

Service Manual



Service Manual

MG150



Model : MG150



REVISED HISTORY

DATE	ISSUE	CONTENTS OF CHANGES	S/W VERSION
01/JUL/2005	ISSUE 1.0	Initial Release	

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 MG150.

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1. Introduction

1.1. Purpose

This manual provides the information necessary to repair, calibration, description and download the features of the MG150.

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 MG150 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 MG150 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 MG150 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 MG150 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. Introduction

APC	Automatic Power Control
BB	Baseband
BER	Bit Error Ratio
CC-CV	Constant Current - Constant Voltage
DAC	Digital to Analog Converter
DCS	Digital Communication System
dBm	dB relative to 1 milliwatt
DSP	Digital Signal Processing
EEPROM	Electrical Erasable Programmable Read-Only Memory
EL	Electroluminescence
ESD	Electroluminesc 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
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

1. Introduction

RTC	Real Time Clock
SAW	Surface Acoustic Wave
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
DCXO	Digitally Control Crystal Oscillator
WAP	Wireless Application Protocol

2. General Performance

2.1 Product Name

MG150: Support GPRS (Class 10)

2.2 Supporting Standard

Item	Feature	Comment
Supporting Standard	GSM850/PCS1900/DCS1800 with seamless handover Phase 2+(include AMR) SIM Toolkit : Class 1,2,3,A~E	
Frequency Range	GSM850 TX : 824 - 849 MHz GSM850 RX : 869 - 894 MHz PCS1900 TX : 1850 - 1910 MHz PCS1900 RX : 1930 - 1990 MHz DCS1800 TX : 1710-1785 MHz DCS1800 RX : 1805-1880 MHz	
Application Standard	WAP .2.0 JAVA 2.0 MMS IM : WV1.1	

2.3 Main Parts: GSM Solution

Digital Baseband	Calypso-AMR C035(D751992GHH)
Analog Baseband	IOTA(TWL3025)
RF Chip	Aero I+/Si4206

2. General Performance

2.4 H/W Features

Item	Feature	Comment
Form Factor	Dual LCD Folder	
Battery	1) Capacity Standard : Li-ion, 830mAh, 2) Packing Type : Hard Pack	Size: 34.15 53.55 5.7 mm Weight: 30g
Size	Standard : 88 × 46 × 24.3	
Weight	96.5 gram	
Volume	82.8cc	
PCB	One PCB:8 Layers , 1t	
Stand by time	220 hours	Paging Period:9, RSSI: -85dBm
Charging time	3 hr.	
Talk time	2.5hours	
RX sensitivity	GSM 850 : -105 dBm PCS/DCS : -105 dBm	
TX output power	GSM 850 : 32 dBm PCS /DCS : 29.5 dBm	Class4 (GSM) Class1 (PCS/DCS)
GPRS compatibility	GPRS Class 10	
SIM card type	Plug-In SIM 3V	
Display	Main LCD 128*128, 65K Color CSTN Sub LCD 96*64, Color Filter Backlight : White LED	
Built-in Camera	N.A.	

2. General Performance

Status Indicator	No	
Keypad	Alpha/numeric Key : 10 Function Key : 14 Side Key : 2 Total # of Keys : 26	
ANT	Fixed Type	
System connector	24 Pin	
Ear Phone Jack	3 Pole (2.5mm)	
PC synchronization	Yes	
Memory	Flash : 128Mbit SRAM : 64Mbit	
Speech coding	FR, EFR, HR,AMR	
Data & Fax	Built in Data & Fax support	
Vibrator	Built in Vibrator	
IrDA	NO	
MIDI(for Buzzer Function)	YAMAHA 40 Poly	Buzzer Function By Using Speaker Phone & MIDI IC
Voice Recording	YES	
Speaker Phone	YES	
Travel Adapter	Yes	
CDROM	TBD	
Options	Ear-Microphone Data Cable Cigarette Lighter Adapter 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	
Audio Volume	1 ~ 5 Level	
Time / Date Display	Yes	NITZ
Multi- Language	Yes	English / Spanish / France
Quick Access Mode	Phone Book / Web Access/ Sound / Message / IM /	
Speed Dial	Yes	
CLIP / CLIR	Yes (different melody)	
Phone Book	3 Numbers + 1 Memo + 1 e-mail- + Group Select + Picture	Total 255 Member
Last Dial Number	Yes	
Last Received Number	Yes	
Last Missed Number	Yes	
Search by Number/ Name	Name only	
Group	7	
Fixed Dial Number	Yes	
Service Dial Number	Yes	
Own Number	Yes	
Voice Memo	Yes	
Call Reminder	Yes	
Network Selection	Automatic / Manual	
Mute	Yes	
Call Divert	Yes	
Call Barring	Yes	
Call Charge (AoC)	Yes	
Call Duration	Yes	
SMS (EMS)	100	EMS : Release4 (Except Text align)
E- Mail	Yes	Over SMS
SMS Over GPRS	Yes	

2. General Performance

Game	1	Java Game
Calendar	Yes	
Memo	20	
World Clock	Yes	
Unit Convert	Length/Surface/Volume/Weight	
Fax & Data	Yes	
Wall Paper	Yes	Default 4ea
WAP Browser	WAP 2. 0	Openwave 6.2
Download Melody / Wallpaper	Yes	Over WAP
SIM Lock	Yes	Operator Dependent
SIM Toolkit	Class 1, 2, 3, A - E	
MMS	Yes	Openwave MMS Client
EONS	Yes	
CPHS	Yes	V4.2
Camera	NO	
JAVA	Yes	CLDC V1. 1 / MIDP V 2.0 Download Over WAP
Voice Dial	Yes	10
IrDA	No	
GPRS	Yes	Class10
Hold / Retrieve	Yes	
Conference Call	Yes	Max. 6
DTMF	Yes	
Memo pad	Yes	
TTY	No	
AMR	Yes	

3. H/W Circuit Description

3. H/W Circuit Description

3.1 General Description

The RF part consists of a transmitter, a receiver, a synthesizer, a voltage supply and a DCXO part. And the main RF Chipset Aero I+ is a single-chip triple-band transceiver for the extended global system for mobile communication [GSM850MHz] /Digital communication system [PCS1900MHz] voice and data transfer applications. The Aero I+ includes a digitally-controlled crystal oscillator(DCXO) function and completely integrates the reference oscillator and varactor

3.2 Receiver Part

The Receiver part in Aero I+ contains all active circuits completely, full receiver chain with the exception of discrete front-end RF SAW filters. The filtered and amplified signal is down converted in the RF-mixer to the base-band output. The receive path is supported by internal channel filtering.

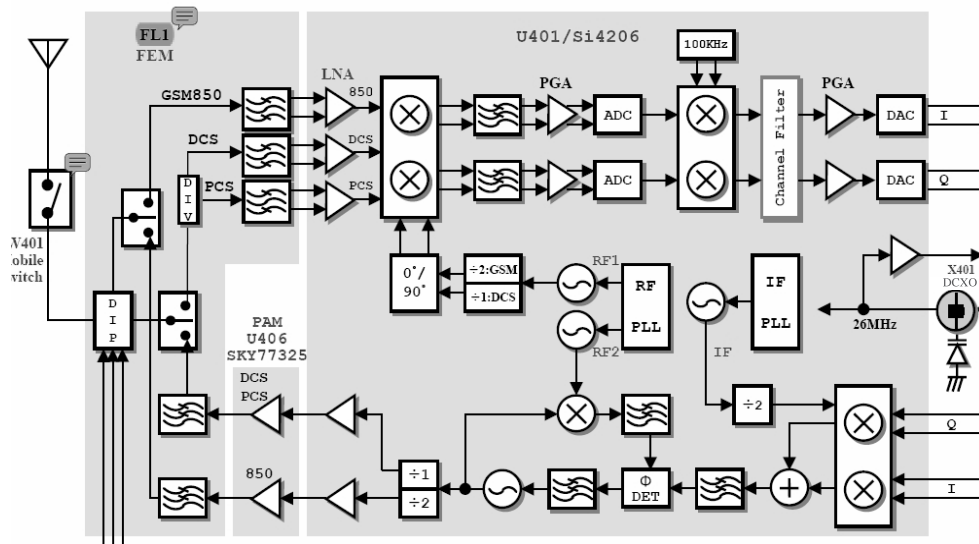


Figure 1. RF Receiver Block

3. H/W Circuit Description

3.2.1. RF Front End

Antenna switch and dual saw filters are integrated in FEM (F400). The Received RF signals (GSM 869MHz ~ 894MHz, PCS 1930MHz ~ 1990MHz), DCS(1710MHz ~ 1880 MHz) are fed into the antenna and Mobile switch. An antenna matching circuit is between the antenna and the mobile switch.

The Antenna Switch in FEM (F400) is used to control the Rx and Tx paths. And, the input signals VC1, VC2 and VC3 of FEM are directly connected to base-band controller to switch either Tx or Rx path on. FEM (F400) supports for dual FEM control logics given below Table 3.1 The receiver part uses a LOW IF conversion receiver architecture that allows for the on-chip integration.

Switch Mode	SW1	SW2	SW3
GSM850 Tx	H	L	L
PCS1900 Tx	L	H	H
GSM850 Rx	L	L	L
PCS1900 Rx	L	L	H
DCS1800 Rx	L	L	L

Table 3-1. The Logic and Current

The Aero I+ integrates dual differential input LNAs that are matched to the 150 ohm in GSM850 and 150 ohm in PCS balanced-output FEM through external LC matching networks.

3.2.2. Demodulator and Baseband Processing

In LOW IF receiver there is only one mixer down-converting received RF signal to BB signal directly. Aero I+ has 4 Gain steps. Front end and VGA high gain mode is 66dB, Front-end intermediate Gain and VGA high gain mode is 60dB, Front-end low gain and VGA high gain mode is 46dB, Front-end and VGA low gain mode is 20dB. The Rx gain setting is done in the AGC algorithm.

The nominal gain of the receiver is set as a function of the expected signal strength at the antenna input so that a desired level is reached at the Rx I/Q. The receiver chain in Aero I+ has variable gain parts, LNA, Mixer, LPF, VGA, VGA Filter, Auxiliary gain control and VGA. The gain settings can be adjustable via 3-wire bus control lines. The base-band signals pass via integrated low-pass filters to the base-band A/D converters. The remainder of the channel filtering is performed by the baseband chipset. The demodulator contains switches to maintain the sense of the baseband I/Q outputs with respect to the incoming RF signal on GSM850 and PCS1900.

3. H/W Circuit Description

3.2.3. Synthesizer

The RF main chipset includes a fully integrated VCO with an on-chip LC tank. A fractional-N synthesizer can phase lock the local oscillator used in both transmit and receive path to a precision frequency reference input. The fractional-N operation offers low phase noise and fast setting times, allowing for multiple slot applications such as GPRS. The counter and mode settings of the synthesizer are also programmed via 3-wire interface.

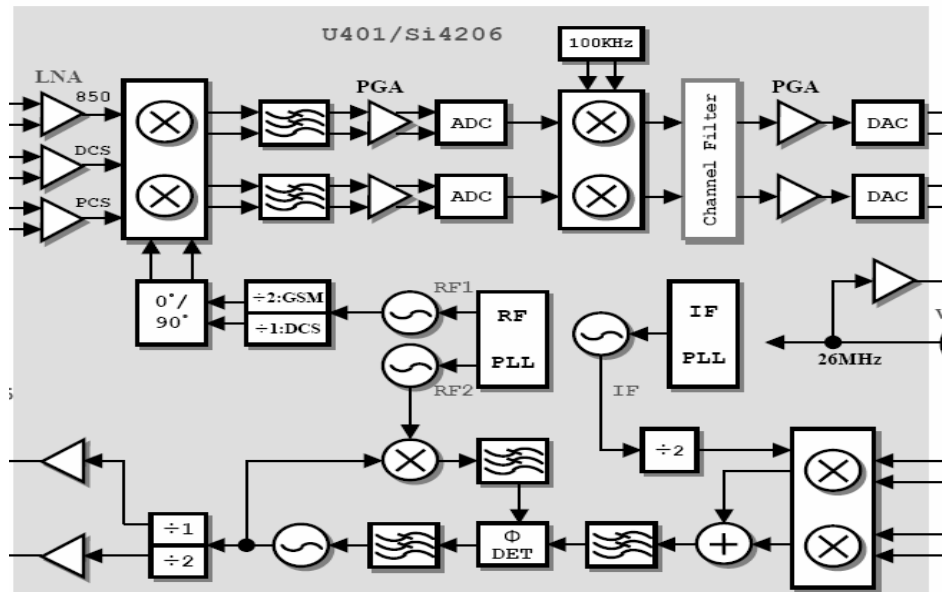


Fig 2. Block diagram of Synthesizer Part

3.3 Transmitter Part

The transmit (TX) section consists of an I/Q baseband upconverter, an offset phase-locked loop (OPLL), and two 50 Ω output buffers that can drive external power amplifiers (PA), one for the GSM 850 (824-849 MHz) and E-GSM 900 (880-915 MHz) bands and one for the DCS 1800 (1710-1785 MHz) and PCS 1900 (1850-1910 MHz) bands. The OPLL requires no external duplexer to attenuate transmitter noise and spurious signals in the receive band, saving both cost and power.

Additionally, the output of the transmit VCO (TXVCO) is a constant-envelope signal that reduces the problem of spectral spreading caused by non-linearity in the PA.

A quadrature mixer upconverts the differential in-phase (BIP, BIN) and quadrature (BQP, BQN) signals with the IFLO to generate a SSB IF signal that is filtered and used as the reference input to the OPLL.

The IFLO frequency is generated between 766 and 896 MHz. The IFLO is divided by two to generate the quadrature LO signals for the quadrature modulator, resulting in an IF between 383 and 448 MHz.

For the E-GSM 900 band, two different IFLO frequencies are required for spur management.

The OPLL consists of a feedback mixer, a phase detector, a loop filter, and a fully integrated TXVCO.

The TXVCO is centered between the DCS 1800 and PCS 1900 bands, and its output is divided by two for the GSM 850 and E-GSM 900 bands.

The Si4133T generates the RFLO frequency between 1272 and 1483 MHz. To allow a single VCO to be used for the RFLO, high-side injection is used for the GSM 850 and E-GSM 900 bands, and lowside injection is used for the DCS 1800 and PCS 1900 bands.

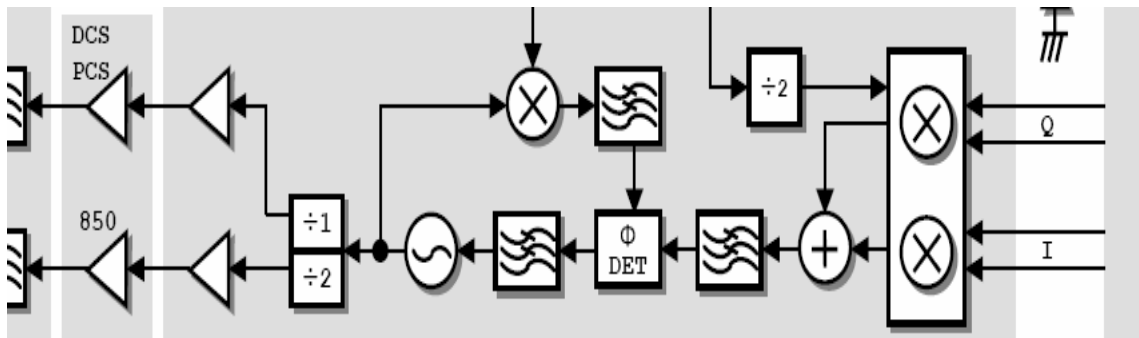


Fig 3. Transmitter Block diagram

3.3.1. Digital low IF

The receive section uses a digital low IF architecture that avoids the difficulties associated with direct conversion while delivering lower solution cost and reduced complexity. The baseband interface is compatible with any supplier's baseband subsystem. The transmit section is a complete up-conversion path from the baseband subsystem to the power amplifier, and includes an offset phase-locked loop (PLL) with a fully integrated transmit VCO. The frequency synthesizer uses

3. H/W Circuit Description

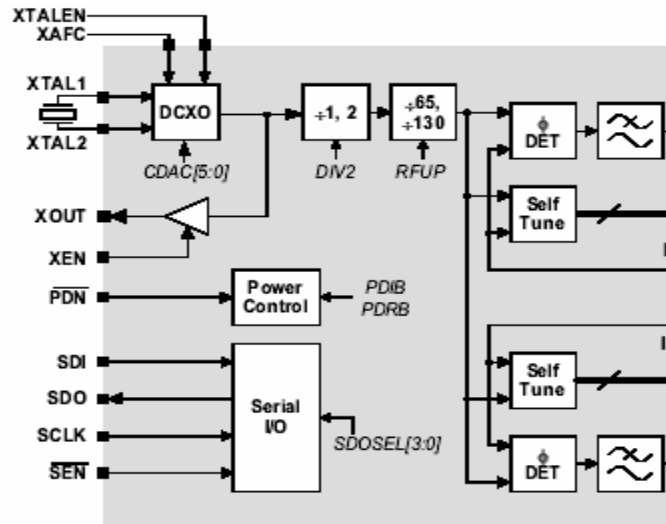


Fig 4. Block diagram of IF Modulator

3.3.2. PLL

The OPLL consists of a feedback mixer, a phase detector, a loop filter, and a fully integrated TXVCO. The TXVCO is centered between the DCS 1800 and PCS 1900 bands, and its output is divided by 2 for the GSM 850 and E-GSM 900 bands. The RFLO frequency is generated between 1272 and 1483 MHz. To allow a single VCO to be used for the RFLO, high-side injection is used for the GSM 850 and E-GSM 900 bands, and low-side injection is used for the DCS 1800 and PCS 1900 bands. Low-pass filters before the OPLL phase detector reduce the harmonic content of the quadrature modulator and feedback mixer outputs. The cutoff frequency of the filters is programmable with the FIF[3:0] bits in register 04h. The OPLL requires no external duplexer to attenuate transmitter noise and spurious signals in the receive band. Additionally, the output of the transmit VCO (TXVCO) is a constant-envelope signal which reduces the problem of spectral spreading caused by non-linearity in the PA.

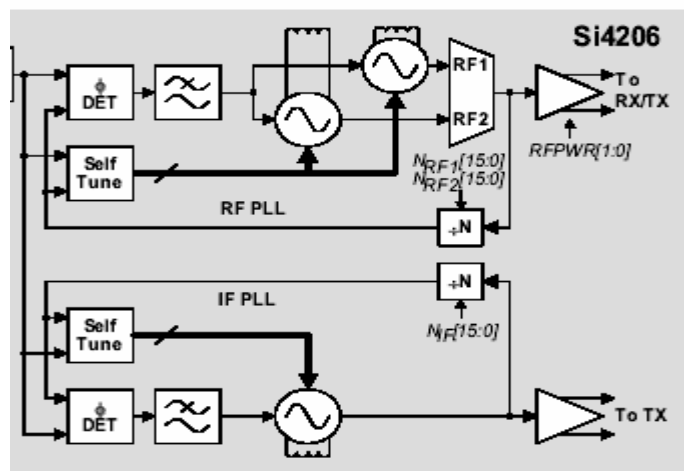


Fig 5. Block diagram of PLL

3.3.3 Power Amplifier

The Power Amplifier Module [SKY77325, U406] is a dual-band GSM/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 [VAPC]. Efficiency is about 49% at GSM850 and about 53% at PCS.

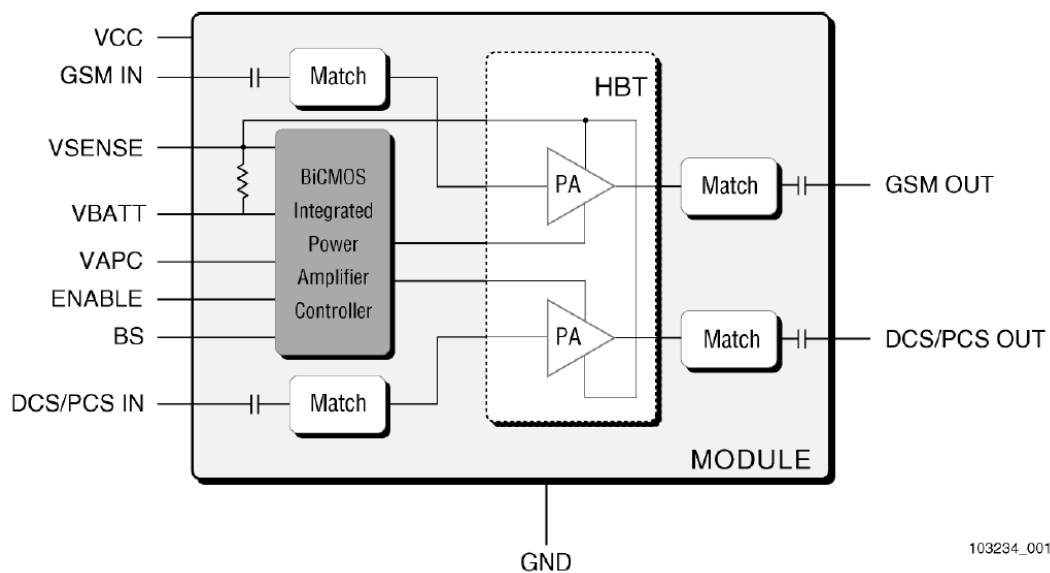


Fig 6. Internal Functional Block diagram

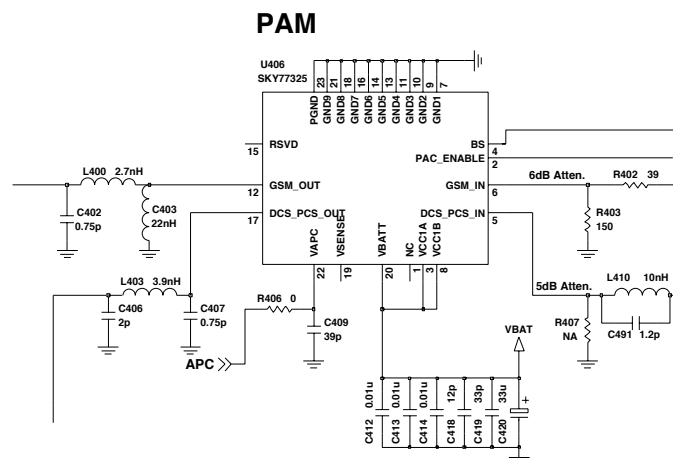


Fig 7. Schematic of PAM circuit

3. H/W Circuit Description

3.3.4 26MHz Clock

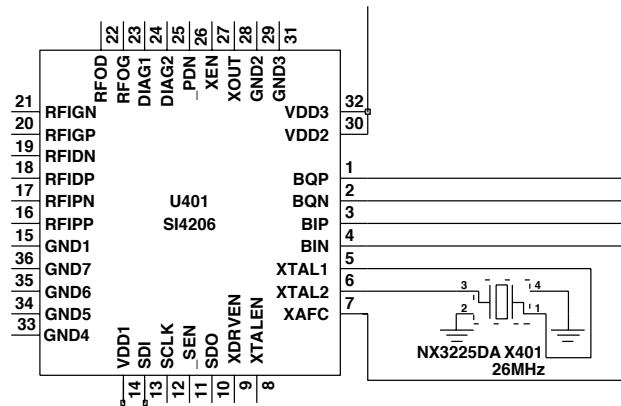
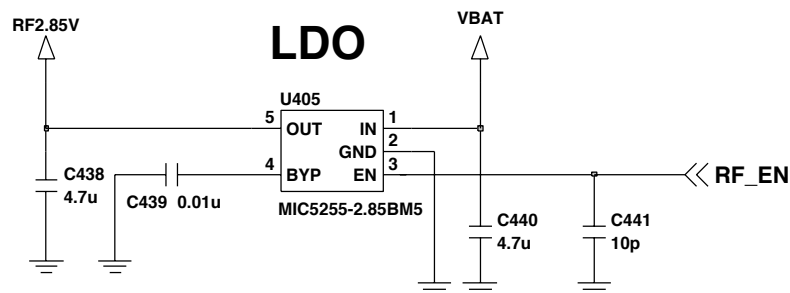


Figure 8. Schematic of DCXO circuit

3.3.5 Power Supplies and Control Signals

An external LDO [U405] is used to provide DC power to Buffer [U402] & Aero I+ , Buffer [U402] which is used for buffering FEM control signals from DBB and the RF Main Chip [Aero I+, U406]



3.4 Digital Baseband (DBB) Processor

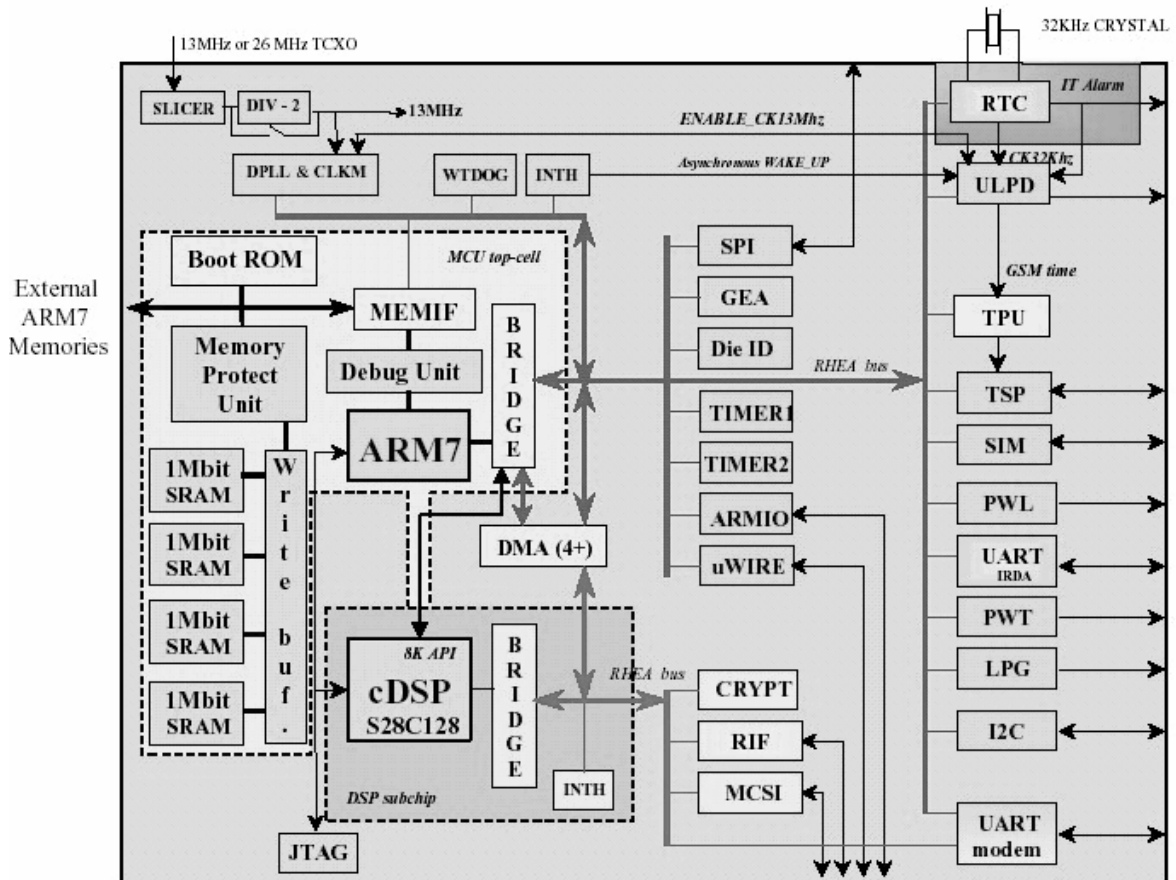


Figure 9. Top level block diagram of the Calypso-AMR C035(PD751992GHH)

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. H/W Circuit Description

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:

- ARM7TDMIE : ARM7TDMI CPU core
- DSP subchip
- 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)
 - Autobaud 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 : FLAHS2, 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).

3.4.3 RF Interface (TPU, TSP Block)

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

Table 3-2. RF Interface Spec.

TSP (Time Serial Port)		
Resource	Interconnection	Description
TSPDO	ABB & RF main Chip	Control Data
TSPEN0	ABB	ABB Control Data Enable Signal
TSPEN1	RF main Chip	RF Control Data Enable Signal
TSP (Time Serial Port)		
TSPACT0	PDNB	RF main Chip Reset Signal
TSPACT1	PA_ON	Power Amp ON signal
TSPACT2	PA_BAND	Power Amp band-selection signal
TSPACT3	VC1	Ant. Switch control signal
TSPACT4	VC2	Ant. Switch control signal
TSPACT5	VC3	Ant. Switch control signal

3. H/W Circuit Description

3.3.4. SIM Interface

SIM interface scheme is shown in (Figure 10).

SIM_IO, SIM_CLK, SIM_RST ports are used to communicate DBB with ABB and the Charge Pump in ABB enables 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

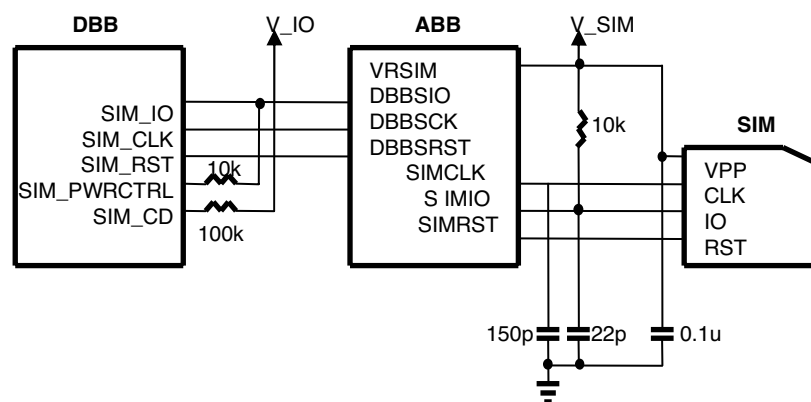


Figure 10. SIM Interface

3.3.6. UART Interface

C1500 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

Figure 3-3. UART Interface spec.

3. H/W Circuit Description

3.4.7. GPIO Map

In total 16 allowable resources, MG150 is using 13 resources except 3 resources dedicated to SIM and Memory. MG150 GPIO (General Purpose Input/Output) Map, describing application, I/O state, and enable level, is shown in below table.

I/O #	Net Name	I/O	Resource State	Inactive State	Active State
I/O (0)	Not used				
I/O (1)	MELODY_INT	I	GPIO	HIGH	LOW
I/O (2)	LCD_ID	I	GPIO	LOW (Giant Plus)	HIGH (Nanya)
I/O (3)	DSR (Note 1)	I	GPIO	HIGH	LOW
I/O (4)	LCD_DIMCTRL1 (Note 2)	O	GPIO	LOW (LCD B/L Off)	HIGH (LCD B/L On)
I/O (5) I/O (6)	SIM_PWCTL	O	SIM		
I/O (7)	VOICE_EN	O	GPIO	LOW	HIGH
I/O (8)	LCD_RESET	O	GPIO	HIGH	LOW
I/O (9)	SPK_EN	O	GPIO	LOW	HIGH
I/O (10)	Not used	O			
I/O (11)	INDLED_R	O	GPIO	LOW	HIGH
I/O (12)	Not used				
I/O (13)	Not used				
	LCD_DIMCTRL2 (Note 2)	O	GPIO	LOW (LCD Dimming Off)	HIGH (LCD Dimming On)
I/O (14)	NBHE	O	MEMORY		
I/O (15)	NBLE	O	MEMORY		

Table 3-4. GPIO Map Table

3.5 Analog Baseband (ABB) Processor

3.5.1. General Description

IOTA is Analog Baseband (ABB) Chip supports GSM850, 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
- RF interface with DBB (time serial port)
- Supply voltage regulation

3. H/W Circuit Description

- Battery charging control
- Switch ON/OFF
- 3V SIM card Interface
- 4 internal & 4external ADC channels

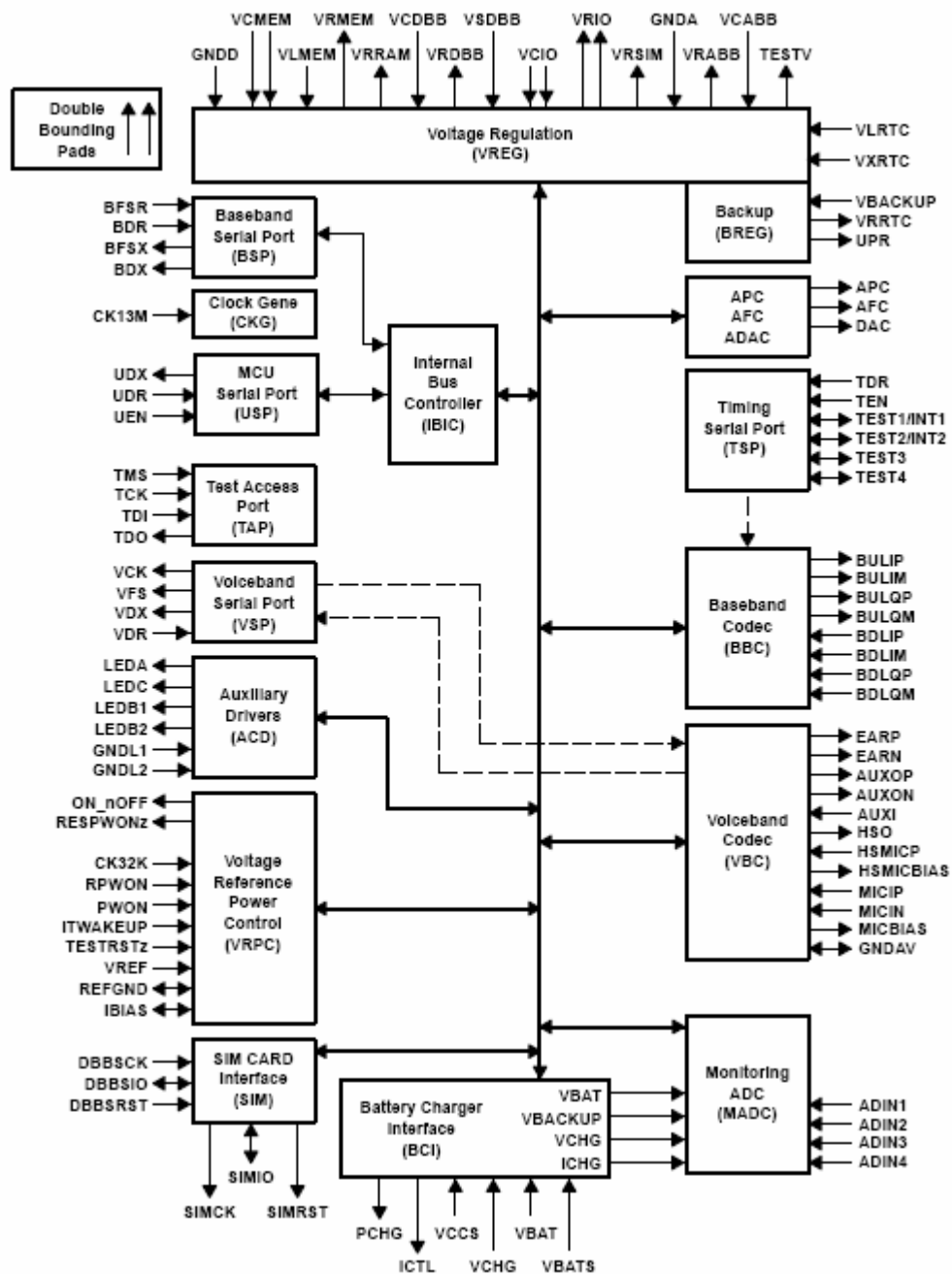


Figure 11. Top level block diagram of the IOTA(TWL3014)

3. H/W Circuit Description

3.5.2. Audio Signal Processing & Interface

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.

