Internal Use Only

Service Manual

LG-A100

Date: March, 2011 / Issue 1.0

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1. INTRODUCTION

1.1 Purpose

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

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 for 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. The manufacturer 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. The manufacturer 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 this phone 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 this model must be performed only by the manufacturer 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.

E. Notice of Radiated Emissions

This model 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

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

H. Electrostatic Sensitive Devices

ATTENTION

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

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

1.3 Abbreviations

For the purposes of this manual, following abbreviations apply:

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 milli watt
DSP	Digital Signal Processing
EEPROM	Electrical Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
FPCB	Flexible Printed Circuit Board
GMSK	Gaussian Minimum Shift Keying
GPIB	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
RTC	Real Time Clock
SAW	Surface Acoustic Wave
SIM	Subscriber Identity Module
SLR	Sending Loudness Rating
SRAM	Static Random Access Memory
PSRAM	Pseudo SRAM
STMR	Side Tone Masking Rating
TA	Travel Adapter
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
UART	Universal Asynchronous Receiver/Transmitter
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Control Temperature Compensated Crystal Oscillator
WAP	Wireless Application Protocol

2. PERFORMANCE

Item	Feature	Comment
Standard Battery	Lithium-ion , 3.7V 950mAh	
Stand by TIME	Up to 950 hrs : Paging Period 9, RSSI 85dBm	
Talk time	Up to 9 hrs : GSM Tx Level 10	
Charging time	Approx. 3.5 hours	
RX Sensitivity	GSM, EGSM: -108dBm, DCS: -108dBm	
TX output power	GSM, EGSM: 32.5dBm(Level 5), DCS , PCS: 29.5dBm(Level 0)	
GPRS compatibility	Not Support	
SIM card type	3V Small	
Display	MAIN : 1.5" TFT 128 × 128 pixel 65K Color	
Status Indicator	Hard icons. Key Pad 0 ~ 9, #, *, Up/Down Left/Right Navigation Key Send Key, PWR Key ,Soft Key(Left/Right)	
ANT	Internal	
EAR Phone Jack	Yes	
PC Synchronization	Not Support	
Speech coding	EFR/FR/HR	
Data and Fax	Yes	
Vibrator	Yes	
Loud Speaker	Yes	
Voice Recoding	Not Support	
Microphone	Yes	

Item	Feature	Comment
Speaker/Receiver	18x12Φ Speaker/ Receiver	
Travel Adapter	Yes	
MIDI	32 poly	
Camera	Not Support	
FM Radio	Yes	

2.2 Technical Specification

<table>
<tr><th>Item</th><th>Description</th><th>Specification</th></tr>
<tr><td>1</td><td>Frequency Band</td><td>EGSM
TX: 880 ~ 915MHz
RX: 925 ~ 960 MHz

DCS
TX: 1710 ~ 1785 MHz
RX: 1805 ~ 1880 MHz</td></tr>
<tr><td>2</td><td>Phase Error</td><td>RMS < 5 degrees
Peak < 20 degrees</td></tr>
<tr><td>3</td><td>Frequency Error</td><td>< 0.1 ppm</td></tr>
<tr><td rowspan="20">4</td><td rowspan="20">Power Level</td><td>GSM850/EGSM</td></tr>
<tr><td>
<table>
<tr><td>Level</td><td>Power</td><td>Toler.</td><td>Level</td><td>Power</td><td>Toler.</td></tr>
<tr><td>5</td><td>33dBm</td><td>±2dB</td><td>13</td><td>17dBm</td><td>± 3dB</td></tr>
<tr><td>6</td><td>31dBm</td><td>±3dB</td><td>14</td><td>15dBm</td><td>± 3dB</td></tr>
<tr><td>7</td><td>29dBm</td><td>±3dB</td><td>15</td><td>13dBm</td><td>± 3dB</td></tr>
<tr><td>8</td><td>27dBm</td><td>±3dB</td><td>16</td><td>11dBm</td><td>± 5dB</td></tr>
<tr><td>9</td><td>25dBm</td><td>±3dB</td><td>17</td><td>9dBm</td><td>± 5dB</td></tr>
<tr><td>10</td><td>23dBm</td><td>±3dB</td><td>18</td><td>7dBm</td><td>± 5dB</td></tr>
<tr><td>11</td><td>21dBm</td><td>±3dB</td><td>19</td><td>5dBm</td><td>± 5dB</td></tr>
<tr><td>12</td><td>19dBm</td><td>±3dB</td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>DCS/PCS</td></tr>
<tr><td>
<table>
<tr><td>Level</td><td>Power</td><td>Toler.</td><td>Level</td><td>Power</td><td>Toler.</td></tr>
<tr><td>0</td><td>30dBm</td><td>±2dB</td><td>8</td><td>14dBm</td><td>± 3dB</td></tr>
<tr><td>1</td><td>28dBm</td><td>±3dB</td><td>9</td><td>12dBm</td><td>± 4dB</td></tr>
<tr><td>2</td><td>26dBm</td><td>±3dB</td><td>10</td><td>10dBm</td><td>± 4dB</td></tr>
<tr><td>3</td><td>24dBm</td><td>±3dB</td><td>11</td><td>8dBm</td><td>± 4dB</td></tr>
<tr><td>4</td><td>22dBm</td><td>±3dB</td><td>12</td><td>6dBm</td><td>± 4dB</td></tr>
<tr><td>5</td><td>20dBm</td><td>±3dB</td><td>13</td><td>4dBm</td><td>± 4dB</td></tr>
<tr><td>6</td><td>18dBm</td><td>±3dB</td><td>14</td><td>2dBm</td><td>± 5dB</td></tr>
<tr><td>7</td><td>16dBm</td><td>±3dB</td><td>15</td><td>0dBm</td><td>± 5dB</td></tr>
</table>
</td></tr>
</table>

Item	Description	Specification	
5	Output RF Spectrum (due to modulation)	**GSM850/ EGSM**	
		Offset from Carrier (kHz).	Max. dBc
		100	+0.5
		200	-30
		250	-33
		400	-60
		600~ <1,200	-60
		1,200~ <1,800	-60
		1,800~ <3,000	-63
		3,000~ <6,000	-65
		6,000	-71
		DCS/PCS	
		Offset from Carrier (kHz).	Max. dBc
		100	+0.5
		200	-30
		250	-33
		400	-60
		600~ <1,200	-60
		1,200~ <1,800	-60
		1,800~ <3,000	-65
		3,000~ <6,000	-65
		6,000	-73
6	Output RF Spectrum (due to switching transient)	**GSM850/ EGSM**	
		Offset from Carrier (kHz).	Max. dBm
		400	-19
		600	-21
		1,200	-21
		1,800	-24

<table>
<tr><th>Item</th><th>Description</th><th colspan="3">Specification</th></tr>
<tr><td rowspan="6">6</td><td rowspan="6">Output RF Spectrum
(due to switching
transient)</td><td colspan="3">DCS/PCS</td></tr>
<tr><td colspan="2">Offset from Carrier (kHz).</td><td>Max. dBm</td></tr>
<tr><td colspan="2">400</td><td>-22</td></tr>
<tr><td colspan="2">600</td><td>-24</td></tr>
<tr><td colspan="2">1,200</td><td>-24</td></tr>
<tr><td colspan="2">1,800</td><td>-27</td></tr>
<tr><td>7</td><td>Spurious Emissions</td><td colspan="3">Conduction, Emission Status</td></tr>
<tr><td>8</td><td>Bit Error Ratio</td><td colspan="3">GSM850, EGSM
BER (Class II) < 2.439% @-102 dBm
DCS,PCS
BER (Class II) < 2.439% @-100 dBm</td></tr>
<tr><td>9</td><td>RX Level Report Accuracy</td><td colspan="3">±3 dB</td></tr>
<tr><td>10</td><td>SLR</td><td colspan="3">13±4 dB</td></tr>
<tr><td rowspan="9">11</td><td rowspan="9">Sending Response</td><td>Frequency (Hz)</td><td>Max.(dB)</td><td>Min.(dB)</td></tr>
<tr><td>100</td><td>-12</td><td>-</td></tr>
<tr><td>200</td><td>0</td><td>-</td></tr>
<tr><td>300</td><td>0</td><td>-12</td></tr>
<tr><td>1,000</td><td>0</td><td>-6</td></tr>
<tr><td>2,000</td><td>4</td><td>-6</td></tr>
<tr><td>3,000</td><td>4</td><td>-6</td></tr>
<tr><td>3,400</td><td>4</td><td>-9</td></tr>
<tr><td>4,000</td><td>0</td><td>-</td></tr>
<tr><td>12</td><td>RLR</td><td colspan="3">2±3 dB</td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th><th colspan="3">Specification</th></tr>
<tr><td rowspan="11">13</td><td rowspan="11">Receiving Response</td><td>Frequency (Hz)</td><td>Max.(dB)</td><td>Min.(dB)</td></tr>
<tr><td>100</td><td>-12</td><td>-</td></tr>
<tr><td>200</td><td>0</td><td>-</td></tr>
<tr><td>300</td><td>2</td><td>-7</td></tr>
<tr><td>500</td><td>*</td><td>-5</td></tr>
<tr><td>1,000</td><td>0</td><td>-5</td></tr>
<tr><td>3,000</td><td>2</td><td>-5</td></tr>
<tr><td>3,400</td><td>2</td><td>-10</td></tr>
<tr><td>4,000</td><td>2</td><td></td></tr>
<tr><td colspan="3">* Mean that Adopt a straight line in between 300 Hz and 1,000 Hz to be Max. level in the range.</td></tr>
<tr><td>14</td><td>STMR</td><td colspan="3">Over 17 dB</td></tr>
<tr><td>15</td><td>Stability Margin</td><td colspan="3">> 6 dB</td></tr>
<tr><td>16</td><td>System frequency
(13 MHz) tolerance</td><td colspan="3">≤ 2.5 ppm</td></tr>
<tr><td>17</td><td>32.768KHz tolerance</td><td colspan="3">≤ 30 ppm</td></tr>
<tr><td>18</td><td>Ringer Volume</td><td colspan="3">At least 65 dBspl under below conditions:
1. Ringer set as ringer.
2. Test distance set as 50 cm</td></tr>
<tr><td>19</td><td>Charge Current</td><td colspan="3">Fast Charge : Typ. 400 mA
Total Charging Time : < 3.5 hours</td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th><th colspan="2">Specification</th></tr>
<tr><td rowspan="7">20</td><td rowspan="7">Antenna Display</td><td>Bar Number</td><td>Power</td></tr>
<tr><td>5</td><td>-92 ± 2</td></tr>
<tr><td>5 -> 4</td><td>-93 ± 2</td></tr>
<tr><td>4 -> 2</td><td>-101± 2</td></tr>
<tr><td>2 -> 1</td><td>-104 ± 2</td></tr>
<tr><td>1 -> 0</td><td>-106 ± 2</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="5">21</td><td rowspan="5">Battery Indicator</td><td>Battery Bar Number</td><td>Voltage</td></tr>
<tr><td>3</td><td>> 3.75± 0.05 V</td></tr>
<tr><td>3 -> 2</td><td>3.75 ± 0.05 V</td></tr>
<tr><td>2 -> 1</td><td>3.67 ± 0.05 V</td></tr>
<tr><td>1 -> 0</td><td>3.6 ± 0.05 V</td></tr>
<tr><td rowspan="2">22</td><td rowspan="2">Low Voltage Warning
(Blinking Bar)</td><td colspan="2">1 time per 1 minute (Receiver)</td></tr>
<tr><td colspan="2">1 time per 3 minute (Speaker)</td></tr>
<tr><td>23</td><td>Forced shut down
Voltage</td><td colspan="2">3.3 ± 0.05V</td></tr>
<tr><td>24</td><td>Battery Type</td><td colspan="2">Lithium-Ion Battery
Standard Voltage = 3.7 V
Battery full charge voltage = 4.2 V
Capacity: 950mAh</td></tr>
<tr><td>25</td><td>Travel Charger</td><td colspan="2">Switching-mode charger
Input: 100 ~ 240V, 50/60 Hz
Output: 4.8 V, 400 mA</td></tr>
</table>

3. TECHNICAL BRIEF

3.1 Digital Main Processor

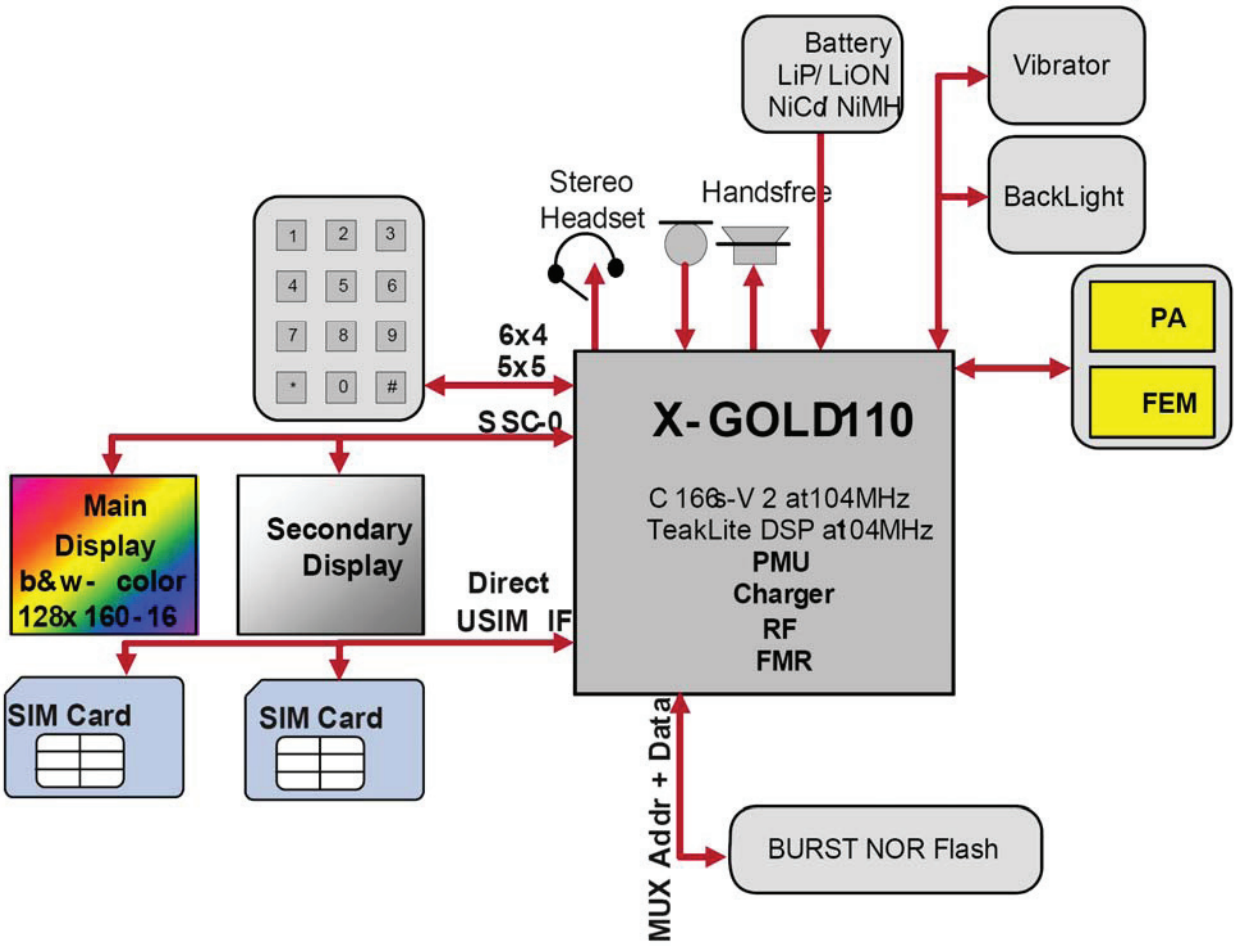


Figure. 3.1.1 X-Gold tm 110 Hardware Block Diagram

3.1.1 General

Technology:
– SoC, Monolithic, 65 nm CMOS
• Package:
– WFWLB, 8x8x0.8 mm
– 0.5 mm pitch
– 217 balls

3.1.2 RF Transceiver

• Dual-band direct conversion receiver
• Tri/Quad-band possible with external circuitry
• Fully integrated digital controlled X0
• Additional buffer for 2 external system clocks
• Fully digital RF-Synthesizer incl. ΣΔ-Transmitter

3.1.3 Baseband

• High performance fixed-point TEAKlite DSP
• C166S-V2 high performance microcontroller with a 16KB Instruction Cache and a Data cache Buffer.
• FM Stereo Radio Receiver with RDS
• There are several Interfaces:
– I2S interface for DAI connections (for Tape Approval) and external Audio component connection.
– High Speed SSC Interface for connection of companion chips (like Serial SD Cards)
– High Speed SSC Interface dedicated to Display control
– USIM Interface with support of Protocol T=1 and Dual USIM support.
– Keypad Interface (6x4 or 5x5 keys)
– External Memory Controller (EBU) for external RAM/NOR FLASH/Busrt Flash/NAND Flash/Serial Flash (SPI/SQI) and Parallel Display connection
– Asynchronous serial interface.
– Asynchronous serial interface for WLAN/BT/GPS control (incl. IrDA support capability) .
– JTAG Interface, OCDS, Multi-Core Debug and Real Time Trace facilities.
– Black & white and 128x160 - 16bit color displays are supported
– PWM source to drive vibrator
– Keypad and display backlight supported.
– HASH Unit support for hashing.

Crystal Oscillator

• Fully digital controlled crystal oscillator core with a highly linear tuning characteristic

Mixed Signal and Power Management Unit

• Embedded stepdown converter (1.8V)
• DC/DC boost for voltages up to 15 V for driving White or Blue LEDs
• 8-Ω loud speaker driver (700 mW)
• 16-Ω earpiece driver
• 32-Ω headset driver
• Measurement interfaces (PA temperature, battery voltage, battery temperature, and ambient temperature)
• Accessory Detection
• PCB ID detection as part of measurement interface.
• Differential microphone input
• System start up circuitry
• Charger circuitry for NiCd, NiMh and LiIon cells with integrated Control Current/Voltage Charging.
• Integrated regulators for direct connection to battery.

C166S-V2 Buses

The C166S-V2 is connected to four buses:
1. IMB (Internal Program) bus (64b - 0 cycle instruction bus))
2. DPMI (Data-Program) Bus (16b - 0 cycle data bus)
3. X-Bus (16b - 3 cycle peripheral bus)
4. PD-Bus (16b 0 cycle peripheral bus)

Bus Interconnections

The interconnection between the X-Bus and the TEAKlite Bus uses:
• Multicore Synchronization
• Shared Memory.

3.1.4 FM Radio

• Not supported

3.1.5 Display

• Type

– 128*128, QQVGA, 65k color (parallel)

• Interface

– Parallel 8/9bit MIPI-DBI Type B

– Interf. voltage at 1.8V or 2.8V

• gRacr - Display Controller (Hardware)

– 30 fps Display update without DMA (up to 60 fps) (full or partial)

– Video post processing Scaling, Rotation (90° steps), Mirroring

– Overlay with alpha blending

– Color conversion YUV -> RGB

– 2D vector graphics (Lines, filled rectangles, Bit block transfer (e.g. sprites, scrolling, antialiased bitmap fonts)

3.2 Power Management

A mobile platform requires power supplies for different functions. These power supplies are generated in the integrated power management Unit (PMU). The PMU is designed to deliver the power for a typical standard phone.

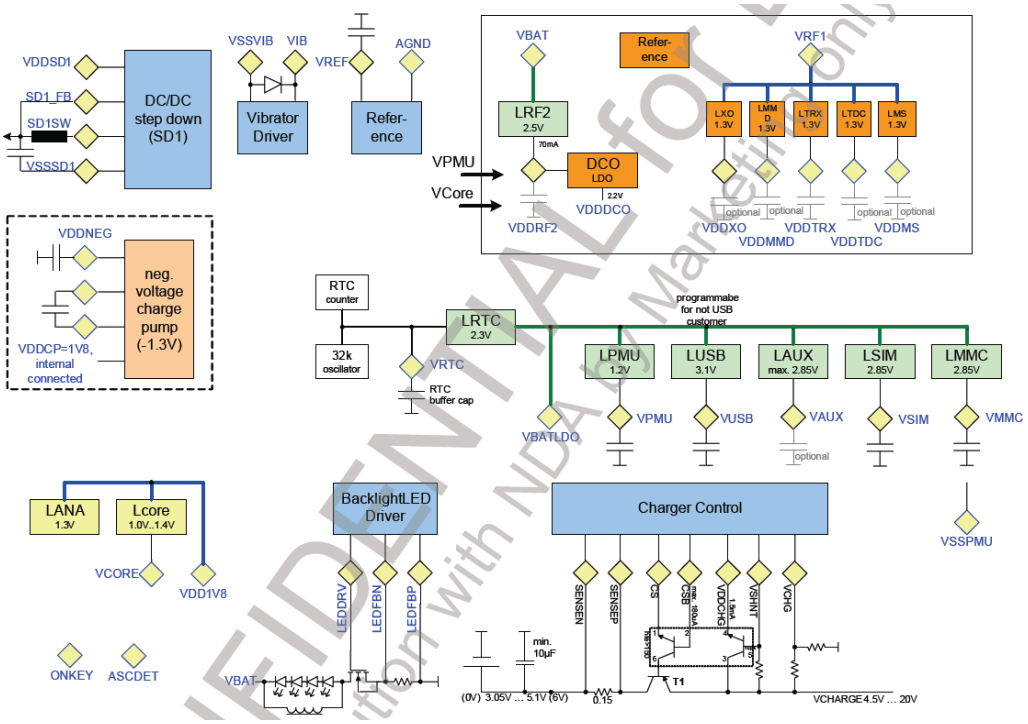


Figure. 3-2-1 Block Figure of the PMU Modules X-Gold tm 110

- **DC/DC Step Down Converter for 1.8V (SD1)**

The DC/DC converter generates a 1.8 V supply rail. This voltage rail is used to supply main parts of the system, like the digital core of the chip (via LDO LCORE), parts of the mixed signal macro, parts of the RF macro and the external memory if a 1.8V memory is used.

▪ **Linear voltage Regulators (low dropout) LDOs**

The LDOs are used to generate the supply for the different supply domains not directly supplied out of the DC/DC converter.

▪ **LCORE**

The LCORE LDO provides the VCORE supply used for most of the digital parts of the chip

▪ **LPMU**

The LPMU provides VPMU sued for the PMU supply, e.g. for the startup state machine and analog parts like ADC, sense amplifier etc.

▪ **LAUX**

The LAUX generates VAUX. It is a general purpose LDO and can be used for different functions depending on the phone application, e.g. for the display or Camera.

▪ **LSIM**

The LSIM LDO generates the VSIM supply for the SIM card and interface. It is designed to supply Standard SIM cards.

▪ **Other LDOs**

The RF module has implemented several LDO's for different RF Power domain.
The mixed signal module has some LDO's for the audio driver and microphone supply.

Supply Domain LDO Name	Voltage	Max. Current	Output Cap	Input Domain	Comment
VBAT	0 ... 6.0 V				Operating range is 3.05 V ... 5.5 V, system emergency switch off voltage is about 2.8 V
VDD1V8	1.8 V	450 mA	22 µF optional 10 µF	VBAT	This voltage is generated by the DC/DC converter with 3.3 µH inductor, (10 µF output cap is preferred but needs to be checked) The voltage is used for: Memory supply, and via LDOs for digital core supply, mixed signal supply and RF supply.
LCORE	1.2 V	100 mA	2x100 nF	VDD1V8	Assumption: C166 core clock 104 MHz, DSP clock 104 MHz
LANA	1.3 V	10 mA	No	VDD1V8	No ball
LRTC	2.3 V	2 mA	>=100 nF	VBAT	This supply is only used for the HPBG, the 32.768 kHz oscillator and the real-time clock counter required during the sleep- and low-power mode.
LPMU	1.3 V	15 mA	100 nF	VBAT	Supply for the digital part of the PMU including digital control of DC/DC converter. This voltage is also used for the N-DEMOS driver of DC/DC converter and the class-D amplifier and the core PLL.
LAUX	1.5 V ... 2.85 V	150 mA	>=470 nF	VBAT	General purpose LDO for e.g. Display, Bluetooth, Camera etc. Programmable output voltages are (1.5 V, 1.8 V, 2.5 V, 2.85 V)
LSIM	1.8 V / 2.85 V	30 mA	>=100 nF	VBAT	LDO dedicated to the SIM-Card supply. It is chip internal connected to the SIM interface driver.
VDDNEG	-1.3 V	100 mA	100 nF	VDD1V8	Negative voltage for the bipolar headset audio driver. Generated by a charge pump.

Table. 3-2-1 Power supply Domains (without RF)

3.2.1 Power on and startup

- **Analog startup Circuit**

Because the POR circuit and the LPBG are directly connected to the battery, it is not possible to switch them off. If the battery voltage exceed the power on reset threshold (2.5V), the power on reset is released, the LPMU regulator and the LRTC voltage regulator are switched on. The LPMU regulator starts in its ultra-low power mode.

The LPMU regulator generates a control signal (lpmu_OK) that enables the 50KHZ PMU oscillator. The output clock of the oscillator is checked with a fully coded counter. A counter overflow releases the reset (vpmu_rst_n) signal for the small PMU state-machine.

- **Small first digital State-Machine**

The small PMU state-machine is always connected to VPMU After starting from reset the small startup state machine enters the SYSTEM OFF state and only continuous the startup procedure if a switch on event like first connect, on-key, wake up or charge detect occurs.

