

Features of Mobile Subscriber Radio Handset (LG-KD3500 Type)

1. Wave Type

- G7W

2. Frequency Scope

- Transmit Frequency : 824.820 ~ 848.190MHz
- Receive Frequency : 869.820 ~ 893.190MHz

3. Rated Output Power

- 0.282W(24.5dBm)

4. Output Conversion Method : This is possible by correcting the key board channel.

5. Voltage and Current Value of Termination Part Amplifier(Catalogue included)

Mode	Type Name	Voltage	Current	Power
CDMA	SKY77162	3.4V	455mA	0.282W

6. Functions of Major Semi-Conductors

Classification	Function
QSC6010	MSM baseband, radioOne RF, and power management.
MCP (PF38F2040W0YBQ0)	Flash Memory (64Mbit) ► Storing of the mobile station operation program
MCP (PF38F2040W0YBQ0)	PSRAM (32Mbit) ► Temporary storing of the data created while busy

7. Frequency Stability

- ± 0.5 PPM



LGE

LG Electronics Inc.



CDMA MOBILE SUBSCRIBER UNIT

LG-KD3500

SERVICE MANUAL

**SINGLE BAND
CDMA MOBILE PHONE**

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General Introduction

The LG-KD3500 cellular phone functions as digital cellular phone worked in CDMA (Code Division Multiple Access) mode.

CDMA mode applies the DSSS (Direct Sequence Spread Spectrum) technique that has been used in military. This technique enables to share one frequency channel with many users in the same specific area. As a result, that it increases the capacity 10 times more compared with that in the analog mode (AMPS) currently used.

Soft/Softer Handoff, Hard Handoff, and Dynamic RF power Control technologies are combined into this phone to reduce the call being interrupted in a middle of talking over phone.

CDMA digital cellular network consists of MSC (Mobile Switching Office), BSC (Base Station Controller), BTS (Base station Transmission System), and MS (Mobile Station). Communication between MS and BTS is designed to meet the specification of TIA/EIA/IS-95-A/B/C (Common Air Interface). MS meets the specifications of the below :

- TIA/EIA/IS-95-A/B/C (Common Air Interface) : Protocol between MS and BTS
- TIA/EIA/IS-96-B : Speech CODEC
- TIA/EIA/IS-98 : Basic MS functions
- IS-126 : Voice loopback
- TIA/EIA/IS-99 : Short Message Service, Asynchronous Data Service, and G3 Fax Service

LG-KD3500 is composed of a transceiver, a adapter, a Li-Polymer Battery.



CHAPTER 1. System Introduction

1. System Introduction

1.1 CDMA Abstract

The cellular system has a channel hand-off function that is used for collecting the information on the locations and movements of radio mobile telephones from the cell site by automatically controlling several cell site through the setup of data transmission routes and thus, enabling one switching system to carry out the automatic remote adjustment. This is to maintain continuously the call state through the automatic location confirmation and automatic radio channel conversion when the busy subscriber moves from the service area of one cell site to that of another by using automatic location confirmation and automatic radio channel conversion functions. The call state can be maintained continuously by the information exchange between switching systems when the busy subscriber moves from one cellular system area to the other cellular system area.

In the cellular system, the cell site is a small-sized low output type and utilizes a frequency allocation system that considers mutual interference, in an effort to enable the re-use of corresponding frequency from a cell site separated more than a certain distance. The analog cellular systems are classified further into an AMPS system, E-AMPS System, NMT system, ETACS system, and JTACS system depending on technologies used.

Unlike the Time Division Multiple Access (TDMA) or the Frequency Division Multiple Access (FDMA) used in the band limited environment, the Code Division Multiple Access(CDMA) system which is one of digital cellular systems is a multi-access technology under the interference limited environment. It can process more number of subscribers compared to other systems (TDMA system has the processing capacity three times greater than the existing FDMA system whereas CDMA system, about 12~15 times of that of the existing system).

CDMA system can be explained as follows: TDMA or SDMA can be used to enable each person to talk alternately or provide a separate room for each person when two persons desire to talk with each other at the same time, whereas FDMA can be used to enable one person to talk in soprano, whereas the other in bass (one of the two talkers can carry out synchronization for hearing in case there is a bandpass filter function in the area of the hearer).

Another method available is to make two persons to sing in different languages at the same time, space, and frequency when wishing to let the audience hear the singing without being confused. This is the characteristics of CDMA.



On the other hand, when employing the CDMA technology, each signal has a different pseudo-random binary sequence used to spread the spectrum of carrier. A great number of CDMA signals share the same frequency spectrum. In the perspective of frequency area or time area, several CDMA signals are overlapped. Among these types of signals, only desired signal energy is selected and received through the use of pre-determined binary sequence; desired signals can be separated and then, received with the correlator used for recovering the spectrum into its original state. At this time, the spectrums of other signals that have different codes are not recovered into its original state and instead, processed as noise and appears as the self-interference of the system.



2. Features and Advantages of CDMA Mobile Phone

2.1 Various Types of Diversities

When employing the narrow band modulation (30kHz band) that is the same as the analog FM modulation system used in the existing cellular system, the multi-paths of radio waves create a serious fading. However, in the CDMA broadband modulation(1.25MHz band), three types of diversities (time, frequency, and space) are used to reduce serious fading problems generated from radio channels in order to obtain high-quality calls.

Time diversity can be obtained through the use of code interleaving and error correction code whereas frequency diversity can be obtained by spreading signal energy to more wider frequency band. The fading related to normal frequency can affect the normal 200~300kHz among signal bands and accordingly, serious affect can be avoided. Moreover, space diversity (also called path diversity) can be realized with the following three types of methods.

First, it can be obtained by the duplication of cell site receive antenna. Second, it can be obtained through the use of multi-signal processing device that receives a transmit signal having each different transmission delay time and then, combines them. Third, it can be obtained through the multiple cell site connection (Soft Handoff) that connects the mobile station and more than two cell sites at the same time.

2.2 Power Control

The CDMA system utilizes the forward (from a base station to mobile stations) and backward (from the mobile station to the base station) power control in order to increase the call processing capacity and obtain high-quality calls. In case the originating signals of mobile stations are received by the cell site in the minimum call quality level (signal to interference) through the use of transmit power control on all the mobile stations, the system capacity can be maximized.

If the signal of mobile station is received too strong, the performance of that mobile station is improved. However, because of this, the interference on other mobile stations using the same channel is increased and accordingly, the call quality of other subscribers is reduced unless the maximum accommodation capacity is reduced.

In the CDMA system, forward power control, backward open loop power control, and closed loop power control methods are used. The forward power control is carried out in the cell site to reduce the transmit power on mobile stations less affected by the multi-path fading and shadow phenomenon and the interference of other cell sites when the mobile station is not engaged in the call or is relatively nearer to the corresponding cell site. This is also used to provide additional power to mobile stations having high call error rates, located in bad reception areas or far away from the cell site.

The backward open loop power control is carried out in a corresponding mobile station; the mobile station measures power received from the cell site and then, reversely increases/decreases transmit power in order to compensate channel changes caused by the forward link path loss and terrain



characteristics in relation to the mobile station in the cell site. By doing so, all the mobile office transmit signals in the cells are received by the cell site in the same strength.

Moreover, the backward closed loop power control used by the mobile station to control power with the commands issued out by the cell site. The cell site receives the signal of each corresponding mobile station and compares this with the pre-set threshold value and then, issues out power increase/decrease commands to the corresponding mobile station every 1.25 msec (800 times per second).

By doing so, the gain tolerance and the different radio propagation loss on the forward/backward link are complemented.

2.3 Voice Encoder and Variable Data Speed

The bi-directional voice service having variable data speed provides voice communication which employs voice encoder algorithm having power variable data rate between the mobile telephone cell site and mobile station. On the other hand, the transmit voice encoder performs voice sampling and then, creates encoded voice packets to be sent out to the receive voice encoder, whereas the receive voice encoder demodulates the received voice packets into voice samples.

One of the two voice encoders described in the above is selected for use depending on inputted automatic conditions and message/data; both of them utilize four-stage frames of 9600, 4800, 2400, and 1200 bits per second. In addition, this type of variable voice encoder utilizes adaptive threshold values when selecting required data rate. It is adjusted in accordance with the size of background noise and the data rate is increased to high rate only when the voice of caller is inputted.

Therefore, background noise is suppressed and high-quality voice transmission is possible under the environment experiencing serious noise. In addition, in case the caller does not talk, data transmission rate is reduced so that the transmission is carried out in low energy. This will reduce the interference on other CDMA signals and as a result, improve system performance (capacity, increased by about two times).

2.4 Protecting Call Confidentiality

CDMA signals have the function of effectively protecting call confidentiality by spreading and interleaving call information in broad bandwidth. This makes the unauthorized use of crosstalk, search receiver, and radio very hard substantially. Also included is the encryption function on various authentication and calls specified in IS-95 for the double protection of call confidentiality.

2.5 Soft Handoff

During the soft hand, the cell site already in the busy state and the cell site to be engaged in the call later participate in the call conversion. The call conversion is carried out through the original call



connection cell site, both cell sites, and then, new cell site. This method can minimize call disconnection and prevent the user from detecting the hand-off.

2.6 Frequency Re-Use and Sector Segmentation

Unlike the existing analog cellular system, the CDMA system can reuse the same frequency at the adjacent cell and accordingly, there is no need to prepare a separate frequency plan. Total interference generated on mobile station signals received from the cell site is the sum of interference generated from other mobile stations in the same cell site and interference generated from the mobile station of adjacent cell site. That is, each mobile station signal generates interference in relation to the signals of all the other mobile signals.

Total interference from all the adjacent cell sites is the ratio of interference from all the cell sites versus total interference from other mobile stations in the same cell site (about 65%). In the case of directional cell site, one cell normally uses a 120° sector antenna in order to divide the sector into three. In this case, each antenna is used only for 1/3 of mobile stations in the cell site and accordingly, interference is reduced by 1/3 on the average and the capacity that can be supported by the entire system is increased by three times.

2.7 Soft Capacity

The subscriber capacity of CDMA system is flexible depending on the relation between the number of users and service classes. For example, the system operator can increase the number of channels available for use during the busy hour despite the drop in call quality. This type of function requires 40% of normal call channels in the standby mode during the handoff support, in an effort to avoid call disconnection resulting from the lack of channels.

In addition, in the CDMA system, services and service charges are classified further into different classes so that more transmit power can be allocated to high class service users for easier call set-up; they can also be given higher priority of using hand-off function than the general users.



3. Structure and Functions of CDMA Mobile Phone

The mobile station of CDMA system is made up of a radio frequency part and logic/control (digital) part. The mobile station antenna is connected with the transmitter/receiver via a SAW duplexer filter so that it can carry out the transmit/receive function at the same time.

The transmit frequency is the 25MHz band of 824~849MHz, whereas the receive frequency is the 25MHz band of 869~894MHz. The transmit/receive frequency is separated by 45MHz. The RF signal from the antenna passes the LNA, bandpass SAW filter having the 1.25MHz band and then, is directly converted into baseband signal by the frequency synthesizer and frequency down converter. Baseband output signals that have been filtered from spurious signal are converted into digital signals via an analog-to-digital converter (Rx ADC) and then, sent out respectively to 5 correlators in each CDMA de-modulator. Of these, one is called a searcher whereas the remaining 4 are called data receiver (finger). Rx signals include a great number of call signals that have been sent out by the adjacent cells. These signals are detected with pseudo-noise sequence (PN Sequence). Signal to interference ratio (C/I) on signals that match the desired PN sequence are increased through this type of correlation detection process. Then, other signals obtain processing gain by not increasing the ratio. The carrier wave of pilot channel from the cell site most adjacently located is demodulated in order to obtain the sequence of encoded data symbols.

During the operation with one cell site, the searcher searches out multi-paths in accordance with terrain and building reflections. On three data receivers, the most powerful four paths are allocated for the parallel tracing and receiving. Fading resistance can be improved a great deal by obtaining the diversity combined output for de-modulation. Moreover, the searcher can be used to determine the most powerful path from the cell sites even during the soft handoff during the two cell sites. Moreover, four data receivers are allocated in order to carry out the de-modulation of these paths. Data output that has been demodulated change the data string in the combined data row as in the case of original signals (deinterleaving), and then, are de-modulated by the forward error correction decoder which uses the Viterbi algorithm.

On the other hand, mobile station user information sent out from the mobile station to the cell site pass through the digital voice encoder via a mike. Then, they are encoded and forward errors are corrected through the use of convolution encoder. Then, the order of code rows is changed in accordance with a certain regulation in order to remove any errors in the interleaver. Symbols made through the above process are spread after being loaded onto PN carrier waves. At this time, PN sequence is selected by each address designated in each call.

Signals that have been code spread as above are digital modulated (OQPSK) and then, power controlled at the automatic gain control amplifier (AGC Amp). Then, they are converted into RF band by the frequency synthesizer synchronizing these signals to proper output frequencies. Transmit signals obtained pass through the duplexer filter and then, are sent out to the cell site via the antenna.



4. Specification

4.1 General Specification

4.1.1 Transmit/Receive Frequency Interval : 45MHz

4.1.2 Number of Channels (Channel Bandwidth) : 20CH (BW : 1.23MHz)

4.1.3 Operating Voltage : DC 3.2~4.2V

4.1.4 Battery Power Consumption : DC 3.7V

	SLEEP	IDLE	MAX POWER
CDMA	1.2 mA	80 ~ 100 mA	580 mA (25dBm)

4.1.5 Operating Temperature : -30° ~ +60°

4.1.6 Frequency Stability : ± 0.5 PPM

4.1.7 Antenna : Fixed PIFA Type (Internal), 50 Ω

4.1.8 Size and Weight

- Size : 105.7 x 44 x 16.5mm (L x W x D)
- Weight : 70g(TBD)

4.1.9 Channel Spacing : 1.25MHz

4.1.10 Battery Type, Capacity and Operating Time

Unit = Hours, Minutes

	Standard (950mAh)
Stand-By Time	140 Hrs (SCI=2)
Talk Time	145 Min (Cell power -92dBm)

4.2 Receive Specification

4.2.1 Frequency Range : 869.820 MHz ~ 893.190 MHz

4.2.2 Local Oscillating Frequency Range : 1738.08MHz ~ 1787.94MHz



4.2.3 Intermediate Frequency : QSC60X0 seires (Zero IF)

4.2.4 Sensitivity : -104dBm (C/N 12dB or more)

4.2.5 Selectivity : 3dB C/N Degration (With Fch $\pm$ 1.25KHz : -30dBm)

4.2.6 Spurious Wave Suppression : Maximum of -80dB

4.2.7 CDMA Input Signal Range

- Dynamic area of more than -115~ -12.6 dB : 102.4dB at the 1.23MHz band

4.3 Transmit Specification

4.3.1 Frequency Range : 824.820 MHz ~ 848.190 MHz

4.3.2 Intermediate Frequency : QSC60X0 seires (Zero IF)

4.3.3 Output Power : 0.282W

4.3.4 Interference Rejection

- Single Tone : -30dBm at 900 kHz
- Two Tone : -43dBm at 900 kHz & 1700kHz

4.3.5 CDMA TX Frequency Deviation : $\pm$ 300Hz or less

4.3.6 CDMA TX Conducted Spurious Emissions

- 900kHz : - 42 dBc/30kHz below
- 1.98MHz : - 54 dBc/30kHz below

4.3.7 CDMA Minimum TX Power Control : - 50dBm below



4.4 MS (Mobile Station) Transmitter Frequency

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	824.640 MHz	11	404	837.120 MHz
2	29	825.870 MHz	12	445	838.350 MHz
3	70	827.100 MHz	13	486	839.580 MHz
4	111	828.330 MHz	14	527	840.810 MHz
5	152	829.560 MHz	15	568	842.04 MHz
6	193	830.790 MHz	16	609	843.270 MHz
7	234	832.020 MHz	17	650	844.500 MHz
8	275	833.250 MHz	18	697	845.910 MHz
9	316	834.480 MHz	19	738	847.140 MHz
10	363	835.890 MHz	20	779	848.370 MHz

4.5 MS (Mobile Station) Receiver Frequency

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	869.640 MHz	11	404	882.120 MHz
2	29	870.870 MHz	12	445	883.350 MHz
3	70	872.100 MHz	13	486	884.580 MHz
4	111	873.330 MHz	14	527	885.810 MHz
5	152	874.560 MHz	15	568	887.04 MHz
6	193	875.790 MHz	16	609	888.270 MHz
7	234	877.020 MHz	17	650	889.500 MHz
8	275	878.250 MHz	18	697	890.910 MHz
9	316	879.480 MHz	19	738	892.140 MHz
10	363	880.890 MHz	20	779	893.370 MHz

4.6 Charge time

4.6.1 Standard Battery : 200 Min.



5. Installation

5.1 Installing a Battery Pack (Soft Pack type)

- 1) The soft battery pack is keyed so it can only fit one way. Align the groove in the battery pack with the rail on the back of the phone until the battery pack rests flush with the back of the phone.
- 2) Insert the bottom of battery into the opening on the back of the phone. Then, push the battery cover up until the latch clicks.

5.2 For Adapter Use

- 1) Plug the adapter into a wall outlet. The adapter can be operated from either a 110V or a 220V source.
- 2) Insert the adapter jack into the phone with the installed battery pack.
Red light indicates battery is being charged. Green light indicates battery is fully charged

5.3 For Mobile Mount

5.3.1 Installation Position

In order to reduce echo sound when using the Hands-Free Kit, make sure that the speaker and microphone are not facing each other and keep microphone a generous distance from the speaker.

5.3.2 Cable Connections

5.3.2.1 Power and Ignition Cables

Connect the red wire to the car battery positive terminal and the black wire to the car ground. Connect the green wire to the car ignition sensor terminal. (In order to operate HFK please make sure to connect green wire to ignition sensor terminal.) Connect the kit's power cable connector to the interface box power receptacle.

5.3.2.2 Antenna Cable Connection

Connect the antenna coupler cable connector from the cradle to the external antenna connector. (Antenna is not included.)



CHAPTER 2. NAM Input Method (Inputting of MIN included)

1. HOW TO POWER UP

1. Press power key.
2. You have to input correct PIN code[Default Code: 0000], then press [OK] key.
3. Handset start data loading process, and then searching signal.

2. NAM Input Method (Inputting of telephone numbers included)

1. Telephone Number and NAM Programming Method

- Press # # # #

Then, the following Menu is appeared.

1 : Service Program
2 : Test Calls
3 : CDG Test
4 : Field Menu
5 : Applications

- Press 1: Service Mode to program MIN and NAM.

1. ESN
2. MIN
3. NAM Name
4. Security Code
5. MCC
6. NMSID
7. IMSI_T MCC
8. IMSI_T NMSID
9. PRL Enabled
10. MDN
11. CDMA Home SID
12. CDMA Home NID

13. CDMA Pri.ChA
14. CDMA Sec.ChA
15. CDMA Pri.ChB
16. CDMA Sec.ChB
17. Lockout SID
18. Lockout NID
19. Home SID Reg
20. Forn SID Reg
21. Forn NID Reg
22. ACCOLC
23. Phone Model
24. Slot Cycle Index

- Press a number what you want to edit.
- Press [edit] to edit, after input, press [OK] to save
- To reset the handset, press [END]



CHAPTER 3. Circuit Description

1. RF Transmit/Receive Part

1.1 Overview

The RF transmit/receive part employs the direct conversion architecture (ZIF, Zero Intermediate Frequency). The transmit/receive frequency is respectively 824.04~848.97MHz and 869.04~893.97 MHz. The block diagram is shown in [Figure 3-1].

RF signals received through the antenna are fed QSC6010 through the duplexer. And then, they pass the low noise amplifier (LNA), combined with the signals of local oscillator (VCO) at the frequency mixer in order to create baseband signal directly.

Baseband signals created are changed into digital signals by the analog / digital converter (ADC, A/D Converter) and then, auto gain controlled and, are demodulated by the modulator / demodulator.

In the case of transmission, QSC6010 modulates, interpolates, and converts the digital signal into an analog baseband before upconverts the Tx analog baseband into RF.

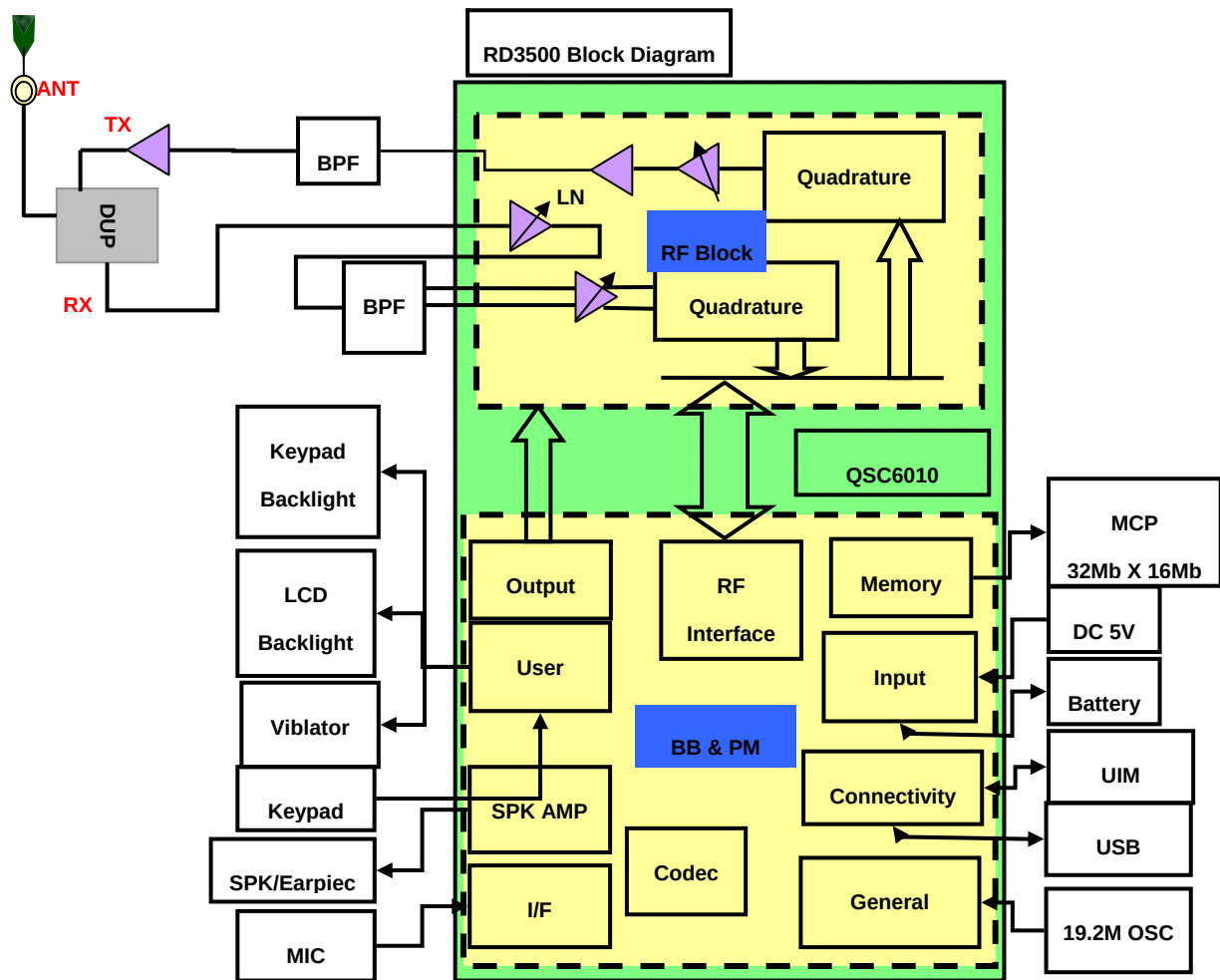
The baseband quadrature signals are upconverted to the Cellular Tx frequency bands and amplified to provide signal drive capability to the power amp.

After that, the RF signal is amplified by the Power Amp in order to have enough power for radiation.

Finally, the RF signal is sent out to the cell site via the antenna after going through the duplexer



[Figure 3-1] Block Diagram Of RD3500



1.2 Description of Receive Part Circuit

1.2.1 Duplexer (DP101)

The duplexer consists of the receive part bandpass filter (BPF) and the transmit part bandpass filter (BPF) which have the function of separating transmit/receive signals in the full duplex system using the transmit/receive common antenna. The transmit part BPF is used to suppress noises and spurious waves entering the receive band among transmit signals in order to prevent the drop in receive sensitivity characteristics. The receive part BPF blocks the signals sent out from entering the receive end in order to improve sensitivity characteristics.

Insertion loss (IL) in the transmit band is 2.8dB (Max), whereas IL in the receive band is 3.5dB (Max).

The receive band attenuation amount of transmit filter is 45dB (Min) and the transmit band attenuation amount of receive filter is 57dB or more (Min).



1.2.2 Rx RF SAW FILTER (F101)

The main function of Rx RF SAW filter is to attenuate mobile phone spurious frequency, attenuate noise amplified by the LNA and suppress second harmonic originating in the LNA.

1.2.3 Down-Converter Mixers (U201)

The QSC6010 device performs signal direct-down-conversion for Cellular applications. It contains all the circuitry (with the exception of external filters) needed to support conversion of received RF signals to baseband signals. The LO Buffer Amplifier buffers the RF VCO to the RF Transmit Upconverter. QSC6010 offers the most advanced and integrated CDMA Rx solution designed to meet cascaded Noise Figure (NF) and Third-order Intercept Point (IIP3) requirements of IS-98C and J-STD-018 specifications for Sensitivity, Two-Tone Intermodulation, and Single-tone Desense.

Operation modes and band selection are specially controlled from the Mobile Station Modem QSC6010.

1.3 Description of Transmit Part Circuit

1.3.1 Description on the Internal Circuit of QSC6010(U201)

For the transmit data path(Tx), the QSC6010 modulates, interpolates, and converts the digital signal into an analog baseband, and upconverts the Tx analog baseband into RF. The QSC6010 communicates with the external RF and analog baseband to control signal gain in the RF Rx and Tx signal paths, reduce base band offset errors, and tune the system frequency reference.

The QSC6010 baseband-to-RF Transmit Processor performs all Tx signal-processing functions required between digital baseband and the Power Amplifier Module (PAM). The baseband quadrature signals are upconverted to the Cellular frequency bands and amplified to provide signal drive capability to the PAM. The QSC6010 includes an mixer for up-converting analog baseband to RF, a programmable PLL for generating Tx and Rx LO frequency, cellular driver amplifier and Tx power control. As added benefit, the single sideband upconversion eliminates the need for a band-pass filter normally required between the upconverter and driver amplifier.

I, I/, Q and Q/ signals are modulated by Offset Quadrature Phase Shift Keying (OQPSK). I and Q are 90 deg. out of phase, and I and I/ are 180 deg. The mixer in QSC6010 converts baseband signals into RF signals. After passing through the upconverters, RF signal is inputted into the Power Amplifier Module.

The QSC6010 Cellular CDMA RF specifications are described below:



	Condition	Min.	Typ.	Max.	Unit
Maximum Output Power		28			dBm
Noise power	869-894 MHz, all power levels			-135.0	dBm/Hz
ACPR	$\pm 885\text{kHz}$, < 2:1 VSWR			-44	dBc
	$\pm 1.98\text{MHz}$, < 2:1 VSWR			-57	dBc

1.3.2 Power Amplifier (U102)

The power amplifier that can be used in the CDMA mode has linear amplification capability.

For higher efficiency, it is made up of one module (Monolithic Microwave Integrated Circuit) for which RF input terminal and internal interface circuit are integrated onto one IC after going through the GaAs HBT (heterojunction bipolar transistor) process.

The module of power amplifier is made up of an output end interface circuit including this module.

The maximum power that can be inputted through the input terminal is 8dBm and conversion gain is about 28.5dB. RF transmit signals that have been amplified through the power amplifier are sent to the duplexer.

1.4 Description of Frequency Synthesizer Circuit

1.4.1 Crystal Oscillator (X202)

Crystal Unit generates the reference frequency of 19.2MHz. Tolerance at 25°C is $\pm 12 \times 10^{-6}$ Max. Tolerance over the temperature range is $\pm 12 \times 10^{-6}$ Max. at -30 to 85°C



2. Digital/Voice Processing Part

2.1 Overview

The digital/voice processing part processes the user's commands and processes all the digital and voice signal processing in order to operate in the phone. The digital/voice processing part is made up of a keypad/LCD, receptacle part, voice processing part, mobile station modem part, memory part, and power supply part.

2.2 Configuration

2.2.1 Keypad/LCD and Receptacle Part

This is used to transmit keypad signals to QSC6010. It is made up of a keypad backlight part that illuminates the keypad, LCD part that displays the operation status on to the screen, and a receptacle that receives and sends out voice and data with external sources.

