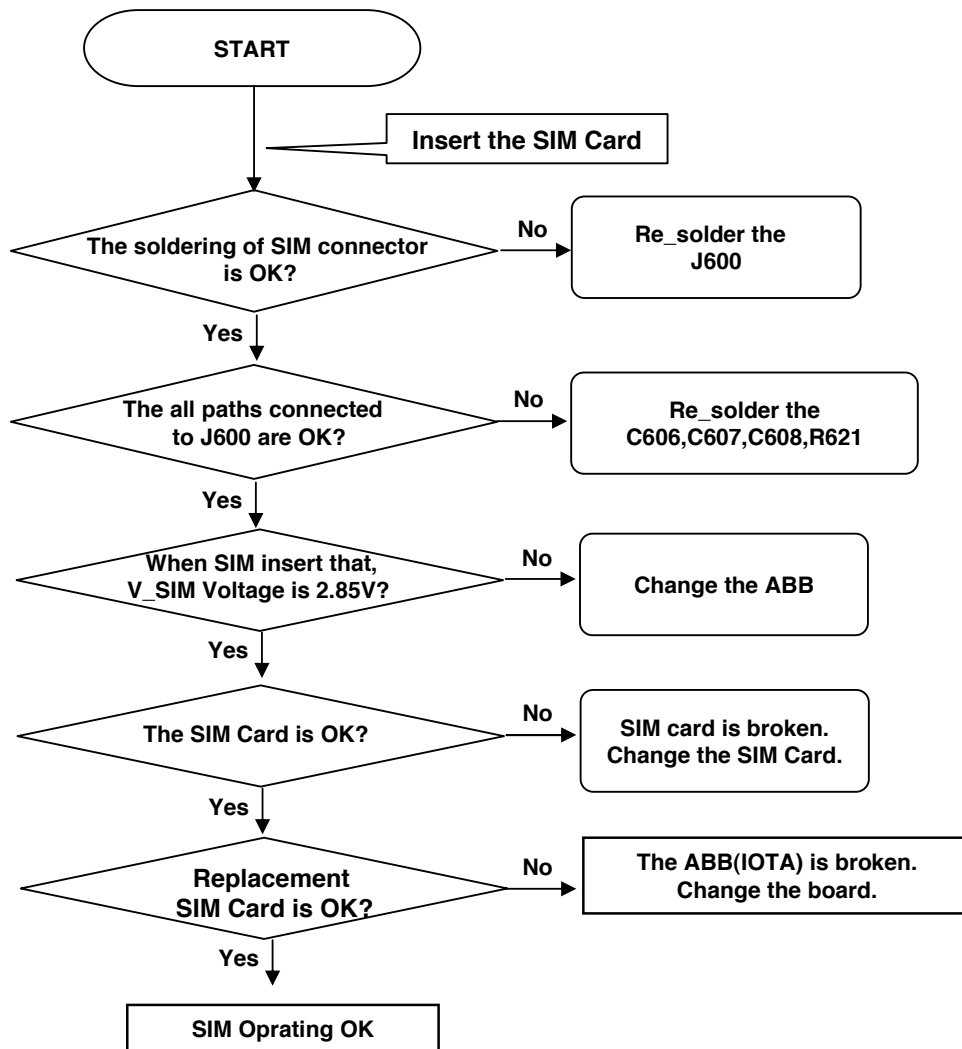
#### Trouble Shooting Setup

- Insert the SIM into socket
  - Connect PIF to the phone, and power on.

#### Trouble Shooting Procedure

- Check the power supply.
  - Check the soldering of SIM socket.
  - Check the SIM.

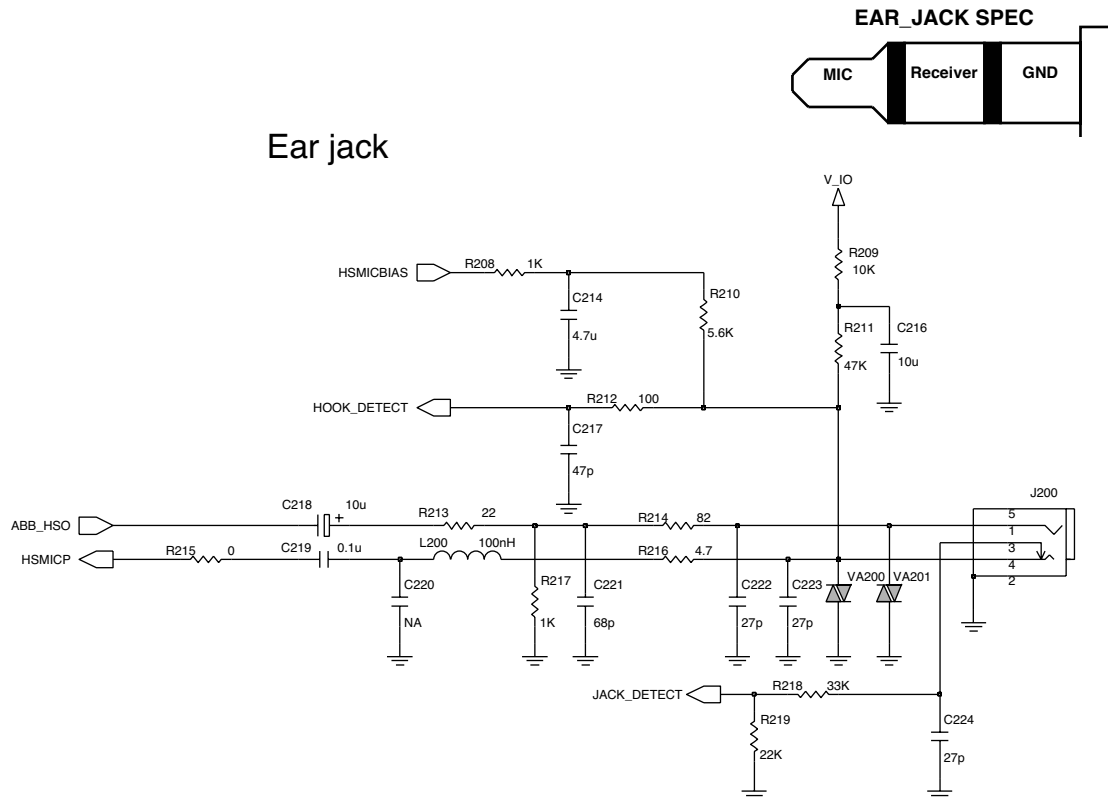
## 4. TROUBLE SHOOTING



## 4. TROUBLE SHOOTING

### 4.15 Earphone Trouble

#### Block Diagram



#### Earphone Detecting Operation

- The ABB operates A/D conversion continuously and if the voltage of “HOOK\_DETECT” node goes to about 40mV, it detects hook switch is pushed in call state.
- First - “HOOK\_DETECT” had Pull up by V\_IO
- Second - “HOOK\_DETECT” Change to Pull Down by Mic resistor of Earmic

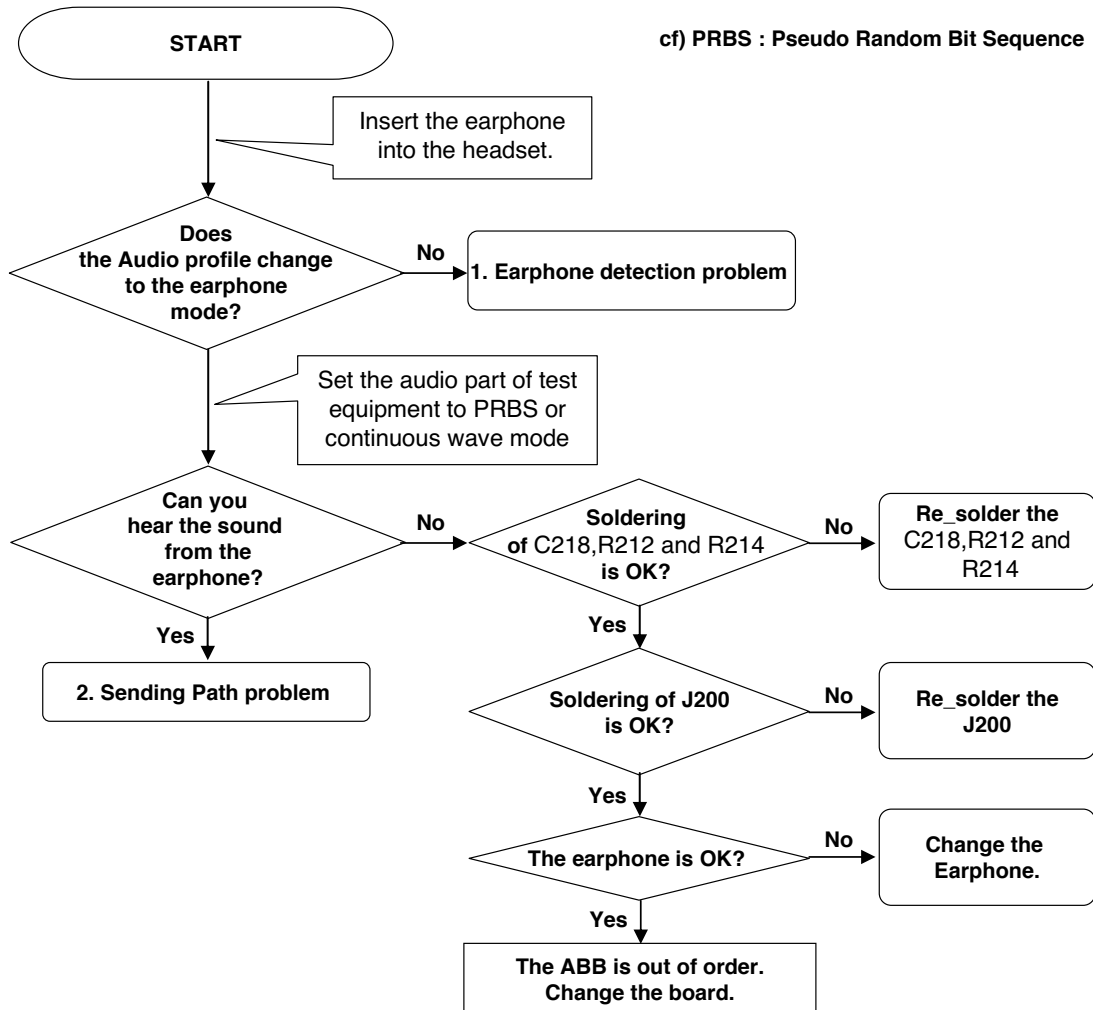
#### Earphone Sending Path

- HSMICP is the audio signal from the microphone of the earphone.
- R215, C219, L200 and R216 make the path of the audio signal from the microphone of the earphone.
- This audio signal is delivered to ABB(IOTA).

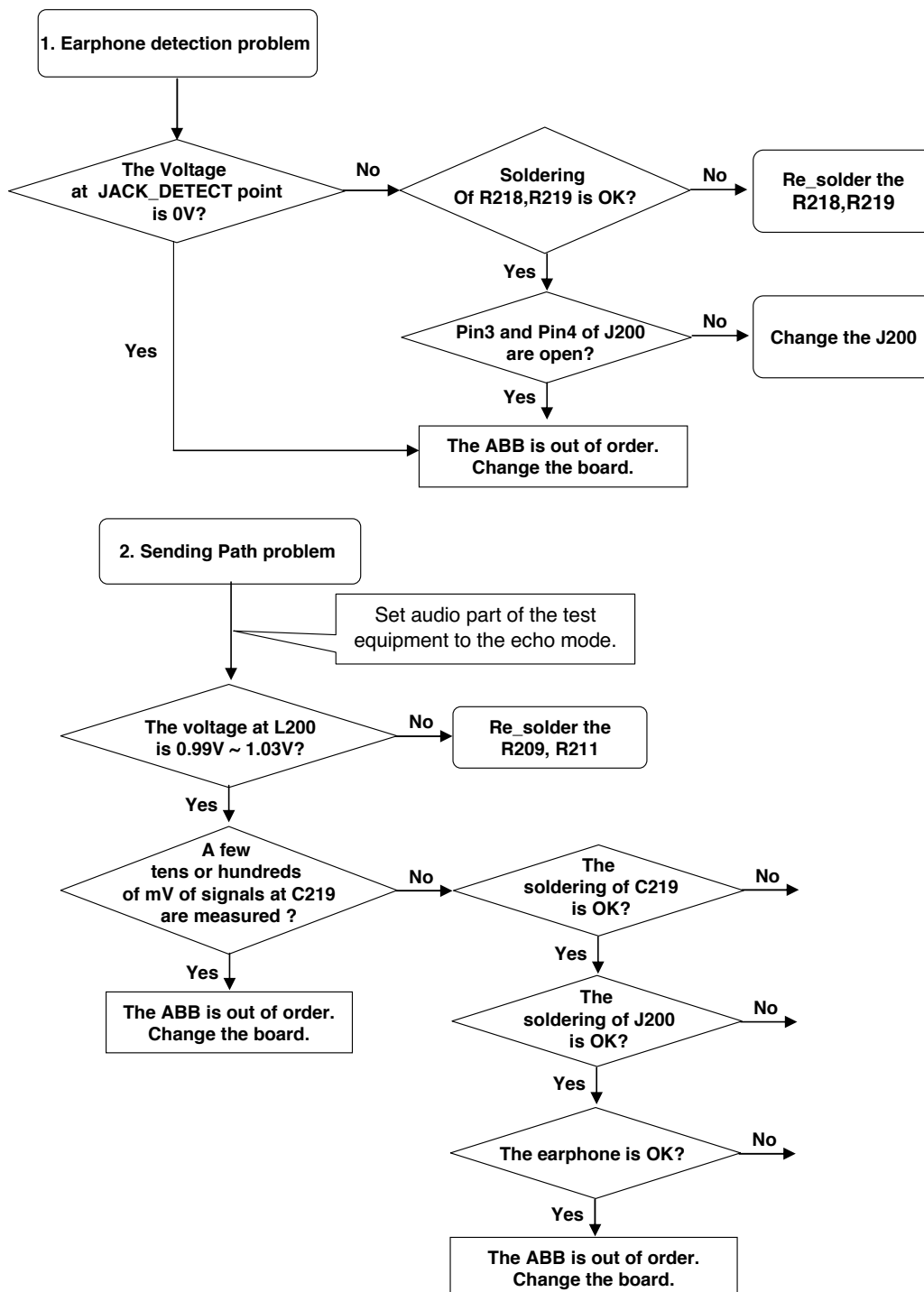
#### Earphone Receiving Path

- ABB\_HSO is the audio signal from ABB(IOTA).
- C218, R212 and R214 make the path of the audio signal from ABB to earphone.

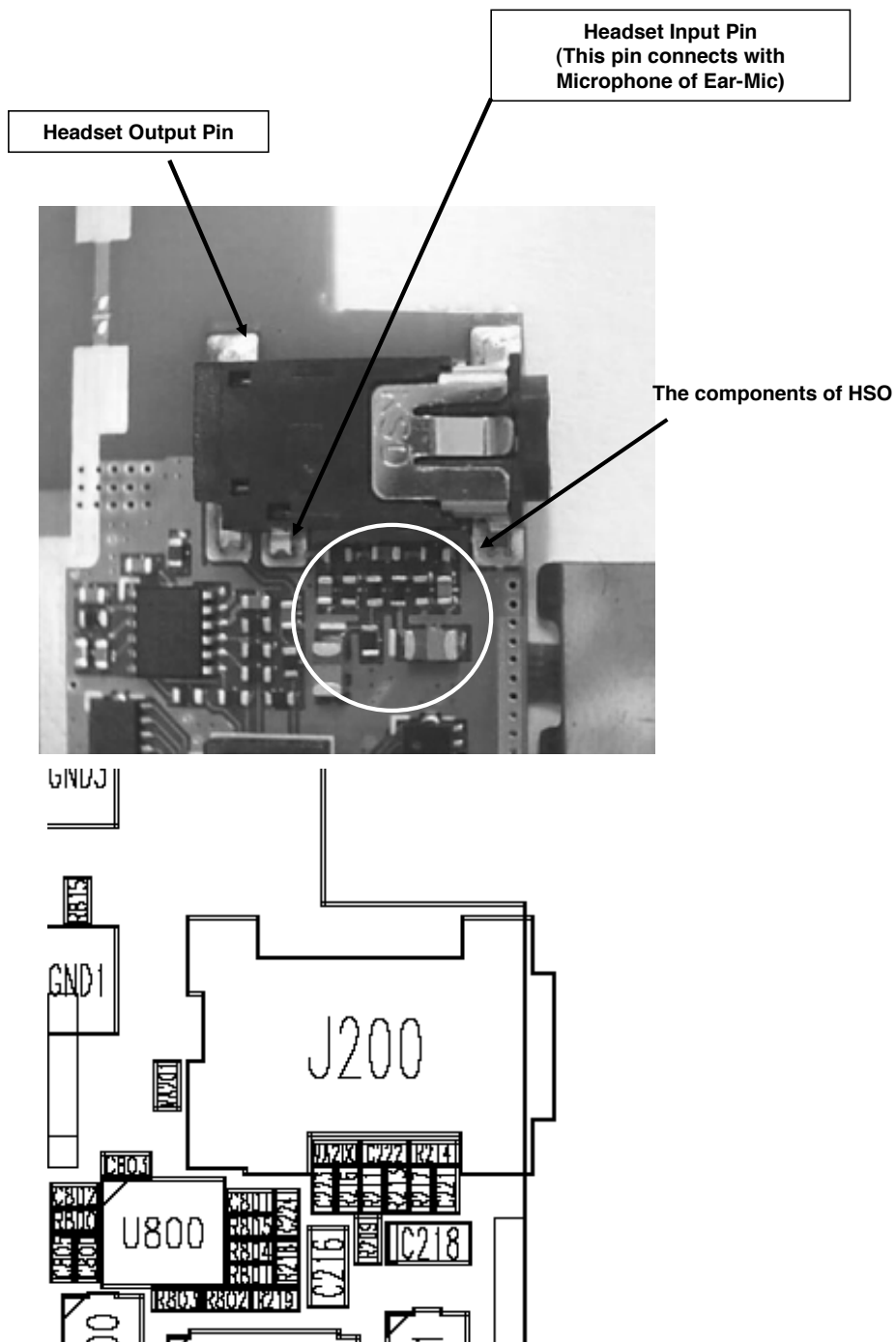
## 4. TROUBLE SHOOTING



## 4. TROUBLE SHOOTING



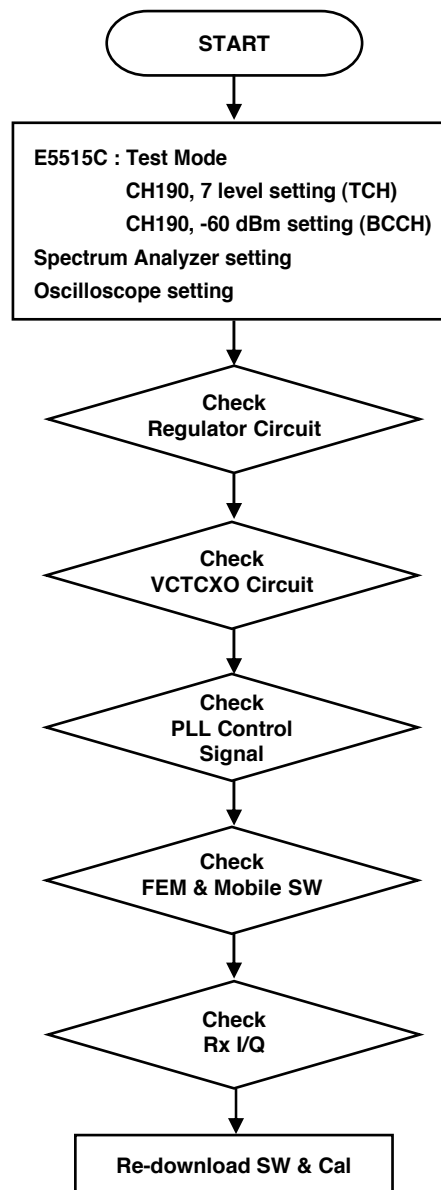
## 4. TROUBLE SHOOTING



## 4. TROUBLE SHOOTING

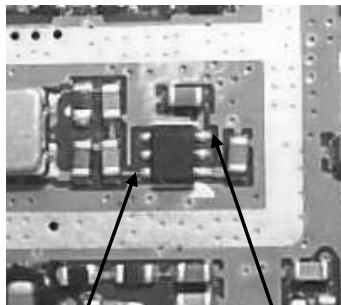
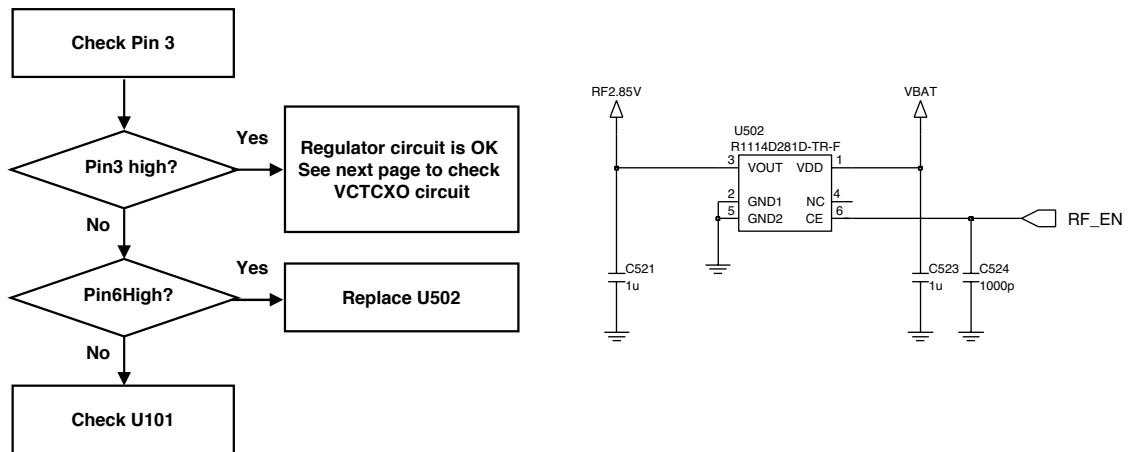
---