- **PMU-main State-Machine**

The main PMU state-machine is always connected to VPMU also. The power up sequence driven by the PMU state-machine can be seen in Figure18. After enabling the reference (HPGB) and waiting for the settling time, the battery voltage is measured and compared with the power on threshold. If the battery voltage is high enough, the SD1 DC/DC converter and the LCORE LDO are started. A timer ensures that the supply voltage will be stable before the DCXO is enabled. The DCXO settling time is ensured using a fixed timer. After an overflow of this timer, the reset is released for the rest of the system. The PMU state machine remains in this System-ON state until the system is switched into the OFF state. For example the system sleep mode is completely configured by software(for example switching off the LDO's, switching of the DCXO etc.) and controlled by the VCXO_enable signal. The reason for the startup is stored in the ResetSourceRead register.

- **Battery Measurement**

The ADC and the oscillator for the ADC needs the VDD_ADC supply voltage from the LADC LDO. LADC uses either the charger voltage VDD_CHARGE or VDDRTC as input voltage. The input voltage is selected automatically by a bulk switch circuit. LADC, the ADC and the oscillator are enabled on request for every battery measurement if the charger unit is not running. This is handled by an ADC control block in one of the state-machines. If the charger unit is running the ADC is controlled by the charger state-machine

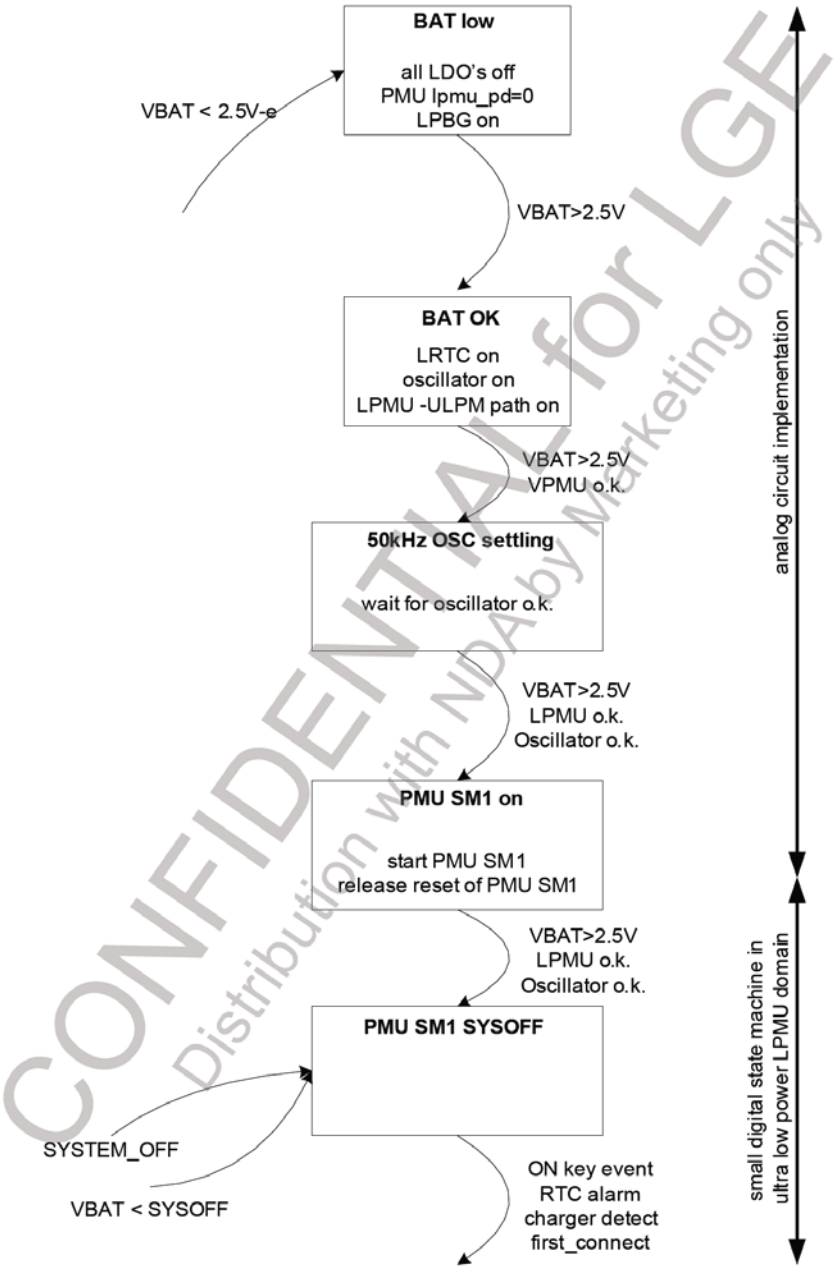


Figure.3.2.1 First Part of the State Machine, Running in Different Power Domains than the Second Part

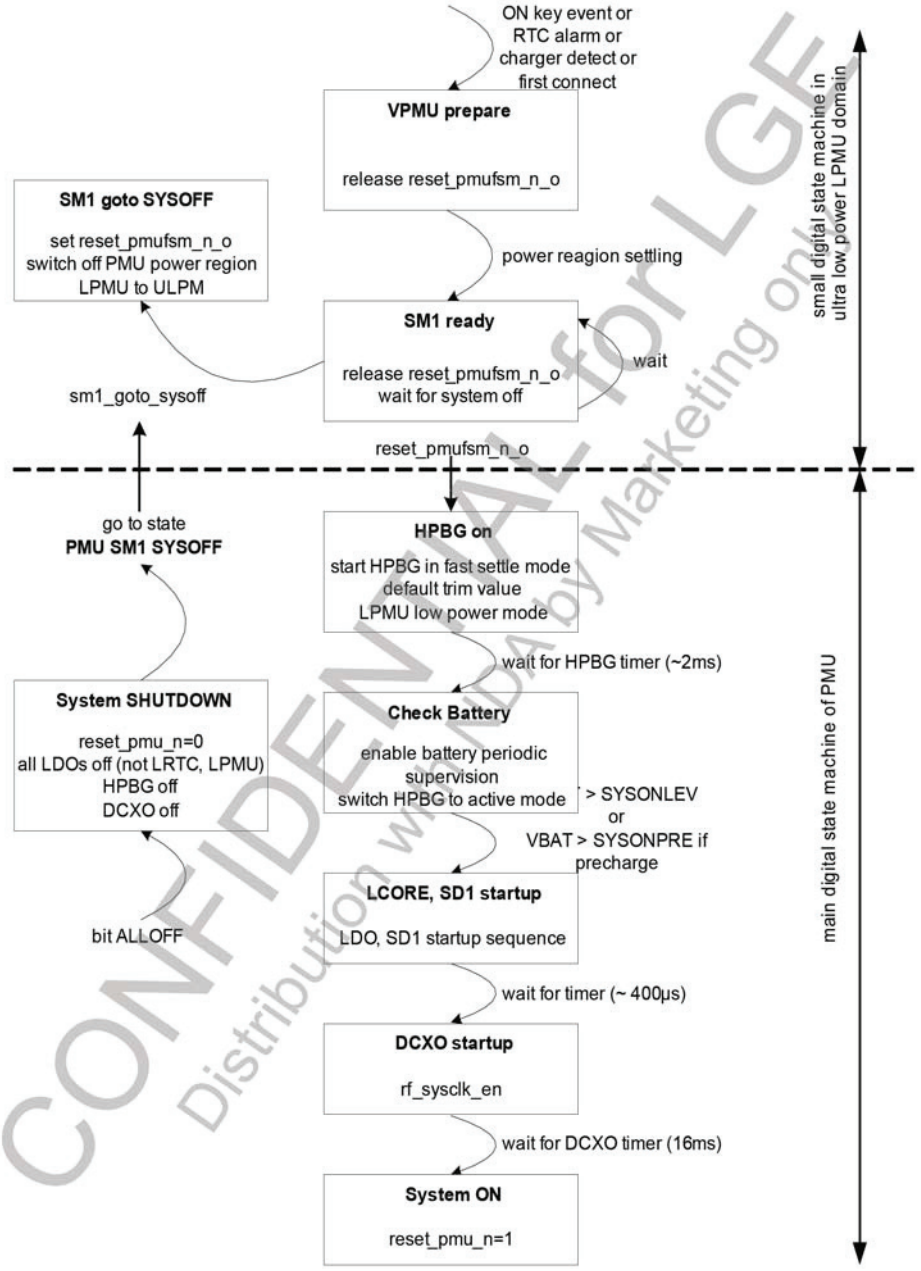


Figure 3.2.2 Second (Main) Part of the Startup State Machine in the VPMU Domain

3.2.2 Switching on due to first connect

If the battery voltage is connected the first time, that means the system enters the first time the SYSOFF state, this is stored in a first connect flag. If the first connect flag is set, the system will start immediately and not wait for any other system on event in the SYSOFF state.

3.2.3 Switching on due to on-Key event

The on key is connected to the ONKEY pad. The ESD protection and the input structure of this pad are connected to VRTC. If the ONKEY pad is forced to VRTC by an external key or similar circuit, the system starts. The ONKEY is sampled with the PMU clock. It has to be sampled four times high before a valid on event is generated. The status of the ON key can be read in the PMU registers, so it can be used as a functional key during phone operation also

3.2.4 Switching on due to RTC alarm

The real time clock can generate a wakeup signal called RTC alarm. This signal is sampled from the state-machine and after successfully detecting a high, the system is switched on.

3.2.5 Switching on due to charging

When a battery with a voltage below the SSONLEV level is inserted, the state machine will not start the system. As long as the battery voltage stays lover than SYSONLEV the system will stay off. The only possibility to start up the system is due to an external charger.

If an external charger is connected and detected and the battery is charged above the SYSONPRE voltage level the system will start up.

The PMU main state machine waits in the Check battery state until the battery voltage condition is fulfilled. The charger state machine provides the necessary pre-charge indication signal. This pre-charge signal is denounced in a small counter to have a stable signal. This is important, especially in half/full-wave charging where the charger detection is switching between charger detected/not detected according the AC supply frequency. reasons

For details on pre-charging see the charger chapter. The charger is controlled by an independent state machine. The pre-charge signal is used to trigger the pre-charge signal is used to trigger the pre-charge functionality. The charger state machine fully control the pre-charge, the PMU-state machine now changes to state HPBG on state and the system starts. This state change is indicated to the charger state-machine to enable the charger watchdog for safety

3.2.6 Power Supply Start-up sequence

In order to avoid an excessive drop on the battery voltage caused by in-rush current during system power-on, possibly leading to system instability and “hick-ups” a staggered turn-on approach for the regulators is implemented. The regulators are turned on in a well defined sequence, thus spreading the in-rush current transients over time.

The IO’s of X-GOLD TM 213 are isolated in OFF mode (core supply is off). The isolation signal is controlled by the PMU state machine. This ensures that the PADs are in a well defined state during core supply settling. This allows to power up the LCORE core regulator and wait for the core to reach reset state before powering up the I/O supply regulators.

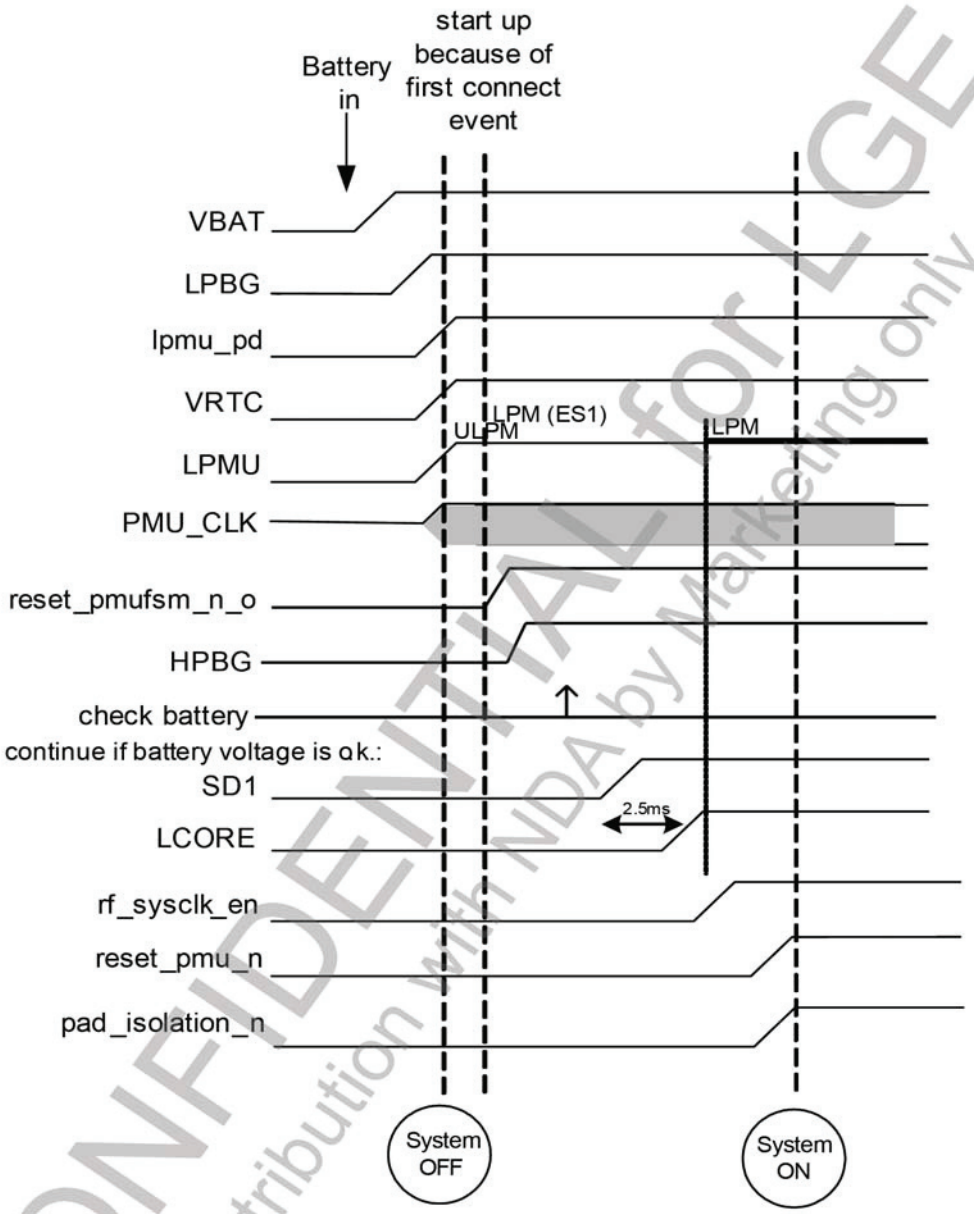


Figure 3.2.3 Start Up Sequence (triggered by First Connect Event)

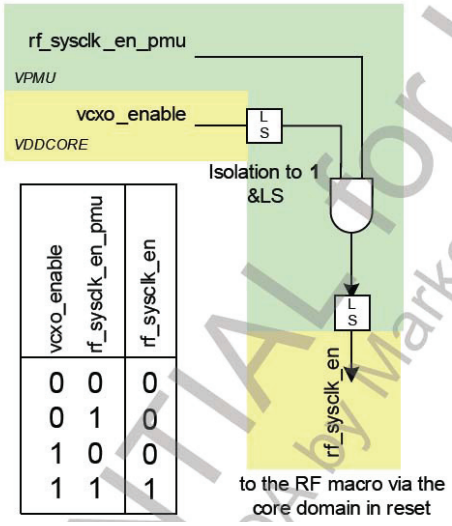


Figure 3.2.4 How sysclock Enable is Routed in the PMU

3.2.7 Sysclock Switching

The PMU controls the rf_sysclk_en signal of the DCXO in the RF macro. During startup the PMU enables the DCXO. After the system is running the DCXO is controlled by the SCU of the baseband by using the vcxo_enable signal. This is handled by a dedicated logic in the PMU, see **Figure 21**. As long as rf_sysclk_en_pmu, the output of the PMU state-machine is high, vcxo_enable controls the rf_sysclk_en signal to the RF. If rf_sysclk_en_pmu is low, the DXCO is switched off, independent from vcxo_enable.

3.2.8 Undervoltage Shutdown

In active mode the PMU periodically measures the battery voltage using the ADC from the charger unit. If the battery is measured to be below the programmable shut-down level (called SYSOFF), the system changes to OFF mode. This is done via the SHUTDOWN state of the PMU state machine. (see chapter switch OFF)

3.2.9 Silent Reset

WDT-reset and software-reset shall happen silently to ending customer: SIM card and interfaces have to stay powered and not reset by neither WDT-reset or C166s SRST instruction. To allow this, some LDO settings and some registers (as e.g. USIM_pad control register) are reset only by system-reset (HW-reset or power-on reset)

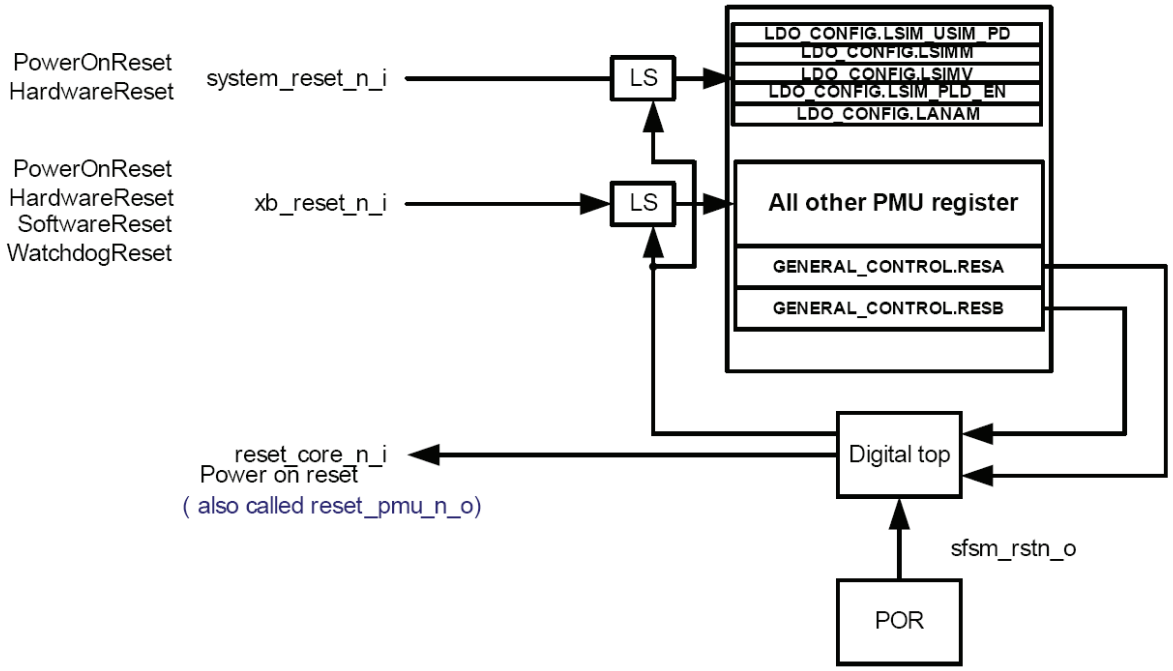


Figure 3.2.5 PMU Reset

3.2.10 PMU Clock

During the first startup (for example plugging in a battery) a PMU internal oscillator is used for generation of the PMU clock (pmu_clock). The frequency is slightly above 32 kHz (typ. 50 kHz) to be out of the audio band also for worst case devices. After first startup the software shall enable the 32 kHz crystal oscillator. It is not possible to use the 32 kHz oscillator during first startup, because the settling time of the oscillator can be quite long. After the 32 kHz oscillator is running and settled the software shall switch the PMU clock to the 32 kHz clock and disable the internal PMU oscillator for power saving reasons. The 32 kHz oscillator shall never be disabled after the PMU clock has been switched. The ADC in the charger unit has it's own oscillator generating a frequency of about 10 MHz. This oscillator is running during charging and during battery measurements triggered by the PMU. It is off otherwise.

3.2.11 System Sleep Mode

The sleep mode is controlled by using the VCXO_enable signal (dcxo_en_i) and gsm_sleep_i. These signals are used to deactivate the HPBG and setting LDO LPMU in the ultra-low-power mode. In addition the DCXO is switched off by the VCXO_enable signal. The VCXO_enable signal is also used to switch some LDO's (software configured) to sleep and/or off mode or to change the output voltages of said LDO's. The state of the main PMU state machine is not changed due to VCXO_enable.

3.2.12 DC/DC Pre-Load Register Handling

The DC/DC converter works in different modes. If the mode is switched from PFM to PWM the pulse-width of the DC/DC converter depends on the current battery voltage (and on the output voltage). The PMU state-machine knows the battery voltage because of the battery supervision function. Depending on this value it selects a startup pulse-width for the DC/DC converter out of a register table. (4-values)

3.2.13 Power Down Sequence

Setting bit OFF in the GeneralControl register switches the system into OFF mode. After the turn off event, the state-machine switches to the SHUTDOWN state. The reset_pmu_n_o signal changes to low, the I/O pads are isolated using the padisolation_n signal, the LCORE LDO and the SD1 DC/DC converter are switched off, the LPMU LDO is switched to ultra-low power mode, the DCXO is turned off and the bandgap buffer is disabled. Before switching OFF the software shall have enabled the 32 kHz oscillator and has switched the PMU clock to the 32 kHz clock to archive the target OFF current

3.3 FEM with integrated Power Amplifier Module (SKY77550, U301)

3.3.1 Internal Block Diagram

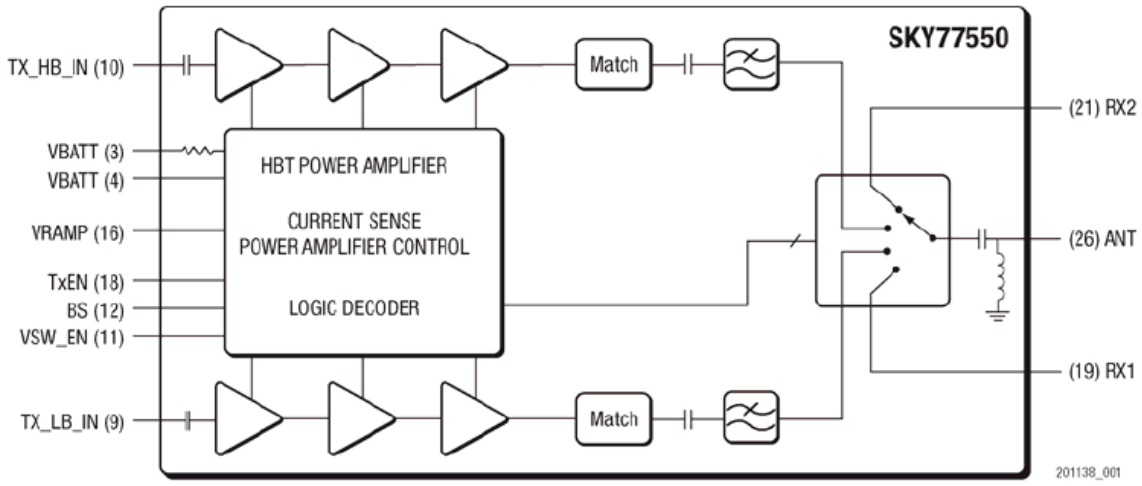


Figure. 3.3.1 SKY77550 FUNCTIONAL BLOCK DIAGRAM

3.3.2 General Description

SKY77550 is a transmit and receive Front-End Module (FEM) with Integrated Power Amplifier Control (iPAC™) for Dual-band cellular handsets comprising GSM850/900 and DCS1800/PCS1900 operation. Designed in a low profile, compact form factor, the SKY77550 offers a complete Transmit VCO-to-Antenna and Antenna-to-Receive SAW filter solution. The FEM also supports Class 12 General Packet Radio Service (GPRS) multi-slot operation. The module consists of a GSM850/900 PA block and a DCS1800/PCS1900 PA block, impedancematching circuitry for 50 ohm input and output impedances, Tx harmonics filtering, high linearity / low insertion loss RF switch, and a Power Amplifier Control (PAC) block with internal current sense resistor. The two Heterojunction Bipolar Transistor (HBT) PA blocks, a BiFET PAC and switch control circuit are fabricated onto a single Gallium Arsenide (GaAs) die. One PA block supports the GSM850/900 bands and the other PA block supports the DCS1800/PCS1900 bands. Both PA blocks share common power supply pads to distribute current. The output of each PA block and the outputs to the two receive pads are connected to the antenna pad through an RF switch. The GaAs die, Switch die and passive components are mounted on a multi-layer laminate substrate. The assembly is encapsulated with plastic overmold.

Band selection and control of transmit and receive are performed using four external control pads. Refer to the block diagram in Figure 1 below. The band select pad, BS, selects GSM850, GSM900, DCS, and PCS modes of operation. Transmit enable TxEN controls receive or transmit mode of the RF switch (Tx = logic 1). Proper timing between transmit enable TxEN and Analog Power Control VRAMP allows for high isolation between the antenna and Tx–VCO while the VCO is being tuned prior to the
transmit burst. The SKY77550 is compatible with logic levels from 1.2 V to 2.9 V for BS, TxEN, and VSW_EN pads.