2.2.2 Voice Processing Part

The voice processing part is made up of an audio codec in QSC6010 used to convert MIC signals into digital voice signals and other external MIDI Synthesizer used to convert digital voice signals into analog voice signals, amplifying parts for amplifying the voice signals and MIC signals are on external MIDI Synthesizer and Codec in QSC6010.

2.2.3 QSC6010 (Mobile Station Modem) Part

QSC6010 is the core elements of a CDMA mobile station and carries out the functions of CPU, encoder, interleaver, deinterleaver, Viterbi decoder, Mod/Demod, codec, and vocoder. with RF, and PA module

2.2.4 Memory Part

The memory part is made up of a flash memory, SRAM for storing data.



2.3 Circuit Description

2.3.1 Keypad/LCD and Receptacle Part

Once the keypad is pressed, the key signals are sent out to QSC6010 for processing. In addition, when the key is pressed, the keypad lights up through the use of 8 LEDs and LCD backlights up. The status and operation of a mobile station are displayed on the screen for the user with the characters and icons on the LCD.

Receptacle(CON404) exchanges audio signals and data with external sources and external power.

Battery Connector receives power from the battery.

2.3.2 QSC Part

The baseband circuits and system software incorporate a low-power, high-performance RISC microprocessor core featuring the ARM926EJ-S™ CPU and Jazelle™ accelerator circuit from ARM® Limited. There are two low-power, high-performance QDSP4000™ digital signal processor (DSP) cores, one for the modem and one for applications. Camera functions are supported by the QSC6030 device only, and MIDI and MP3 functions are supported by the various QSC tiers as indicated in Table 1-2.

The baseband function reduces part costs by using two external bus interfaces to support next-generation memory architectures such as NAND FLASH, SRAM and pseudo SRAM (PSRAM), page and burst mode NOR or MLC NOR FLASH. The EBI2 also serves as an enhanced LCD interface.

A variety of connectivity options are supported: the keypad interface and USB, UART, and RUIM ports are available.

A camera interface is provided; this feature is available in the QSC6030 device only (not the QSC6020 or QSC6010 devices).

Audio support supplements the analog/RF function's CODEC, including up to 32- polyphonic MIDI in the QSC6010 device, MP3, AAC and AAC+ decoding support in the QSC6020 and QSC6030 devices and additionally a Compact Media Extension (CMX™)/MIDI synthesizer, and QCELP®.

The CDMA air interfaces mentioned earlier are implemented on the baseband CDMA processor. All necessary interfaces to the RF functions are provided, some using a portion of the 57 GPIOs. Many of the AMSS-configurable GPIOs are available for alternate uses as desired by the wireless product designers.

Support circuitry and baseband internal functions include security, clock generation and distribution, JTAG/ETM test interfaces, mode and reset controls, and the Q-fuse.



2.3.2.1 Audio Processing Part

MIC signals are inputted into the audio codec, and amplified with programmable gain, and converted into digital signals(PCM). Then, they are inputted into QSC6010.

In addition, digital audio signals(PCM) outputted from QSC6010 are converted into analog signals after going through the audio codec. These signals are amplified with programmable gain on codec's internal AMP and external MIDI Synthesizer, transferred to the ear-piece.

2.3.3 Memory Part

The memory part consists of a 64Mbits Flash Memory and a 32Mbits SRAM. On the Flash Memory, there are programs used for the operation of a mobile station and the non-volatile data of the mobile station such as a ESN(Electronic Serial Number) are stored. The programs can be changed through down loading after the assembling of mobile stations. On the SRAM, data generated during the operation of a mobile station are stored temporarily.

2.3.4 Power Supply Part

When the battery voltage (+4.2V) is fed and the PWR key of keypad is pressed, the power-up circuitry in QSC6010(U201) is activated by the PWR_ON_SW/ signal, and then the LDO regulators embedded in QSC6010 are operated and +2.80V_MSMC, +2.85V_MSMP and +2.6V_MSMA are generated.



2.3.5 Logic Part

The Logic part consists of internal CPU of QSC6010, MCP (SRAM+FLASH ROOM).

The QSC6010 receives X-tal(19.20MHz) clock signals, and then controls the phone during the CDMA mode. The major components are as follows:

CPU : ARM926EJ-S microprocessor core

MEMORY :

- FLASH ROM : 64Mbits (U301, PF38F2040W0YBQ0)
- STATIC RAM : 32Mbits (U301, PF38F2040W0YBQ0)

CPU

The ARM7TDMI 32-bit microprocessor is used and CPU controls all the circuitry. Some of the features of the ARM microprocessor include a 3 stage pipelined RISC architecture, both 32-bit ARM and 16-bit THUMB instruction sets, a 32-bit address bus, and a 32-bit internal data bus. It has a high performance and low power consumption.

FLASH ROM and SRAM

Flash Memory is used to store the program of the mobile station. Using the down-loading program, the program can be changed even after the mobile station is fully assembled.

SRAM is used to store the internal flag information, call processing data, and timer data.

KEYPAD

For key recognition, key matrix is setup using KEY_SENSE[0]-[4] signals and GPIO of output ports of QSC6010. 8 LEDs and backlight circuitry are included in the keypad for easy operation in the dark.

LCD MODULE

LCD module contains a controller which will display the information onto the LCD by 16-bit data from the QSC6010. It is also supplied stable 1.8V_MSM_E1 by inner regulator in U201 for fine view angle and and LCD reflects to improve the display efficiency.



CHAPTER 4. BGA IC Pin Check

1. U201 (QSC6010)

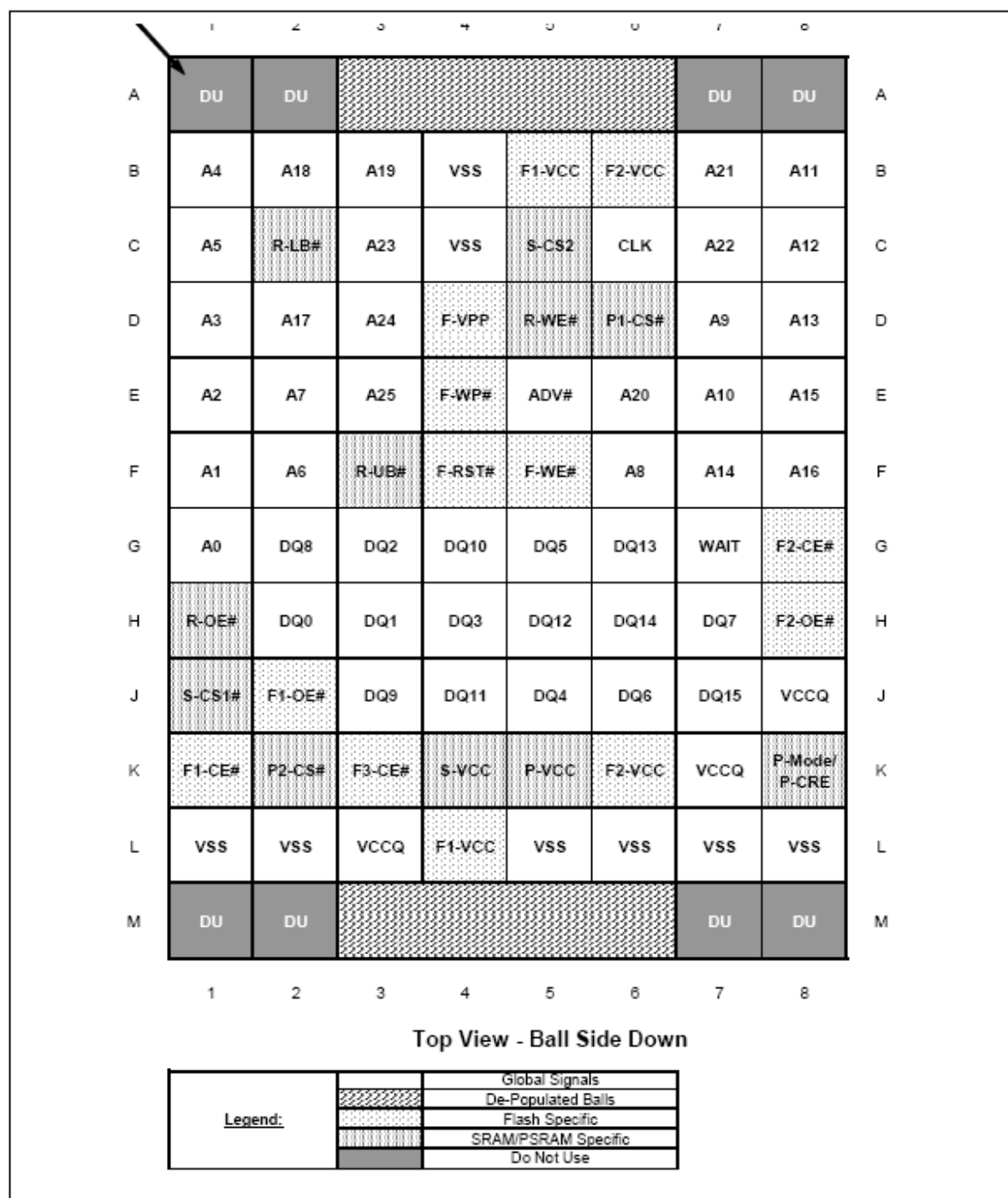
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
A	NC_1	NC_1	EB1_ADV_N	GND_B_DIG	GND_B_CORE	EB1_A_D_4	GND_B_DIG	EB1_A_19	GND_B_DIG	EB1_CS2_N	GND_B_CORE	GND_B_DIG	GND_A_AN	EAR1_OP	EAR1_ON	MIC_BAS	UNA_N	DNC	VDD_RFRX1	DNC	NC_4		A	
B	NC_1	GPI0_28	EB1_WAIT_N	VDD_P1	VDD_CORE	EB1_A_D_6	VDD_P1	EB1_A_17	VDD_P1	VDD_CORE	HA1N0	VDD_A_AN	AUXOP	AUXON	MIC2N	MIC2P	DNC	DNC	RBAS_UNA	UNA_OUT	NC_4		B	
C	GPI0_26	GPI0_27																			VDD_RFRX2	NC_4	C	
D	GPI0_22	GPI0_23	EB1_A_D_14	EB1_A_D_13	EB1_A_D_10	EB1_A_D_8	EB1_A_D_2	EB1_A_21	EB1_CS0_N	GND_A_AN	HA1N1	HRH_OUT	GND_A_AN	MIC1N	MIC1P	GND_A_RF4	GND_A_RF4	GND_A_RF4	GND_A_RF4	VDD_RFRX2	MX_INM		D	
E	EB2_UB_N	GPI0_34	EB1_A_D_15	EB1_A_D_12	EB1_A_D_5	EB1_A_D_9	EB1_A_22	EB1_A_18	EB1_LRES_OUTM	GND_A_AN	VDD_A_AN	VDD_A_AN	COOMP	VDD_A_AN	GND_A_AN	GND_A_RF4	GND_A_RF4	GND_A_RF4	GND_A_RF4	VDD_RFRX2	MX_INP		E	
F	EB2_EB2_N	EB2_UB_N	EB12_D_15	EB12_D_11															GND_A_RF3	GND_A_RF3	GND_VDD_RFRX3		F	
G	GND_B_DIG	VDD_P2	EB12_WE_N	EB12_OE_N		EB1_A_D_9	EB1_A_D_3	EB1_A_16	EB1_A_23	MODUX	GND_B_AN	VDD_A_AN	VDD_A_AN	GUARD_RING1	GND_B_SR				GND_A_RF2	GND_A_RF2	VDD_RFRX3	RX_CP		G
H	EB2_D_8	EB2_D_10	EB12_D_14	EB12_D_13		EB2_D_12	EB1_A_D_1	EB1_A_20	EB1_A_24	VDD_B_AN	GND_A_AN	GND_A_AN	GND_A_AN	GND_B_SR					VDD_RFRX4	GND_A_RF2	GND_A_RF2	GND_VDD_RFTX1		H
J	GND_B_CORE	VDD_CORE	EB12_D_11	EB12_D_9		EB2_D_7	EB2_D_4							GND_B_SR	GND_B_SR				GND_A_RF2	GND_A_RF2	VDD_RFTX1	TX_CP		J
K	GND_B_DIG	EB2_D_5	EB12_D_6	EB12_D_3		EB2_D_2	EB2_D_1			GND_B_AN	GND_B_AN	DNC		GND_B_SR	RBAS_TX				GND_A_RF1	GND_A_RF1	VDD_RFTX1	VDD_RFTX2		K
L	LCD_CS_N	VDD_P2	EB12_D_0	LCD_RS		EB12_RES_OUTM	LCD_EN			VDD_B_AN	GND_B_SR	GND_B_SR	DNC	GUARD_RING2	GND_A_RF1				GND_A_RF1	GND_A_RF1	GND_A_RF1	CELL_OUTM		L
M	EB2_CS0_N	EB2_CS2_N	GRO_36	GRO_34		GPI0_34	GPI0_31			GND_B_DIG	GND_B_SR	GND_B_SR	DNC	CELL_PWR_N	GND_A_RF1				GND_A_RF1	GND_A_RF1	GND_A_RF1	CELL_OUTP		M
N	GPI0_25	GPI0_15	GRO_21	GRO_29		GPI0_8	GPI0_35			DNC	VREG_TCXO	DNC	GND_TCXO	VDD_IN	KPD_PWR_N				GND_P_DRV1	VDD_RFTX5	VDD_RFTX4	VDD_RFTX3		N
P	GND_B_DIG	VDD_P3	GRO_12	GRO_16		GPI0_19	GPI0_20							KPD_DRV_N	VB_DRV_N				VDD_IN	VREG_MSM1	VDD_RFTX4	VDD_RFTX4		P
R	GPI0_13	GPI0_7	GRO_39	GRO_41		GPI0_9	GPI0_17	GRO_4	TDO	GND_B_DIG	GND_B_CORE	TRK_LO_ADV	TCXO_OUT	RS_HOLD	LCD_DRV_N				GND_P_GEN	GND_P_RF	MPP1	MPP2		R
T	GPI0_5	GPI0_18	GRO_38	GRO_40		GPI0_44	GPI0_5	GRO_2	TOK	TDI	VDD_CORE	RESN_N	RON_RESET_N	XO_TUNE	GND_P_GEN				GND_P_RF	VDD_IN	VREG_RFRX	VREG_RFTX		T
U	GND_B_CORE	VDD_CORE	GRO_34	GRO_30															GND_P_DRV1	VDD_IN	SPKR_IN_P	SPKR_IN_M		U
V	GND_B_DIG	VDD_P3	GRO_30	GRO_32	GRO_46	GRO_51	GRO_42	TRST_N	MODE_9	MODE_3N	GPI0_9	VDD_P3	VDD_IN	VCHG	VBAT	GND_P_GEN	GND_P_SPKR	SPKR_OUT_P	VREG_MSM1	VREG_MSM2			V	
W	GPI0_37	GPI0_36	GRO_49	GRO_47	GRO_45	GRO_43	GRO_48	RSTOK	DNC	MODE_1	BIU_MODE	VREG_MSM3	VDD_IN	VCON	CHG_CNT_N	BAT_RET_N	USB_ID	SPKR_OUT_M	VDD_IN	XTAL_32K_IN			W	
Y	PA_ON	GPI0_33																		GND_P_SPKR	XTAL_32K_OUT			Y
AA	NC_2	GPI0_36	UART1_RX_D	VDD_P3	VDD_CORE	GPI0_51	VDD_CORE	RESOUT_N	VDD_P3	GPI0_11	GPI0_10	VREG_RJUM	ISNS_P	ISNS_M	USB_BUS	VDD_IN	REF_GND	REF_BIP	REF_SET		NC_3		AA	
AB	NC_2	NC_2	GPI0_33	UART1_TX_D	GND_B_DIG	GND_B_CORE	GPI0_3	GND_B_CORE	TMS	GND_B_DIG	GPI0_32	VREG_MSM4	GND_MSMC	VDD_IN_CORE	VREG_MSMC	USB_DP	USB_DM	VREG_USB	XO_IN	XO_OUT	NC_3	NC_3	AB	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
	Baseband functions		Analog / RF functions			Power supply voltages				Power management functions								NC (mechanical), DNC				Grounds		

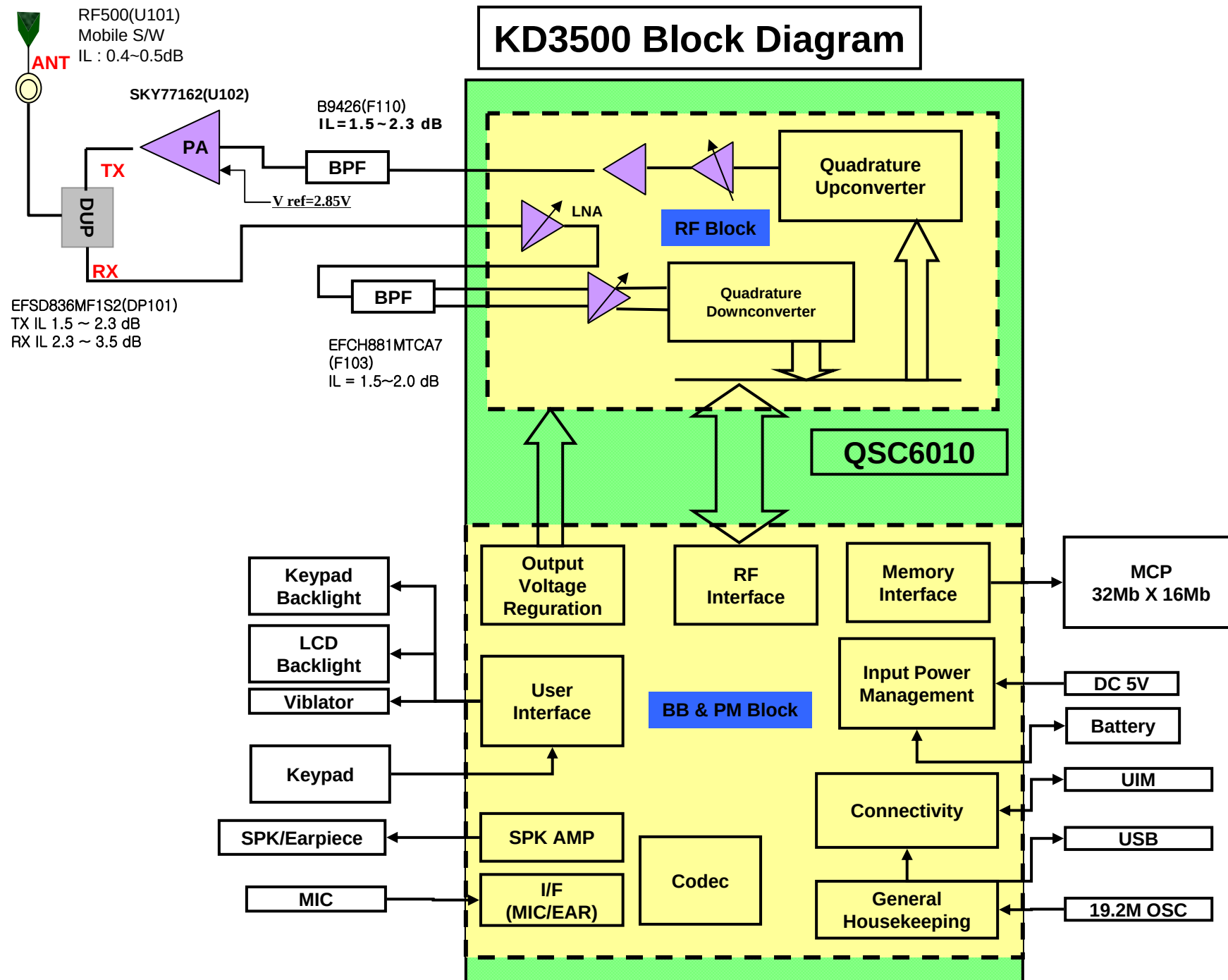
Figure 2-1 QSC60X0 pin assignments (top view)