### 4.16 RF Rx pass Trouble Shooting



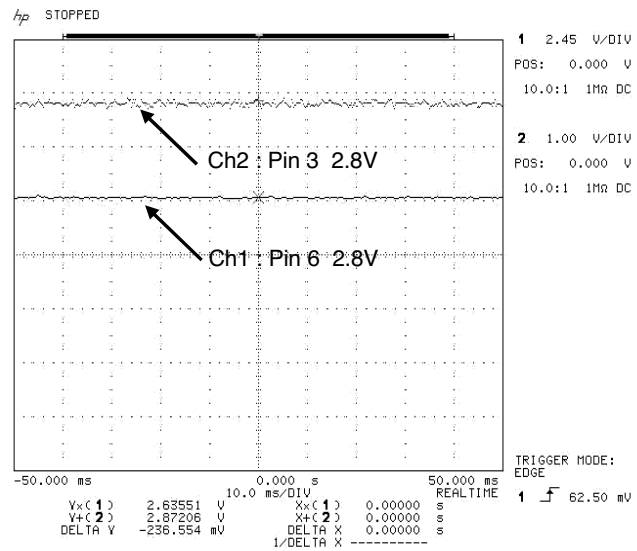
## 4. TROUBLE SHOOTING

### 4.16.1 Checking Regulator Circuit (Rx pass continued)



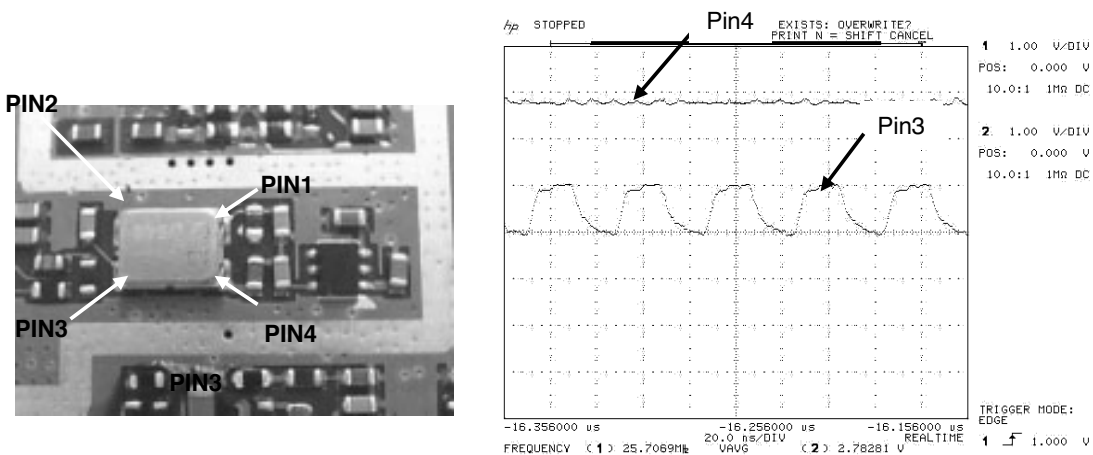
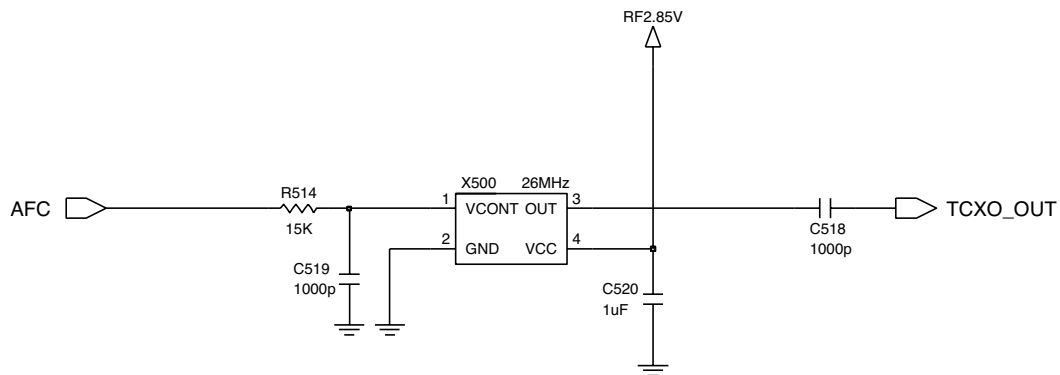
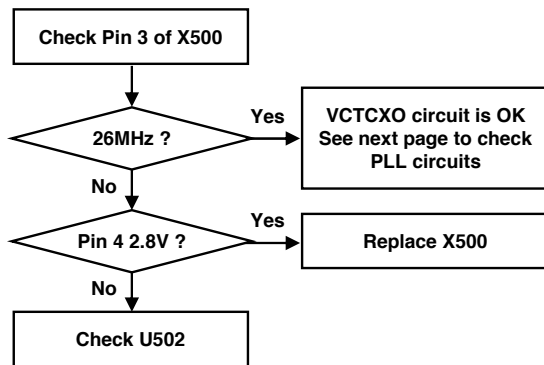
PIN6

PIN3



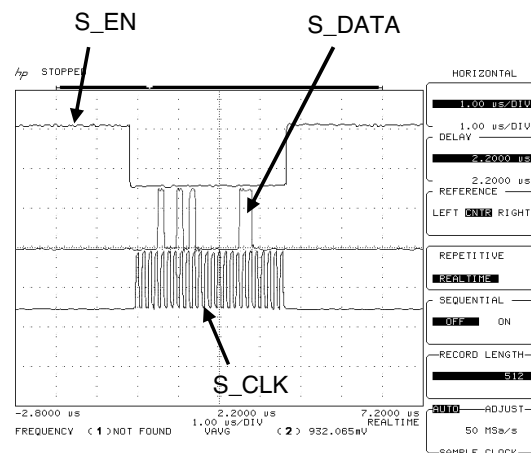
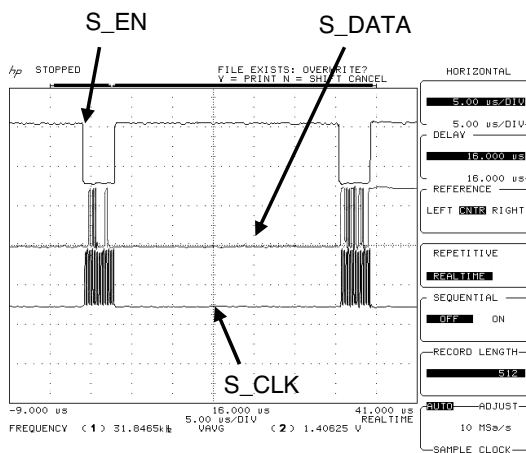
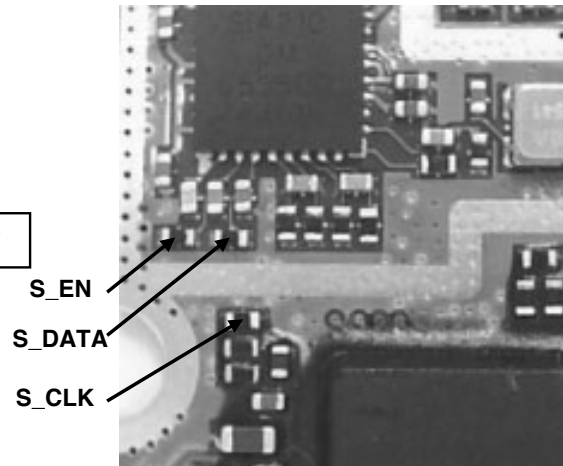
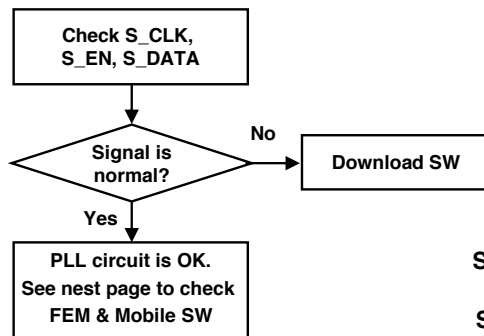
## 4. TROUBLE SHOOTING

### 4.16.2 Checking VCTCXO Circuit (Rx pass continued)



## 4. TROUBLE SHOOTING

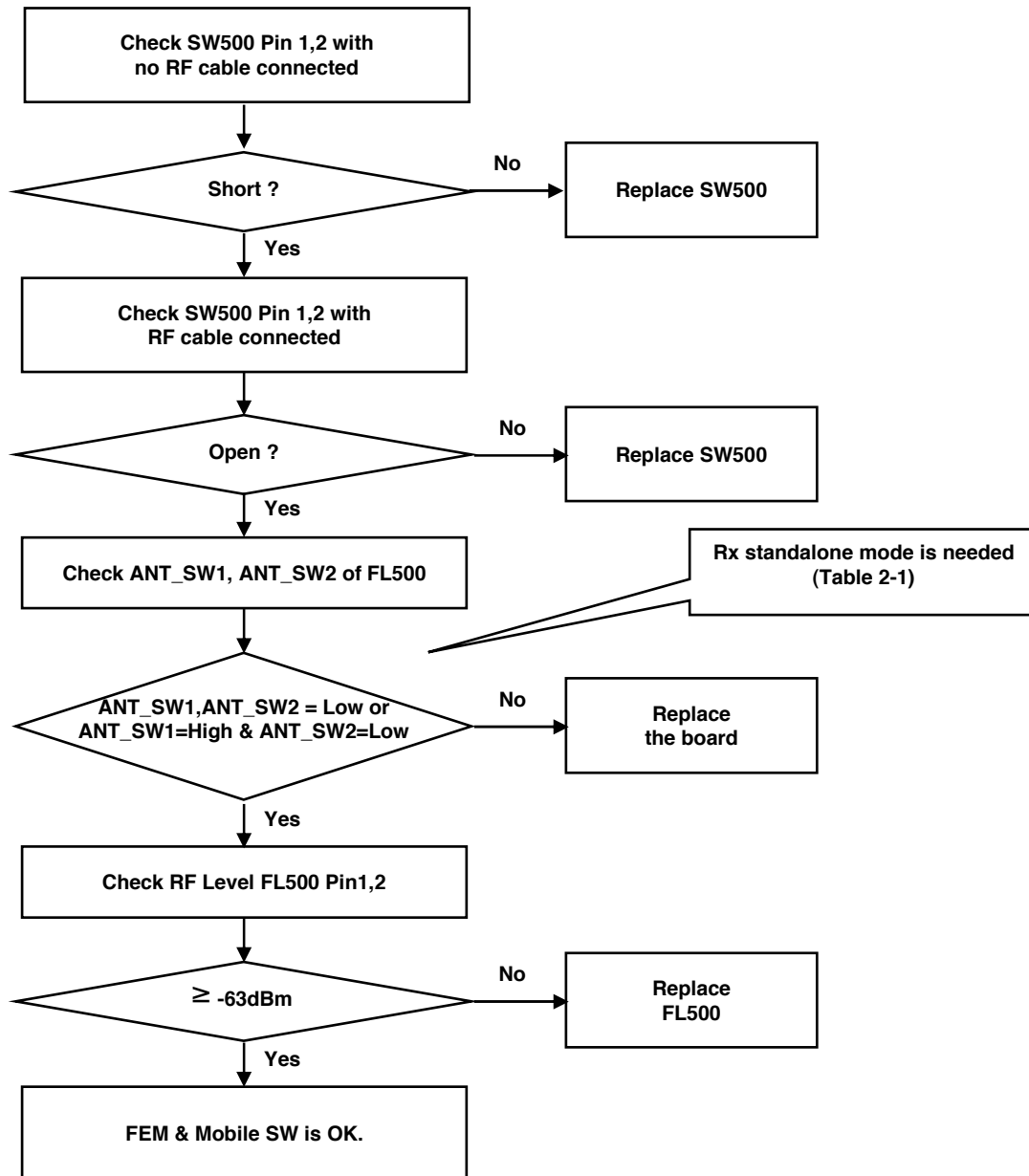
### 4.16.3 Checking PLL Circuit (Rx pass continued)



## 4. TROUBLE SHOOTING

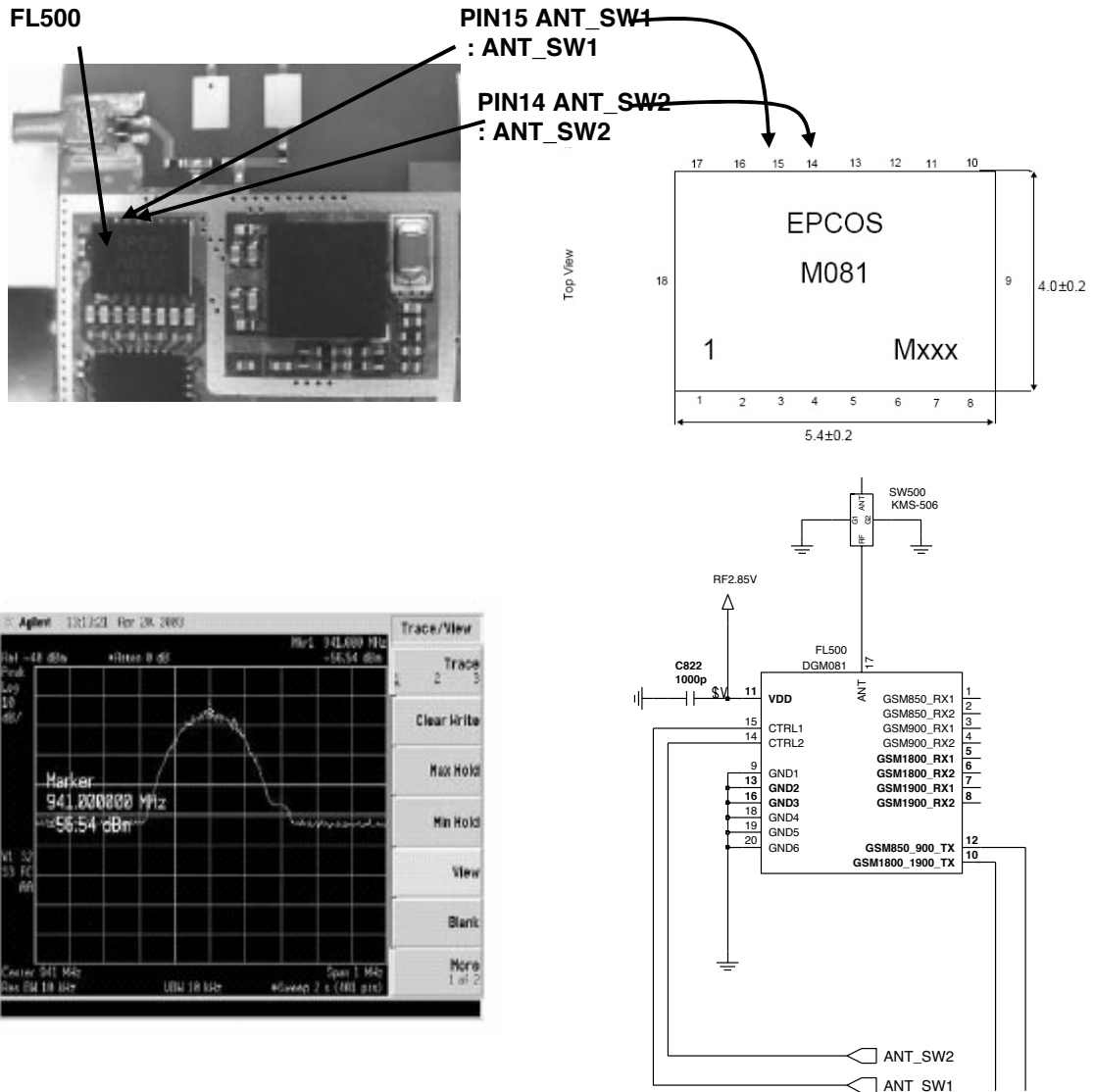
---

### 4.16.4 Checking FEM & Mobile SW (1) (Rx pass continued)



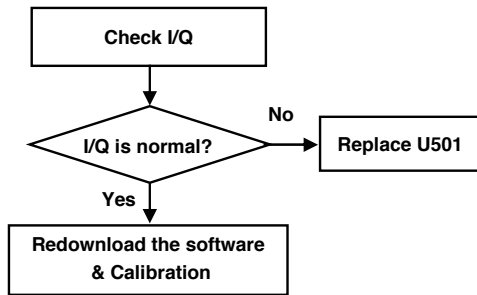
## 4. TROUBLE SHOOTING

### 4.16.5 Checking FEM & Mobile SW (2) (Rx pass continued)

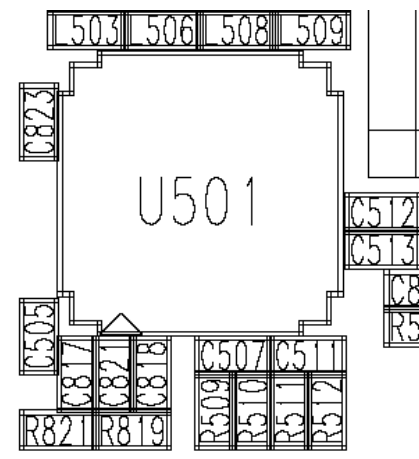
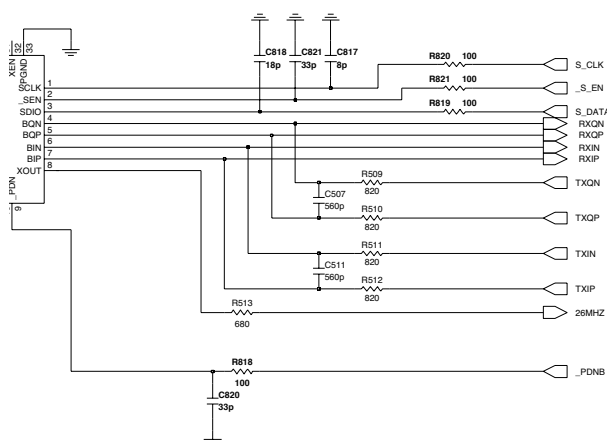
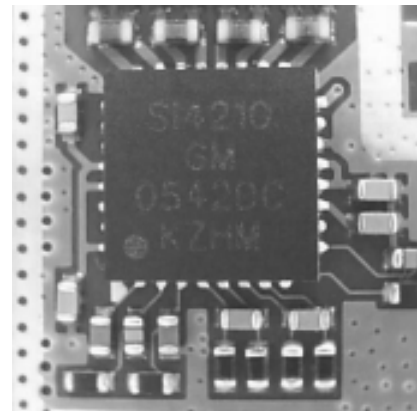
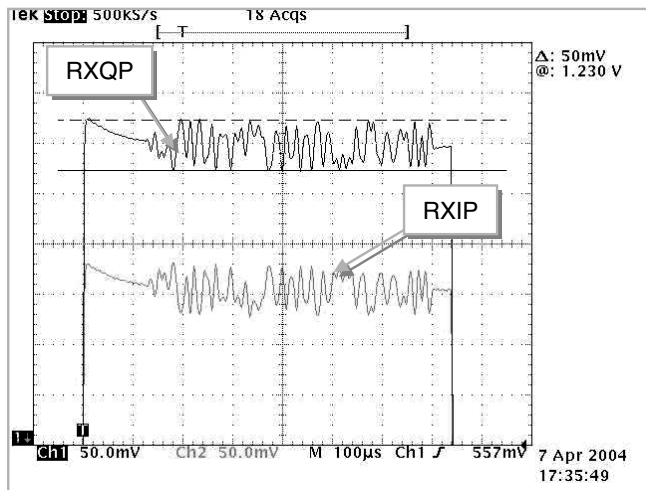
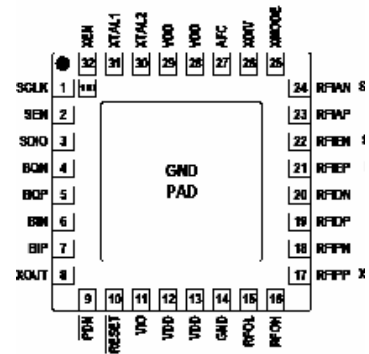


## 4. TROUBLE SHOOTING

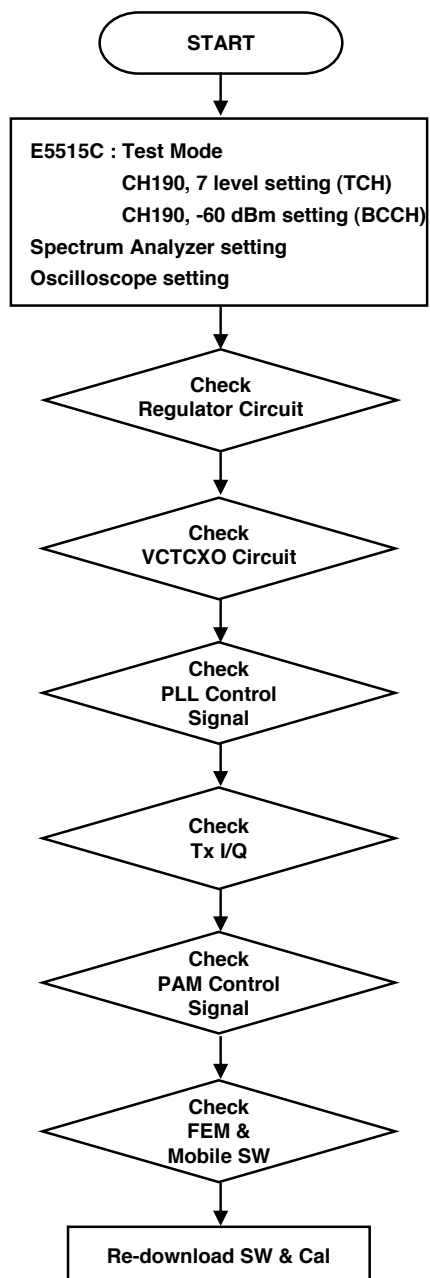
### 4.16.6 Checking Rx I/Q (Rx pass continued)



**SI4210-GM**  
(Pin descriptions, see page 27)

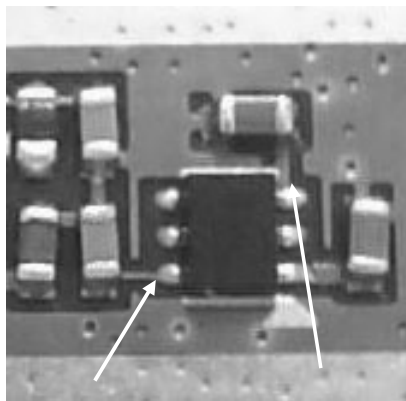
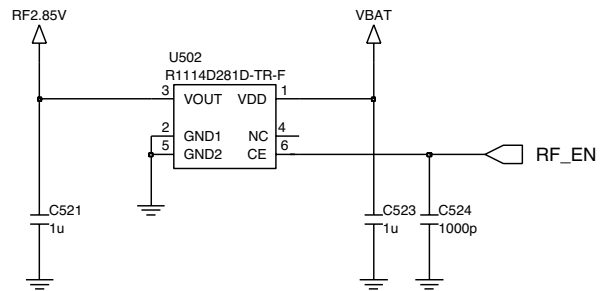
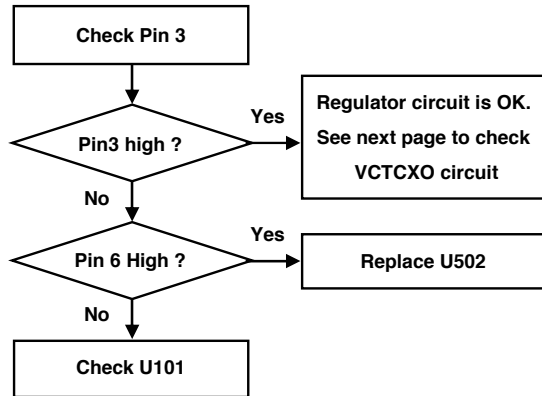