Mode	Input Control Bits		
	VSW_EN	TxEN	BS
STANDBY	0	0	0
Rx1[1]	1	0	0
Rx2[1]	1	0	1
Tx_LB	1	1	0
Tx_HB	1	1	1

1 Rx1 and Rx2 are broadband receive ports and each supports the GSM850, GSM900, DCS, and PCS bands.

Figure 3.3.2 Band SW Logic Table

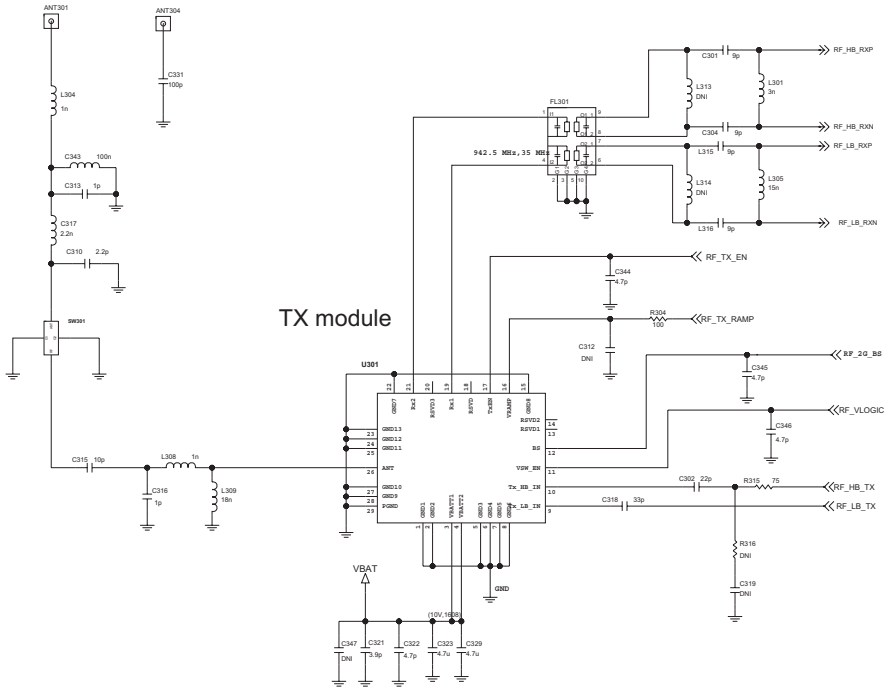


Figure 3.3.3 FEM CIRCUIT DIAGRAM

3.4 Crystal(26 MHz, X102)

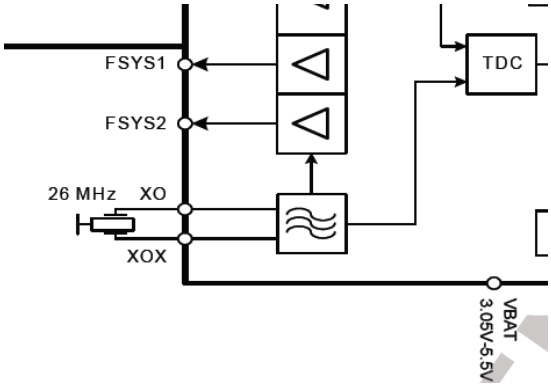


Figure. 3.4.1 Crystal Oscillator External Connection

The X-GOLDTM110 RF-Subsystem contains a fully integrated 26 MHz digitally controlled crystal oscillator,
designed for 8 pF crystals. The only external part of the oscillator is the crystal itself. Overall pulling range of the
DCXO is approximately ±55 ppm, controllable by a 13-bit tuning word DCXO_AFC[16:4].

The 26 MHz reference clock can also be applied to external components like Bluetooth or GPS, via the buffered output signal FSYS1.

3.5 RF Subsystem of PMB8810 (U101)

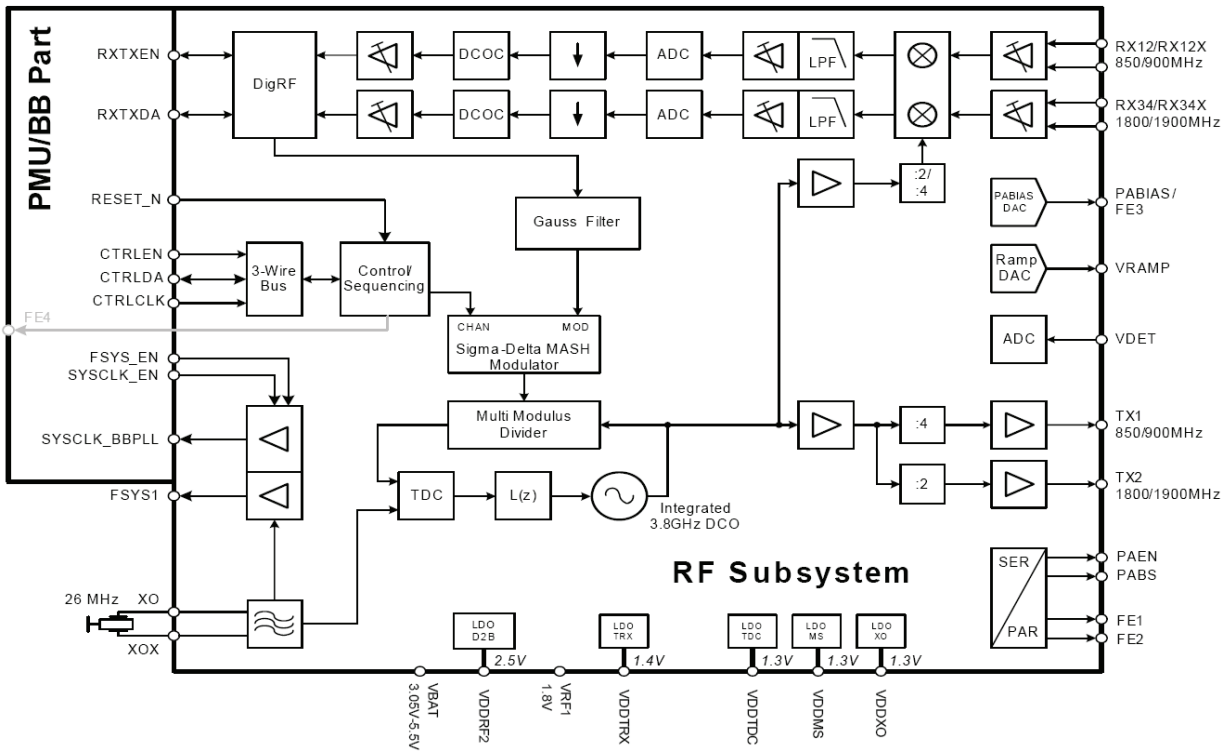


Figure. 3-5-1 Block DIAGRAM of RF Subsystem

3.5.1 GENERAL DESCRIPTION

The PMB8810 RF subsystem is designed for dual-band GSM voice and data applications (GPRS class 12).
The system can be configured to support one low band, GSM850 or EGSM900, and one high band, DCS1800 or PCS1900. A block diagram of the RF subsystem is given in Figure 3-4-1.

3.5.2 FUNCTIONAL DESCRIPTION

3.5.2.1 Receiver

The X-GOLDTM110 receiver is based on the Direct Conversion Receiver architecture (DCR) and can be configured to support one low band, GSM850 or EGSM900, and one high band, DCS1800 or PCS1900. A fully differential receive path is chosen to suppress on-chip interference.
The analog section of the receiver contains two LNAs, quadrature mixer, low-pass filter, and a high resolution continuous-time delta-sigma analog-to-digital converter.

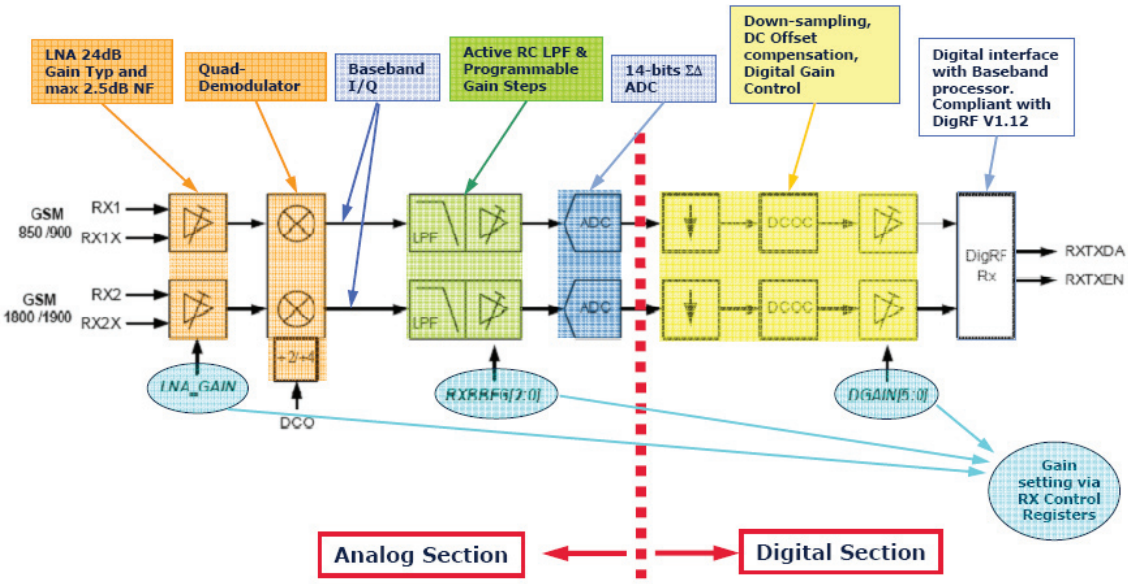


Figure. 3.5.2 RECEIVER CHAIN BLOCK DIAGRAM

3.5.2.2 Transmitter

The GMSK transmitter supports power class 4 for GSM850 or GSM900 as well as power class 1 for DCS1800 or PCS1900. The digital transmitter architecture is based on a fractional-N sigma-delta synthesizer for constant envelope GMSK modulation. This configuration allows a very low power design without any external components. Up- and down-ramping is performed via the ramping DAC connected to VRAMP.

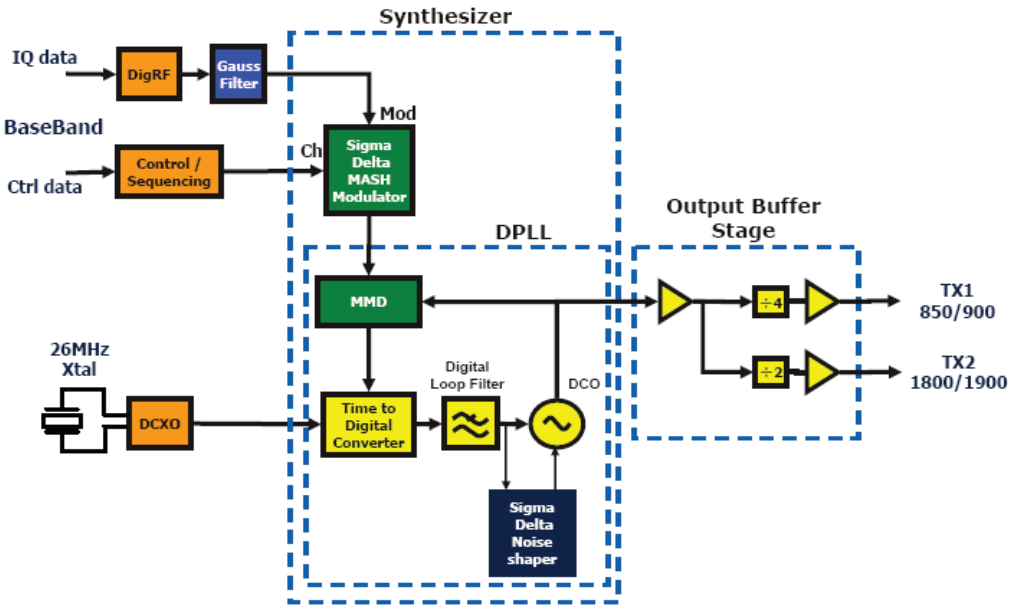


Figure. 3.5.3 TRANSMITTER CHAIN BLOCK DIAGRAM

3.5.2.3 RF synthesizer

The X-GOLDTM110 transceiver contains a fractional-N sigma-delta synthesizer for frequency synthesis in RX mode. In TX mode, the fractional-N sigma-delta synthesizer is used as a Sigma-delta modulation loop to process the phase/frequency signal. The 26 MHz reference signal is provided by the reference oscillator. This reference signal frequency serves as the comparison frequency for the phase detector and provides the digital circuitry with a clock signal.

3.5.2.4 Front-end/PA Control Interface

Two outputs (FE1, FE2) for direct control of antenna switch modules enable to select RX- and TX-mode as well as low- and high-band operation.
An extra band select signal PABS for the power amplifier is used, to support discrete PA and switching modules. Time accurate power dissipation of the PA is achieved by the control signal PAEN.
A minor set of power amplifiers require a bias voltage to enhance power efficiency. Support of this power amplifiers is achieved by the implemented bias DAC.

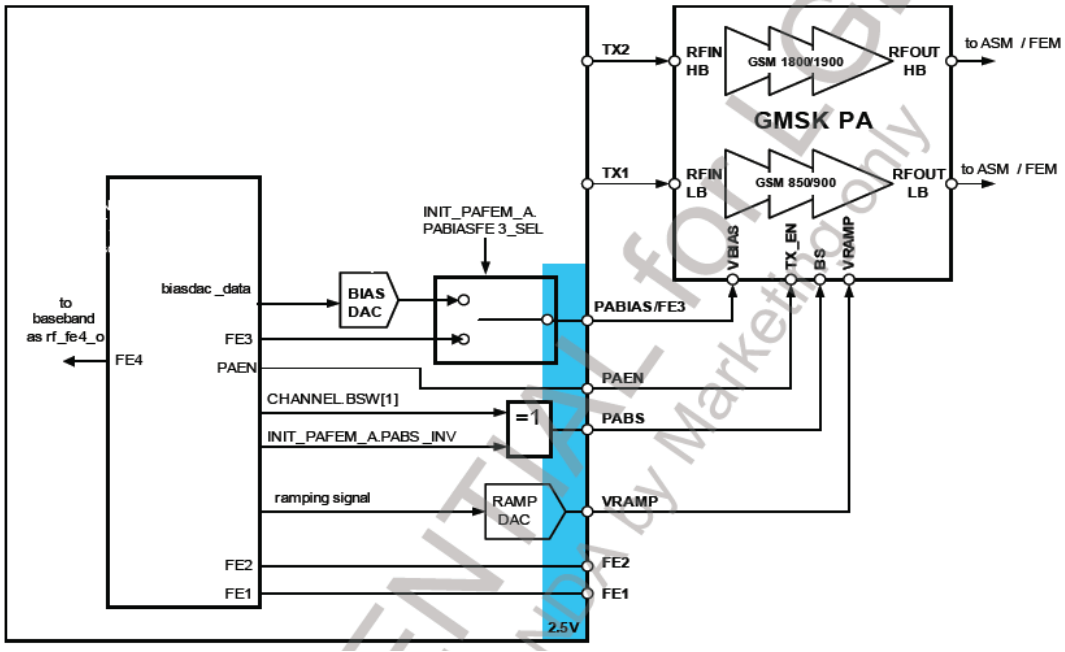


Figure. 3.5.4 PA AND FEM CONTROL BLOCK DIAGRAM

3.6 MEMORY(FM25Q32, U102)

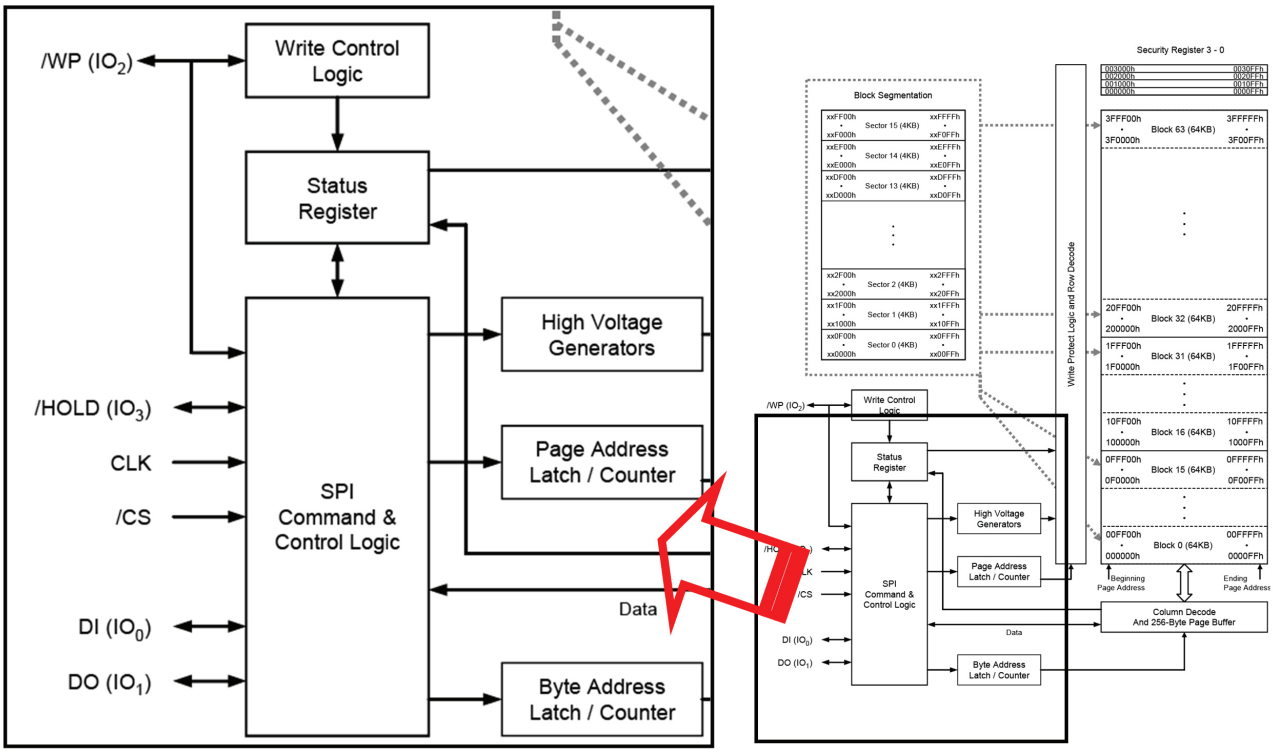


Figure. 3.6.1 MEMORY BLOCK DIAGRAM

The FM25Q32 Serial Flash memory provides a storage solution for systems with limited space, pins and power. The 25Q series offers flexibility and performance well beyond ordinary Serial Flash devices. They are ideal for code shadowing to RAM, executing code directly from Dual/Quad SPI (XIP) and storing voice, text and data. The devices operate on a single 2.7V to 3.6V power supply with current consumption as low as 5mA active and 1μA for power-down. All devices offered in space-saving packages.

The FM25Q32 array is organized into 16.384 programmable pages of 256-bytes each. Up to 256 bytes can be programmed at a time using the Page Program instructions. Pages can be erased in groups of 16 (sector erase) groups of 128 (32KB block erase), groups of 256 (64KB block erase) or the entire chip (chip erase). The FM25Q32 has 1,024 erasable sectors and 64 erasable blocks respectively. The small 4KB sectors allow for greater flexibility in applications that require data and parameter storage.

The FM25Q32 supports the standard Serial peripheral Interface (SPI), and a high performance Dual output as well as Dual I/O SPI using pins: Serial Clock, Chip Select, Serial Data I/O0(DI), Serial Data I/O1(DO). SPI clock frequencies of up to 104MHz are supported allowing equivalent clock rates of 208MHz for Dual Output and 416Mhz for Quad Output when using the Fast Read Dual/Quad Output instructions. These transfer rates are comparable to those of 8 and 16-bit Parallel Flash memories.

A Hold pin, Write protect pin and programmable write protection, with top or bottom array control, provide further control flexibility. Additionally, the device supports JEDEC standard manufacturer and device identification with a 4K-bit Secured OTP.

3.7 SIM Card Interface

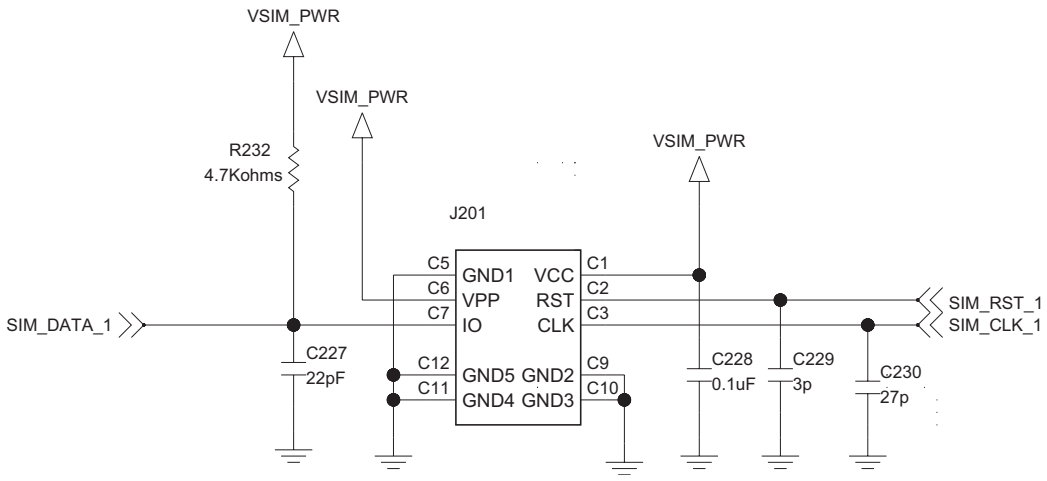


Figure 3.7.1. SIM CARD Interface

The Main Base Band Processor(XMM1100) provides SIM Interface Module.
The XMM1100 checks status Periodically During established call mode whether SIM card is inserted or not, but it doesn't check during deep sleep mode. In order to communicate with SIM card, 3 signals SIM_DATA, SIM_CLK, SIM_RST.
And This model supports 1.8/3V SIM Card.

Signal	Description
SIM_RST	This signal makes SIM card to HW default status.
SIM_CLK	This signal is transferred to SIM card.
SIM_DATA	This signal is interface datum.

3.8 Display Interface

3.8.1 LCD Interface

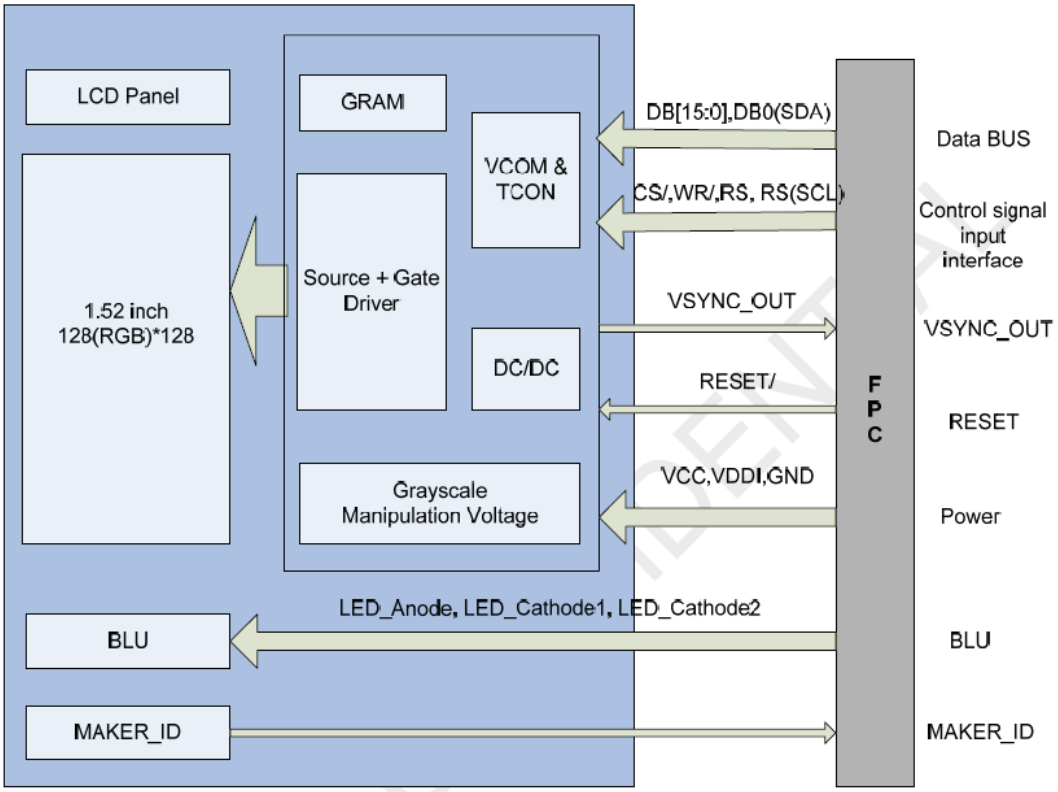


Figure 3.8.1. LCD Module Block Diagram

ILI9163C is a 262,144-color one-chip SoC driver for a-TFT liquid crystal display with resolution of 132RGBx162 dots, comprising a 396-channel source driver, a 162-channel gate driver, 48,114bytes GRAM for graphic data of 132RGBx162 dots, and power supply circuit. The ILI9163C supports 18-/16-/9-/8-bit data bus interface and serial peripheral interfaces(SPI). It also supplies 18-bit, 16-bit or 6-bit RGB interface for driving video signal directly from application controller. The moving picture area can be specified in internal GRAM by window address function. The specified window area can be updated selectively, so that moving picture can be displayed simultaneously independent of still picture area.
ILI9163C can operate with 1.65V I/O interface voltage, and an incorporated voltage follower circuit to generate voltage levels for driving an LCD. The ILI9163C also supports a function to display in 8 colors and a sleep mode, allowing for precise power control by software and these features make the ILI9163C an ideal LCD driver for medium or small size portable products such as digital cellular phones, smart phone, MP3 and PMP where long battery life is a major concern.