2. U310 (Memory)

88-Ball (8x10 Active Ball Matrix) QUAD+ Ballout



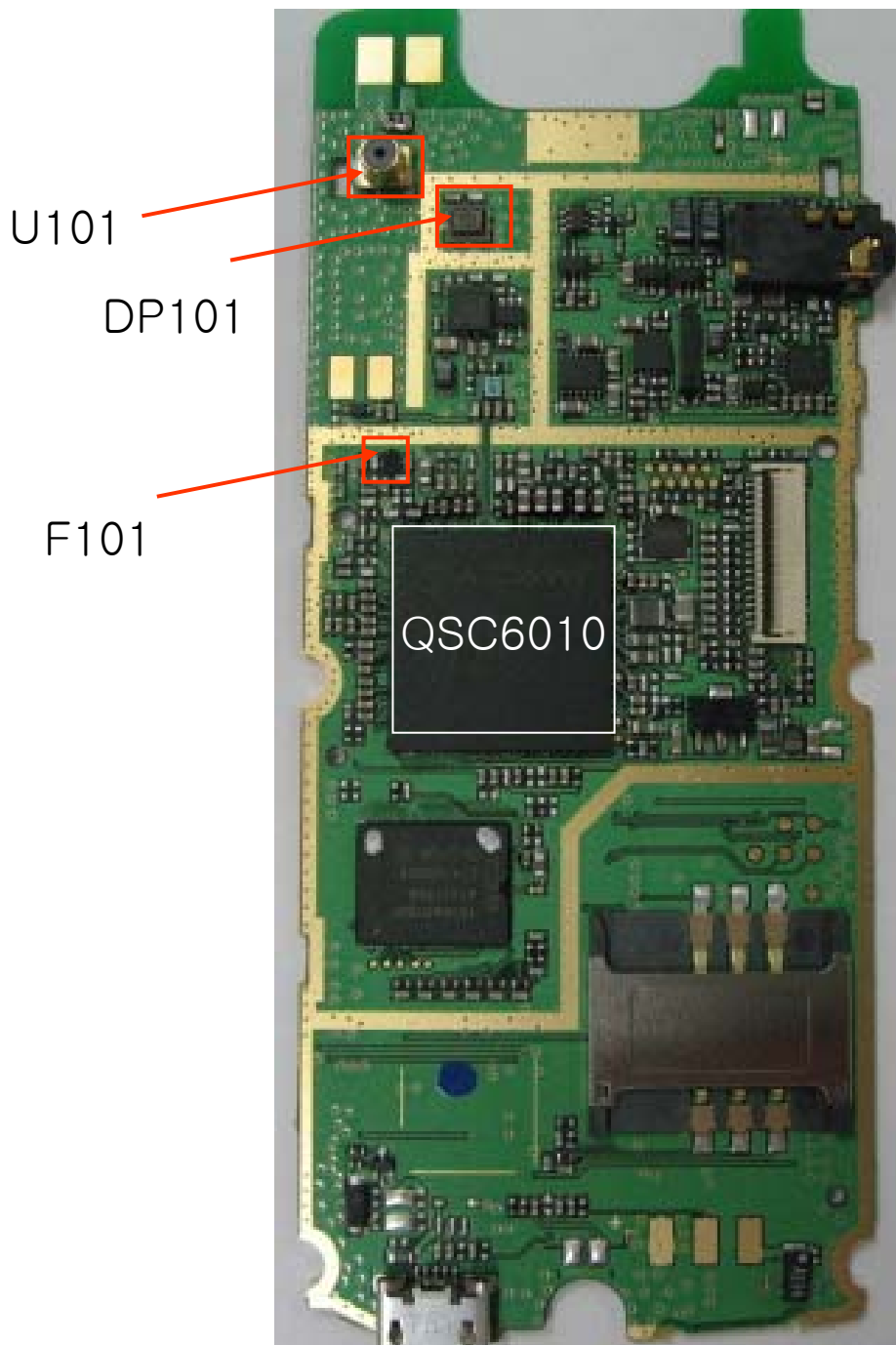


CHAPTER 4. Trouble Shooting

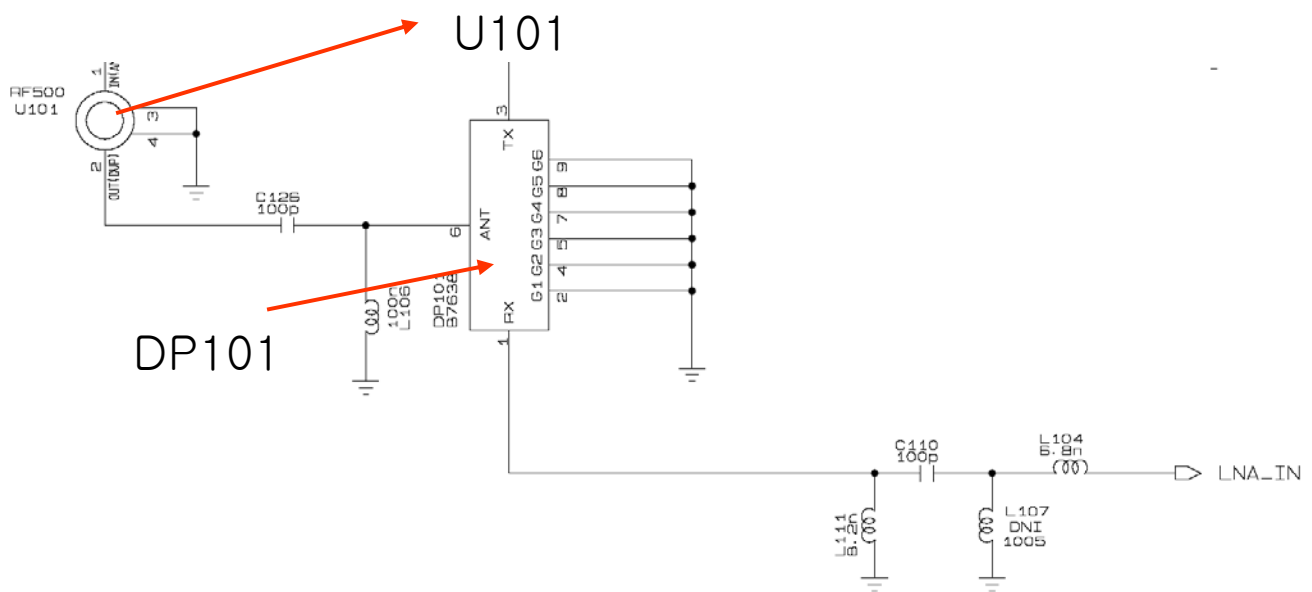
4.1 Rx Part Trouble

When Rx Sensitivity isn't good enough

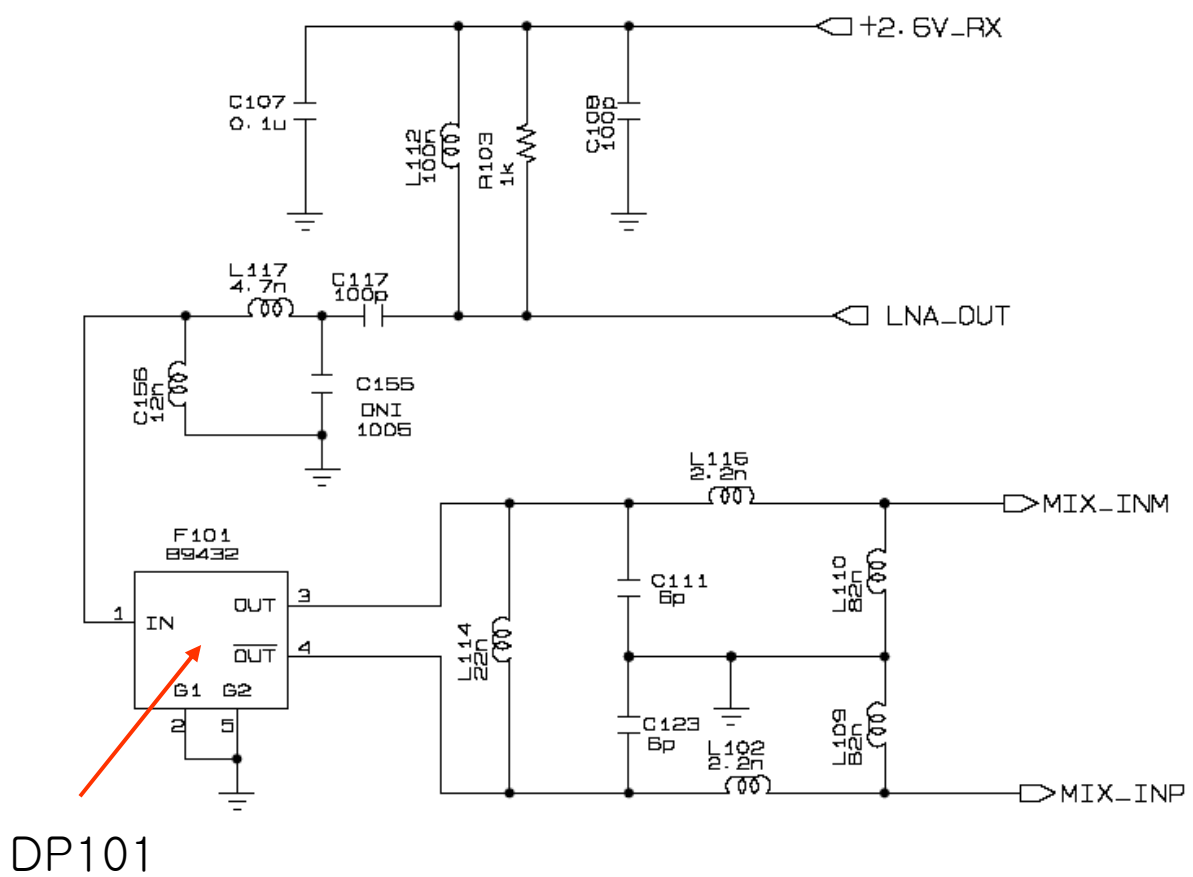
Test Point



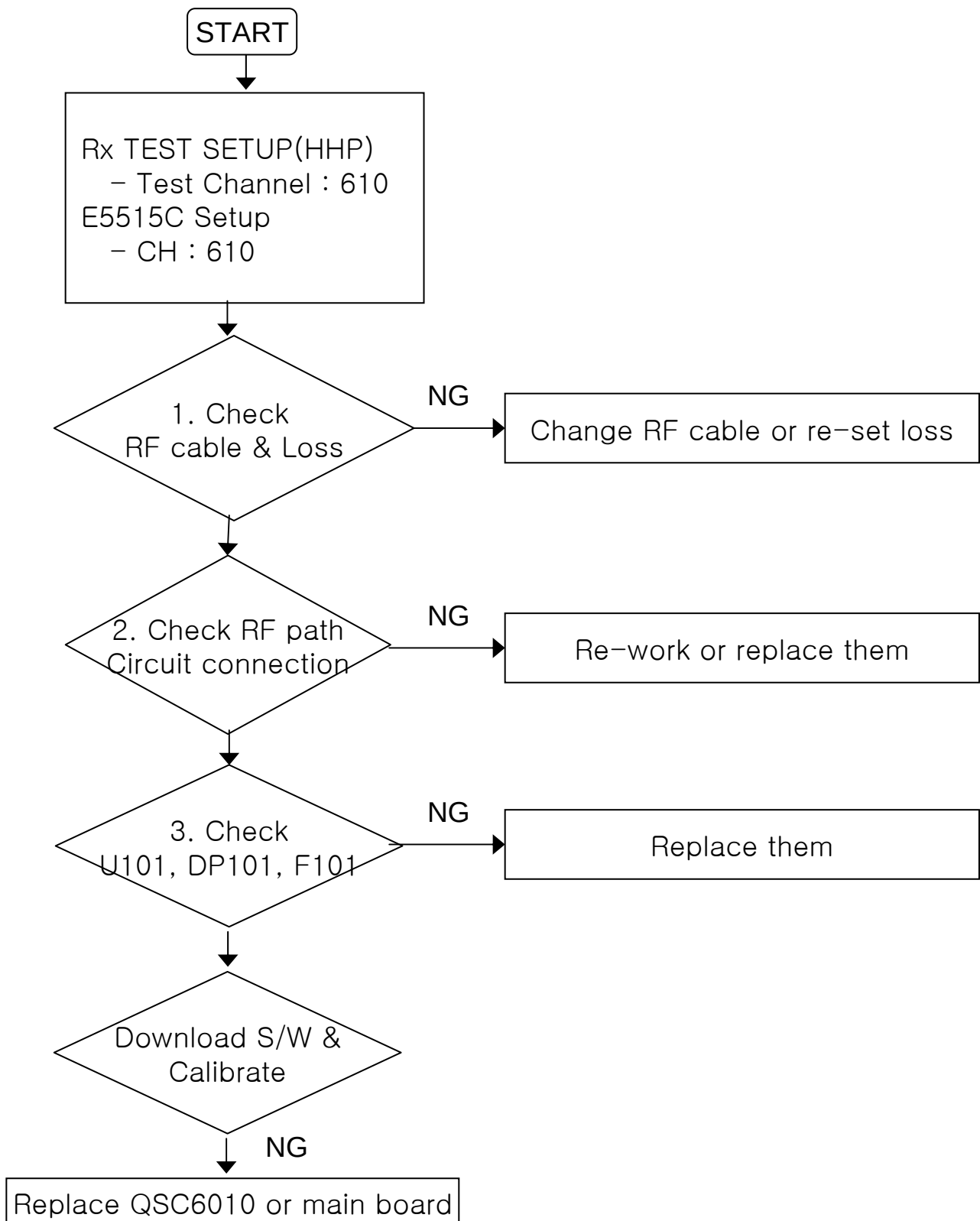
Circuit Diagram



<RF Rx PATH>

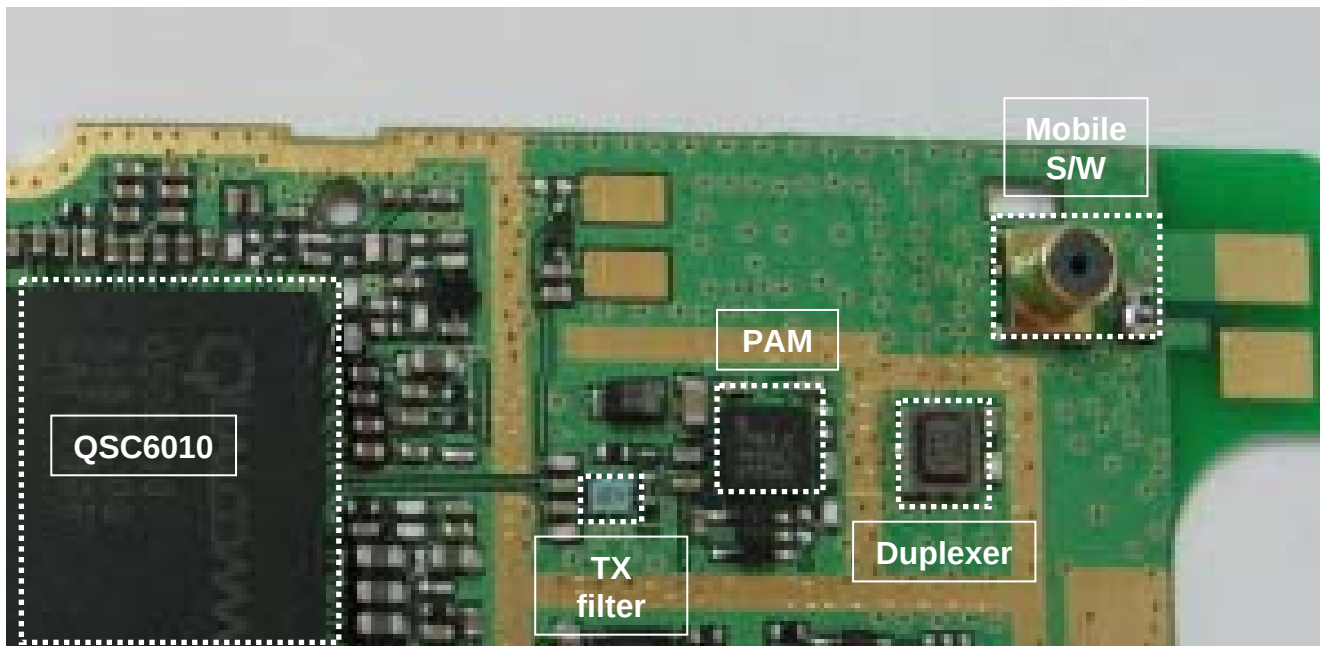


Checking Flow

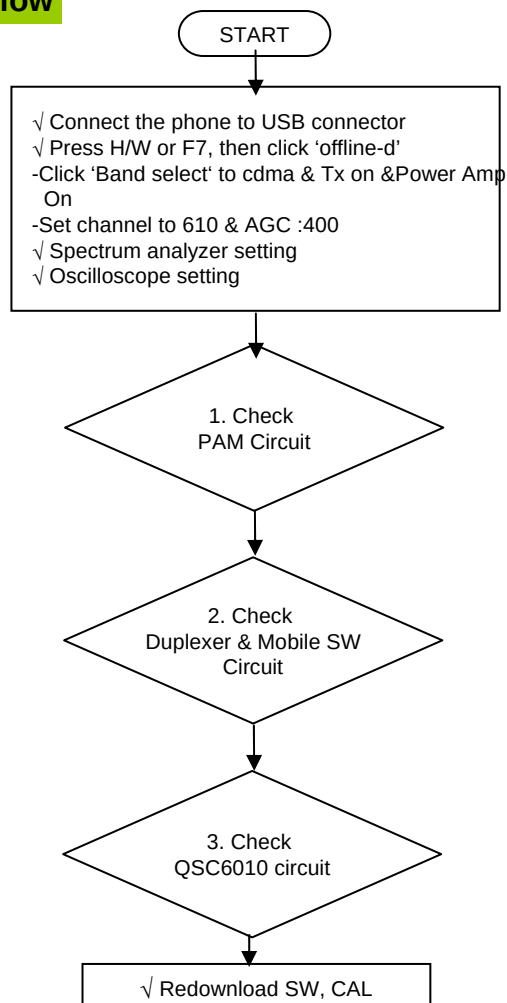


4.2 Tx Trouble

Test Point

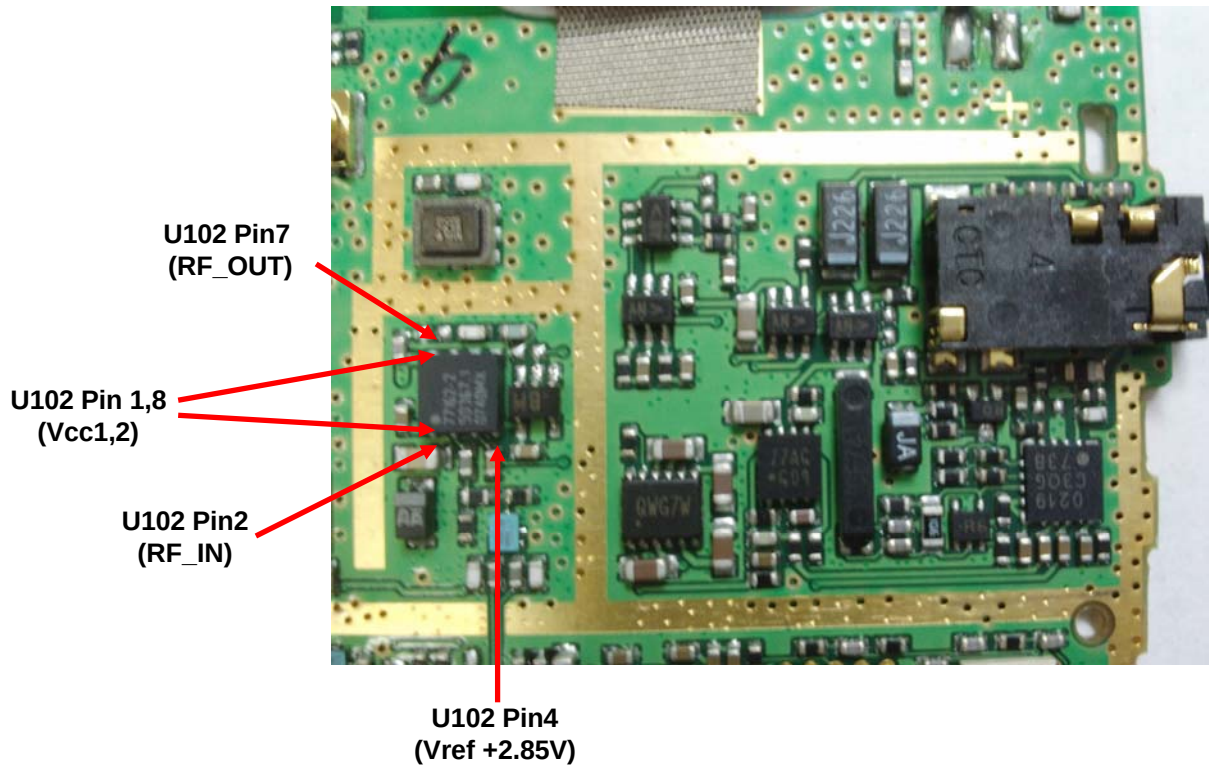


Checking Flow

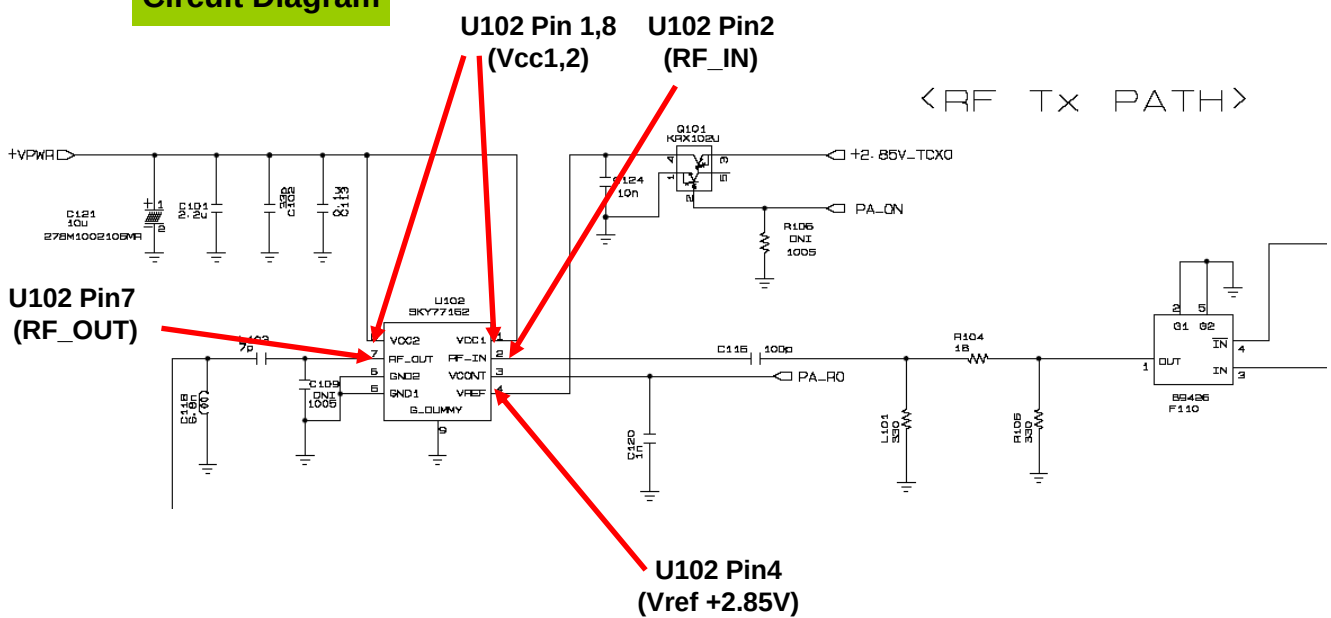


4.2.1 Check PAM Circuit

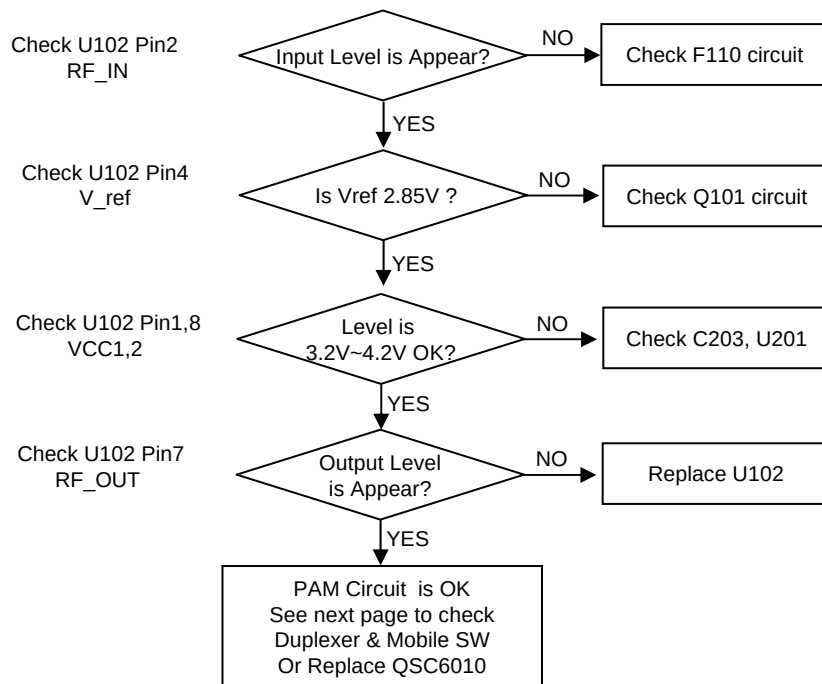
Test Point



Circuit Diagram



Circuit Flow



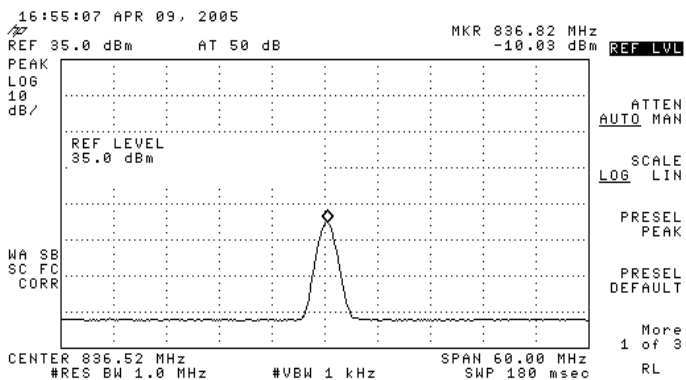
Waveform

SPECTRUM ANALYZER CONDITION

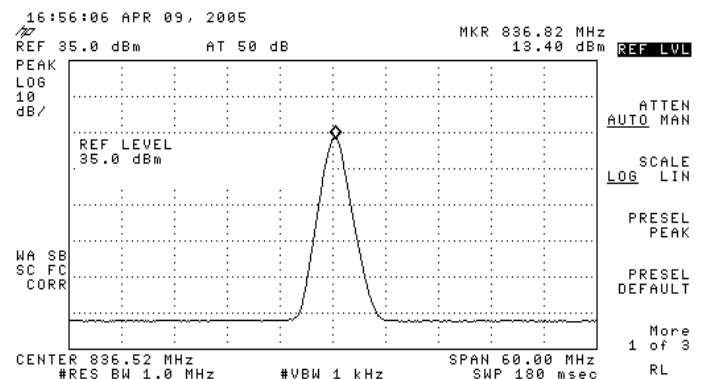
-RBW : 1MHz,VBW: 1KHz

-Span : 60MHz

-Frequency : DCN(836.52MHz)