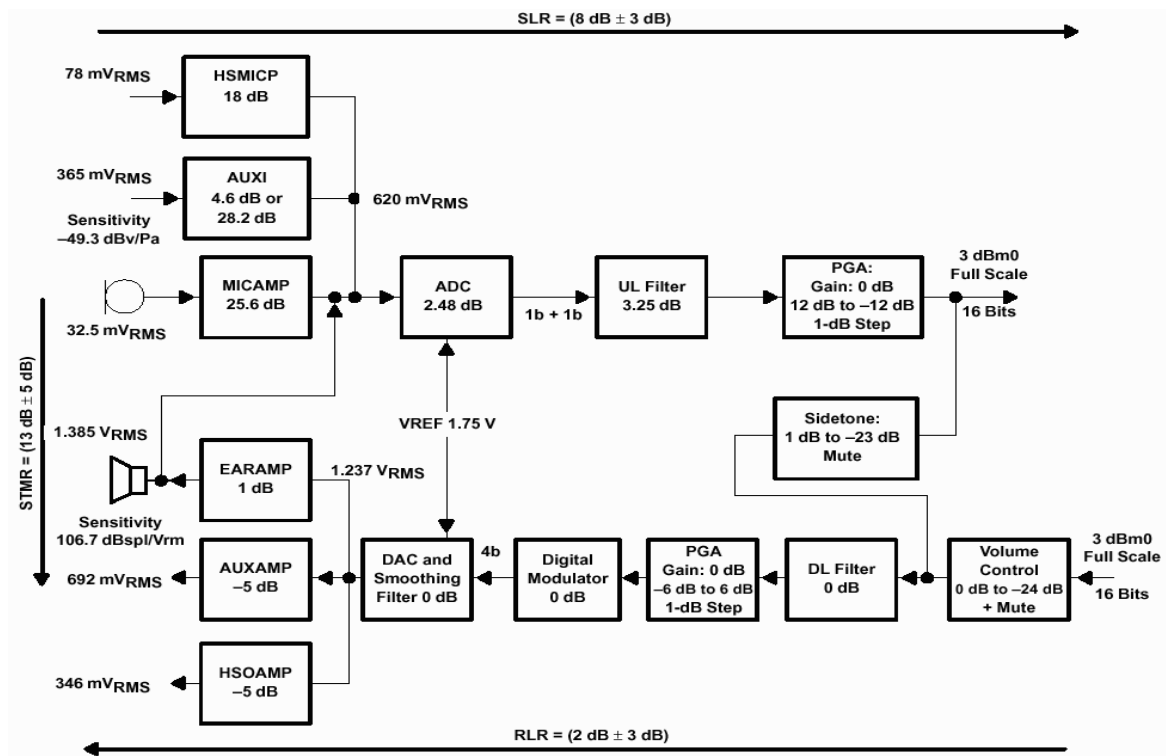


Figure 12. Audio Interface Block Diagram

3.5.3. Audio uplink processing

The VUL path includes two input stages. The first stage is a microphone amplifier, compatible with electret microphones containing a FET buffer with open drain output. The microphone amplifier has a gain of typically 25.6 dB (1 dB) and provides an external voltage of 2.0 V or 2.5 V to bias the microphone (MICBIAS). The auxiliary audio input can be used as an alternative source for higher level speech signals. This stage performs single-ended-to differential conversion and provides a programmable gain of 4.6 dB or 28.2 dB. The third stage is a headset microphone amplifier, compatible with electret microphones. The headset microphone amplifier has a gain of typically 18 dB and provides an external voltage of 2.0 V or 2.5 V to bias the headset microphone (HSMICBIAS).

When one of the input stages (MICI, AUXI, HSMICP) is in use, the two other input stages are disabled and powered down. The resulting fully differential signal is fed to the analog-to-digital converter (ADC). The ADC conversion slope depends on the value of the internal voltage reference. Analog-to-digital conversion is performed by a third-order Σ - Δ modulator with a sampling rate of 1 MHz. Output of the ADC is fed to a speech digital filter, which performs the decimation down to 8 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 4-0 (VULPG(4:0)) of the voiceband uplink register. The speech samples are then transmitted to the DSP via the VSP at a rate of 8 kHz.

There are 15 meaningful output bits. Programmable functions of the VUL path, power-up, input selection, and gain are controlled by the BSP or the USP via the serial interfaces.

The VUL path can be powered down by bit 0 (VULON) of the power down register.

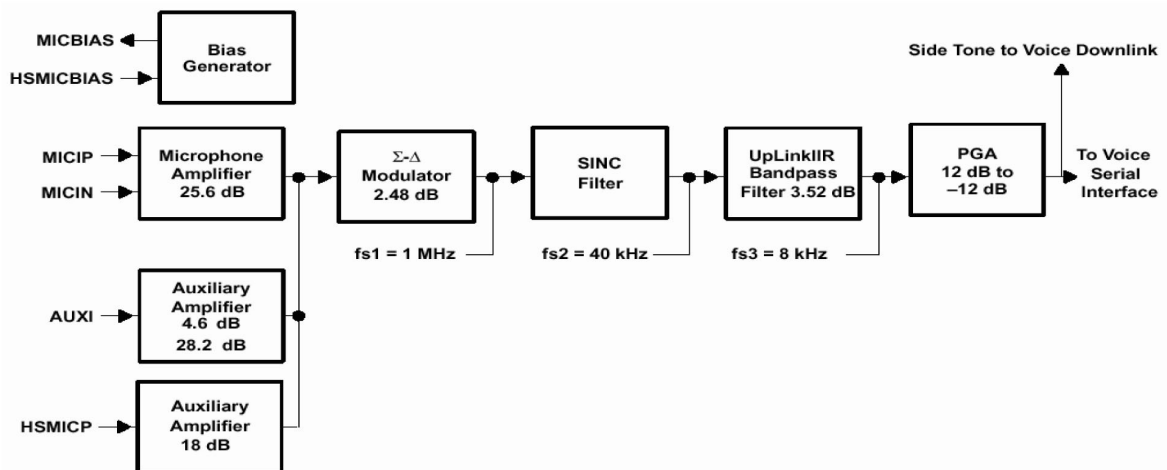


Figure 13. Uplink Path

3. H/W Circuit Description

3.5.4. Audio downlink processing

The VDL path receives speech samples at the rate of 8 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 is to interpolate the input signal and to increase the sampling rate from 8 kHz up to 40 kHz to allow the digital-to-analog conversion to be performed by an oversampling digital modulator. The second function is to band-limit the speech signal with both low-pass and high-pass transfer functions. The filter, the PGA gain, and the volume gain can be bypassed by programming bit 9 (VFBYP) in the voiceband control register 1. The interpolated and band-limited signal is fed to a second order 1- Σ digital modulator sampled at 1 MHz to generate a 4-bit (9 levels) oversampled signal. This signal is then passed through a dynamic element matching block and then to a 4-bit digital-to-analog converter (DAC). The volume control and the programmable gain are performed in the voiceband digital filter. Volume control is performed in steps of 6 dB from 0 dB to -24 dB. In 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 downlink control register.

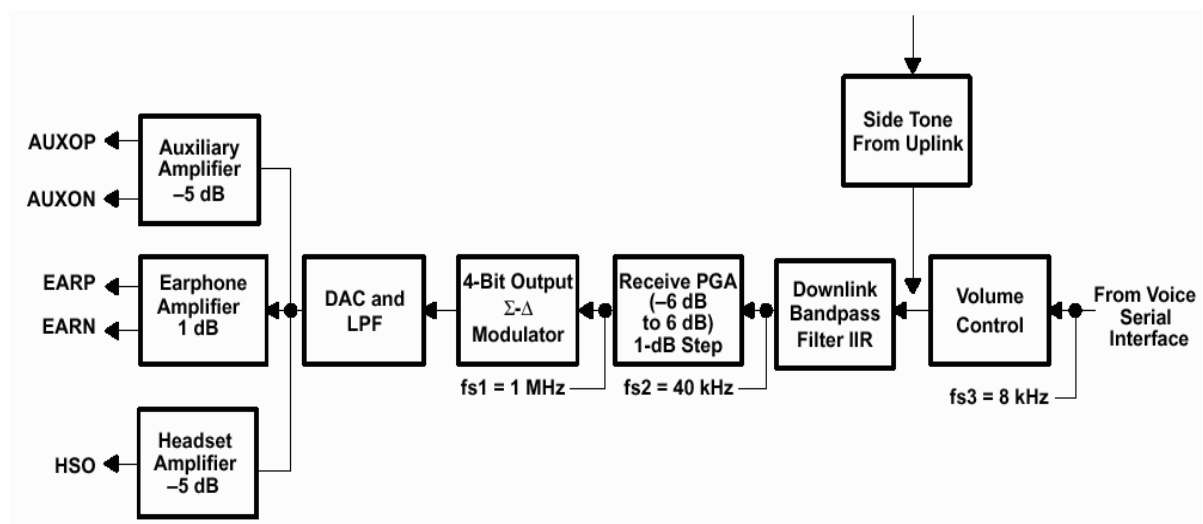


Figure 14. Downlink Path

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.

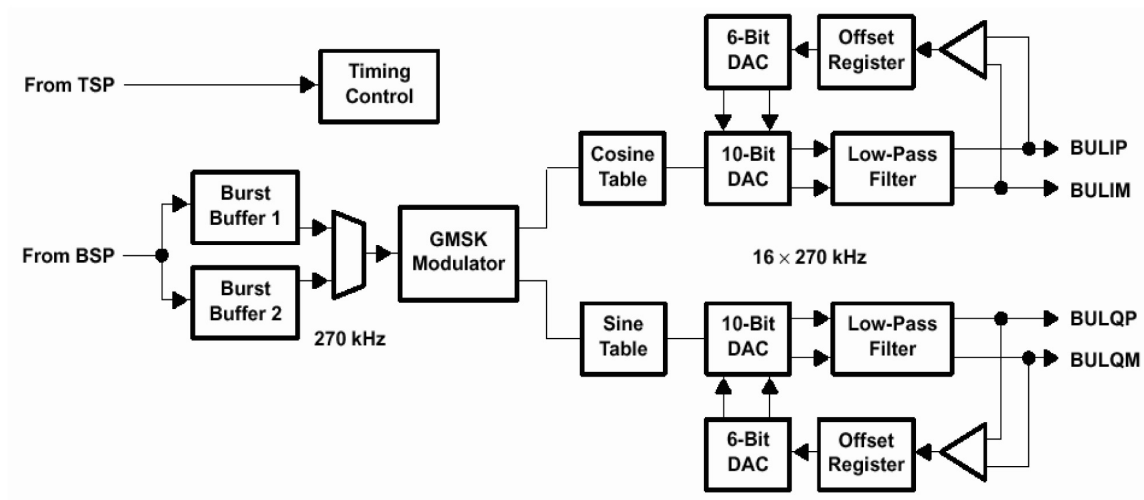


Figure 15. Baseband Codec Block Diagram

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. (Figure16) shows the power supply related blocks of DBB/ABB and their interfaces in MG150.

3. H/W Circuit Description

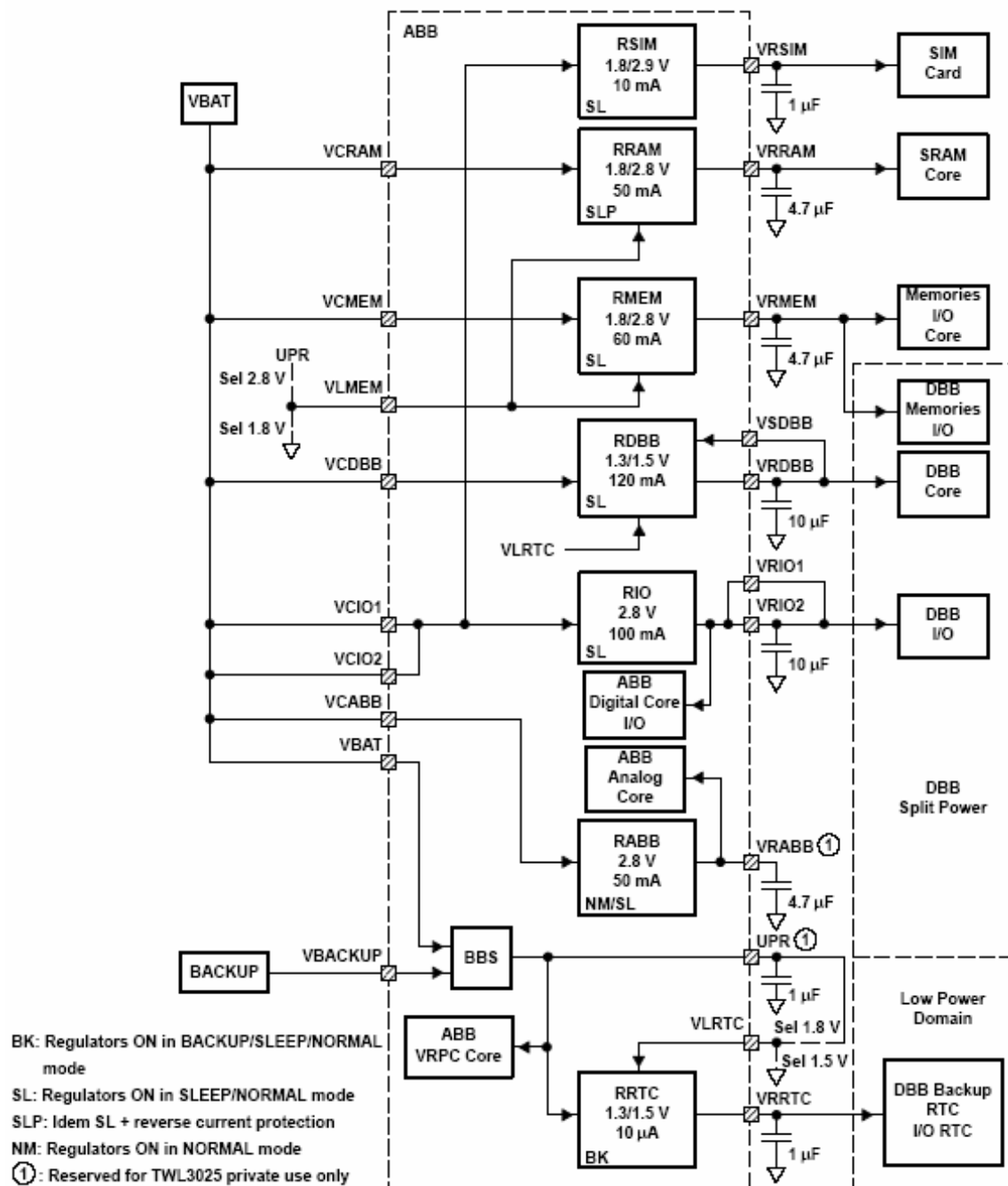


Figure 16. Power Supply Scheme

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 3-5. 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
ADIN1	ADIC1	PCB_Revision
ADIN2	BATT_TEMP	Battery Detect
ADIN3	TEMPSENSE	Temperature Sensing
ADIN4	HOOK_DETECT	HOOK_DETECT

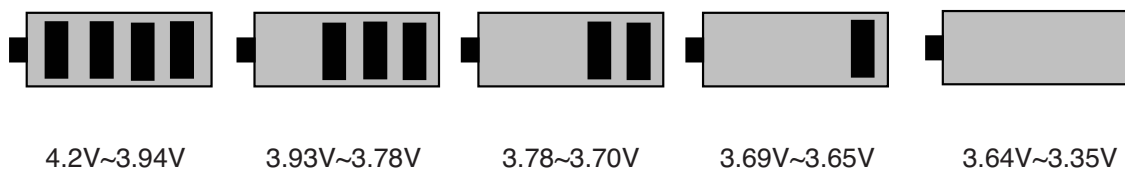
Table 3-6. ADC Channel Spec

3. H/W Circuit Description

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 MG150 is as follow.

Figure 17. 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: 50mA
8. Full charge indication current (icon stop current) : 100mA
9. Recharge voltage: 4.16V
10. Low battery alarm
 - a. Idle: 3.55V
 - b. Dedicated: 3.65V
11. Low battery alarm interval :
 - a. Idle: 3min
 - b. Dedicated: 1min
12. Switch-off voltage: 3.35V
13. Charging temperature ADC range
 - a. ~ -5# : not charging operation.
 - b. -5# ~ 50# : charging.
 - c. 50#~ : not charging operation.

3.5.9. Switch On/Off

MG150 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

MG150 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

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

Pin #	NAME	Description
1	V_IO	2.8V Power
2	VBACKUP	Backup Battery
3	VBAT	Battery Power
4	_LCD_RESET	Main LCD Reset
5	D(0)	LCD Data
6	D(1)	LCD Data
7	D(2)	LCD Data
8	D(3)	LCD Data
9	D(4)	LCD Data
10	D(5)	LCD Data
11	D(6)	LCD Data
12	D(7)	LCD Data
13	LCD_BL_IN	LCD Back Light In
14	LCD_BL_OUT	LCD Back Light Out (C1300 GND)
15	MOTOR	Vibrator
16	GND	GND
17	A(1)	Select Data or Instruction
18	LCD_ID	LCD ID(Nanya / Giant Plus)
19	MAIN_CS	Main LCD Chip Select
20	_WR	Main LCD Write Control
21	LEDC	Indicator LED (Red)
22	LEDA	Indicator LED (Green)
23	D(8)	LCD Data
24	D(9)	LCD Data
25	D(10)	LCD Data
26	D(11)	LCD Data
27	D(12)	LCD Data
28	D(13)	LCD Data
29	D(14)	LCD Data
30	D(15)	LCD Data
31	GND	GND
32	SPK_REVP	Speaker & Receiver Positive
33	SPK_REVN	Speaker & Receiver Negative
34	GND	GND

Table 3-7 Connector Interface Spec.

3. H/W Circuit Description

	KBC0	KBC1	KBC2	KBC3	KBC4
KBR0	LEFT	RIGHT	UP	DOWN	OK
KBR1	1	2	3	F3	KB1
KBR2	4	5	6	F1	VOL_UP
KBR3	7	8	9	F2	VOL_DOWN
KBR4	AST	0	SHA	SEND	KB2

Table 3-8. Keypad Map

DBB supports 25 Key Map and Switch-ON Key is connected directly to ABB as (Figure18).

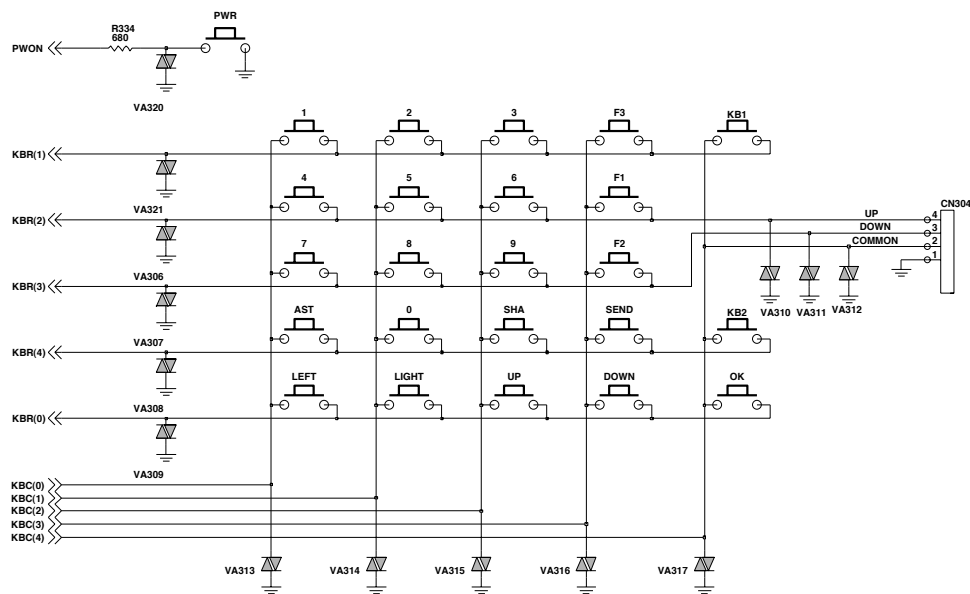


Figure 18. Keypad Scanning Scheme

3. H/W Circuit Description

3.5.13. Keypad back-light Illumination

There are 10 Deep Blue LEDs in Main Board for Keypad Backlight.
Keypad Back-light is driven by 'LEDB' line from IOTA .

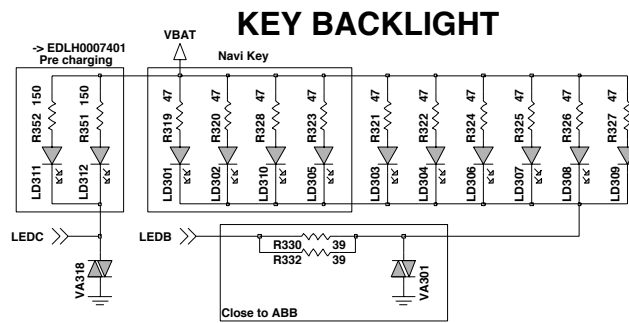


Figure 19. Keypad Back-light Scheme

3.5.14. LCD Illumination

There are 3 LEDs in the LCD module for LCD backlighting.

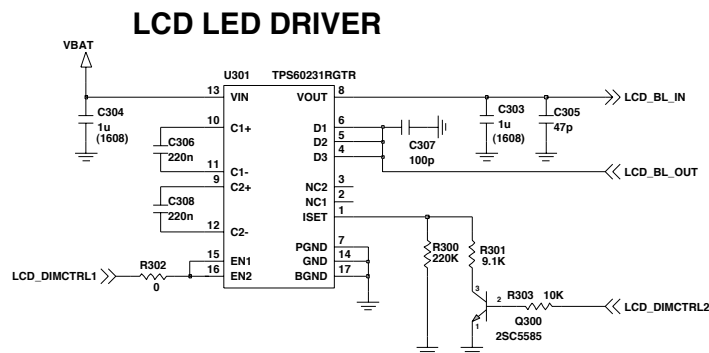


Figure 20. LCD Back-light Scheme

3.5.15. Audio Circuit

Microphone circuits

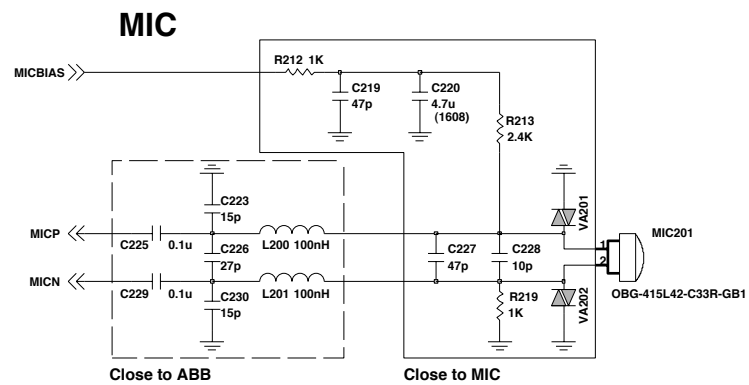


Figure 21. Microphone system

When a call is established, MICBIAS signal goes up to '2.5V' in the MG150. IOTA(ABB) provides both 2.0V and 2.5V for MICBIAS to circuit designer. VA201, VA202 are employed to enhance ESD immunity.

3. H/W Circuit Description

Head set Jack Interface

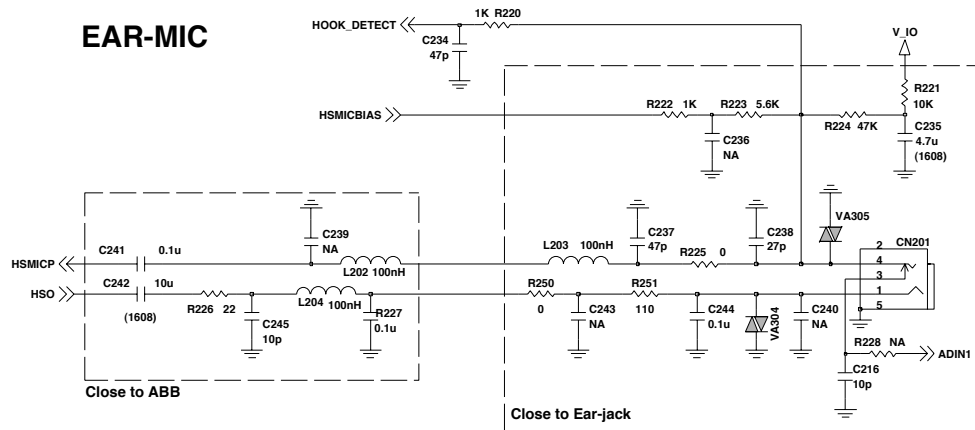


Figure 22. Ear-Jack interface

When ear-mic set or head set plug is inserted into the receptacle, HOOK_DETECT signal level which is input of ADIN4 in ABB is changed. If hook button is pushed for a second to make a call, then HOOK_DETECT signal which is input of ADIN4 in ABB goes GND level. 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

Receiver / Speaker phone Circuits

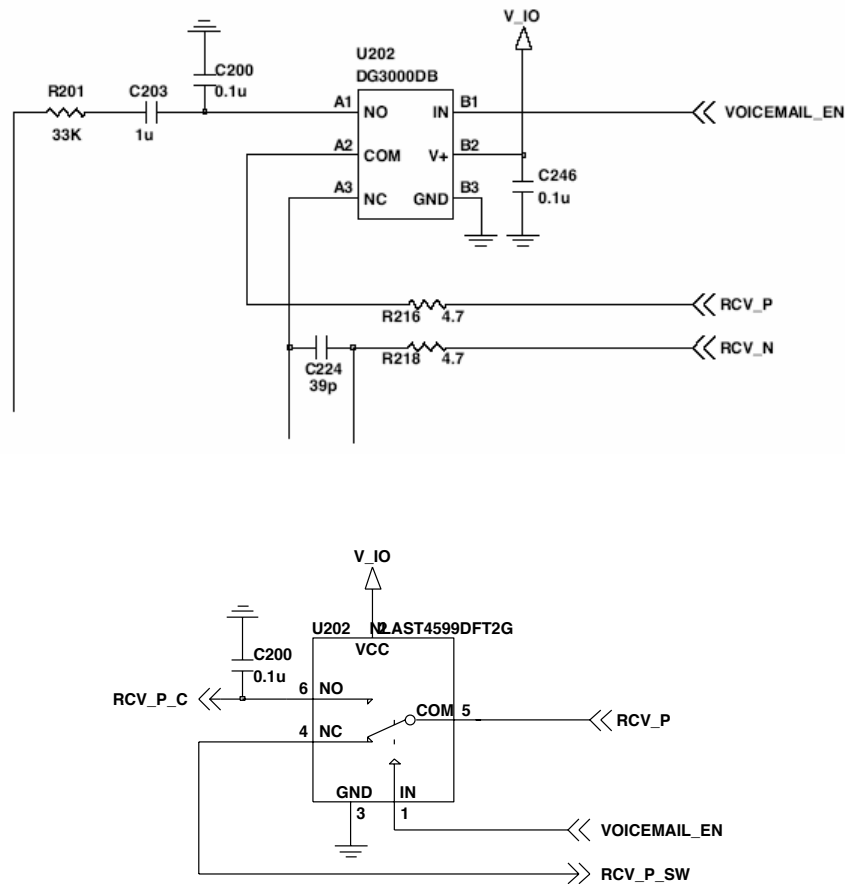


Figure 23. Receiver and Speaker phone mode system switch

A single analog switch is employed to support both voice and speaker phone mode with RCV_P. In the speaker phone mode the SPK_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_EN port will remain 'L' state and RCV_P will be connected with receiver path EAR_P(NC)

3. H/W Circuit Description

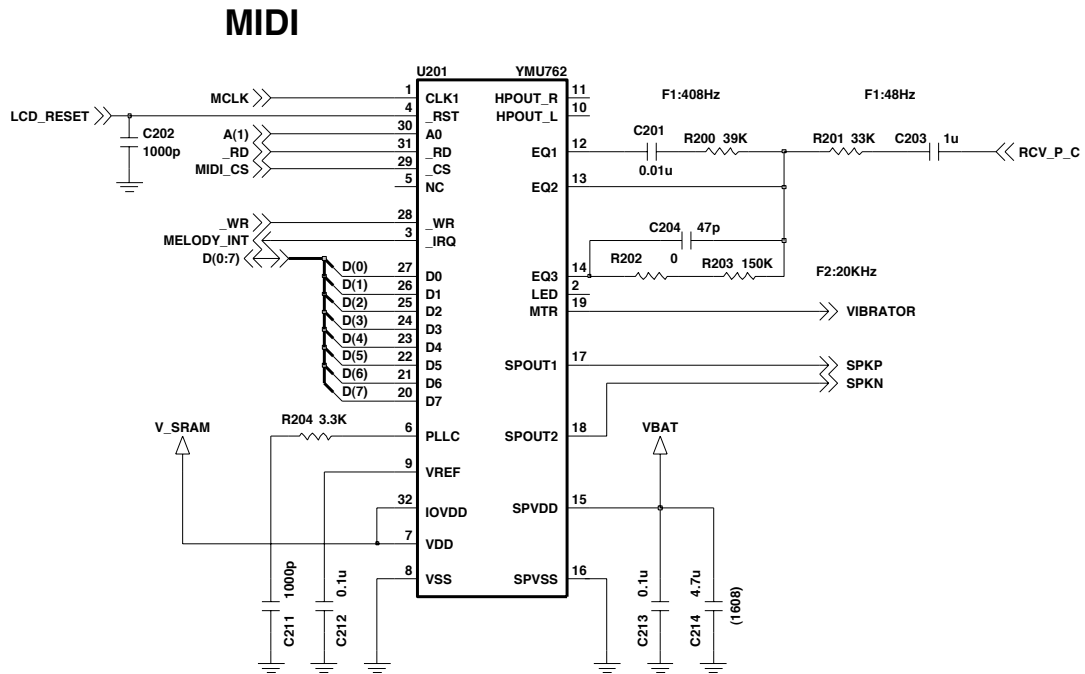


Figure 24. MIDI sound Circuit

The YMU762 has features as described below.

- Simultaneous generation of up to 64 tones:
- Polyphonic synthesizer specification
- Has built-in default tones for FM and Waveform table synthesizers in the ROM, and the tones can be downloaded to RAM.
- Stream replay with ADPCM/PCM
- Software interrupt mechanism for external synchronization
- Equipped with 8 bit parallel I/F for control from CPU
- Equipped with speaker amplifier and equalizer circuit
- Has built-in PLL to support inputting of master clock up to 20 MHz.
- Contains a 16-bit stereophonic D/A converter.

3. H/W Circuit Description

Receiver and Speaker circuit

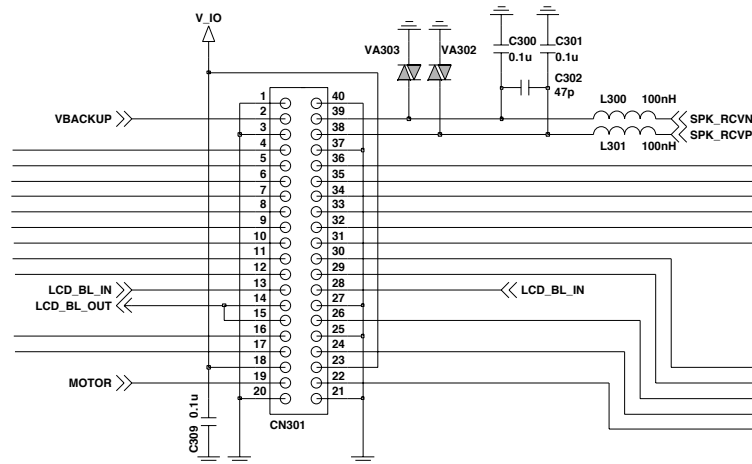


Figure 25. Receiver and Speaker Circuit

SPK_RCVP, SPK_RCVN signals from Analog switch are connected to speaker through SPK+ and SPK-.