3.8.2 LCD Backlight Interface

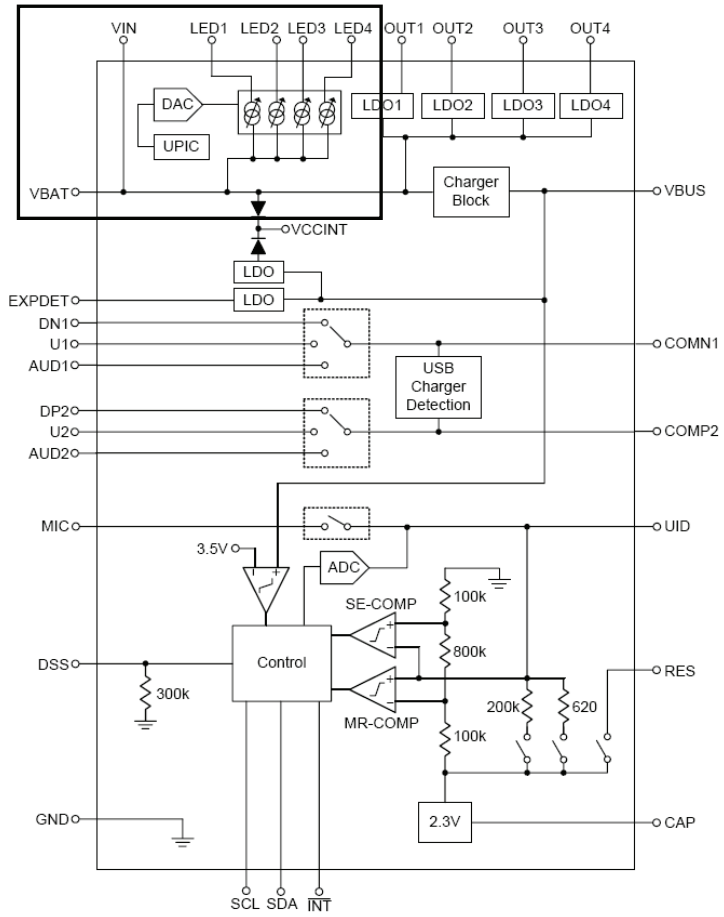


Figure 3.8.2. RT8966 Block Diagram

There are four current source LED drivers in the RT8966. These current sources can be programmed via I2C in the following control registers, Enable and LED Set. These registers include each driver's enable/disable control, source current control, and LED brightness dimming.

The RT8966 provides a constant current for the white LEDs. Each channel supports up to 30mA current and regulates a constant current for uniform intensity. In order to maintain LED constant current, the input voltage must provide the required LED forward voltage and current source dropout voltage. If the forward voltage of the white LEDs is 3.3V, the input voltage should be higher than 3.4V to provide enough voltage headroom for maintaining constant brightness.

3.9 Battery Charger Interface

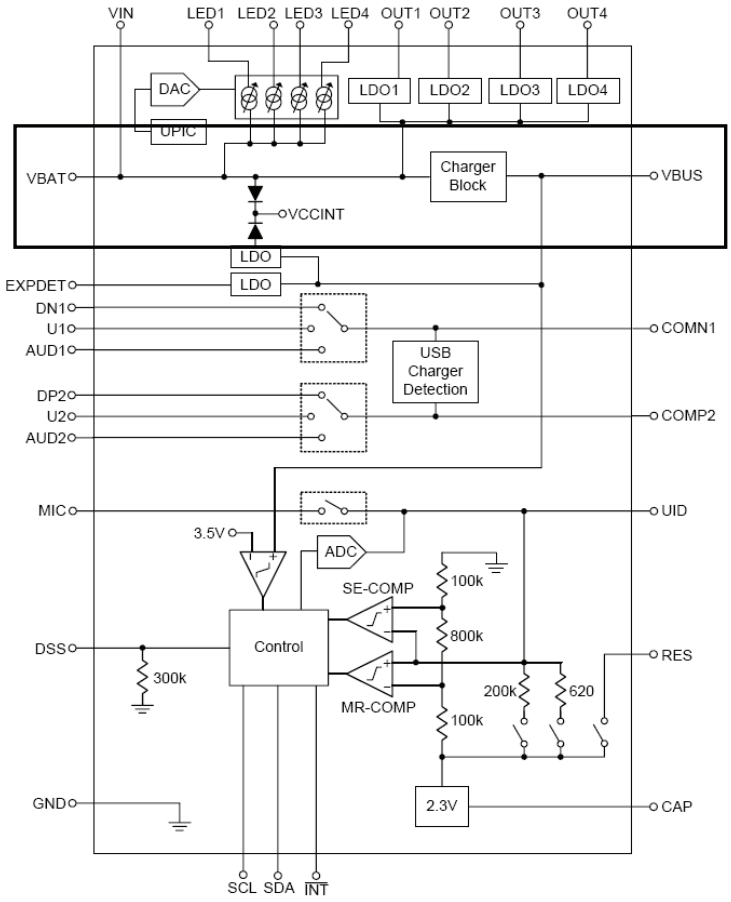


Figure 3.9.1. RT8966 Block Diagram

The RT8966 integrates a single-cell Li-ion battery charger IC with pre-charge mode, a fast charge mode (constant current mode) or constant voltage mode. The charge current is programmable via the I2C interface as shown in the control register address tables, CHG_Ctrl1 and CHG_Ctrl2. The CV mode voltage is fixed at 4.2V. The pre-charge threshold is fixed at 2.6V. If the battery voltage is below the pre-charge threshold, the RT8966 charges the battery with a trickle current until the battery voltage rises above the pre-charge threshold. The RT8966 is capable of being powered up from AC adapter and USB (Universal Serial Bus) port inputs. Moreover, the RT8966 includes a linear regulator (LDO 4.9V, 50mA) for supplying low power external circuitry.

3.10 Keypad Interface

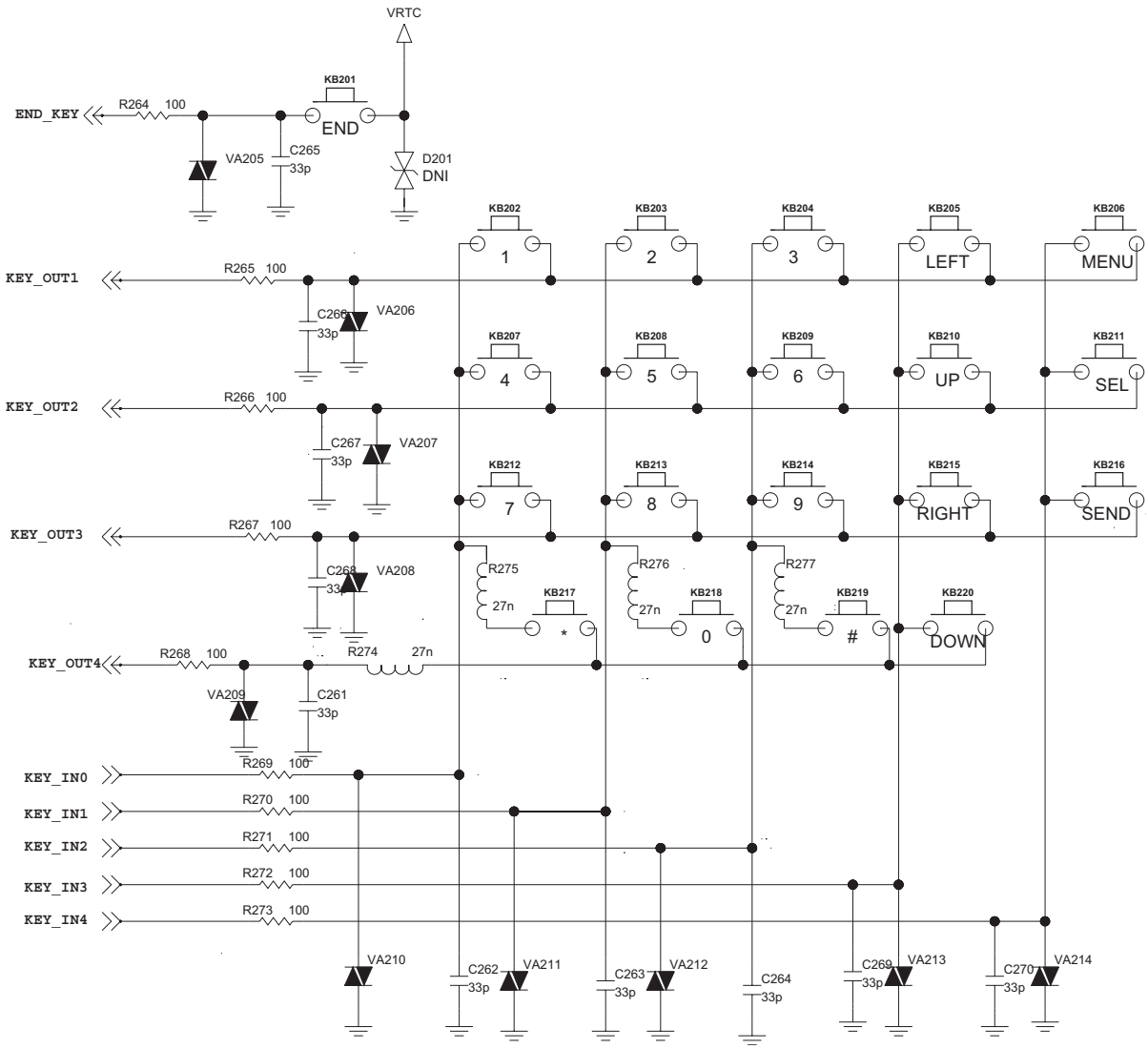


Figure 3.10.1 MAIN KEY STRUCTURE

The Keypad Interface is a peripheral controller, which can be used for scanning external keypad matrices with up to 8 rows and 8 columns (that is 64 standard keys). By adding an additional row of keys connected to ground the number of keys can be extended by up to 8 keys. This results in a maximum number of 72 keys to by identified by the Keypad Interface Controller.
The Keypad Scan Module reduces the number of interrupts and polling through the processor and therefore reduces the power consumption. The module is able to debounce and scan the external keypad matrix automatically without any software intervention. After debouncing it generates an interrupt. The interface controller contains information about the key (or key combination) that was pressed and how long it was pressed.

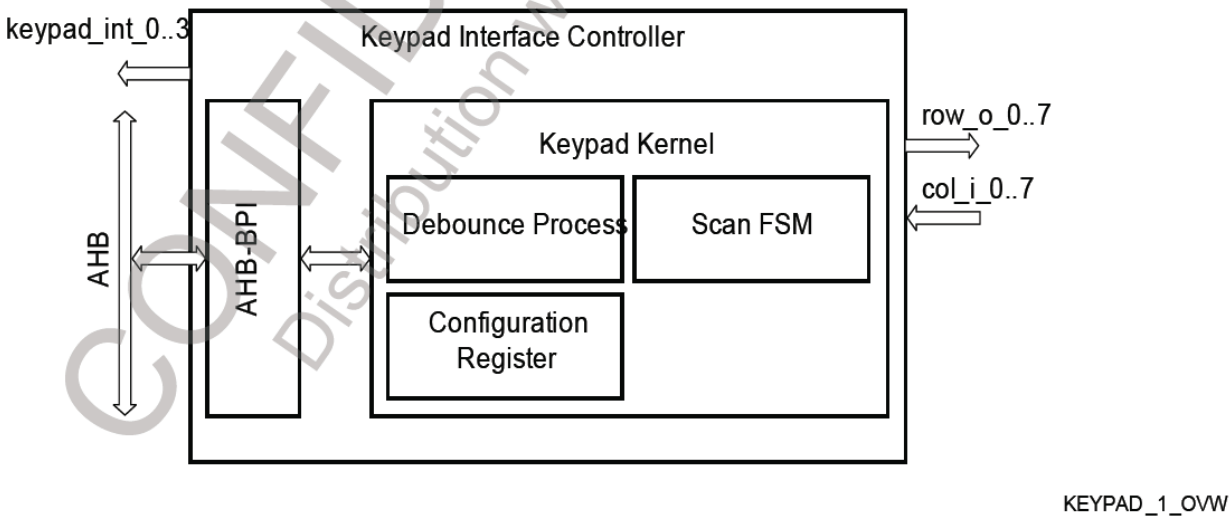


Figure 3.10.2 Block Diagram and System Integration of the KPD

3.11 Audio Front-End

3.11.1 Functional Overview

The audio front-end of X-GOLD™ 110 offers the digital and analog circuit blocks for both receive and transmit audio operation, from a mobile phone perspective (called audio-in and audio-out subsequently). It features a high-quality, stereo digital-to-analog path with amplifier stages for connecting acoustic transducers to X-GOLD™ 110. In audio-in path the supply voltage generation for electret microphones, a low-noise amplifier and analog to digital conversion are integrated in X-GOLD™ 110. A more detailed functional description will be given in the following sections.

The audio front-end itself can be considered to be organized in three sub-blocks:
• Interface to processor cores (TEAKLite® and - indirectly - ARM)
• Digital filters
• Analog part

The following figure shows an architecture overview of the Audio section.

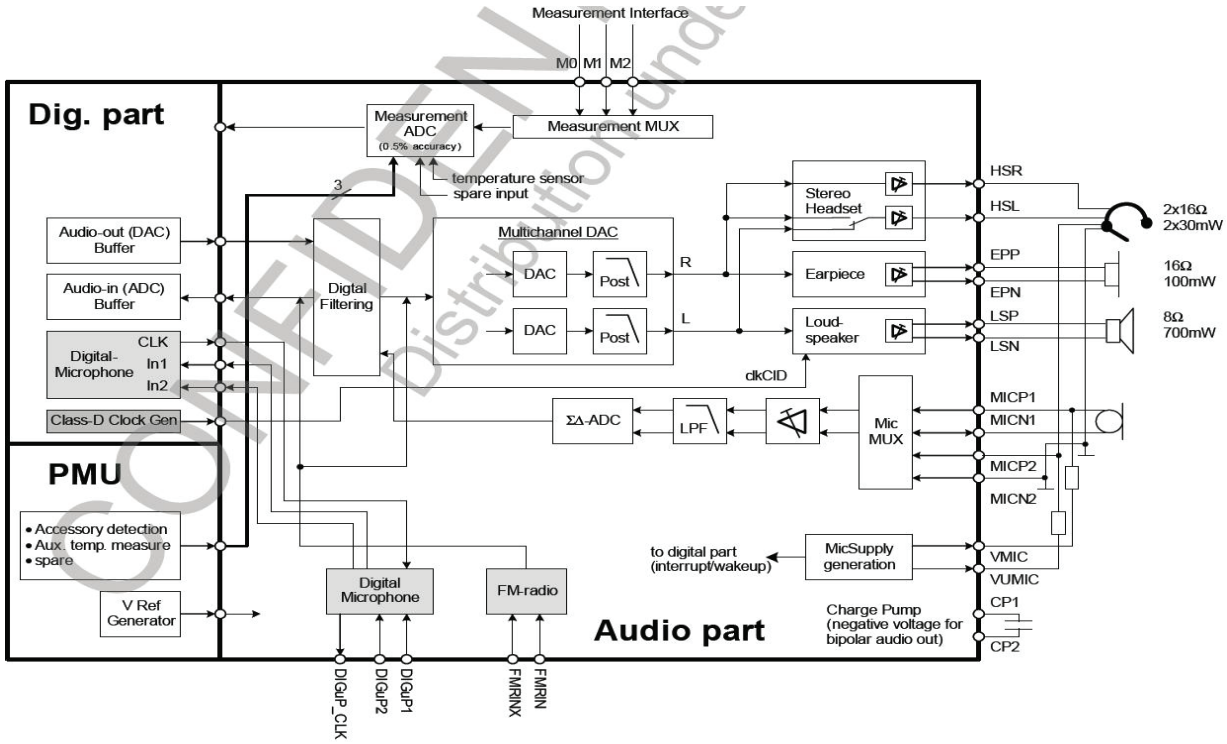


Figure 3.11.1 Audio Section Overview

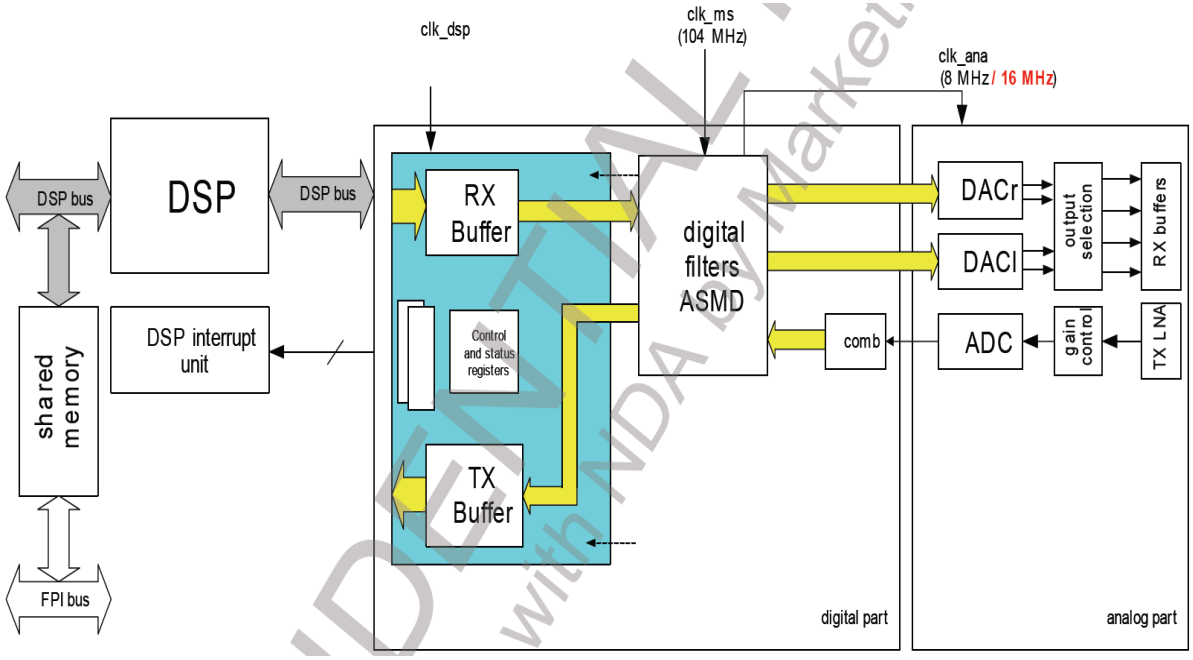


Figure 3.11.2 Overview of Clocking and Interfaces of Audio Front End

The audio front-end of X-GOLDTM110 has the following major operation modes:

- Power-down: All analog parts are in power down and all clocks of the digital part are switched off.
- Audio mode: Digital decimation/interpolation filters are connected to the interface buffers and the analog part is enabled.

These major modes can be modified by certain control register settings.

- Due to the new gain settings in the TX path, the maximum input voltage is limited to 0.8 Vpp.
- In both voiceband paths, the value range for voice samples is confined to 97.5%, i.e. to [-31948, 31947] or [8334H, 7CCBH] in X-GOLDTM110 .
- On the TX path, 83% "1"s on the VTPDM line correspond to a 16-bit value of 7CCBH and 17% "1"s correspond to a 16-bit value of 8334H at the digital filter output. Thus the usable range is 66%. This range can be scaled to 100% by Firmware.
- The high-pass functions of the voiceband filters have to be implemented in firmware on TEAKLite®.

3.11.2 Digital Part

The digital part of the X-GOLDTM110 audio front-end comprises an interface to the TEAKLite® bus, interfaces to the interrupt units of TEAKLite®, digital interpolation filters for oversampling digital-to-analog conversion, digital decimation filters for analog-to-digital conversion and an interface to the analog part of the audio front-end.
For the digital microphone all the filtering is done in a dedicated hardware. The output sample stream is then fed in a duplicated ring buffer structure like the data from the analog microphone path (after A/D conversion and subsequent digital filtering).

▪ Interpolation Filter
The interpolation path of the X-GOLD™110 audio front-end increases the sampling rate of the audio samples to the rate of the digital-to-analog converter. Because the input sampling rates can vary between 8 kHz and 47.619 kHz the filter characteristic and oversampling ratio can be adjusted to the respective sampling rate. The requirements for the interpolation filters depend on the sampling rate, because a sufficient out-of-band discrimination in the audio frequency band (20 Hz,...,20 kHz) has to be ensured.

▪ Decimation Filter
The digital decimation filter on X-GOLD™110 has two operating modes: 8 kHz output sampling rate and 16 kHz output sampling rate (or 16 kHz output sample rate and 16kHz bandwidth in case of doubled ASMD clock).

3.11.3 Analog Part

The analog part of the X-GOLD™110 audio front-end in audio-out direction consists of a stereo digital to analog converter (multi-bit oversampling converter) which transforms the output of the digital interpolation filter into analog signals. It is followed by the gain control/amplifier section. The DAC outputs can be switched to several output buffers. In audio-in section there is an input multiplexer which selects either one of two differential microphone inputs to be connected to the low-noise amplifier and analog pre-filter. The signals from the analog pre-filter are input to a second-order sigma-delta analog-to-digital converter. In addition there is a connection for FM-radio playing.

▪ Audio-out Part
The analog audio-out part consists of two multi-bit digital-to-analogue converters (DAC) and an output stage. The signal sources are switched to the output drivers in the output stage. The output drivers consist of: a) one mono, differential class-D Loudspeaker driver, b) one mono, differential Earpiece driver and c) one stereo, single-ended (with uni- or bipolar signals), Headset driver.

▪ **Digital-to-analog converters**

The multi-bit oversampling DACs of the X-GOLD™110 audio front-end convert the 16-bit data words coming from the digital interpolation filters to analogue signals.

▪ **Output Amplifier**

The different output buffers in X-GOLD™110 are driven by the outputs of the selection block. The differential earpiece driver can be used to drive a 16 Ω earpiece and works in differential. The two single ended headset drivers can be used to drive a 16 Ω headset. They can work unipolar mode, where an AC coupling of the headset might be needed, or can work also in bipolor mode. The differential loudspeaker driver can be used to drive a 8 Ω loudspeaker. As it is a class-D amplifier the needed suppression of the higher harmonics of the switching signals
has to be achieved by the external circuitry. The buffers are designed to be short circuit protected.

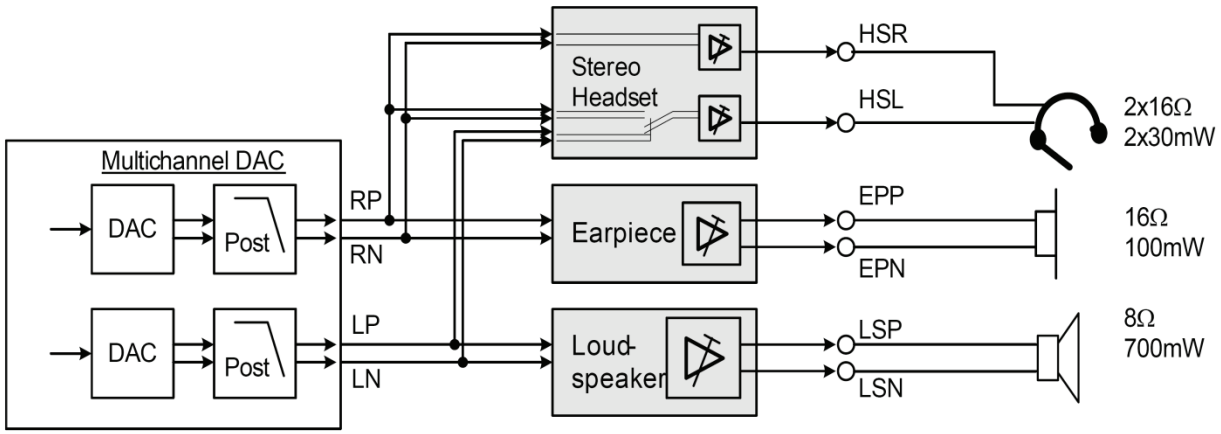


Figure 3.11.3 Switching for R/L DACs onto Buffers

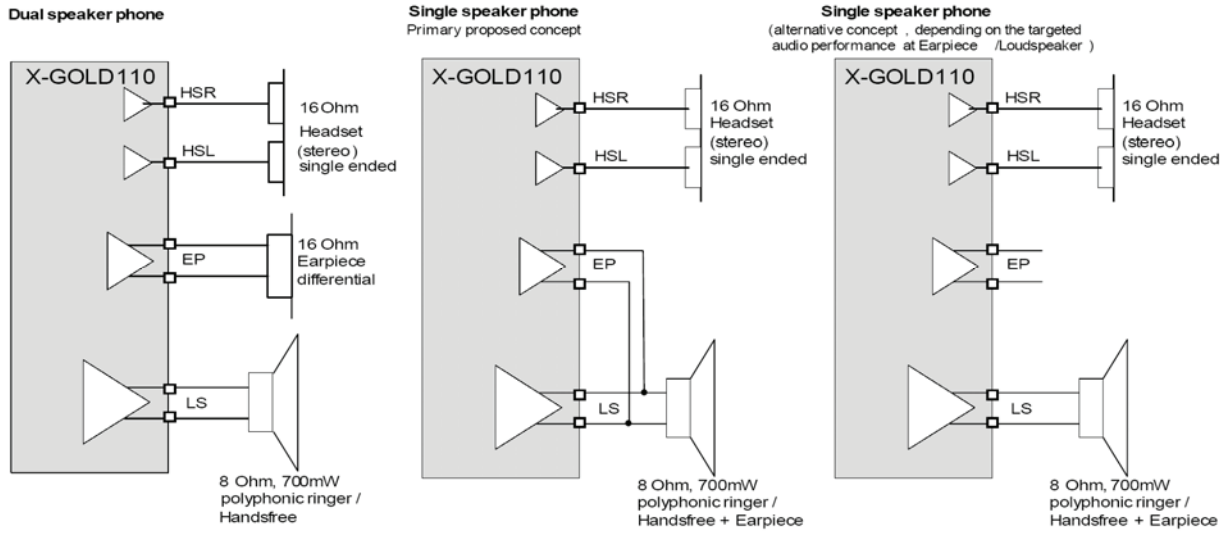


Figure 3.11.4 Different Application Scenarios

In order to achieve the single-speaker concept by parallel connection of Earpiece and Headset amplifier the Earpiece amplifier have to sustain the up to 5 V voltage of the class-D amplifier.