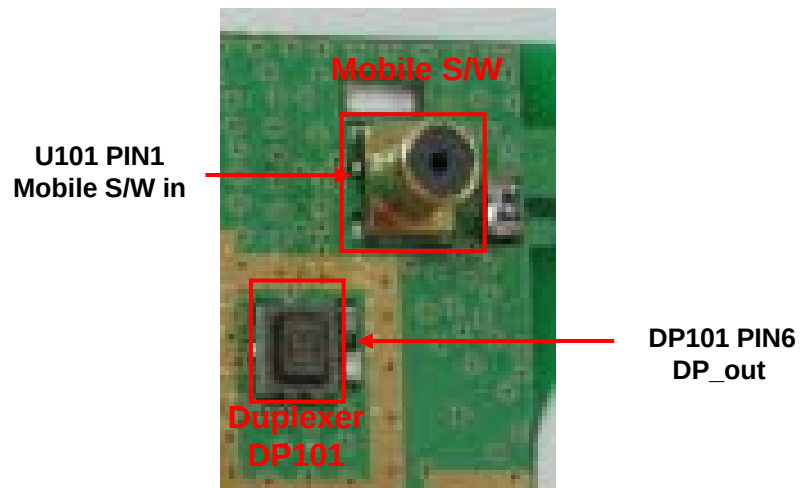
U102 Pin2 DCN PAM_IN



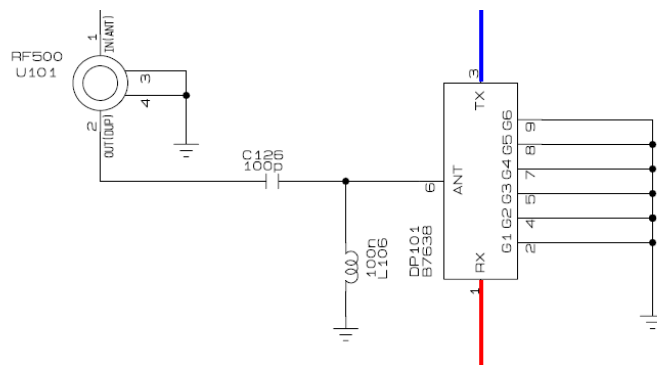
U102 Pin7 DCN PAM_OUT

4.2.2 Check Duplexer & Mobile SW

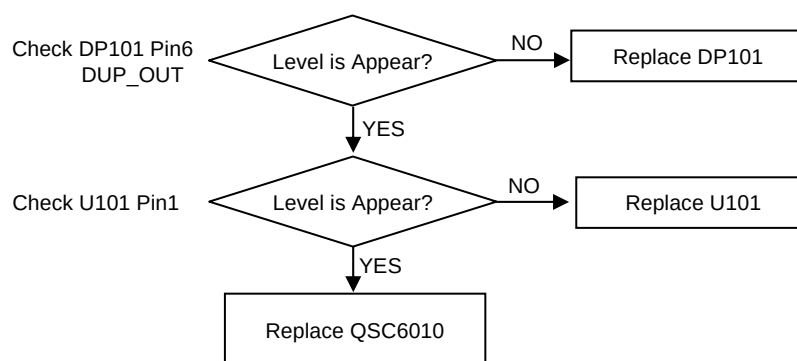
TEST POINT



Circuit Diagram



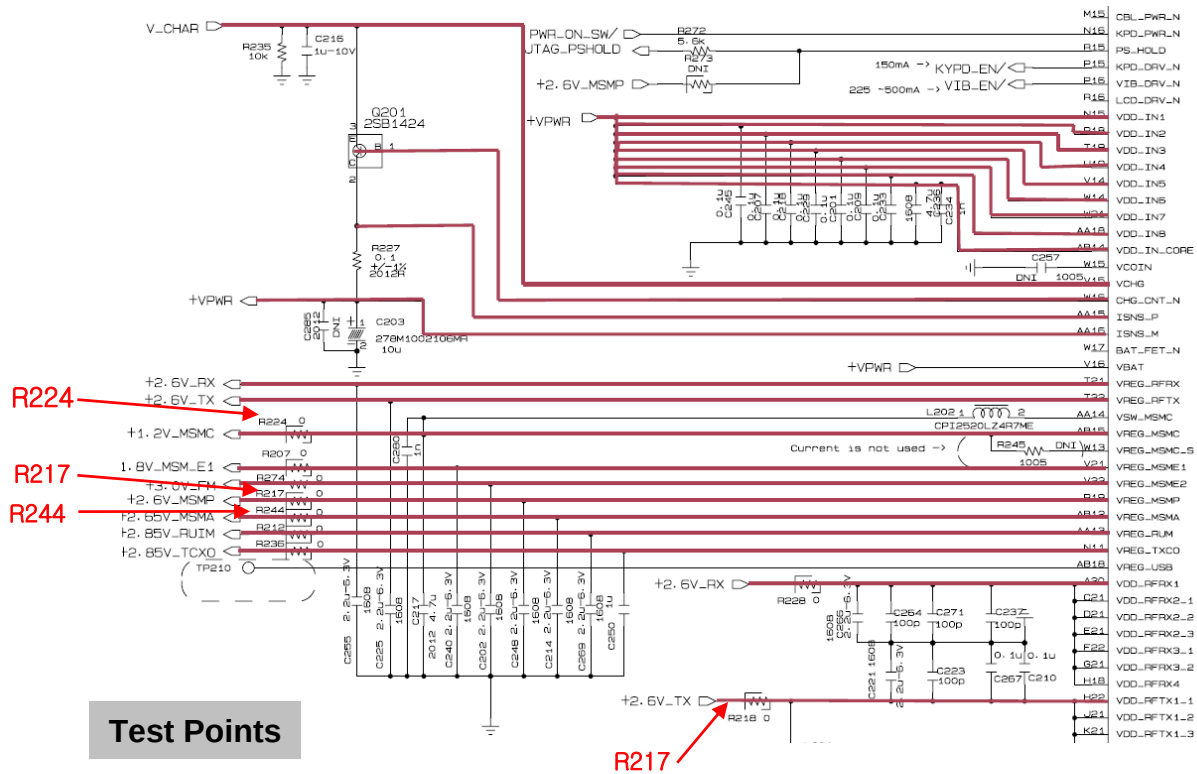
Circuit Flow



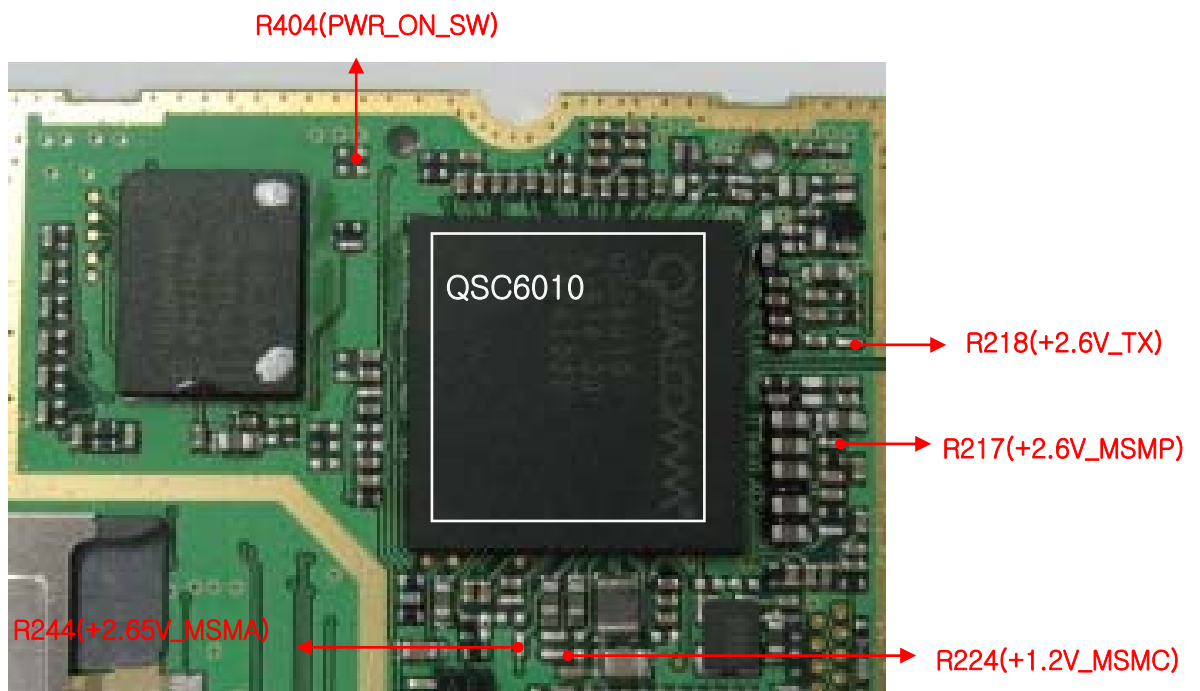
4.3 Logic Part Trouble

4.3.1 Power On Trouble

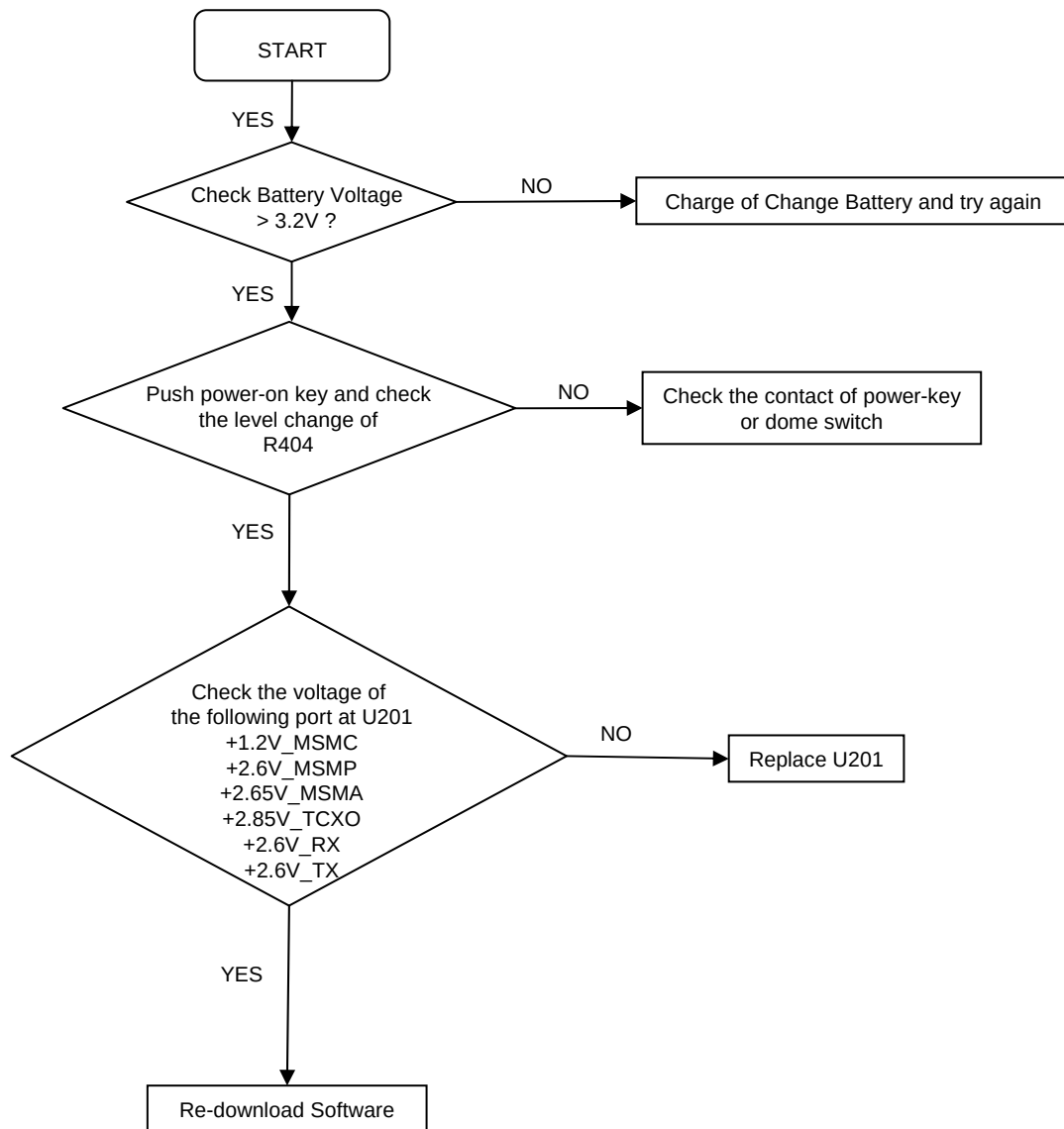
Circuit Diagram



Test Points



Checking Flow

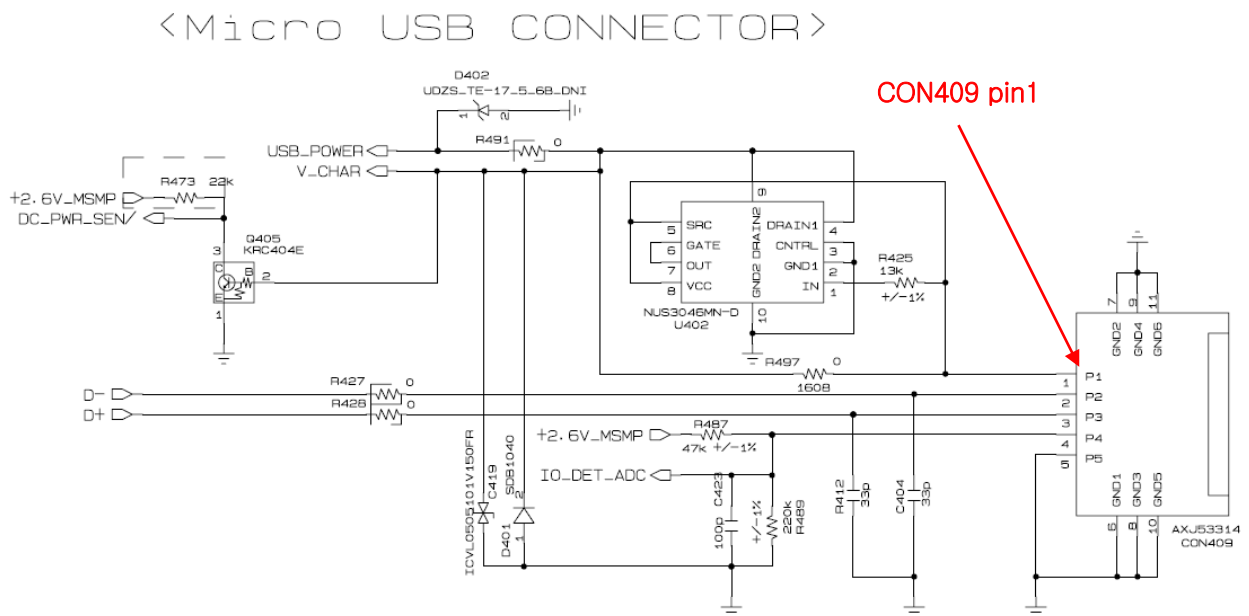


4.3.2 Charging Trouble

Test Points

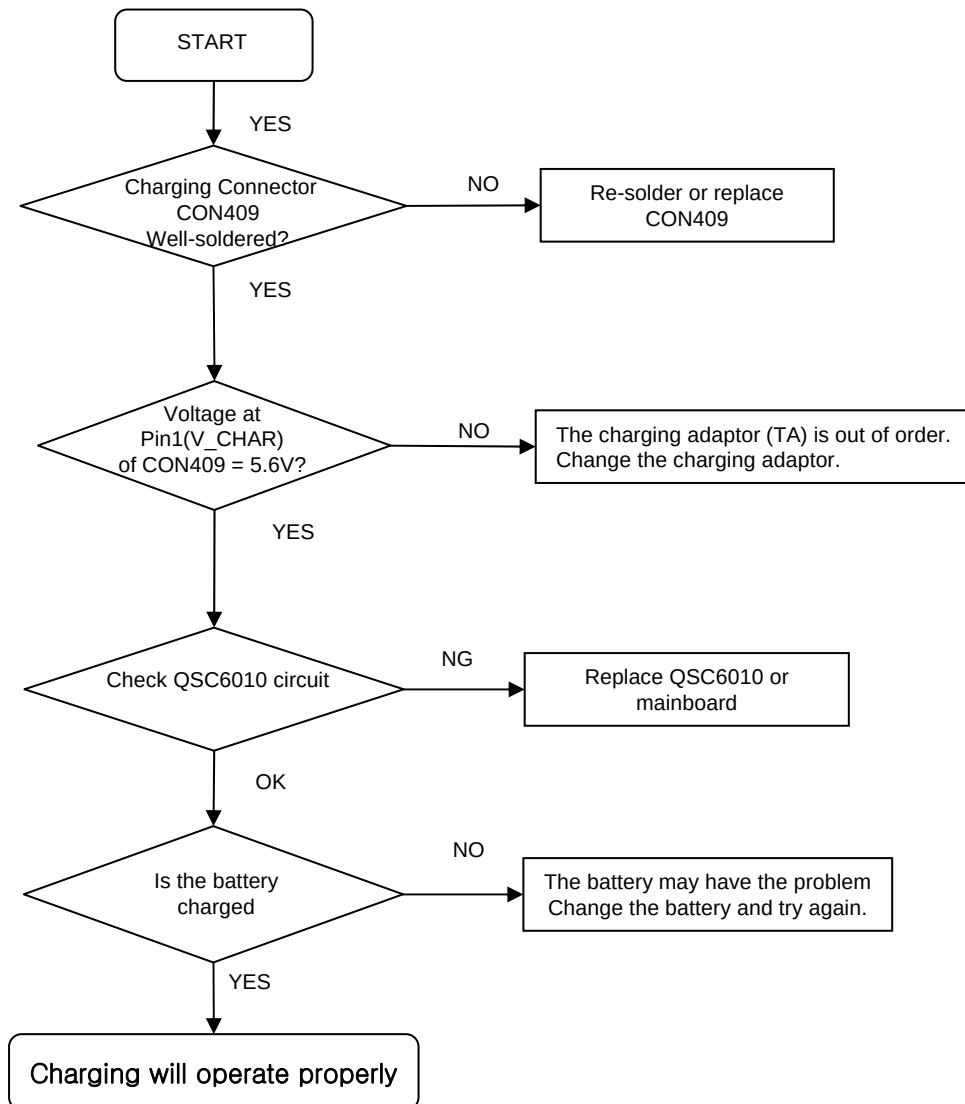


Circuit Diagram



Checking Flow

SETTING : Connect the battery and the charging adaptor (TA) to the phone



4.3.3 Audio Trouble

Test Points

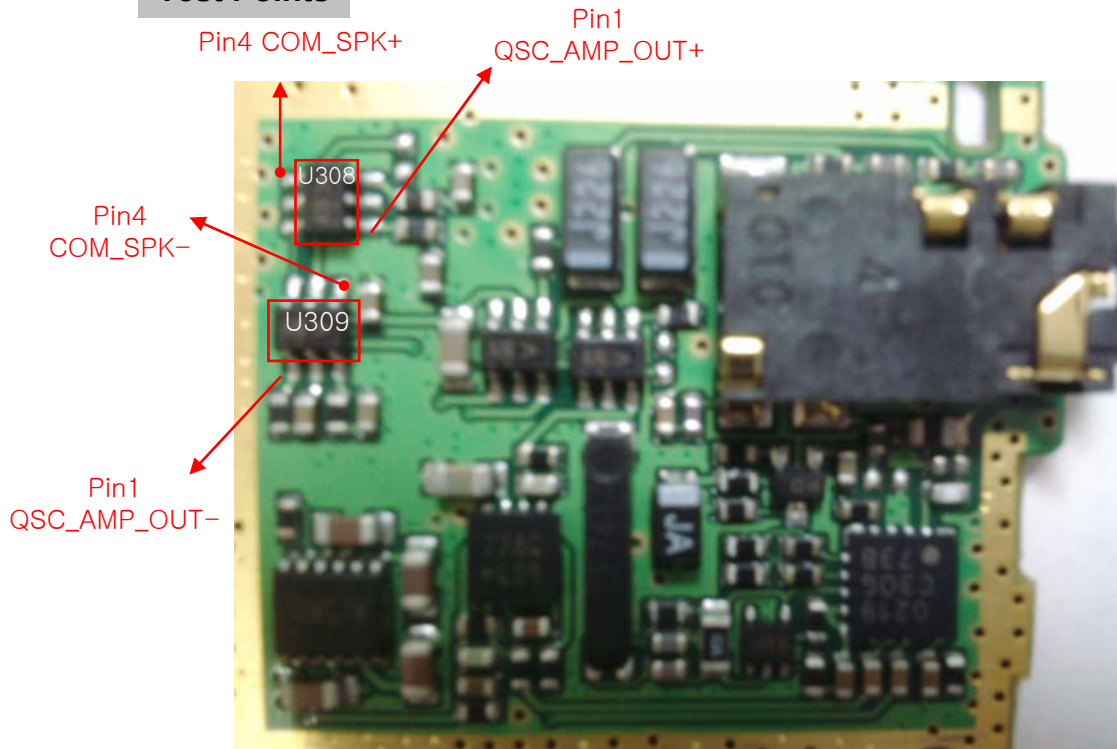
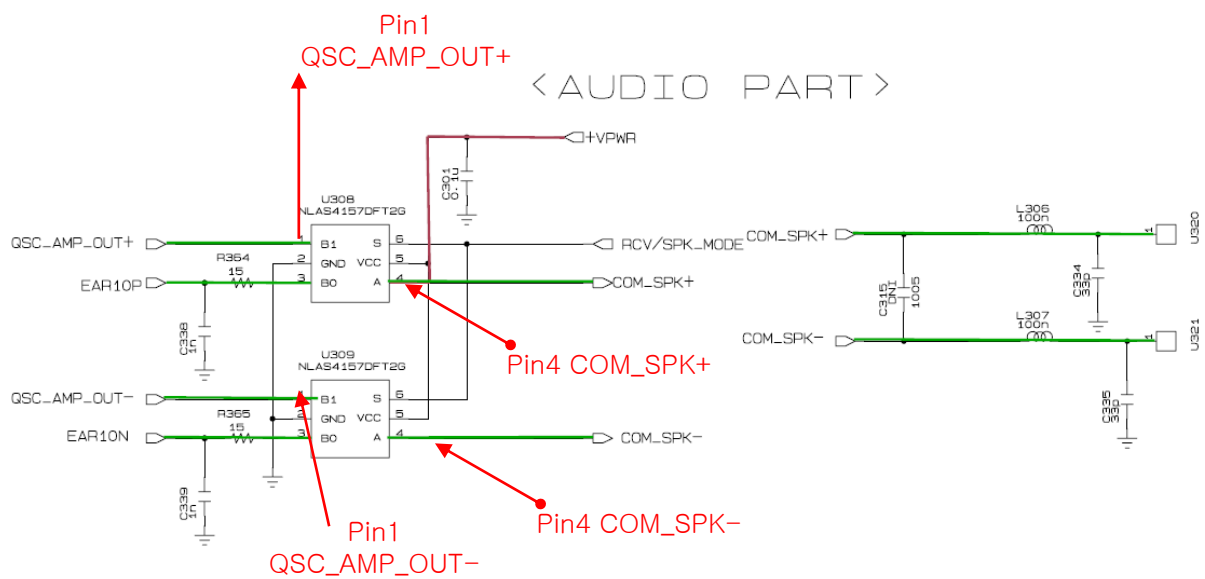


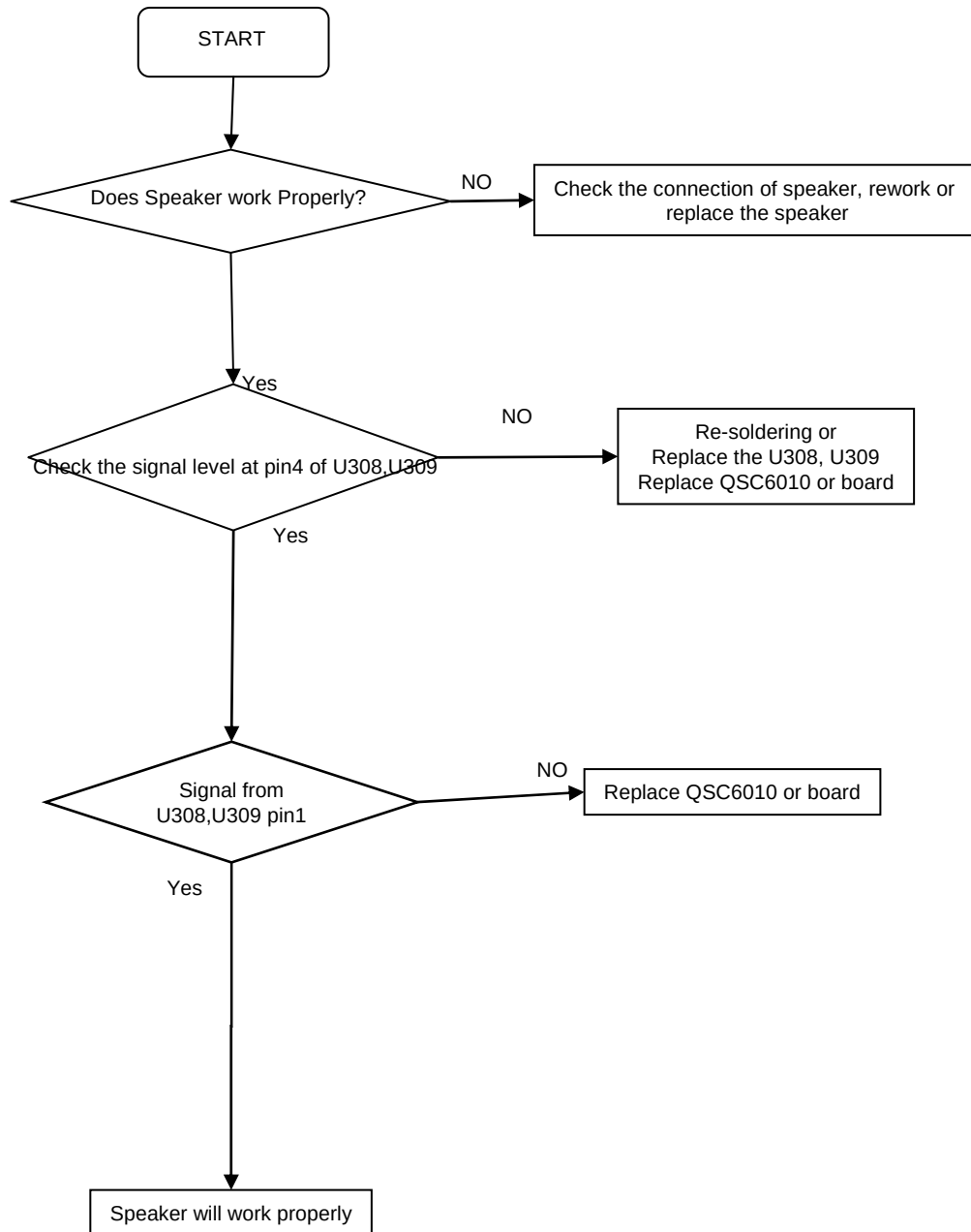
Figure 4.3.3 RECEIVER PART

Circuit Diagram



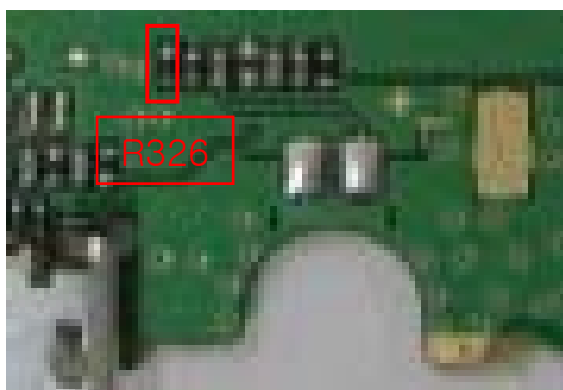
Checking Flow

SETTING : “Ringers” at Sounds menu

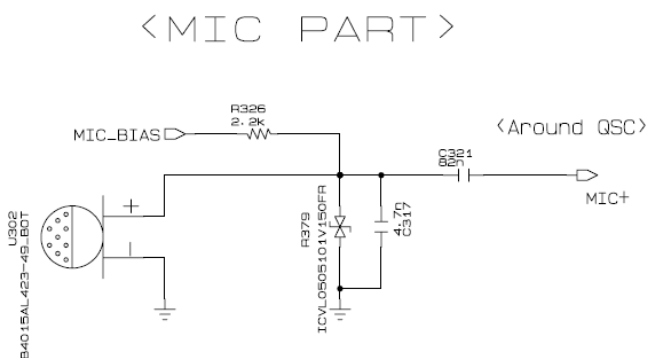


4.3.6 MIC Trouble

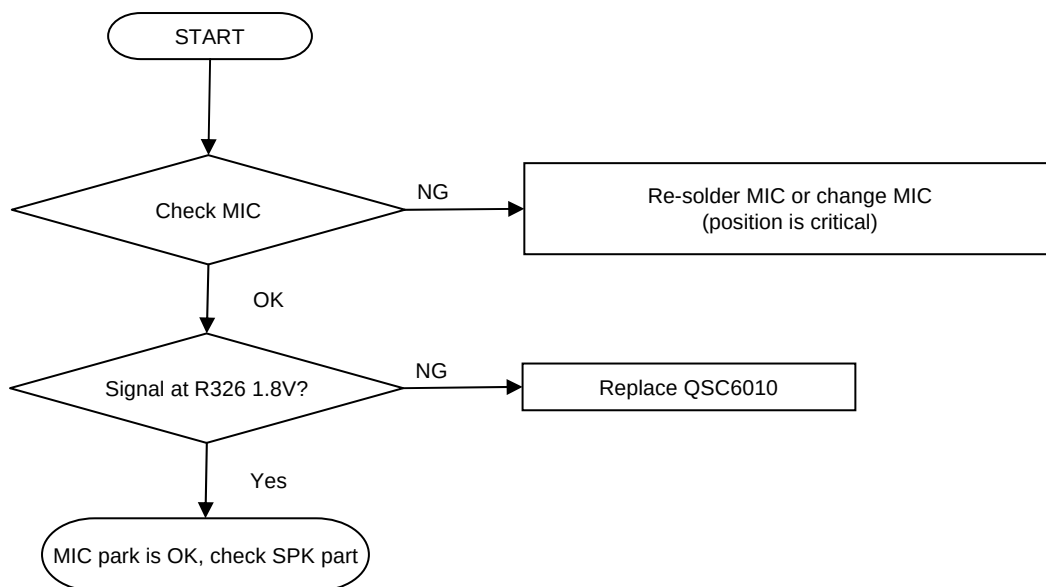
Test points



Circuit Diagram

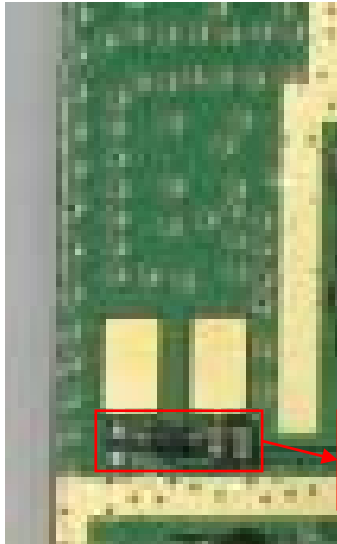


Checking Flow



4.3.7 Vibrator Trouble

Test points



D301, C324,
C345, C346

Circuit Diagram

< MOTOR >

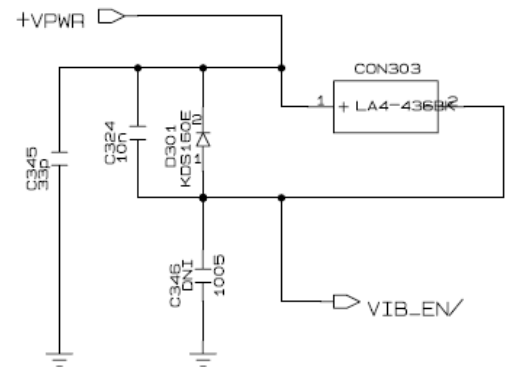
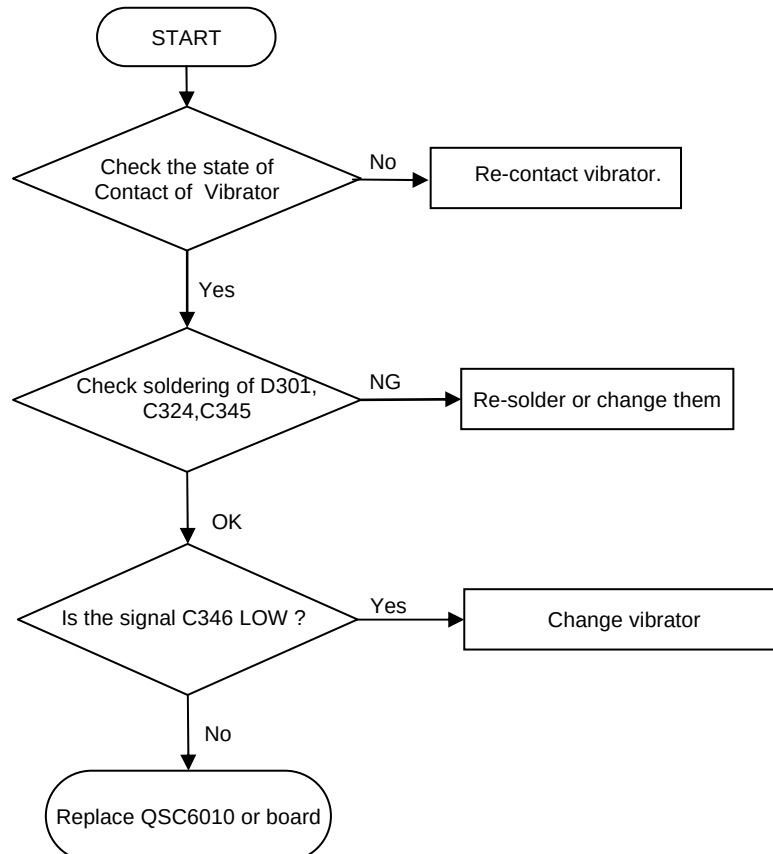


Figure 4.3.7 Vibrator PART

Figure 4.3.7 VIBRATION CONTROL BLOCK

Checking Flow

SETTING : “Vibrator on” at Sounds of test menu



4.3.8 Key Backlight LED Trouble

Test Points

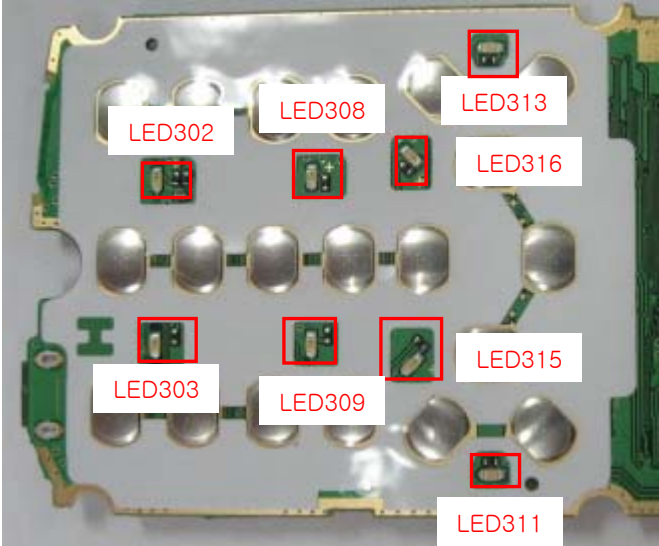


Figure 4.3.8 KEYPAD BACK LIGHT PART

Circuit Diagram

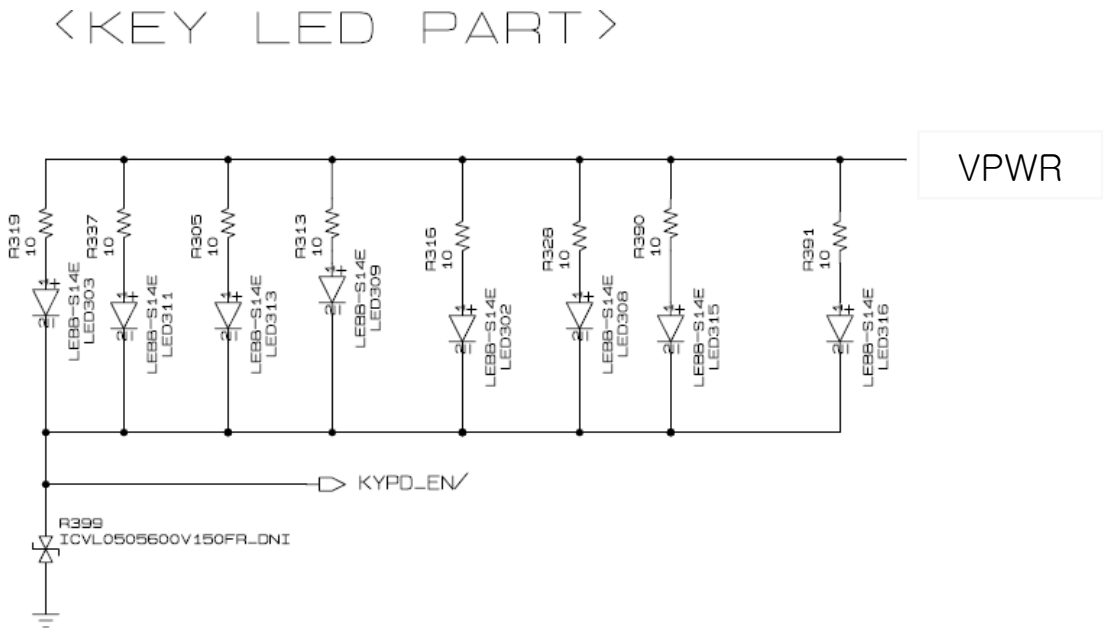
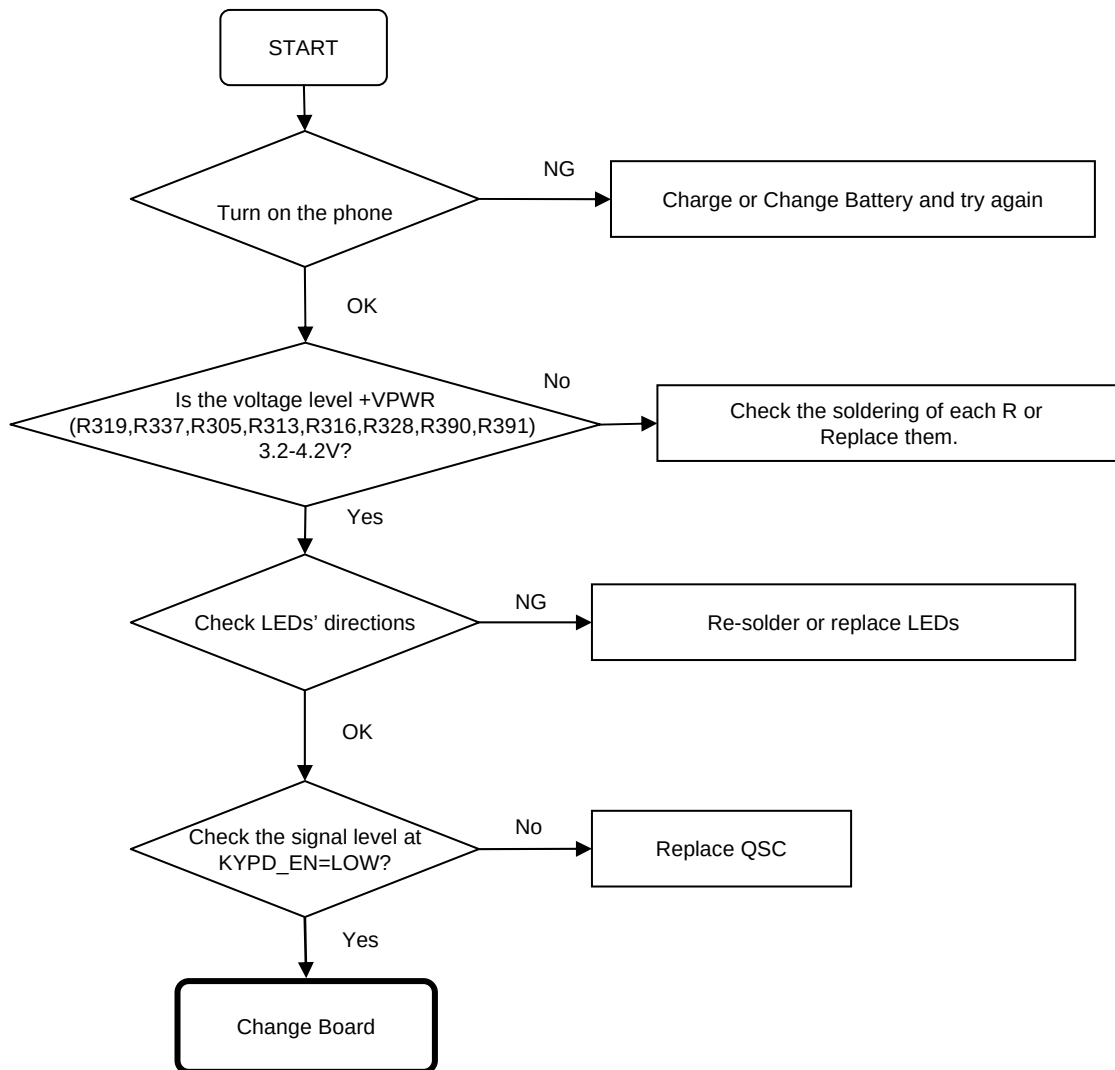