### 4.17 RF Tx pass Trouble Shooting



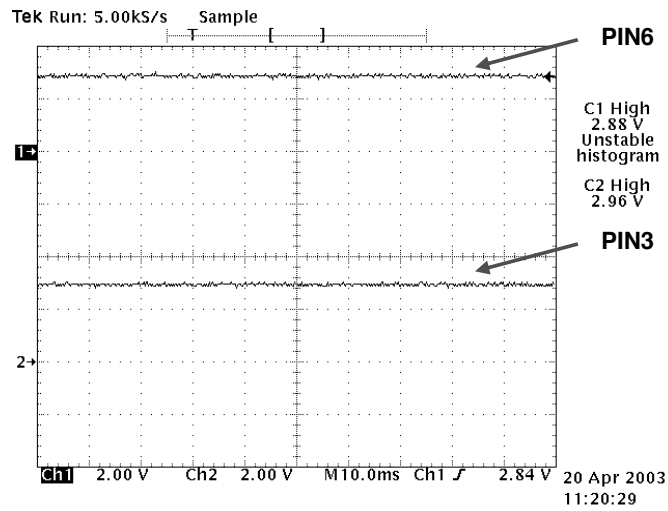
## 4. TROUBLE SHOOTING

### 4.17.1 Checking Regulator Circuit (Tx pass continued)

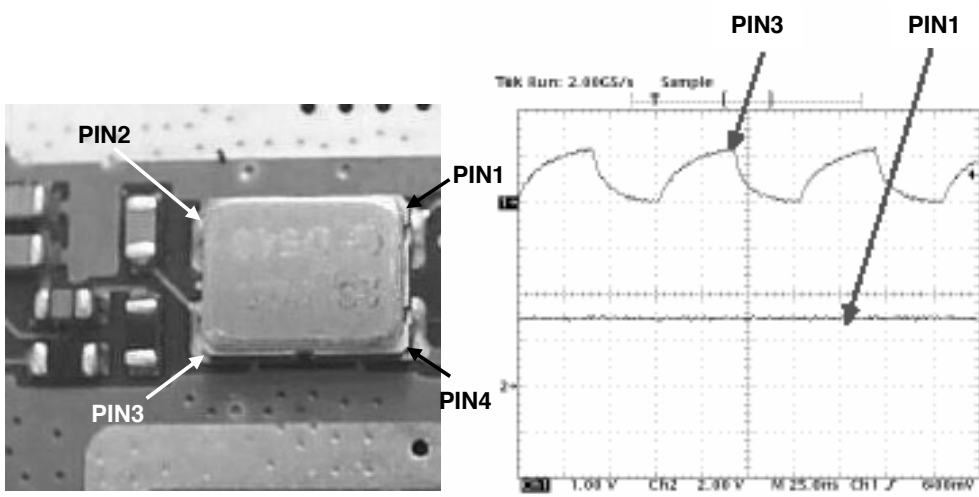
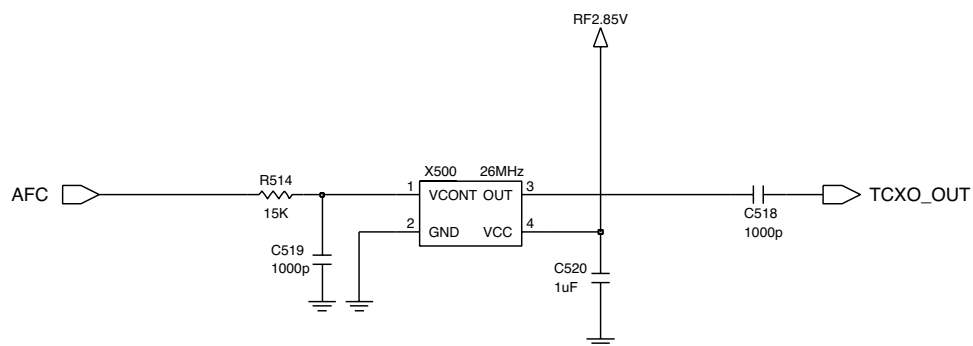
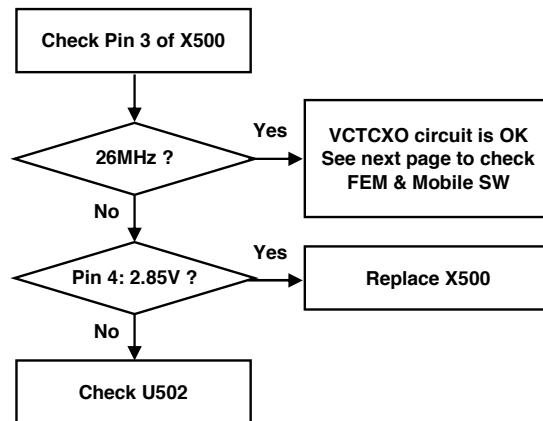


PIN6

PIN3

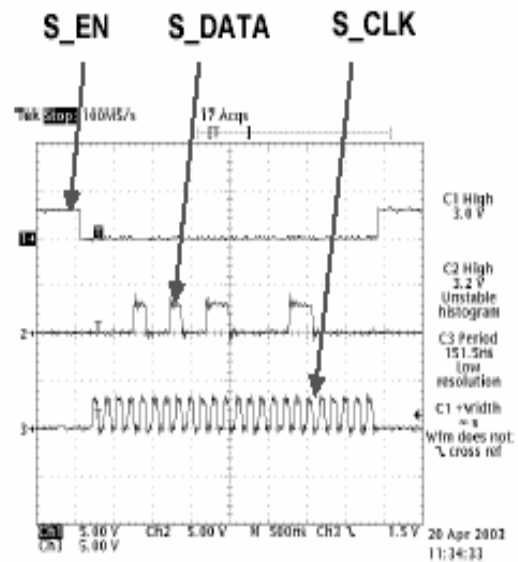
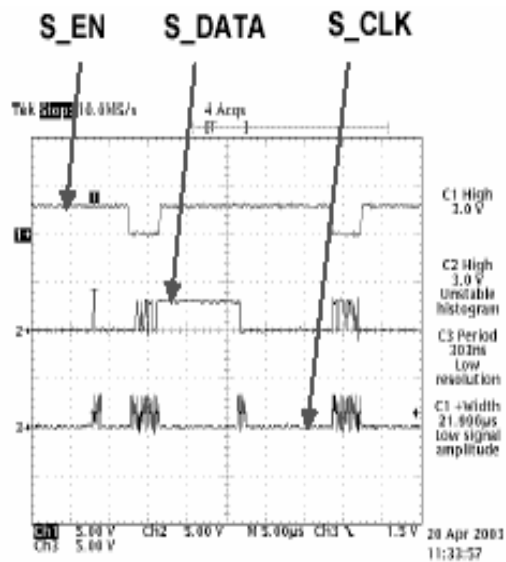
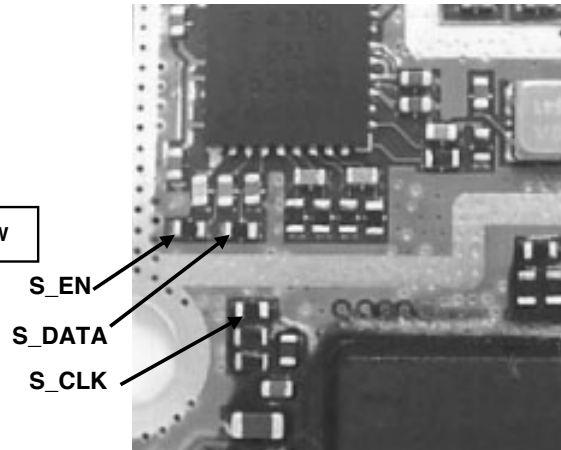
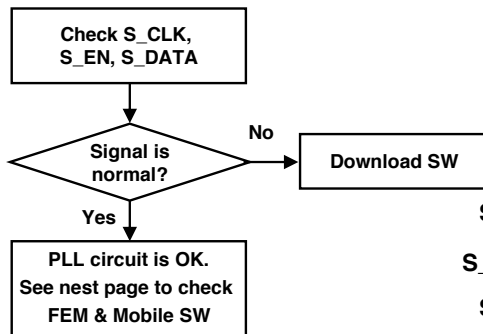


### 4.17.2 Checking VCTCXO Circuit (Tx pass continued)

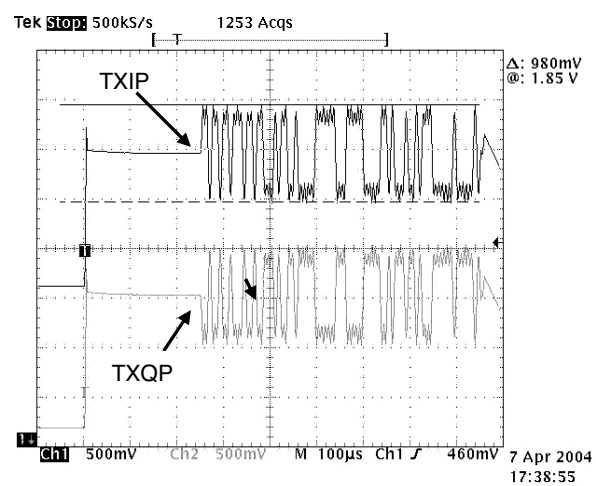
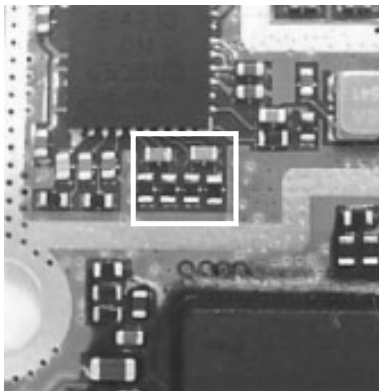
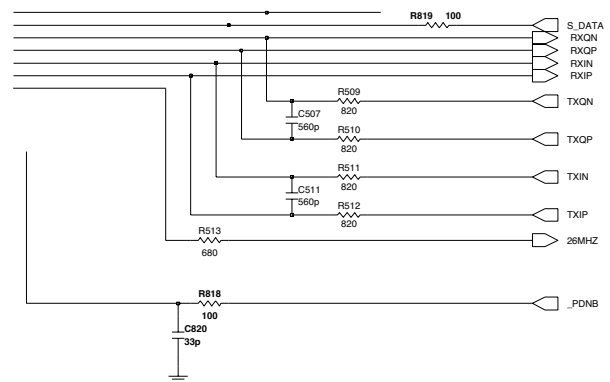
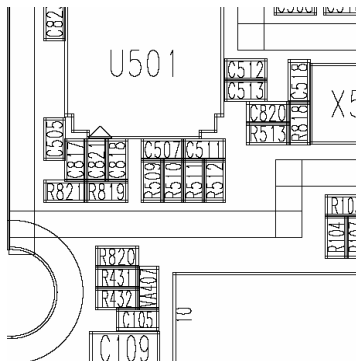
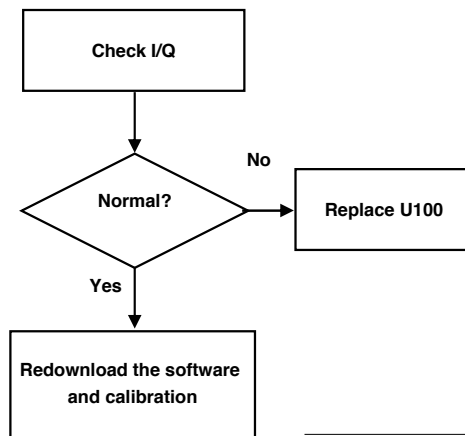


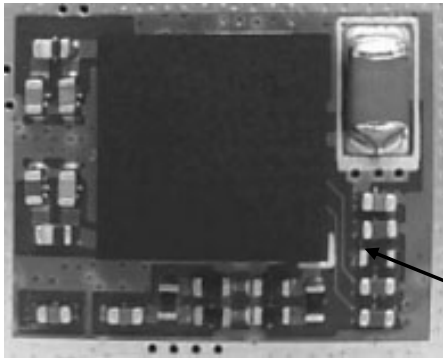
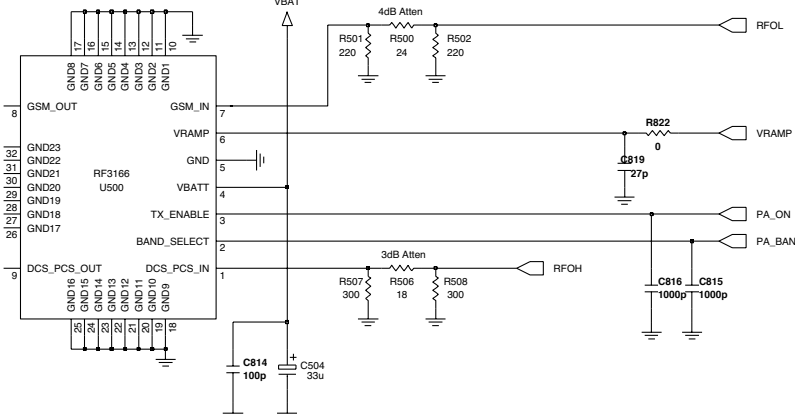
## 4. TROUBLE SHOOTING

### 4.17.3 Checking PLL Circuit (Tx pass continued)

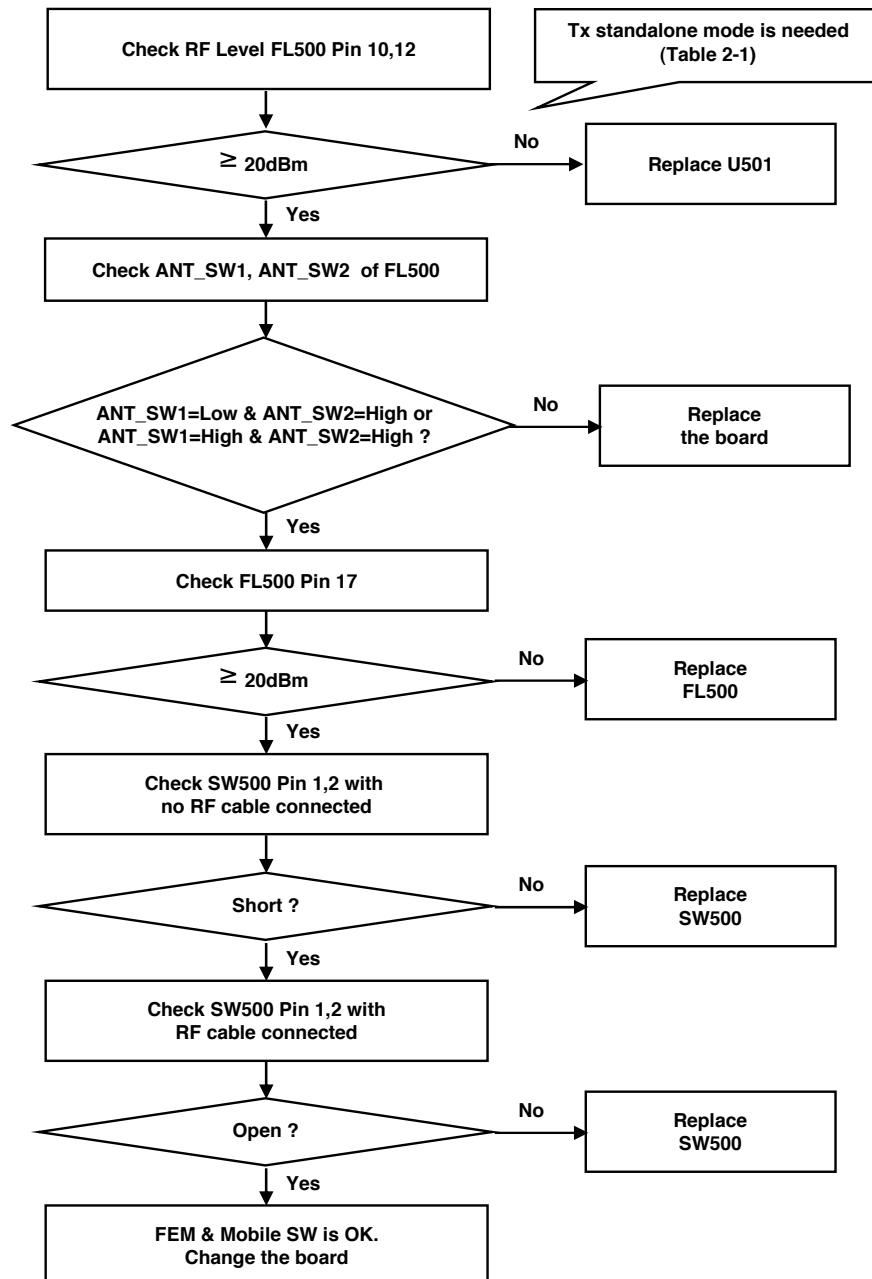


#### 4.17.4 Checking Tx I/Q (Tx pass continued)



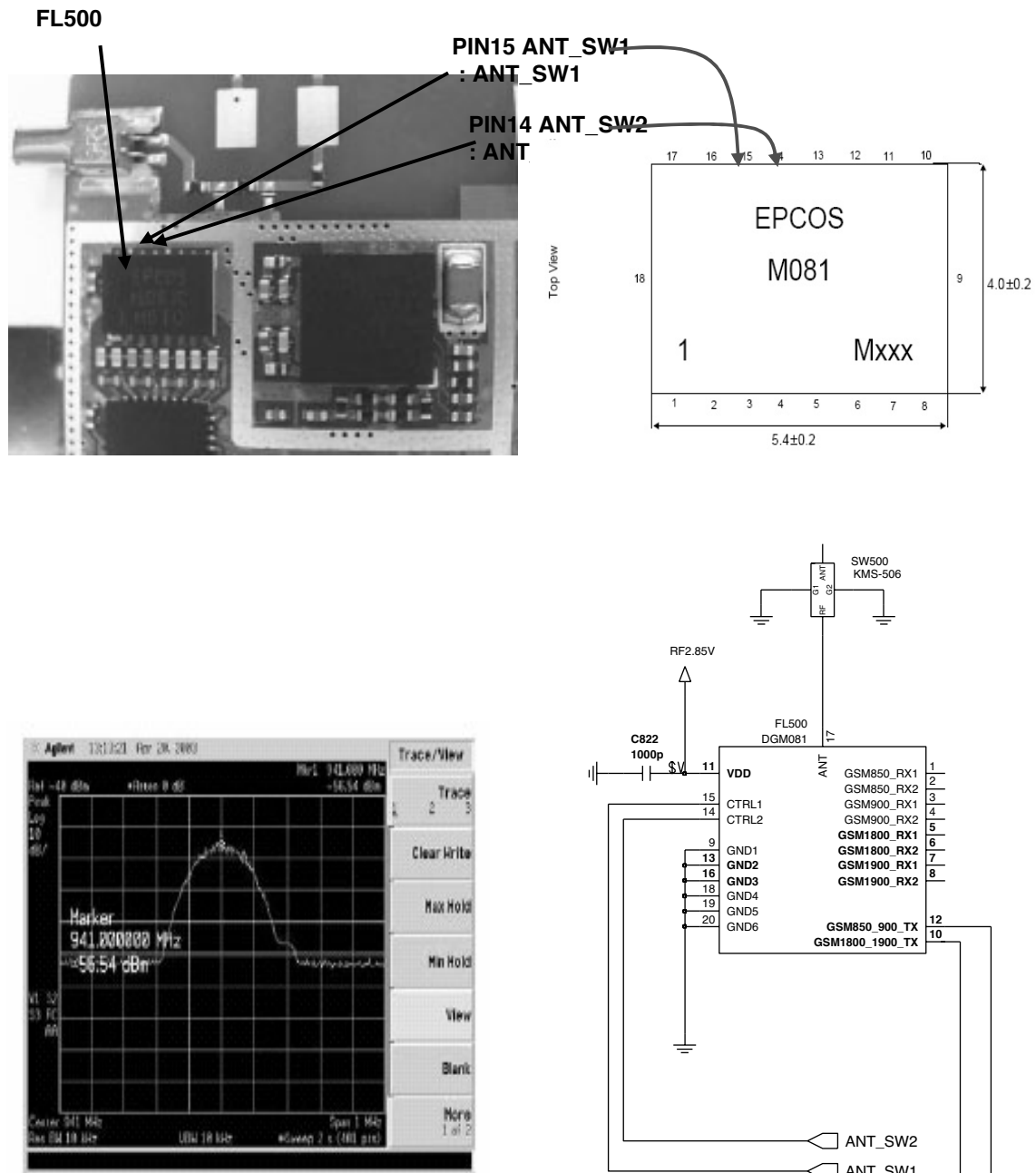


### 4.17.6 Checking FEM & Mobile SW (1) (Tx pass continued)



## 4. TROUBLE SHOOTING

### 4.17.7 Checking FEM & Mobile SW (2) (Tx pass continued)



## 5. DOWNLOAD

### 5.1 Download Setup

#### 5.1.1 In case of using the Data kit

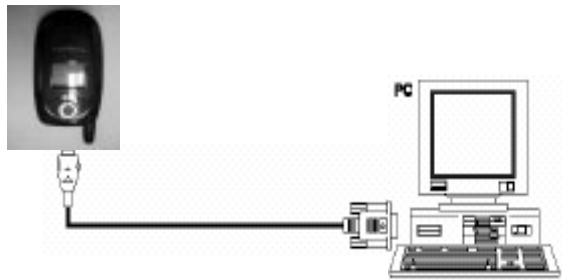


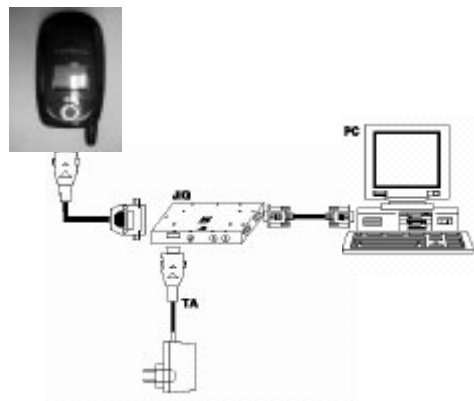
Figure 5-1 Describes Download Setup

#### Preparation

- Target Handset
- Data kit
- Battery
- IBM compatible PC supporting RS-232 with Windows 98 or newer

If you use data kit, you should have a battery with the voltage above 3.7V.

#### 5.1.2 In case of using the PIF



#### Preparation

- Target Handset
- PIF
- RS-232 Cable and PIF-to-Phone interface Cable
- TA/Power Supply or Battery
- BM compatible PC supporting RS-232 with Windows 98 or newer

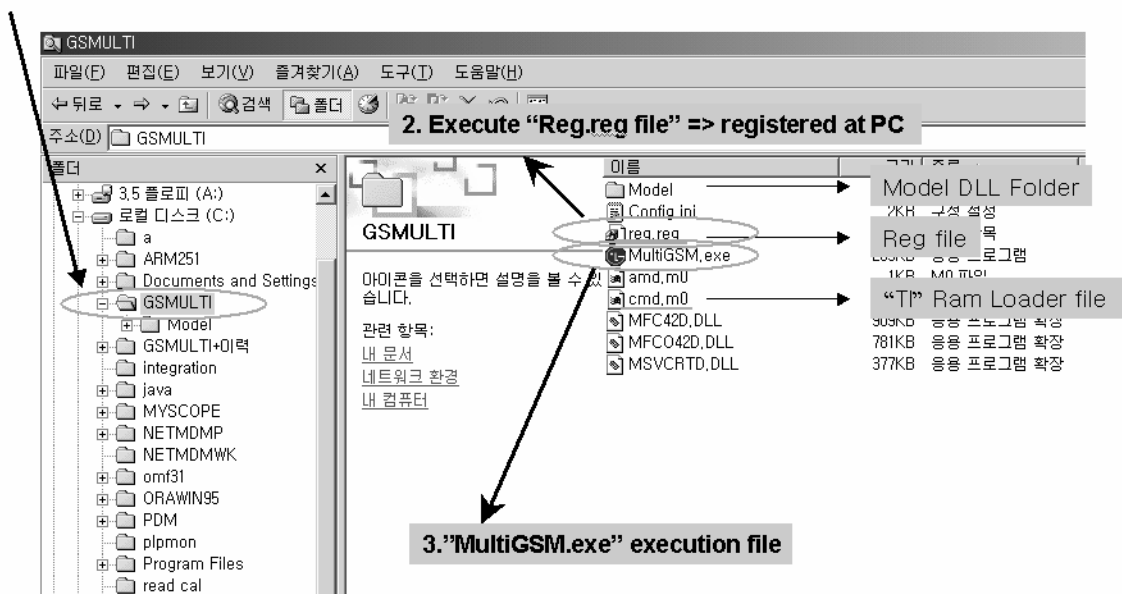
If you use battery, you should have a battery with the voltage above 3.7V.