3. H/W Circuit Description

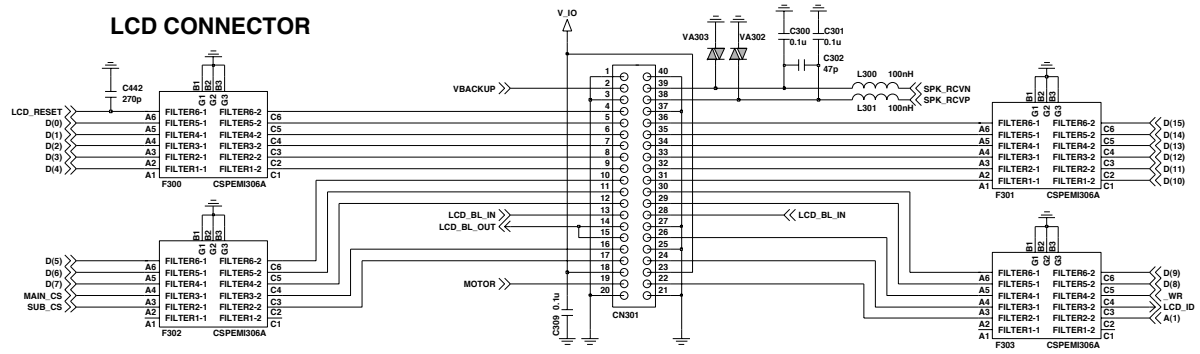
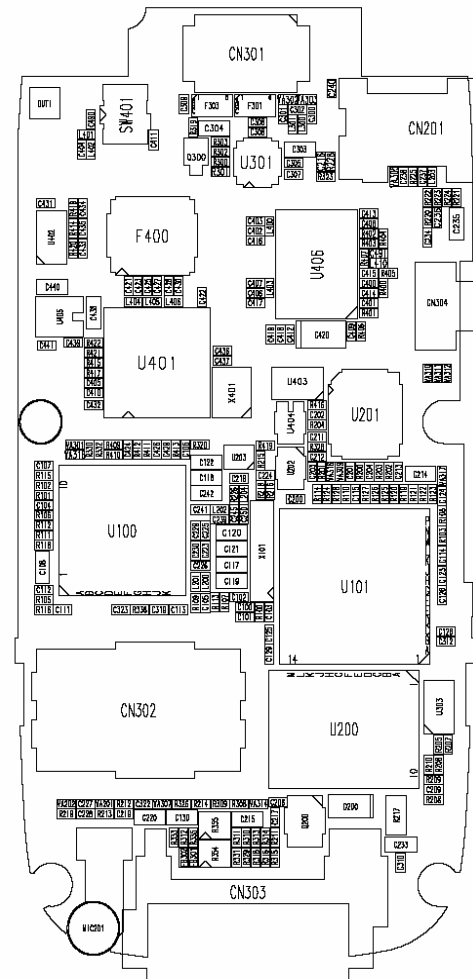
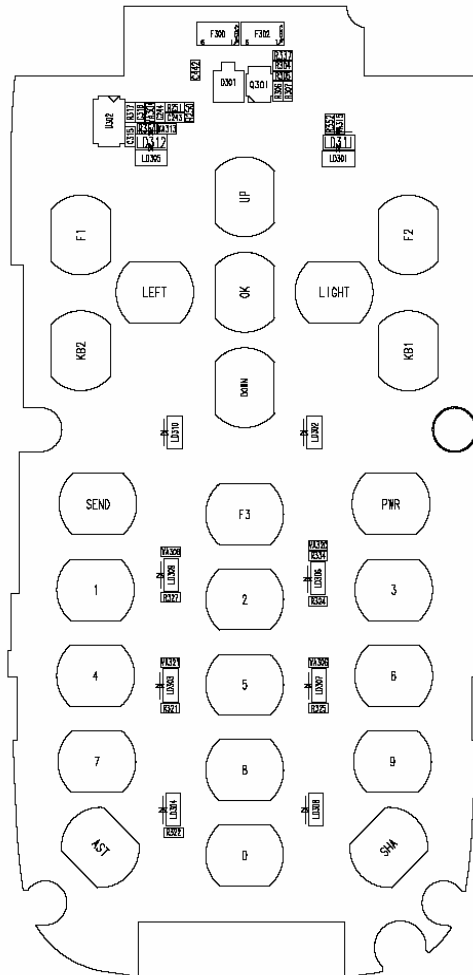


Figure 26. LCD Connection.

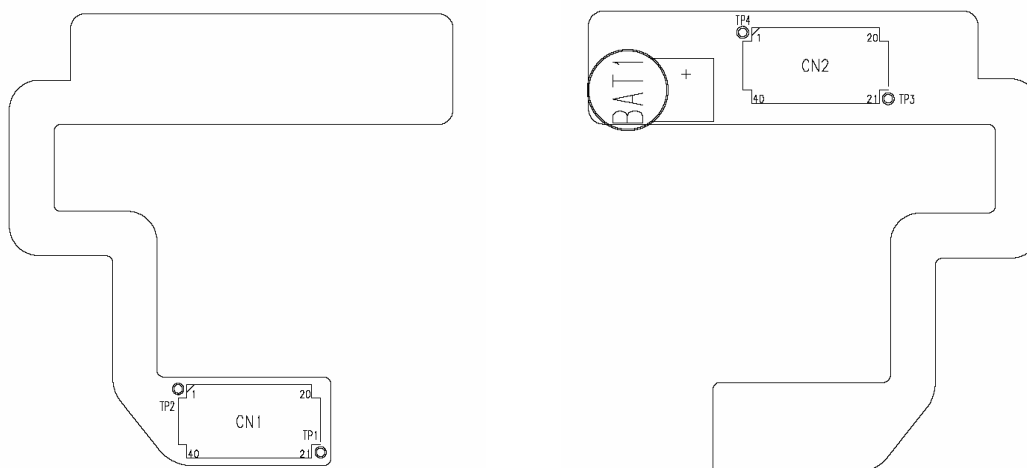
4. TROUBLE SHOOTING

4.1 Main Components Placement

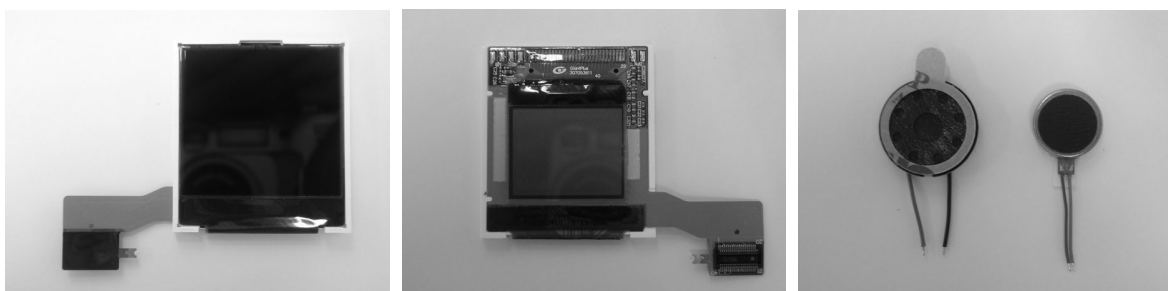


4. TROUBLE SHOOTING

4.2 FPCB Components Placement



4.3 Baseband Components



4. TROUBLE SHOOTING

4.4 Main Components (Description)

MAIN

U302	Hall effect switch	CN201	Ear-Mic jack
CN301	LCD connector	U403	UHS DUAL 2-INPUT AND GATE
U301	LCD Back Light LED charge pump	U401	RF Transceiver
SW401	RF Mobile switch	U406	Power Amplifier Module
F400	TRIPLE FEM	U100	Analog Base Band (IOTA)
U404	CMOS INVERTER	X101	XTAL 32.768KHz
X401	XTAL 26MHz	U203	SPDT Analog switch
U201	MIDI chip(40 poly)	U101	Digital Base Band(Calypso)
CN302	SIM Connector	CN303	IO connector
U200	Memory(Flash 128Mbit/SRAM 64Mbit)	MIC201	Microphone
U402	UHS Triple Buffer		

FPCB

CN1	Main PCB connector	BAT1	Backup Battery
CN2	LCD connector		

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

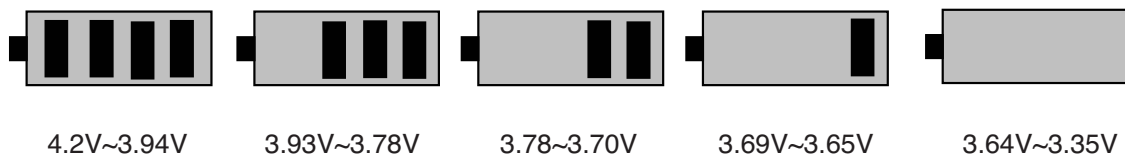
- Connect PIF-UNION to the phone
- Set the TI-remote switch PIF-UNION off

4.5.4 Trouble Shooting Procedure

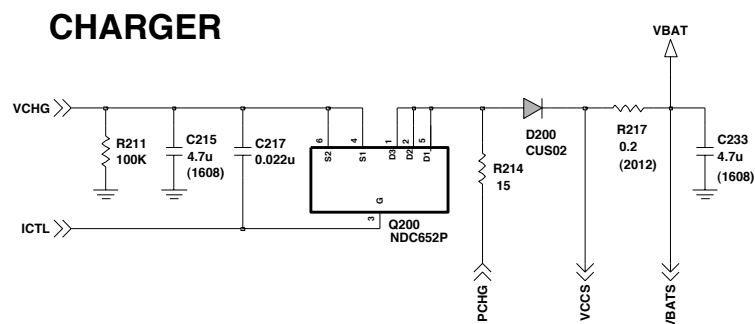
- Check Battery voltage
- END_KEY Dome Switch condition
- Check the output voltages of all LDOs

4.6 Charging Trouble

- Charging method : CC-CV
- Charger detect voltage : about 5.2V
- Charging time : under 3hours
- Charging current : 500mA
- Cutoff current : 50mA
- Low battery alarm
 - Idle : 3.55V
 - Dedicated : 3.65V
- Switch-off voltage : 3.35V
- Charging temperature adc range
 - . ~ -5# : not charging operation.
 - . -5# ~ 50# : charging.
 - . 50#~ : not charging operation.



Block Diagram



4. TROUBLE SHOOTING

Charging Procedure

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

Check Points

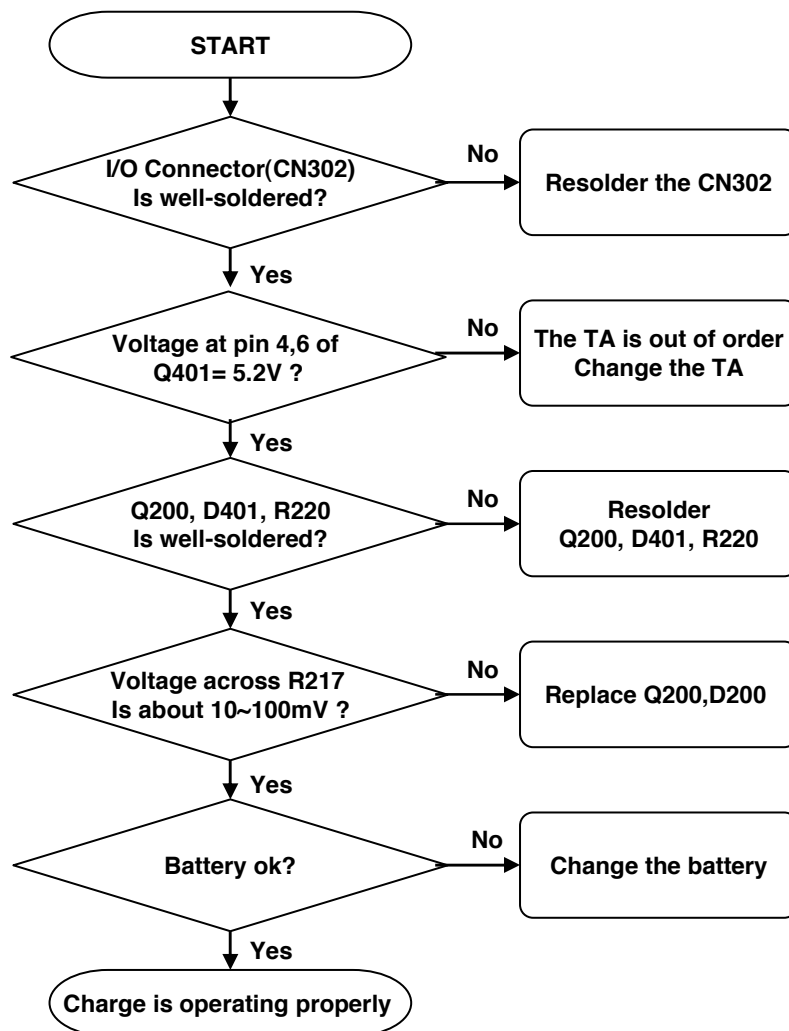
- Connection of TA
- Charging Current Path
- Battery

Trouble Shooting Setup

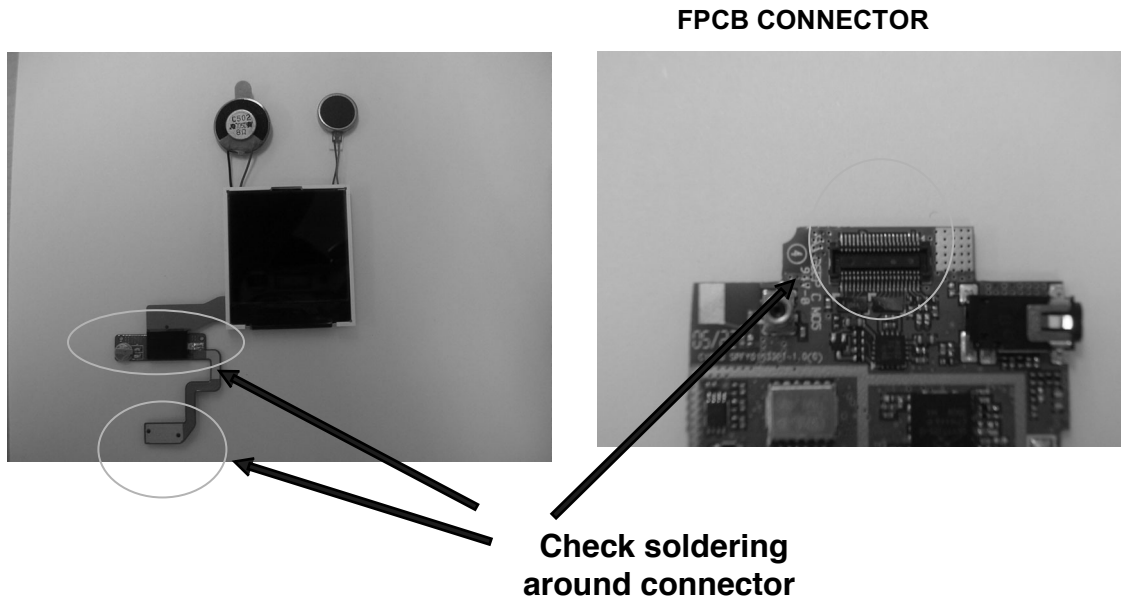
- Connect Battery & TA to the handset.

Trouble Shooting Procedure

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



4.7 LCD Display Trouble



- FPCB CONNECTOR

- LCD CONNECTOR

LCD Control Signals From Main Board

- LEDA, LEDC , MAIN_CS, LCD_RESET, _WR, LCD_ID
- A(1), D(0)~L_D(15), IFMODE

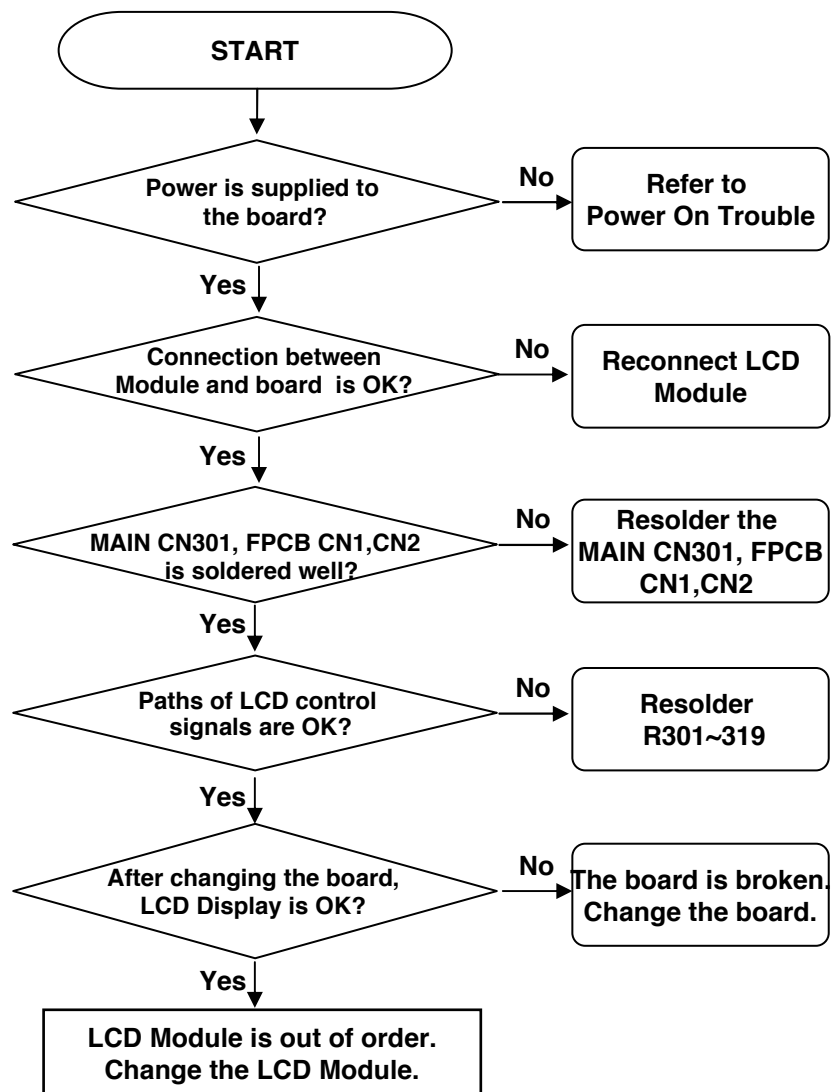
Check Points

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

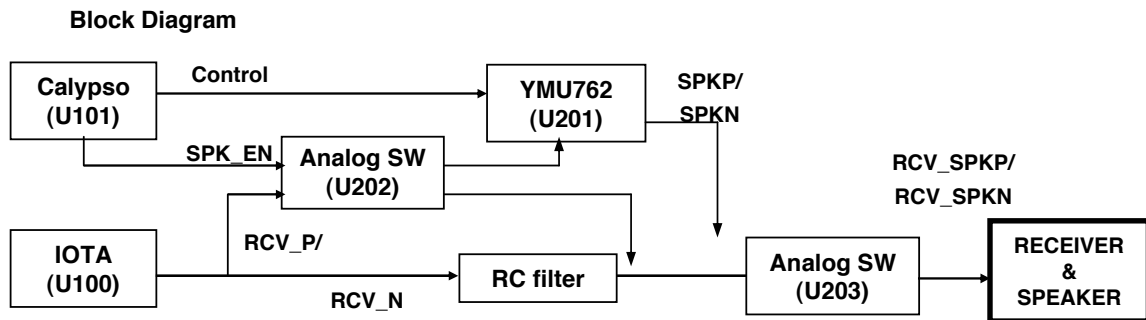
Trouble Shooting Setup

- Connect PIF, and power on

4. TROUBLE SHOOTING



4.8 Receiver Trouble



Melody Generation

- U201 (YMU762, MIDI) is controlled by DBB.
- U201 generates 40 poly MIDI sound and it is delivered to the speaker
- When SPK_EN is 'H', RCV_P from U202 is delivered to the speaker through U201

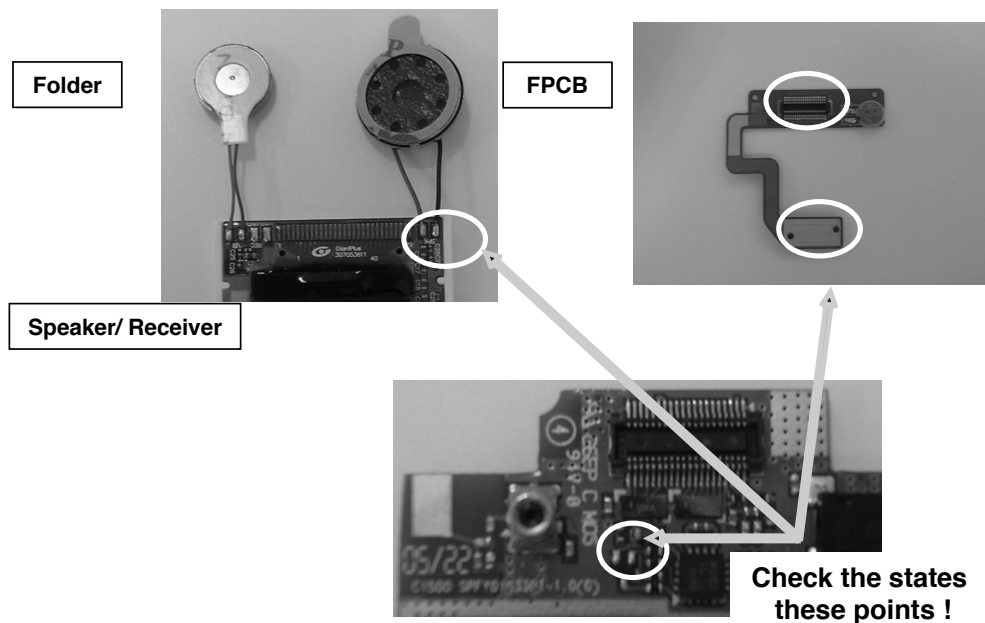
Signals to the receiver

- RCV_P, RCV_N From ABB
- RCV_N, RCV_P are delivered to Receiver, when SPK_EN is 'L'

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



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.

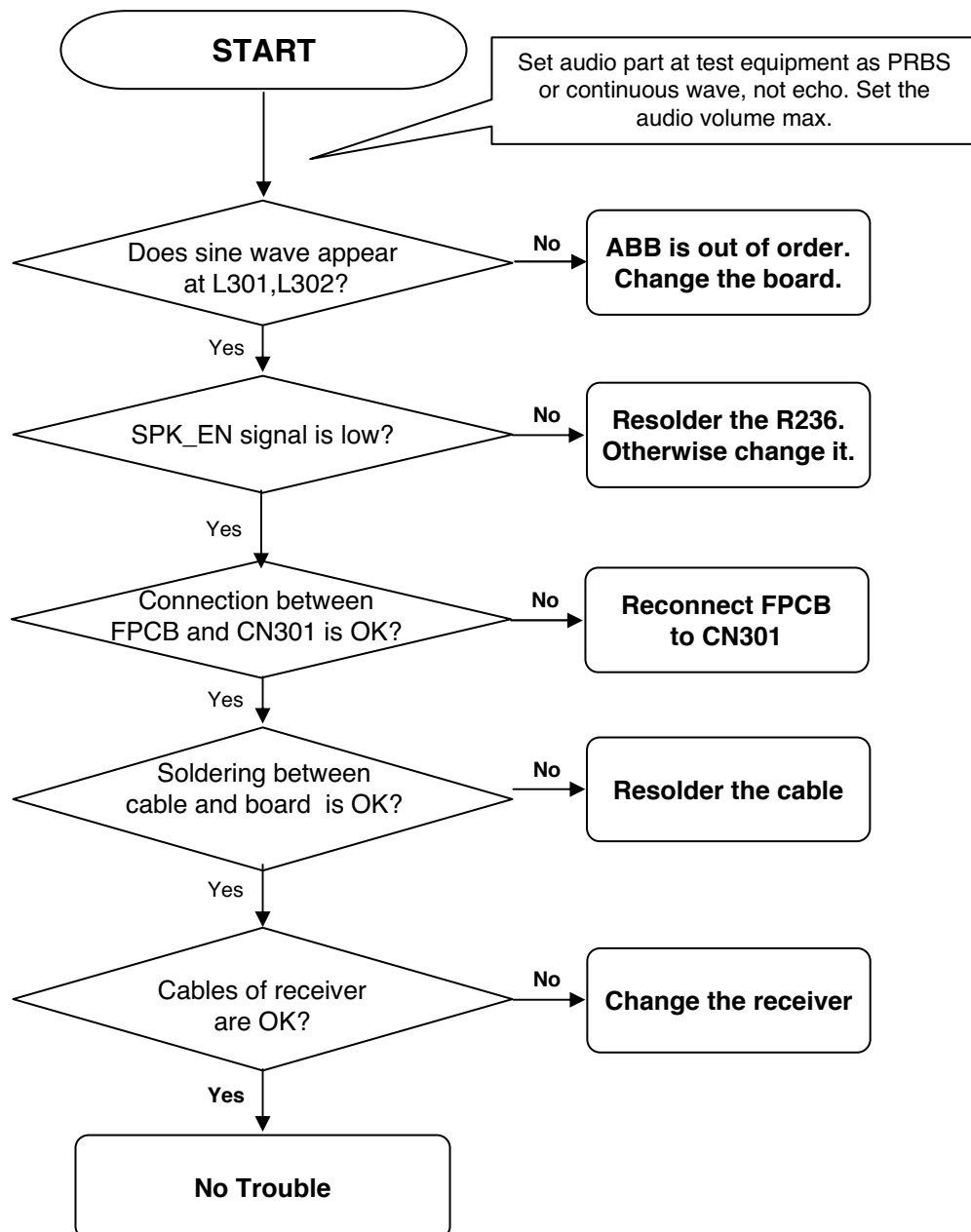
Speaker Trouble Shooting Setup

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

Trouble Shooting Procedure

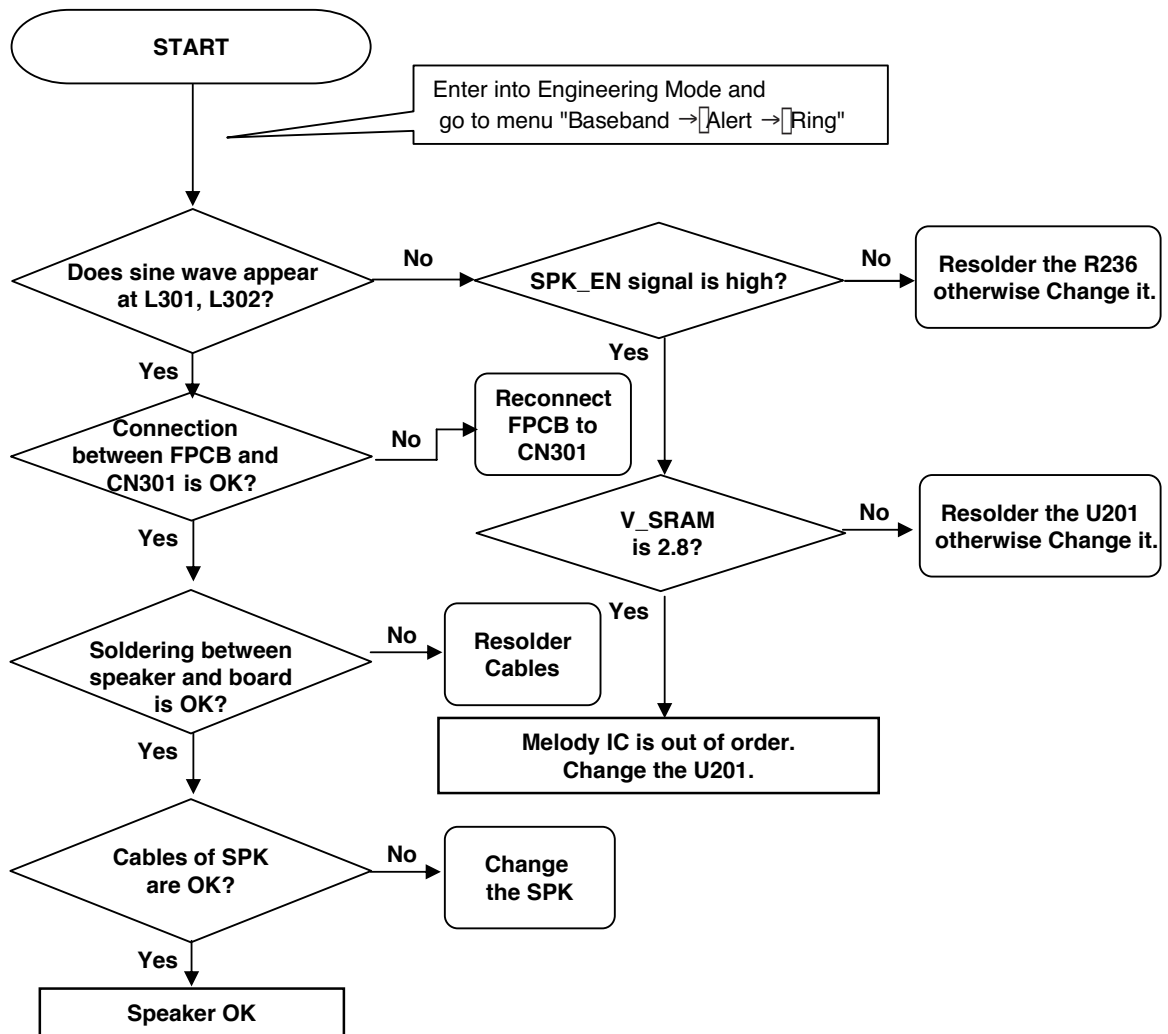
- Check the voltage levels of power supplies.
- Check all sound path.
- Check the sound level to the speaker.
- Check the speaker and the soldering.

4.8.1. Receiver Trouble



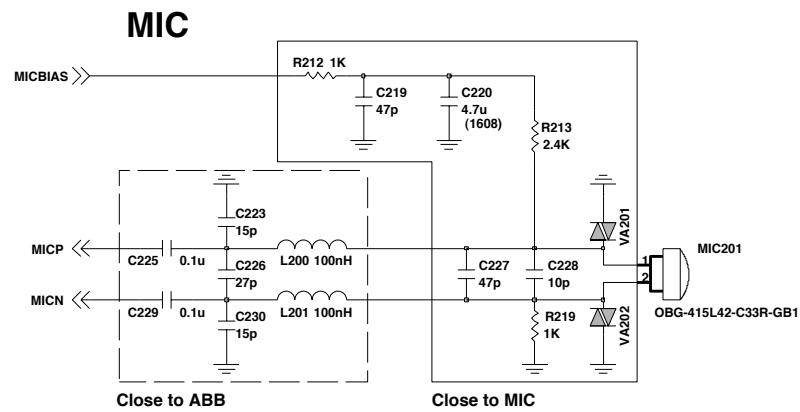
4. TROUBLE SHOOTING

4.8.2. Speaker Trouble



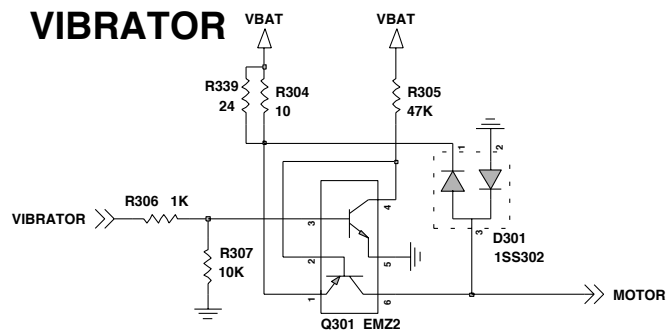
4.9 Microphone Trouble

Circuit Diagram



4.10 Vibrator Trouble

Block Diagram



Vibrator Operation

- Vibrator is controlled by MIDI chip
- When vibrator signal is high, vibrator is enabled

Check Points

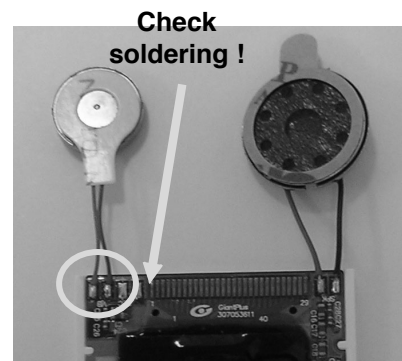
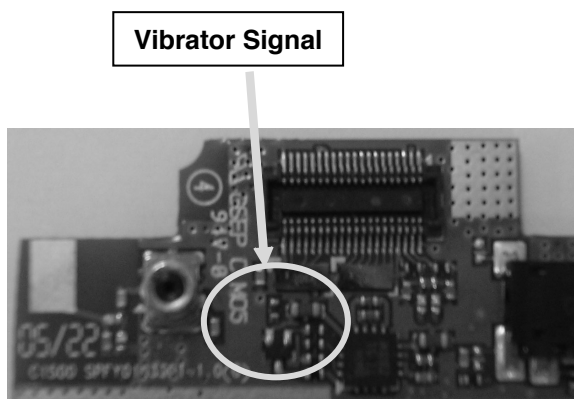
- VCC lines (V_SRAM) of MIDI chip
- Vibrator signal path
- The connection between the main board and vibrator module
- The soldering of wire

Trouble Shooting Setup

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

Trouble Shooting Procedure

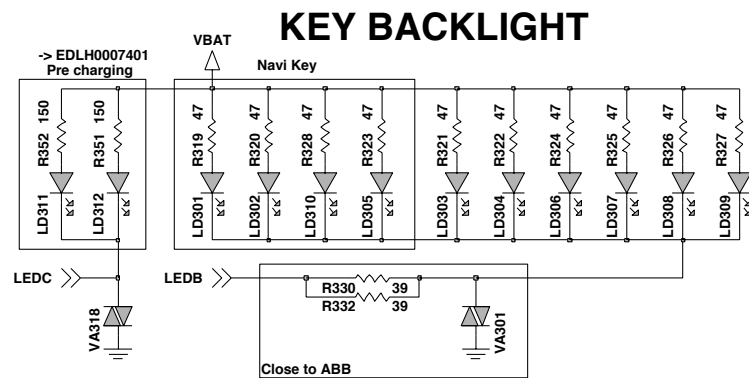
- Check vibrator signal
- Check soldering of components
- Check connection of wire



4. TROUBLE SHOOTING

4.11 Keypad Backlight Trouble

Block Diagram



Backlight Operation

- The keypad LED backlight is controlled with LEDB signal.
- LEDB signal from ABB.
- 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

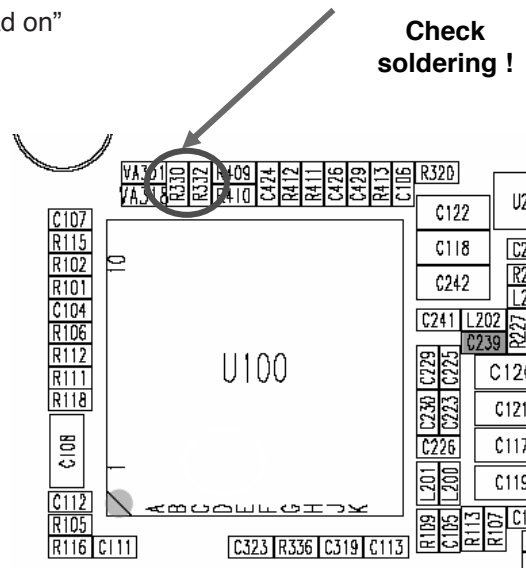
- Check the soldering of components
- Check the LEDB signal
- Check LEDs

Check Points

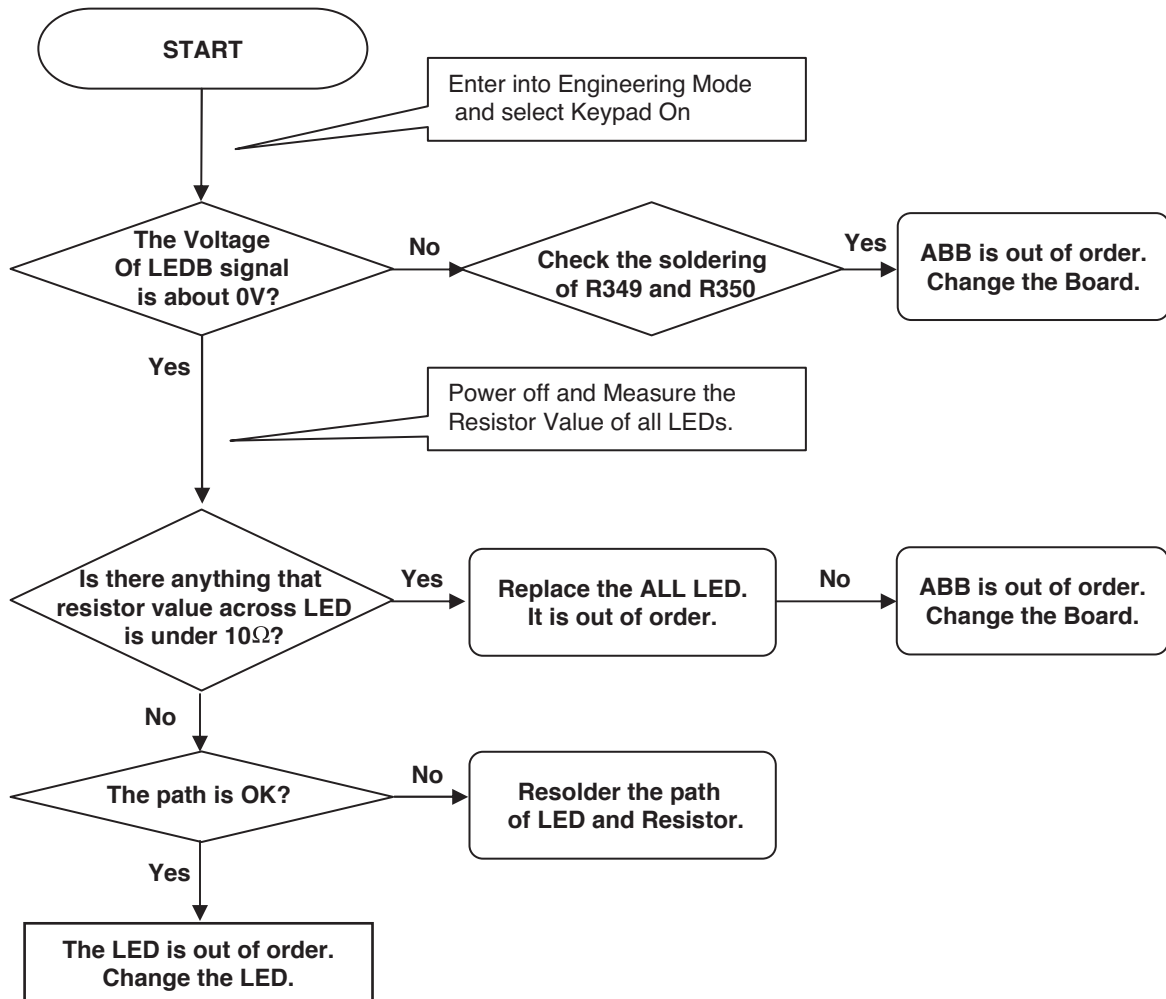
- LEDB signal
- LEDs

Check
LEDB signal
R330, R332

Check
soldering !