Figure 4.3.8 KEYPAD Back Light Circuit

Checking Flow



4.3.9 Earphone Trouble

Test Points

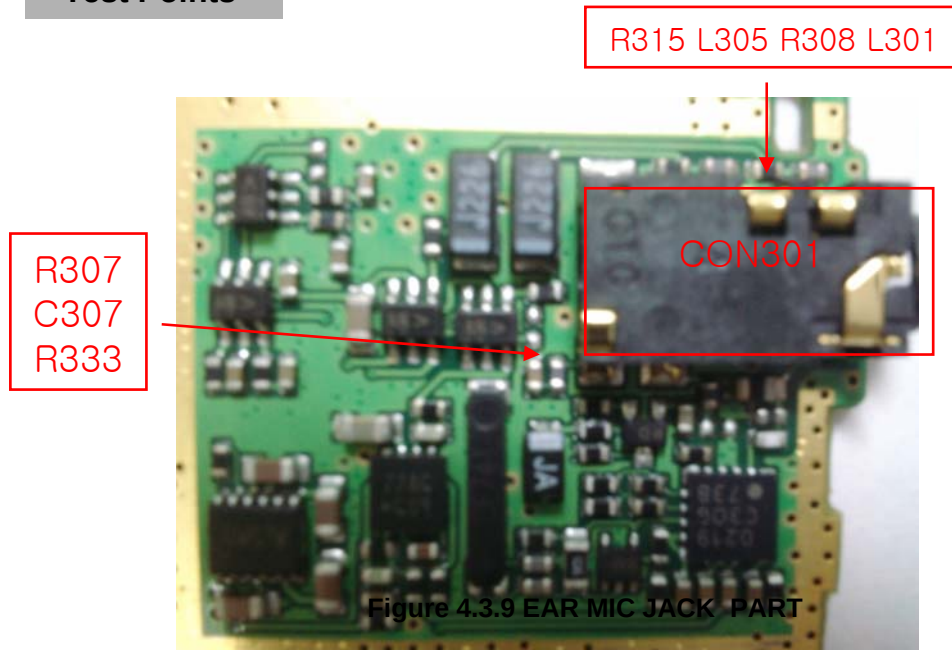
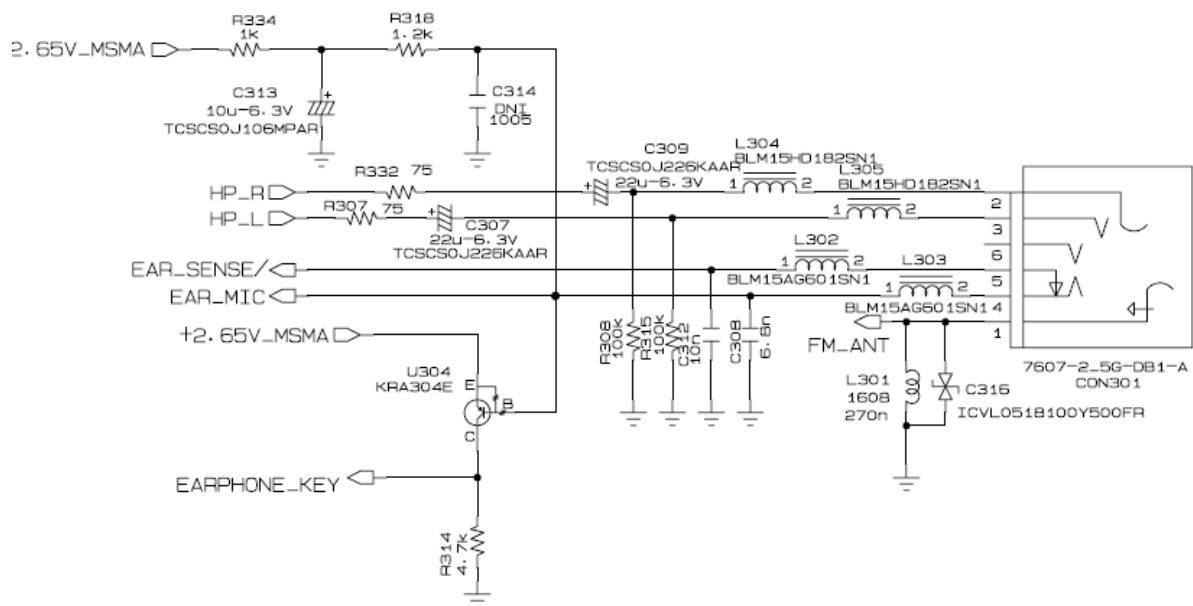


Figure 4.3.9 EAR MIC JACK PART

Circuit Diagram

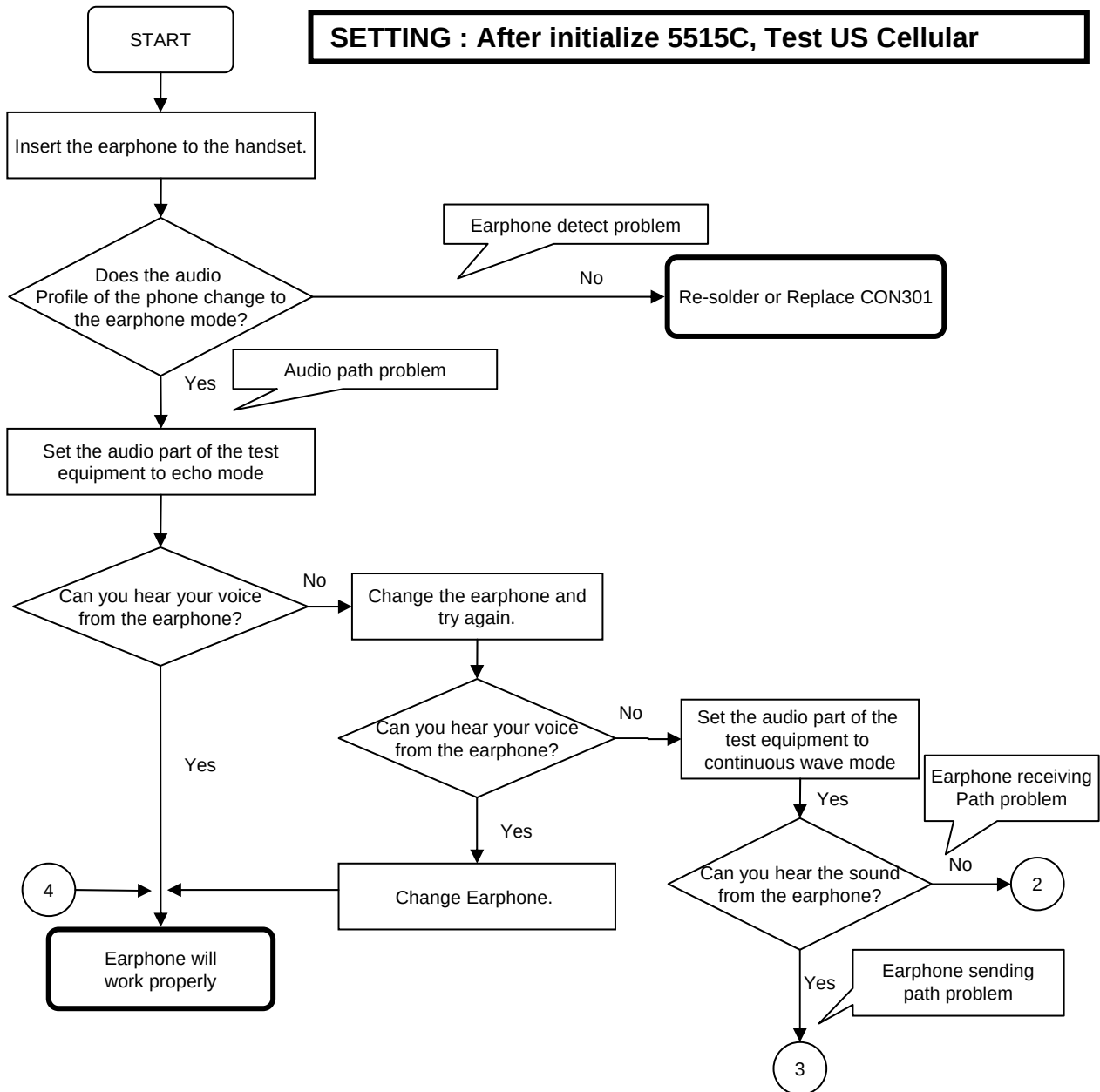
<EAR MIC JACK>



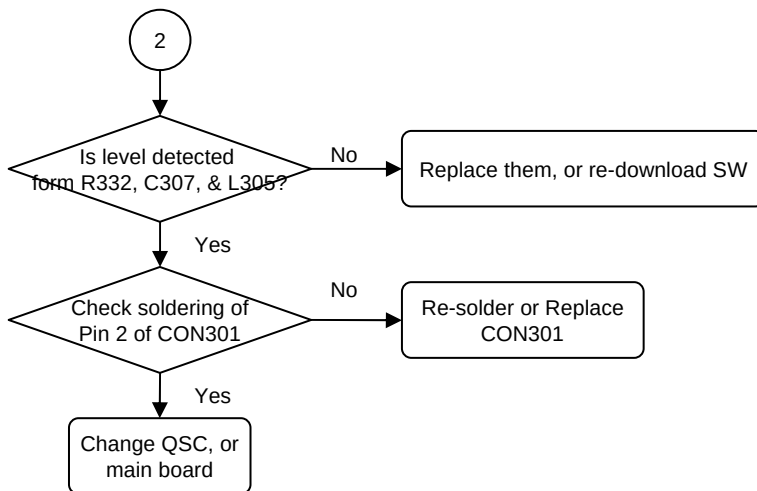
Circuit 4.3.9 EAR MIC JACK PART

Checking Flow

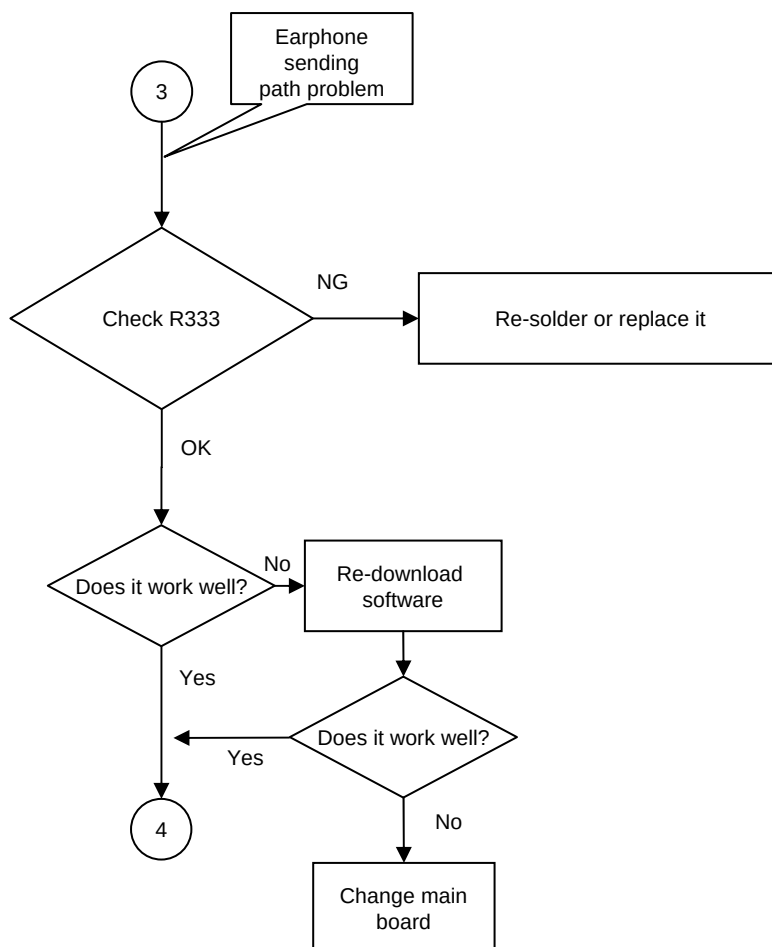
SETTING : After initialize 5515C, Test US Cellular



Earphone receiving path problem

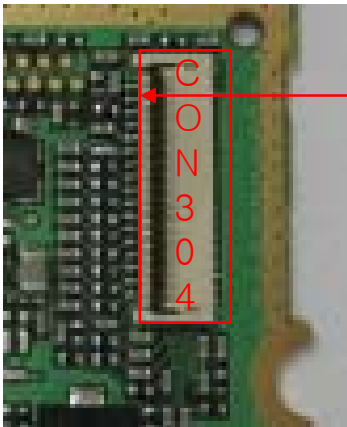


Earphone sending path problem



4.3.10 LCD Trouble

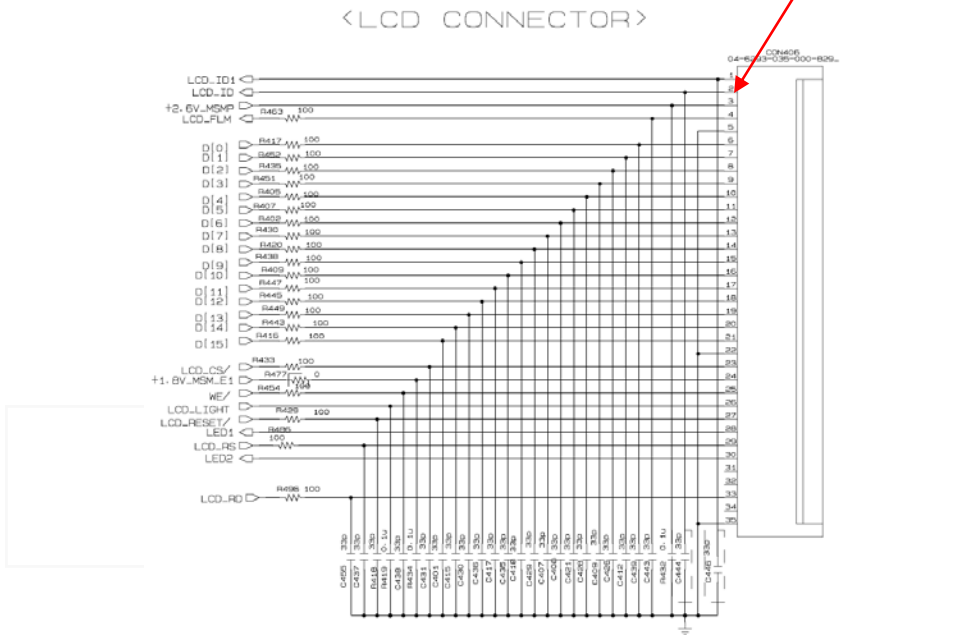
Test Points



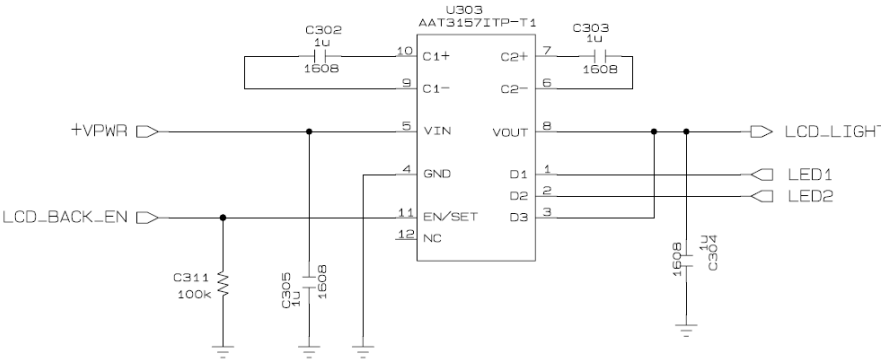
CON304 pin3

Circuit Diagram

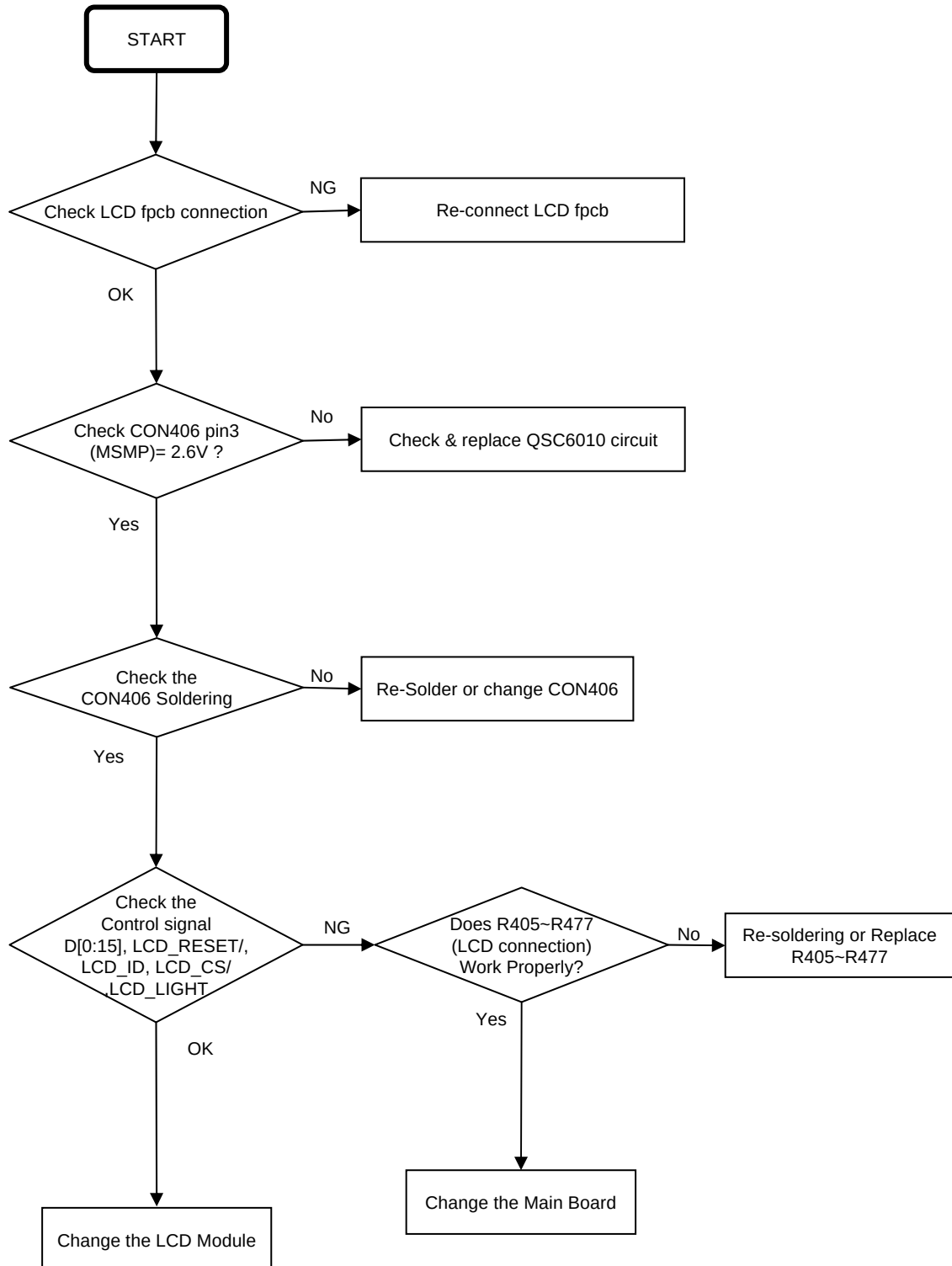
CON304 pin3



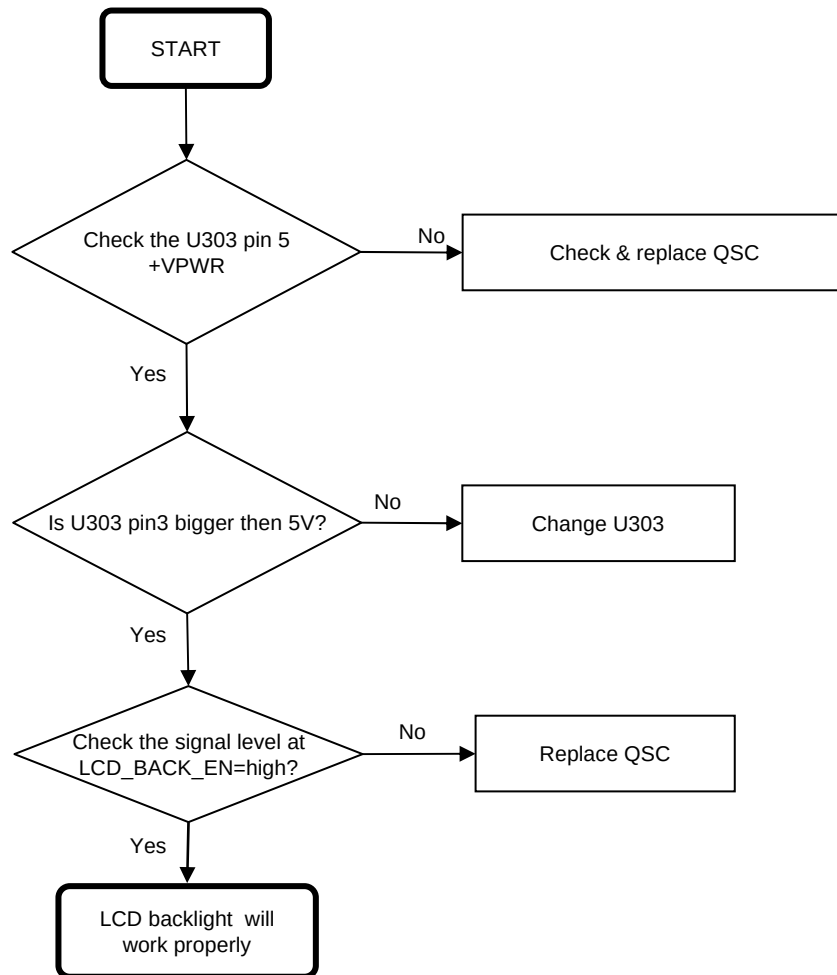
<LCD Back Light>



Checking Flow : LCD

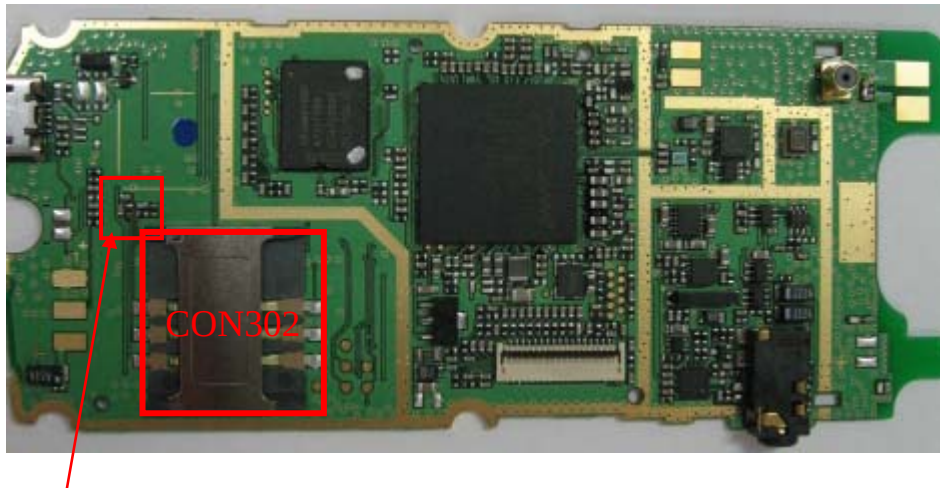


Checking Flow : Back Light



4.3.11 UIM Trouble

Test Points

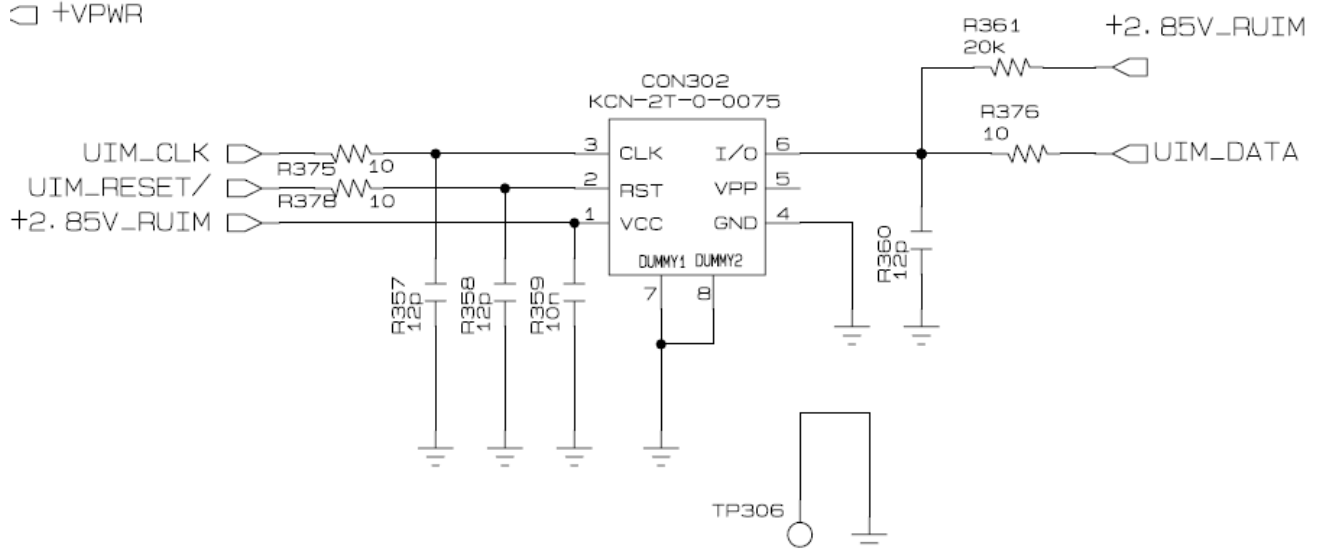


(R375, R378, R361, R376)