▪ Audio-in Path

The audio-in path of X-GOLD™110 provides two differential microphone input sources, MIC1and MIC2.

• The inputs for microphone MIC1 are MICP1 and MICN1.
• The inputs for microphone MIC2 are MICP2 and MICN2.

The audio-in path consists of an input selector, a low noise amplifier and following pre-filter with gain control, a second order ΣΔ-converter and a digital decimation filter. It supports both standard GSM (bandwidth 3.5 kHz) and wideband (bandwidth 7 kHz) speech bands.
The differential input signal from the microphone first passes a low noise amplifier and following pre-filter and an anti-aliasing pre-filtering stage achieving and overall variable gain ranging from 0 dB to +39 dB . The signal is then modulated by a second order ΣΔ-converter which is clocked with the same clock rate as the digital to analog converters. The ΣΔ-converter delivers a 1-bit pulse density modulated data stream at a rate of 2 MHz to the digital decimation filter which reduces the rate to 8 kHz or 16 kHz, depending on the current mode.
To improve SNR the sample frequency can be doubled in dedicated modes and the modulated data stream is 4MHz instead of 2 MHz.

▪ Microphone Supply

X-GOLD™213 has a single ended power-supply concept for electret microphones:
For both modes a minimal load capacitance of t.b.d. nF is necessary to guarantee stable operation of the buffer. The maximal load capacitance must not exceed t.b.d. nF.
2 microphone supplies VMIC and VUMIC are available. The supply VUMIC has a ultra-low-power mode, where the current consumption is minimum, whilst at the same time the noise performance is reduced.
For this purpose the VUMIC is directly supplied out of the VMIC regulator, the Mic-Buffer can be switched off and only the quiescent current of the VMIC regulator is present. This mode can be used to supply a headset and allow accessory detection with highly reduced current consumption For normal operation the supply can be switched to normal operation mode with improved noise performance. In case of an digital microphone VMIC can be used for supplying this microphone.

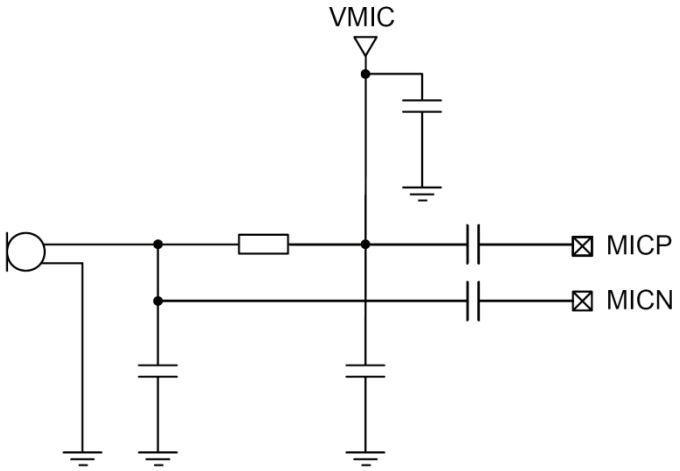


Figure 3.11.5 Typical Microphone Supply Generation (alternative)

3.12 KEY BACLKLIGHT LED Interface

Key Backlight LED is controlled by Current source LED driver port(LED3) of RT8966 like as LCD Backlight.

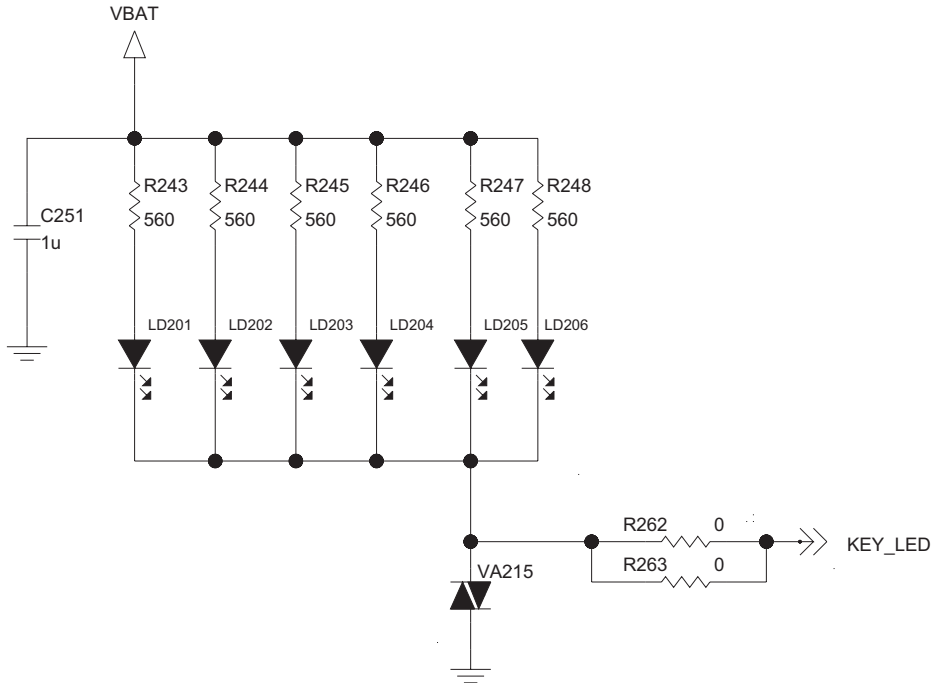


Figure 3.12.1 Key Backlight Block

3.13 Vibrator Interface

Support PWM signal which generated by hardware itself via register control
Direct connect to the VIB and VSSVIB pin from XMM110 without any external component required
It is capable to driver the vibrator motor up to 150mA

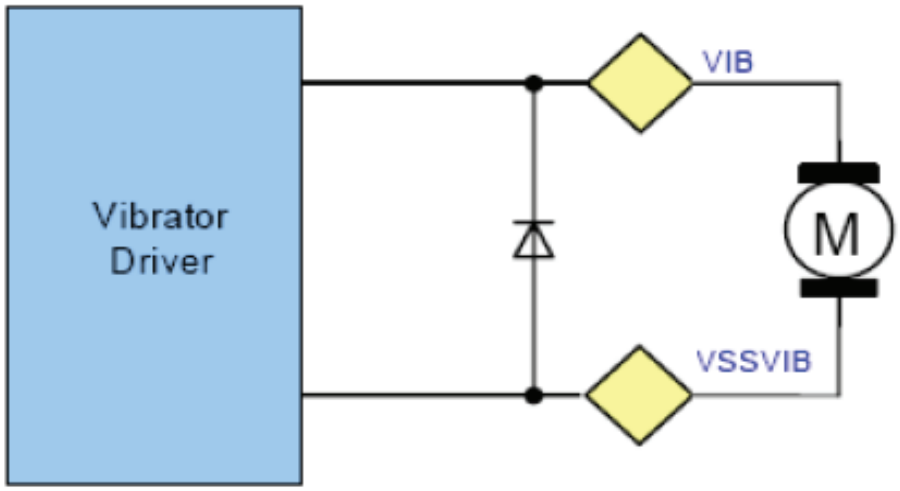


Figure 3.13.1 Vibrator Driver Block Diagram

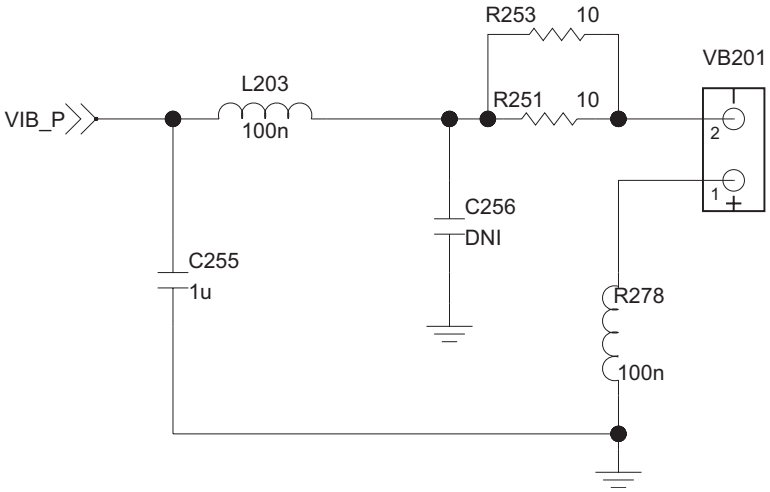


Figure 3.13.2 Vibrator Driver Block

3.14 Torch LED Interface

Torch LED is controlled by LDO port(LDO4) of RT8966.
There are four LDOs in the RT8966. These LDOs can be programmed via I2C in the following control registers Enable, OUT Set1, OUT Set2.
These registers include each LDO's enable/disable control as well as its output voltage selection from 1V to 3.3V.

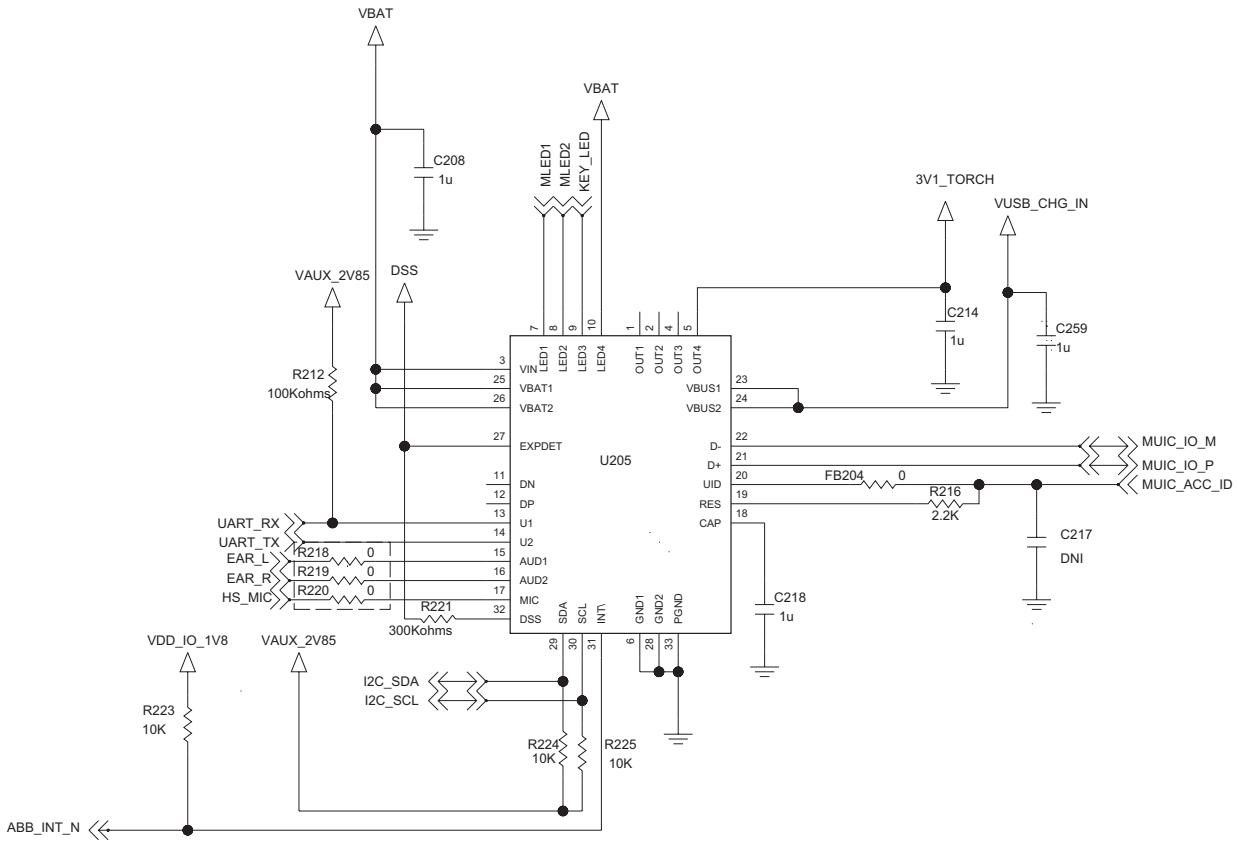


Figure 3.14.1 Torch LED Block

4. TROUBLE SHOOTING

4.1 RF Component

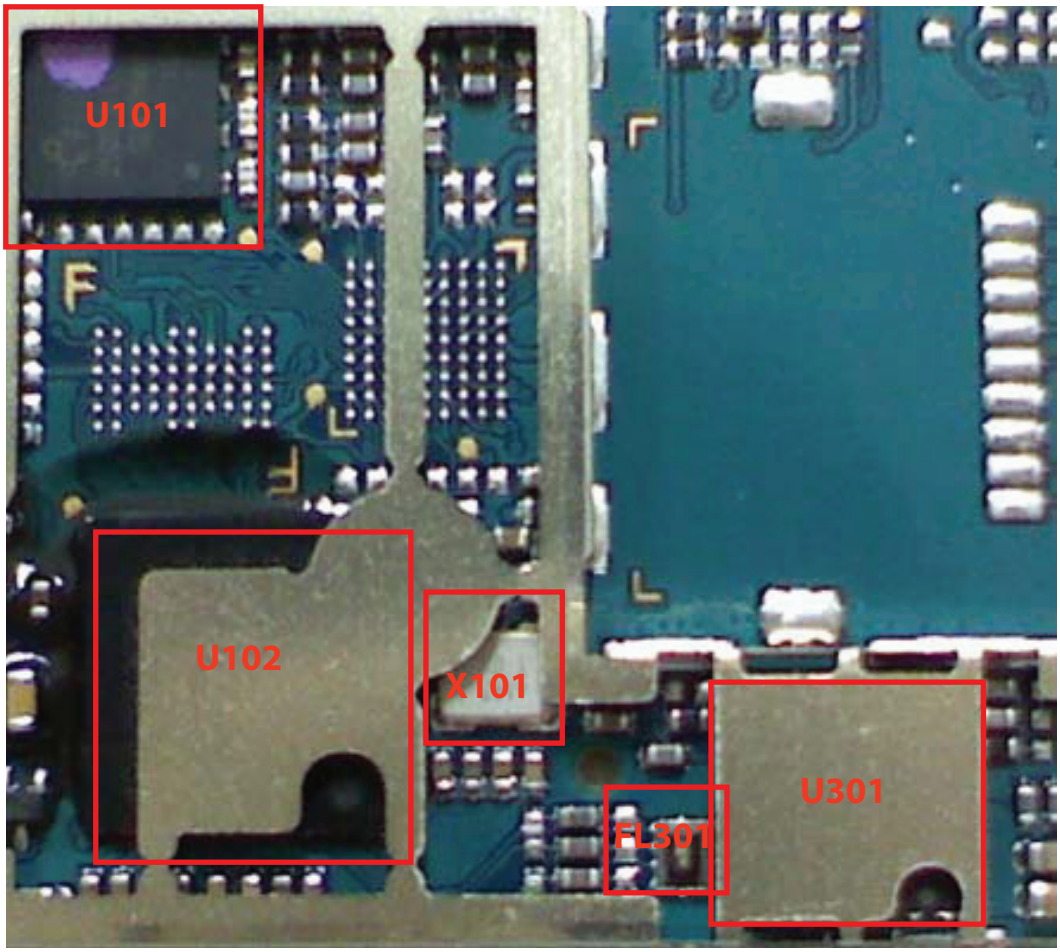
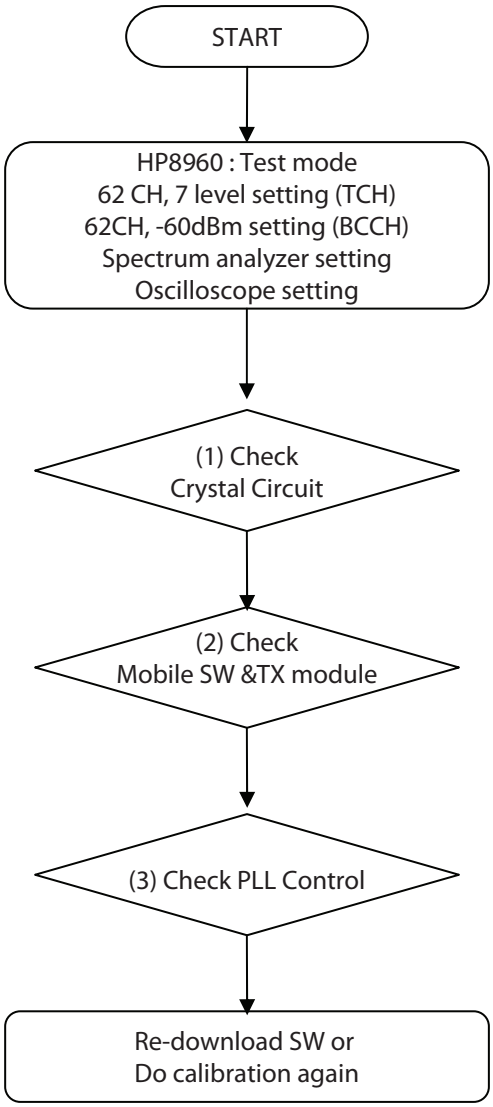


Figure 4.1

U102	Main Chip (EGV3)
U101	Memory
U301	FEM (Tx Module)
FL301	SAW Filter
X101	Crystal, 26MHz Clock