4. TROUBLE SHOOTING

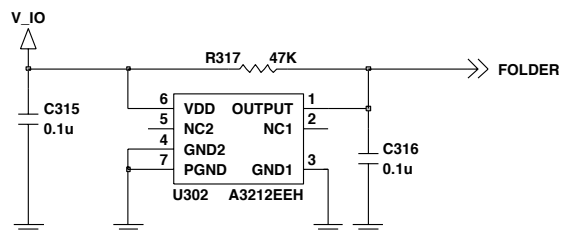


4. TROUBLE SHOOTING

4.12 FOLDER Open/Close Trouble

Block Diagram

HALL EFFECT S/W



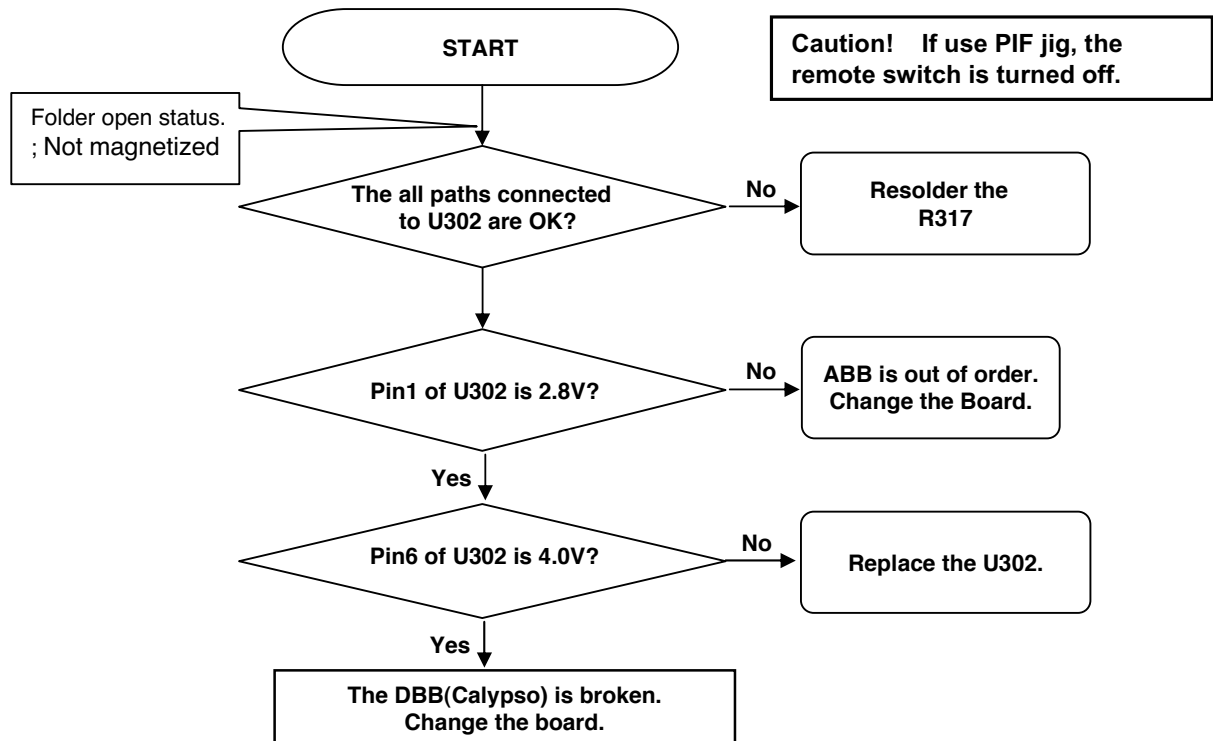
Folder Operation

- There is a magnet to detect the Flip status, opened or closed.
- If a magnet is close to the hall-effect switch(U302), the voltage at pin 1 of U302 goes to 0V. Otherwise, V_{IO}.
- This Folder signal is delivered to DBB, and the status of Flip is reported.

Folder Signal Status

- L : Close (Magnetized)
- H : Open (Not magnetized)

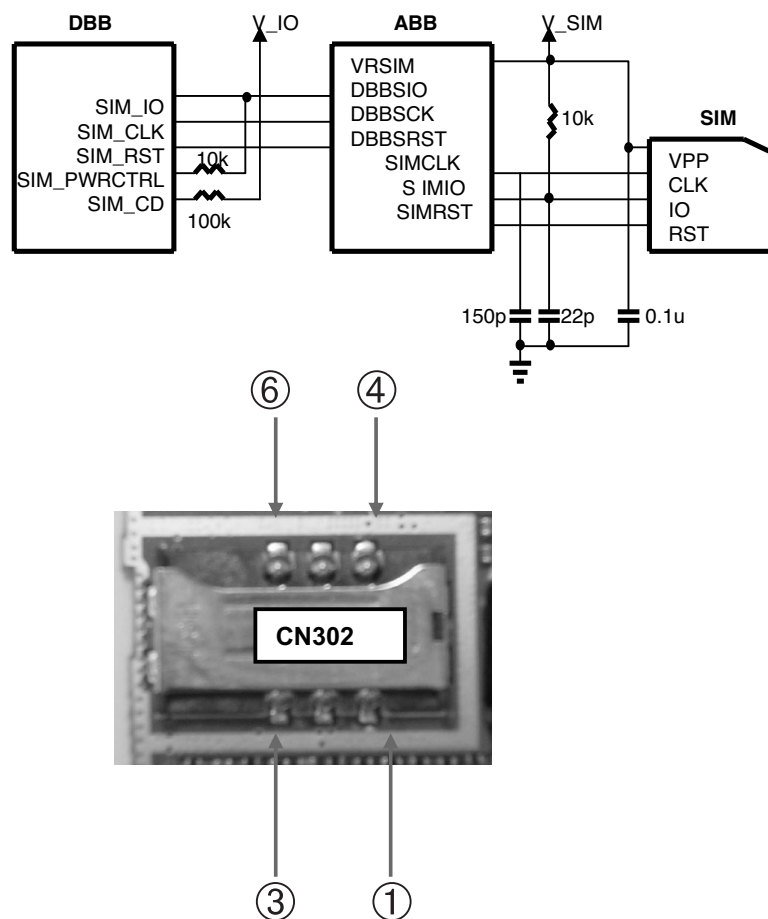
4. TROUBLE SHOOTING



4. TROUBLE SHOOTING

4.13 SIM Detect Trouble

Block Diagram



Connection between SIM and DBB

- SIM_CLK, SIM_IO, SIM_RST

Check Points

- Contact between SIM and socket
- . Soldering of SIM socket

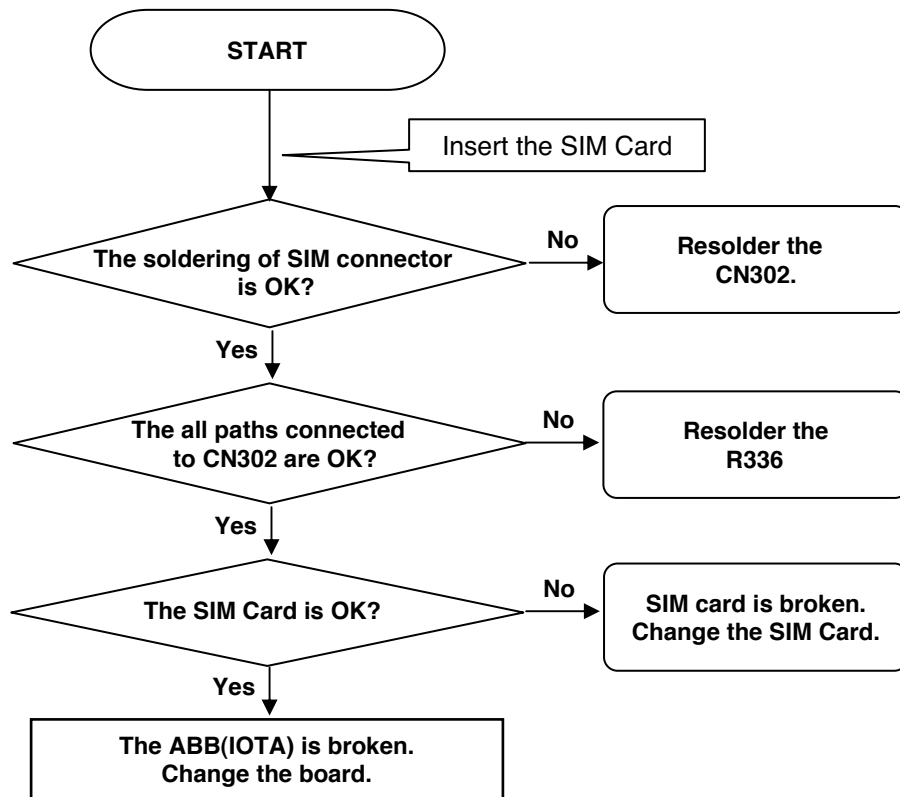
Trouble Shooting Setup

- 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.

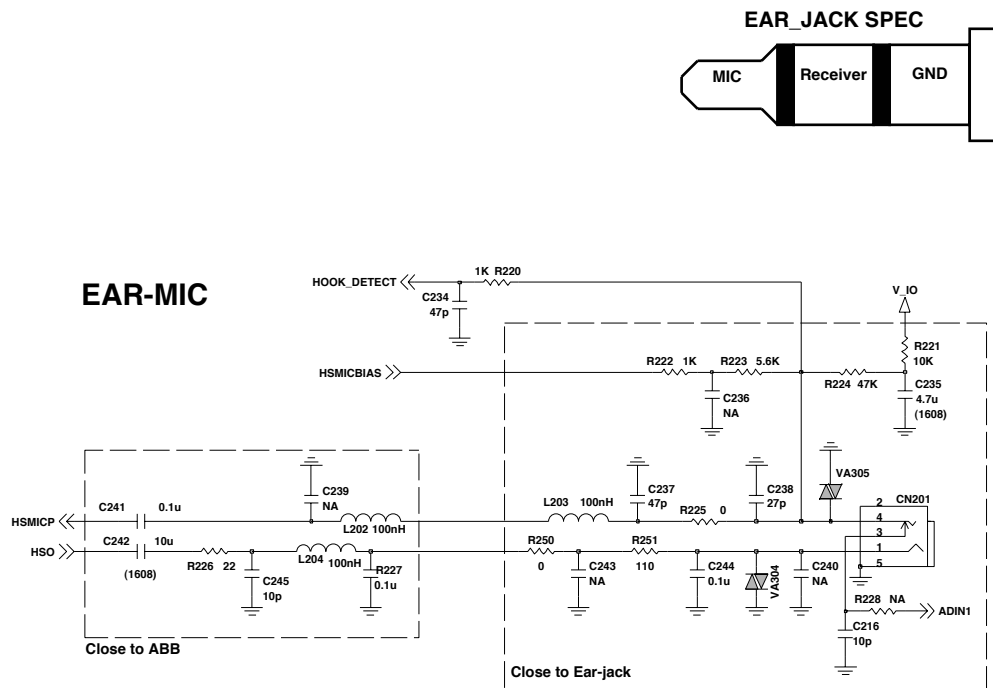
4. TROUBLE SHOOTING



4. TROUBLE SHOOTING

4.14 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.

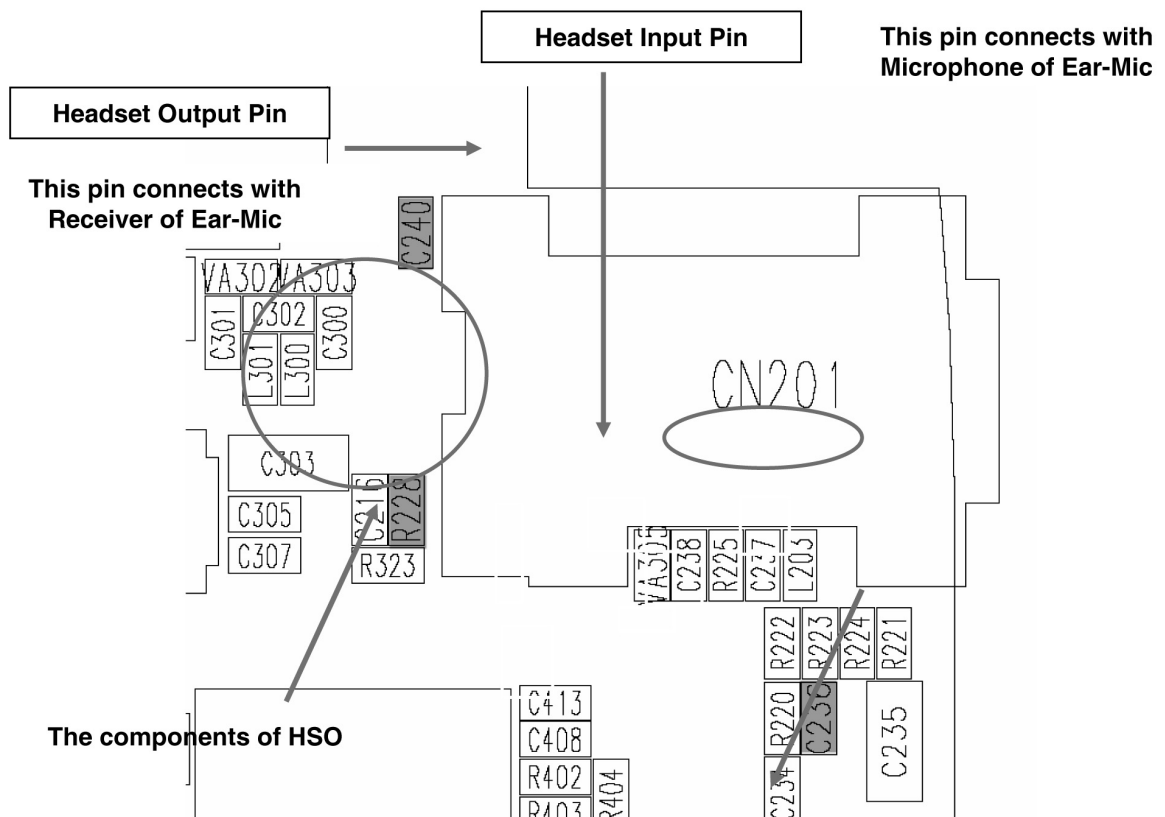
Earphone Sending Path

- HSMICP is the audio signal from the microphone of the earphone.
- L207, C237, L201 and R229 make the path of the audio signal from the microphone of the earphone.
- This audio signal is delivered to ABB(IOTA).

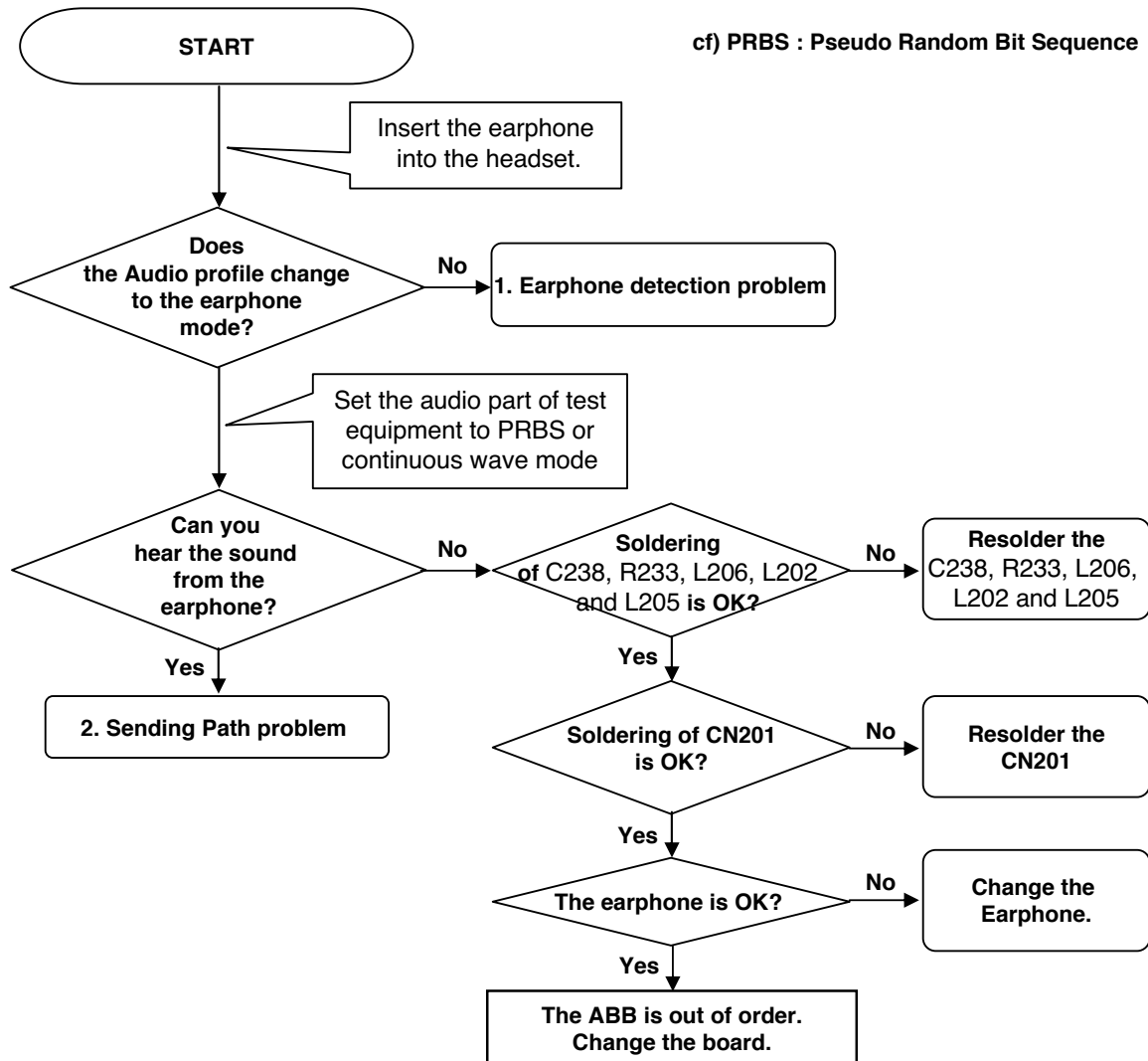
Earphone Receiving Path

- HSO is the audio signal from ABB(IOTA).
- C238, R233, L206, L202 and L205 make the path of the audio signal from ABB to earphone.

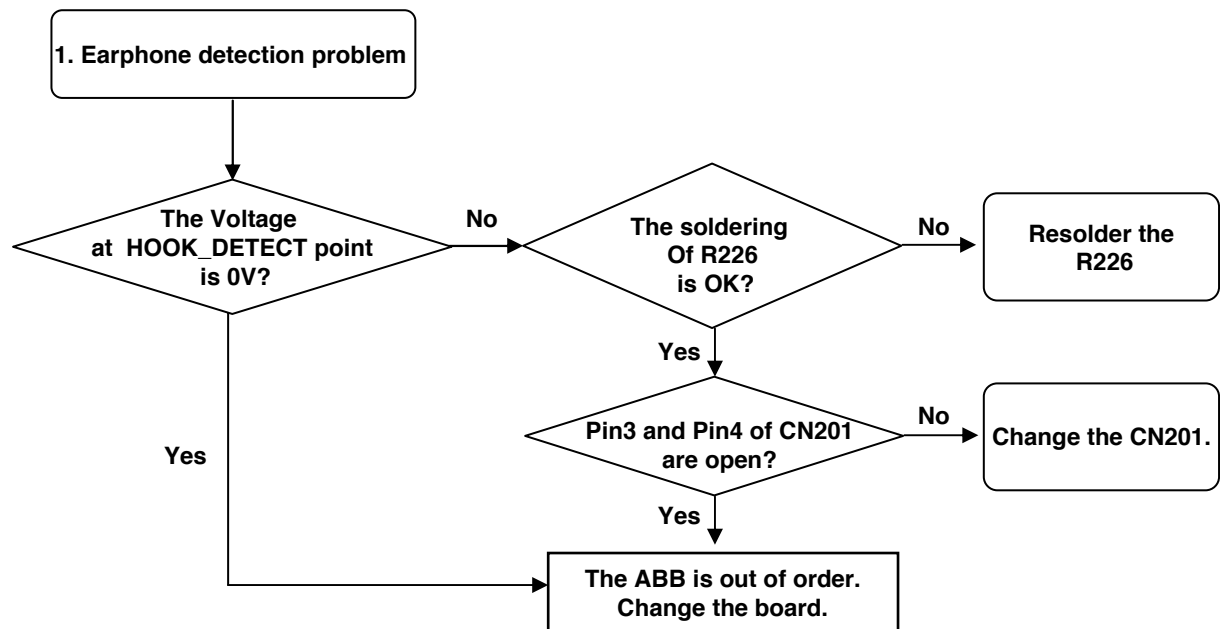
4. TROUBLE SHOOTING



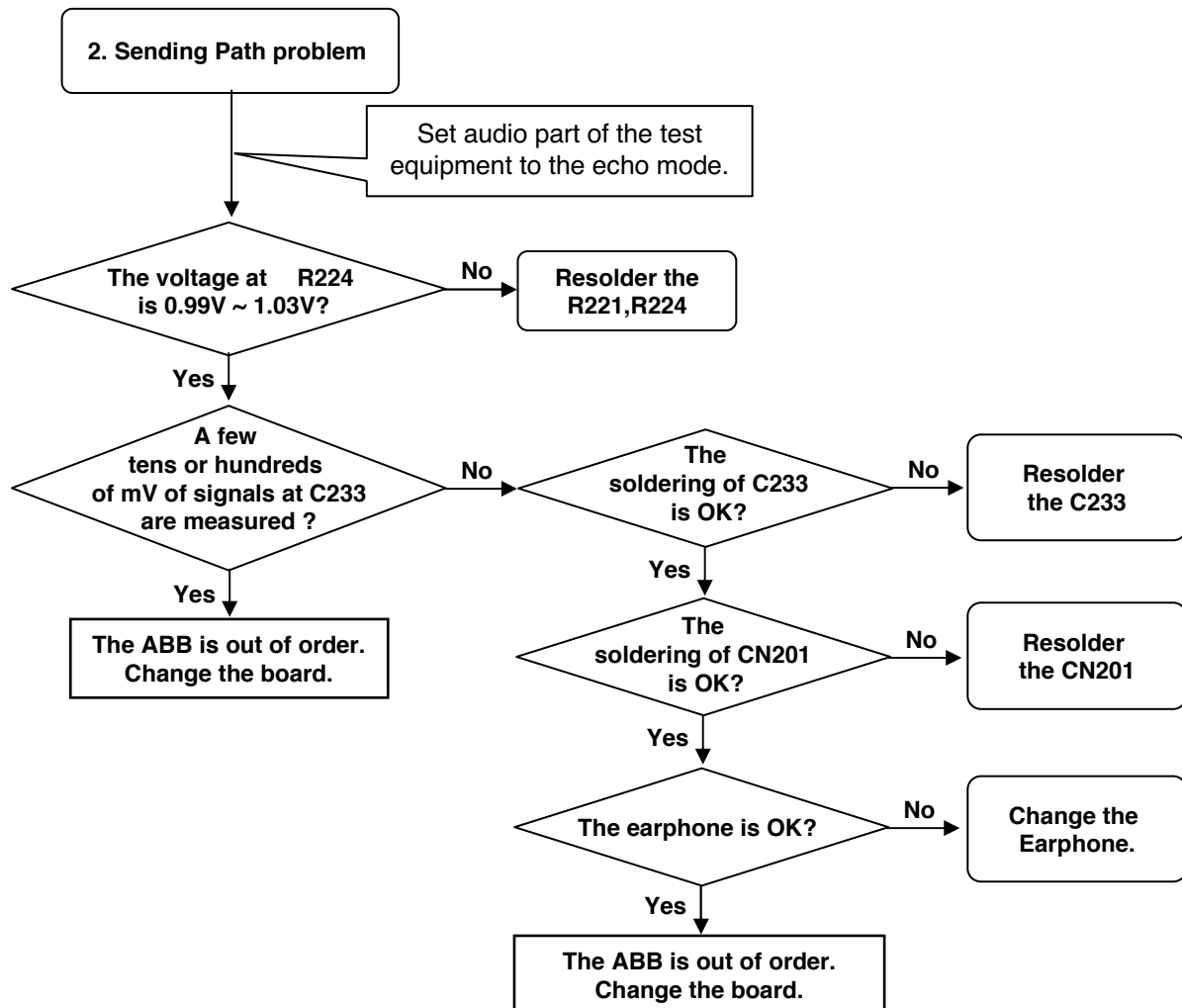
4. TROUBLE SHOOTING



4. TROUBLE SHOOTING



4. TROUBLE SHOOTING



RF Part Troubleshooting

RF Components

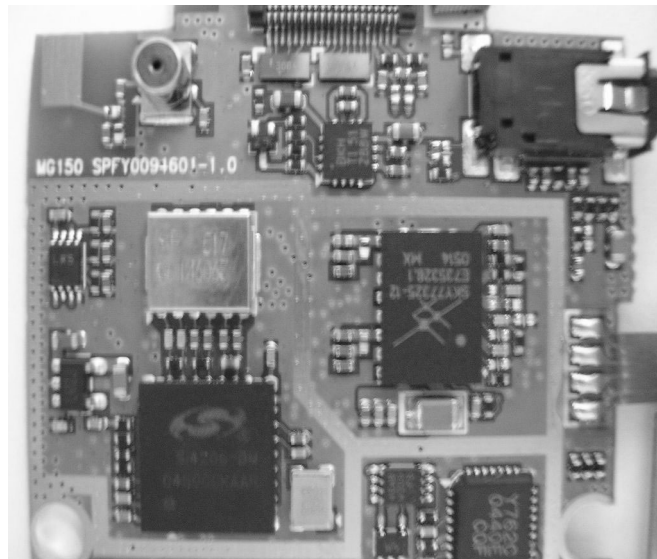


Figure 27. RF Components

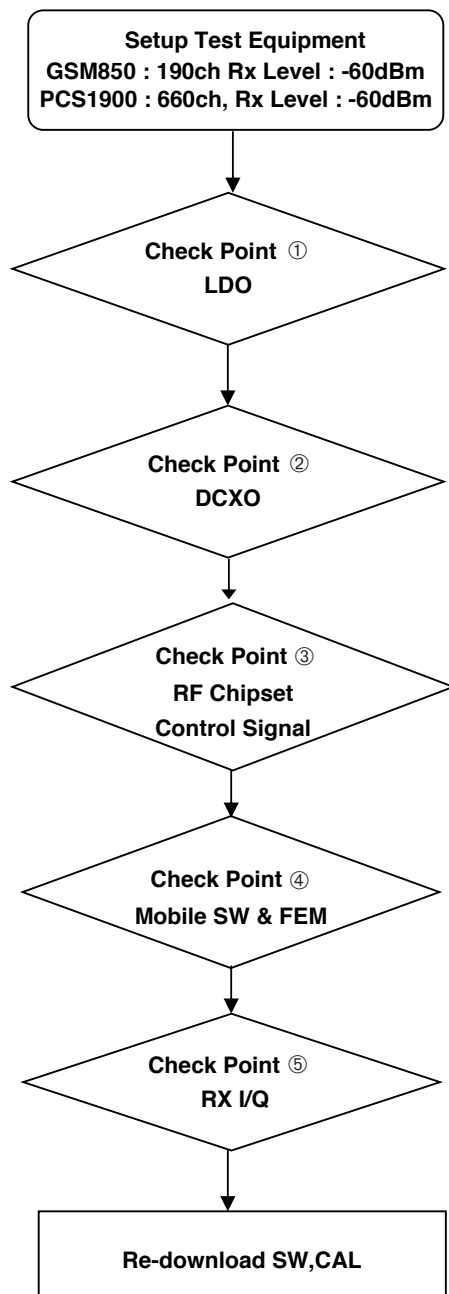
Table . RF Components

Reference	Description	Reference	Description
SW401	Mobile S/W	U405	LDO(Voltage Regulator)
F400	FEM	X401	DCXO(26MHz)
U402	Triple Buffer	U406	PAM
U401	Tranceiver		

4. TROUBLE SHOOTING

Trouble Shooting of Receiver Part

Checking Flow



Checking Points

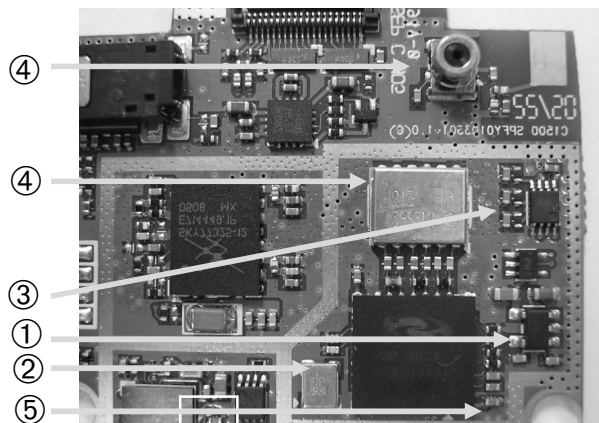
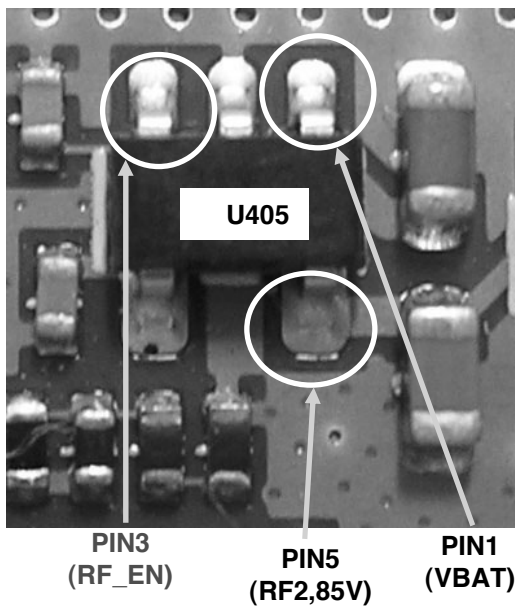