Circuit Diagram

<UIM CARD>

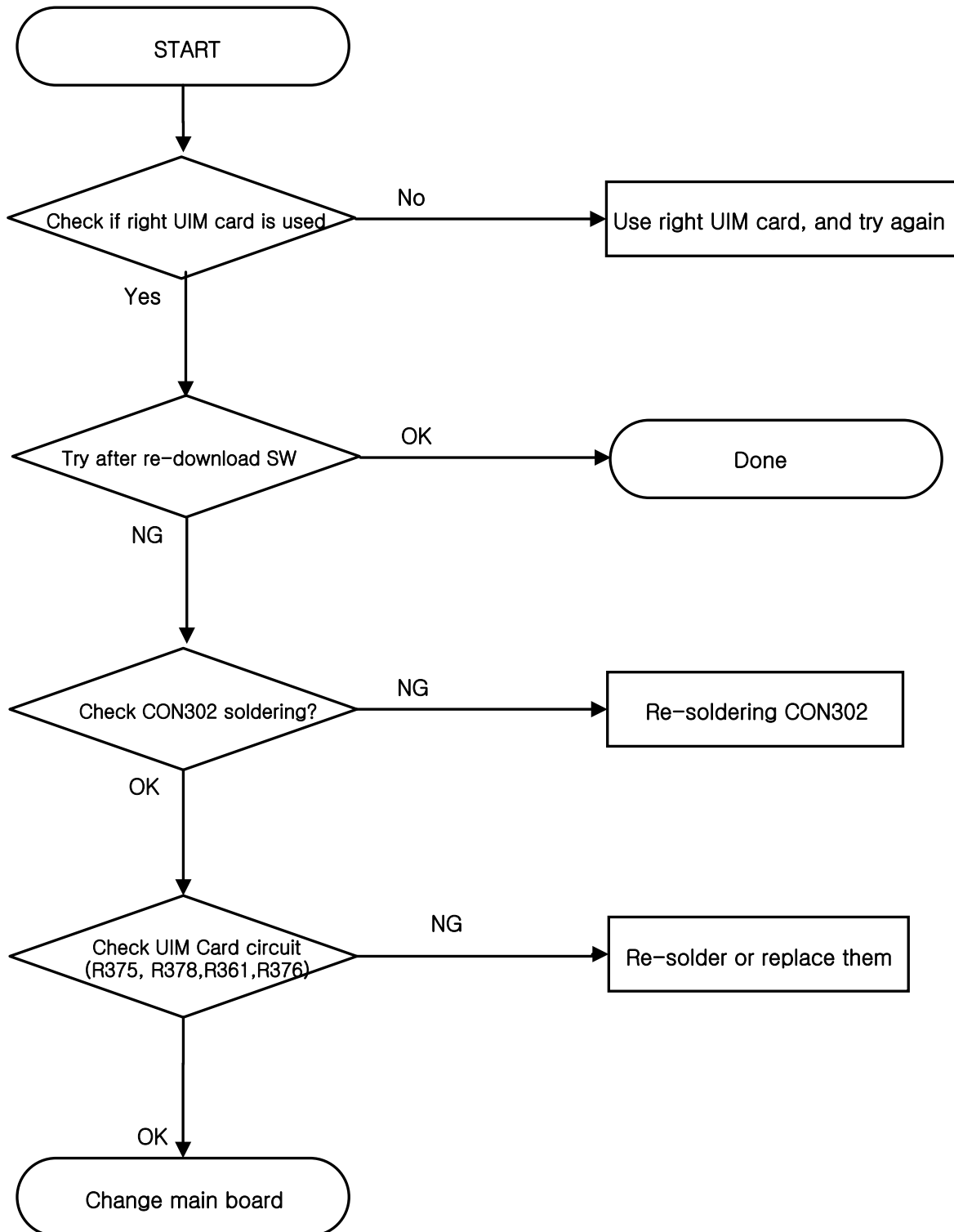
□ +VPWR



Checking Flow

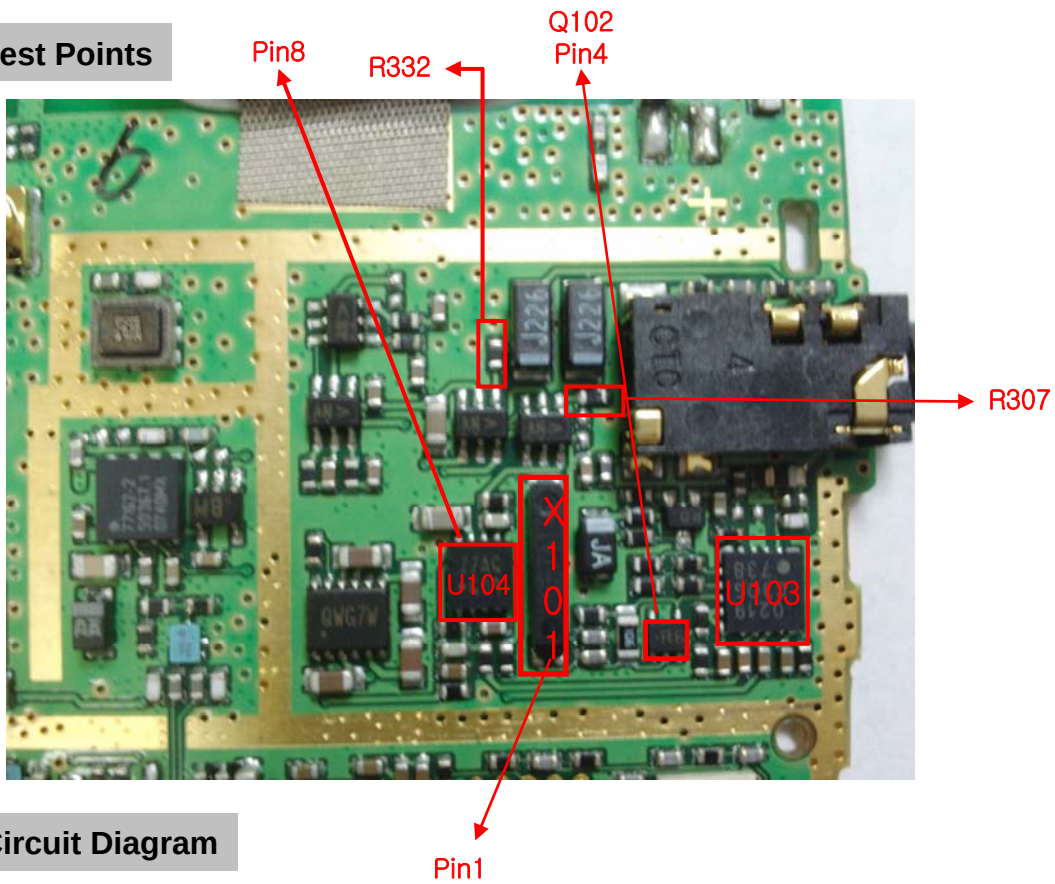
- CON302 : KCN-2T-0-0075

- U201 : QSC6010

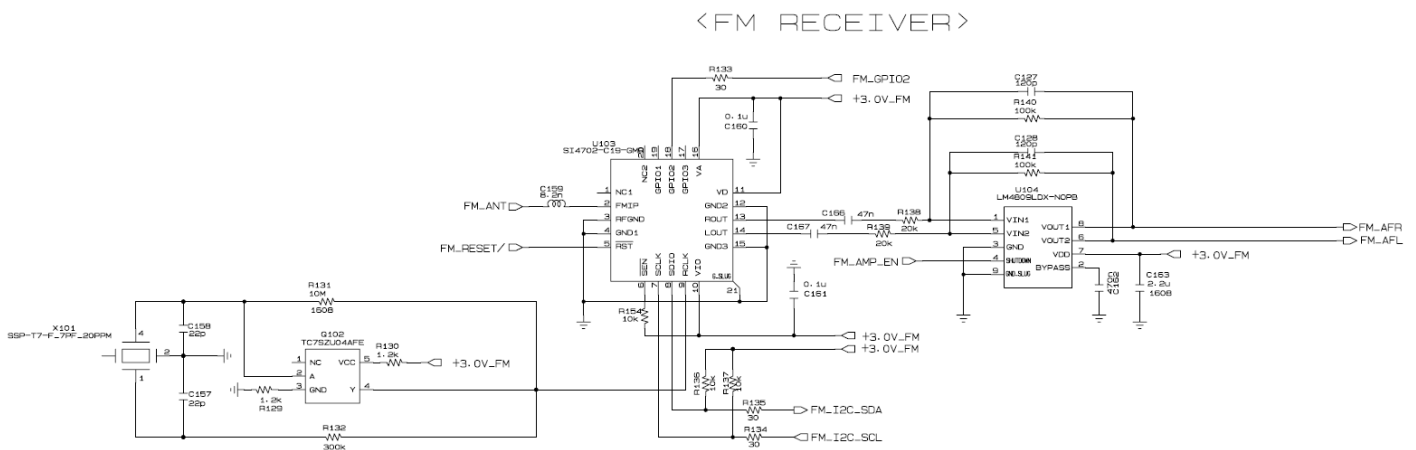


4.3.12 FM Radio Trouble

Test Points

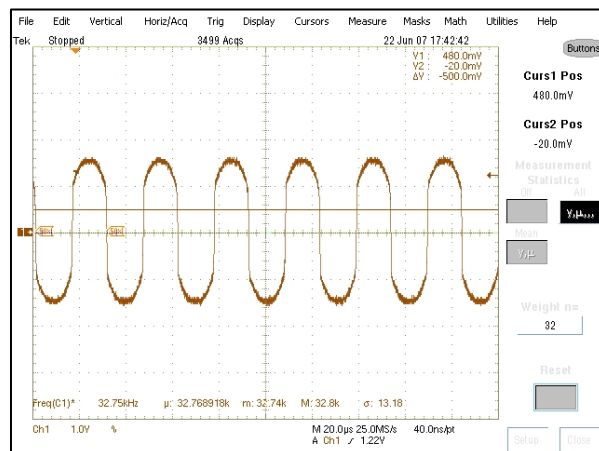
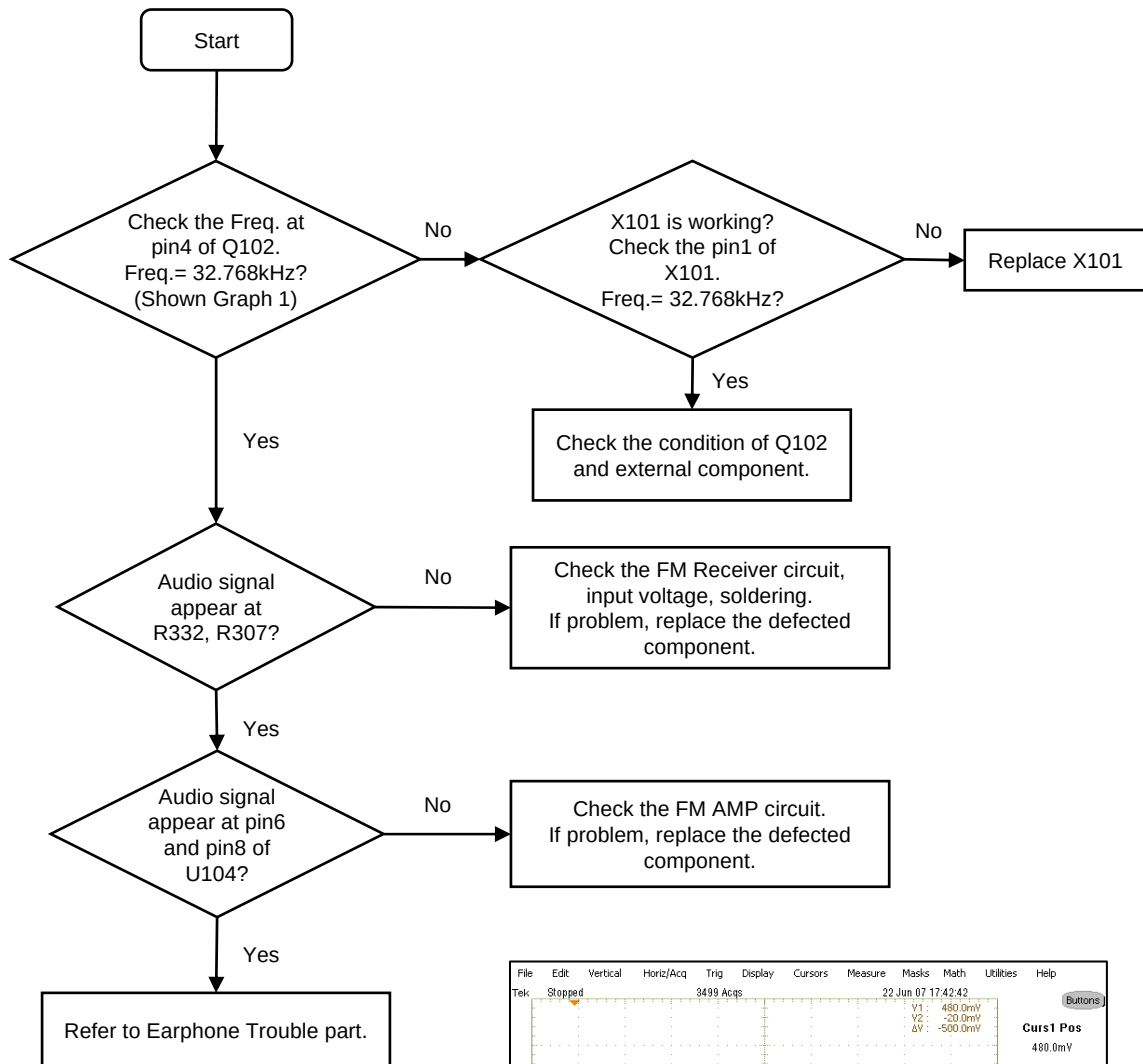


Circuit Diagram



Checking Flow

SETTING : Attach the headset and “Listen to Radio” at Radio menu



Graph 1. FM Radio Clock

Rev. B

C113: DNI → 0.1uF Change

TX_PAM Matching

L103: 3.3n → 7p Change

C118: 2p → 6.8n Change

Rev. C

ACPR MAJIN

C119, C103: 10p → 100p

L115, L113: 1.8n → 15n

ANT MATCHING CHANGE

C115: 0R → 5p

L105: DNI → 10n

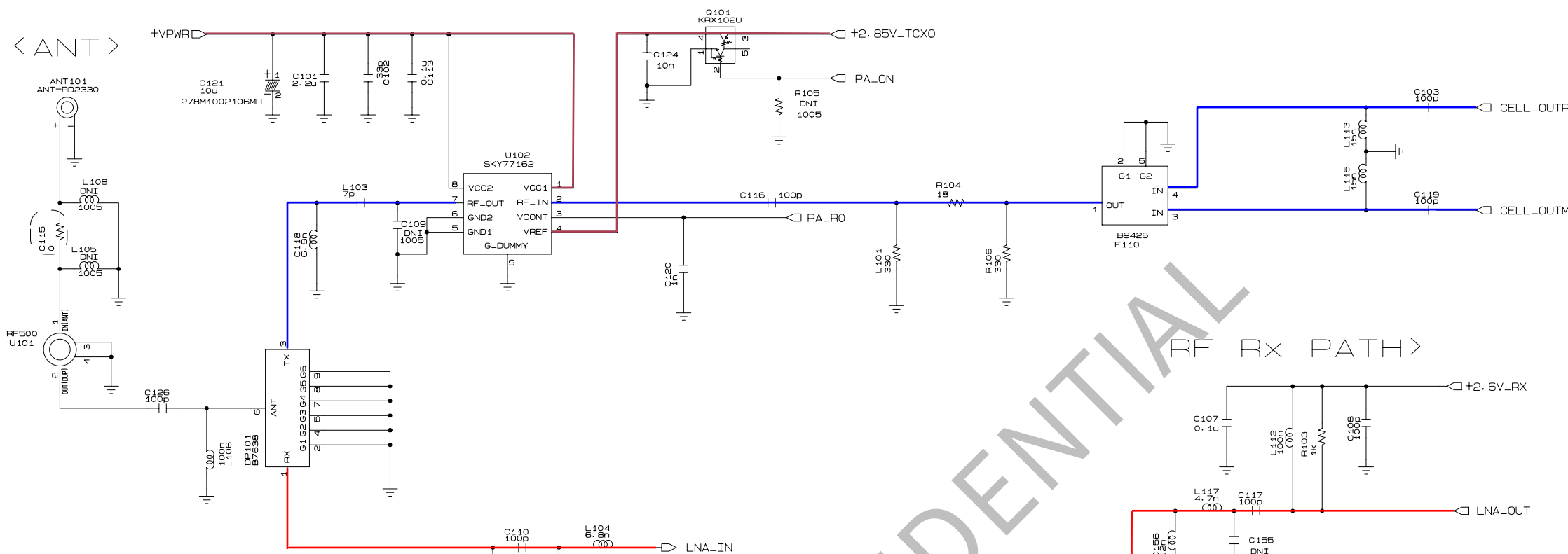
Rev. 1.0

ANT MATCHING CHANGE

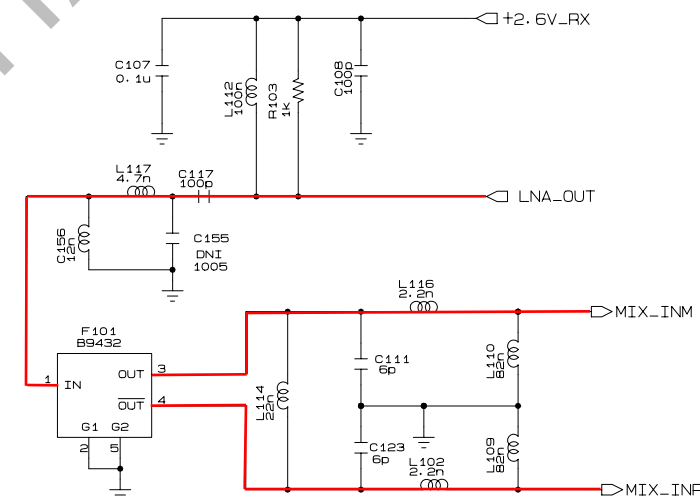
C115: 5p → 0R

L105: 10n → DNI

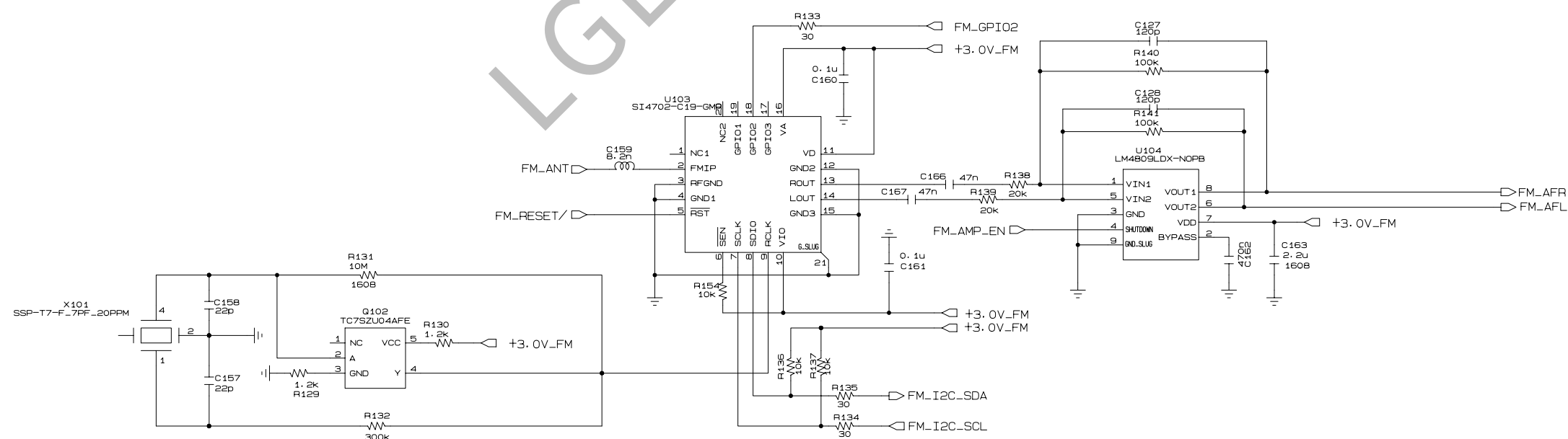
<RF Tx PATH>



<RF Rx PATH>



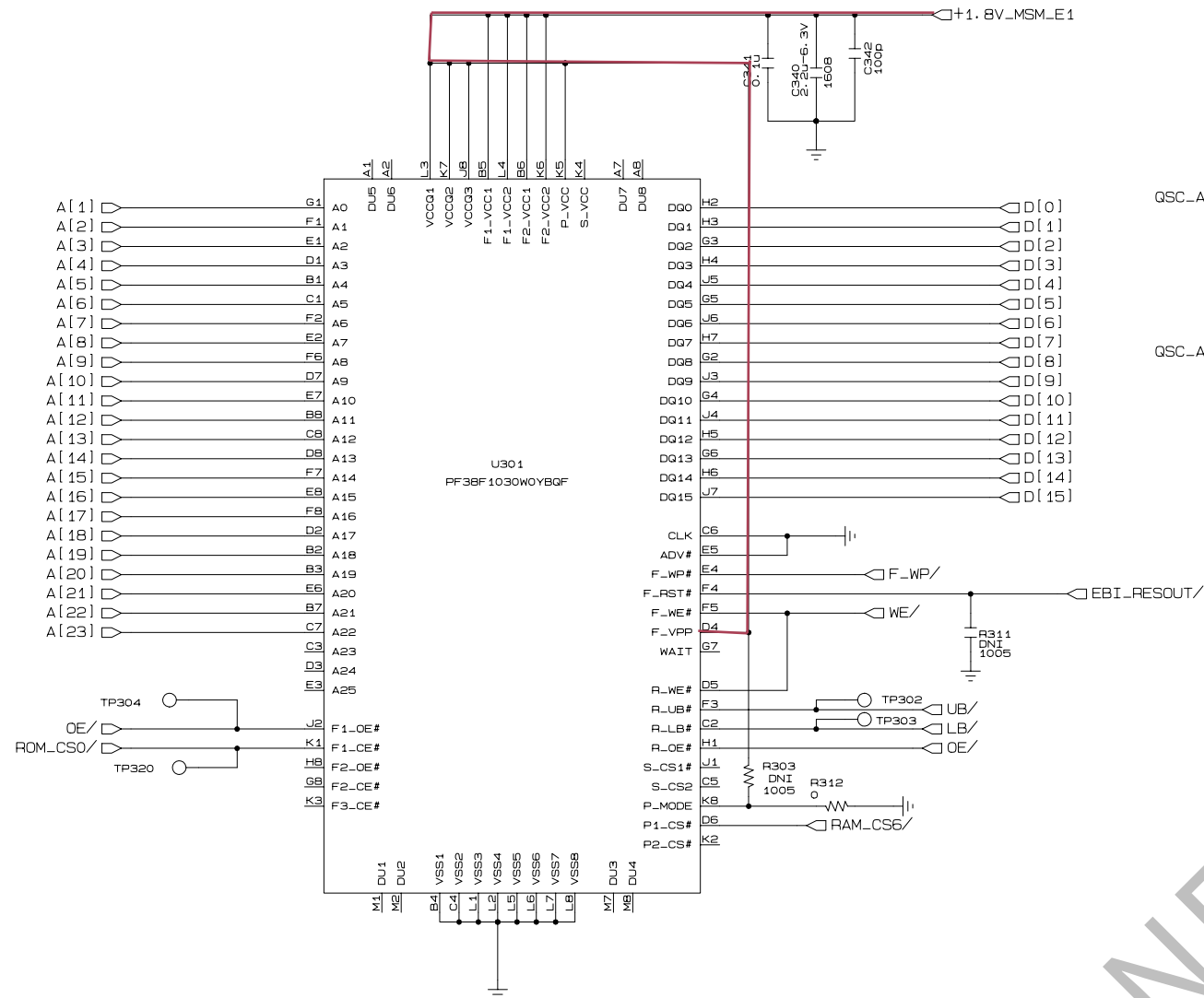
<FM RECEIVER>



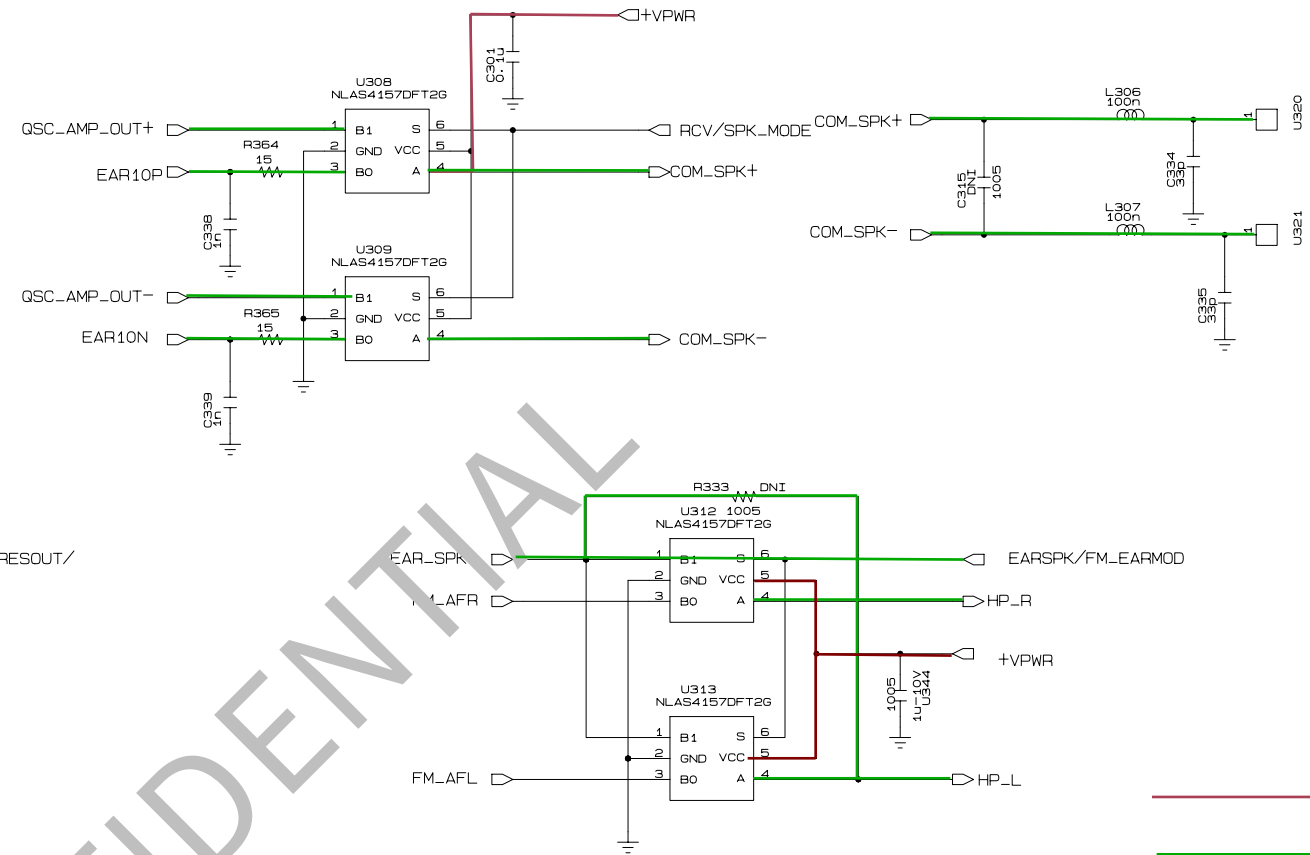
```
1. PCB VER CHECK
C277: DNI -> 33K
```