## 5. DOWNLOAD

### 5.2 Download Procedure

#### 5.2.1. Computer Program file -> MultiGSM.EXE Click

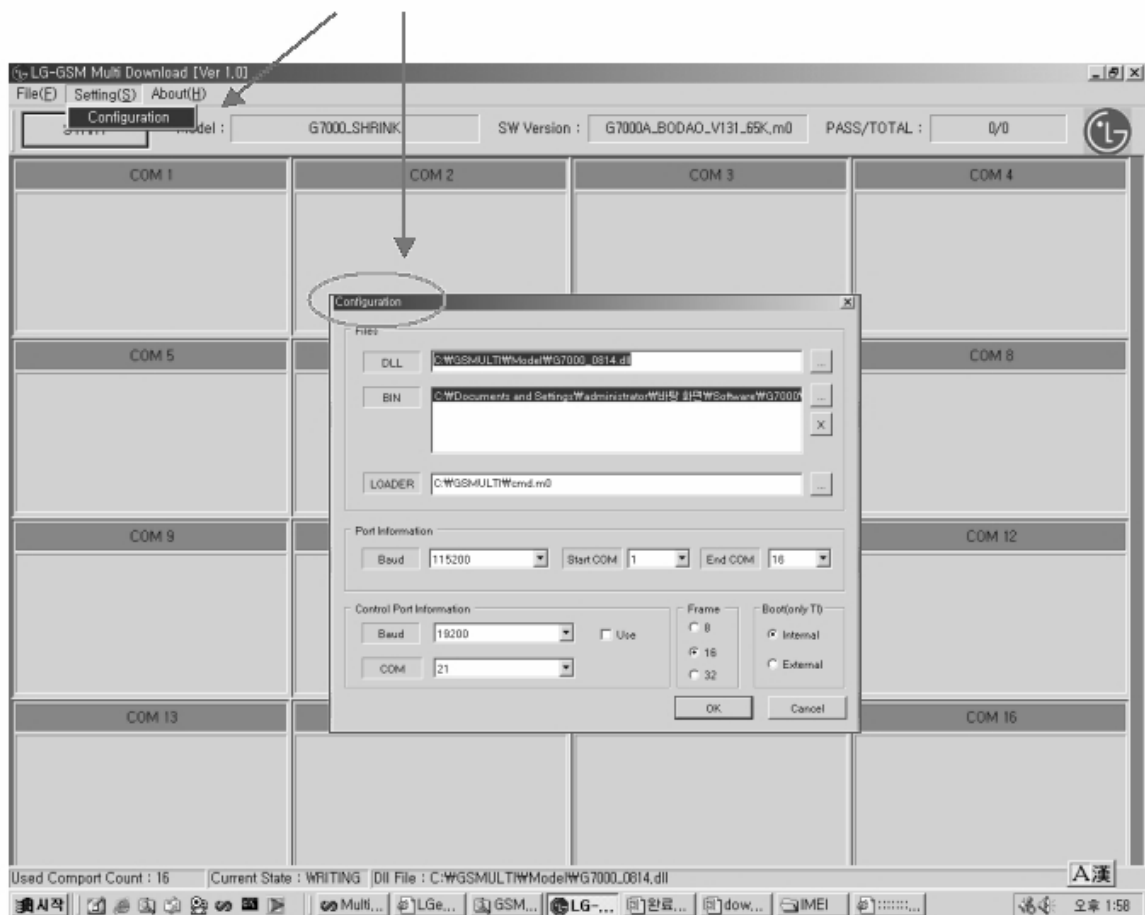
1. Copy "GSMULTI" folder, paste in "C:!"



### 5.2.2. Click the “Setting” button.

Then, choose Configuration which is going to download.

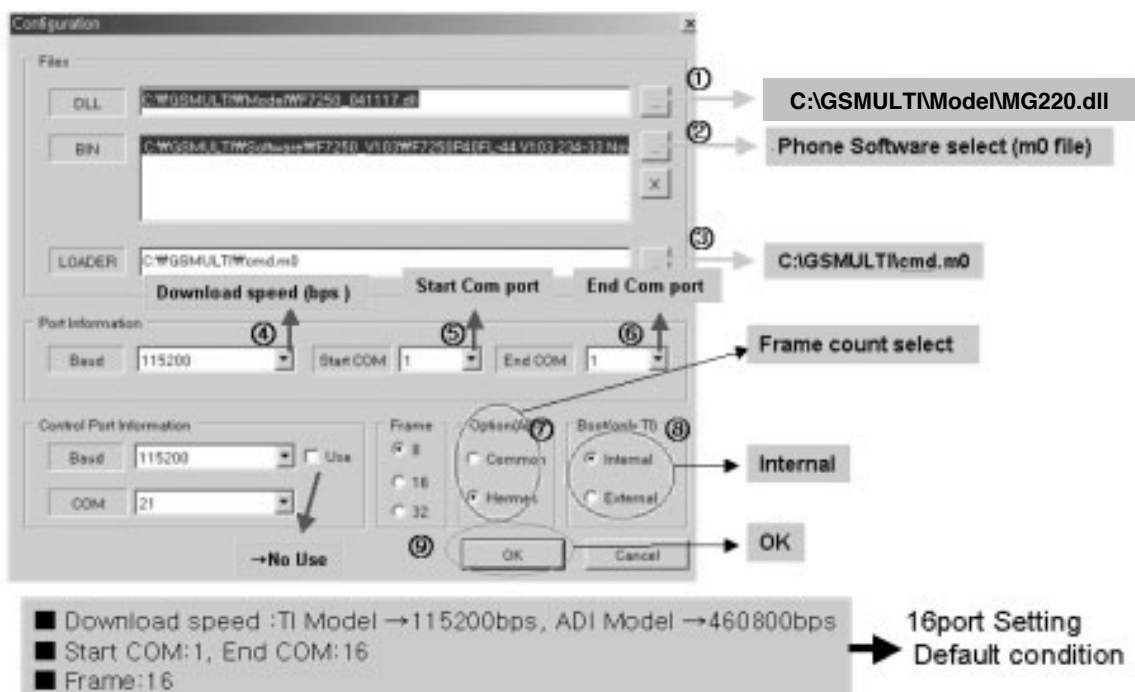
#### 4. Menu “Setting” → “Configuration”



## 5. DOWNLOAD

### 5.2.3. Configuration Setting

#### 5. Configuration : Select values like below



### 5.2.4. Press “Start Button”.

6. Press the “START” button.



## 5. DOWNLOAD

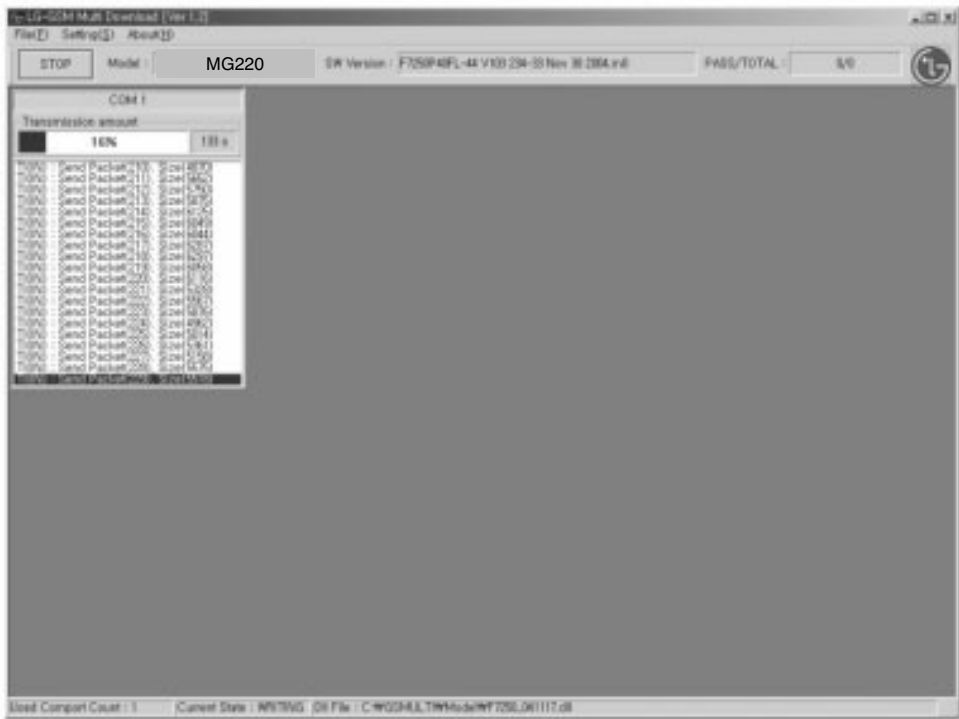
### 5.2.5. After “Start Button”, Which Stand-by condition

#### 7. Stand-by Condition: “Wait phone connecting” is displayed → Connect the Phone.



5.2.6. SW downloading Condition.

✕ Downloading : Start

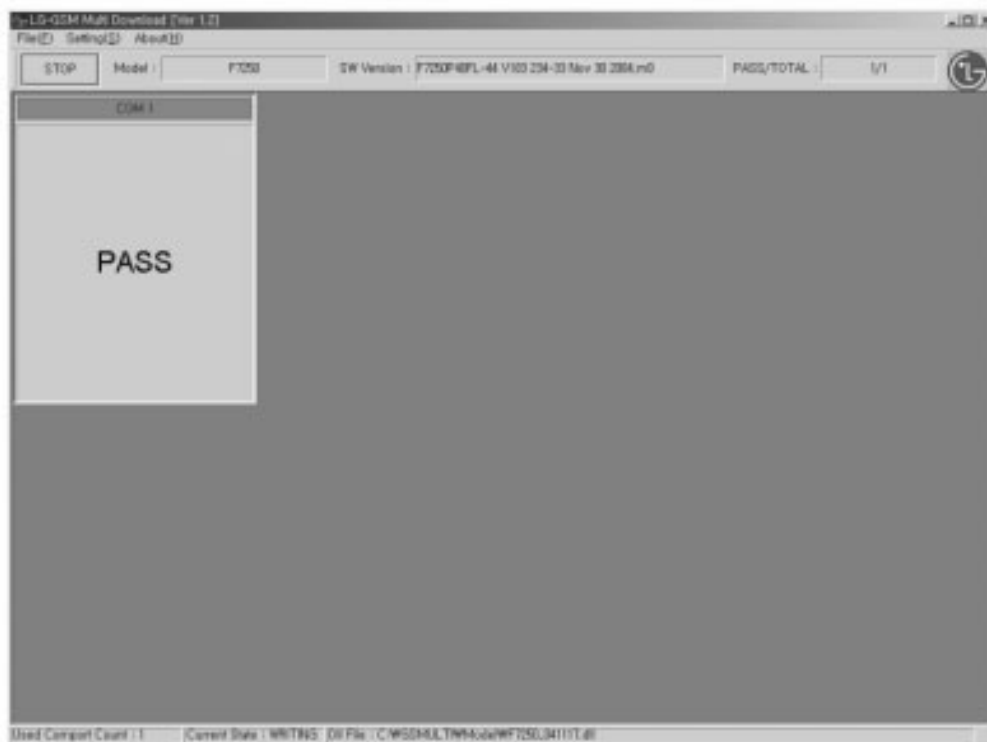


## 5. DOWNLOAD

---

### 5.2.7. SW downloading END Condition.

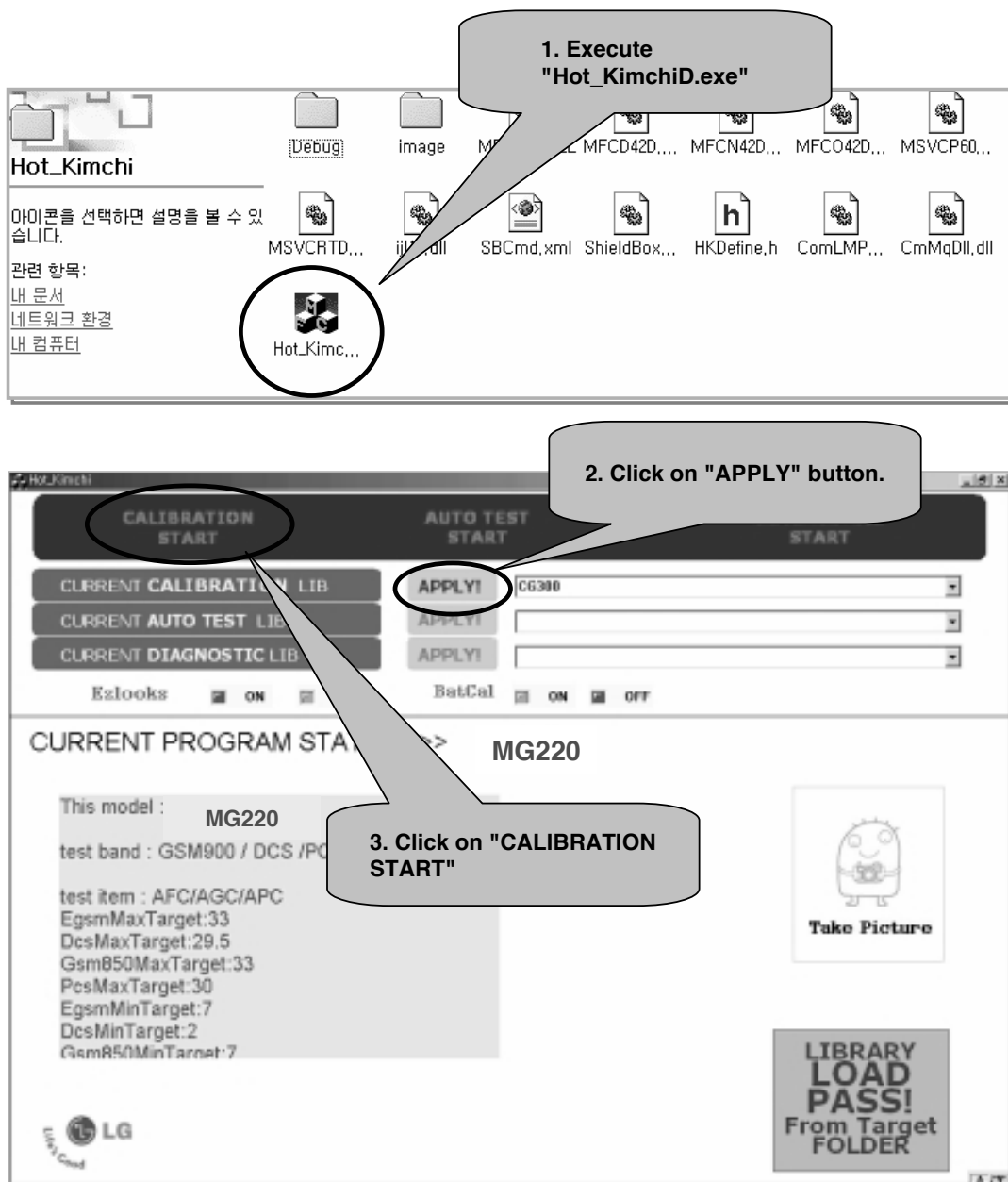
※ Downloading : End



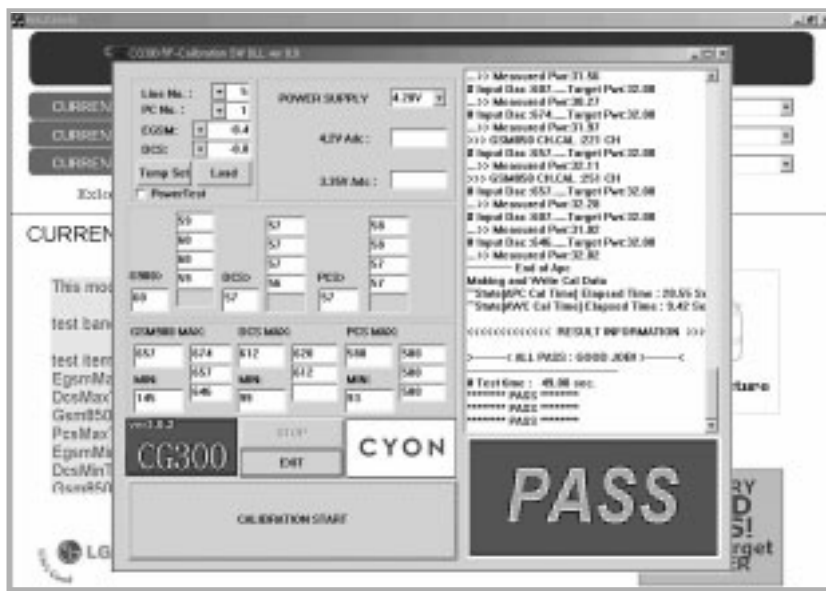
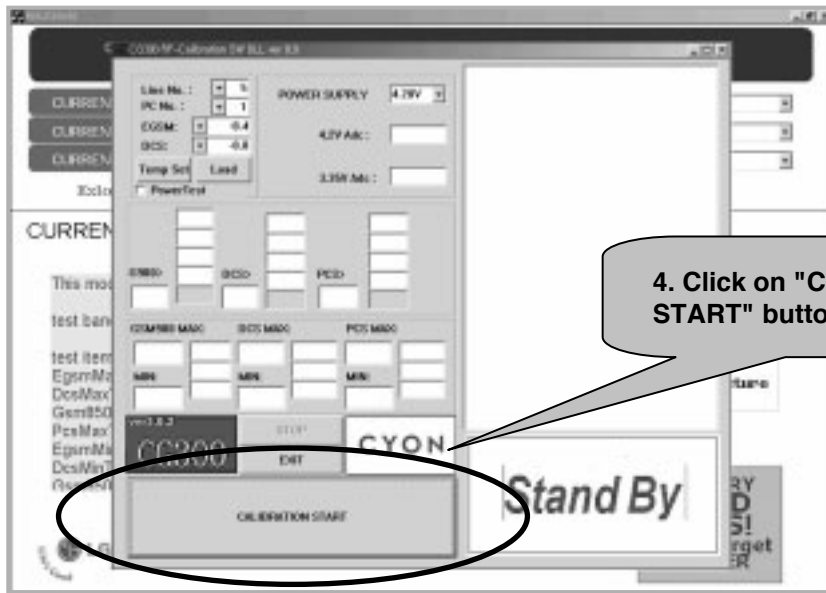
## 6. SERVICE AND CALIBRATION