Figure 28. RF BLOCK

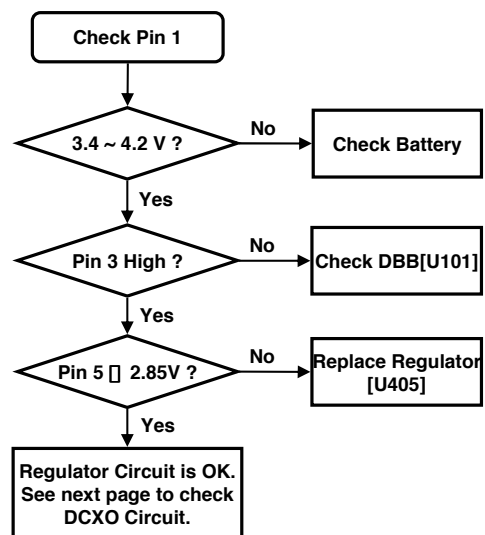
4. TROUBLE SHOOTING

Checking LDO Circuit

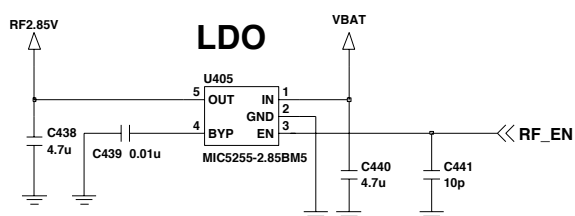
Checking Flow



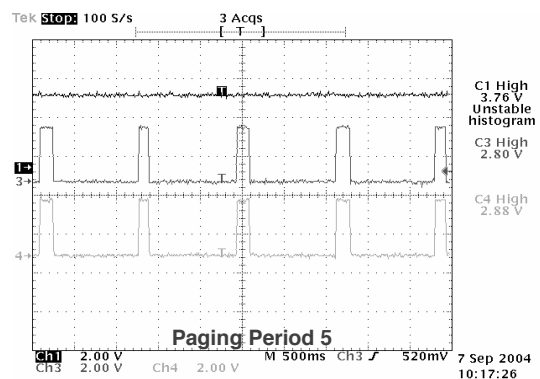
Checking Points



LDO Circuit Diagram



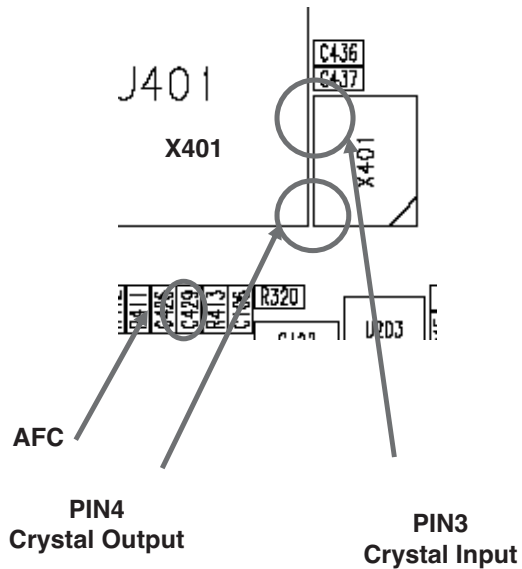
Waveform



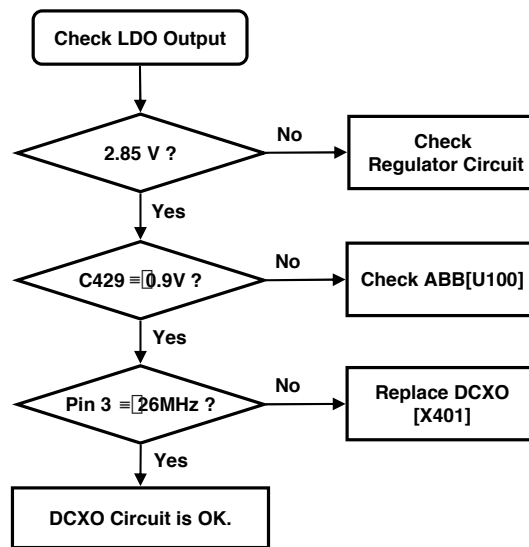
4. TROUBLE SHOOTING

Checking DCXO Circuit

Checking Points



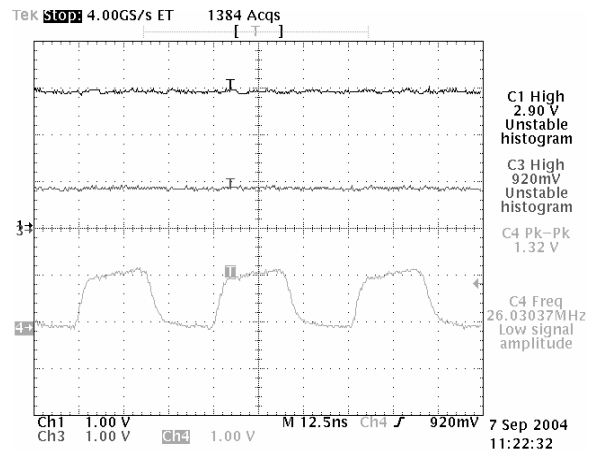
Checking Flow



VCTCXO Circuit Diagram

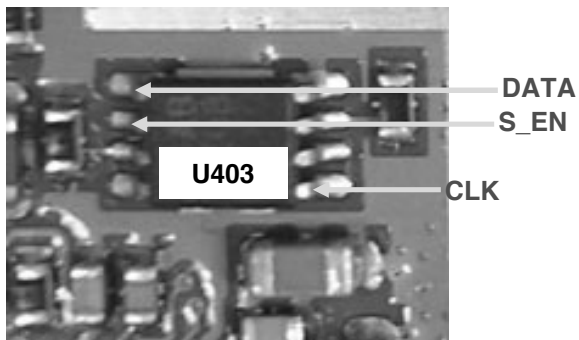


Waveform

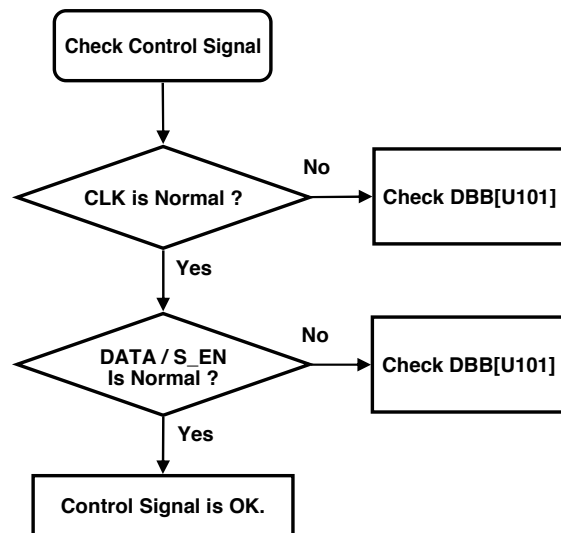


Checking RF Chipset Control Signal

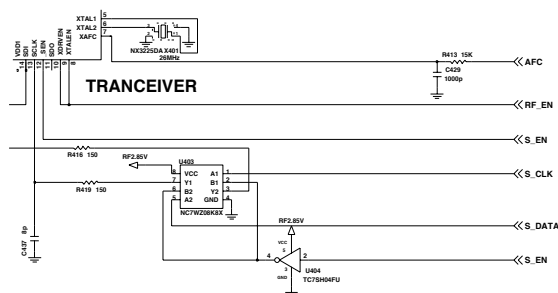
Checking Points



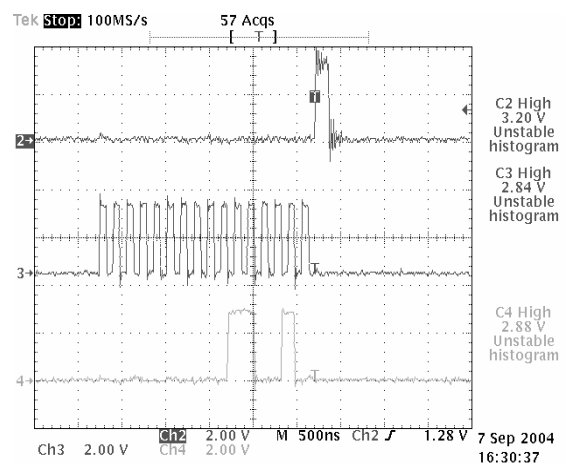
Checking Flow



Control Signal Circuit Diagram



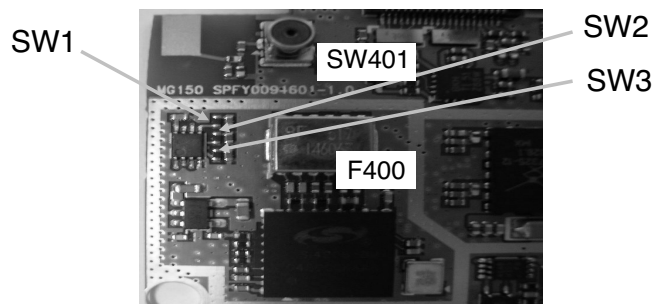
Waveform



4. TROUBLE SHOOTING

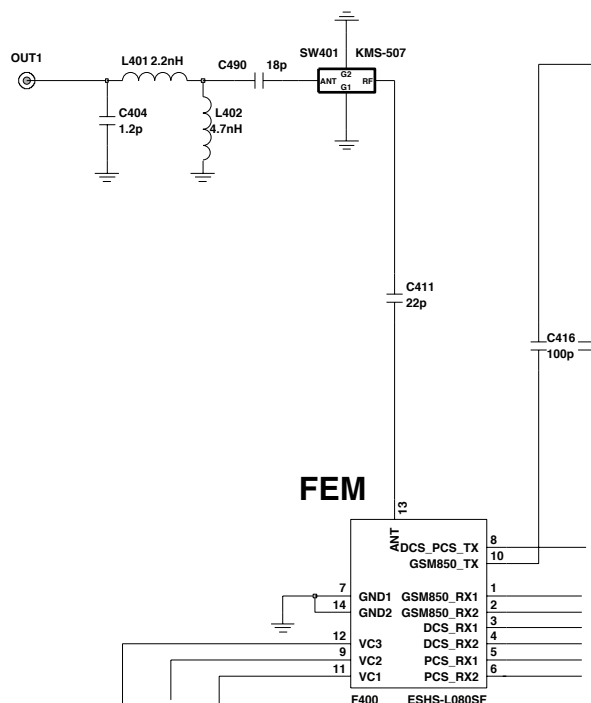
Checking Mobile SW & FEM Circuit

Checking Points

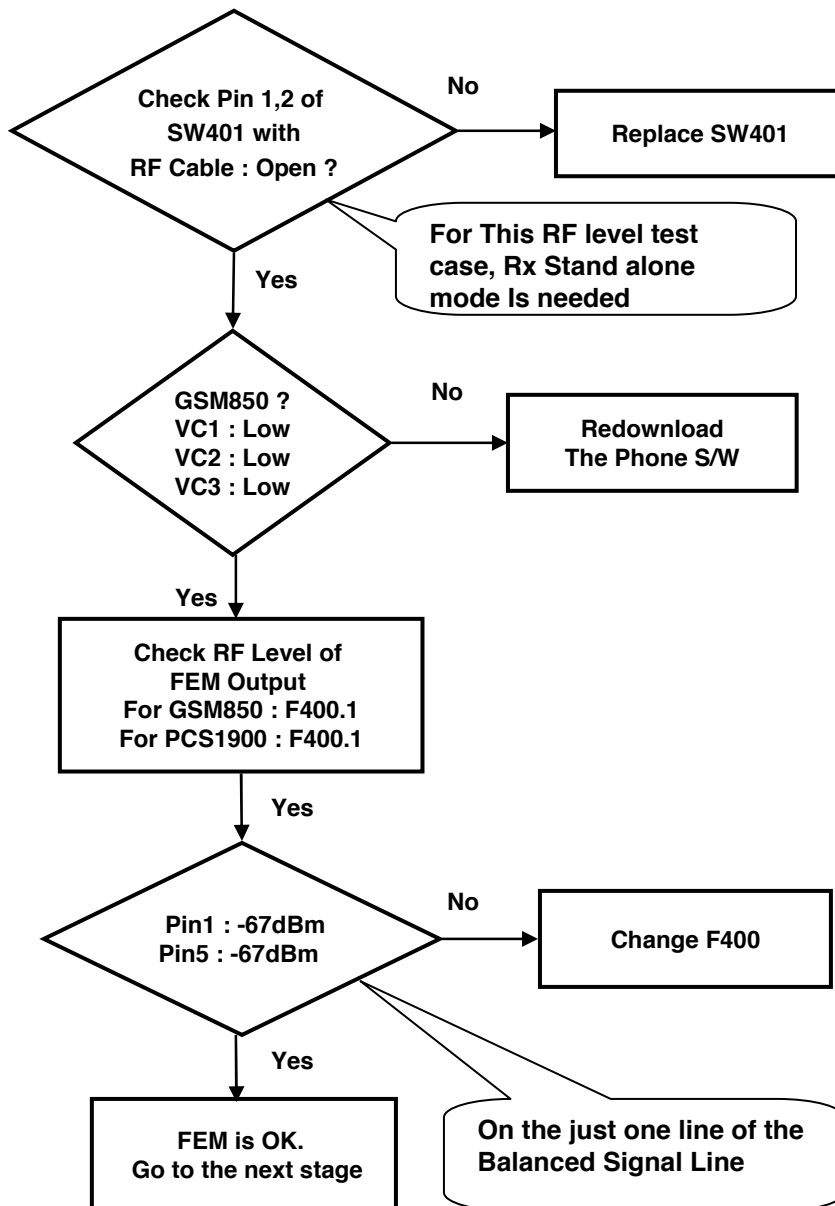


	SW1	SW2	SW3
GSM850 RX	L	L	L
DCS RX	L	L	L
PCS RX	L	L	H
GSM850 TX	H	L	L
DCS/PCS TX	L	H	H

Mobile S/W & FEM Circuits Diagram



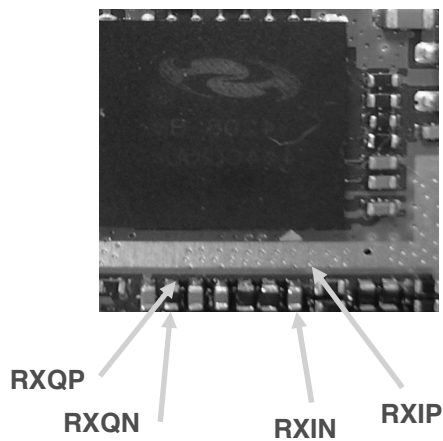
Checking Flow



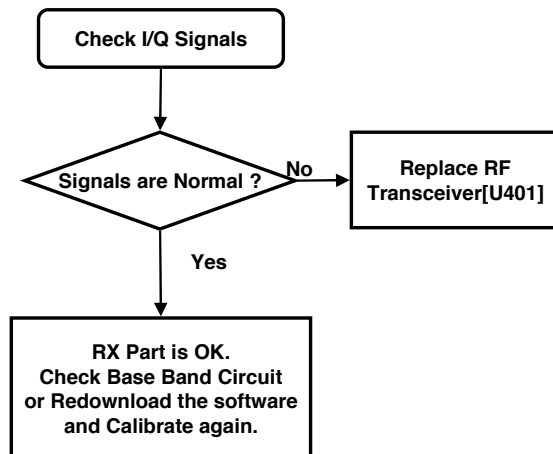
4. TROUBLE SHOOTING

Checking Rx IQ Circuit

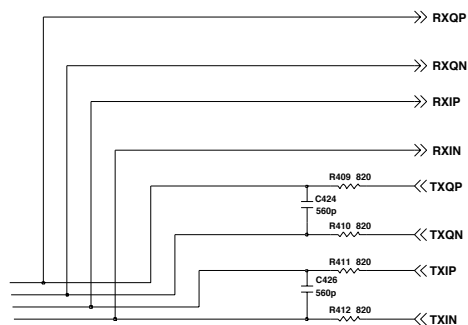
Checking Points



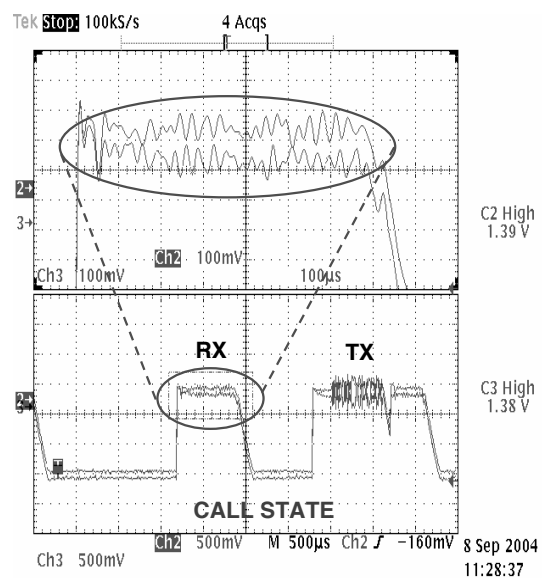
Checking Flow



Rx IQ Circuit



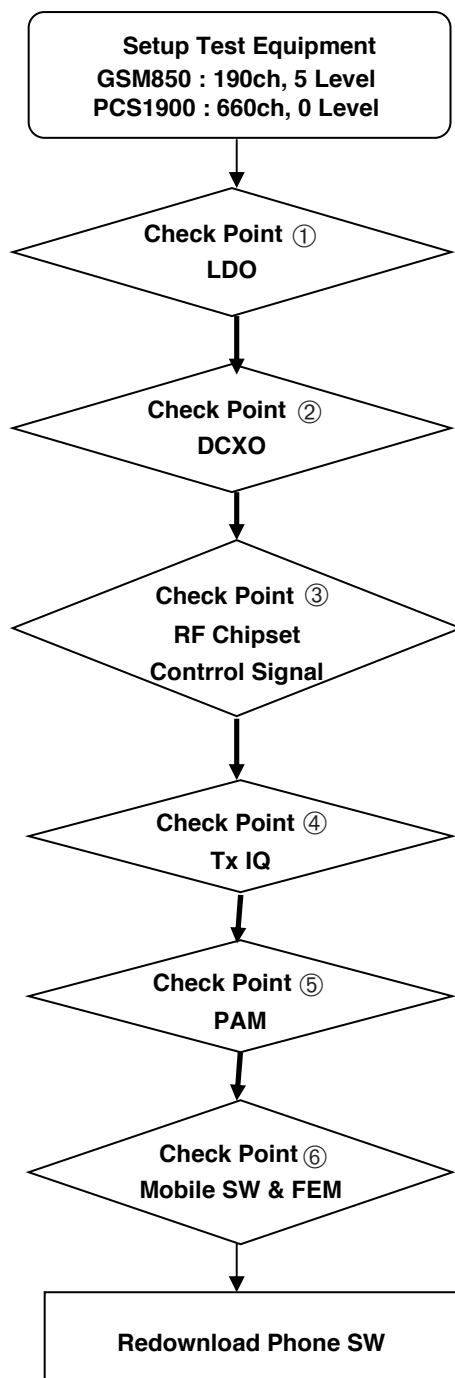
Waveform



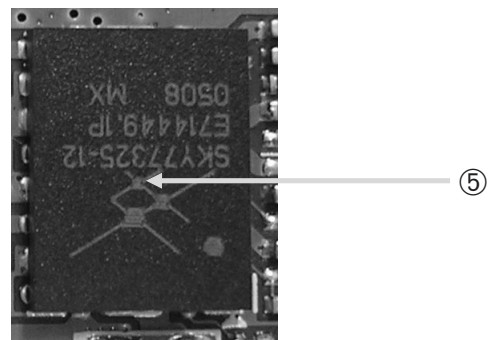
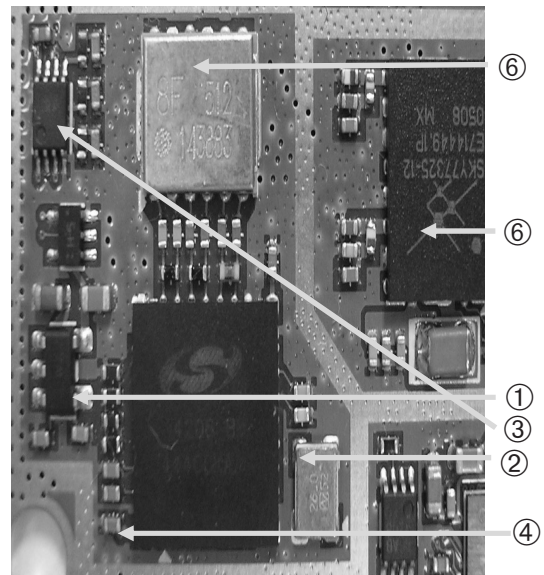
4. TROUBLE SHOOTING

Trouble Shooting Transmitter Part

Checking Flow



Checking Points



4. TROUBLE SHOOTING

Checking LDO Circuit

- See RX Part “Check LDO Circuit”

Checking DCXO circuits

- See RX Part “Check DCXO Circuit”

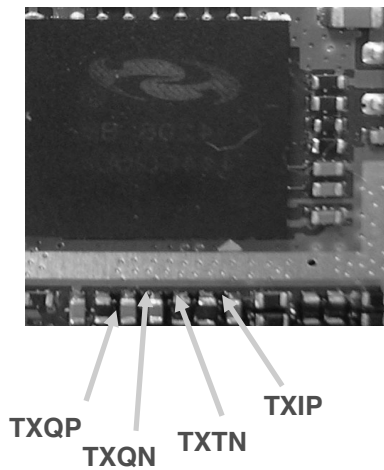
Checking RF Chipset Control Signals

- See RX Part “Check RF chipset control signal”

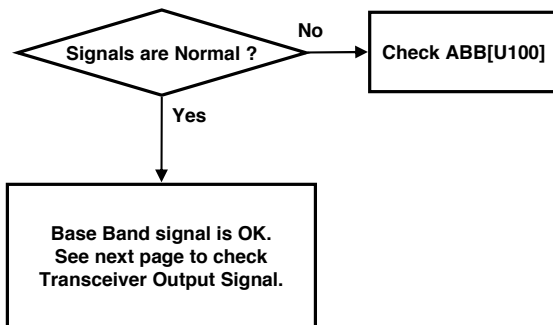
4. TROUBLE SHOOTING

Checking Tx IQ signals

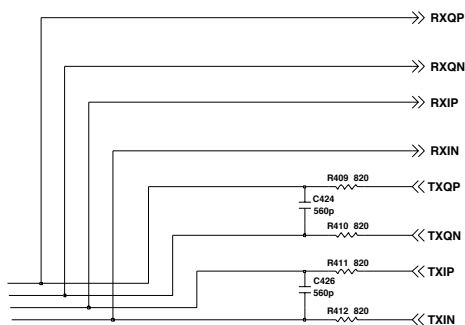
Checking Points



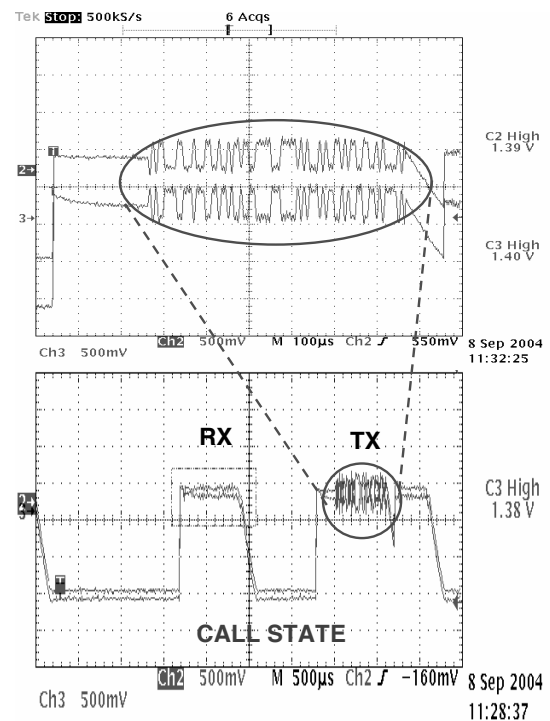
Checking Flow



Tx IQ Circuit Diagram



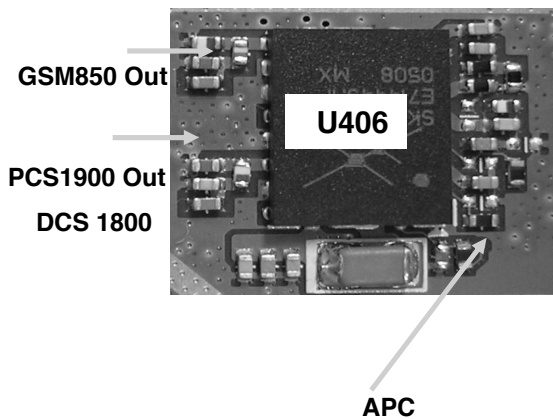
Waveform



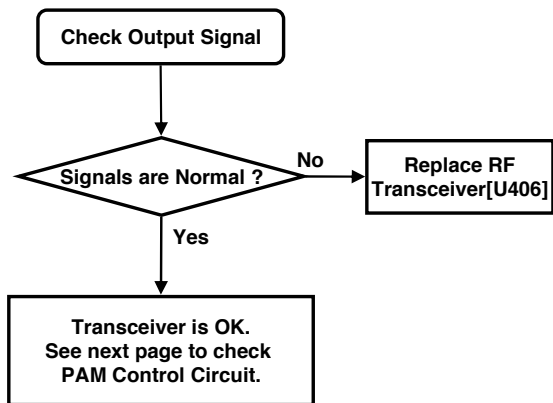
4. TROUBLE SHOOTING

Checking PAM Circuits

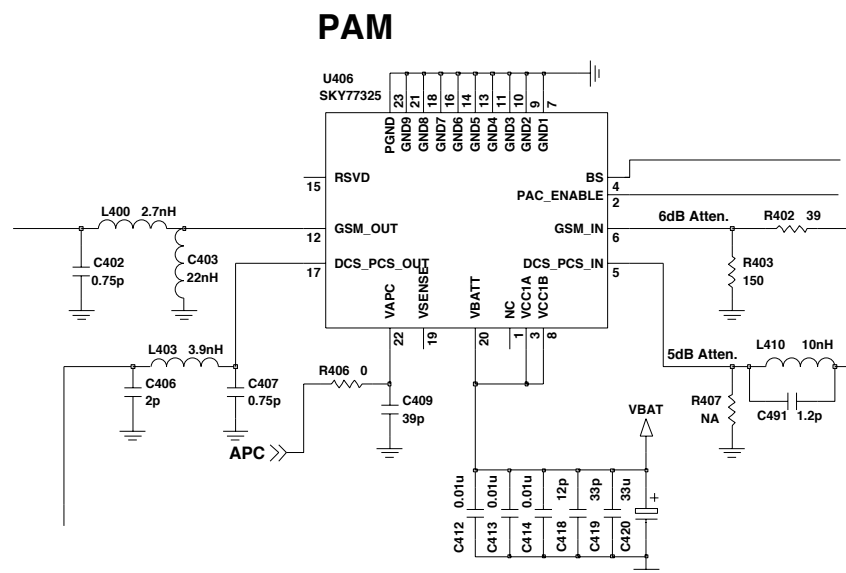
Checking Points



Checking Flow

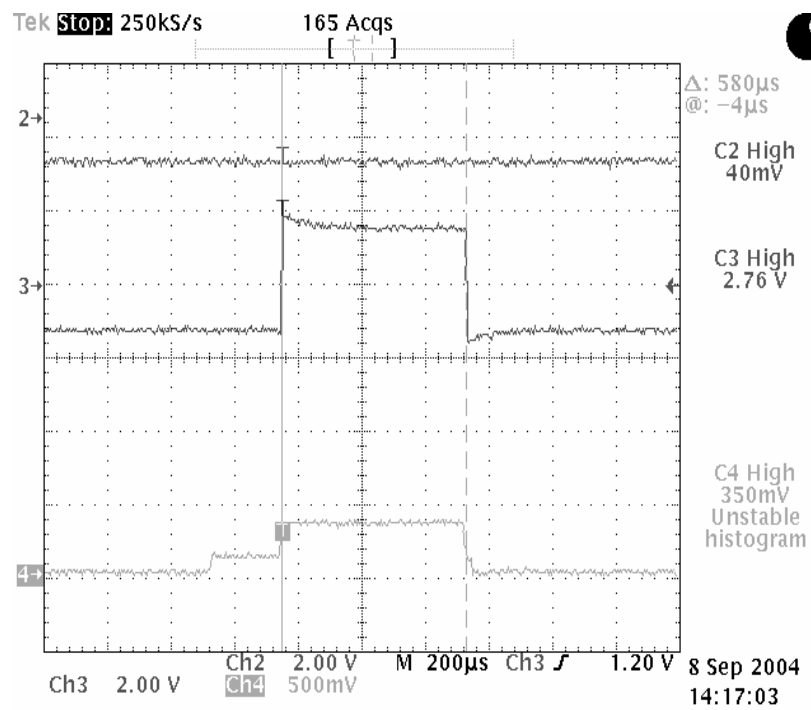


Tx PAM Circuit Diagram



4. TROUBLE SHOOTING

Tx PAM Circuit Diagram

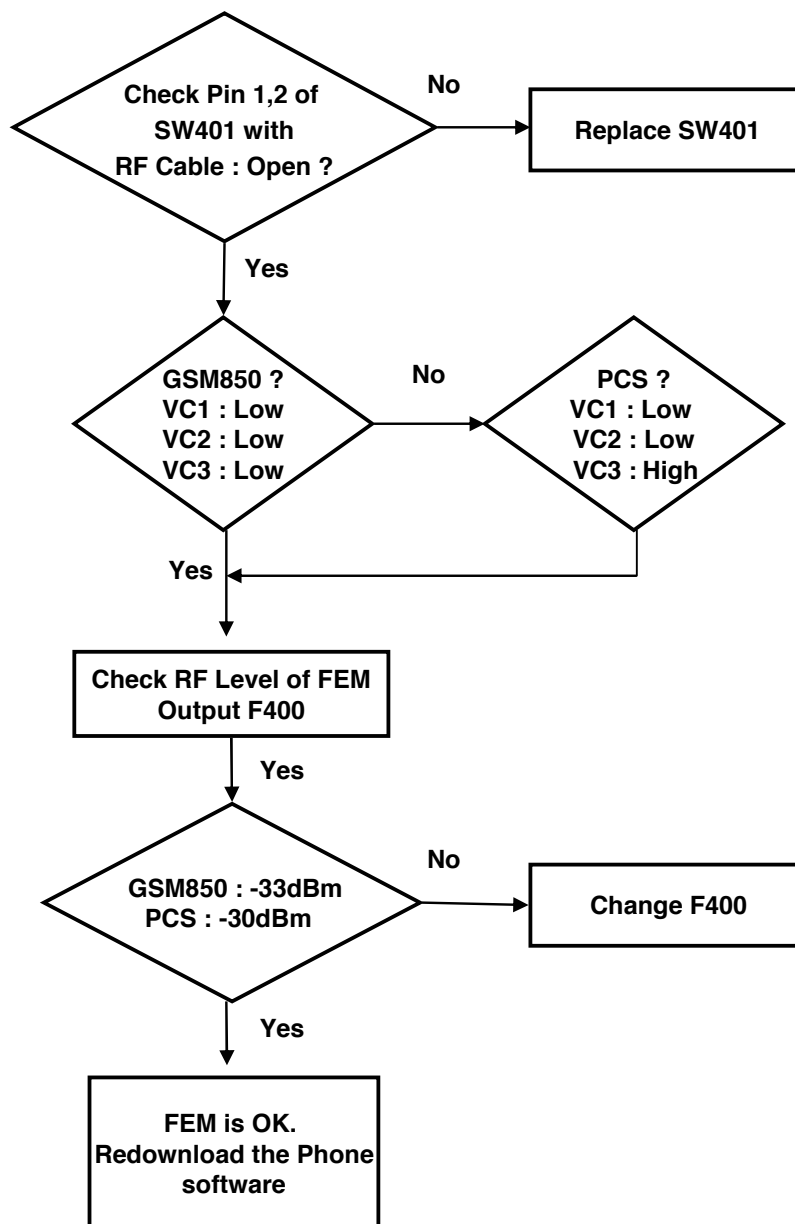


4. TROUBLE SHOOTING

Checking Mobile S/W & FEM circuits

- See RX Part “Check Mobile S/W & FEM circuit”

Checking Flow



5. DOWNLOAD

5.1 Download Setup

5.1.1 In case of using the Data kit

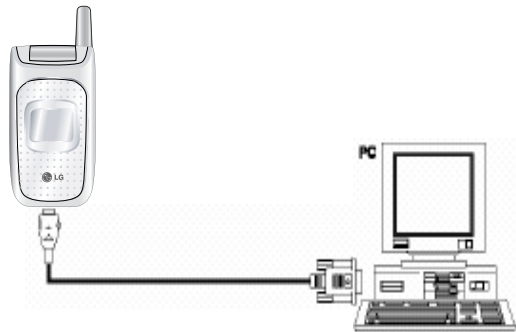
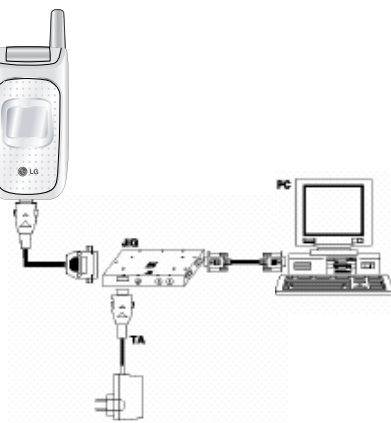


Figure 11. Top level block diagram of the IOTA(TWL3014)