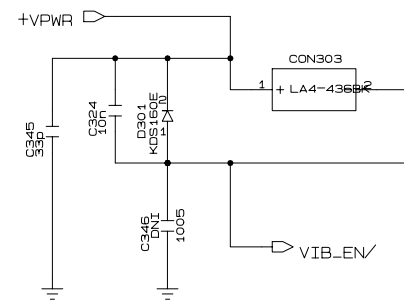
< MEMORY >



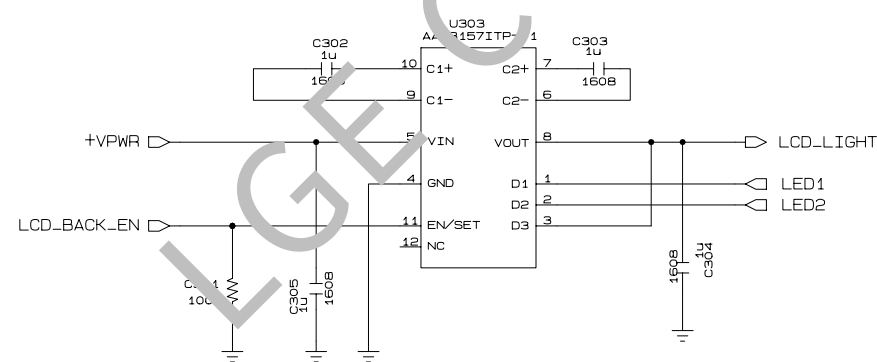
< AUDIO PART >



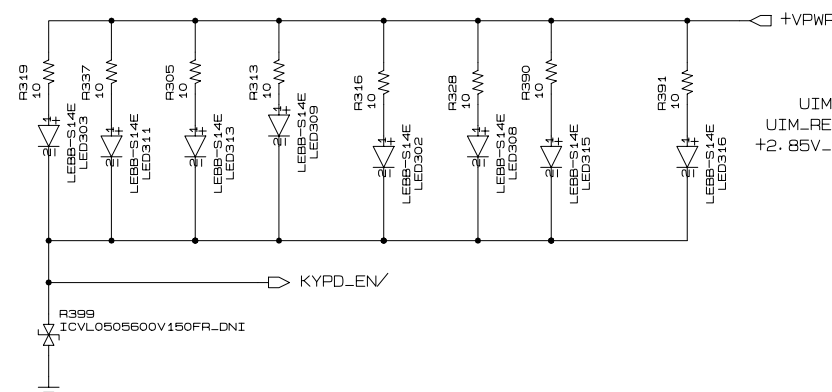
< MOTOR >



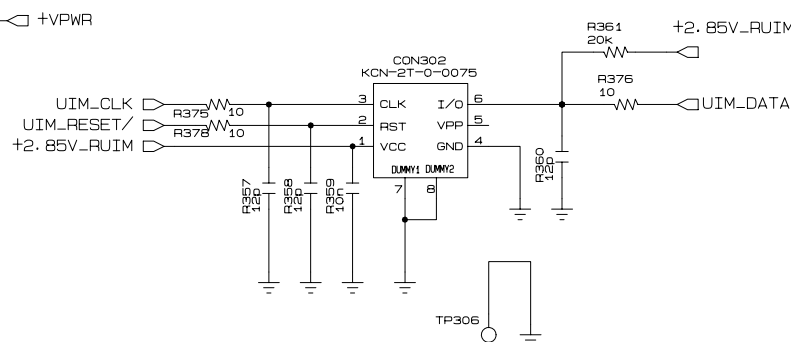
< LCD Back Light >



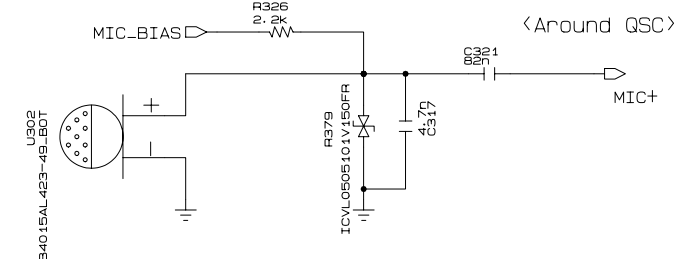
< KEY LED PART >



< UIM CARD >



< MIC PART >



DRAW : S. Y. JANG

DATE 2007. 11. 29

CHKD H. T. KIM

APRD

REF

MAN

ISSUE :

CONTENT : Rev. 11

< REV B >
1. Memory 0ohm DNI DELETE
2. R390 DELETE
3. L302, L303 SFBH0006806
->SFBH0008101
4. L306 : 82n Insert
5. LED314, R331 DNI

< REV C >
AUDIO PART
1. L306, L307 : 82n ->100n
2. C334, C335 Move
3. R309, R310 : DELETE

< REV 10 >
1. R364, R365 : 12R ->15R
2. LED PART 2EA INSERT
R390, R391, LED315, LED316

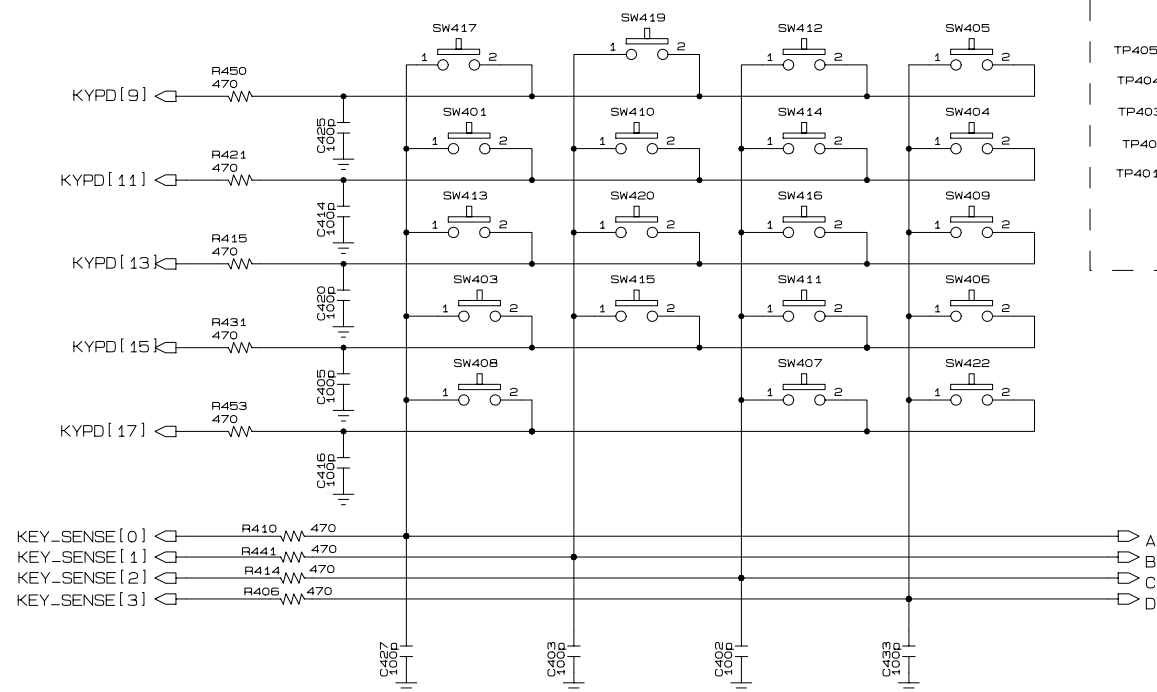
< REV 11 >
1. LED314, R311 : DEL
2. SPK PAD CHANGE

POWER

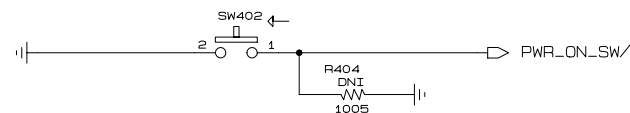
Audio

MIC

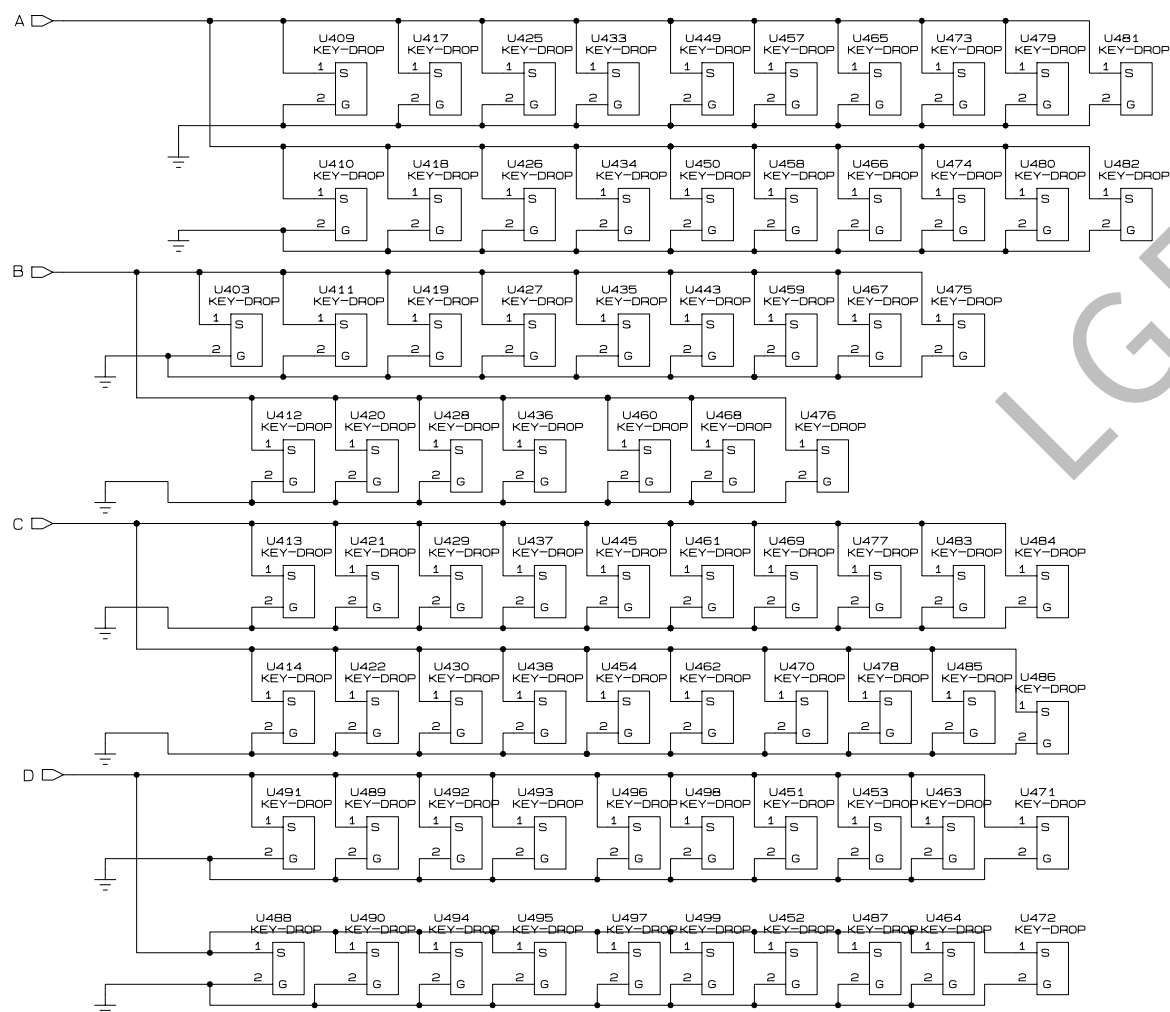
<MAIN KEY>



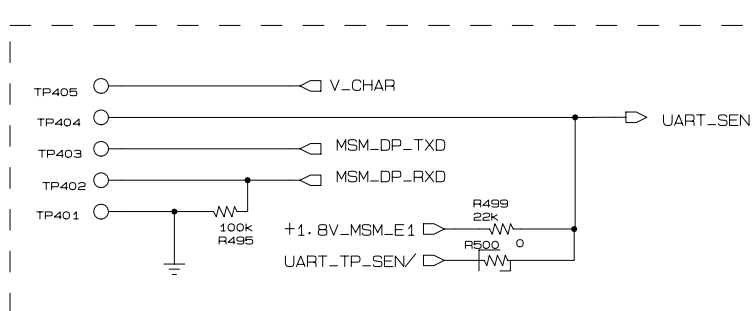
<POWER ON/OFF SWITCH>



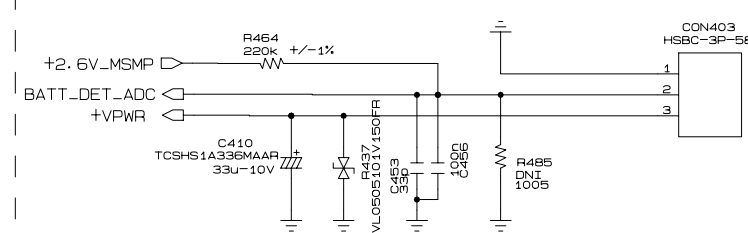
<KYPD KEY-DROP>



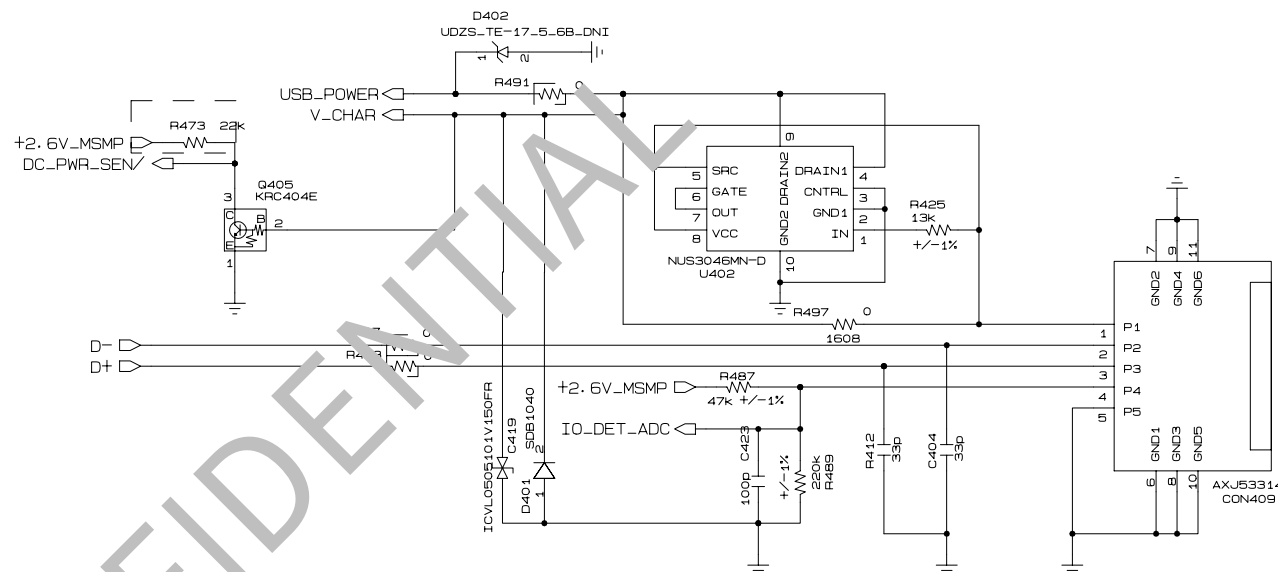
<UART TP >



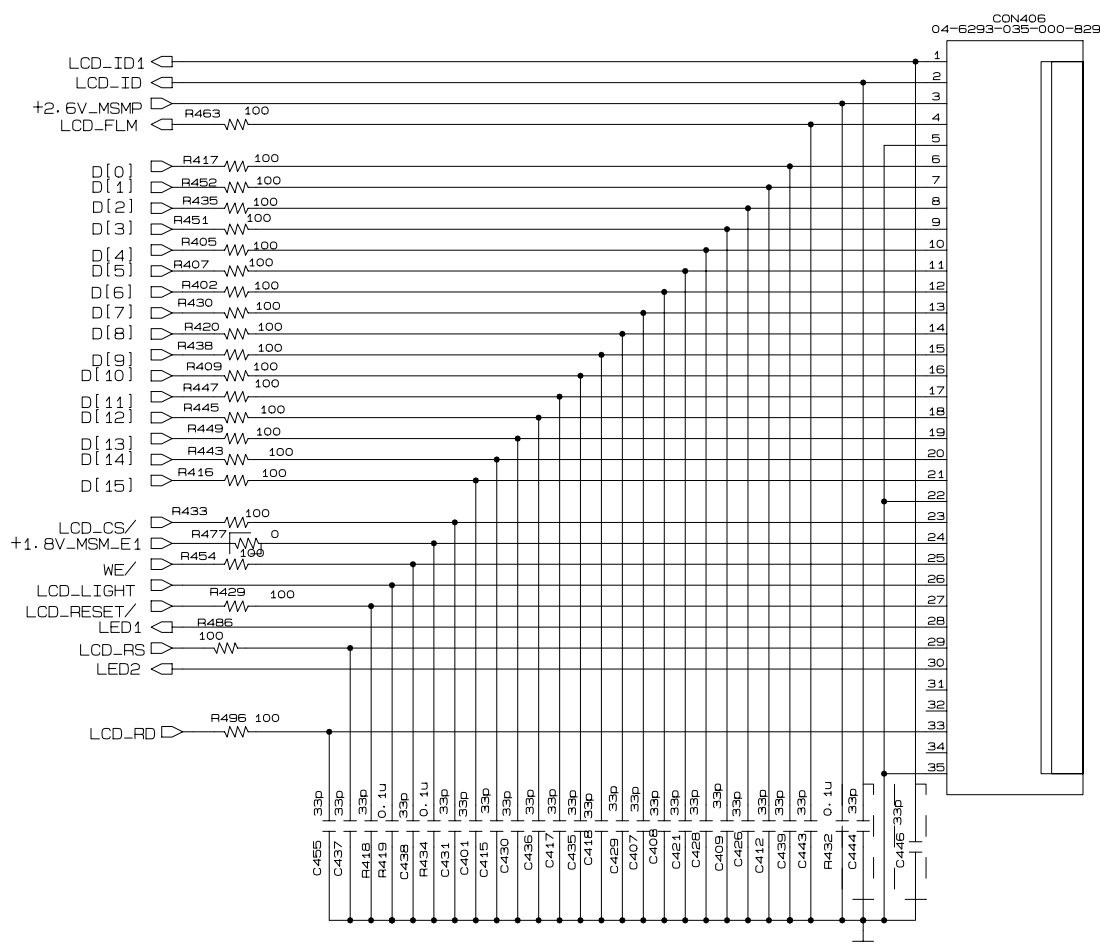
<BATTERY CONNECTOR>



<Micro USB CONNECTOR>



<LCD CONNECTOR>



<REV B>

1. R484, C432, R485 DELETE
2. R412, C404 33p Change
3. U402, R497 Add
4. A[21] INSERT
5. LCD_RD, R496, C455: INSERT
6. 0VP INSERT

<REV C>

1. USB HUB PART DEL
U401, R422, C254, R424, R423
R413, R401, R403, R411, R408
VDAT_LKG+- TP DEL

<REV 10>

2. UART TP INSERT

TP401 - TP405, R495 INSERT

<REV 10>

1. A[21] delete
2. Micro USB DP Rx, Tx
Delete
3. R464 5 -> 1

<REV 11>

1. Q406, R484, R483: DEL

RD3600

CON409
Micro USB connector
Power trouble
Sync trouble

U201
QSC6010
All troubles

F110
TX filter
TX trouble

U102
PAM
TX trouble

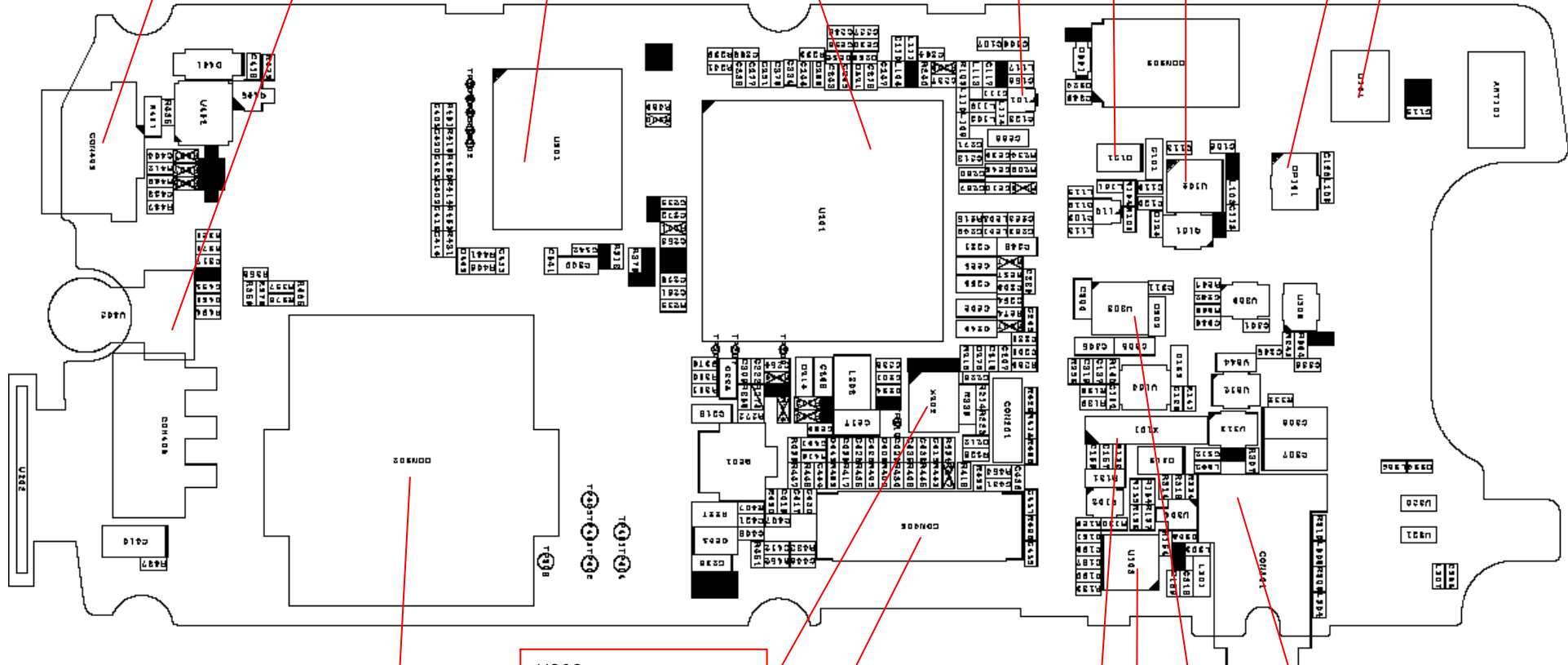
DP101
Duplexer
All RF trouble

U101
RF switch
All RF trouble

F101
RX filter
RX trouble

U301
Memory
Bootling trouble

U302
MIC connector
MIC trouble



CON302
UIM socket
UIM trouble
Network connection trouble

X202
X-tal
Power trouble
No service

X101
X-tal
FM trouble

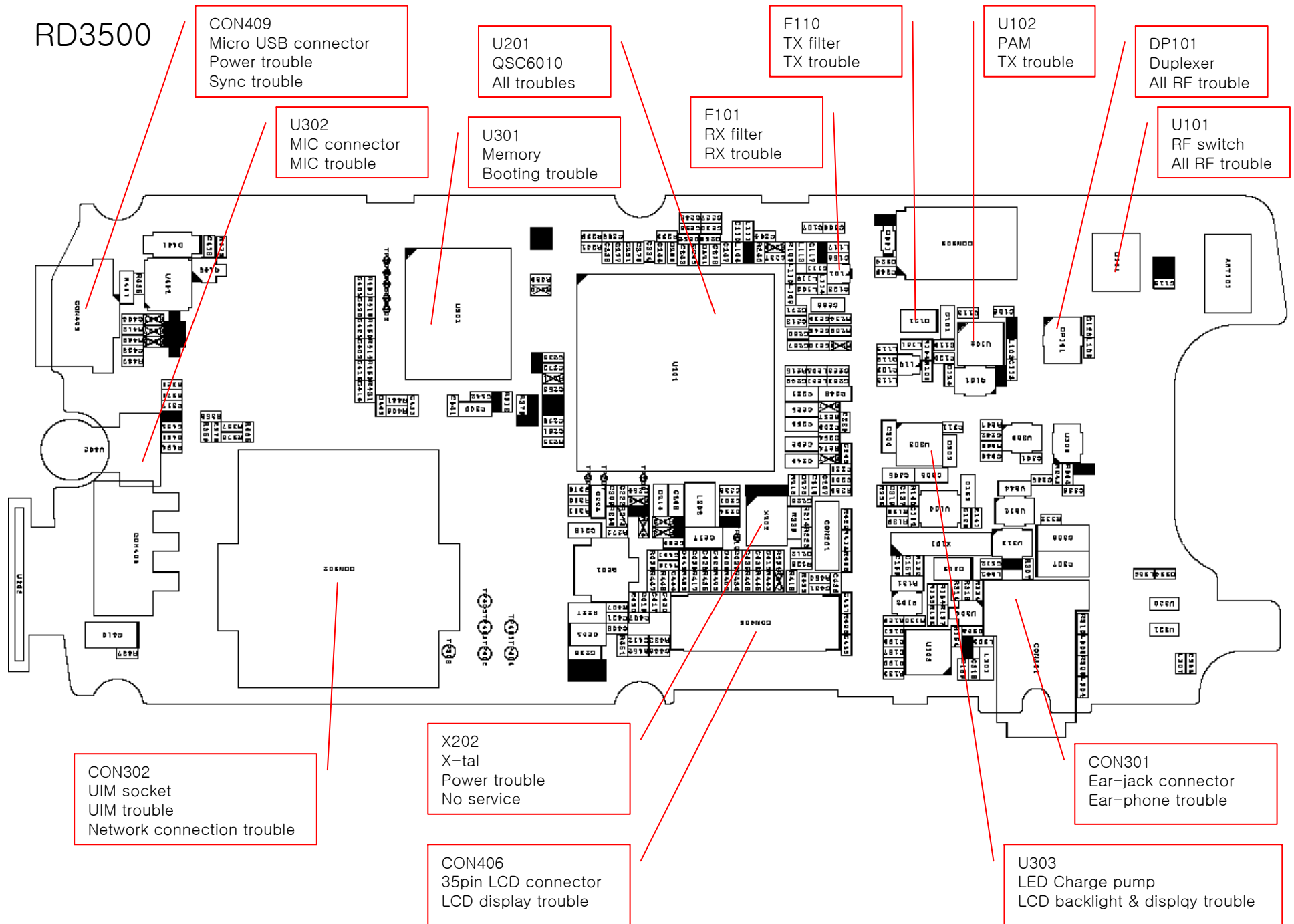
CON301
Ear-jack connector
Ear-phone trouble