### 6.1 Service S/W

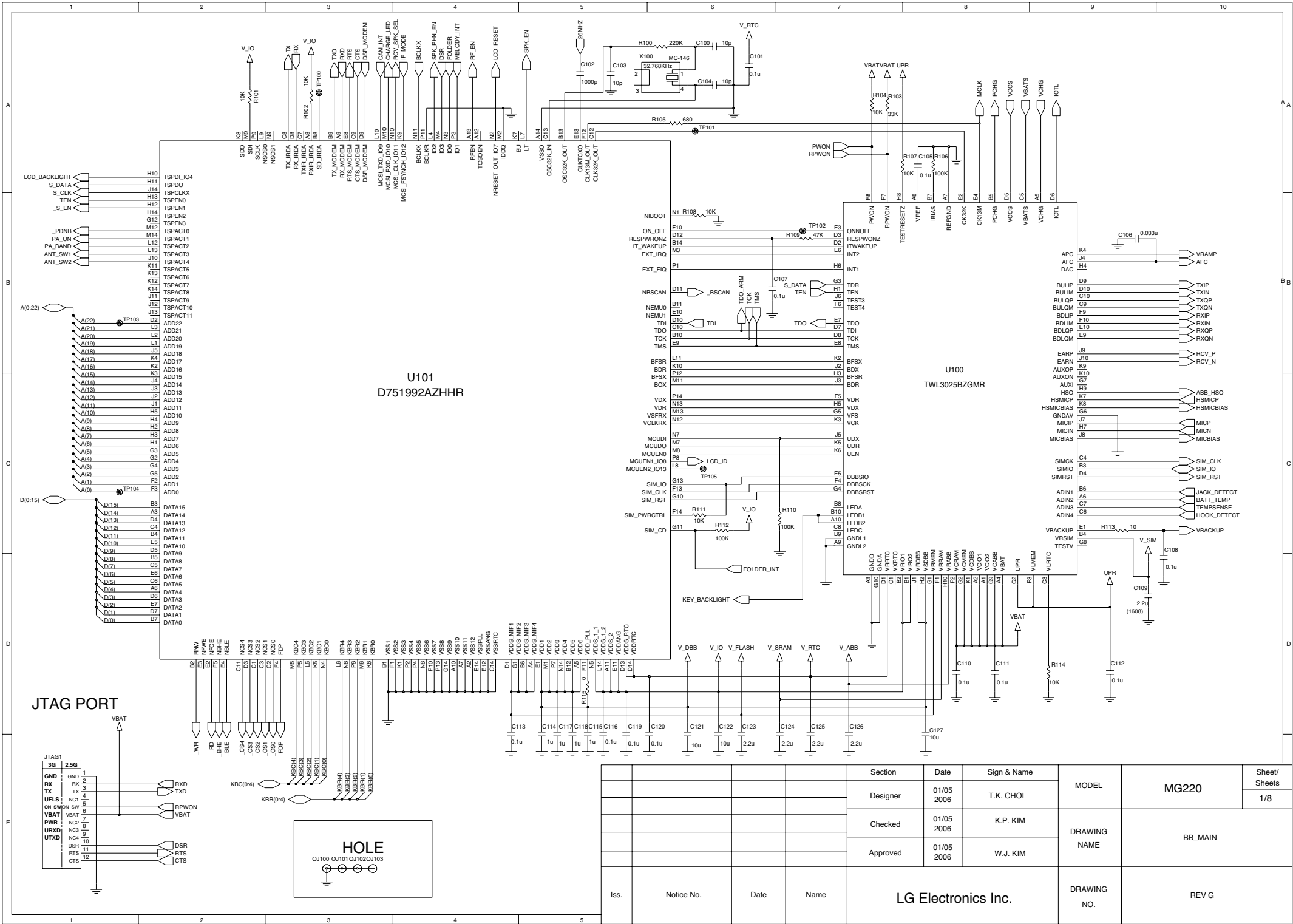
#### 6.1.1. RF Calibration Program



## 6. SERVICE AND CALIBRATION



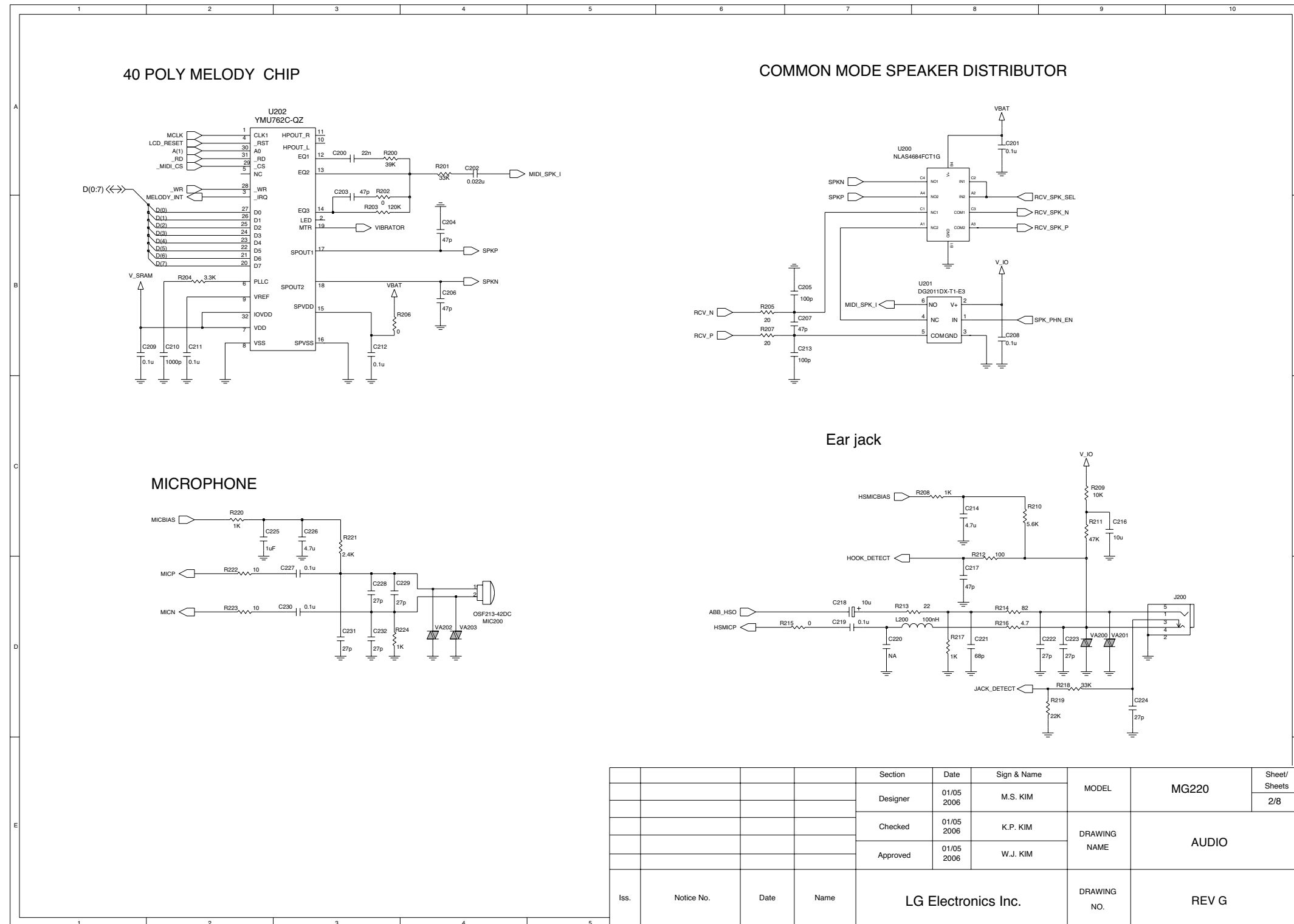
7. CIRCUIT DIAGRAM



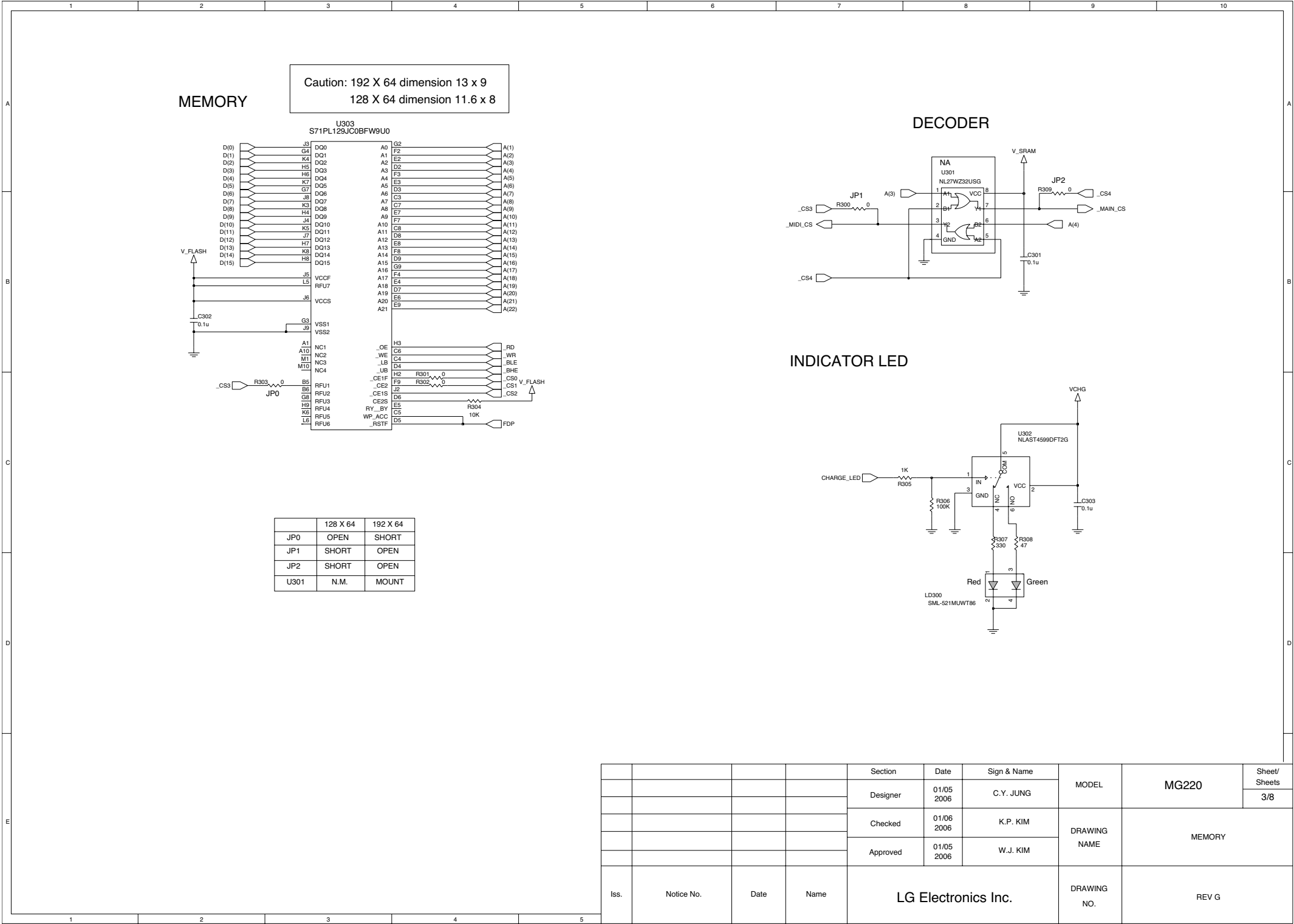
LGIC(42)-A-5505-10:01

LG Electronics Inc.

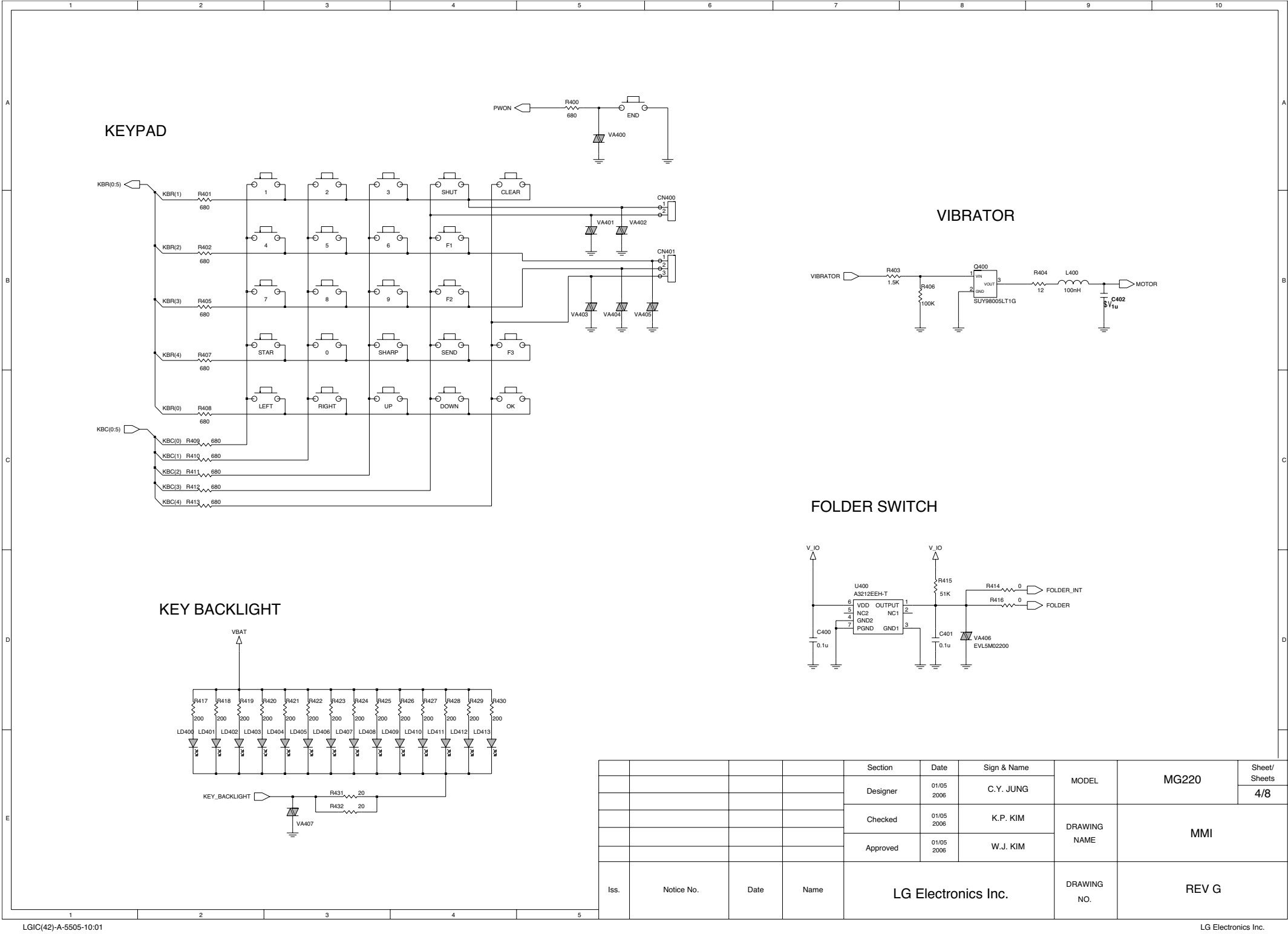
## 7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM

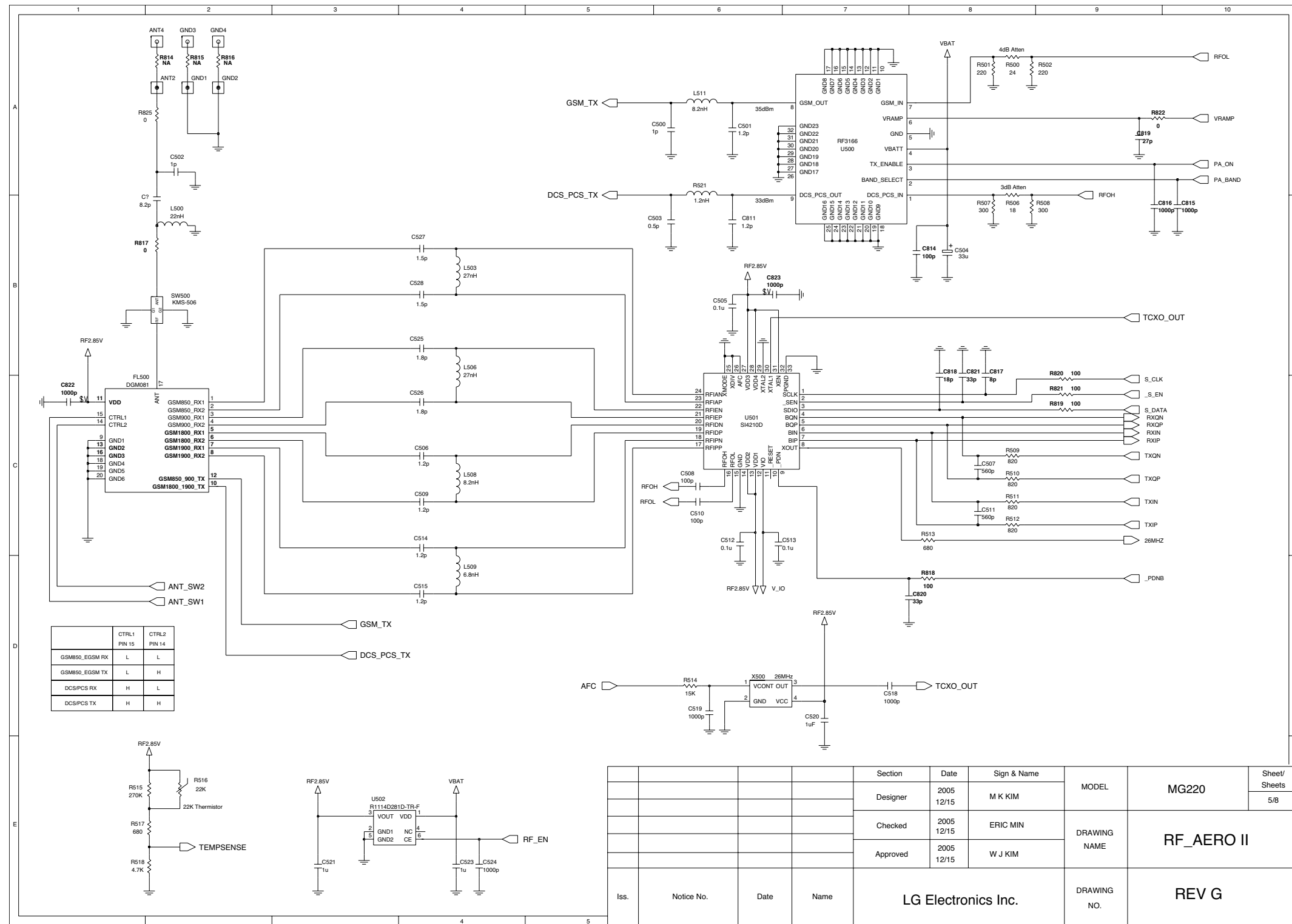


|      |            |      |      |                     |               |             |                 |       |                  |
|------|------------|------|------|---------------------|---------------|-------------|-----------------|-------|------------------|
|      |            |      |      | Section             | Date          | Sign & Name | MODEL           | MG220 | Sheet/<br>Sheets |
|      |            |      |      | Designer            | 01/05<br>2006 | C.Y. JUNG   |                 |       | 4/8              |
|      |            |      |      | Checked             | 01/05<br>2006 | K.P. KIM    | DRAWING<br>NAME | MMI   |                  |
|      |            |      |      | Approved            | 01/05<br>2006 | W.J. KIM    |                 |       |                  |
| Iss. | Notice No. | Date | Name | LG Electronics Inc. |               |             | DRAWING<br>NO.  | REV G |                  |

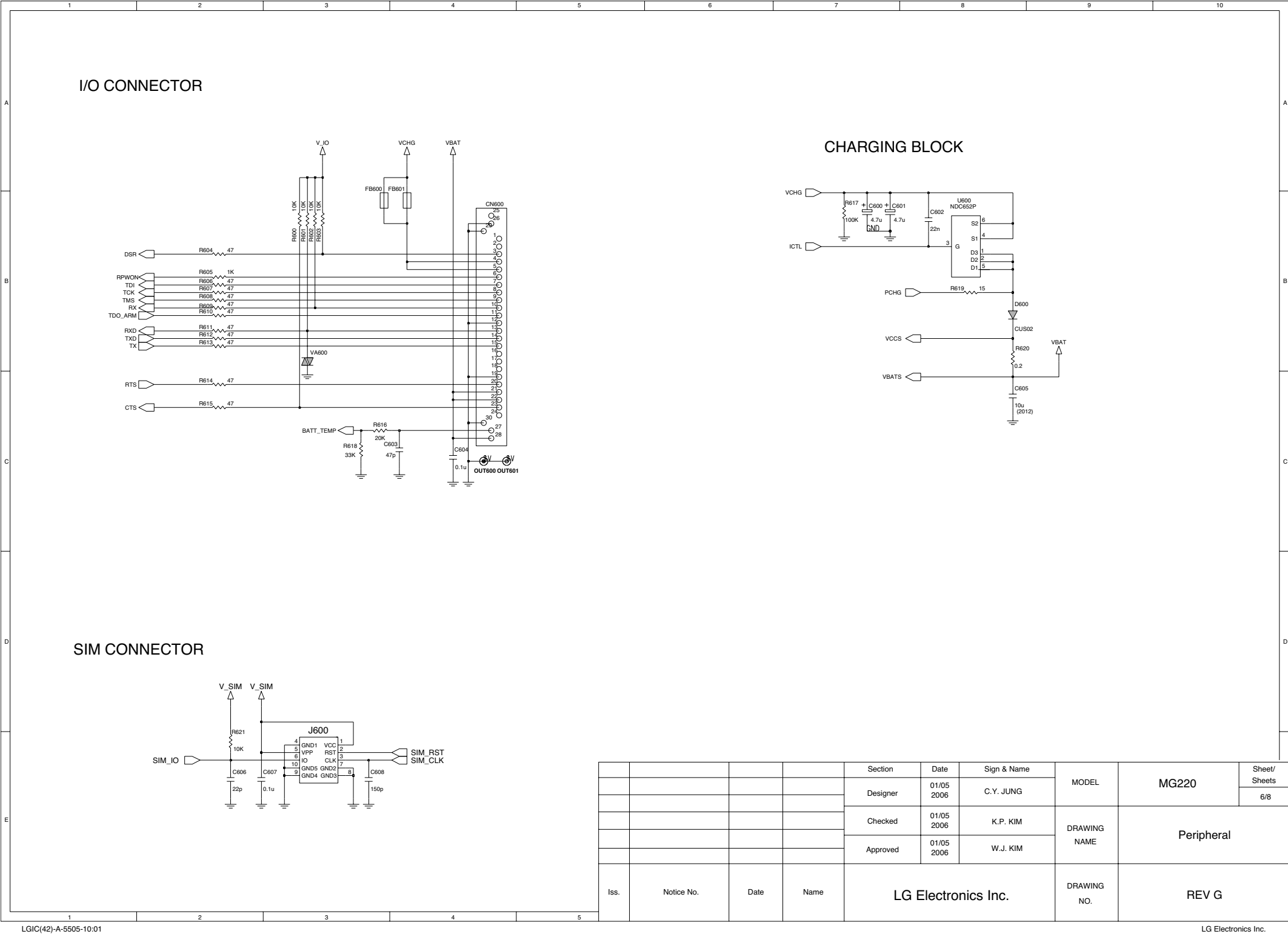
LGIC(42)-A-5505-10:01

LG Electronics Inc.