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



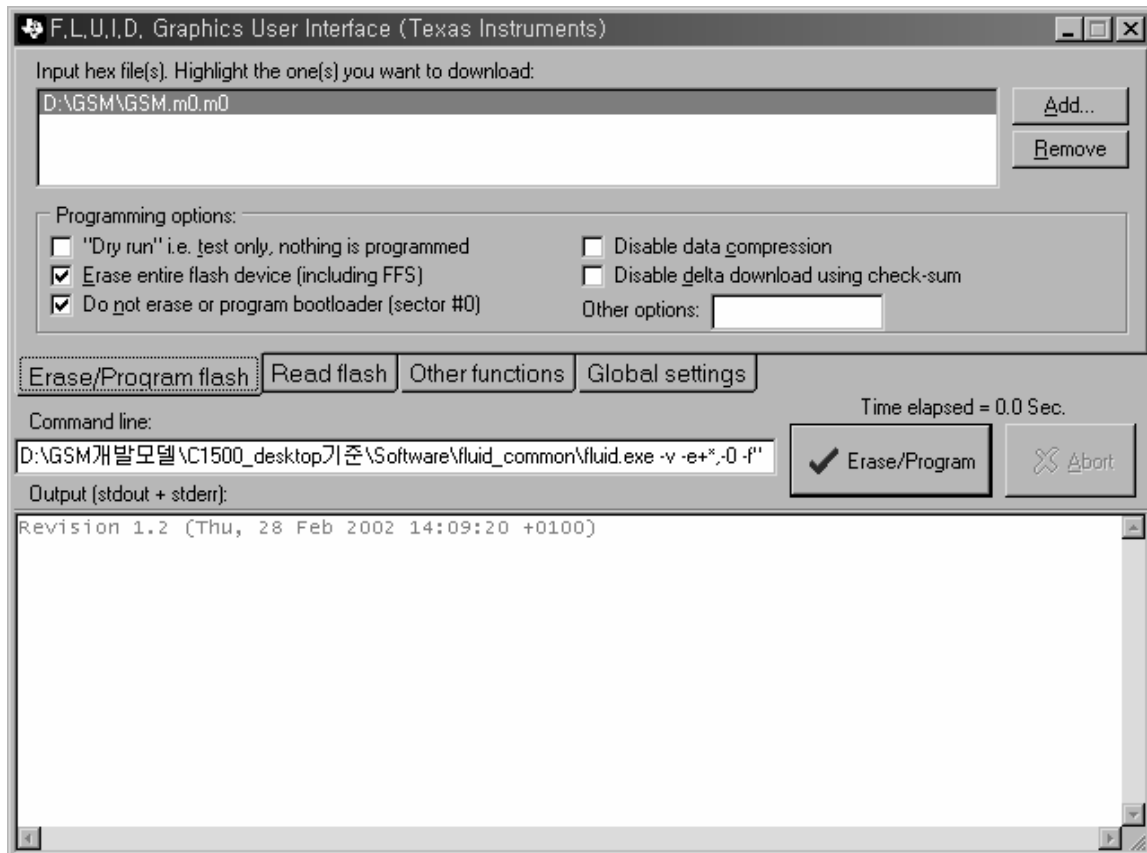
Preparation

- 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

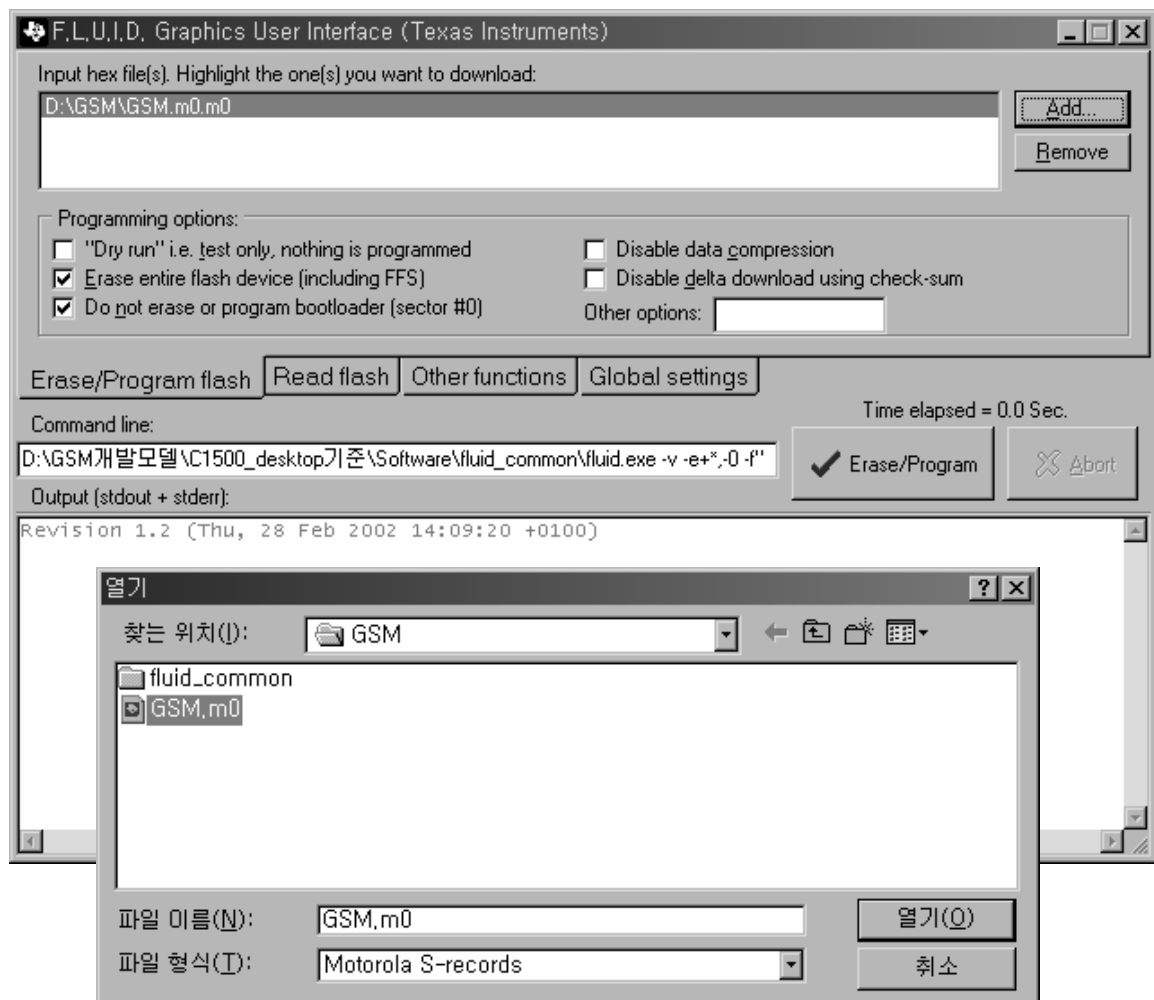
5.2 Download Procedure

1. Execute Fluid_GUI.exe and select "Erase/Program flash" menu.



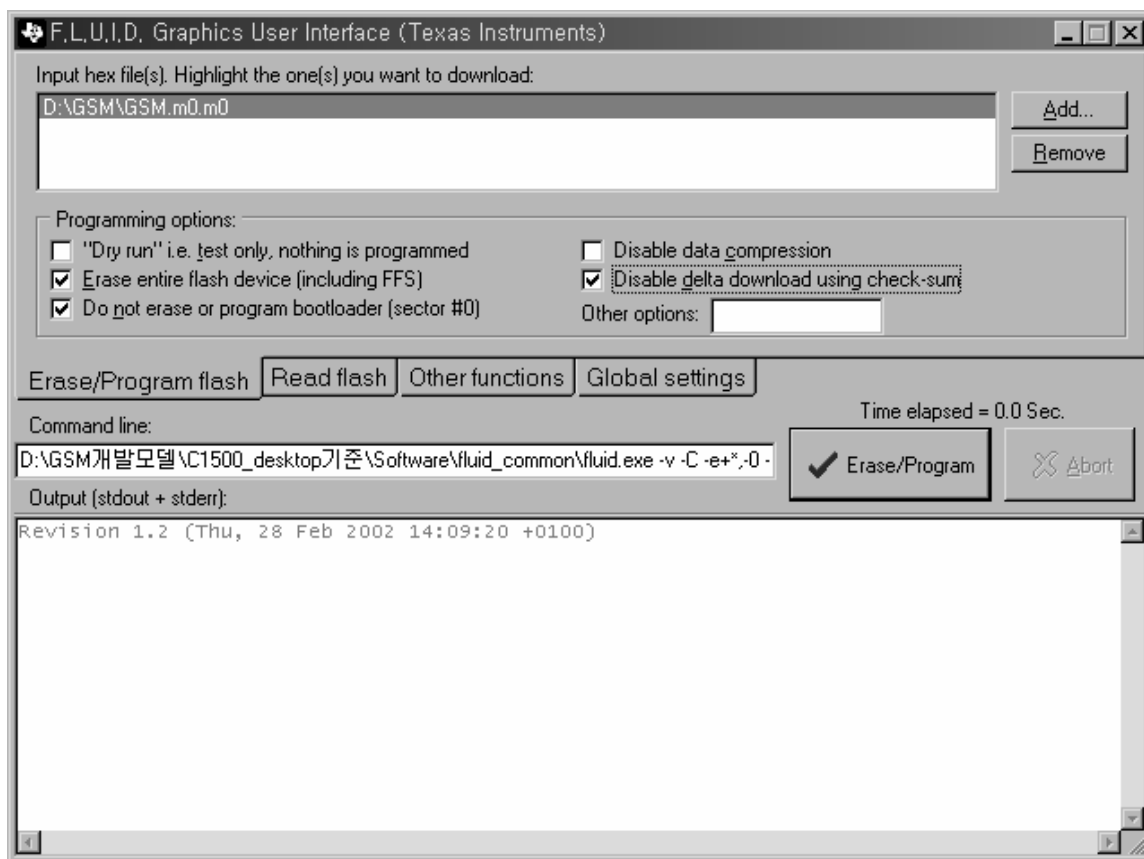
5. DOWNLOAD

2. Click the “Add” button. Then, choose m0 file which is going to download.



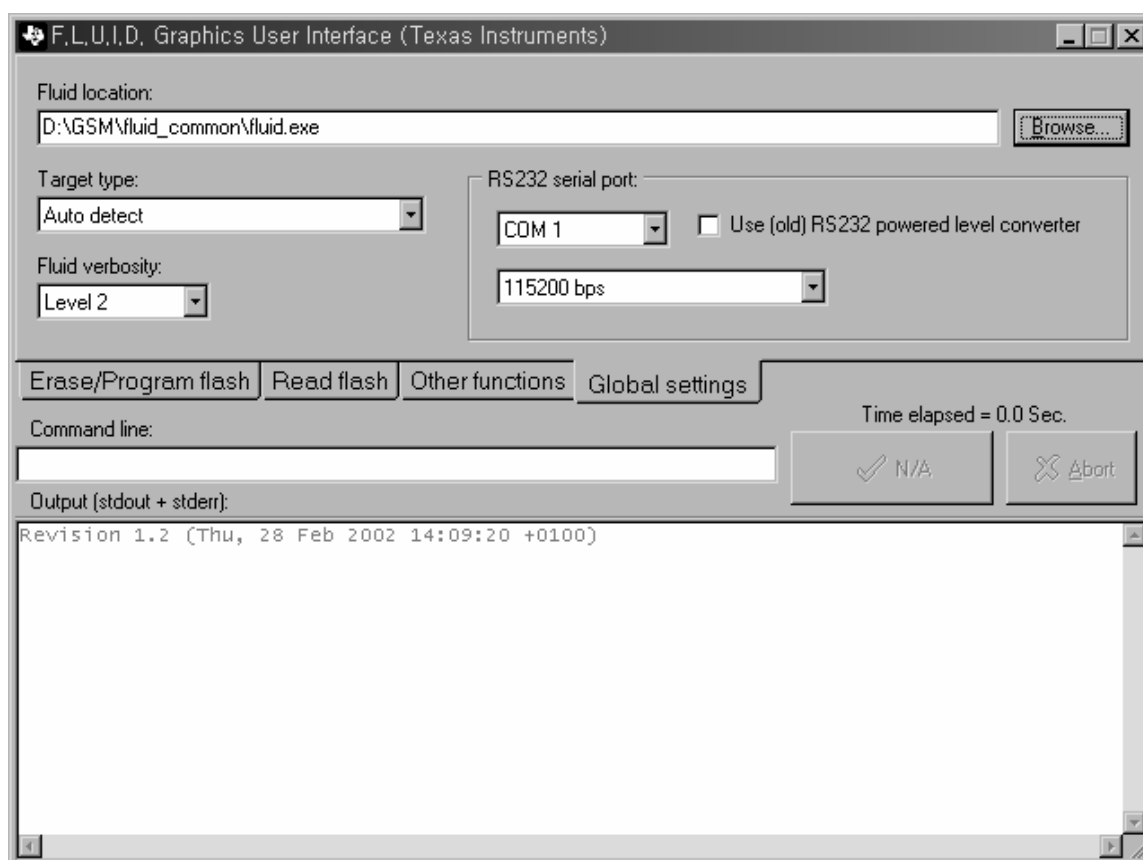
5. DOWNLOAD

3. You must choose three programming options in programming options box. One is to decide whether you erase entire flash. If m0 file which is going to download have the change of pcm structure for current target's m0 file, you must erase entire flash memory. The second programming option is to decide whether you erase bootloader. It is recommended not to erase bootloader. The third is to decide whether you take delta-download, or not. If you use delta-download, You can save download time through comparing m0 and flash block, and not downloading flash block same with m0 file.



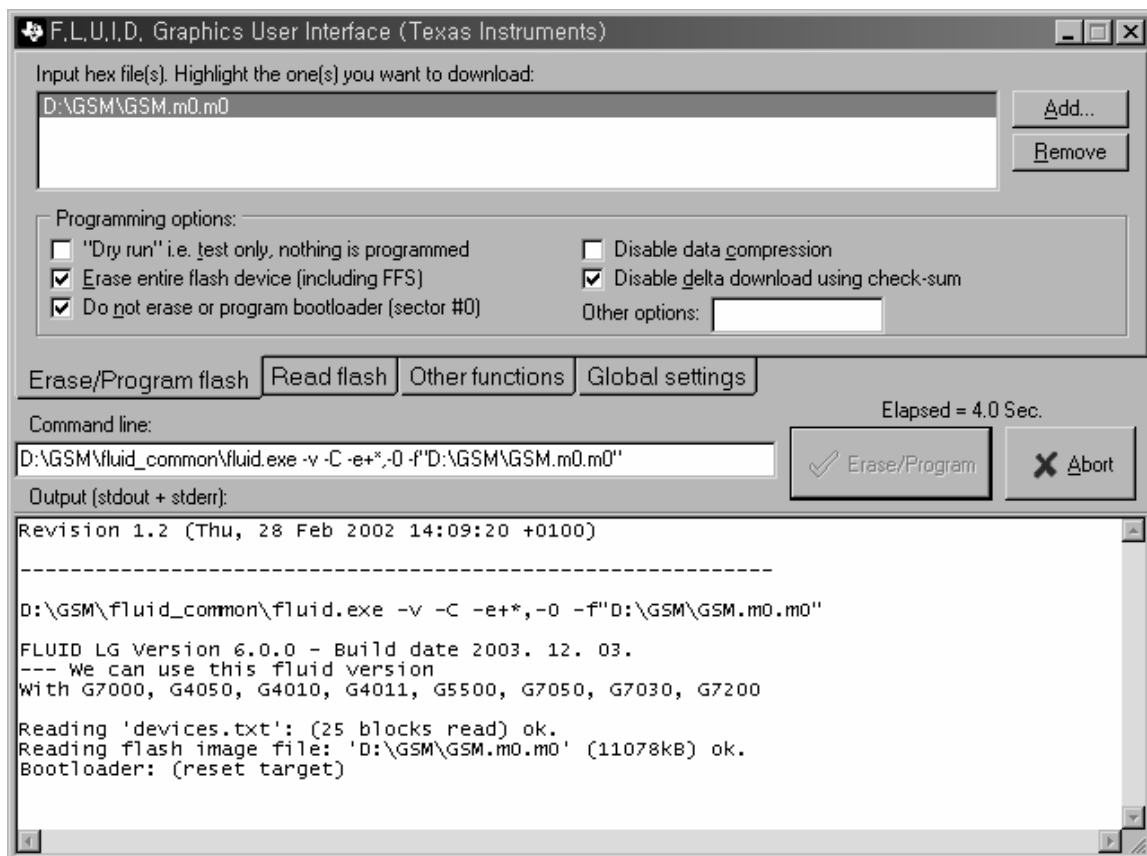
5. DOWNLOAD

4. Press “Global Settings” menu. Choose a correct serial port and set the configuration as below.



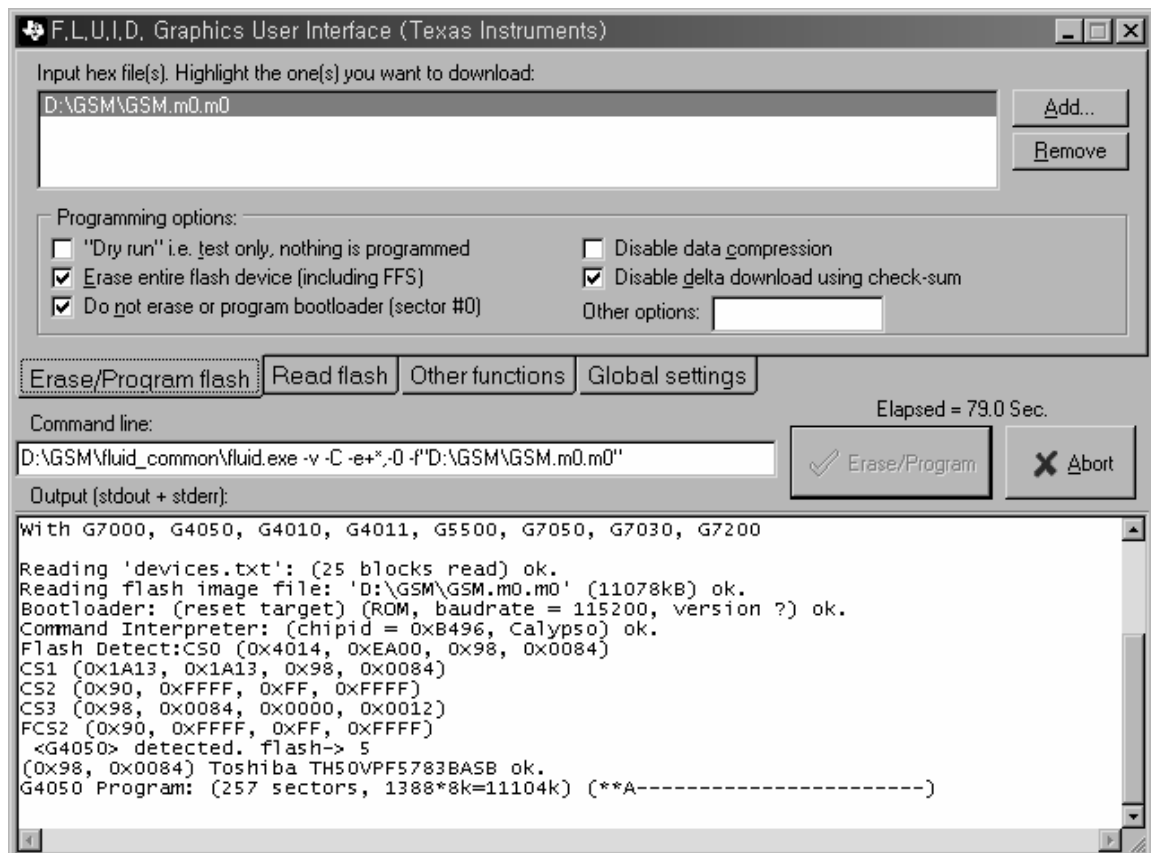
5. DOWNLOAD

5. After checking programming options, Click “Erase/Program” button. If you click “Erase/Program” button, you will be able to see that “(reset target)” is displayed in the “Output” window. And then if you push shortly the “Power key” of the mobile, downloading will be started.



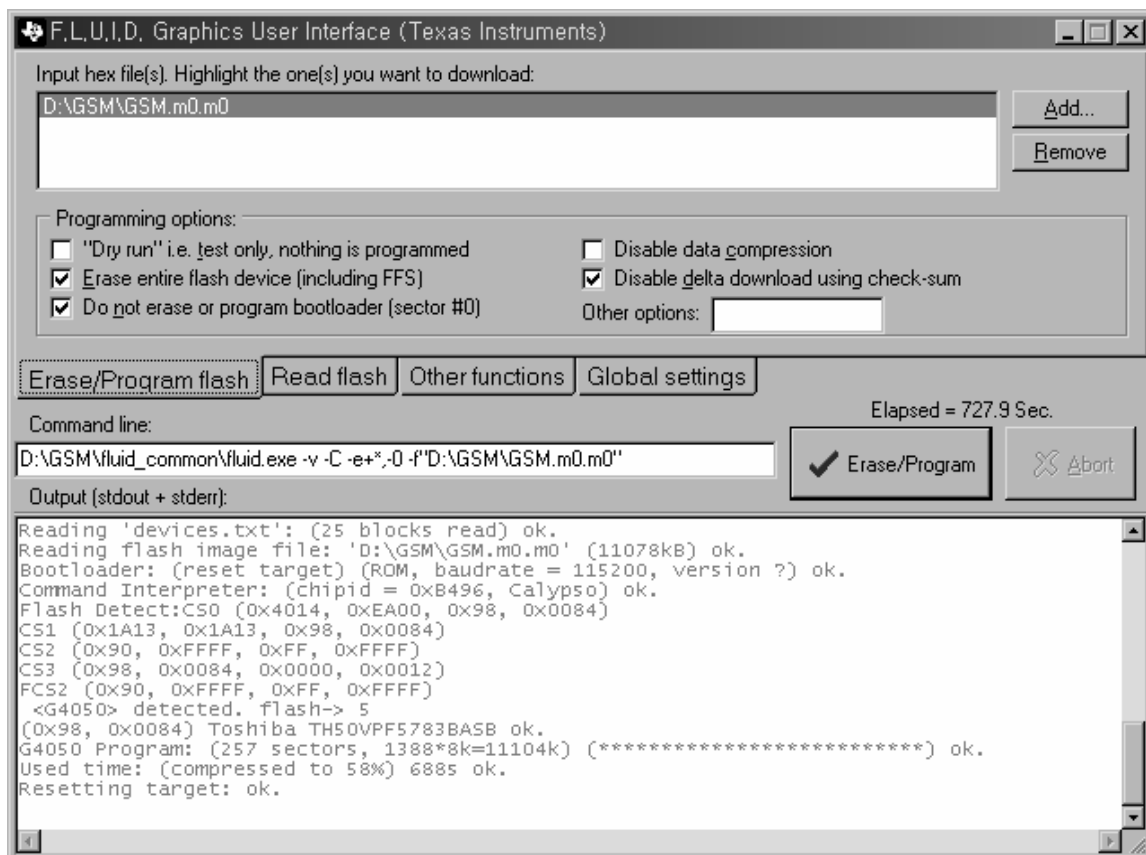
5. DOWNLOAD

6. Wait for downloading to be finished.



5. DOWNLOAD

7. If downloading is finished, we can switch on the mobile. When you switch on the mobile first time after downloading, you must not remove the battery until switch-on procedure is completed. If you remove the battery before switch-on procedure is completed, we will not be able to save user data in the flash memory of the mobile.



6. SERVICE AND CALIBRATION

6.1 Service S/W

6.1.1 Overview

This service S/W is used for Calibration and Standalone test.

6.1.2 Hardware and Software Environment

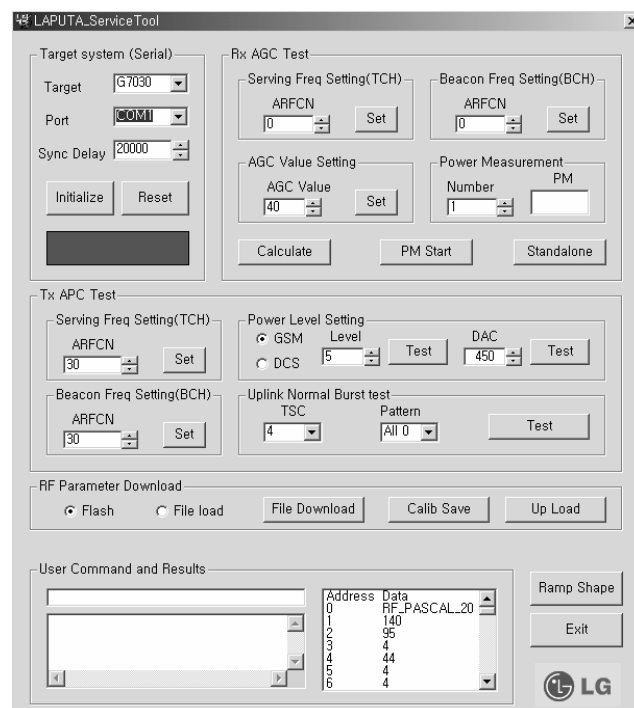
- More than 486 computer
- 16Mbyte RAM
- Remained more than 10Mbyte in Hard Disk Memory
- Under Microsoft window 98 or more than

6.1.3 Software Installation

Unzip the phones service software provided where slide you want there are some files extracted in that slide. Start Setup.exe in Service software setup slide. GS2USramp.dat, default transmit ramping table, and GS2US.epm, default calibration data, are located in window system slide so that these files are loaded automatically, if you execute LaputaService.exe.

6.1.4 Common Properties of Service Software

When you execute this program, you'll see the below user interface window titled LAPUTA_Service Tool in figure 7-1. The LAPUTA_Service Tool has five main frames.



6. SERVICE AND CALIBRATION

A. Target System Frame

This is for initializing the target phone. When you use this program to test L1100 phone, you have to initialize target at first. To initialize target phone, select target (L1100 is default) and COM port used at your computer and then click the Initialize button. If target initializing is ended successfully, the box in red below the initialize button will turn into green.

B. RX AGC Test Frame

At this part, you can control receiver path of target phone.

Serving Freq. Setting (TCH)

You can set TCH of phone. The number means ARFCN of Traffic channel. You can change the value by clicking arrow button by one step or just entering the number directly.

Beacon Freq. Setting (BCH)

You can set BCH of phone. The number means ARFCN of base station broadcasting channel.

AGC Value Setting

You can set AGC gain of phone. The number means gain of AGC amplifier in Rx path.

Power Measurement

The number means channel index according to pre-defined ARFCN. There are 12 pre-defined ARFCNs within Rx band. 4 ARFCNs are for GSM, DCS and others for PCS. Clicking arrow button to change number, you can see TCH and BCH ARFCN changed automatically. PM window displays the power level measured in baseband chip. PM value is useful to calculate the received absolute power. The unit of PM is dBd.

PM Start

You can measure Rx power that target received from test equipment. When you click this button the result of power measurement displayed at PM blank in Power Measurement frame.

You can measure PM for all 12-channel indexes by changing Number and clicking PM Start.

Calculate

You have to do this work after measuring PM for all 12-channel indexes. When you click this button, service software calculate the calibration data from measured 12 PM data.

Standalone

This button makes target operate in Rx mode continuously. Target will be operated under the condition that you set. During continuous receiving mode, label of Standalone button is changed to Stop. If you want stop receiving mode operating, click this button one more.

6. SERVICE AND CALIBRATION

C. TX APC Test Frame

At this part, you can control transmit path of target phone.

Serving Freq. Setting (TCH)

You can set TCH of phone. The number means ARFCN of Traffic channel.

Beacon Freq. Setting (BCH)

You can set BCH of phone. The number means ARFCN of base station broadcasting channel.

Power Level Setting

First, you have to choose operating mode (GSM, DCS, PCS) according to TCH and BCH frequency that you selected before. Then select the Level and adjust the DAC value. Level means GSM/DCS/PCS output power level. Usable range is 5 to 19 for GSM, 0 to 15 for DCS/PCS. DAC value is a factor to determine output power. Its variable range is 0 to 1023.

Uplink Normal Burst test

You can also control the traffic slot number by using by changing TCS value. Because GSM has 8-time slot, TCS value varies 0 to 7. Pattern is to select data format that is transmitted. You can send all data 0, or 1 or repeating of 1010. But it is good to you to using the default value because data format doesn't affect to RF characteristics.

Test

Transmitting is started when you click this button. During Transmitting, label of Test button is changed to Stop. If you want stop transmitting, click this button one more.

D. RF Parameter Download Frame

Saving epm file into Flash

When you have a epm file, contains calibrated data, and you want to download into target Flash, check Flash and click File Download button. Then you can see RF parameters Save window.

Select epm file you want to save into Flash then click Open. During saving file into Flash, The statement bar indicating download process is displayed under the RF Parameter Download frame.

As successfully ending download, information box will be appeared. Click Ok.

Saving Cal. Data to Flash

After Rx or Tx calibration, you can save the calibration results into Flash and epm file. Check Flash and click Calib Save button. Then you can see RF parameters Save window. Write the file name and click Save button.

6. SERVICE AND CALIBRATION

E. User Command and Results Frame

Whenever you click button or make some event in service software, every ordered event is displayed in this frame. You can also see calibration results here.

F. Ramp shape button

This button is for burst shape table. But it is deactivated in service software.

6.2 Calibration

6.2.1 Overview

The calibration values of the phone reside on the Flash. The contents of the Flash can be read by the service software and saved as a file. This is advisable when there is need to retain that information, e.g. in view of replacement of the circuit. The program also enables writing the default parameters on the Flash, in which case all calibration steps should be carried out. The service software can't control the equipment, so only manual calibration process is possible.

6.2.2 Equipment List

Table 6-1. Calibration Equipment List

Equipment for Calibration	Type / Model	Brand
Wireless Communication Test Set	HP-8960,HP8922,CMU200, any other call equipment	
RS-232 Cable and Test JIG		
RF Cable		
Power Supply		
Service S/W	Laputa	
PC (For Software Installation)	Pentium % class above 300MHz	

6.2.3 Equipment Setup

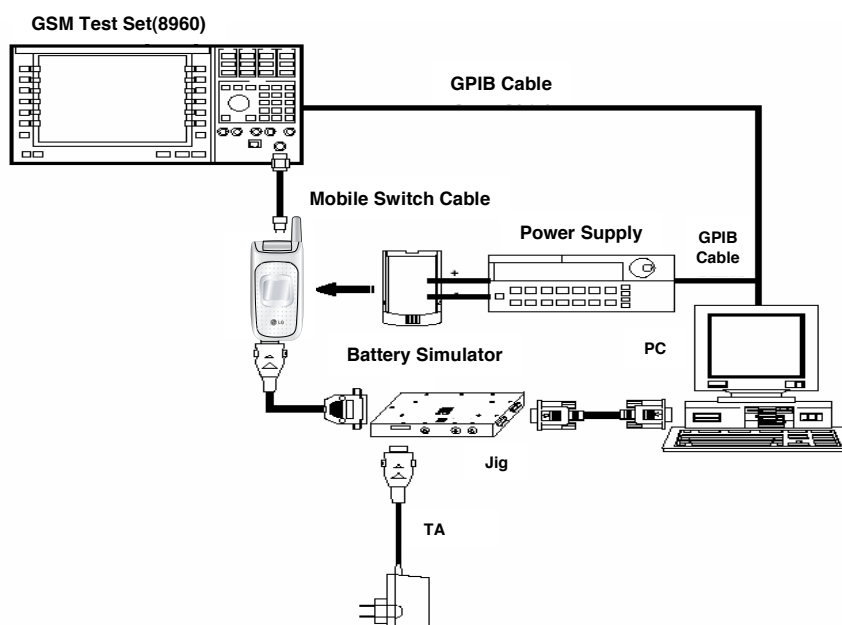


Figure 6-1 Calibration Equipment List

6.2.4 Calibration steps

A. RX Calibration

In order for the RSSI measurements to be within the GSM specifications, some calibration is necessary. Also, due to AGC implementation, some AGC specific constants need calibration. In total, three calibrations are required per receive band, AGC calibration, channel compensation and temperature compensation. Of these, temperature compensation is not needed in replacement of the circuit. In AGC calibration the reference power fed into the phone via permanent antenna connector is -74dBm. In channel compensation, the channel numbers in Rx band are;

GSM850 band : 128, 139, 150, 170, 190, 202, 213, 232 and 251

PCS band : 512, 562, 661, 711, 761, and 885.

Procedure

- Initialize phone by clicking Initialize button.
- Set the GSM test equipment CW mode and BCH and TCH of GSM test equipment '0', same with phone.
- Set the power of GSM test equipment '-74dBm'.
- Click the PM Start button, then the value, received power by phone, is displayed in PM measurement window at service software.
- Change the BCH and TCH of phone by clicking the Number button and set the channel (BCH & TCH) of equipment to be same.

6. SERVICE AND CALIBRATION

- f) Click the PM Start button.
- g) Repeat above procedure until the displayed number in Power Measurement window is 12.
- h) Click the Calculate button, then the service software calculate the channel compensation parameters.
- i) Saving updated calibration data into phone by clicking Calib Saving button.

NOTE

If the calibration does not done for all channels, 9 channels for GSM850 and 6 channels for PCS1900, the service software reports, "Please execute after measuring the PM".

B. TX Calibration

In order for the Tx power to be within the GSM specifications for each Tx level, some calibration is necessary. In total, four calibrations are required per transmit band, power calibration, channel compensation, temperature compensation and low voltage compensation. Of these, temperature compensation and low voltage compensation are not needed in replacement of the circuit and channel compensation is not needed because the transmit power is in GSM specification with enough margin In power compensation, the channel numbers used in Tx band are;

GSM850 band : 190

PCS band : 661.

And the target powers in dBm for each power level are;

Table 6-2 TX Target Powers

Power Level	GSM [dBm]	DCS [dBm]	PCS [dBm]
0	-	29	29
1	-	28	28
2	-	26	26
3	-	24	24
4	-	22	22
5	32	20	20
6	31	18	18
7	29	16	16
8	27	14	14
9	25	12	12
10	23	10	10
11	21	8	8
12	19	6	6
13	17	4	4
14	15	2	2
15	13	0	0
16	11	-	-
17	9	-	-
18	8	-	-
19	7	-	-

6. SERVICE AND CALIBRATION

Procedure

- Initialize phone by clicking Initialize button.
- Set the BCH and TCH of the phone 190 for GSM850 and 661 for PCS1900. Of cause you have to match test equipment's BCH and TCH ARFCN with this value. For each power level, adjust the DAC value to get target power and click Test button. Then you can see the output power displayed on test equipment.
- Saving updated calibration data into phone by clicking Calib Saving button.

6.2.5 Test JIG Operation

JIG Power

Equipment	Description
Power Supply	Usually 4.0V
DC Adaptor	9.5V, 500mA

JIG DIP Switch

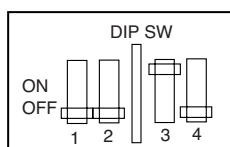
Switch Number	Name	Description
Switch 1	ADI_REMOTE	In On state phone is awaked. Not used - OFF state
Switch 2	TI_REMOTE	In On state phone is awaked.
Switch 3	VBAT	Power is provided for phone from Power supply
Switch 4	PS	Power is provided for phone from DC adaptor

JIG LED

LED Number	Name	Power is provided for test JIG
LED 1	POWER	Indicate charging state of the phone battery with travel charger
LED 2	TA	Indicate data transfer state through the UART IrDA
LED 3	MON STATUS	Power is provided for phone from Power supply
LED 4	UART STATUS	Power is provided for phone from DC adaptor

Procedure

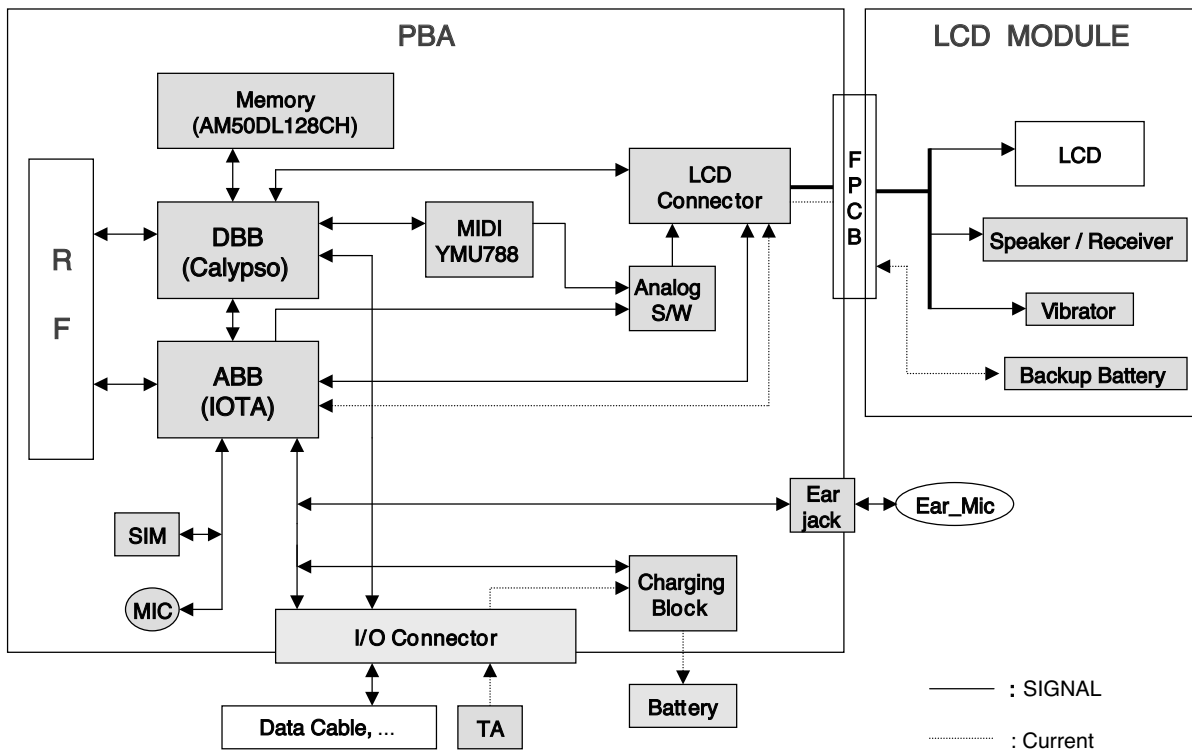
- Connect the RS232 serial cable between COM port of notebook and MON port of test JIG in general
- Set the power supply 4.0V
- set the 3rd of DIP SW ON state.
- set the 4th of DIP SW ON state.
- Press the phone power key. If the remote power on is used, switch the 1st of DIP SWITCH ON.