CON406
35pin LCD connector
LCD display trouble

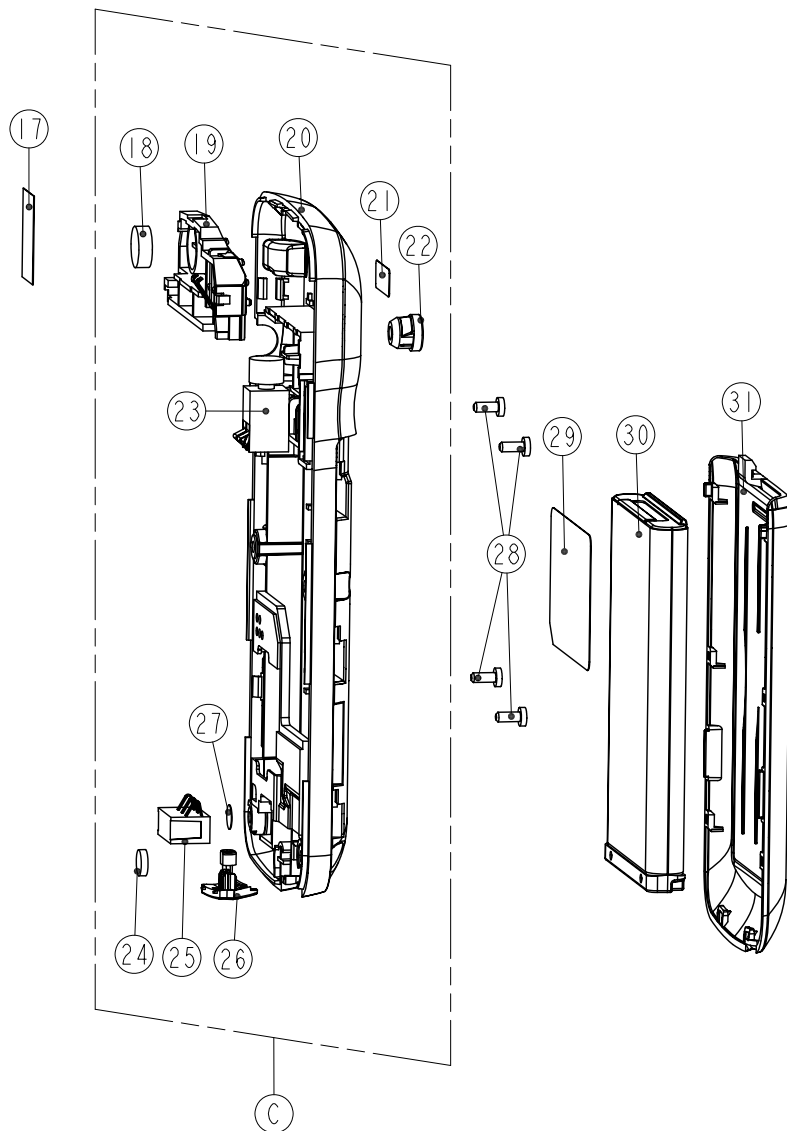
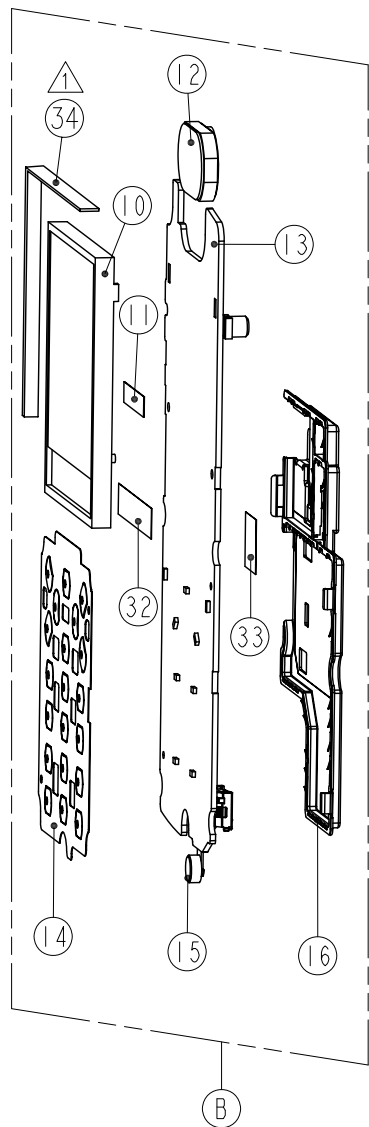
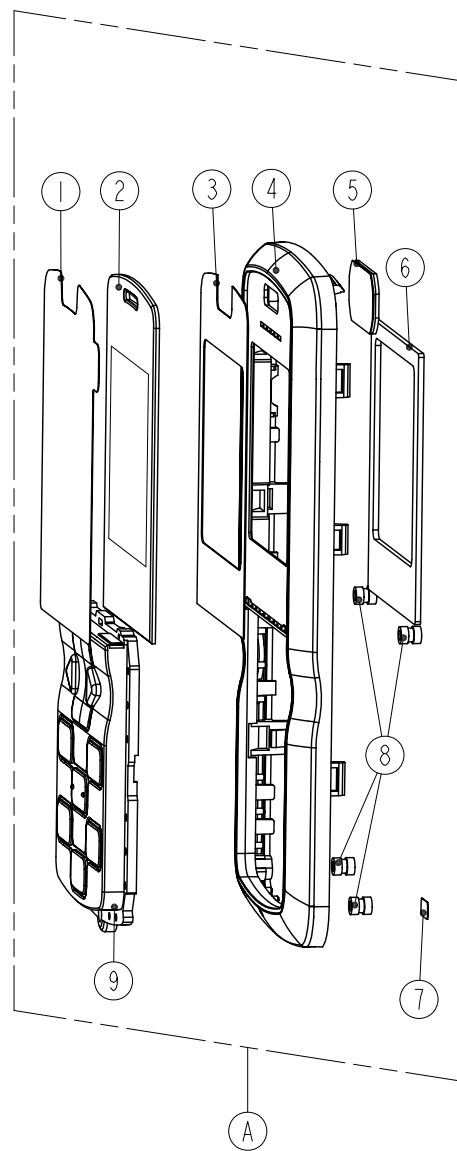
U103
FM-tuner chip
FM trouble

U303
LED Charge pump
LCD backlight & display trouble

RD3500



A	COVER ASSY FRONT	ACGK0099501
B	PCB ASSY, MAIN	SAFY0244601
C	COVER ASSY REAR	ACGM0100301



REVISION				
ISSUE	CONTENTS	ENGINEER	APPROVER	DATE
1.0	Drawing Creation	jd.sung	dh.jo	07.09.10
1.1	Add PAD LCD SIDE	jd.sung	dh.jo	08.01.18

34	PAD LCD SIDE	I	MPBG0076401	
33	INSULATOR SHIELD CAN	I	MIDZ0161701	
32	INSULATOR LCD	I	MIDZ0161501	
31	COVER BATTERY	I	MCJA0053901	
30	BATTERY PACK	I	SBPL0091401	
29	LABEL APPROVAL	I	MLAA0002505	
28	SCREW MACHINE	4	GMEY0009201	
27	LABEL AS	I	MLAB0000601	
26	CAP USB	I	MCCE0041201	
25	BATTERY CONTACT	I	ENZY0021201	
24	PAD MIKE	I	MPBH0034501	
23	MOTOR	I	SJMY0007905	
22	CAP MOBILE SWITCH	I	MCCF0048201	
21	LABEL QUALCOMM	I	MLAN0000604	
20	COVER REAR	I	MCJN0075701	
19	INTENNA CARRIOR	I	SNMF0036701	
18	PAD SPEAKER	I	MPBZ0199701	
17	PCB GASKET	I	MCCF0048201	
16	CAN SHIELD	I	MCBA0025101	
15	MICROPHONE	I	SUMY0003809	
14	DOME ASSY METAL	I	ADCA0073301	
13	PCB MAIN	I	SAFY0244601	
12	SPEAKER	I	SUSY0027901	
11	LCD GASKET	I	MGAZ0061201	
10	LCD MODULE	I	SVLM0028001	
9	KEYPAD	I	ABGF0001201	
8	INSERT	4	MICZ0028601	
7	FILTER MIKE	I	MFBD0027201	
6	PAD LCD	I	MPBG0069401	
5	FILTER SPEAKER	I	MFBC0035501	
4	COVER FRONT	I	MCJK0079701	
3	TAPE WINDOW LCD	I	MTAD0077301	
2	WINDOW LCD	I	MWAC0088101	
1	TAPE PROTECTION FRONT	I	MTAB0199701	

허용공차		UNIT	SCALE	NO.	DESCRIPTION		Q'TY	DRAWING NO.		REMARK
치수	공차	mm	NS	PARTS INDEX						
		TOLERANCE			DATE	NAME	MATERIAL			
				APP.	07.09.10	dh.jo				
		FINISH		CHEC.	07.09.10	sw.yang	REL DWG			
				DESG.	07.09.10	jd.sung				
		F/N				SIZE	DWG NAME	RD3500 PHONE		
		 LGE LG Electronics Inc.				A3	DWG NO.	RD3500 PHONE		
							DWG NO.	APEY0494101		

Part Lists

N O	Part Name	Part Number	QTY	Spec
1	COVER,BAT TERY	MCJA0 053901	1	MOLD, PC LUPOY HP-5004, , , , ,
2	MANUAL,OP ERATION	MMBB0 267501	1	PRINTING, (empty), , , , ,
3	BATTERY PACK,LI-ION	SBPL00 91401	1	3.7 V,950 mAh,1 CELL,PRISMATIC ,KU250 BATT, Europe, Pb- Free ,; ,3.7V ,950mAh ,0.2C ,PRISMATIC ,50x34x55 , ,BLACK ,Innerpack ,Europe Label
4	BATTERY PACK,LI-ION	SBPL00 90501		3.7 V,950 mAh,1 CELL,PRISMATIC ,KU250 Europe BATT, IP, Pb- Free ,; ,3.7 ,950 ,0.2C ,PRISMATIC ,50x34x55 , ,BLACK ,Innerpack ,Europe Label
5	ADAPTOR,A C-DC	SSAD0 028701	1	100-240V ,5060 Hz,5.6 V,.4 A,CE ,AC-DC Adaptor ,; ,150Vac~350Vac ,5.6V +/- 0.8V ,400mA ,5060 , ,WALL 2P ,I/O CONNECTOR ,
6	ADAPTOR,A C-DC	SSAD0 028702		100-240V ,5060 Hz,5.6 V,0.4 A,CE ,AC-DC Adaptor ,; ,150Vac~350Vac ,5.6V (+/- 0.8V) ,400mA ,5060 , ,WALL 2P ,I/O CONNECTOR ,

NO	Ref No	Description	PN	Specification	Maker P/N
352	SPFY00	PCB,MAIN	SPFY0166502	FR-4 ,0.8 mm,BUILD-UP 4 ,main ,; , , , , , , , ,	SPFY0166502

N O	Level	Ref No	품명	품번	규격	Maker 도번	구품번
23	3	ABGF00	BUTTON ASSY,MAIN	ABGF0001201		ABGF0001201	ABGF0001201
24	3	MCJK00	COVER,FRONT	MCJK0079701	MOLD, PC LUPOY HP-5004, , , , ,	MCJK0079701	MCJK0079701
25	4	MICZ00	INSERT	MICZ0028601	CUTTING, BeCu, , , , ,	MICZ0028601	MICZ0028601
26	3	MFBC00	FILTER,SPEAKER	MFBC0035501	COMPLEX, (empty), , , , ,	MFBC0035501	MFBC0035501
27	3	MFBD00	FILTER,MIKE	MFBD0027201	COMPLEX, (empty), , , , ,	MFBD0027201	MFBD0027201
28	3	MPBG00	PAD,LCD	MPBG0069401	COMPLEX, (empty), , , , ,	MPBG0069401	MPBG0069401
29	3	MTAB00	TAPE,PROTECTION	MTAB0199701	COMPLEX, (empty), , , , ,	MTAB0199701	MTAB0199701
30	3	MTAD00	TAPE,WINDOW	MTAD0077301	COMPLEX, (empty), , , , ,	MTAD0077301	MTAD0077301
31	3	MWAC00	WINDOW,LCD	MWAC0088101	CUTTING, PMMA MR 200, , , , ,	MWAC0088101	MWAC0088101
33	3	ENZY00	CONNECTOR,ETC	ENZY0021201	3 PIN,0.25 mm,ANGLE , ,	KQ03LC-3R	ENZY0021201
34	3	MCCE00	CAP,RECEPTACLE	MCCE0041201	MOLD, Urethane Rubber S190A, , , , ,	MCCE0041201	MCCE0041201
35	3	MCCF	CAP,MOBILE SWITCH	MCCF0048201	MOLD, Silicone Rubber KE971-U, , , , ,	MCCF0048201	MCCF0048201
36	3	MCJN00	COVER,REAR	MCJN0075701	MOLD, PC LUPOY HP-5004, , , , ,	MCJN0075701	MCJN0075701
37	3	MLAB00	LABEL,A/S	MLAB0000601	PRINTING, (empty), , , , ,	MLAB0000601	MLAB0000601
38	3	MLAN	LABEL,QUALCOMM	MLAN0000604	White,95B		MLAN0000604

39	3	MPBH00	PAD,MIKE	MPBH0034501	COMPLEX, (empty), , , , ,	MPBH0034501	MPBH0034501
40	3	MPBZ00	PAD	MPBZ0199701	CUTTING, NS, , , , ,	MPBZ0199701	MPBZ0199701
43	3	SNMF00	ANTENNA,MOBILE,FIXED	SNMF0036701	5:0 ,-6 dB,Internla, DCN_Single, Pb Free ; , ,SINGLE , , , ,	10LN31A7W000033	SNMF0036701
44	2	GMEY00	SCREW MACHINE,BIND	GMEY0009201	1.4 mm,3.5 mm,MSWR3(BK) ,B ,+ ,HEAD D=2.7mm	GMEY0009201	GMEY0009201
45	2	MGAZ00	GASKET	MGAZ0061101	CUTTING, NS, , , , ,	MGAZ0061101	MGAZ0061101
46	2	MLAA00	LABEL,APPROVAL	MLAA0002505	ULCP_App Label		MLAA0002505
49	4	ADCA00	DOME ASSY,METAL	ADCA0073301		ADCA0073301	ADCA0073301
50	4	MCBA00	CAN,SHIELD	MCBA0025101	COMPLEX, (empty), , , , ,	MCBA0025101	MCBA0025101
51	4	MGAZ00	GASKET	MGAZ0061201	CUTTING, NS, , , , ,	MGAZ0061201	MGAZ0061201
52	4	MIDZ00	INSULATOR	MIDZ0161501	CUTTING, NS, , , , ,	MIDZ0161501	MIDZ0161501
53	4	MIDZ01	INSULATOR	MIDZ0161701	CUTTING, NS, , , , ,	MIDZ0161701	MIDZ0161701
54	4	MPBG	PAD,LCD	MPBG0076401	CUTTING, NS, , , , ,	MPBG0076401	MPBG0076401
59	4	MLAZ00	LABEL	MLAZ0038301	PID Label 4 Array	LG-VX6000	MLAZ0038301

RD3500_MAIN_REV11_TOP

N O	Zuken)Desig-No	Component- Name	Desc/Remark	Maker-PN	ItemNo	Qt y	Siz e	Valu e	Toleran ce
1	C427	C1005C0G1H10 1JT	CHIP- CAPACITOR	TDK	ECZH00008 13	1	100 5	100 p	+/-5%
2	LED302,LED303,LED308,LED309,LED311, LED313	LEBB-S14E	LED	LG- INNOTEK	EDLH00045 01	6			
3	R305,R313,R316,R319,R328,R337	MCR01MZSJ100	RESISTOR	ROHM	ERHZ00004 02	6	100 5	10	+/-5%
4	R410	MCR01MZSJ471	RESISTOR	ROHM	ERHZ00004 84	1	100 5	470	+/-5%

RD3500_MAIN_REV11_BOT

N O	Zuken)Desig-No	Component- Name	Desc/Remark	Maker- PN	ItemNo	Qt y	Siz e	Value	Toleran ce
1	C118	C1005C0G1H1R 5CT	CHIP- CAPACITOR	TDK	ECZH0000 822	1	10 05	1.5p	+/-0.25p
2	C111,C123	MCH155A060DK	CHIP- CAPACITOR	ROHM	ECCH0000 107	2	10 05	6p	+/-0.5p
3	C115	MCH155A070DK	CHIP- CAPACITOR	ROHM	ECCH0000 108	1	10 05	7p	+/-0.5p
4	C120,C234,C280,C338,C339	MCH155CN102 KK	CHIP- CAPACITOR	ROHM	ECCH0000 143	5	10 05	1n	+/-10%
5	C213	MCH155CN332 KK	CHIP- CAPACITOR	ROHM	ECCH0000 149	1	10 05	3.3n	+/-10%
6	C317	MCH152CN472 KK	CHIP- CAPACITOR	ROHM	ECCH0000 151	1	10 05	4.7n	+/-10%
7	C124,C312,C324,R359	MCH153CN103 KK	CHIP- CAPACITOR	ROHM	ECCH0000 155	4	10 05	10n	+/-10%
8	C208,C254	MCH153CN153 KK	CHIP- CAPACITOR	ROHM	ECCH0000 157	2	10 05	15n	+/-10%
9	C239	C1005X5R473K DT	CHIP- CAPACITOR	TDK	ECCH0000 163	1	10 05	47n	+/-10%
1 0	C101	GRM39X5R225 K10	CHIP- CAPACITOR	MURAT A	ECCH0005 603	1	16 08	2.2u	+/-10%
1 1	C236	C1608X5R0J475 KT	CHIP- CAPACITOR	TDK	ECCH0006 201	1	16 08	4.7u	+/-10%
1 2	C410	TCSHS1A336M AAR	TANTAL- CAPACITOR	SAMSU NG	ECTH0005 103	1	32 16	33u- 10V	+/-20%
1 3	C121,C203	278M1002106M R	TANTAL- CAPACITOR	MATSU O	ECTH0005 802	2	20 12	10u	+/-20%
1 4	C313	TCSCS0J106MP AR	TANTAL- CAPACITOR	SAMSU NG	ECTZ0003 701	1	20 12	10u- 6.3V	+/-20%
1 5	C307	TCSCS0J226KA AR	TANTAL- CAPACITOR	SAMSU NG	ECTZ0003 704	1	32 16	22u- 6.3V	+/-10%
1 6	C260	C1005C0G1C22 1JT	CHIP- CAPACITOR	TDK	ECZH0000 801	1	10 05	220p	+/-5%

1 7	C115	MCH155A180J	CHIP- CAPACITOR	TDK	ECCH0000 113	1	10 05	18p	+/-5%
1 8	C103,C108,C110,C116,C117,C119,C 126,C223,C237,C249,C264,C268,C27 1,C342,C402,C403,C405,C414,C416, C420,C423,C425,C433	C1005C0G1H10 1JT	CHIP- CAPACITOR	TDK	ECZH0000 813	23	10 05	100p	+/-5%
1 9	R357,R358,R360	C1005C0G1H12 0JT	CHIP- CAPACITOR	TDK	ECZH0000 816	3	10 05	12p	+/-5%
2 0	C102,C334,C335,C345,C401,C404,C 407,C408,C409,C412,C415,C417,C41 8,C421,C426,C428,C429,C430,C431, C435,C436,C437,C438,C439,C443,C 444,C446,C453,C455,R412,R418	C1005C0G1H33 0JT	CHIP- CAPACITOR	TDK	ECZH0000 830	31	10 05	33p	+/-5%
2 1	C246	C1005X7R1C82 2KT	CHIP- CAPACITOR	TDK	ECZH0001 105	1	10 05	8.2n	+/-10%
2 2	C308	C1005X7R1E68 2KT	CHIP- CAPACITOR	TDK	ECZH0001 108	1	10 05	6.8n	+/-10%
2 3	C212	C1005X7R1H47 1KT	CHIP- CAPACITOR	TDK	ECZH0001 121	1	10 05	470p	+/-10%
2 4	C250	C1005X5R1A10 5KT	CHIP- CAPACITOR	TDK	ECZH0001 215	1	10 05	1u	+/-10%
2 5	C258	C1005X5R1A22 4KT	CHIP- CAPACITOR	TDK	ECZH0001 216	1	10 05	220n	+/-10%
2 6	C216	C1608X5R1A10 5KT	CHIP- CAPACITOR	TDK	ECZH0001 420	1	16 08	1u-10V	
2 7	,C214,C221,C225,C228,C240,C248,C 255,C266,C269,C340	C1608X5R0J225 KT	CHIP- CAPACITOR	TDK	ECZH0001 421	10	16 08	2.2u- 6.3V	

2 8	C107,C113,C201,C206,C207,C209,C210,C218,C220,C222,C224,C227,C229,C230,C233,C235,C238,C242,C244,C245,C251,C252,C253,C256,C261,C265,C267,C272,C275,C276,C277,C278,C282,C286,C301,C341,R419,R432,R434,C263	GRM36X7R104K10PT	CHIP-CAPACITOR	MURATA	ECZH0003103	3 9	1005	0.1u	+/-10%
2 9	C226,C259	GRM36X7R683K16PT	CHIP-CAPACITOR	MURATA	ECZH0003124	2	1005	68n-16V	+/-10%
3 0	C205,C247,C279,C321	GRM36X7R823K16	CHIP-CAPACITOR	MURATA	ECZH0003125	4	1005	82n	+/-10%
3 1	C302,C303,C304,C305	GRM39X5R105K25PT	CHIP-CAPACITOR	MURATA	ECZH0003503	4	1608	1u	+/-10%
3 2	C456	MCH153C104ZK	CHIP-CAPACITOR	ROHM	ECZH0004402	1	1005	100n	79.8
3 3	D301	KDS160E	SWITCHING-DIODE	KEC	EDSY0009901	1			
3 4	D401	SDB1040	SCHOTTKY	AUK	EDSY0017701	1	1.6X2.7X0.8		
3 5	L102,L116	LL1005-FHL2N2S	CHIP-INDUCTOR	TOKO	ELCH0001427	2	1005	2.2n	+/-0.3n
3 6	L117	SDCL1005C4N7STF	CHIP-INDUCTOR	SUNLORD	ELCH0010612	1	1005	4.7n	+/-0.3nH
3 7	L104	SDCL1005C6N8JTf	CHIP-INDUCTOR	SUNLORD	ELCH0010614	1	1005	6.8n	+/-5%
3 8	L111	SDCL1005C8N2JTf	CHIP-INDUCTOR	SUNLORD	ELCH0010615	1	1005	8.2n	+/-5%
3 9	L103	SDCL1005C3N3STF	CHIP-INDUCTOR	SUNLORD	ELCH0010610	1	1005	3.3n	+/-0.3nH
4 0	L105	SDCL1005C10NJTF	CHIP-INDUCTOR	SUNLORD	ELCH0010616	1	1005	10n	+/-5%
4 1	C156	SDCL1005C12NJTF	CHIP-INDUCTOR	SUNLORD	ELCH0010617	1	1005	12n	+/-5%

4 2	L113,L115	SDCL1005C15NJTF	CHIP-INDUCTOR	SUNLORD	ELCH00106 18	2	1005	15n	+/-5%
4 3	L114,L201,L203	SDCL1005C22NJTF	CHIP-INDUCTOR	SUNLORD	ELCH00106 20	3	1005	22n	+/-5%
4 4	L109,L110	SDCL1005C82NJTF	CHIP-INDUCTOR	SUNLORD	ELCH00106 27	2	1005	82n	+/-5%
4 5	L106,L112,L306,L307	SDCL1005CR10JTf	CHIP-INDUCTOR	SUNLORD	ELCH00106 28	4	1005	100n	+/-5%
4 6	L202	CPI2520LZ4R7ME	POWER-INDUCTOR	SAMHWA	ELCP00080 05	1	2025	4.7u	+/-20%
4 7	CON409	AXJ53314	MINI-USB	MATSUSHIT A	ENRY0007 201	1			
4 8	CON302	KCN-2T-0-0075	SIM-SOCKET	KSD	ENSY00181 01	1	17.0X17.8X 1.5		
4 9	U101	RF500	MOBILE-S/W	HIROSE	ENWY0004 501	1			
5 0	CON407	HSBC-3P-58	BATT-TERMINAL	HANSHIN	ENZP00199 01	1	3.9X9.6X6. 3		
5 1	Q101	KRX102U	TRANSISTOR	KEC	EQBA0000 601	1			
5 2	Q405	KRC404E	TR	KEC	EQBN0012 301	1			
5 3	U304	KRA304E	PNP-TR	KEC	EQBP0006 701	1			
5 4	Q201	2SB1424	TRANSISTOR	ROHM	EQBP0008 701	1			

5 5	R402,R405,R407,R409,R416,R417, R420,R429,R430,R433,R435,R438, R443,R445,R447,R449,R451,R452, R454,R463,R486,R496	MCR01MZSJ1 01	RESISTO R	ROHM	ERHY0003301	22	1005	100	+/-5%
5 6	R375,R376,R378	MCR01MZSF1 0R0	RESISTO R	ROHM	ERHZ0000206	3	1005	10	+/-1%
5 7	R234	MCR01MZSF1 202	RESISTO R	ROHM	ERHZ0000212	1	1005	12k	+/-1%
5 8	R209	MCR01MZSF1 502	RESISTO R	ROHM	ERHZ0000221	1	1005	15k	+/-1%
5 9	R489	MCR01MZSF2 203	RESISTO R	ROHM	ERHZ0000245	1	1005	220k	+/-1%
6 0	R487	MCR01MZSF4 702	RESISTO R	ROHM	ERHZ0000287	1	1005	47k	+/-1%
6 1	R214,R239,R241	MCR01MZSF4 703	RESISTO R	ROHM	ERHZ0000288	3	1005	470k	+/-1%
6 2	R223	MCR01MZSF8 062	RESISTO R	ROHM	ERHZ0000318	1	1005	80.6k	+/-1%
6 3	R464	MCR01MZSF2 203	RESISTO R	ROHM	ERHZ0000245	1	1005	220k	+/-1%
6 4	R215	MCR01MZSF1 182	RESISTO R	ROHM	ERHZ0000351	1	1005	11.8k	+/-1%
6 5	R312,R333,C316	MCR01MZSJ0 00	RESISTO R		ERHZ0000401	3	1005	0	+/-5%
6 6	R255	MCR01MZSJ1 00	RESISTO R	ROHM	ERHZ0000402	1	1005	10	+/-5%
6 7	R103,R334	MCR01MZSJ1 02	RESISTO R	ROHM	ERHZ0000404	2	1005	1k	+/-5%
6 8	R230,R235	MCR01MZSJ1 03	RESISTO R	ROHM	ERHZ0000405	2	1005	10k	+/-5%
6 9	C311,R315,R495	MCR01MZSJ1 04	RESISTO R	ROHM	ERHZ0000406	3	1005	100k	+/-5%
7 0	R318	MCR01MZSJ1 22	RESISTO R	ROHM	ERHZ0000412	1	1005	1.2k	+/-5%
7 1	R364,R365	MCR01MZSJ1 50	RESISTO R	ROHM	ERHZ0000419	2	1005	15	+/-5%

7 2	R104	MCR01MZSJ18 0	RESISTOR	ROHM	ERHZ0000428	1	1005	18	+/-5%
7 3	R361	MCR01MZSJ20 3	RESISTOR	ROHM	ERHZ0000438	1	1005	20k	+/-5%
7 4	R233	MCR01MZSJ22 0	RESISTOR	ROHM	ERHZ0000441	1	1005	22	+/-5%
7 5	R326	MCR01MZSJ22 2	RESISTOR	ROHM	ERHZ0000443	1	1005	2.2k	+/-5%
7 6	R473,R499	MCR01MZSJ22 3	RESISTOR	ROHM	ERHZ0000444	2	1005	22k	+/-5%
7 7	L101,R106	MCR01MZSJ33 1	RESISTOR	ROHM	ERHZ0000464	2	1005	330	+/-5%
7 8	R277,R278	MCR01MZSJ33 3	RESISTOR	ROHM	ERHZ0000466	2	1005	33k	+/-5%
7 9	R406,R414,R415,R421,R431,R441,R 450,R453	MCR01MZSJ47 1	RESISTOR	ROHM	ERHZ0000484	8	1005	470	+/-5%
8 0	R314	MCR01MZSJ47 2	RESISTOR	ROHM	ERHZ0000485	1	1005	4.7k	+/-5%
8 1	R225	MCR01MZSJ47 3	RESISTOR	ROHM	ERHZ0000486	1	1005	47k	+/-5%
8 2	R243,R267	MCR01MZSJ4R 7	RESISTOR	ROHM	ERHZ0000488	2	1005	4.7	+/-5%
8 3	R257,R272	MCR01MZSJ56 2	RESISTOR	ROHM	ERHZ0000499	2	1005	5.6k	+/-5%
8 4	R307	MCR01MZSJ75 0	RESISTOR	ROHM	ERHZ0000509	1	1005	75	+/-5%
8 5	R240	MCR01MZSF57 61	RESISTOR	ROHM	ERHZ0003202	1	1005	5.76k	+/-1%
8 6	R497	MCR03EZHJ00 0	RESISTOR	ROHM	ERHZ0000701	1	1608	0	+/-5%
8 7	R227	MCR10EZHFLR 100	RESISTOR- 1/8W	ROHM	ERHZ0003901	1	2012	0.1	+/-1%
8 8	R216	MCR01MZSF12 13	RESISTOR	ROHM	ERHZ0004201	1	1005	121k	+/-1%

8 9	U303	AAT3157ITP-T1	LED-CHARGE-PUMP	ANALOGIC-TECH	EUSY0238702	1	2.85X3.0X1.1		
9 0	U308,U309	NLAS4157DFT2G	Single-SPDT-Switch	ON-SEMI	EUSY0263301	2	2.0X2.1X1.1		
9 1	U201	QSC6010	MODEM	QUALCOMM	EUSY0298001	1	15.0X15.0X1.2		
9 2	U301	PF38F1030W0YBQF	MEMORY	INTEL	EUSY0327804	1	8.0X10.0X1.2	32M_/16	
9 3	X202	DSX321G_19_2MHZ_8PF	X-TAL	DAISHINKU	EXXY0025101	1	2.5X3.2X0.9		
9 4	DP101	B7638	DUPLEXER	EPCOS	SDDY0004001	1	2.5X3.0X1.3	DCN	
9 5	R226	NCP18WM154J03RB	THERMISTOR	MURATA	SETY0004501	1			
9 6	C419,R379,R437	ICVL0505101V150FR	VARISTOR	INNOCHIPS	SEVY0003601	3	1005	5.6V-100p	
9 7	L302,L303	BLM15AG601SN1	BEAD-INDUCTOR	MURATA	SFBH0008101	2	1005	600	
9 8	L305	BLM15HD182SN1	BEAD-INDUCTOR	MURATA	SFBH0008102	1	1005	1800	
9 9	F110	B9426	SAW-FILTER	EPCOS	SFSY0031901	1	1.1X1.4X0.4	836.5MHZ	
1 0 0	F101	B9432	SAW-FILTER	EPCOS	SFSY0034801	1	1.1X1.4X0.4	881.5MHZ	
1 0 1	U102	SKY77162	PAM	SKYWORKS	SMPY0009101	1			
1 0 2	CON406	04-6293-035-000-829+	35PIN-CONNECTOR	KYOCERA/E LCO	ENQY0013901	1	3.7X12.4X0.95	SLIDE-TYPE	
1 0 3	CON301	7607-2.5G-DB1-A	EAR-JACK	POWER-NET	ENJE0004105	1	5.5X11.4X3.0		
1 0 4	C217	GRM40-034X5R475K6.3	CHIP-CAPACITOR	MURATA	ECZH0025501	1	2012	4.7u	+/- 10%