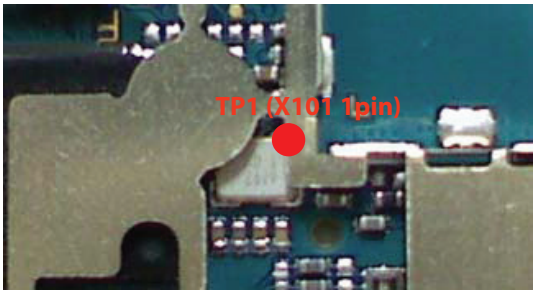
4.2 RX Trouble

CHECKING FLOW

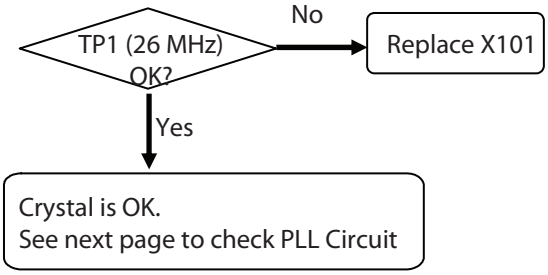


(1) Checking Crystal Circuit

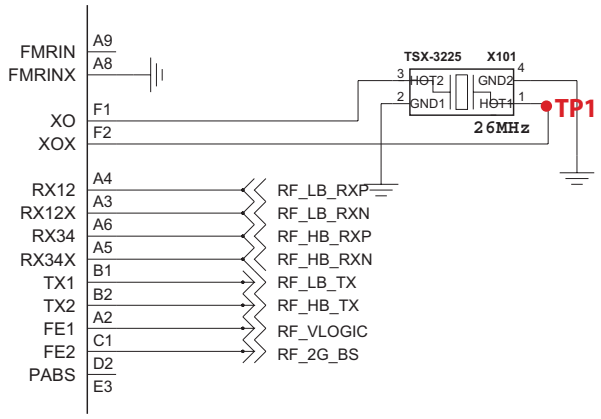
TEST POINT



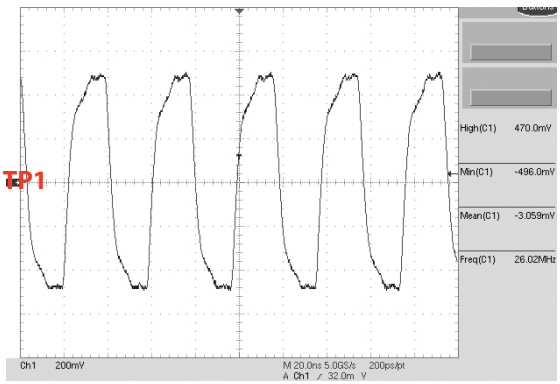
CHECKING FLOW



CIRCUIT

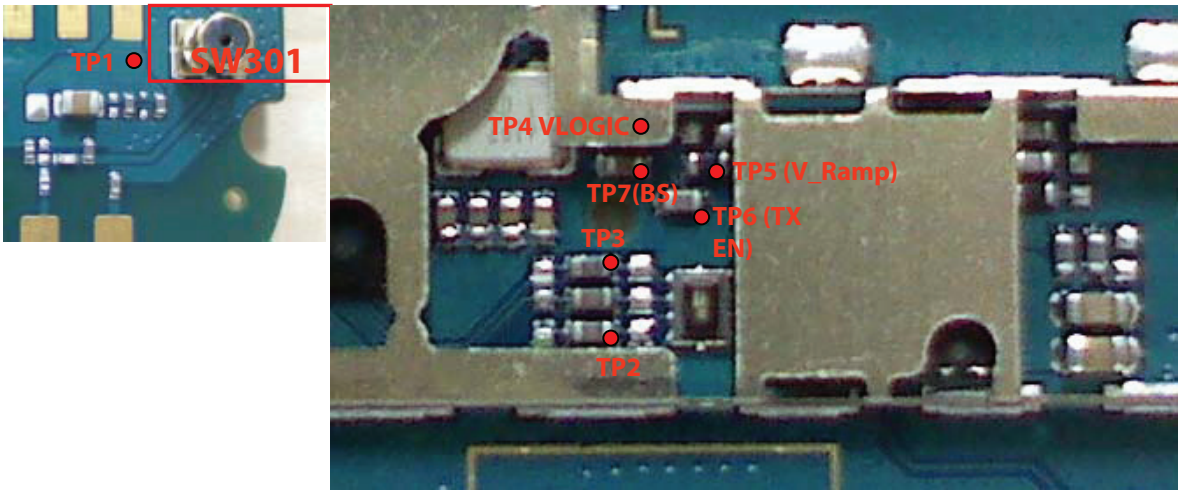


WAVEFORM

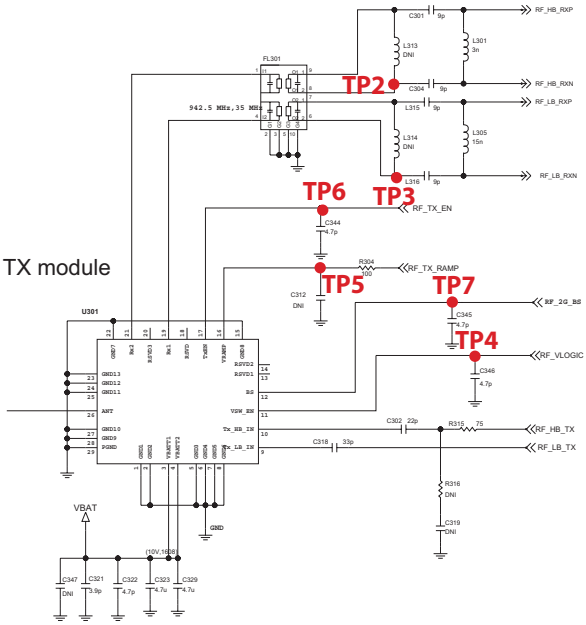


(2) Checking Mobile SW &FEM

TEST POINT

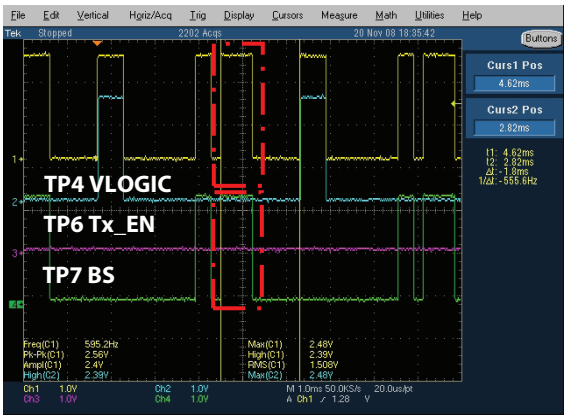


CIRCUIT

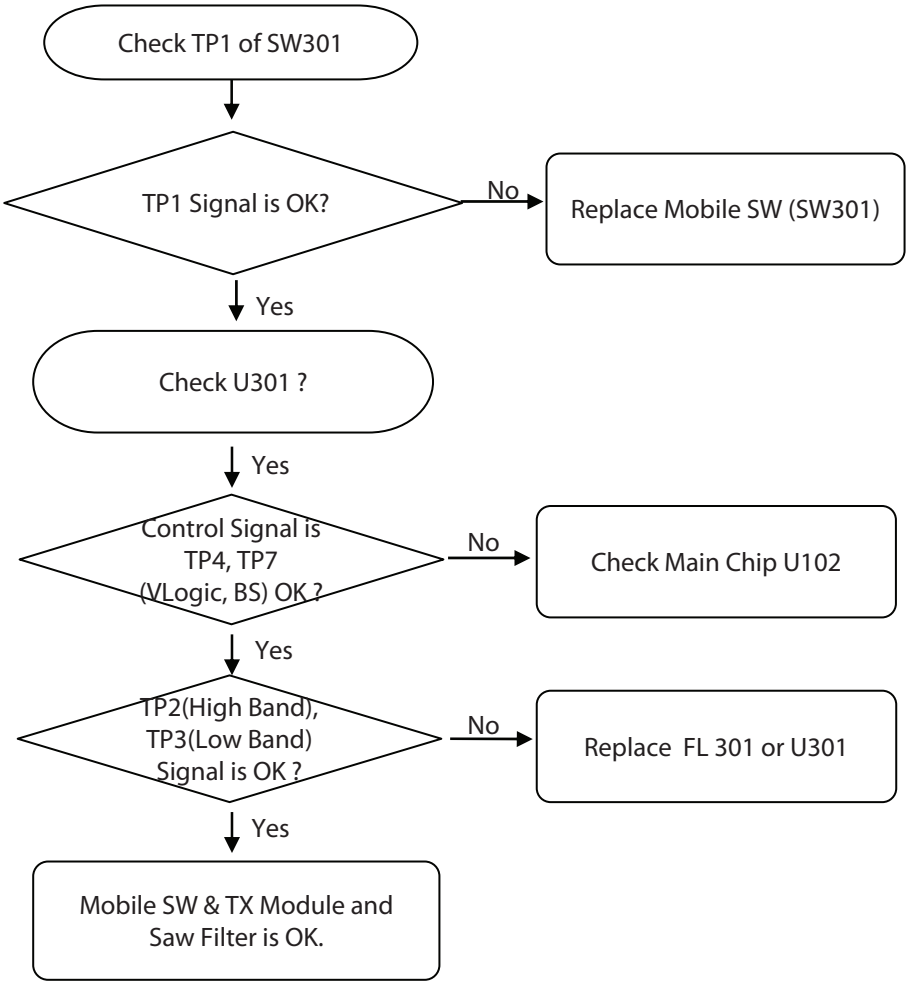


CONTROL LOGIC

EGSM Rx



CHECKING FLOW



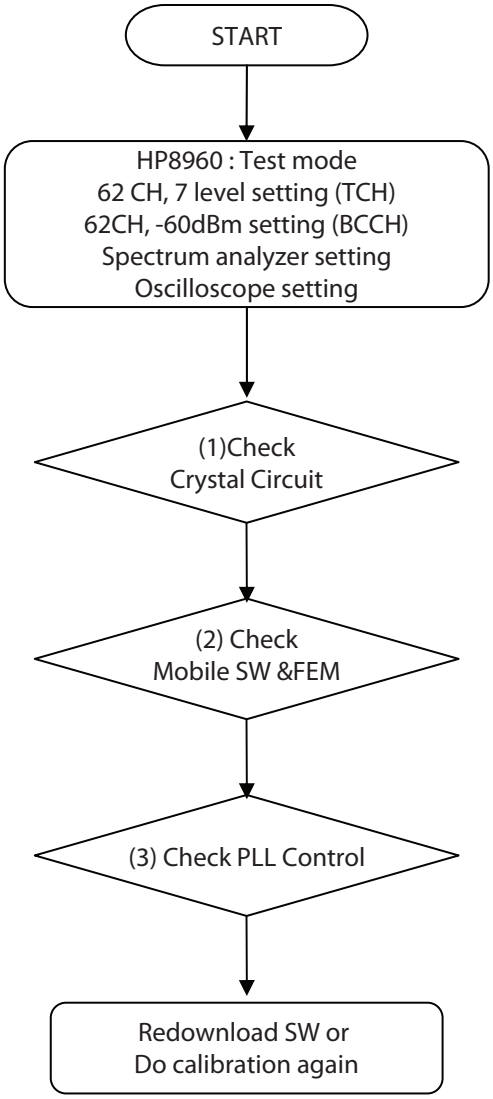
EGSM Rx

Mode	VLOGIC	Input Control Bits	
		Tx_EN	BS
STANDBY	0	X [1]	X [1]
GSM_Rx	1	0	0
DCS_Rx	1	0	1
GSM_Tx	1	1	0
DCS_Tx	1	1	1

[1] X = don't care

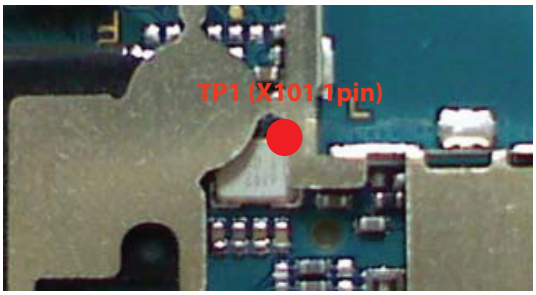
4.3 TX Trouble

CHECKING FLOW

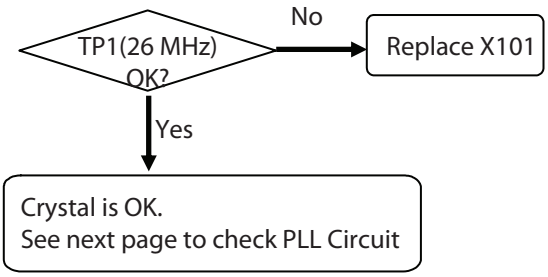


(1) Checking Crystal Circuit

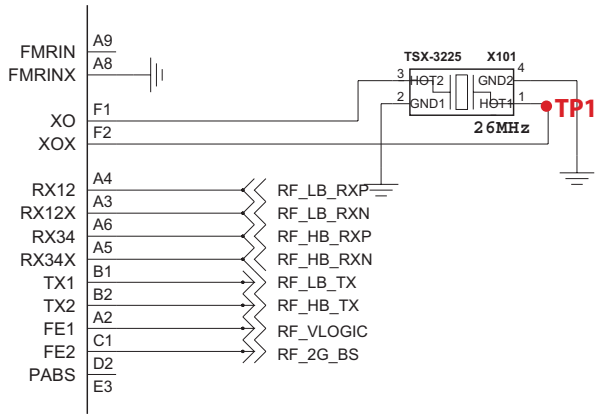
TEST POINT



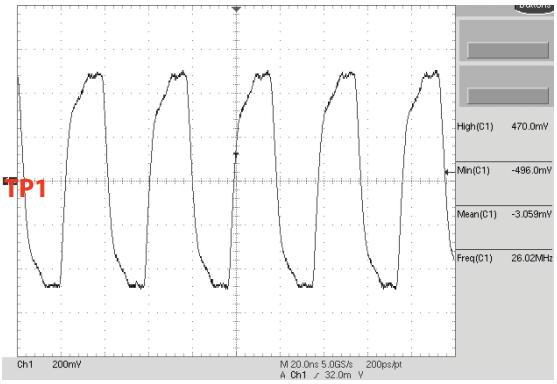
CHECKING FLOW



CIRCUIT

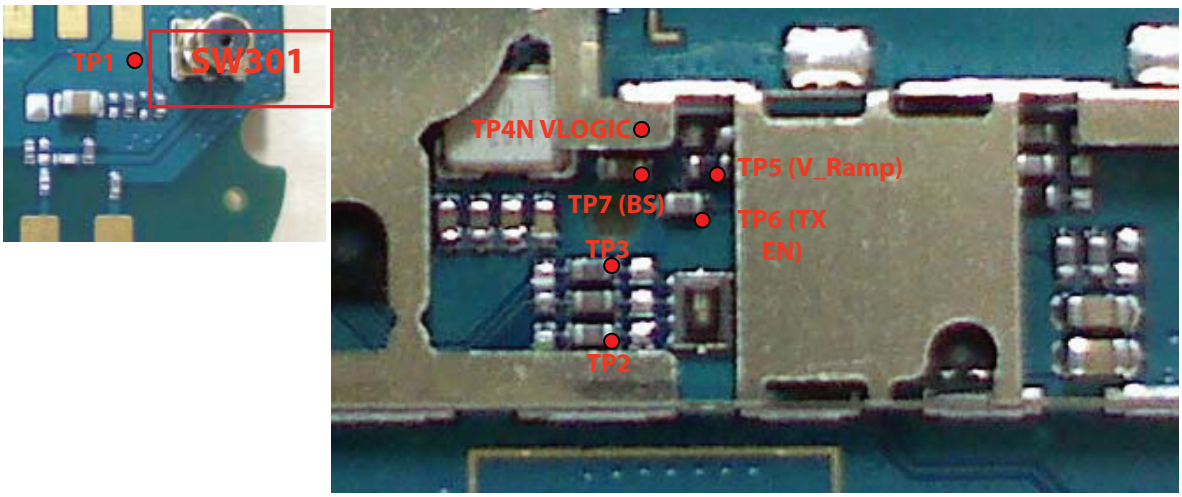


WAVEFORM

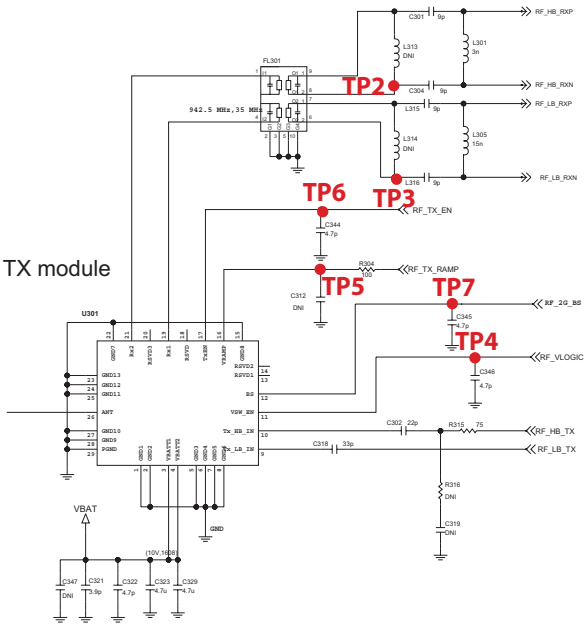


(2) Checking Mobile SW &FEM

TEST POINT

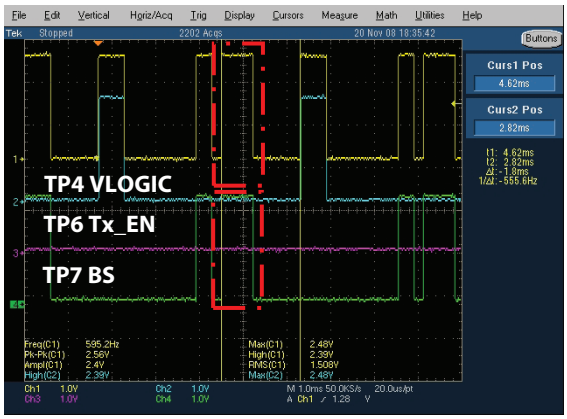


CIRCUIT

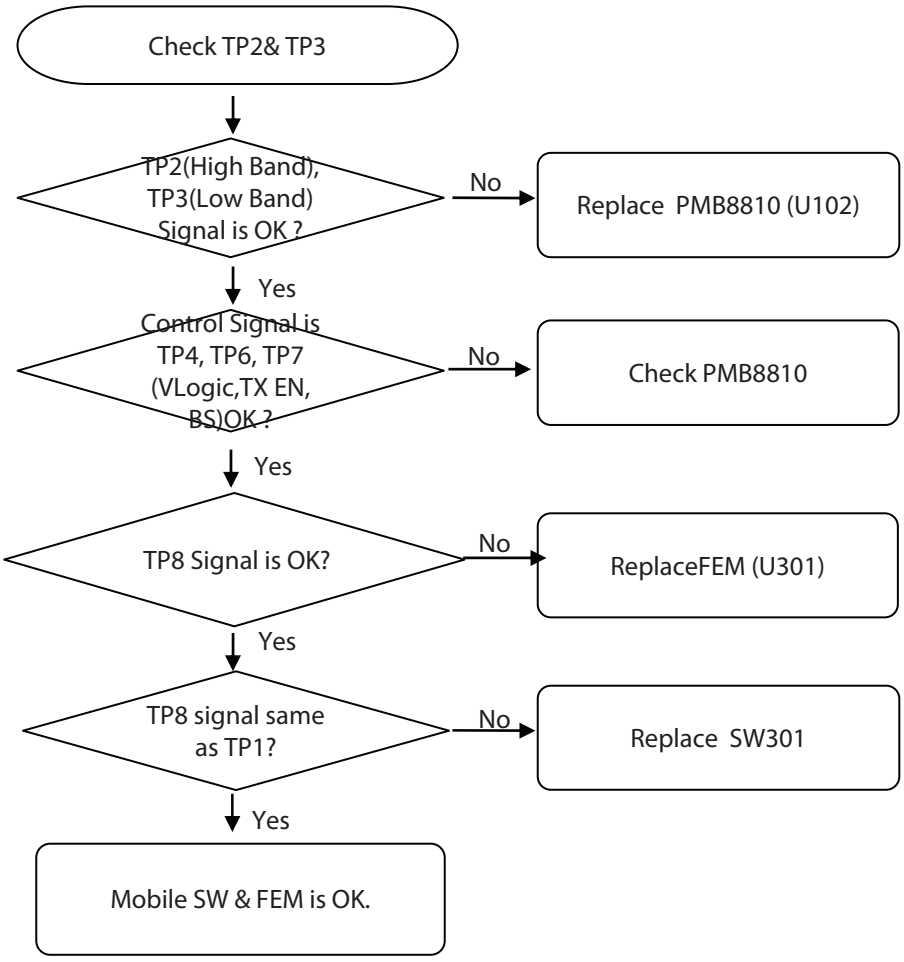


CONTROL LOGIC

EGSM Rx



CHECKING FLOW

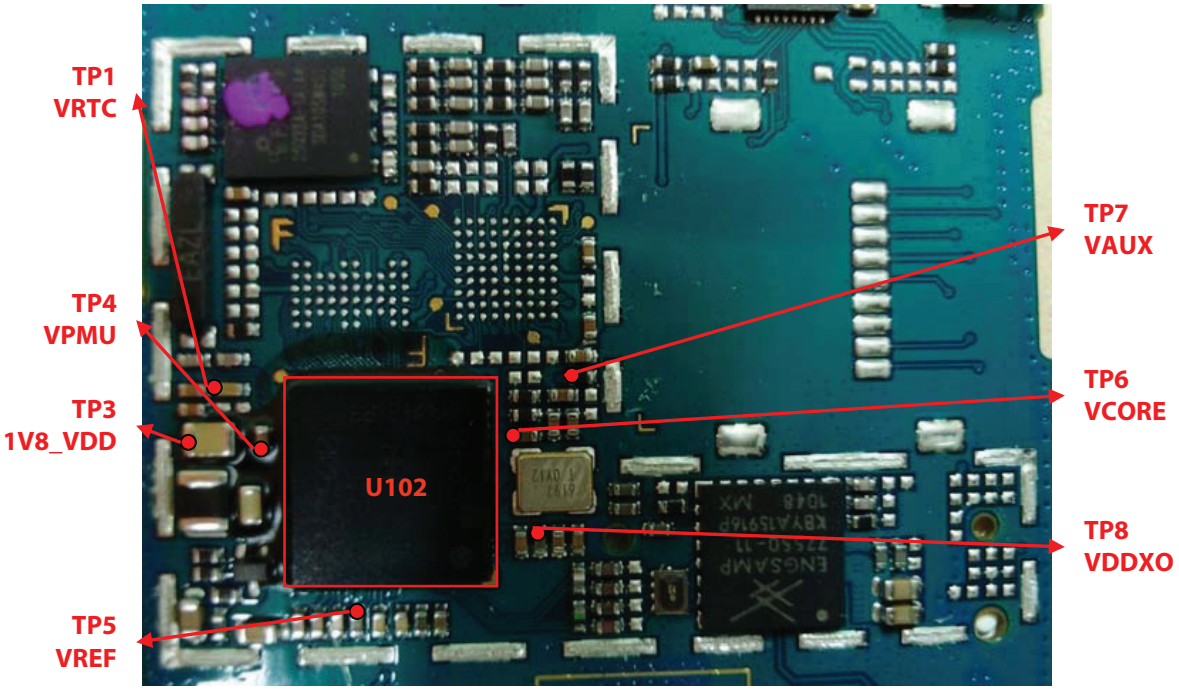


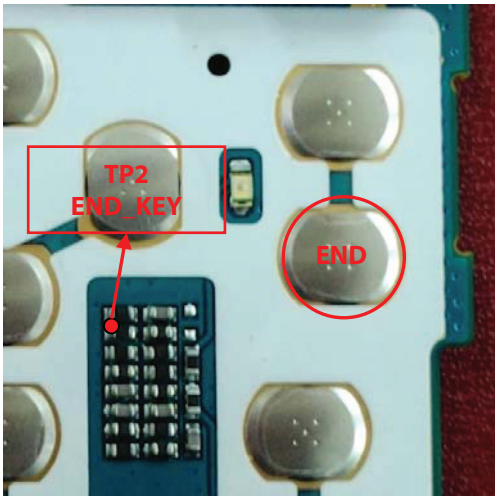
EGSM Tx

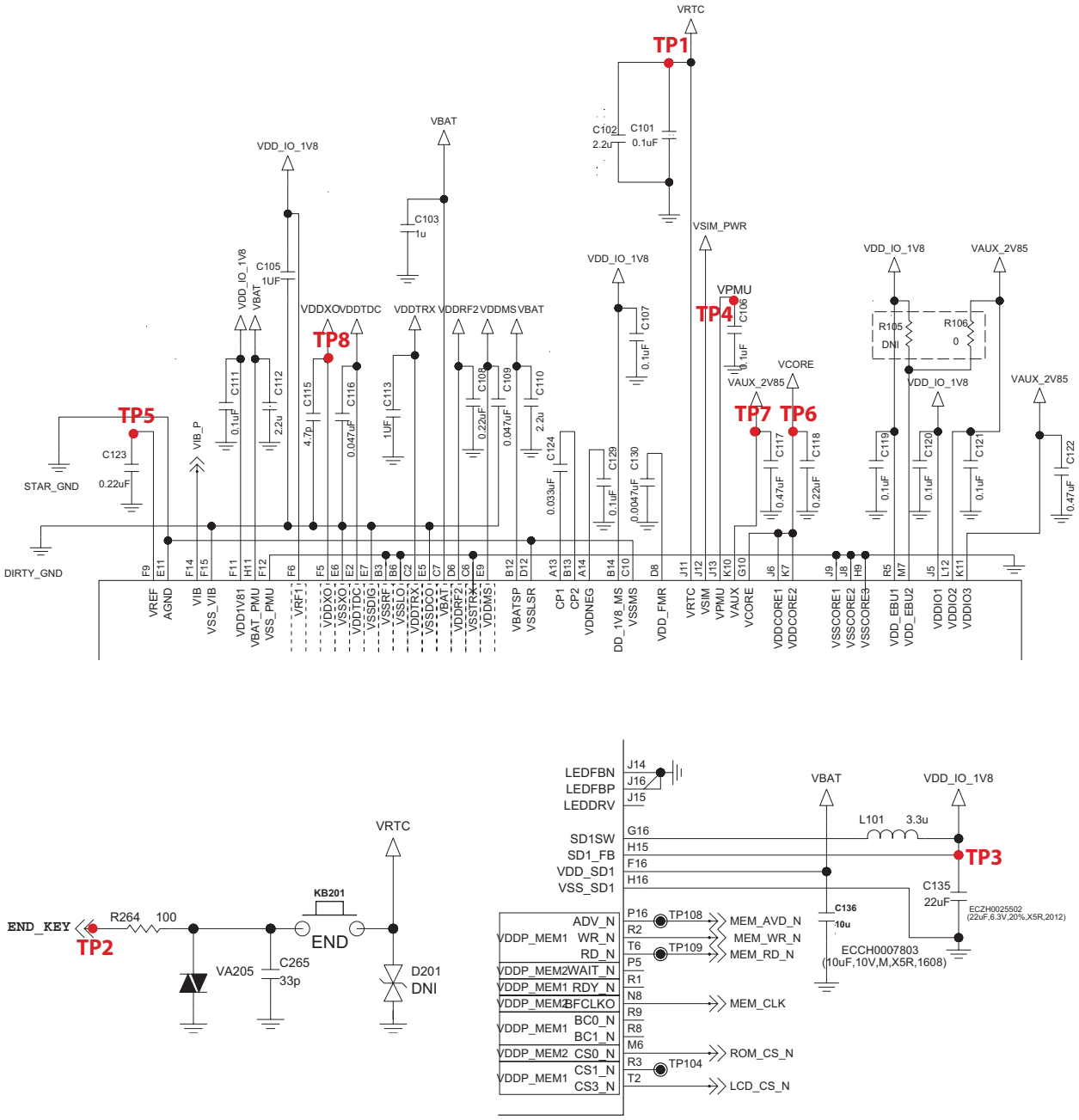
Mode	VLOGIC	Input Control Bits	
		Tx_EN	BS
STANDBY	0	X[1]	X[1]
GSM_Rx	1	0	0
DCS_Rx	1	0	1
GSM_Tx	1	1	0
DCS_Tx	1	1	1