7. BLOCK DIAGRAM

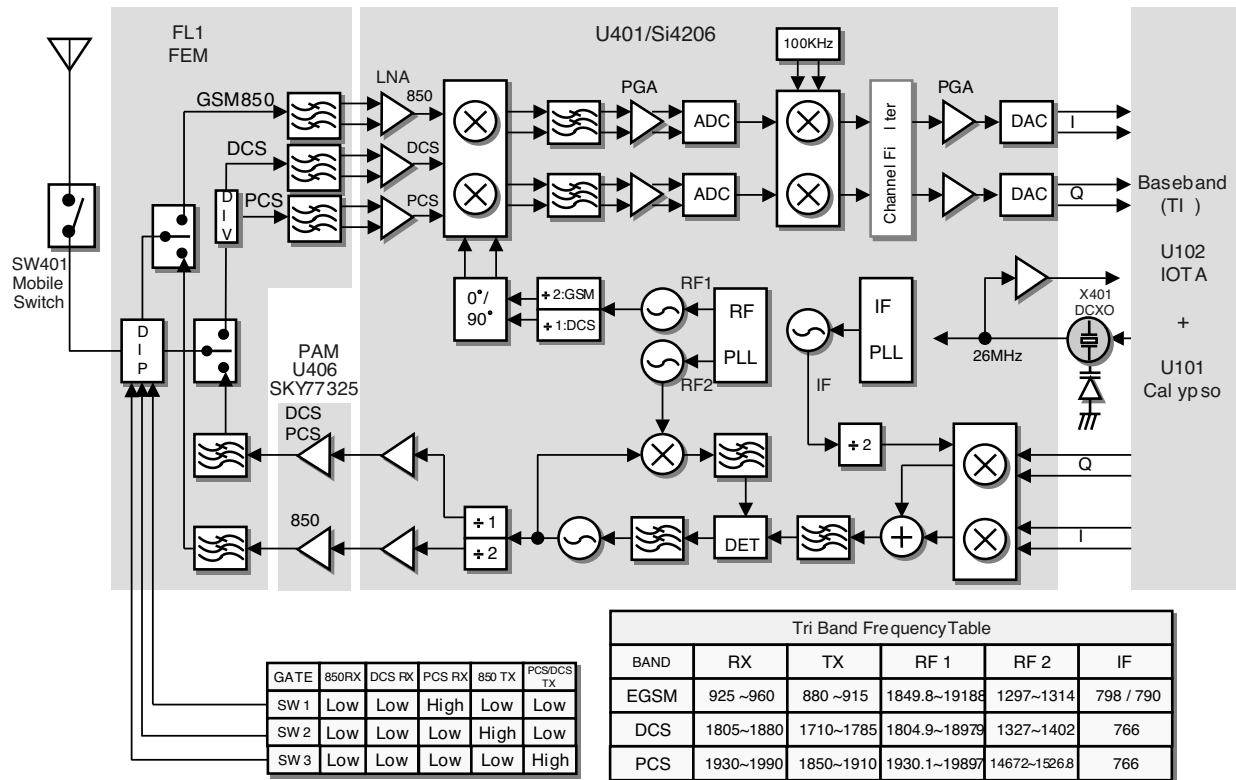
7. BLOCK DIAGRAM

The Block Diagram of the Baseband Part



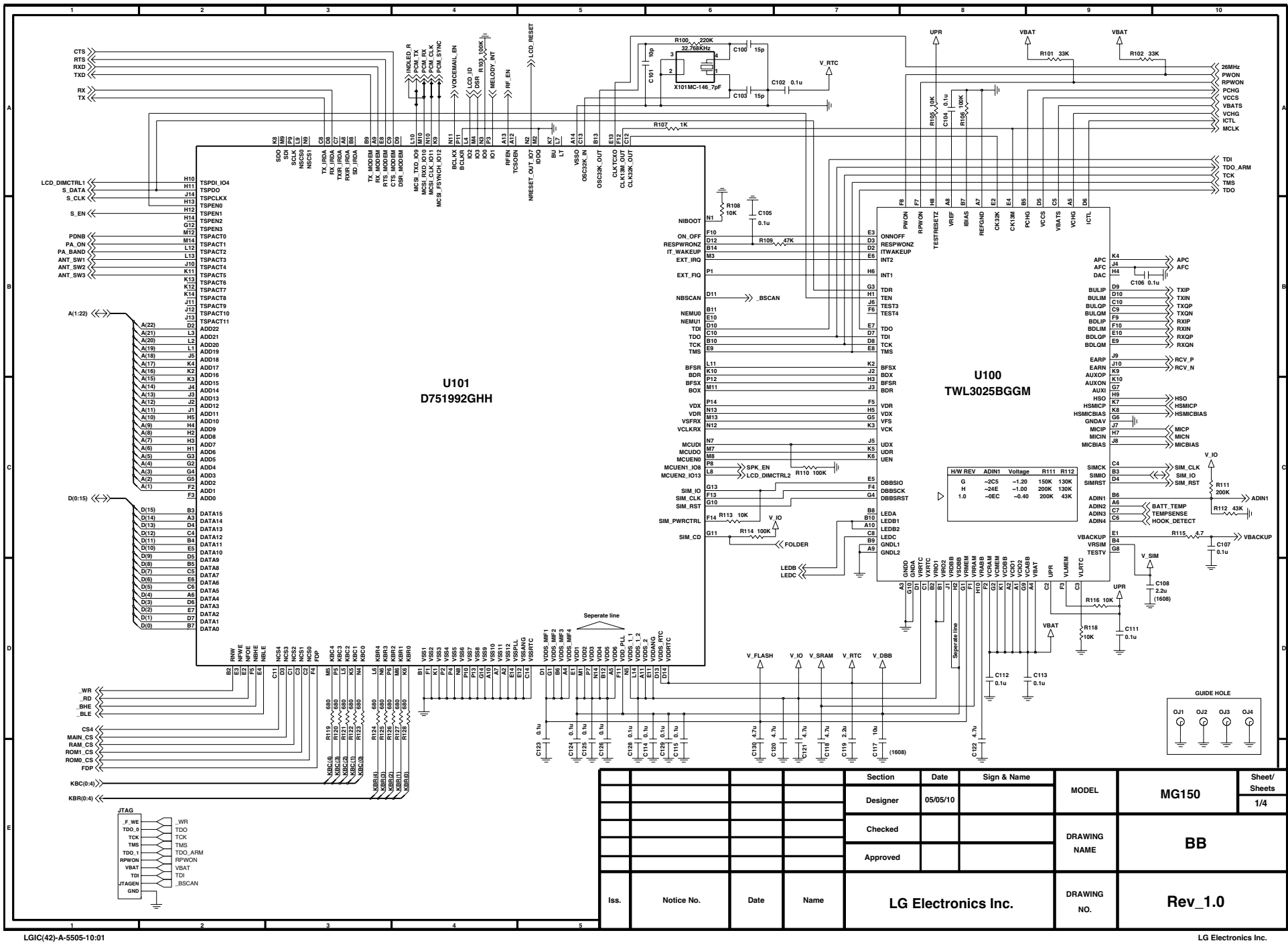
7. BLOCK DIAGRAM

The Block Diagram of the RF Part

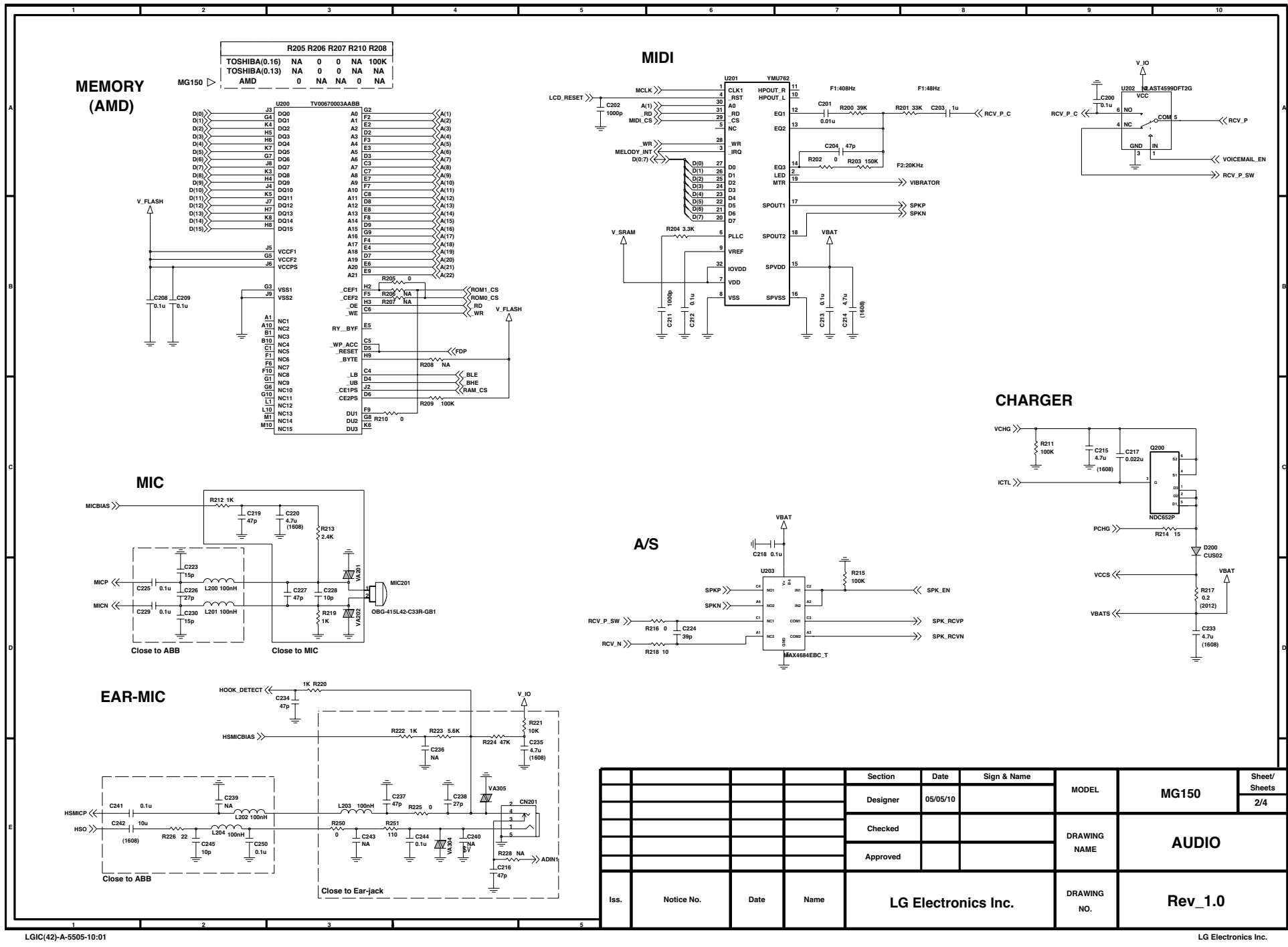




8. CIRCUIT DIAGRAM



8. CIRCUIT DIAGRAM

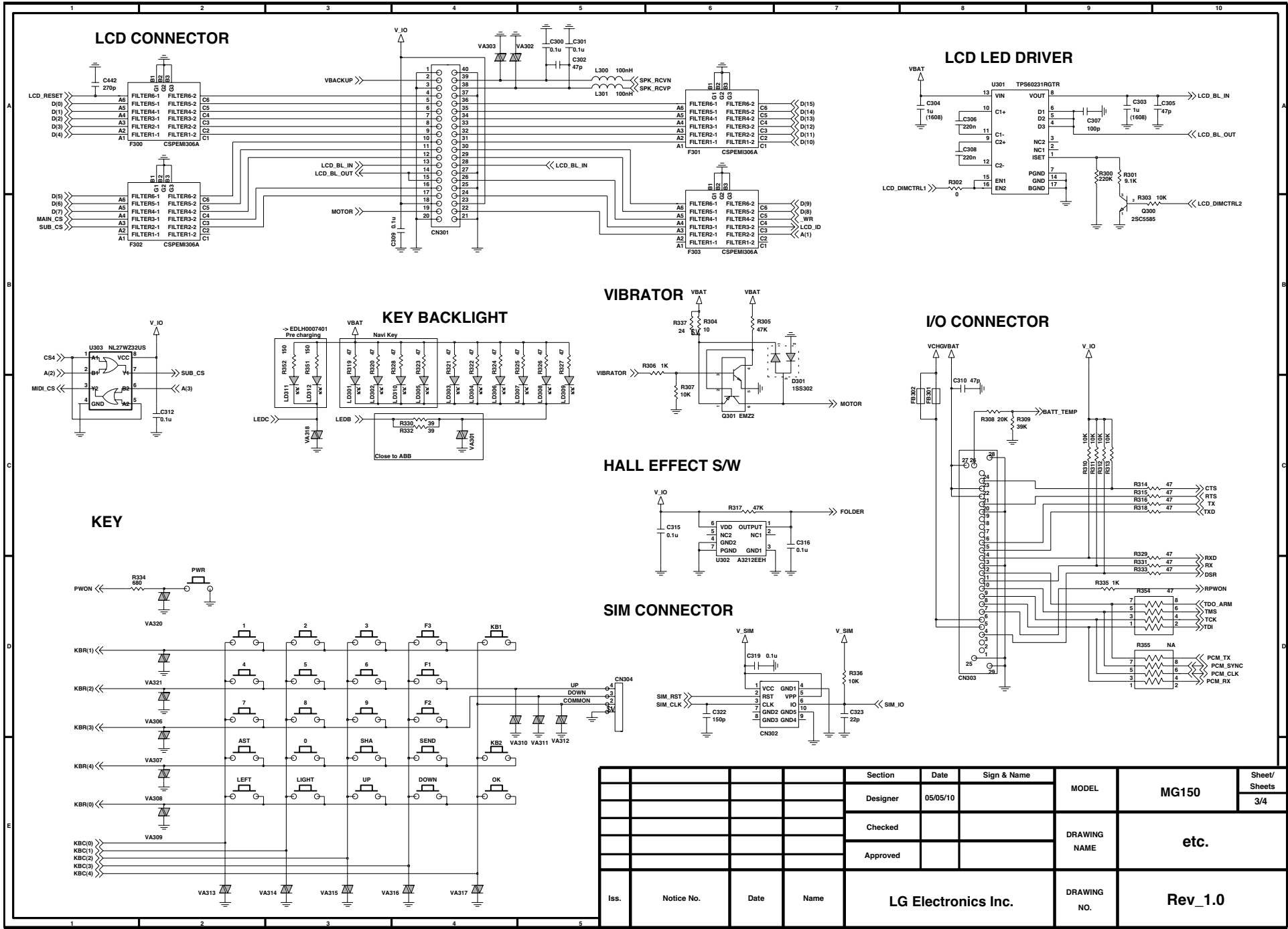


Section				Date	Sign & Name	MODEL	MG150	Sheet/ Sheets
Designer				05/05/10				2/4
Checked						DRAWING NAME	AUDIO	
Approved								
Iss.	Notice No.	Date	Name	LG Electronics Inc.		DRAWING NO.	Rev_1.0	

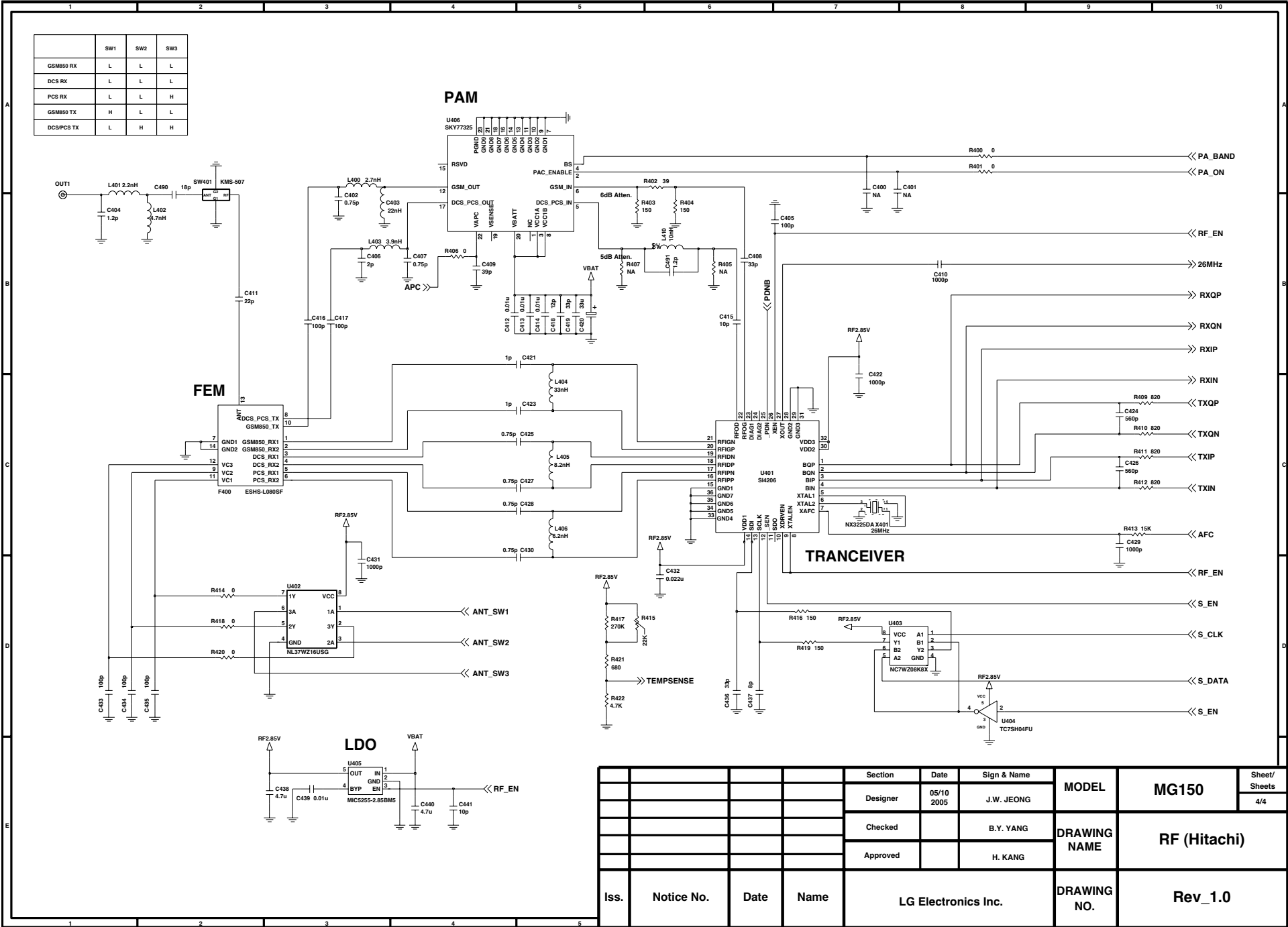
LGIC(42)-A-5505-10-01

LG Electronics Inc.

8. CIRCUIT DIAGRAM



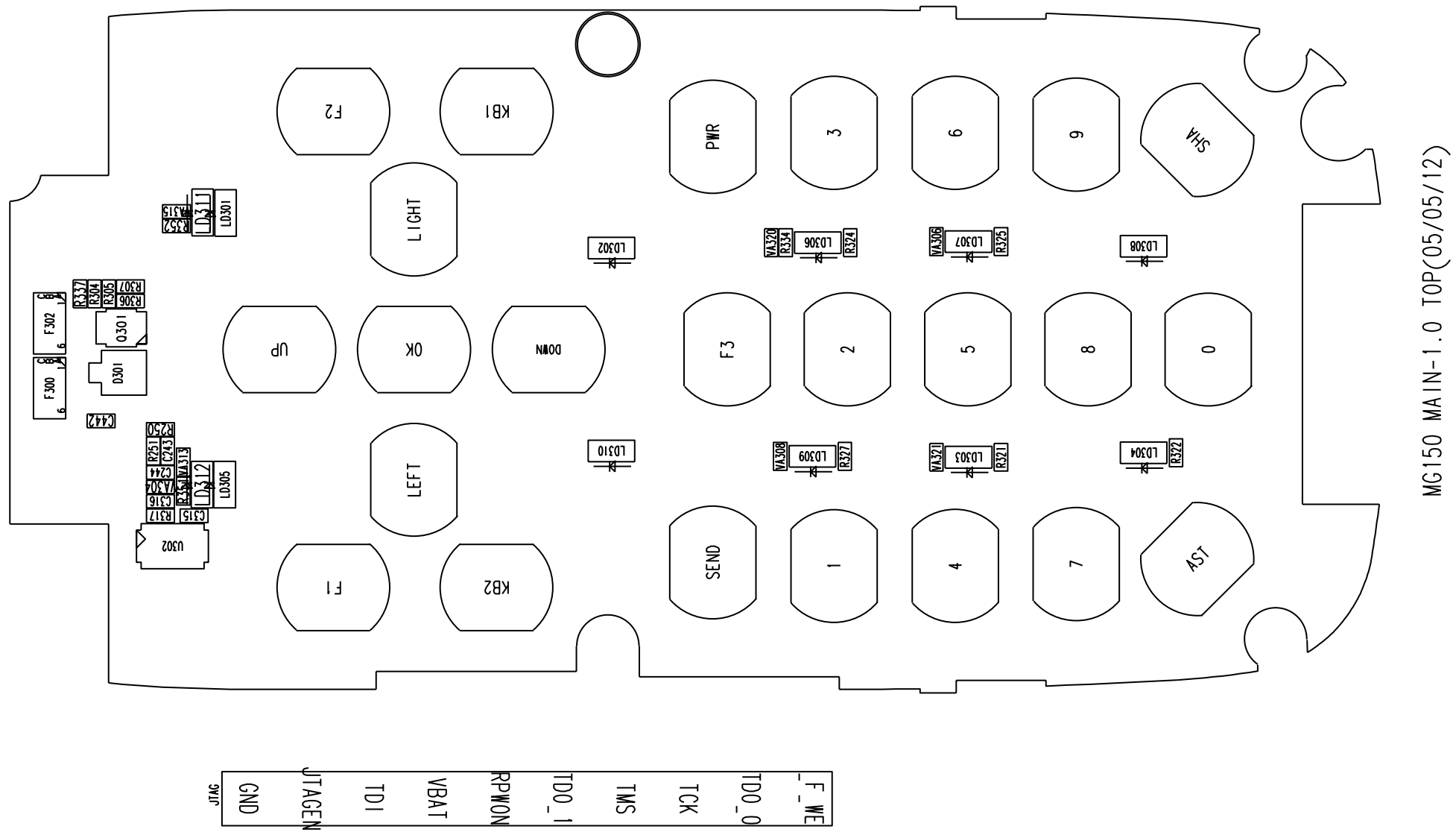
8. CIRCUIT DIAGRAM



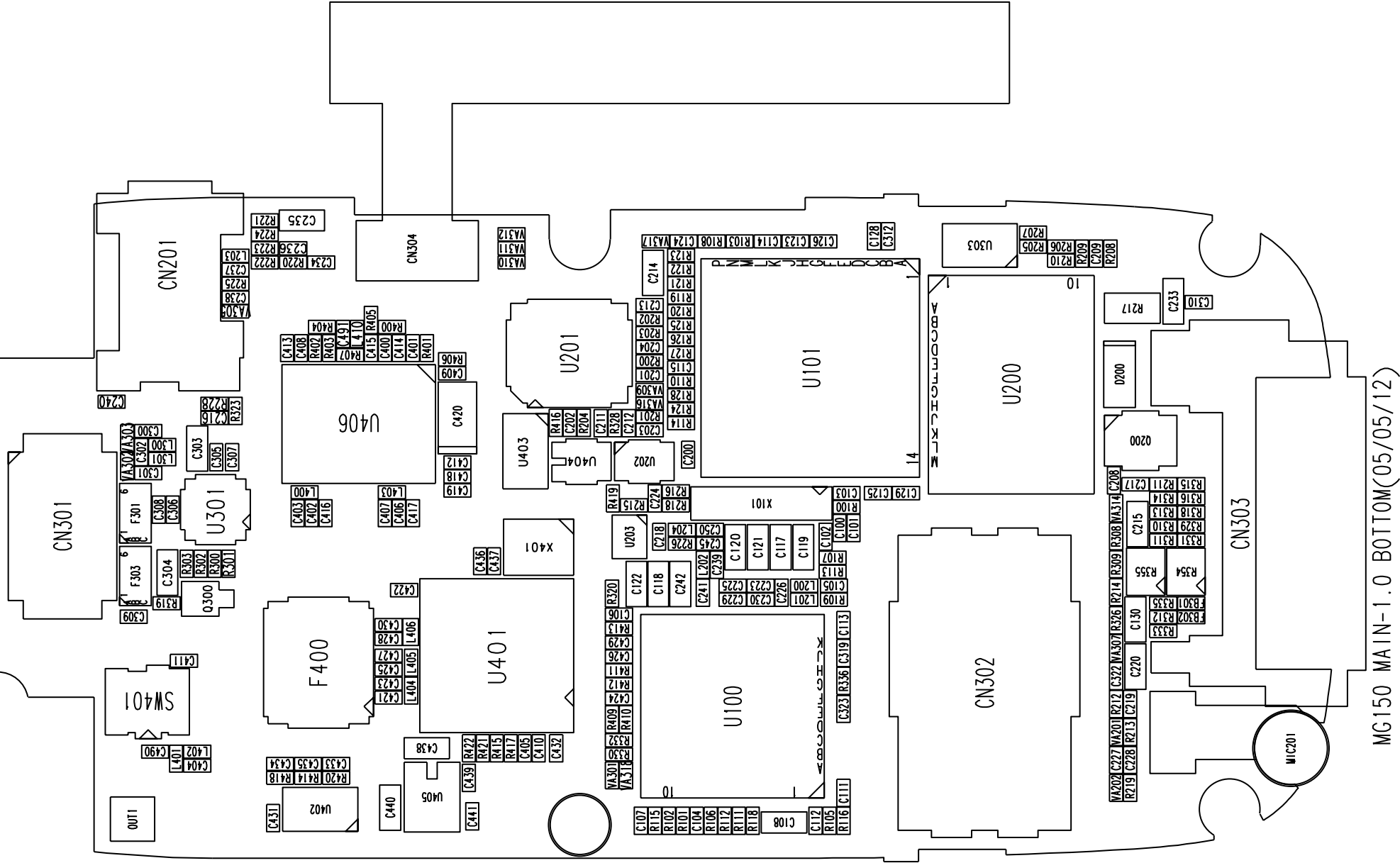
LGIC(42)-A-5505-10-01

LG Electronics Inc.

9. PCB LAYOUT



9. PCB LAYOUT



10. 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 ON/OFF
- [2-1-2] INDICATOR LED ON/OFF

[2-2] LCD

- [2-2-1] LCD AUTO
- [2-2-2] LCD COLOR
- [2-2-3] LCD CONTRAST
- [2-2-4] MAIN LCD RGB

[2-3] CAMERA

- [2-3-1] PREVIEW

[2-4] FONT

- [2-4-1] FONT 810
- [2-4-2] FONT 810 I
- [2-4-3] FONT 810B
- [2-4-4] FONT 814
- [2-4-5] FONT 814I
- [2-4-6] FONT 814B
- [2-4-7] FONT 1018
- [2-4-8] FONT 1019
- [2-4-9] IMFONT

[2-5] ALERT

- [2-5-1] VIBRATOR
- [2-5-2] RING
- [2-5-3] EFFECT SOUND
- [2-5-4] IMELODY TEST
- [2-5-5] EMS SOUND
- [2-5-6] VOLUME

[2-6] SERIAL PORT

- [2-6-1] MODEM

[2-7] BATTERY INFO1

[2-8] AUDIO GAIN

- [2-8-1] RECEIVER
- [2-8-2] EAR MIC
- [2-8-3] LOUD SPEAKER
- [2-8-4] HANDSFREE
- [2-8-5] DEFAULT VALUE
- [2-8-6] DAI TEST
- [2-8-7] LOOPBACK TEST

[3] S/W VERS

[4] ENG MODE

[4-1] CELL ENVIRON

[4-2] LOCATION INFO

[4-3] LAYER1 INFO

[4-4] WORLD PHONE

[5] CALL TIMER

[6] FACTORY DEFAULT

11. STANDALONE TEST

11. STANDALONE TEST

11.1 Setting Method

11.1.1 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

11.1.2 Tx Test

1. Selecting Channel

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

2. Selecting APC

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

11.1.3 Rx Test

1. Selecting Channel

- Select one of GSM 850, DCS, PCS Band and input appropriate channel.

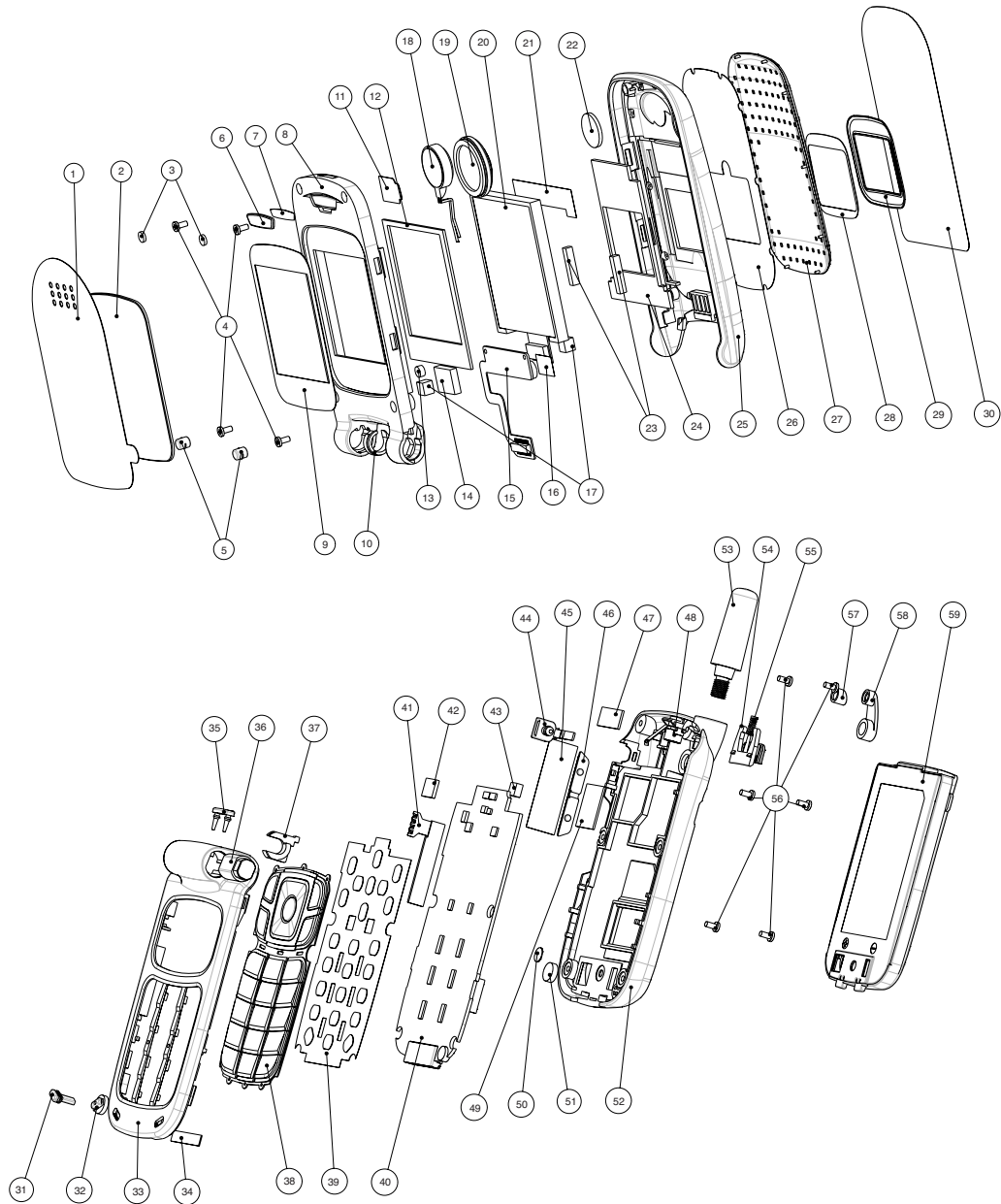
2. Automatic Gain Control and Instrument Power level

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.