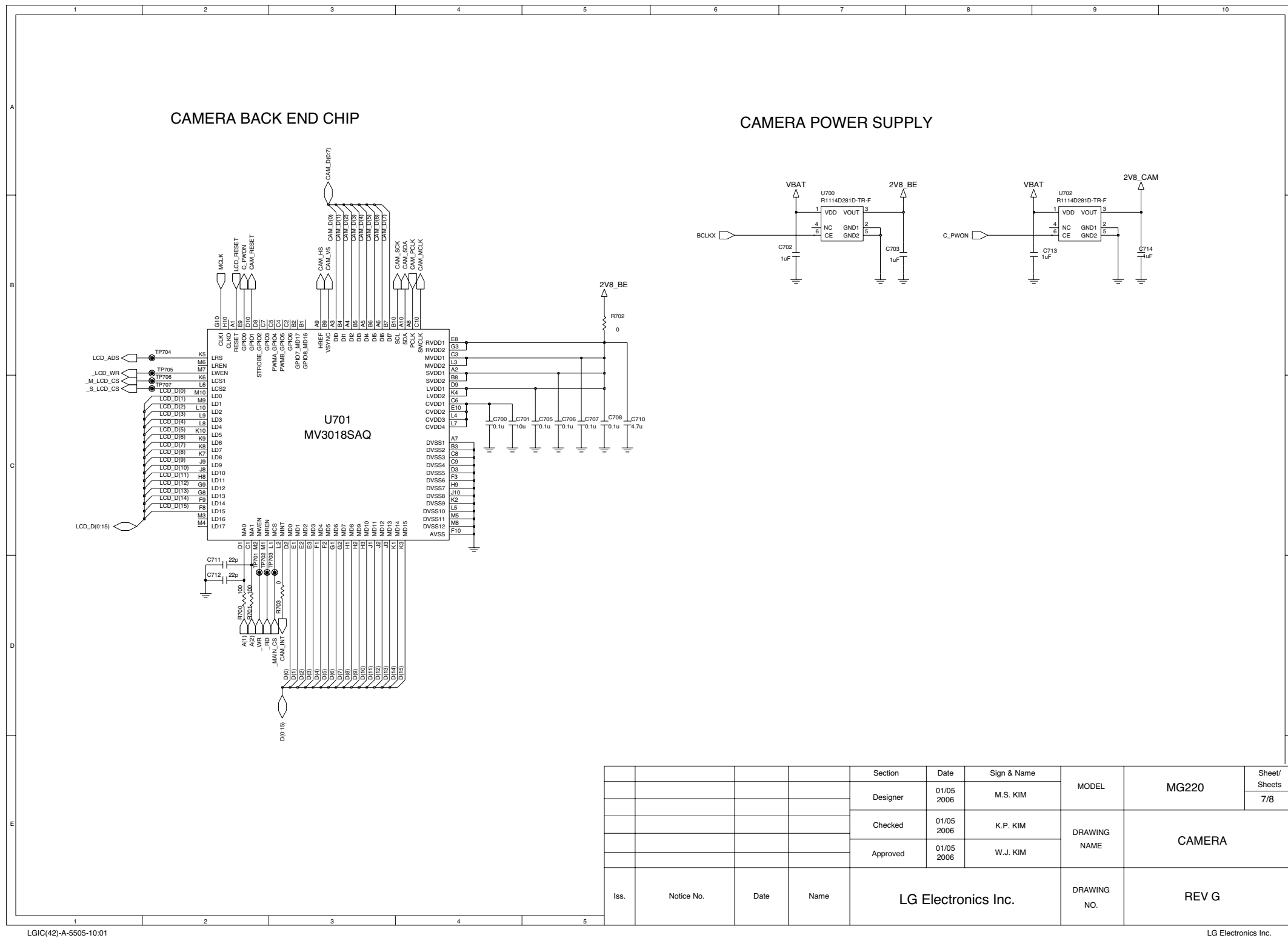
## 7. CIRCUIT DIAGRAM



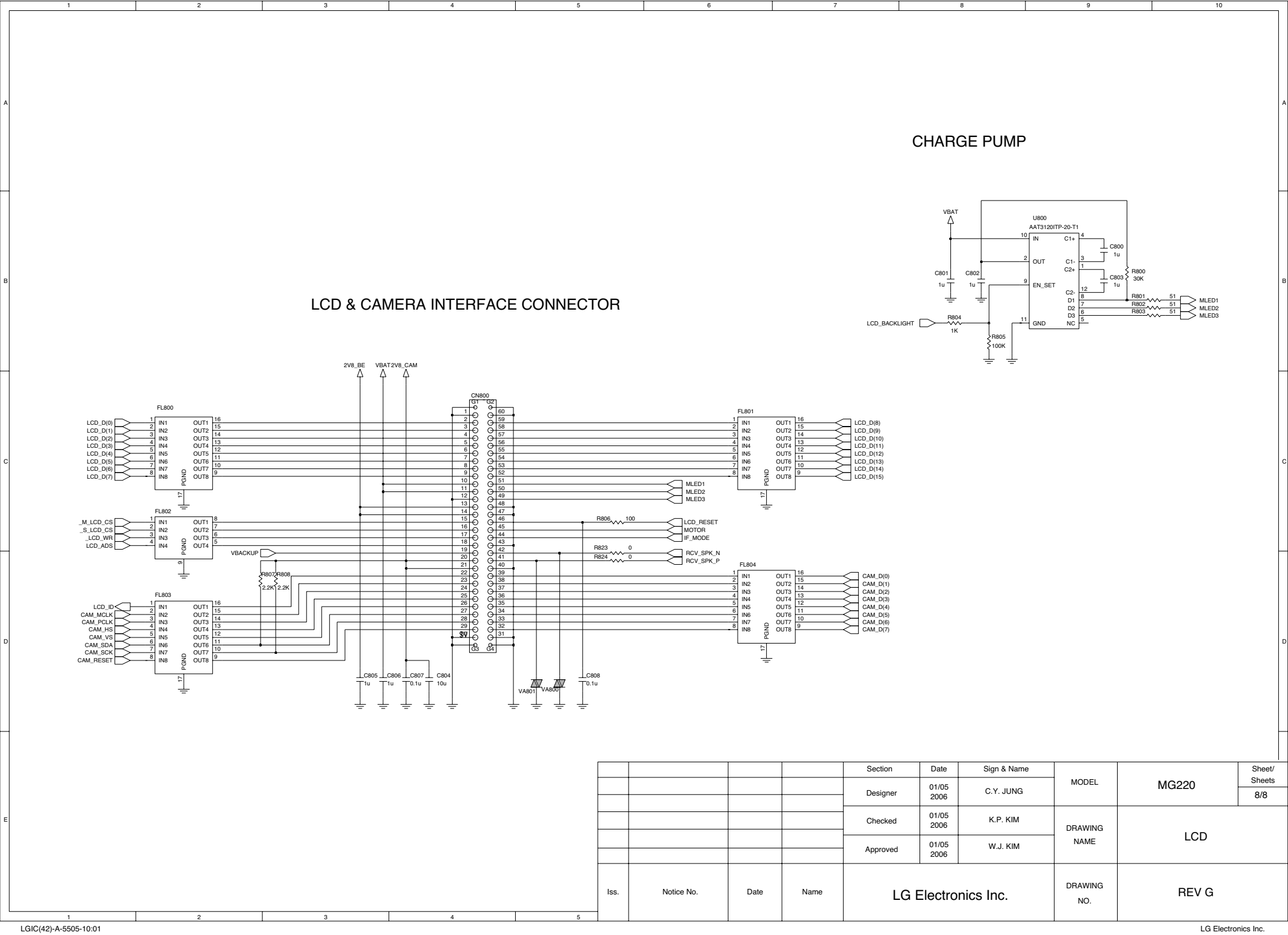
7. CIRCUIT DIAGRAM



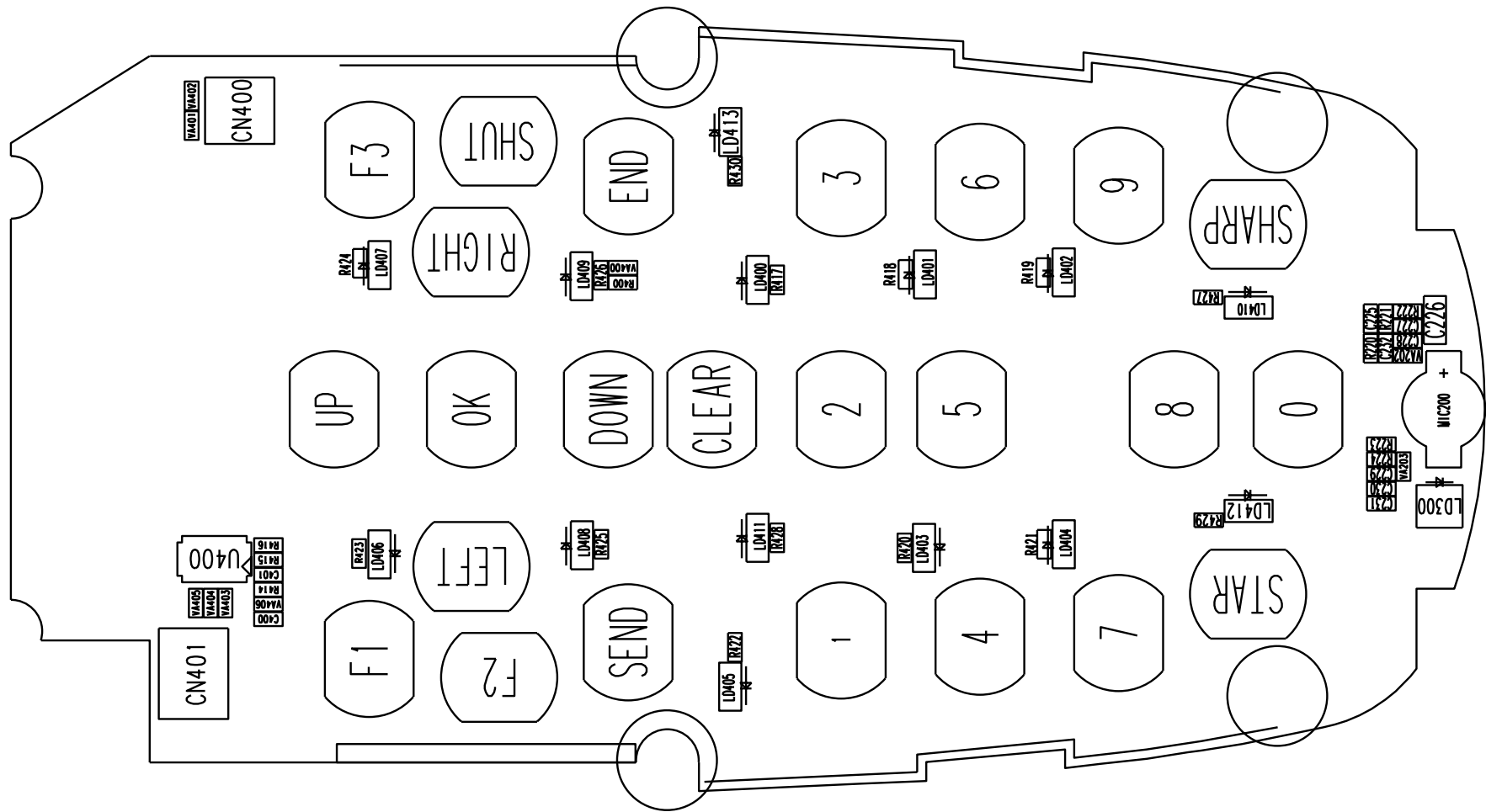
## 7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM

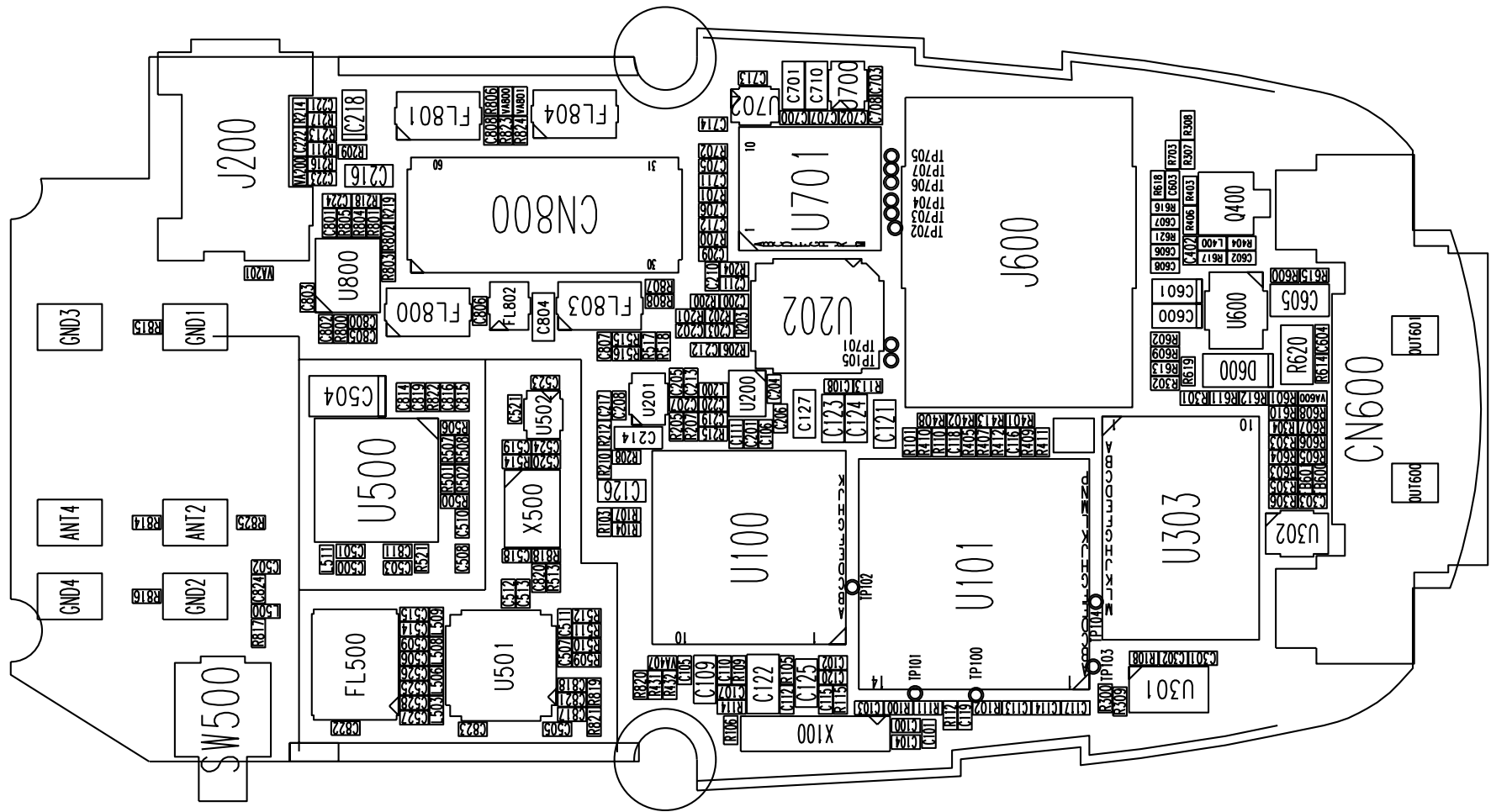


8. pcb layout



MG220-SPFY0117601-1.0-TOP

8. pcb layout



MG220-SPFY0117601-1.0-BTM

## 9. ENGINEERING MODE

Engineering mode is designed to allow a service man/engineer to view and test the basic functions provided by a handset. The key sequence for switching the engineering mode on is "2945\*#\*#" Select. Pressing END will switch back to non-engineering mode operation. Use Up and Down key to select a menu and press 'select' key to progress the test. Pressing 'back key will switch back to the original test menu.

### [1] All auto test

### [2] Baseband test

#### [2-1] LED

[2-1-1] BACKLIGHT

[2-1-1-1] MAIN LCD ON/OFF

[2-1-1-2] KEYPAD ON/OFF

#### [2-2] LCD

[2-2-1] LCD AUTO

[2-2-2] LCD COLOR

#### [2-3] FONT

[2-3-1] FONT 810

[2-3-2] FONT 810i

[2-3-3] FONT 816

[2-3-4] FONT 816i

[2-3-5] FONT 816b

[2-3-6] FONT 1018

[2-3-7] FONT 1019

[2-3-8] FONT 1320

#### [2-4] ALERT

[2-4-1] VIBRATOR

[2-4-2] RING

[2-4-3] EFFECT SOUND

[2-4-4] IMELODY SOUND

[2-4-5] EMS SOUND

### [2-5] SERIAL PORT

[2-5-1] MODEM

### [2-6] BATTERY INFO1

### [2-7] AUDIO GAIN

[2-7-1] RECEIVER

[2-7-2] EAR MIC

[2-7-3] LOUD SPEAKER

[2-7-4] HANDSFREE

[2-7-5] DEFAULT VALUE

[2-7-6] DAI TEST

[2-7-7] LOOPBACK TEST

### [3] MG220 VERS

### [4] ENG MODE

[4-1] CELL ENVIRON

[4-2] LOCATION INFO

[4-3] LAYER1 INFO

[4-4] SELECTION DE BANDE

[4-5] CMU200 BLER

### [5] CALL TIMER

### [6] FACTORY DEFAULT

### [7] FACTORY RESULT

## 10. STANDALONE TEST

---

## 10. STANDALONE TEST

### 10.1 Setting Method

#### 10.1.1 COM Port

In the “Dialog Menu”, select the values as explained below.

- Port : select a correct COM port
- Baudrate : 115200
- Leave the rest as default values

#### 10.1.2 Tx Test

##### 1. Selecting Channel

- Select one of GSM850, EGSM, DCS, PCS Band and input appropriate channel.

##### 2. Selecting VRAMP

- Select either Power level or DAC value.
- Power level
  - Input appropriate value GSM (between 5~19) or PCS (between 0~15)
- DAC value
  - You may adjust directly the power level with DAC values.

#### 10.1.3 Rx Test

##### 1. Selecting Channel

- Select one of GSM850, PCS Band and input appropriate channel.

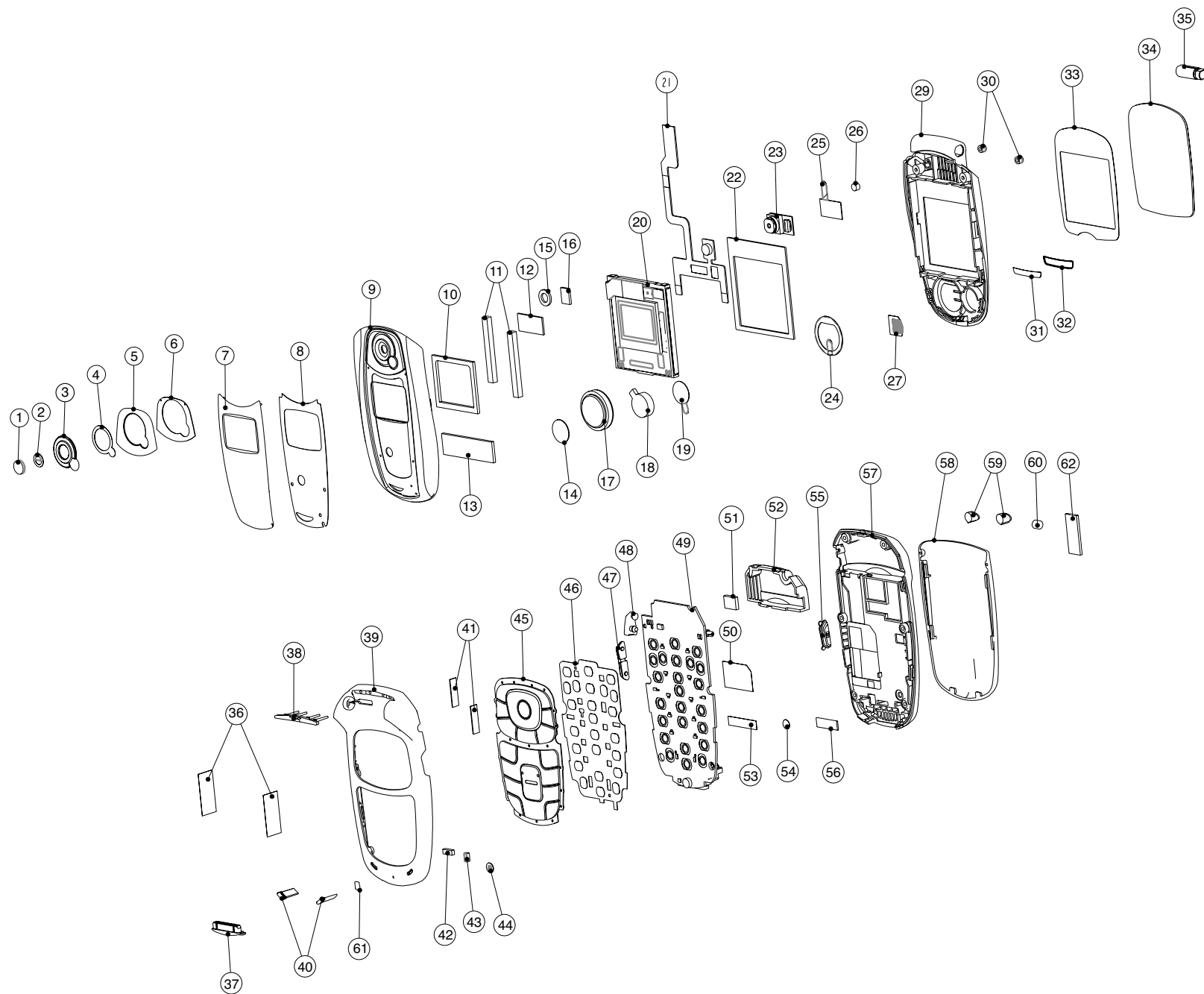
##### 2. Automatic Gain Control and Instrument Power level

See if the value of RSSI is close to -60dBm when setting the value 40 AGC Value Setting.

- Normal phone should indicate the value of RSSI close to -60dBm.

# 11. EXPLODED VIEW & REPLACEMENT PART LIST

## 11.1 EXPLODED VIEW



| No. | 품 명                  | 도 번         | 수량 | 비고           |
|-----|----------------------|-------------|----|--------------|
| 1   | WINDOW, CAMERA       | MWAE0014701 | 1  |              |
| 2   | TAPE                 | MTAZ0113901 | 1  |              |
| 3   | DECO, CAMERA         | MDAD0019301 | 1  |              |
| 4   | TAPE, DECO           | MTAA0110501 | 1  | camera       |
| 5   | DECO, FOLDER(UPPER)  | MDAE0034501 | 1  |              |
| 6   | TAPE, DECO           | MTAA0110301 | 1  | UPPER        |
| 7   | WINDOW ASSY, LCD     | AWAB0021101 | 1  |              |
| 8   | TAPE, WINDOW(SUB)    | MTAE0027001 | 1  |              |
| 9   | COVER, FOLDER(UPPER) | MCJ0042301  | 1  |              |
| 10  | PAD, LCD(SUB)        | MPB00026801 | 1  |              |
| 11  | GASKET, SHIELD FORM  | MGAD0108201 | 2  |              |
| 12  | PAD                  | MPBZ0117501 | 1  | CON          |
| 13  | PAD                  | MPBZ0117601 | 1  |              |
| 14  | PAD, MOTOR           | MPBJ0030301 | 1  |              |
| 15  | PAD, CAMERA          | MPBT0026001 | 1  |              |
| 16  | PAD                  | MPBZ0117401 | 1  | BATTERY      |
| 17  | SPEAKER              | SUSY0021101 | 1  |              |
| 18  | VIBRATOR, MOTOR      | SJMY0006506 | 1  |              |
| 19  | TAPE, MOTOR          | MTAF0007701 | 1  |              |
| 20  | LCD MODULE           | SVLM0018301 | 1  |              |
| 21  | PCB ASSY, FLEXIBLE   | SACY0042901 | 1  |              |
| 22  | PAD, LCD             | MPBG0044001 | 1  | LOWER        |
| 23  | CAMERA               | SVCY0004001 | 1  |              |
| 24  | PAD, SPEAKER         | MPBN0028201 | 1  |              |
| 25  | TAPE                 | MTAZ0115701 | 1  | CAMERA       |
| 26  | MAGNET, SWITCH       | MMAA0001601 | 1  |              |
| 27  | FILTER, SPEAKER      | MFBC0024801 | 1  |              |
| 29  | COVER, FOLDER(LOWER) | MCJH0034101 | 1  |              |
| 30  | CAP, SCREW           | MCCH0073701 | 2  | LOWER        |
| 31  | TAPE, DECO           | MTAA0110201 | 1  | RECEIVER     |
| 32  | DECO, RECEIVER       | MDAH0016701 | 1  |              |
| 33  | TAPE, WINDOW         | MTAD0049501 | 1  |              |
| 34  | WINDOW, LCD          | MWAC0063201 | 1  |              |
| 35  | HINGE, FOLDER        | MHFD0013301 | 1  |              |
| 36  | TAPE                 | MTAZ0116401 | 2  | BUTTON FIXED |
| 37  | CAP, RECEPTACLE      | MCCE0030302 | 1  |              |
| 38  | STOPPER              | MSGY0014501 | 1  |              |
| 39  | COVER, FRONT         | MCJK0054301 | 1  |              |
| 40  | BUMPER               | MBHY0018001 | 2  |              |
| 41  | PAD                  | MPBZ0127801 | 2  |              |
| 42  | PAD                  | MPBZ0125301 | 1  |              |
| 43  | GASKET, SHIELD FORM  | MGAD0119901 | 1  | FRONT        |
| 44  | FILTER, MIKE         | MFBD0017001 | 1  |              |
| 45  | BUTTON, DIAL         | MBJA0020301 | 1  |              |
| 46  | DOME ASSY, METAL     | ADCA0049901 | 1  |              |
| 47  | BUTTON, SIDE         | MBJL0029201 | 1  |              |
| 48  | CAP, EARPHONE JACK   | MCCC0033001 | 1  |              |
| 49  | PCB ASSY, MAIN       | SAFY0155702 | 1  |              |
| 50  | INSULATOR            | M1DZ0080901 | 1  |              |
| 51  | PAD                  | MPBZ0121201 | 1  | PAD, ANTENNA |
| 52  | ANTENNA, GSM, FIXED  | SNGF0013501 | 1  |              |
| 53  | INSULATOR            | M1DZ0081001 | 1  |              |
| 54  | LABEL, A/S           | MLAB0001102 | 1  |              |
| 55  | BUTTON               | MBJZ0007201 | 1  |              |
| 56  | GASKET, SHIELD FORM  | MGAD0108401 | 1  |              |
| 57  | COVER, REAR          | MCJN0049901 | 1  |              |
| 58  | COVER, BATTERY       | MCJA0029201 | 1  |              |
| 59  | CAP, SCREW           | MCCH0073601 | 2  | REAR         |
| 60  | CAP, MOBILE SWITCH   | MCCF0032801 | 1  |              |
| 61  | INDICATOR, LED       | M1AA0017501 | 1  |              |
| 62  | GASKET, SHIELD FORM  | MGAD0108301 | 1  |              |