[1] X = don't care

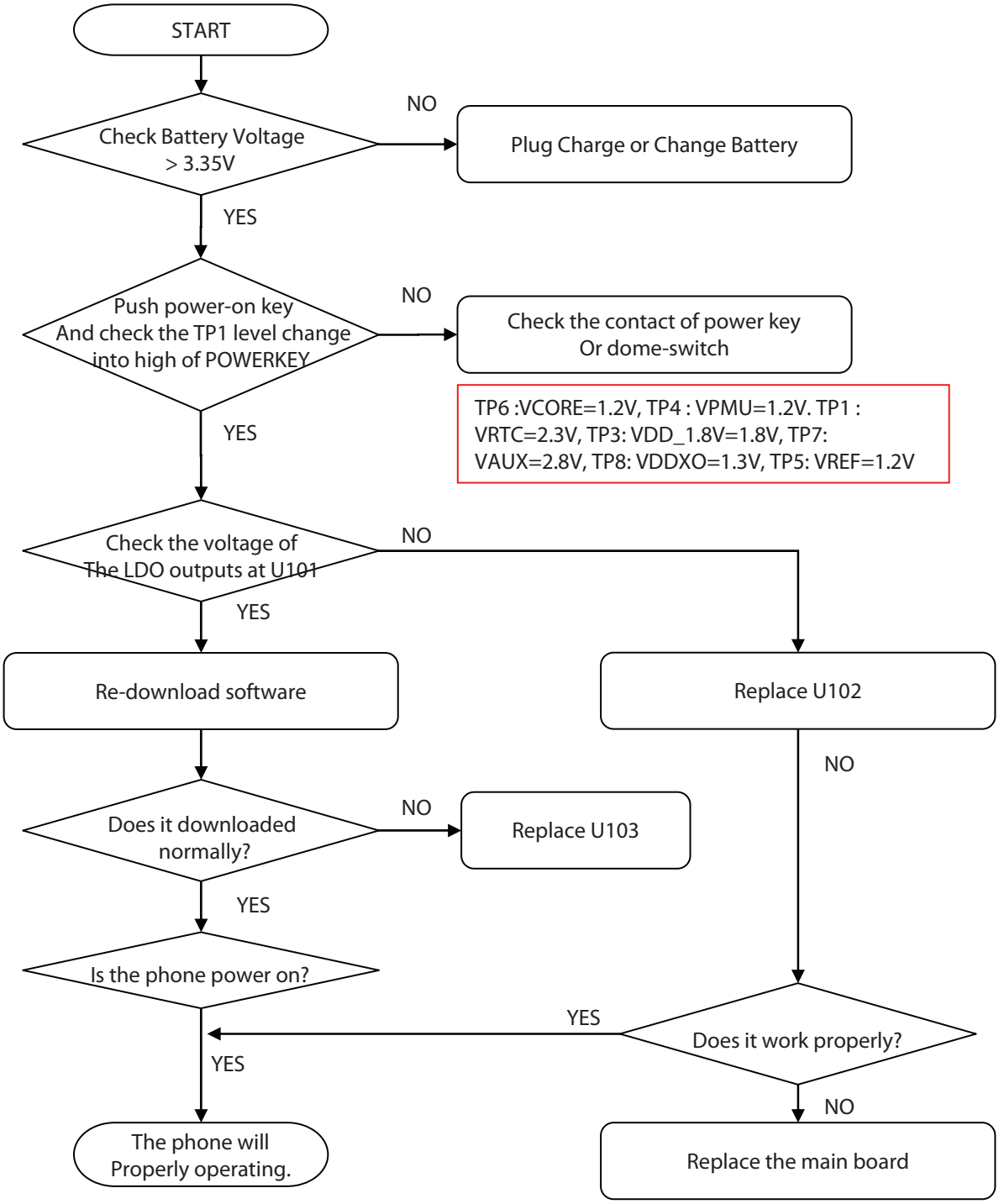
4.4 Power On Trouble





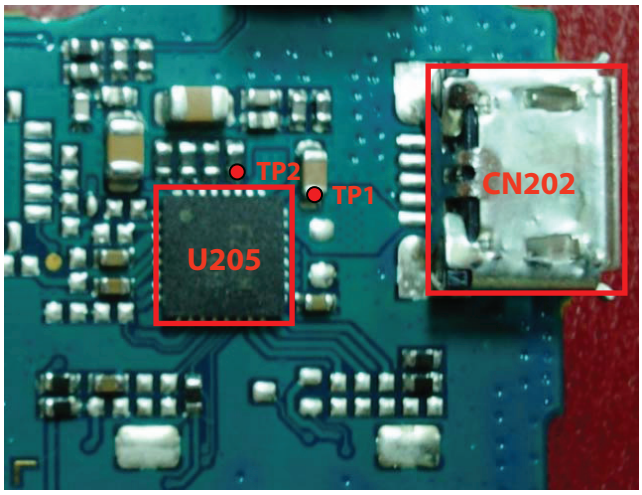


CHECKING FLOW

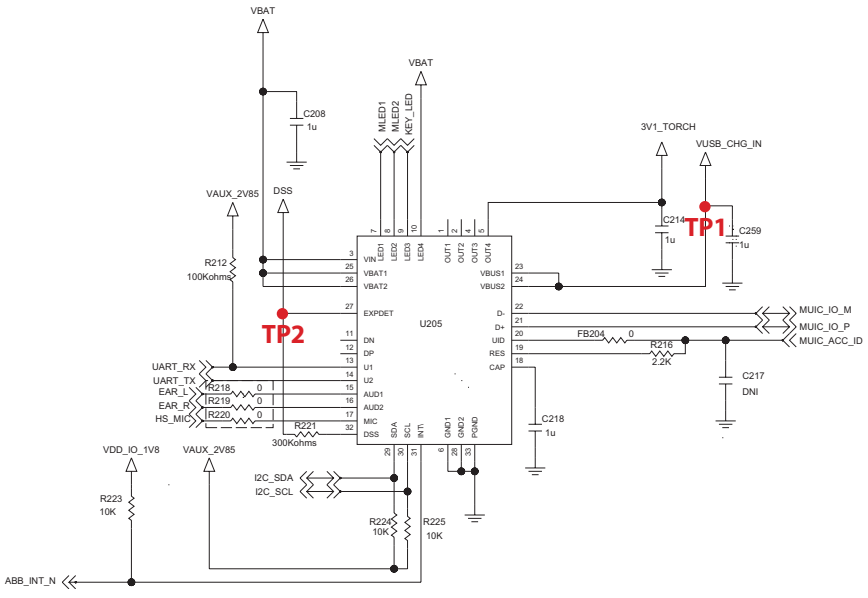


4.5 Charging Trouble

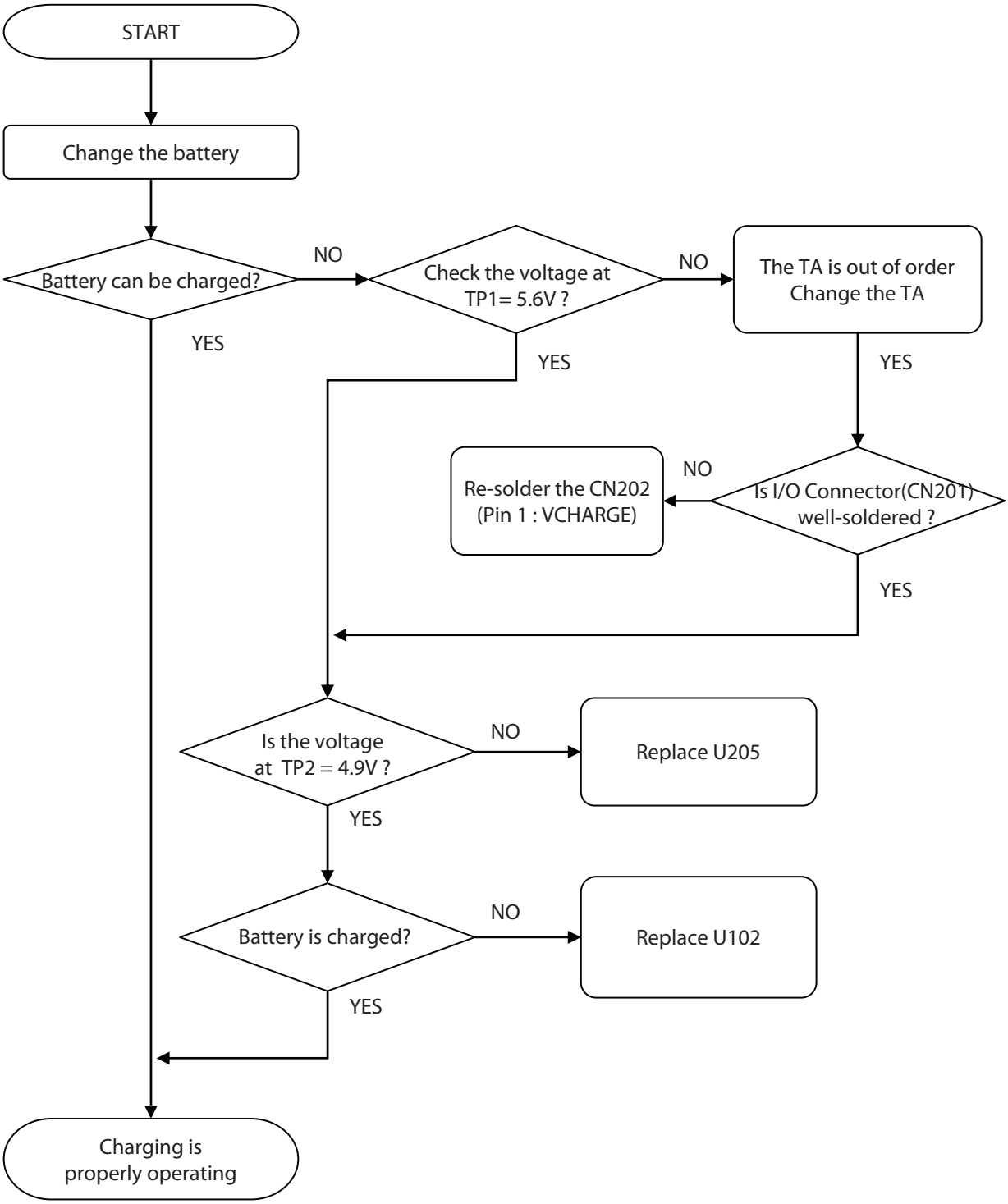
TEST POINT



CIRCUIT



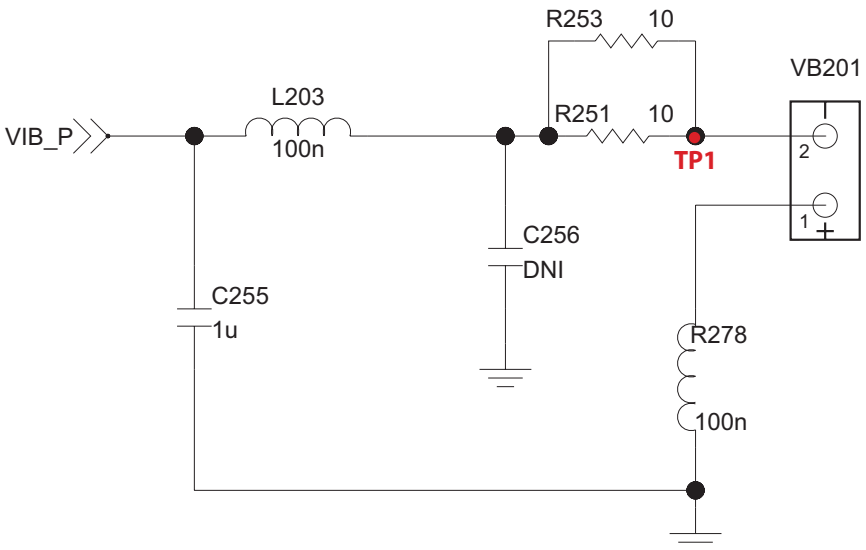
CHECKING FLOW



4.6 Vibrator Trouble

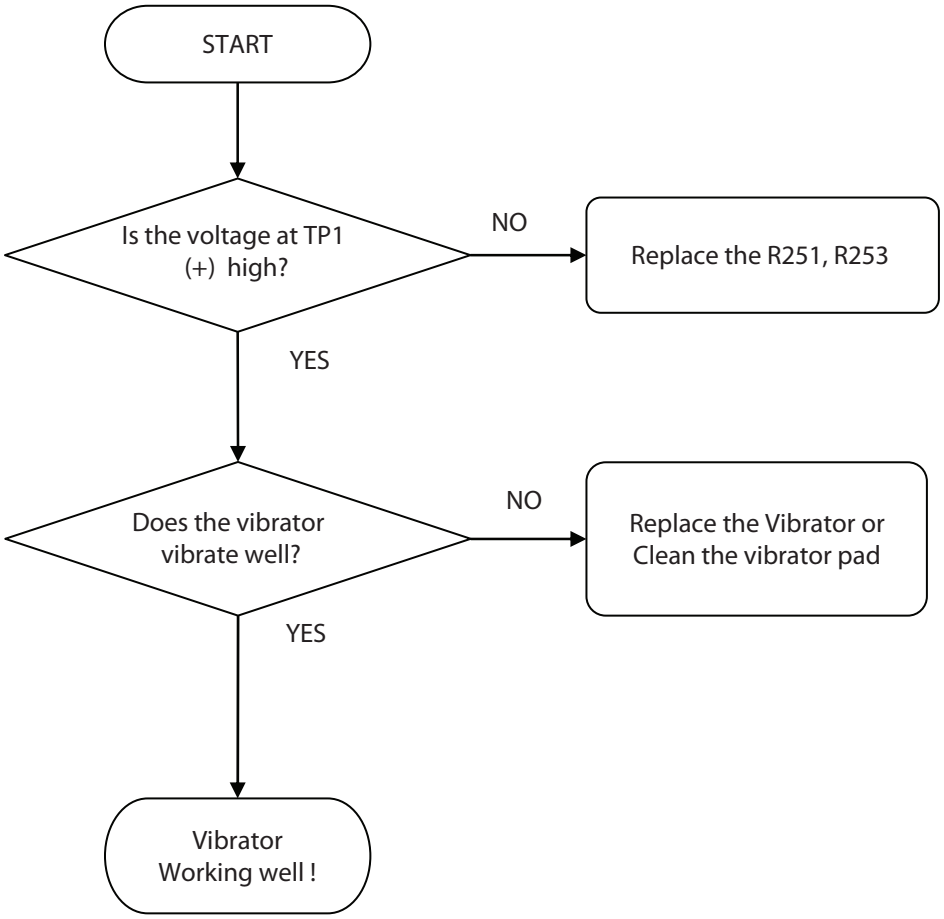
TEST POINT

CIRCUIT



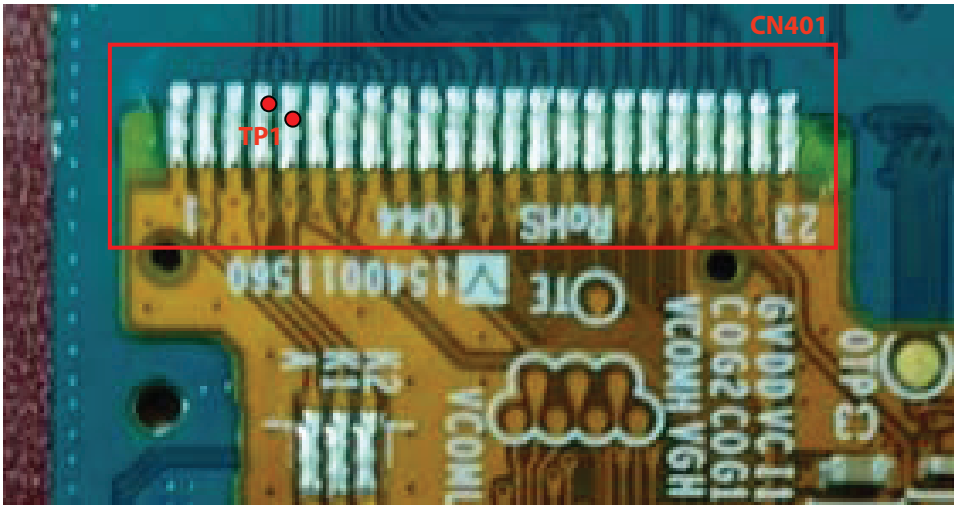
CHECKING FLOW

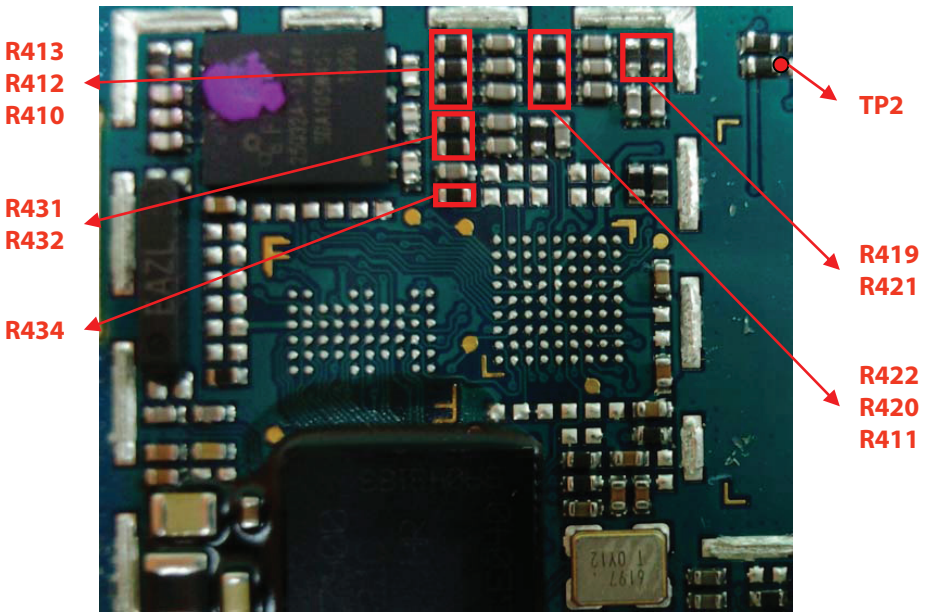
SETTING : Enter the engineering mode, and set vibrator on at vibration of Device test menu