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.1 EXPLODED VIEW



	PART NAME	PART No.	Q'ty
1	TAPE, PROTECTION	MTAB0044101	1
2	WINDOW, LCD	MWAC0052601	1
3	CAP. SCREW	MCCH0051603	2
4	SCREW, MACHINE	GMZZ0015101	4
5	CAP. SCREW	MCCH0051703	2
6	DECO, SPEAKER	MDAN0005201	1
7	TAPE, DECO	MTAA0081101	1
8	COVER, FOLDER(LOWER)	MCJH0024503	1
9	TAPE, WINDOW	MTAD0035601	1
10	DECO, HINGE	MDAJ0007701	1
11	FILTER, SPEAKER	MFBC0015001	1
12	PAD, LCD	MPBG0032901	1
13	MAGNET, SWITCH	MMAA0000601	1
14	GASKET, SHIELD FOAM	MGAD00082801	1
15	PCB ASSY, FLEXIBLE	SACY0035501	1
16	INSULATOR	MIDZ0041401	1
17	GASKET, SHIELD FOAM	MGAD00082901	2
18	VIBRATOR, MOTOR	SJMY0002802	1
19	SPEAKER	SUSY0006202	1
20	LCD	SVLY0026601	1
21	INSULATOR	MIDZ0064601	1
22	PAD, SPEAKER	MPBN0018701	1
23	GASKET, SHIELD FOAM	MGAD0049904	2
24	PAD, LCD(SUB)	MPBQ0022201	1
25	COVER, FOLDER(UPPER)	MCJJ0031203	1
26	TAPE, WINDOW(SUB)	MTAE0022401	1
27	WINDOW ASSY, LCD	AWAB0015103	1
28	TAPE, DECO	MTAA0080501	1
29	DECO, WINDOW(SUB)	MDAM0006601	1
30	TAPE,PROTECTION	MTAB0068401	1
31	BUMPER	MBHY0008401	1
32	BUMPER	MBHY0008501	1
33	COVER, FRONT	MCJK0036203	1
34	GASKET, SHIELD FOAM	MGAD00082601	1
35	STOPPER	MSGY0010303	1
36	HINGE, FOLDER	MHFD0007801	1
37	STOPPER, HINGE	MSGB0010801	1
38	BUTTON, DIAL	MBJA0017003	1
39	DOME ASSY, METAL	ADCA0033001	1
40	PCB ASSY, MAIN	SAFY0136401	1
41	DOME ASSY, METAL	ADCA0033101	1
42	GASKET, SHIELD FOAM	MGAD00089901	1
43	GASKET, SHIELD FOAM	MGAD00086901	1
44	CAP. EARPHONE JACK	MCCC0024303	1
45	INSULATOR	MIDZ0062301	1
46	BUTTON, SIDE	MBJL0019001	1
47	GASKET, SHIELD FOAM	MGAD00082501	1
48	CONTACT, ANTENNA	MCIA0013801	1
49	PAD	MPBZ00084201	1
50	LABEL, A/S	MLAB0001102	1
51	PAD	MPBZ00086501	1
52	COVER, REAR	MCJN0032403	1
53	ANTENNA, GSM, FIXED	SNGF0006602	1
54	LOCKER, BATTERY	MLEA0023503	1
55	SPRING, LOCKER	MSDC0001301	1
56	SCREW, MACHINE	GMZZ0015101	6
57	CAP. SCREW	MCCH0051503	1
58	CAP. MOBILE SWITCH	MCCF0024603	1
59	BATTERY PACK, LI-ION	SBPL0077504	1

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.2 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)	TGFF0075801		White Silver	
2	AAAY00	ADDITION	AAAY0109501		White Silver	
2	APEY00	PHONE	APEY0225101		White Silver	
3	ACGG00	COVER ASSY,FOLDER	ACGG0054603	MG150 TCLWV.	White Silver	
4	ACGH00	COVER ASSY, FOLDER(LOWER)	ACGH0030403	MG150 TCLWV.	Silver	
5	MCJH00	COVER,FOLDER(LOWER)	MCJH0024503	MG150 TCLWV.	Silver	8
5	MDAJ00	DECO,HINGE	MDAJ0007701	C1500. MIM(LEFT)	Silver	10
5	MDAN00	DECO,SPEAKER	MDAN0005201	C1500.	Silver	6
5	MFBC00	FILTER,SPEAKER	MFBC0015001	C1500	Black	11
5	MGAD00	GASKET,SHIELD FORM	MGAD0082801	C1500	Gold	14
5	MGAD01	GASKET,SHIELD FORM	MGAD0082901	C1500. Gasket for ground between fpcb and lower.	Gold	17
5	MMAA00	MAGNET,SWITCH	MMAA0000601	LG-G510,511,512 common use, DIA : 3.0mm+1.5t	Silver	13
5	MPBG00	PAD,LCD	MPBG0032901	C1500	Black	12
5	MTAA00	TAPE,DECO	MTAA0081101	C1500		7
5	MTAD00	TAPE,WINDOW	MTAD0035601	C1500		9
4	ACGJ00	COVER ASSY, FOLDER(UPPER)	ACGJ0042003	MG150 TCLWV.	White	
5	MCJJ00	COVER,FOLDER(UPPER)	MCJJ0031203	MG150 TCLWV.	White	25
5	MGAD00	GASKET,SHIELD FORM	MGAD0049904	C1500 TCLSV 10.5 x 2 x 2.0t	Gold	23
5	MICA00	INSERT,FRONT	MICA0001201	LG-G510,511,512 common use, DIA = 1.7mm+2.3t		
5	MPBN00	PAD,SPEAKER	MPBN0018701	C1500	Black	22
5	MPBQ00	PAD,LCD(SUB)	MPBQ0022201	C1500	Black	24
5	MTAE00	TAPE,WINDOW(SUB)	MTAE0022401	C1500		26
4	ACGK00	COVER ASSY,FRONT	ACGK0047403	MG150 TCLWV.	Silver	
5	MBHY00	BUMPER	MBHY0008401	C1300 CGRSV 4.4 X 1.9	Silver	31
5	MBHY01	BUMPER	MBHY0008501	C1300 CGRSV 4.4 X 1.9, 5.2 Pl for MIKE	Silver	32
5	MCJK00	COVER,FRONT	MCJK0036203	MG150 TCLWV.	Silver	33
5	MGAD00	GASKET,SHIELD FORM	MGAD0082601	C1500. 3X16.5X0.3t	Gold	34
5	MICA00	INSERT,FRONT	MICA0001201	LG-G510,511,512 common use, DIA = 1.7mm+2.3t		
5	MSGB00	STOPPER,HINGE	MSGB0010801	Hinge Stopper.	Silver	37
5	MSGY00	STOPPER	MSGY0010303	MG150 TCLWV.	Silver	35
4	ADBY00	DECO ASSY	ADBY0007501	C1500. Sub Window Deco Assy.	Silver	
5	MDAM00	DECO,WINDOW(SUB)	MDAM0006601	C1500	Silver	29

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
5	MTAA00	TAPE,DECO	MTAA0080501	C1500		28
4	AWAB	WINDOW ASSY,LCD	AWAB0015103	MG150 TCLWV.	White	27
5	BFAA00	FILM,INMOLD	BFAA0032301	MG510 TCLWV INMOLD FILM		
5	MWAC00	WINDOW,LCD	MWAC0055601	MG150 SUBWINDOW,LCD		
4	GMZZ00	SCREW MACHINE	GMZZ0015101	1.4 mm,3.0 mm,MSWR3(FN) ,N ,+ , - ,	Silver	4
4	MCCH00	CAP,SCREW	MCCH0051603	MG150 TCLWV	Silver	3
4	MCCH01	CAP,SCREW	MCCH0051703	MG150 TCLWV.	Silver	5
4	MGAD00	GASKET,SHIELD FORM	MGAD0082901	C1500. Gasket for ground between fpcb and lower.	Gold	
4	MHFD00	HINGE,FOLDER	MHFD0007801	L1100 HINGE(pi 7.0*11.5L)		36
4	MIDZ00	INSULATOR	MIDZ0041401	C1300 CGRSV 9 X 5.5 X 0.05t	Blue	16
4	MIDZ01	INSULATOR	MIDZ0064601	C1500 LCD INSULATOR.	Blue	21
4	MLAC00	LABEL,BARCODE	MLAC0003401	EZ LOOKS(user for mechanical)		
4	MTAB00	TAPE,PROTECTION	MTAB0044101	C1200, LCD protection tape, 0.05t		1
4	MTAB01	TAPE,PROTECTION	MTAB0068401	C1500		30
4	MWAC00	WINDOW,LCD	MWAC0052601	MG150	Silver	2
4	SJMY00	VIBRATOR,MOTOR	SJMY0002802	3 V,0.08 A,12*15 ,G5300 VIBRATOR (0.5t PAD)		18
4	SUSY00	SPEAKER	SUSY0006202	ASSY ,8 ohm,92 dB,17 mm,G5400 DUAL SPEAKER		19
4	SVLY00	LCD	SVLY0026601	MAIN ,35.78*39.7*4.8(t) ,128*128, 96*64 (MONO) ,65k ,CSTN ,TM ,M:NT7525 (NOVATEK),S:NT7534(NOVATEK) ,		20
3	ACGM00	COVER ASSY,REAR	ACGM0047003	MG150 TCLWV.	White Silver	
4	MBJL00	BUTTON,SIDE	MBJL0019001	C1500	Silver	46
4	MCCC00	CAP,EARPHONE JACK	MCCC0024303	MG150 TCLWV.	White	44
4	MCIA00	CONTACT,ANTENNA	MCIA0013801	C1500	Gold	48
4	MCJN00	COVER,REAR	MCJN0032403	MG150 TCLWV.	White	52
4	MGAD00	GASKET,SHIELD FORM	MGAD0082501	C1500. 5.2x12X0.6t	Gold	47
4	MIDZ	INSULATOR	MIDZ0062301	C1500 SIDEKEY. 25X9X0.05t	Blue	45
4	MLAB00	LABEL,A/S	MLAB0001102	C2000 USASV DIA 4.0	White	50
4	MLEA00	LOCKER,BATTERY	MLEA0023503	MG150 TCLWV.	White	54
4	MPBZ00	PAD	MPBZ0084201	C1500 absorber. 12X10X0.5t.	Gold	49
4	MPBZ01	PAD	MPBZ0086501	C1500. 5.2piX1.6t	Black	51
4	MSDC00	SPRING,LOCKER	MSDC0001301	C1300 CGRSV Cone Type 1.8PI, 2.5PI, 5.0 Length	Silver Gray	55
4	SNGF00	ANTENNA,GSM,FIXED	SNGF0006602	1.5:1 ,0 dBd,White Silver ,Pb-free		53
3	GMZZ00	SCREW MACHINE	GMZZ0015101	1.4 mm,3.0 mm,MSWR3(FN) ,N ,+ , - ,	Silver	56
3	MBJA00	BUTTON,DIAL	MBJA0017003	MG150 TCLWV.	White Silver	38
3	MCCF00	CAP,MOBILE SWITCH	MCCF0024603	MG150 TCLWV.	White	58
3	MCCH00	CAP,SCREW	MCCH0051503	MG150 TCLWV.	White	57
3	MLAK00	LABEL,MODEL	MLAK0010801	G1500S MODEL LABEL		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
3	MLAZ00	LABEL	MLAZ0041302	MG150 FCC ID LABEL		

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.2 Replacement Parts <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	SACY0035501			15
5	SACB00	PCB ASSY, FLEXIBLE,INSERT	SACB0022901			
6	BAT1	BATTERY,CELL,LITHIUM	SBCL0001001	3 V,1.2 mAh,COIN ,MATUESHITA Backup BATTERY (ML414/F9D)		
5	SACE00	PCB ASSY,FLEXIBLE,SMT	SACE0031501			
6	SACC00	PCB ASSY,FLEXIBLE,SMT BOTTOM	SACC0016901			
7	CN2	CONNECTOR, BOARD TO BOARD	ENBY0013405	40 PIN,0.4 mm,STRAIGHT ,Au ,B to B CNT BOSS		
6	SACD00	PCB ASSY,FLEXIBLE,SMT TOP	SACD0024501			
7	CN1	CONNECTOR, BOARD TO BOARD	ENBY0027409	40 PIN,0.4 mm,ETC ,AU ,H:1.5MM		
6	SPCY	PCB,FLEXIBLE	SPCY0049301	POLYI ,0.4 mm,MULTI-4 ,C1500 FPCB		
3	SAFY00	PCB ASSY,MAIN	SAFY0136401	MG150 TCLWV	White Silver	40
4	SAFB00	PCB ASSY,MAIN,INSERT	SAFB0043302		Silver	
5	ADCA00	DOME ASSY,METAL	ADCA0033001	C1500.	White	39
5	ADCA01	DOME ASSY,METAL	ADCA0033101	C1500 SIDEKEY FPCB	White	41
5	MGAD00	GASKET,SHIELD FORM	MGAD0086901	C1500. 3.5X3.5X2.0t	Gold	43
5	MGAD01	GASKET,SHIELD FORM	MGAD0089901	Gasket PCB , 6 X 5 X 1t	Gold	42
5	SUMY00	MICROPHONE	SUMY0003803	PIN ,42 dB,4*1.5 ,FPCB		
4	SAFF00	PCB ASSY,MAIN,SMT	SAFF0061701	MG150 TCLWV	White Silver	
5	MLAB00	LABEL,A/S	MLAB0001103	C2000 CGRSV	White	
5	MLAC00	LABEL,BARCODE	MLAC0003301	EZ LOOKS(use for PCB ASSY MAIN(hardware))		
5	SAFC00	PCB ASSY,MAIN,SMT BOTTOM	SAFC0055701	MG150 TCLWV	White Silver	
6	C100	CAP,CERAMIC,CHIP	ECCH0000112	15 pF,50V,J,NP0,TC,1005,R/TP		
6	C101	CAP,CERAMIC,CHIP	ECCH0000110	10 pF,50V,D,NP0,TC,1005,R/TP		
6	C102	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C103	CAP,CERAMIC,CHIP	ECCH0000112	15 pF,50V,J,NP0,TC,1005,R/TP		
6	C104	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C105	CAP,CERAMIC,CHIP	ECCH0000182	0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP		
6	C106	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C107	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C108	CAP,CERAMIC,CHIP	ECCH0005801	2.2 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C111	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	C112	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C113	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C114	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C115	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C117	CAP,CERAMIC,CHIP	ECCH0007901	10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP		
6	C118	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C119	CAP,CERAMIC,CHIP	ECCH0005801	2.2 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C120	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C121	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C122	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C123	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C124	CAP,CERAMIC,CHIP	ECCH0000182	0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP		
6	C125	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C126	CAP,CERAMIC,CHIP	ECCH0000182	0.1 uF,10V ,K ,X5R ,HD ,1005 ,R/TP		
6	C128	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C129	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C130	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C200	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C201	CAP,CERAMIC,CHIP	ECCH0000155	10 nF,16V,K,X7R,HD,1005,R/TP		
6	C202	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C203	CAP,CERAMIC,CHIP	ECCH0004904	1 uF,6.3V ,K ,X5R ,TC ,1005 ,R/TP		
6	C204	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	C211	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C212	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C213	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C214	CAP,CERAMIC,CHIP	ECCH0007801	4.7 uF,10V ,Z ,Y5V ,HD ,1608 ,R/TP		
6	C215	CAP,CERAMIC,CHIP	ECCH0007801	4.7 uF,10V ,Z ,Y5V ,HD ,1608 ,R/TP		
6	C216	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C217	CAP,CERAMIC,CHIP	ECCH0000159	22 nF,16V,K,X7R,HD,1005,R/TP		
6	C218	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C219	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C220	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C223	CAP,CERAMIC,CHIP	ECCH0000112	15 pF,50V,J,NP0,TC,1005,R/TP		
6	C224	CAP,CERAMIC,CHIP	ECCH0000120	39 pF,50V,J,NP0,TC,1005,R/TP		
6	C225	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	C226	CAP,CERAMIC,CHIP	ECCH0000117	27 pF,50V,J,NP0,TC,1005,R/TP		
6	C227	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C228	CAP,CERAMIC,CHIP	ECCH0000110	10 pF,50V,D,NP0,TC,1005,R/TP		
6	C229	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C230	CAP,CERAMIC,CHIP	ECCH0000112	15 pF,50V,J,NP0,TC,1005,R/TP		
6	C233	CAP,CERAMIC,CHIP	ECCH0007801	4.7 uF,10V ,Z ,Y5V ,HD ,1608 ,R/TP		
6	C234	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C235	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C237	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C238	CAP,CERAMIC,CHIP	ECCH0000117	27 pF,50V,J,NP0,TC,1005,R/TP		
6	C241	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C242	CAP,CERAMIC,CHIP	ECCH0007901	10 uF,4V ,M ,X5R ,TC ,1608 ,R/TP		
6	C245	CAP,CERAMIC,CHIP	ECCH0000110	10 pF,50V,D,NP0,TC,1005,R/TP		
6	C250	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C300	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C301	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C302	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C303	CAP,CERAMIC,CHIP	ECCH0007701	1 uF,10V ,K ,X5R ,TC ,1608 ,R/TP		
6	C304	CAP,CERAMIC,CHIP	ECCH0007701	1 uF,10V ,K ,X5R ,TC ,1608 ,R/TP		
6	C305	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C306	CAP,CERAMIC,CHIP	ECCH0004902	220 nF,10V ,Z ,Y5V ,TC ,1005 ,R/TP		
6	C307	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C308	CAP,CERAMIC,CHIP	ECCH0004902	220 nF,10V ,Z ,Y5V ,TC ,1005 ,R/TP		
6	C309	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C310	CAP,CERAMIC,CHIP	ECCH0000122	47 pF,50V,J,NP0,TC,1005,R/TP		
6	C312	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C319	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C322	CAP,CERAMIC,CHIP	ECCH0000187	150 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP		
6	C323	CAP,CERAMIC,CHIP	ECCH0000115	22 pF,50V,J,NP0,TC,1005,R/TP		
6	C402	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C403	INDUCTOR,CHIP	ELCH0001413	22 nH,J ,1005 ,R/TP ,PBFREE		
6	C404	CAP,CERAMIC,CHIP	ECCH0000173	1.2 pF,16V ,B ,NP0 ,TC ,1005 ,R/TP		
6	C405	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C406	CAP,CERAMIC,CHIP	ECCH0000174	2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C407	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C408	CAP,CERAMIC,CHIP	ECCH0000186	33 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP		
6	C409	CAP,CERAMIC,CHIP	ECCH0000120	39 pF,50V,J,NP0,TC,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	C410	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C411	CAP,CERAMIC,CHIP	ECCH0000115	22 pF,50V,J,NP0,TC,1005,R/TP		
6	C412	CAP,CERAMIC,CHIP	ECCH0000155	10 nF,16V,K,X7R,HD,1005,R/TP		
6	C413	CAP,CERAMIC,CHIP	ECCH0000155	10 nF,16V,K,X7R,HD,1005,R/TP		
6	C414	CAP,CERAMIC,CHIP	ECCH0000155	10 nF,16V,K,X7R,HD,1005,R/TP		
6	C415	CAP,CERAMIC,CHIP	ECCH0000110	10 pF,50V,D,NP0,TC,1005,R/TP		
6	C416	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C417	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C418	CAP,CERAMIC,CHIP	ECCH0000111	12 pF,50V,J,NP0,TC,1005,R/TP		
6	C419	CAP,CERAMIC,CHIP	ECCH0000186	33 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP		
6	C420	CAP,TANTAL,CHIP,MAKER	ECTZ0003101	33 uF,10V ,M ,STD ,ETC ,R/TP		
6	C421	CAP,CERAMIC,CHIP	ECCH0000102	1 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C422	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C423	CAP,CERAMIC,CHIP	ECCH0000102	1 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C424	CAP,CERAMIC,CHIP	ECCH0000140	560 pF,50V,K,X7R,HD,1005,R/TP		
6	C425	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C426	CAP,CERAMIC,CHIP	ECCH0000140	560 pF,50V,K,X7R,HD,1005,R/TP		
6	C427	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C428	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C429	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C430	CAP,CERAMIC,CHIP	ECCH0000196	0.75 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	C431	CAP,CERAMIC,CHIP	ECCH0000143	1 nF,50V,K,X7R,HD,1005,R/TP		
6	C432	CAP,CERAMIC,CHIP	ECCH0000159	22 nF,16V,K,X7R,HD,1005,R/TP		
6	C433	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C434	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C435	CAP,CERAMIC,CHIP	ECCH0000128	100 pF,50V,J,NP0,TC,1005,R/TP		
6	C436	CAP,CERAMIC,CHIP	ECCH0000186	33 pF,50V ,J ,NP0 ,TC ,1005 ,R/TP		
6	C437	CAP,CERAMIC,CHIP	ECCH0000109	8 pF,50V,D,NP0,TC,1005,R/TP		
6	C438	CAP,CERAMIC,CHIP	ECCH0006201	4.7 uF,6.3V ,K ,X5R ,TC ,1608 ,R/TP		
6	C439	CAP,CERAMIC,CHIP	ECCH0000155	10 nF,16V,K,X7R,HD,1005,R/TP		
6	C440	CAP,CERAMIC,CHIP	ECCH0007801	4.7 uF,10V ,Z ,Y5V ,HD ,1608 ,R/TP		
6	C441	CAP,CERAMIC,CHIP	ECCH0000110	10 pF,50V,D,NP0,TC,1005,R/TP		
6	C490	CAP,CERAMIC,CHIP	ECCH0000113	18 pF,50V,J,NP0,TC,1005,R/TP		
6	C491	CAP,CERAMIC,CHIP	ECCH0000701	1.2 pF,50V ,C ,NP0 ,TC ,1005 ,R/TP		
6	CN201	CONN,JACK/PLUG, EARPHONE	ENJE0002301	3,5 PIN,G7000 EAR JACK 3 pole, 5 pin KSD		
6	CN301	CONNECTOR, BOARD TO BOARD	ENBY0027410	40 PIN,0.4 mm,ETC ,AU ,H:1.5MM RECEPTACLE		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	CN302	CONN,SOCKET	ENSY0015601	6 PIN,ETC , ,2.54 mm,H=3.1		
6	CN303	CONNECTOR,I/O	ENRY0002202	24 PIN,0.5 mm,ETC ,AU ,OFFSET TYPE		
6	D200	DIODE,SWITCHING	EDSY0012101	US-FLAT ,30 V,1 A,R/TP ,2.5*1.25*0.6(t)		
6	F301	FILTER,EMI/POWER	SFEY0006401	SMD ,6 Channel, EMI+ESD, CSP,Pb-free		
6	F303	FILTER,EMI/POWER	SFEY0006401	SMD ,6 Channel, EMI+ESD, CSP,Pb-free		
6	F400	DUPLEXER,GSM	SDGY0000602	850.1800 MHz,1900 MHz,1.4 dB,1.4 dB,30 dB,25 dB,6.7*5.5*1.5 ,SMD ,TRIPLE FEM		
6	FB301	FILTER,BEAD,CHIP	SFBH0007102	10 ohm,1005 ,Ferrite Bead		
6	FB302	FILTER,BEAD,CHIP	SFBH0007102	10 ohm,1005 ,Ferrite Bead		
6	L200	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L201	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L202	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L203	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L204	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L300	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L301	INDUCTOR,CHIP	ELCH0005009	100 nH,J ,1005 ,R/TP ,		
6	L400	INDUCTOR,CHIP	ELCH0005002	2.7 nH,S ,1005 ,R/TP ,		
6	L401	INDUCTOR,CHIP	ELCH0001427	2.2 nH,S ,1005 ,R/TP ,Pb Free		
6	L402	INDUCTOR,CHIP	ELCH0005013	4.7 nH,S ,1005 ,R/TP ,		
6	L403	INDUCTOR,CHIP	ELCH0001420	3.9 nH,S ,1005 ,R/TP ,PBFREE		
6	L404	INDUCTOR,CHIP	ELCH0010502	33 nH,J ,1005 ,R/TP ,Laser Cutting Type		
6	L405	INDUCTOR,CHIP	ELCH0010503	8.2 nH,J ,1005 ,R/TP ,Laser Cutting Type		
6	L406	INDUCTOR,CHIP	ELCH0009106	6.2 nH,J ,1005 ,R/TP ,coil type		
6	L410	INDUCTOR,CHIP	ELCH0001001	10 nH,J ,1005 ,R/TP ,Pb Free		
6	Q200	TR,FET,P-CHANNEL	EQFP0003301	SOT-6 ,1.6 W,30 V,2.4 A,R/TP ,use for charge P-CHANNEL FET		
6	Q300	TR,BJT,NPN	EQBN0007101	EMT3 ,0.15 W,R/TP ,LOW FREQUENCY		
6	R100	RES,CHIP	ERHY0000287	220K ohm,1/16W,J,1005,R/TP		
6	R101	RES,CHIP	ERHY0000138	33K ohm,1/16W,F,1005,R/TP		
6	R102	RES,CHIP	ERHY0000138	33K ohm,1/16W,F,1005,R/TP		
6	R103	RES,CHIP	ERHY0000280	100K ohm,1/16W,J,1005,R/TP		
6	R105	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R106	RES,CHIP	ERHY0000153	100K ohm,1/16W,F,1005,R/TP		
6	R107	RES,CHIP	ERHY0000241	1K 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	ERHY0000153	100K ohm,1/16W,F,1005,R/TP		
6	R111	RES,CHIP	ERHY0000286	200K ohm,1/16W,J,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	R112	RES,CHIP	ERHY0000272	43K ohm,1/16W,J,1005,R/TP		
6	R113	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R114	RES,CHIP	ERHY0000280	100K ohm,1/16W,J,1005,R/TP		
6	R115	RES,CHIP	ERHY0000202	4.7 ohm,1/16W,J,1005,R/TP		
6	R116	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R118	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R119	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R120	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R121	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R122	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R123	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R124	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R125	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R126	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R127	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R128	RES,CHIP	ERHY0000237	680 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	ERHY0000284	150K 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	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R209	RES,CHIP	ERHY0000280	100K ohm,1/16W,J,1005,R/TP		
6	R210	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R211	RES,CHIP	ERHY0000280	100K ohm,1/16W,J,1005,R/TP		
6	R212	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R213	RES,CHIP	ERHY0000248	2.4K ohm,1/16W,J,1005,R/TP		
6	R214	RES,CHIP	ERHY0000205	15 ohm,1/16W,J,1005,R/TP		
6	R215	RES,CHIP	ERHY0000280	100K ohm,1/16W,J,1005,R/TP		
6	R216	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R217	RES,CHIP	ERHY0001102	0.2 ohm,1/4W ,F ,2012 ,R/TP		
6	R218	RES,CHIP	ERHY0000203	10 ohm,1/16W,J,1005,R/TP		
6	R219	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R220	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R221	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R222	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R223	RES,CHIP	ERHY0000255	5.6K ohm,1/16W,J,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	R224	RES,CHIP	ERHY0000273	47K ohm,1/16W,J,1005,R/TP		
6	R225	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R226	RES,CHIP	ERHY0000208	22 ohm,1/16W,J,1005,R/TP		
6	R300	RES,CHIP	ERHY0000287	220K ohm,1/16W,J,1005,R/TP		
6	R301	RES,CHIP	ERHY0000260	9.1K ohm,1/16W,J,1005,R/TP		
6	R302	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R303	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R308	RES,CHIP	ERHY0000265	20K ohm,1/16W,J,1005,R/TP		
6	R309	RES,CHIP	ERHY0000271	39K ohm,1/16W,J,1005,R/TP		
6	R310	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R311	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R312	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R313	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R314	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R315	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R316	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R318	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R319	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R320	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R323	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R326	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R328	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R329	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R330	RES,CHIP	ERHY0000212	39 ohm,1/16W,J,1005,R/TP		
6	R331	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R332	RES,CHIP	ERHY0000212	39 ohm,1/16W,J,1005,R/TP		
6	R333	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R335	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R336	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R354	RES,ARRAY,R	ERNR0000401	47 ohm, ohm,8 PIN,J ,1/32 W ,SMD ,R/TP		
6	R400	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R401	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R402	RES,CHIP	ERHY0000212	39 ohm,1/16W,J,1005,R/TP		
6	R403	RES,CHIP	ERHY0000223	150 ohm,1/16W,J,1005,R/TP		
6	R404	RES,CHIP	ERHY0000223	150 ohm,1/16W,J,1005,R/TP		
6	R406	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R409	RES,CHIP	ERHY0000239	820 ohm,1/16W,J,1005,R/TP		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	R410	RES,CHIP	ERHY0000239	820 ohm,1/16W,J,1005,R/TP		
6	R411	RES,CHIP	ERHY0000239	820 ohm,1/16W,J,1005,R/TP		
6	R412	RES,CHIP	ERHY0000239	820 ohm,1/16W,J,1005,R/TP		
6	R413	RES,CHIP	ERHY0000263	15K ohm,1/16W,J,1005,R/TP		
6	R414	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R415	THERMISTOR	SETY0001201	NTC ,22000 ohm,SMD ,1005, ECTH 1005 Series, Pb Free		
6	R416	RES,CHIP	ERHY0000184	150 ohm,1/16W ,F ,1005 ,R/TP		
6	R417	RES,CHIP	ERHY0000289	270K ohm,1/16W,J,1005,R/TP		
6	R418	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R419	RES,CHIP	ERHY0000184	150 ohm,1/16W ,F ,1005 ,R/TP		
6	R420	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R421	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R422	RES,CHIP	ERHY0000254	4.7K ohm,1/16W,J,1005,R/TP		
6	SW401	CONN,RF SWITCH	ENWY0003001	STRAIGHT ,SMD ,0.6 dB,3.8X3.0X3.6T		
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	EUSY0226301	FBGA ,64 PIN,R/TP ,128M NOR+64M PSRAM / PB FREE		
6	U201	IC	EUSY0111601	32-PIN QFN ,32 PIN,R/TP ,MA-3 / 40 TONES / FM + WAVEFORM TABLE		
6	U202	IC	EUSY0077301	SC70-6 ,6 PIN,R/TP ,SPDT Analog switch		
6	U203	IC	EUSY0119002	4X3 UCSP / CODE : B12-4 ,10 PIN,R/TP ,DUAL SPDT ANALOG SWITCHES(Pb Free)		
6	U301	IC	EUSY0238201	QFN ,16 PIN,R/TP ,3 LEDs, WHITE LED CHARGE PUMP		
6	U303	IC	EUSY0154001	US8 ,8 PIN,R/TP ,Dual 2-Input OR Gate, Pb Free		
6	U401	IC	EUSY0161302	8x8 LGA ,32 PIN,R/TP ,		
6	U402	IC	EUSY0161702	US-8 ,8 PIN,R/TP ,UHS TRIPLE BUFFER / 3.1 WIDE SIZE		
6	U403	IC	EUSY0100502	8-LEAD US8 ,8 PIN,R/TP ,UHS DUAL 2-INPUT AND GATE		
6	U404	IC	EUSY0073401	SSOP5-P-0.65A ,5 PIN,R/TP ,INVERTER, Pb Free		
6	U405	IC	EUSY0118602	SOT23 ,5 PIN,R/TP ,2.85V/150mA Low Noise uCap LDO Regulator, PBFREE		
6	U406	PAM	SMPY0007201	35 dBm,53 %,0.8 A,-50 dBc,50 dB,6.0*8.0*1.2 ,SMD ,QUAD		
6	VA201	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA202	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA301	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	VA302	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA303	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA305	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA307	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA309	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA310	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA311	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA312	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA314	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA316	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA317	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA318	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	X101	X-TAL	EXXY0015601	.032768 MHz,20 PPM,7 pF,65000 ohm,SMD ,6.9*1.4*1.3		
6	X401	X-TAL	EXXY0018401	26 MHz,10 PPM,10 pF,10 ohm,SMD ,3.2*2.5*0.7 ,		
5	SAFD00	PCB ASSY,MAIN,SMT TOP	SAFD0054201	MG150 TCLVW	White Silver	
6	C244	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C315	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C316	CAP,CERAMIC,CHIP	ECCH0000167	0.1 uF,6.3V,K,X5R,HD,1005,R/TP		
6	C442	CAP,CERAMIC,CHIP	ECCH0000135	270 pF,50V ,K ,X7R ,HD ,1005 ,R/TP		
6	D301	DIODE,SWITCHING	EDSY0005301	SC-70 ,80 V,0.1 A,R/TP ,		
6	F300	FILTER,EMI/POWER	SFEY0006401	SMD ,6 Channel, EMI+ESD, CSP,Pb-free		
6	F302	FILTER,EMI/POWER	SFEY0006401	SMD ,6 Channel, EMI+ESD, CSP,Pb-free		
6	LD301	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD302	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD303	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD304	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD305	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD306	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD307	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD308	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD309	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Specification	Color	Remark
6	LD310	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD311	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	LD312	DIODE,LED,CHIP	EDLH0006001	Blue ,1608 ,R/TP ,Blue SMD LED		
6	Q301	TR,BJT,ARRAY	EQBA0002701	EMT6 ,150 mW,R/TP ,NPN, PNP, 150 mA		
6	R250	RES,CHIP	ERHY0000201	0 ohm,1/16W,J,1005,R/TP		
6	R251	RES,CHIP	ERHY0000221	110 ohm,1/16W,J,1005,R/TP		
6	R304	RES,CHIP	ERHY0000203	10 ohm,1/16W,J,1005,R/TP		
6	R305	RES,CHIP	ERHY0000273	47K ohm,1/16W,J,1005,R/TP		
6	R306	RES,CHIP	ERHY0000241	1K ohm,1/16W,J,1005,R/TP		
6	R307	RES,CHIP	ERHY0000261	10K ohm,1/16W,J,1005,R/TP		
6	R317	RES,CHIP	ERHY0000273	47K ohm,1/16W,J,1005,R/TP		
6	R321	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R322	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R324	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R325	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R327	RES,CHIP	ERHY0000213	47 ohm,1/16W,J,1005,R/TP		
6	R334	RES,CHIP	ERHY0000237	680 ohm,1/16W,J,1005,R/TP		
6	R337	RES,CHIP	ERHY0008201	24 ohm,1/16W ,J ,1005 ,R/TP		
6	R351	RES,CHIP	ERHY0000223	150 ohm,1/16W,J,1005,R/TP		
6	R352	RES,CHIP	ERHY0000223	150 ohm,1/16W,J,1005,R/TP		
6	U302	IC	EUSY0200301	Leadless chip ,6 PIN,R/TP ,Hall S/W, Pb Free		
6	VA304	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA306	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA308	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA313	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA315	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA320	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
6	VA321	RES,VARIABLE,ETC	ERVZ0000101	ohm, PIN, ,SMD ,R/TP ,1005 SIZE CHIP VARISTOR, Pb Free		
5	SPFY	PCB,MAIN	SPFY0094601	FR-4 ,1 mm,BUILD-UP 8 , -		
5	WSYY	SOFTWARE	WSYY0252101	MG150P40FL-52-V10a-334-020 May 27 2005+4		

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.3 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	SBPL0077504	3.7 V,830 mAh,1 CELL,PRISMATIC ,MG150 BATTERY(423450), (MEXICO LABEL)	Silver	59
3	SGEY00	EAR PHONE/EAR MIKE SET	SGEY0003204	L1200 ,MONO TYPE		
3	SSAD00	ADAPTOR,AC-DC	SSAD0007843	FREE ,50 Hz,5.2 V,800 mA,NOM ,		