## 11. EXPLODED VIEW & REPLACEMENT PART LIST

### 11.2 Replacement Parts <Mechanic component>

**Note:** This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

| Level | Location No. | Description               | Part Number | Specification                         | Color       | Remark |
|-------|--------------|---------------------------|-------------|---------------------------------------|-------------|--------|
| 1     |              | GSM(FOLDER)               | TGFF0084607 |                                       | Black       |        |
| 2     | AAAY00       | ADDITION                  | AAAY0144707 |                                       | Black       |        |
| 3     | MCJA00       | COVER,BATTERY             | MCJA0029201 | MG220 CLRBK                           | Black       | 58     |
| 2     | APEY00       | PHONE                     | APEY0303001 | MG220c BTMBK                          | Black       |        |
| 3     | ACGG00       | COVER ASSY,FOLDER         | ACGG0070101 | MG220 CLRBK                           | Black       |        |
| 4     | ACGH00       | COVER ASSY, FOLDER(LOWER) | ACGH0042901 | MG220                                 | Black       |        |
| 5     | MCJH00       | COVER,FOLDER(LOWER)       | MCJH0034101 | MG220                                 | Black       | 29     |
| 5     | MDAH00       | DECO,RECEIVER             | MDAH0016701 | MG220 CLRBK                           | Black       | 32     |
| 5     | MFBC00       | FILTER,SPEAKER            | MFBC0024801 | MG220                                 | Black       | 27     |
| 5     | MMAA00       | MAGNET,SWITCH             | MMAA0001601 | 7100 magnetic                         | Silver      | 26     |
| 5     | MPBG00       | PAD,LCD                   | MPBG0044001 | MG220 CLRBK                           | Black       | 22     |
| 5     | MPBN00       | PAD,SPEAKER               | MPBN0028201 | MG220                                 | Black       | 24     |
| 5     | MTAA00       | TAPE,DECO                 | MTAA0110201 | MG220 CLRBK TAPE DECO RECEIVER        | Black       | 31     |
| 5     | MTAD00       | TAPE,WINDOW               | MTAD0049501 | MG220 CLRBK                           | Transparent | 33     |
| 5     | MTAF00       | TAPE,MOTOR                | MTAF0007701 | MG220 CLRBK                           | Transparent | 19     |
| 5     | MTAZ00       | TAPE                      | MTAZ0115701 | MG220 TAPE CAMERA                     | Transparent | 25     |
| 4     | ACGJ00       | COVER ASSY, FOLDER(UPPER) | ACGJ0056101 | MG220                                 | Black       |        |
| 5     | AWAB00       | WINDOW ASSY,LCD           | AWAB0021101 | MG220 CLRBK                           | Black       | 7      |
| 6     | BFAA00       | FILM,INMOLD               | BFAA0037001 | MG220 CLRBK                           | Gray        |        |
| 6     | MWAF00       | WINDOW,LCD(SUB)           | MWAF0032701 | MG220 CLRBK                           | Black       |        |
| 5     | MCJJ00       | COVER,FOLDER(UPPER)       | MCJJ0042301 | MG220                                 | Black       | 9      |
| 5     | MDAD00       | DECO,CAMERA               | MDAD0019301 | MG220 CLRBK                           | Black       | 3      |
| 5     | MDAE00       | DECO,FOLDER(UPPER)        | MDAE0034501 | MG220 CLRBK                           | Black       | 5      |
| 5     | MGAD00       | GASKET,SHIELD FORM        | MGAD0108201 | MG220 CLRBK upper 3.0x2x19.4          | Yellow      | 11     |
| 5     | MPBJ00       | PAD,MOTOR                 | MPBJ0030301 | MG220 CLRBK                           | Black       |        |
| 5     | MPBQ00       | PAD,LCD(SUB)              | MPBQ0026801 | MG220 CLRBK                           | Black       | 10     |
| 5     | MPBT00       | PAD,CAMERA                | MPBT0026001 | MG220 CLRBK                           | Black       | 15     |
| 5     | MPBZ00       | PAD                       | MPBZ0117401 | MG220 CLRBK BACKUP BATTERY            | Black       | 16     |
| 5     | MPBZ01       | PAD                       | MPBZ0117501 | MG220 CLRBK PAD CON FPCB              | Black       | 12     |
| 5     | MPBZ02       | PAD                       | MPBZ0117601 | MG220 CLRBK PAD LCD BOTTOM            | Black       | 13     |
| 5     | MTAA00       | TAPE,DECO                 | MTAA0110301 | MG220 CLRBK TAPE DECO UPPER           | Transparent | 6      |
| 5     | MTAA02       | TAPE,DECO                 | MTAA0110501 | MG220 CLRBK tape deco camera 9.6x12.4 | Transparent | 4      |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description        | Part Number | Specification                                    | Color       | Remark |
|-------|--------------|--------------------|-------------|--------------------------------------------------|-------------|--------|
| 5     | MTAB00       | TAPE,PROTECTION    | MTAB0115001 | MG220c IN UPPER                                  | Blue        |        |
| 5     | MTAE00       | TAPE,WINDOW(SUB)   | MTAE0027001 | MG220 CLR BK                                     | Transparent | 8      |
| 5     | MTAZ01       | TAPE               | MTAZ0113901 | MG220 CLR BK tape window camera                  | Transparent | 2      |
| 4     | ACGK00       | COVER ASSY,FRONT   | ACGK0066801 | MG220 CLR DG                                     | Black       |        |
| 5     | MBHY00       | BUMPER             | MBHY0018001 | MG220 CLR DG                                     | Black       | 40     |
| 5     | MBJL00       | BUTTON,SIDE        | MBJL0029201 | MG220 CLR DG                                     | Black       | 47     |
| 5     | MBJZ00       | BUTTON             | MBJZ0007201 | MG220 CLR DG BUTTON CAMERA                       | Black       | 55     |
| 5     | MCJK00       | COVER,FRONT        | MCJK0054301 | MG220 CLR DG                                     | Black       | 39     |
| 5     | MFBD00       | FILTER,MIKE        | MFBD0017001 | MG220                                            | Black       | 44     |
| 5     | MGAD00       | GASKET,SHIELD FORM | MGAD0119901 | MG220 FRONT ASSY                                 | Yellow      | 43     |
| 5     | MIAA00       | INDICATOR,LED      | MIAA0017501 | MG220 CLR DG                                     | Black       | 61     |
| 5     | MPBZ00       | PAD                | MPBZ0125301 | MG220 PAD LED                                    | Black       | 42     |
| 5     | MSGY00       | STOPPER            | MSGY0014501 | MG220 CLR DG                                     | Black       | 38     |
| 5     | MTAZ00       | TAPE               | MTAZ0116401 | MG220 TAPE , BUTTON FIXED                        | Green       | 36     |
| 4     | GMEY00       | SCREW MACHINE,BIND | GMEY0011201 | 1.4 mm,3 mm,MSWR3(BK) ,N ,+ ,NYLOK               |             |        |
| 4     | MCCH00       | CAP,SCREW          | MCCH0073701 | MG220 CLR BK CAP SCREW LOWER                     | Black       | 30     |
| 4     | MHFD00       | HINGE,FOLDER       | MHFD0013301 | 5.0Pi,4kgf                                       | Green       |        |
| 4     | MIDZ00       | INSULATOR          | MIDZ0082501 | MG220 FPCB FIXED                                 | Blue        |        |
| 4     | MTAB01       | TAPE,PROTECTION    | MTAB0104401 | MG220c TAPE,PROTECTION (SUB)                     | Transparent |        |
| 4     | MTAB02       | TAPE,PROTECTION    | MTAB0104501 | MG220c TAPE,PROTECTION (MAIN)                    | Transparent |        |
| 4     | MTAZ00       | TAPE               | MTAZ0135701 | MG220 FPCB FIXED                                 | Transparent |        |
| 4     | MWAC00       | WINDOW,LCD         | MWAC0063201 | MG220 CLR DG                                     | Black       | 34     |
| 4     | MWAE00       | WINDOW,CAMERA      | MWAE0014701 | MG220 CLR BK                                     | Black       | 1      |
| 3     | ACGM00       | COVER ASSY,REAR    | ACGM0067901 | MG220 CLR BK                                     | Black       |        |
| 4     | MCCC00       | CAP,EARPHONE JACK  | MCCC0033001 | MG220 CLR DG                                     | Black       | 48     |
| 4     | MCJN00       | COVER,REAR         | MCJN0049901 | MG220 CLR DG                                     | Black       | 57     |
| 4     | MGAD00       | GASKET,SHIELD FORM | MGAD0108301 | MG220 CLR DG REAR BTOB                           | Yellow      | 62     |
| 4     | MGAD01       | GASKET,SHIELD FORM | MGAD0108401 | MG220 CLR BK IO                                  | Yellow      | 56     |
| 4     | MIDZ00       | INSULATOR          | MIDZ0081001 | MG220 CLR DG 17.3x3.8                            | Blue        | 53     |
| 4     | MIDZ02       | INSULATOR          | MIDZ0080901 | MG220 CLR DG 11.2x17.3                           | Blue        | 50     |
| 4     | MLAB00       | LABEL,A/S          | MLAB0001102 | C2000 USASV DIA 4.0                              | White       | 54     |
| 4     | MPBZ00       | PAD                | MPBZ0121201 | MG220 PAD FPCB                                   | Black       | 51     |
| 4     | MPBZ01       | PAD                | MPBZ0127801 | MG220c PAD BUTTON FIXED REAR                     | Black       | 41     |
| 4     | SNGF00       | ANTENNA,GSM,FIXED  | SNGF0013501 | 4.0:1 ,-8.9 dBd , ,EGSM/DCS/PCS Internal Pb-Free |             | 52     |
| 3     | GMEY00       | SCREW MACHINE,BIND | GMEY0011201 | 1.4 mm,3 mm,MSWR3(BK) ,N ,+ ,NYLOK               |             |        |
| 3     | MBJA00       | BUTTON,DIAL        | MBJA0020301 | MG220 CLR BK                                     | Black       | 45     |
| 3     | MCCE00       | CAP,RECEPTACLE     | MCCE0030302 | MG210c CAP RECEPTACLE                            | Black       | 37     |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

---

| Level | Location No. | Description       | Part Number | Specification              | Color  | Remark |
|-------|--------------|-------------------|-------------|----------------------------|--------|--------|
| 3     | MCCF00       | CAP,MOBILE SWITCH | MCCF0032801 | MG220 CLRBK                | Black  | 60     |
| 3     | MCCH00       | CAP,SCREW         | MCCH0073601 | MG220 CLRBK CAP SCREW REAR | Black  | 59     |
| 3     | MLAK00       | LABEL,MODEL       | MLAK0006901 |                            |        |        |
| 5     | ADCA00       | DOME ASSY,METAL   | ADCA0049901 | MG220 CLRBK                | Silver | 46     |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

### <Main component>

**Note:** This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

| Level | Location No. | Description                     | Part Number | Specification                                                                                                    | Color | Remark |
|-------|--------------|---------------------------------|-------------|------------------------------------------------------------------------------------------------------------------|-------|--------|
| 4     | SACY00       | PCB ASSY,FLEXIBLE               | SACY0042901 |                                                                                                                  |       | 21     |
| 5     | SACE00       | PCB ASSY,FLEXIBLE,SMT           | SACE0037701 |                                                                                                                  |       |        |
| 6     | SACC00       | PCB ASSY,FLEXIBLE,SMT<br>BOTTOM | SACC0021101 |                                                                                                                  |       |        |
| 7     | CN2          | CONNECTOR,<br>BOARD TO BOARD    | ENBY0019501 | 20 PIN,.4 mm,ETC , ,H=1.5, Socket                                                                                |       |        |
| 7     | CN3          | CONNECTOR,<br>BOARD TO BOARD    | ENBY0020202 | 60 PIN,0.4 mm,STRAIGHT ,AU ,STACKING HEIGHT 0.9 /<br>HEADER FOR KEYPAD TO MAIN                                   |       |        |
| 6     | SACD00       | PCB ASSY,FLEXIBLE,SMT<br>TOP    | SACD0030401 |                                                                                                                  |       |        |
| 7     | CN1          | CONNECTOR,<br>BOARD TO BOARD    | ENBY0020201 | 40 PIN,0.4 mm,ETC , ,H=0.9, Header                                                                               |       |        |
| 7     | SBCL00       | BATTERY,CELL,LITHIUM            | SBCL0001305 | 3 V,1 mAh,COIN ,SMT Temp.260 degree. PB-Free B/B                                                                 |       |        |
| 6     | SPCY00       | PCB,FLEXIBLE                    | SPCY0066901 | POLYI , mm,MULTI-5 ,MG220 LCD FPCB                                                                               |       |        |
| 4     | SJMY00       | VIBRATOR,MOTOR                  | SJMY0006506 | 3 V,0.08 A,10*3.45 ,17mm                                                                                         |       | 18     |
| 4     | SUSY00       | SPEAKER                         | SUSY0021101 | ASSY ,8 ohm,91 dB,17 mm,                                                                                         |       |        |
| 4     | SVCY00       | CAMERA                          | SVCY0004001 |                                                                                                                  |       | 22     |
| 4     | SVLM00       | LCD MODULE                      | SVLM0018301 | MAIN ,128*128 (1.5")+96*64 (MSTN) ,35.78x39.9x4.3(Max)<br>,65k ,CSTN ,TM ,M:S-44206D/S:S-44001A , SUB Color Film |       |        |
| 3     | SAFY00       | PCB ASSY,MAIN                   | SAFY0155702 |                                                                                                                  |       | 49     |
| 4     | SAFB00       | PCB ASSY,MAIN,INSERT            | SAFB0055101 |                                                                                                                  |       |        |
| 5     | SPKY00       | PCB,SIDEKEY                     | SPKY0030001 | POLYI , mm,DOUBLE ,SK1_CAMERA                                                                                    |       |        |
| 5     | SPKY01       | PCB,SIDEKEY                     | SPKY0030101 | POLYI , mm,DOUBLE ,SK2_VOLUME                                                                                    |       |        |
| 4     | SAFF00       | PCB ASSY,MAIN,SMT               | SAFF0077802 | MG220c BTMBK(BRASIL TIM)                                                                                         |       |        |
| 5     | MLAB00       | LABEL,A/S                       | MLAB0000601 | HUMIDITY STICKER                                                                                                 |       |        |
| 5     | MLAC00       | LABEL,BARCODE                   | MLAC0003301 | EZ LOOKS(use for PCB ASSY MAIN(hardware))                                                                        |       |        |
| 5     | SAFC00       | PCB ASSY,MAIN,SMT<br>BOTTOM     | SAFC0068701 |                                                                                                                  |       |        |
| 6     | C100         | CAP,CERAMIC,CHIP                | ECCH0000110 | 10 pF,50V,D,NP0,TC,1005,R/TP                                                                                     |       |        |
| 6     | C101         | CAP,CERAMIC,CHIP                | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP                                                                               |       |        |
| 6     | C102         | CAP,CERAMIC,CHIP                | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP                                                                                      |       |        |
| 6     | C103         | CAP,CERAMIC,CHIP                | ECCH0000110 | 10 pF,50V,D,NP0,TC,1005,R/TP                                                                                     |       |        |
| 6     | C104         | CAP,CERAMIC,CHIP                | ECCH0000110 | 10 pF,50V,D,NP0,TC,1005,R/TP                                                                                     |       |        |
| 6     | C105         | CAP,CERAMIC,CHIP                | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP                                                                               |       |        |
| 6     | C106         | CAP,CERAMIC,CHIP                | ECCH0000161 | 33 nF,16V,K,X7R,HD,1005,R/TP                                                                                     |       |        |
| 6     | C107         | CAP,CERAMIC,CHIP                | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP                                                                               |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description      | Part Number | Specification                       | Color | Remark |
|-------|--------------|------------------|-------------|-------------------------------------|-------|--------|
| 6     | C108         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C109         | CAP,CERAMIC,CHIP | ECCH0005602 | 2.2 uF,16V ,K ,X5R ,HD ,1608 ,R/TP  |       |        |
| 6     | C110         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C111         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C112         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C113         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C114         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C115         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C116         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C117         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C118         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C119         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C120         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C121         | CAP,CERAMIC,CHIP | ECCH0007901 | 10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP    |       |        |
| 6     | C122         | CAP,CERAMIC,CHIP | ECCH0003401 | 10 uF,6.3V ,Z ,Y5V ,HD ,2012 ,R/TP  |       |        |
| 6     | C123         | CAP,CHIP,MAKER   | ECZH0001421 | 2.2 uF,6.3V ,K ,X5R ,HD ,1608 ,R/TP |       |        |
| 6     | C124         | CAP,CHIP,MAKER   | ECZH0001421 | 2.2 uF,6.3V ,K ,X5R ,HD ,1608 ,R/TP |       |        |
| 6     | C125         | CAP,CHIP,MAKER   | ECZH0001421 | 2.2 uF,6.3V ,K ,X5R ,HD ,1608 ,R/TP |       |        |
| 6     | C126         | CAP,CHIP,MAKER   | ECZH0001421 | 2.2 uF,6.3V ,K ,X5R ,HD ,1608 ,R/TP |       |        |
| 6     | C127         | CAP,CERAMIC,CHIP | ECCH0007901 | 10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP    |       |        |
| 6     | C200         | CAP,CERAMIC,CHIP | ECCH0000179 | 22 nF,16V ,K ,X5R ,HD ,1005 ,R/TP   |       |        |
| 6     | C201         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C202         | CAP,CERAMIC,CHIP | ECCH0000159 | 22 nF,16V,K,X7R,HD,1005,R/TP        |       |        |
| 6     | C203         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C204         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C205         | CAP,CERAMIC,CHIP | ECCH0000128 | 100 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C206         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C207         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C208         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C209         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C210         | CAP,CERAMIC,CHIP | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP         |       |        |
| 6     | C211         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C212         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C213         | CAP,CERAMIC,CHIP | ECCH0000128 | 100 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C214         | CAP,CERAMIC,CHIP | ECCH0006201 | 4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP |       |        |
| 6     | C216         | CAP,CERAMIC,CHIP | ECCH0007901 | 10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP    |       |        |
| 6     | C217         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description           | Part Number | Specification                      | Color | Remark |
|-------|--------------|-----------------------|-------------|------------------------------------|-------|--------|
| 6     | C218         | CAP,TANTAL,CHIP,MAKER | ECTZ0005201 | 10 uF,6.3V ,M ,L_ESR ,1608 ,R/TP   |       |        |
| 6     | C219         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C221         | CAP,CERAMIC,CHIP      | ECCH0000126 | 68 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C222         | CAP,CERAMIC,CHIP      | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C223         | CAP,CERAMIC,CHIP      | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C224         | CAP,CERAMIC,CHIP      | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C301         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C302         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C303         | CAP,CERAMIC,CHIP      | ECCH0000167 | 0.1 uF,6.3V,K,X5R,HD,1005,R/TP     |       |        |
| 6     | C402         | CAP,CERAMIC,CHIP      | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP  |       |        |
| 6     | C500         | CAP,CHIP,MAKER        | ECZH0000802 | 1 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP   |       |        |
| 6     | C501         | CAP,CERAMIC,CHIP      | ECCH0000173 | 1.2 pF,16V ,B ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C502         | CAP,CHIP,MAKER        | ECZH0000802 | 1 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP   |       |        |
| 6     | C503         | CAP,CERAMIC,CHIP      | ECCH0000101 | .5 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP  |       |        |
| 6     | C504         | CAP,TANTAL,CHIP,MAKER | ECTZ0000406 | 33 uF,10V ,M ,STD ,3216 ,R/TP      |       |        |
| 6     | C505         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C506         | CAP,CERAMIC,CHIP      | ECCH0000701 | 1.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C507         | CAP,CHIP,MAKER        | ECZH0003118 | 560 pF,50V ,K ,X7R ,HD ,1005 ,R/TP |       |        |
| 6     | C508         | CAP,CERAMIC,CHIP      | ECCH0000128 | 100 pF,50V,J,NP0,TC,1005,R/TP      |       |        |
| 6     | C509         | CAP,CERAMIC,CHIP      | ECCH0000701 | 1.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C510         | CAP,CERAMIC,CHIP      | ECCH0000128 | 100 pF,50V,J,NP0,TC,1005,R/TP      |       |        |
| 6     | C511         | CAP,CHIP,MAKER        | ECZH0003118 | 560 pF,50V ,K ,X7R ,HD ,1005 ,R/TP |       |        |
| 6     | C512         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C513         | CAP,CERAMIC,CHIP      | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP |       |        |
| 6     | C514         | CAP,CERAMIC,CHIP      | ECCH0000701 | 1.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C515         | CAP,CERAMIC,CHIP      | ECCH0000701 | 1.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C518         | CAP,CERAMIC,CHIP      | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP        |       |        |
| 6     | C519         | CAP,CERAMIC,CHIP      | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP        |       |        |
| 6     | C520         | CAP,CHIP,MAKER        | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP  |       |        |
| 6     | C521         | CAP,CERAMIC,CHIP      | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP  |       |        |
| 6     | C523         | CAP,CERAMIC,CHIP      | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP  |       |        |
| 6     | C524         | CAP,CERAMIC,CHIP      | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP        |       |        |
| 6     | C525         | CAP,CERAMIC,CHIP      | ECCH0000178 | 1.8 pF,50V ,D ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C526         | CAP,CERAMIC,CHIP      | ECCH0000178 | 1.8 pF,50V ,D ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C527         | CAP,CHIP,MAKER        | ECZH0000822 | 1.5 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C528         | CAP,CHIP,MAKER        | ECZH0000822 | 1.5 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP |       |        |
| 6     | C600         | CAP,TANTAL,CHIP       | ECTH0002202 | 4.7 uF,10V ,M ,STD ,1608 ,R/TP     |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description      | Part Number | Specification                       | Color | Remark |
|-------|--------------|------------------|-------------|-------------------------------------|-------|--------|
| 6     | C601         | CAP,TANTAL,CHIP  | ECTH0002202 | 4.7 uF,10V ,M ,STD ,1608 ,R/TP      |       |        |
| 6     | C602         | CAP,CERAMIC,CHIP | ECCH0000179 | 22 nF,16V ,K ,X5R ,HD ,1005 ,R/TP   |       |        |
| 6     | C603         | CAP,CERAMIC,CHIP | ECCH0000122 | 47 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C604         | CAP,CERAMIC,CHIP | ECCH0000167 | 0.1 uF,6.3V,K,X5R,HD,1005,R/TP      |       |        |
| 6     | C605         | CAP,CERAMIC,CHIP | ECCH0003401 | 10 uF,6.3V ,Z ,Y5V ,HD ,2012 ,R/TP  |       |        |
| 6     | C606         | CAP,CERAMIC,CHIP | ECCH0000115 | 22 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C607         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C608         | CAP,CERAMIC,CHIP | ECCH0000130 | 150 pF,50V,J ,SL ,TC ,1005 ,R/TP    |       |        |
| 6     | C700         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C701         | CAP,CERAMIC,CHIP | ECCH0007901 | 10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP    |       |        |
| 6     | C702         | CAP,CHIP,MAKER   | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP   |       |        |
| 6     | C703         | CAP,CHIP,MAKER   | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP   |       |        |
| 6     | C705         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C706         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C707         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C708         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C710         | CAP,CERAMIC,CHIP | ECCH0006201 | 4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP |       |        |
| 6     | C711         | CAP,CERAMIC,CHIP | ECCH0000115 | 22 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C712         | CAP,CERAMIC,CHIP | ECCH0000115 | 22 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C713         | CAP,CHIP,MAKER   | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP   |       |        |
| 6     | C714         | CAP,CHIP,MAKER   | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP   |       |        |
| 6     | C800         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C801         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C802         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C803         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C804         | CAP,CERAMIC,CHIP | ECCH0007901 | 10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP    |       |        |
| 6     | C805         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C806         | CAP,CERAMIC,CHIP | ECCH0004904 | 1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP   |       |        |
| 6     | C807         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP  |       |        |
| 6     | C808         | CAP,CERAMIC,CHIP | ECCH0000167 | 0.1 uF,6.3V,K,X5R,HD,1005,R/TP      |       |        |
| 6     | C811         | CAP,CERAMIC,CHIP | ECCH0000173 | 1.2 pF,16V ,B ,NP0 ,TC ,1005 ,R/TP  |       |        |
| 6     | C814         | CAP,CERAMIC,CHIP | ECCH0000128 | 100 pF,50V,J,NP0,TC,1005,R/TP       |       |        |
| 6     | C815         | CAP,CERAMIC,CHIP | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP         |       |        |
| 6     | C816         | CAP,CERAMIC,CHIP | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP         |       |        |
| 6     | C817         | CAP,CERAMIC,CHIP | ECCH0000109 | 8 pF,50V,D,NP0,TC,1005,R/TP         |       |        |
| 6     | C818         | CAP,CERAMIC,CHIP | ECCH0000113 | 18 pF,50V,J,NP0,TC,1005,R/TP        |       |        |
| 6     | C819         | CAP,CERAMIC,CHIP | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP        |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description                  | Part Number | Specification                                                                  | Color | Remark |
|-------|--------------|------------------------------|-------------|--------------------------------------------------------------------------------|-------|--------|
| 6     | C820         | CAP,CERAMIC,CHIP             | ECCH0000186 | 33 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP                                              |       |        |
| 6     | C821         | CAP,CERAMIC,CHIP             | ECCH0000186 | 33 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP                                              |       |        |
| 6     | C822         | CAP,CERAMIC,CHIP             | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP                                                    |       |        |
| 6     | C823         | CAP,CERAMIC,CHIP             | ECCH0000143 | 1 nF,50V,K,X7R,HD,1005,R/TP                                                    |       |        |
| 6     | C824         | CAP,CHIP,MAKER               | ECZH0000846 | 8.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP                                             |       |        |
| 6     | CN600        | CONNECTOR,I/O                | ENRY0003501 | 24 PIN,0.5 mm,ANGLE , ,                                                        |       |        |
| 6     | CN800        | CONNECTOR,<br>BOARD TO BOARD | ENBY0020402 | 60 PIN,0.4 mm,STRAIGHT ,AU ,STACKING HEIGHT 0.9 /<br>SOCKET FOR KEYPAD TO MAIN |       |        |
| 6     | D600         | DIODE,SWITCHING              | EDSY0012101 | US-FLAT ,30 V,1 A,R/TP ,2.5*1.25*0.6(t)                                        |       |        |
| 6     | FB600        | FILTER,BEAD,CHIP             | SFBH0007102 | 10 ohm,1005 ,Ferrite Bead                                                      |       |        |
| 6     | FB601        | FILTER,BEAD,CHIP             | SFBH0007102 | 10 ohm,1005 ,Ferrite Bead                                                      |       |        |
| 6     | FL500        | FILTER,SEPERATOR             | SFAY0006902 | 850.900 ,1800.1900 ,3.8 dB,4.1 dB, dB, dB,ETC ,5.4*4.0<br>Size Quad Band FEM   |       |        |
| 6     | FL800        | FILTER,EMI/POWER             | SFEY0008801 | SMD ,16Pin DFN Package, 8 Channel EMI Filter with ESD<br>Protection            |       |        |
| 6     | FL801        | FILTER,EMI/POWER             | SFEY0008801 | SMD ,16Pin DFN Package, 8 Channel EMI Filter with ESD<br>Protection            |       |        |
| 6     | FL802        | FILTER,EMI/POWER             | SFEY0012201 | SMD ,4ch, 100ohm, 17pF                                                         |       |        |
| 6     | FL803        | FILTER,EMI/POWER             | SFEY0008801 | SMD ,16Pin DFN Package, 8 Channel EMI Filter with ESD<br>Protection            |       |        |
| 6     | FL804        | FILTER,EMI/POWER             | SFEY0008801 | SMD ,16Pin DFN Package, 8 Channel EMI Filter with ESD<br>Protection            |       |        |
| 6     | J200         | CONN,JACK/PLUG,<br>EARPHONE  | ENJE0002301 | 3,5 PIN,G7000 EAR JACK 3 pole, 5 pin KSD                                       |       |        |
| 6     | J600         | CONN,SOCKET                  | ENSY0007608 | 6 PIN,ETC ,BRIDGE NON PROTECTOR TYPE ,2.54<br>mm,2.7T                          |       |        |
| 6     | L200         | INDUCTOR,CHIP                | ELCH0005825 | 100 nH,J ,1005 ,R/TP ,                                                         |       |        |
| 6     | L400         | INDUCTOR,CHIP                | ELCH0005825 | 100 nH,J ,1005 ,R/TP ,                                                         |       |        |
| 6     | L500         | INDUCTOR,CHIP                | ELCH0001413 | 22 nH,J ,1005 ,R/TP ,PBFREE                                                    |       |        |
| 6     | L503         | INDUCTOR,CHIP                | ELCH0009112 | 27 nH,J ,1005 ,R/TP ,chip coil                                                 |       |        |
| 6     | L506         | INDUCTOR,CHIP                | ELCH0009112 | 27 nH,J ,1005 ,R/TP ,chip coil                                                 |       |        |
| 6     | L508         | INDUCTOR,CHIP                | ELCH0009111 | 8.2 nH,J ,1005 ,R/TP ,chip coil                                                |       |        |
| 6     | L509         | INDUCTOR,CHIP                | ELCH0009109 | 6.8 nH,J ,1005 ,R/TP ,chip coil                                                |       |        |
| 6     | L511         | INDUCTOR,CHIP                | ELCH0005016 | 8.2 nH,J ,1005 ,R/TP ,                                                         |       |        |
| 6     | Q400         | IC                           | EUSY0160401 | SOT-23 ,3 PIN,R/TP ,DC MOTOR DRIVER /<br>INTEGRATED RELAY                      |       |        |
| 6     | R100         | RES,CHIP                     | ERHY0000287 | 220K ohm,1/16W,J,1005,R/TP                                                     |       |        |
| 6     | R101         | RES,CHIP                     | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP                                                      |       |        |
| 6     | R102         | RES,CHIP                     | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP                                                      |       |        |
| 6     | R103         | RES,CHIP                     | ERHY0000138 | 33K ohm,1/16W,F,1005,R/TP                                                      |       |        |
| 6     | R104         | RES,CHIP                     | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP                                                      |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description | Part Number | Specification              | Color | Remark |
|-------|--------------|-------------|-------------|----------------------------|-------|--------|
| 6     | R105         | RES,CHIP    | ERHY0000237 | 680 ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R106         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R107         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R108         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R109         | RES,CHIP    | ERHY0000273 | 47K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R110         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R111         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R112         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R113         | RES,CHIP    | ERHY0000203 | 10 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R114         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R115         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R200         | RES,CHIP    | ERHY0000271 | 39K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R201         | RES,CHIP    | ERHY0000138 | 33K ohm,1/16W,F,1005,R/TP  |       |        |
| 6     | R202         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R203         | RES,CHIP    | ERHY0000282 | 120K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R204         | RES,CHIP    | ERHY0000250 | 3.3K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R205         | RES,CHIP    | ERHY0000207 | 20 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R206         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R207         | RES,CHIP    | ERHY0000207 | 20 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R208         | RES,CHIP    | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R209         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R210         | RES,CHIP    | ERHY0000255 | 5.6K ohm,1/16W,J,1005,R/TP |       |        |
| 6     | R211         | RES,CHIP    | ERHY0000273 | 47K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R212         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R213         | RES,CHIP    | ERHY0000208 | 22 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R214         | RES,CHIP    | ERHY0000218 | 82 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R215         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R216         | RES,CHIP    | ERHY0000202 | 4.7 ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R217         | RES,CHIP    | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R218         | RES,CHIP    | ERHY0000138 | 33K ohm,1/16W,F,1005,R/TP  |       |        |
| 6     | R219         | RES,CHIP    | ERHY0000266 | 22K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R300         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R301         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R302         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R304         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R305         | RES,CHIP    | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R306         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description   | Part Number  | Specification                                       | Color | Remark |
|-------|--------------|---------------|--------------|-----------------------------------------------------|-------|--------|
| 6     | R307         | RES,CHIP      | ERHY0000230  | 330 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R308         | RES,CHIP      | ERHY0000213  | 47 ohm,1/16W,J,1005,R/TP                            |       |        |
| 6     | R309         | RES,CHIP      | ERHY0000201  | 0 ohm,1/16W,J,1005,R/TP                             |       |        |
| 6     | R401         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R402         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R403         | RES,CHIP      | ERHY0000244  | 1.5K ohm,1/16W,J,1005,R/TP                          |       |        |
| 6     | R404         | RES,CHIP      | ERHY0000204  | 12 ohm,1/16W,J,1005,R/TP                            |       |        |
| 6     | R405         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R406         | RES,CHIP      | ERHY0000280  | 100K ohm,1/16W,J,1005,R/TP                          |       |        |
| 6     | R407         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R408         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R409         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R410         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R411         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R412         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R413         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R431         | RES,CHIP      | ERHY0000207  | 20 ohm,1/16W,J,1005,R/TP                            |       |        |
| 6     | R432         | RES,CHIP      | ERHY0000207  | 20 ohm,1/16W,J,1005,R/TP                            |       |        |
| 6     | R500         | RES,CHIP      | ERHY00008201 | 24 ohm,1/16W ,J ,1005 ,R/TP                         |       |        |
| 6     | R501         | RES,CHIP      | ERHY0000226  | 220 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R502         | RES,CHIP      | ERHY0000226  | 220 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R506         | RES,CHIP      | ERHY0000206  | 18 ohm,1/16W,J,1005,R/TP                            |       |        |
| 6     | R507         | RES,CHIP      | ERHY0000229  | 300 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R508         | RES,CHIP      | ERHY0000229  | 300 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R509         | RES,CHIP      | ERHY0000239  | 820 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R510         | RES,CHIP      | ERHY0000239  | 820 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R511         | RES,CHIP      | ERHY0000239  | 820 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R512         | RES,CHIP      | ERHY0000239  | 820 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R513         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R514         | RES,CHIP      | ERHY0000263  | 15K ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R515         | RES,CHIP      | ERHY0000289  | 270K ohm,1/16W,J,1005,R/TP                          |       |        |
| 6     | R516         | THERMISTOR    | SETY0006501  | NTC ,22000 ohm,SMD ,1005, ECTH 1005 Series, Pb Free |       |        |
| 6     | R517         | RES,CHIP      | ERHY0000237  | 680 ohm,1/16W,J,1005,R/TP                           |       |        |
| 6     | R518         | RES,CHIP      | ERHY0000254  | 4.7K ohm,1/16W,J,1005,R/TP                          |       |        |
| 6     | R521         | INDUCTOR,CHIP | ELCH0004720  | 1.2 nH,S ,1005 ,R/TP ,                              |       |        |
| 6     | R600         | RES,CHIP      | ERHY0000261  | 10K ohm,1/16W,J,1005,R/TP                           |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description | Part Number | Specification               | Color | Remark |
|-------|--------------|-------------|-------------|-----------------------------|-------|--------|
| 6     | R601         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R602         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R603         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R604         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R605         | RES,CHIP    | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R606         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R607         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R608         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R609         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R610         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R611         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R612         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R613         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R614         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R615         | RES,CHIP    | ERHY0000213 | 47 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R616         | RES,CHIP    | ERHY0000265 | 20K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R617         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R618         | RES,CHIP    | ERHY0000138 | 33K ohm,1/16W,F,1005,R/TP   |       |        |
| 6     | R619         | RES,CHIP    | ERHY0000205 | 15 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R620         | RES,CHIP    | ERHY0001102 | 0.2 ohm,1/4W ,F ,2012 ,R/TP |       |        |
| 6     | R621         | RES,CHIP    | ERHY0000261 | 10K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R700         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R701         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R702         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP     |       |        |
| 6     | R703         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP     |       |        |
| 6     | R800         | RES,CHIP    | ERHY0000269 | 30K ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R801         | RES,CHIP    | ERHY0000214 | 51 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R802         | RES,CHIP    | ERHY0000214 | 51 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R803         | RES,CHIP    | ERHY0000214 | 51 ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R804         | RES,CHIP    | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP    |       |        |
| 6     | R805         | RES,CHIP    | ERHY0000280 | 100K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R806         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R807         | RES,CHIP    | ERHY0000247 | 2.2K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R808         | RES,CHIP    | ERHY0000247 | 2.2K ohm,1/16W,J,1005,R/TP  |       |        |
| 6     | R817         | RES,CHIP    | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP     |       |        |
| 6     | R818         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP   |       |        |
| 6     | R819         | RES,CHIP    | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP   |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description           | Part Number | Specification                                                    | Color | Remark |
|-------|--------------|-----------------------|-------------|------------------------------------------------------------------|-------|--------|
| 6     | R820         | RES,CHIP              | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP                                        |       |        |
| 6     | R821         | RES,CHIP              | ERHY0000220 | 100 ohm,1/16W,J,1005,R/TP                                        |       |        |
| 6     | R822         | RES,CHIP              | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                                          |       |        |
| 6     | R823         | RES,CHIP              | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                                          |       |        |
| 6     | R824         | RES,CHIP              | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                                          |       |        |
| 6     | R825         | RES,CHIP              | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                                          |       |        |
| 6     | SW500        | CONN,RF SWITCH        | ENWY0002301 | ANGLE ,SMD ,0.8 dB,                                              |       |        |
| 6     | U100         | IC                    | EUSY0243001 | BGA , 100 PIN,R/TP ,ABB(IOTA Shrink), Pb Free                    |       |        |
| 6     | U101         | IC                    | EUSY0155201 | 179GHH PBGA , 179 PIN,R/TP ,CALYPSO / DIGITAL BB CHIP, Pb Free   |       |        |
| 6     | U200         | IC                    | EUSY0188601 | MICROBUMP , 10 PIN,R/TP ,Dual SPDT Analog switch(Pb Free)        |       |        |
| 6     | U201         | IC                    | EUSY0198601 | SOT-666 ,6 PIN,R/TP ,Single SPDT Analog Switch                   |       |        |
| 6     | U202         | IC                    | EUSY0111601 | 32-PIN QFN ,32 PIN,R/TP ,MA-3 / 40 TONES / FM + WAVEFORM TABLE   |       |        |
| 6     | U302         | IC                    | EUSY0077301 | SC70-6 ,6 PIN,R/TP ,SPDT Analog switch                           |       |        |
| 6     | U303         | IC                    | EUSY0226301 | FBGA ,64 PIN,R/TP ,128M NOR+64M PSRAM / PB FREE                  |       |        |
| 6     | U500         | PAM                   | SMPY0008901 | 35 dBm,55 %,2 A,-50 dBc,25 dB,6.0 * 6.0 * 1.4 ,SMD ,GSM QUAD PAM |       |        |
| 6     | U501         | IC                    | EUSY0223202 | 5.0*5.0 ,32 PIN,R/TP ,AERO11 TRANSCEIVER, D Version              |       |        |
| 6     | U502         | IC                    | EUSY0232812 | SON1612-6 ,6 PIN,R/TP ,2.8V, 150mA LDO                           |       |        |
| 6     | U600         | TR,FET,P-CHANNEL      | EQFP0003301 | SOT-6 ,1.6 W,30 V,2.4 A,R/TP ,use for charge P-CHANNEL FET       |       |        |
| 6     | U700         | IC                    | EUSY0232812 | SON1612-6 ,6 PIN,R/TP ,2.8V, 150mA LDO                           |       |        |
| 6     | U701         | IC                    | EUSY0291701 | BGA , 100 PIN,ETC ,                                              |       |        |
| 6     | U702         | IC                    | EUSY0232812 | SON1612-6 ,6 PIN,R/TP ,2.8V, 150mA LDO                           |       |        |
| 6     | U800         | IC                    | EUSY0253601 | TSSPJW12 ,12 PIN,R/TP ,BACKLIGHT CHARGE PUMP20mAX3               |       |        |
| 6     | VA200        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA201        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA407        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA600        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA800        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA801        | VARISTOR              | SEVY0003901 | 5.5 V , ,SMD ,480pF, 1005                                        |       |        |
| 6     | X100         | X-TAL                 | EXXY0015601 | .032768 MHz,20 PPM,7 pF,65000 ohm,SMD ,6.9*1.4*1.3               |       |        |
| 6     | X500         | VCTCXO                | EXSK0005601 | 26 MHz,2 PPM,10 pF,SMD ,3.2*2.5*1.0 ,                            |       |        |
| 5     | SAFD00       | PCB ASSY,MAIN,SMT TOP | SAFD0067901 |                                                                  |       |        |
| 6     | C225         | CAP,CHIP,MAKER        | ECZH0003202 | 1 uF,6.3V ,Z ,Y5V ,HD ,1005 ,R/TP                                |       |        |
| 6     | C226         | CAP,CERAMIC,CHIP      | ECCH0006201 | 4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP                              |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description      | Part Number | Specification                                   | Color | Remark |
|-------|--------------|------------------|-------------|-------------------------------------------------|-------|--------|
| 6     | C227         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP              |       |        |
| 6     | C228         | CAP,CERAMIC,CHIP | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP                    |       |        |
| 6     | C229         | CAP,CERAMIC,CHIP | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP                    |       |        |
| 6     | C230         | CAP,CERAMIC,CHIP | ECCH0000182 | 0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP              |       |        |
| 6     | C231         | CAP,CERAMIC,CHIP | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP                    |       |        |
| 6     | C232         | CAP,CERAMIC,CHIP | ECCH0000117 | 27 pF,50V,J,NP0,TC,1005,R/TP                    |       |        |
| 6     | C400         | CAP,CERAMIC,CHIP | ECCH0000167 | 0.1 uF,6.3V,K,X5R,HD,1005,R/TP                  |       |        |
| 6     | C401         | CAP,CERAMIC,CHIP | ECCH0000167 | 0.1 uF,6.3V,K,X5R,HD,1005,R/TP                  |       |        |
| 6     | LD300        | DIODE,LED,CHIP   | EDLH0003401 | RED, GREEN ,ETC ,R/TP ,SIZE 1315 , GSM DUAL LED |       |        |
| 6     | LD400        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD401        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD402        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD403        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD404        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD405        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD406        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD407        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD408        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD409        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD410        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD411        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD412        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | LD413        | DIODE,LED,CHIP   | EDLH0012101 | BLUE ,1608 ,R/TP ,PBB-FREE                      |       |        |
| 6     | MIC200       | MICROPHONE       | SUMY0010508 | PIN ,42 dB,4*4 ,SMD Bridge Type                 |       |        |
| 6     | R220         | RES,CHIP         | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP                        |       |        |
| 6     | R221         | RES,CHIP         | ERHY0000248 | 2.4K ohm,1/16W,J,1005,R/TP                      |       |        |
| 6     | R222         | RES,CHIP         | ERHY0000203 | 10 ohm,1/16W,J,1005,R/TP                        |       |        |
| 6     | R223         | RES,CHIP         | ERHY0000203 | 10 ohm,1/16W,J,1005,R/TP                        |       |        |
| 6     | R224         | RES,CHIP         | ERHY0000241 | 1K ohm,1/16W,J,1005,R/TP                        |       |        |
| 6     | R400         | RES,CHIP         | ERHY0000237 | 680 ohm,1/16W,J,1005,R/TP                       |       |        |
| 6     | R414         | RES,CHIP         | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                         |       |        |
| 6     | R415         | RES,CHIP         | ERHY0000274 | 51K ohm,1/16W,J,1005,R/TP                       |       |        |
| 6     | R416         | RES,CHIP         | ERHY0000201 | 0 ohm,1/16W,J,1005,R/TP                         |       |        |
| 6     | R417         | RES,CHIP         | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                       |       |        |
| 6     | R418         | RES,CHIP         | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                       |       |        |
| 6     | R419         | RES,CHIP         | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                       |       |        |
| 6     | R420         | RES,CHIP         | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                       |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

| Level | Location No. | Description | Part Number | Specification                                                  | Color | Remark |
|-------|--------------|-------------|-------------|----------------------------------------------------------------|-------|--------|
| 6     | R421         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R422         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R423         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R424         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R425         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R426         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R427         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R428         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R429         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | R430         | RES,CHIP    | ERHY0000225 | 200 ohm,1/16W,J,1005,R/TP                                      |       |        |
| 6     | U400         | IC          | EUSY0200301 | Leadless chip ,6 PIN,R/TP ,Hall S/W, Pb Free                   |       |        |
| 6     | VA202        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA203        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA400        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA401        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA402        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA403        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA404        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA405        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 6     | VA406        | VARISTOR    | SEVY0003901 | 5.5 V ,SMD ,480pF, 1005                                        |       |        |
| 5     | SPFY00       | PCB,MAIN    | SPFY0117601 | FR-4 ,1.0 mm,SBL-8 ,MG220 MAIN BOARD                           |       |        |
| 5     | WSYY00       | SOFTWARE    | WSYY0370901 | MG220cP40FL-55-V10a-724-02 MAR 12 2006+13@<br>MG220c BTMBK S/W |       |        |

## 11. EXPLODED VIEW & REPLACEMENT PART LIST

---

### 11.3 Accessory

**Note:** This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

| Level | Location No. | Description            | Part Number | Specification                                                   | Color | Remark |
|-------|--------------|------------------------|-------------|-----------------------------------------------------------------|-------|--------|
| 3     | SBPL00       | BATTERY PACK,LI-ION    | SBPL0077901 | 3.7 V,830 mAh,1 CELL,PRISMATIC ,FG101<br>RUSSV423450, Innerpack |       |        |
| 3     | SSAD00       | ADAPTOR,AC-DC          | SSAD0007837 | FREE ,50 Hz,5.2 V,.8 A,CE, CB ,                                 |       |        |
| 3     | WSAY00       | SOFTWARE,APPLICATION   | WSAY0047201 | 060327_MG220                                                    |       |        |
| 3     |              | EAR PHONE/EAR MIKE SET | SGEY0003204 | L1200 ,MONO TYPE                                                |       |        |

## Note

---