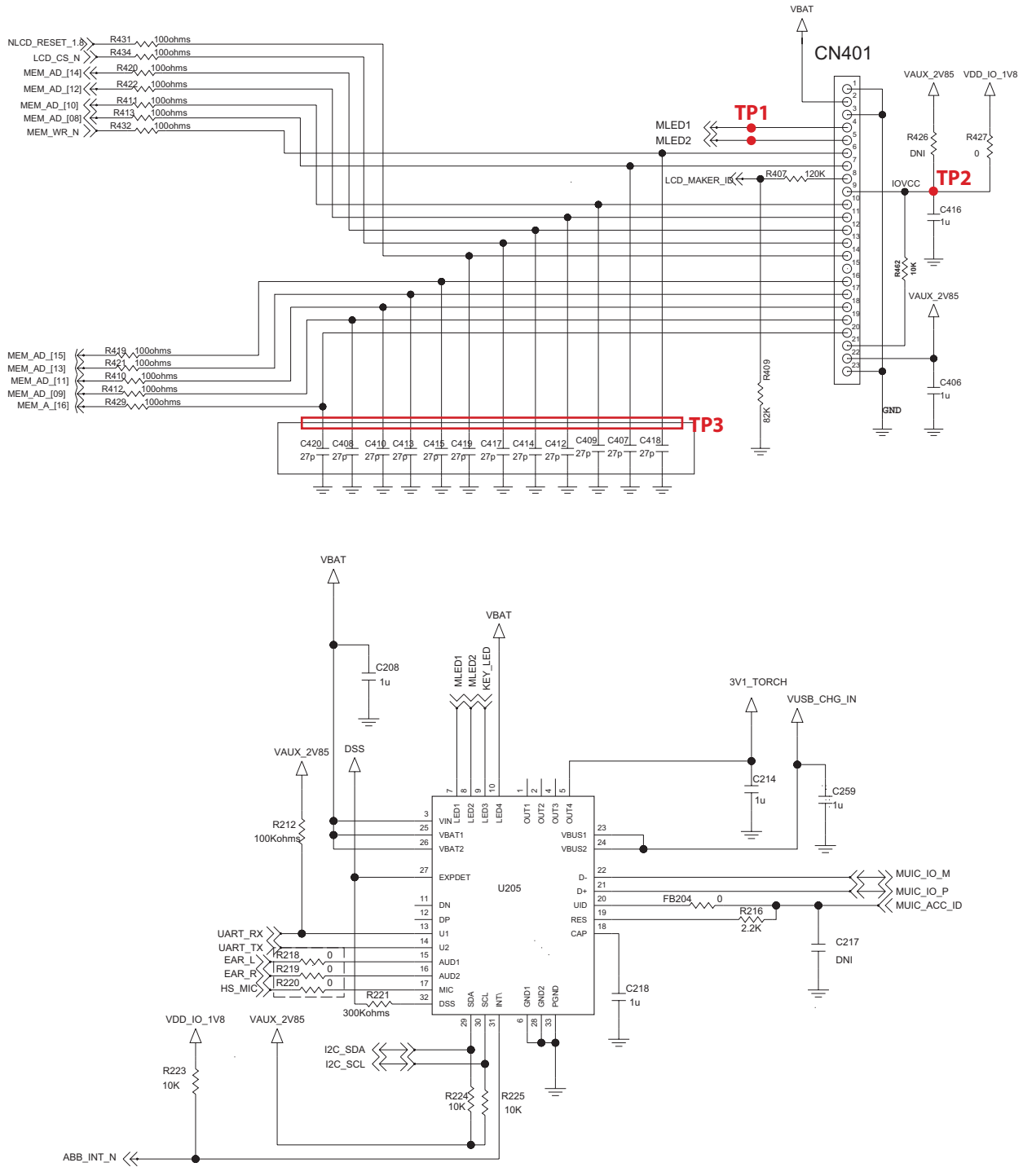
4.7 LCD Trouble

TEST POINT

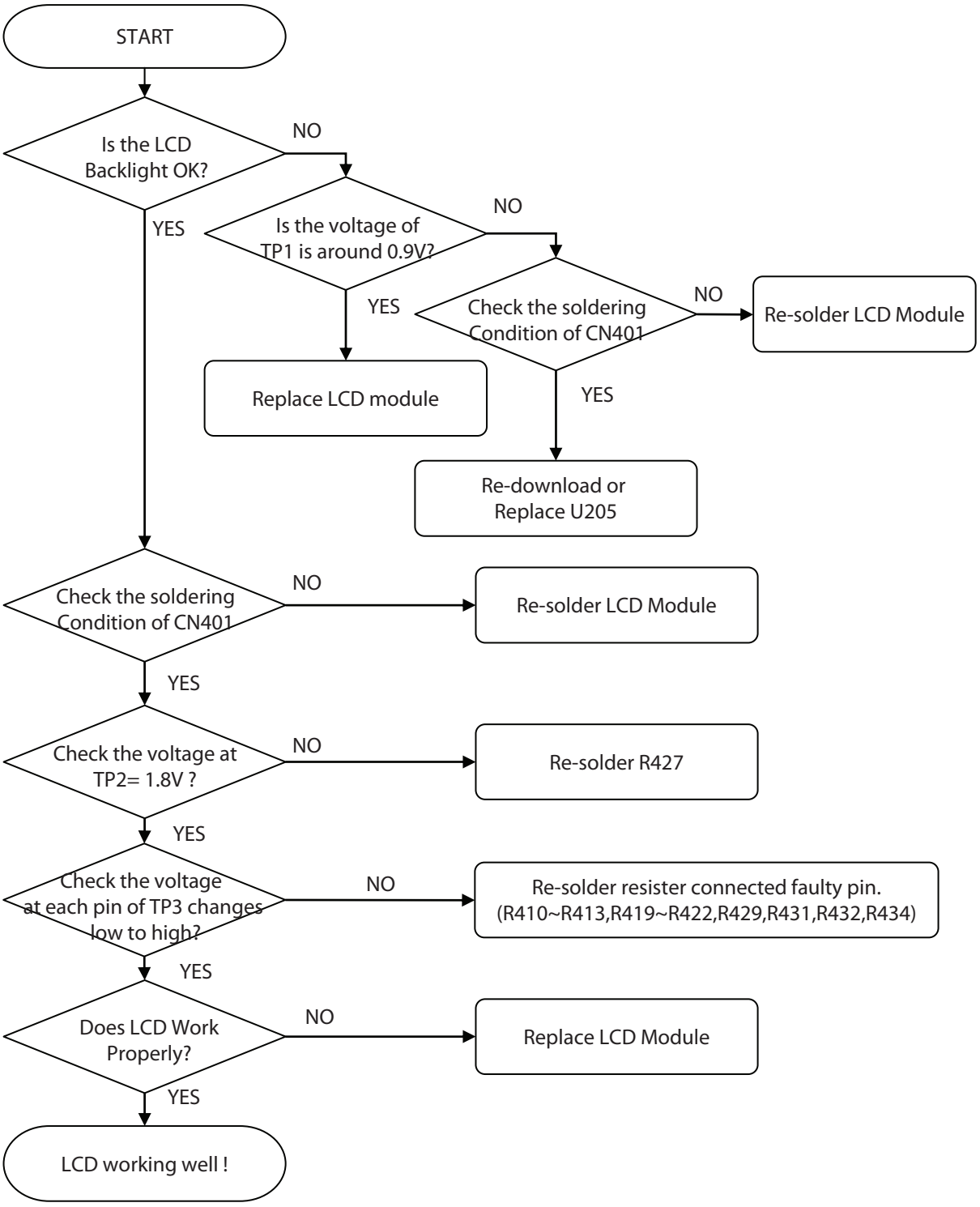




CIRCUIT

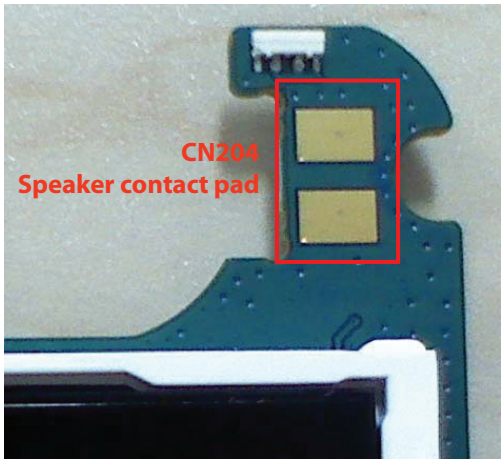


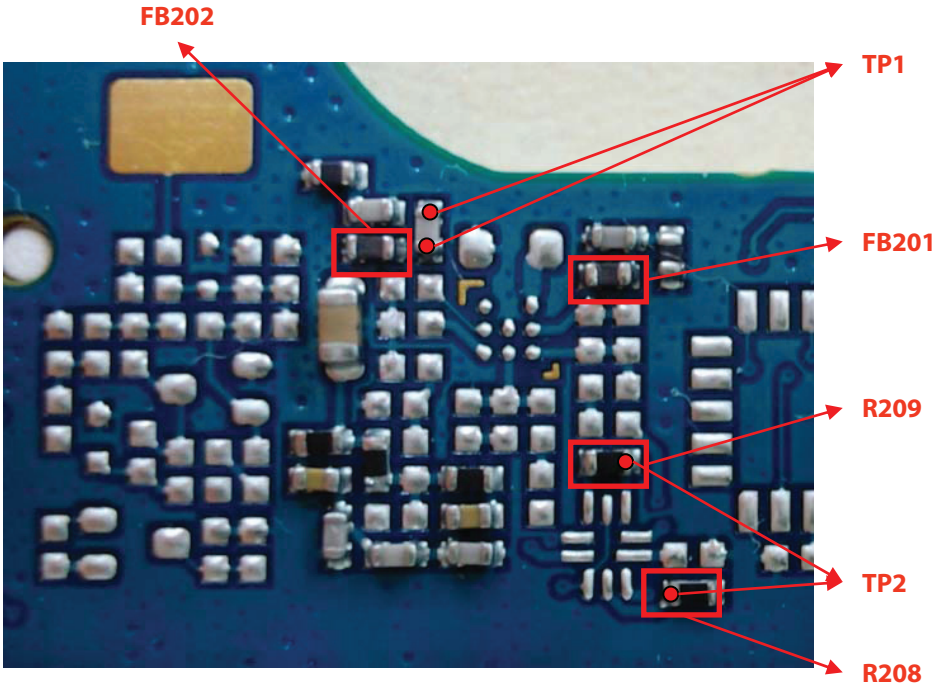
CHECKING FLOW



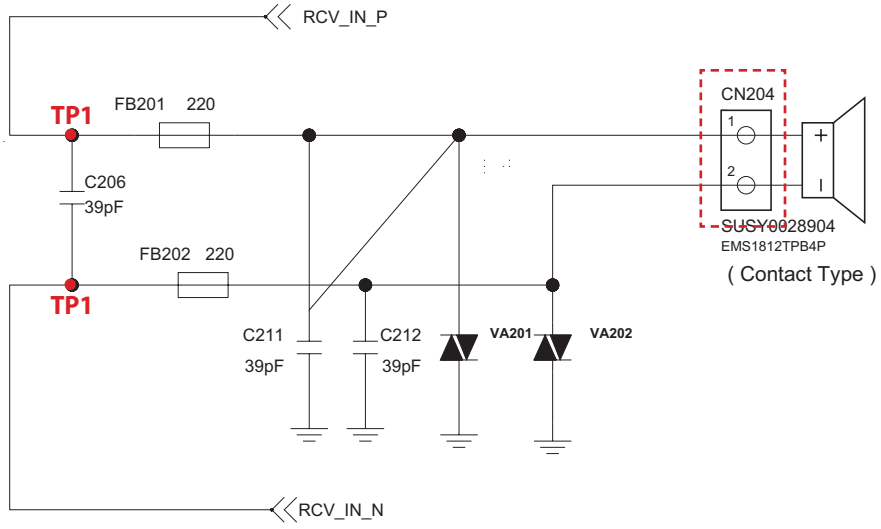
4.8 Speaker Trouble

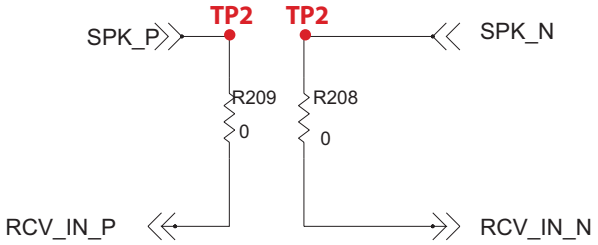
TEST POINT

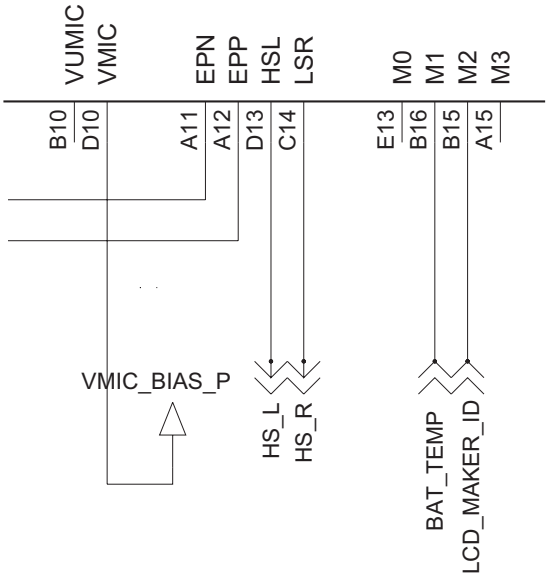


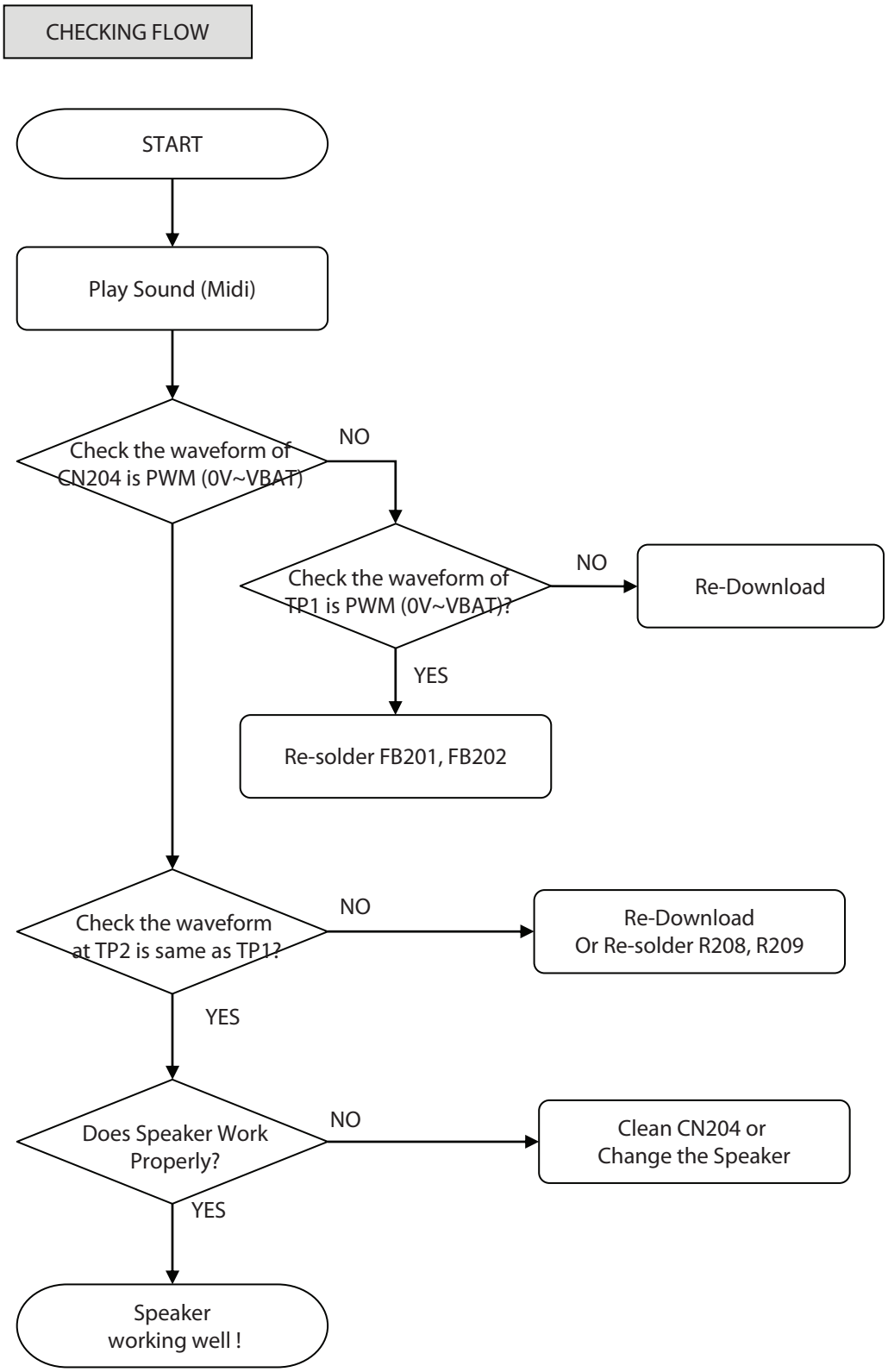


CIRCUIT



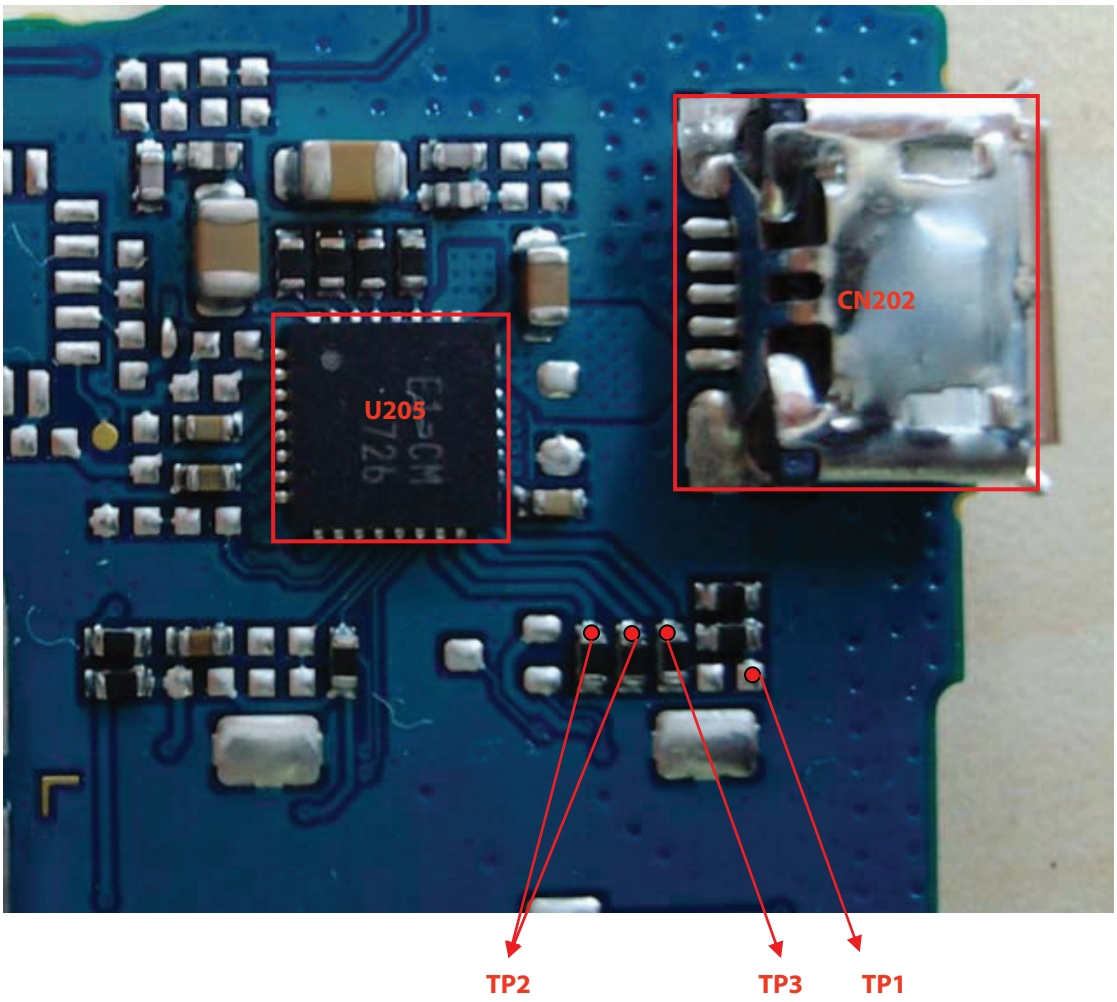




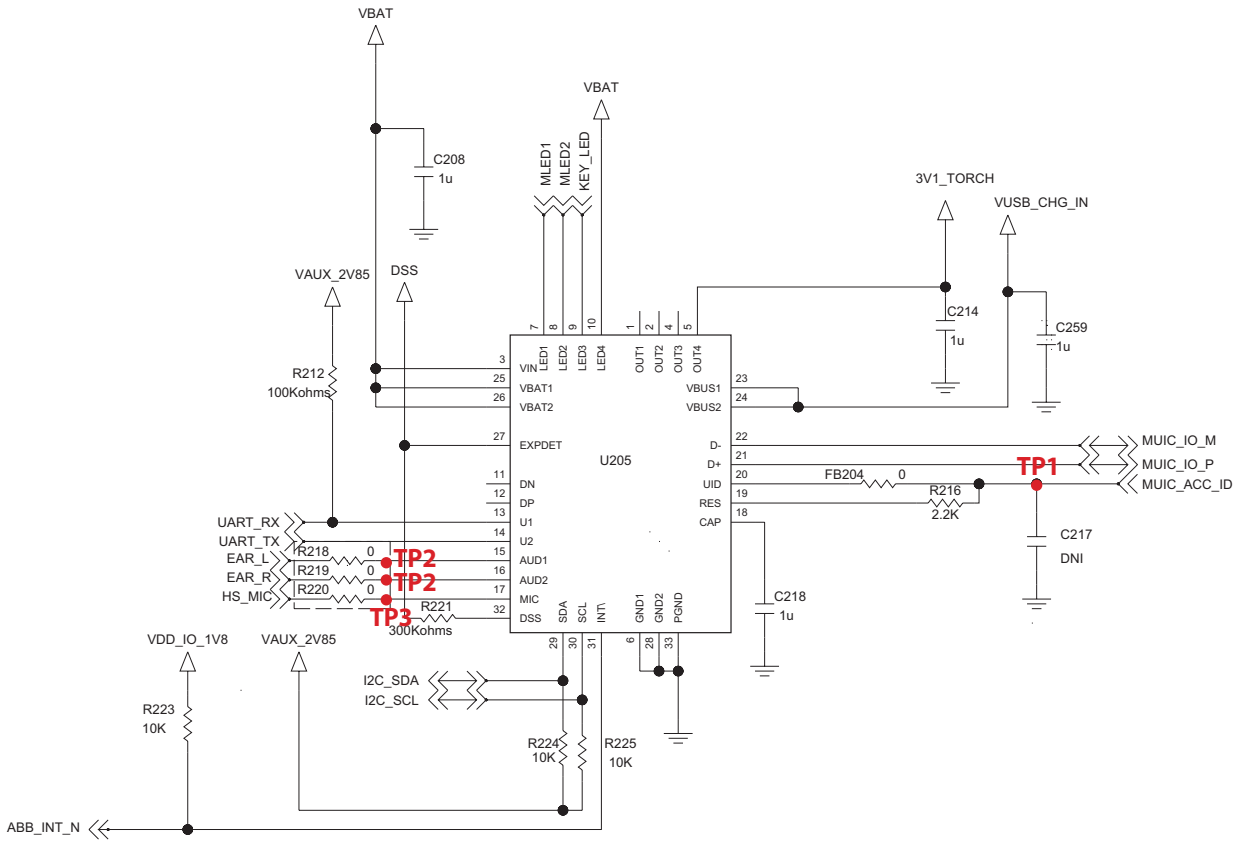


4.9 Earphone Trouble

TEST POINT

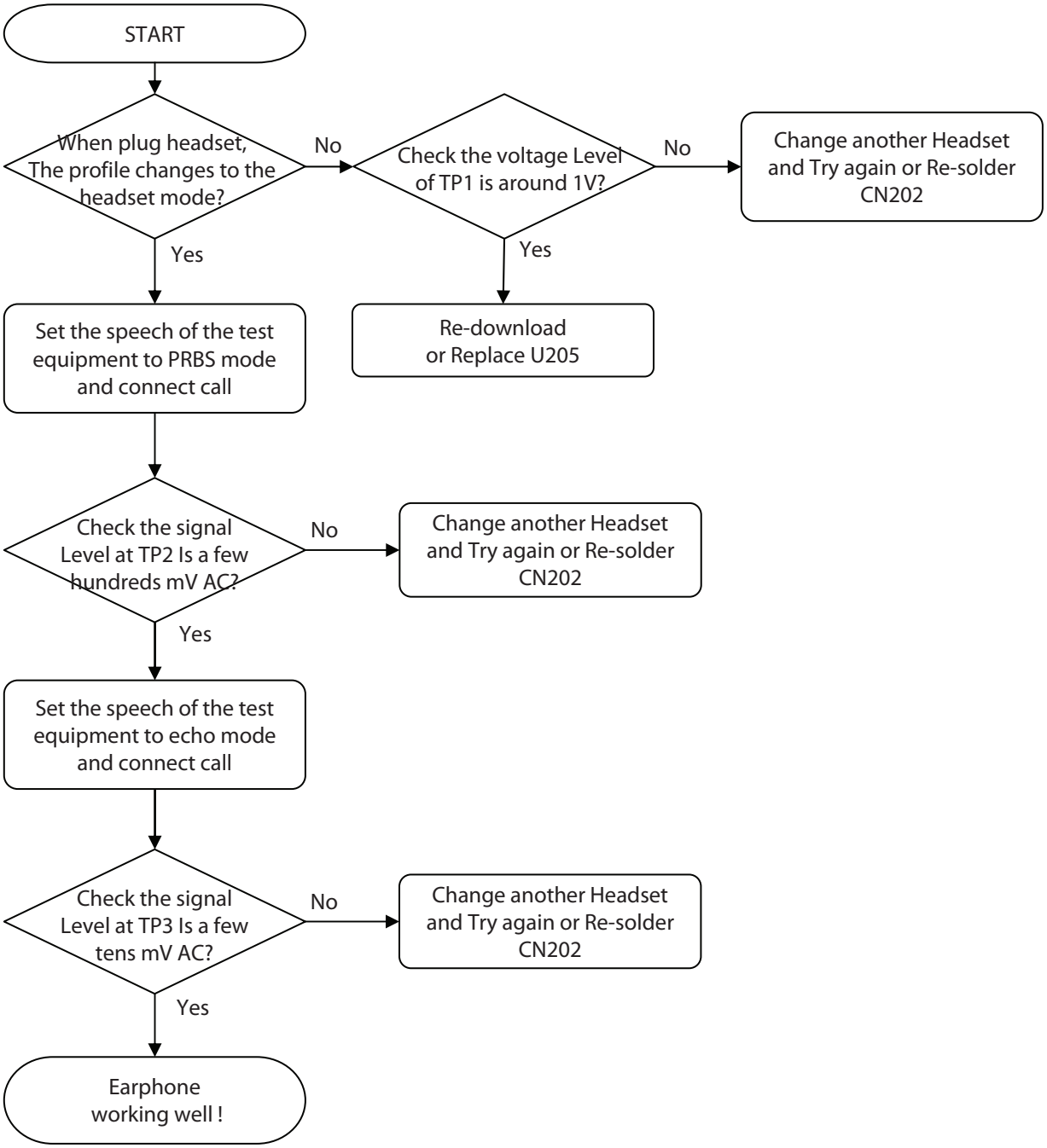


CIRCUIT



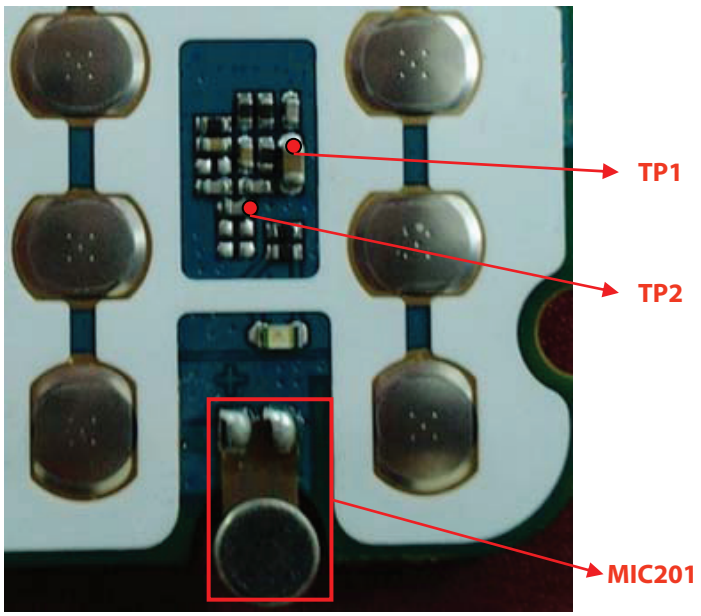
CHECKING FLOW

SETTING : After initialize Agilent 8960, Test EGSM900, DCS mode (or GSM850, PCS mode)

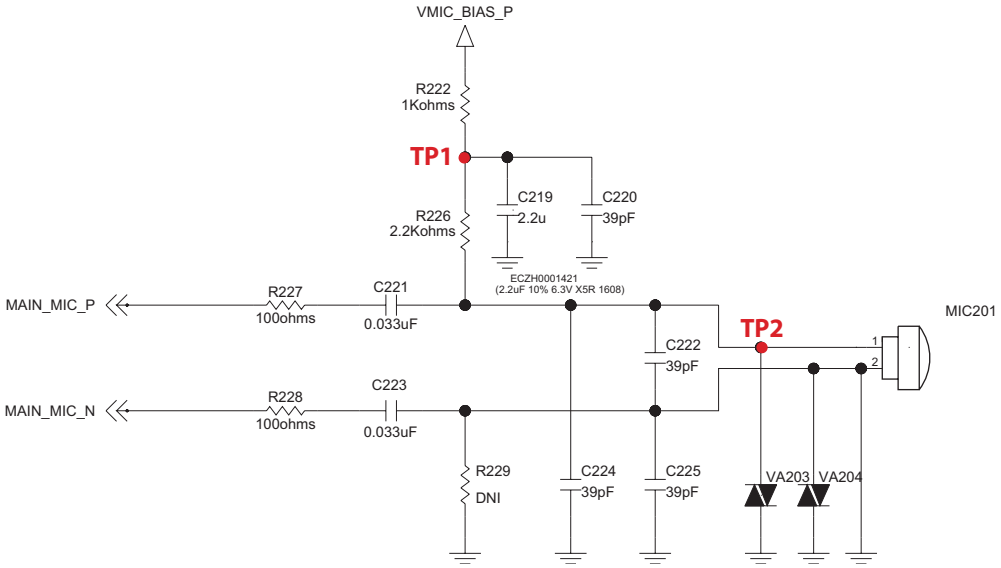


4.10 Microphone Trouble

TEST POINT

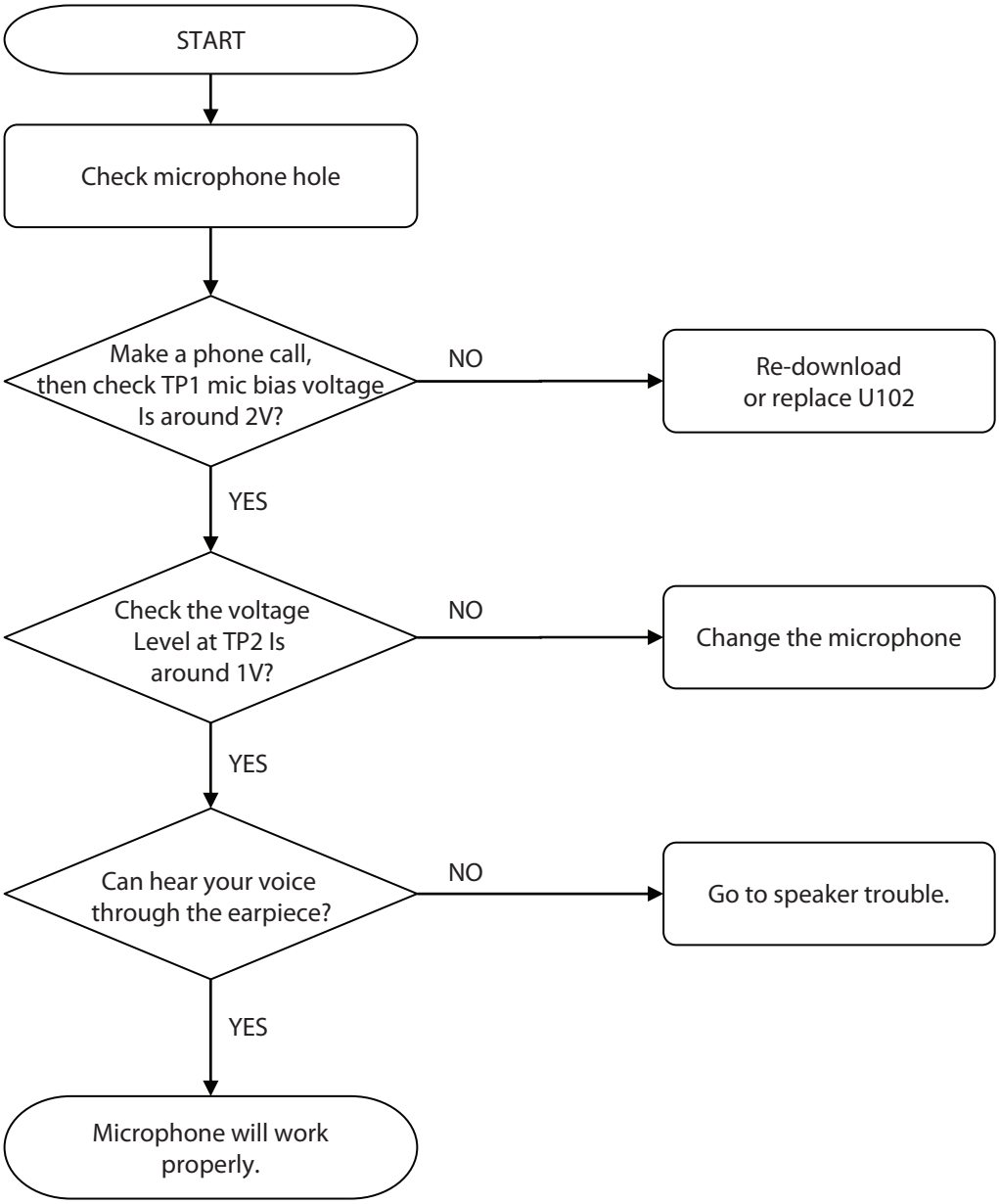


CIRCUIT



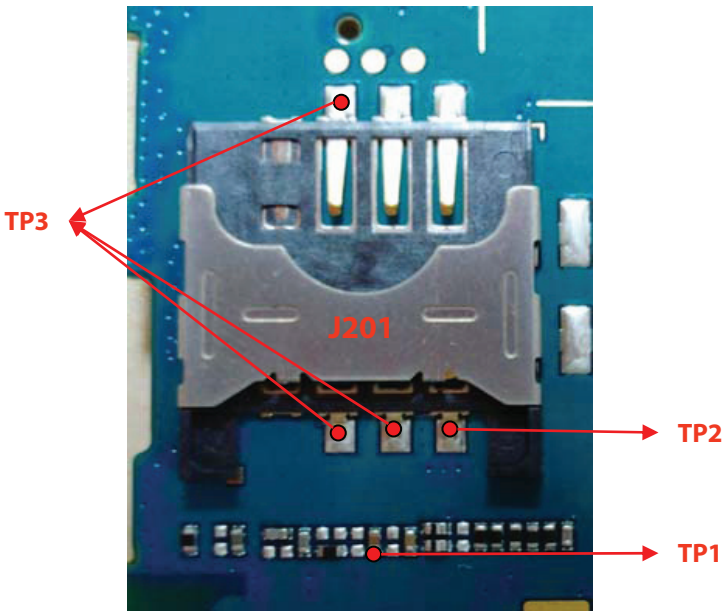
CHECKING FLOW

SETTING : After initialize Agilent 8960, Test EGSM900, DCS mode (or GSM850, PCS mode)
and change speech to echo mode.

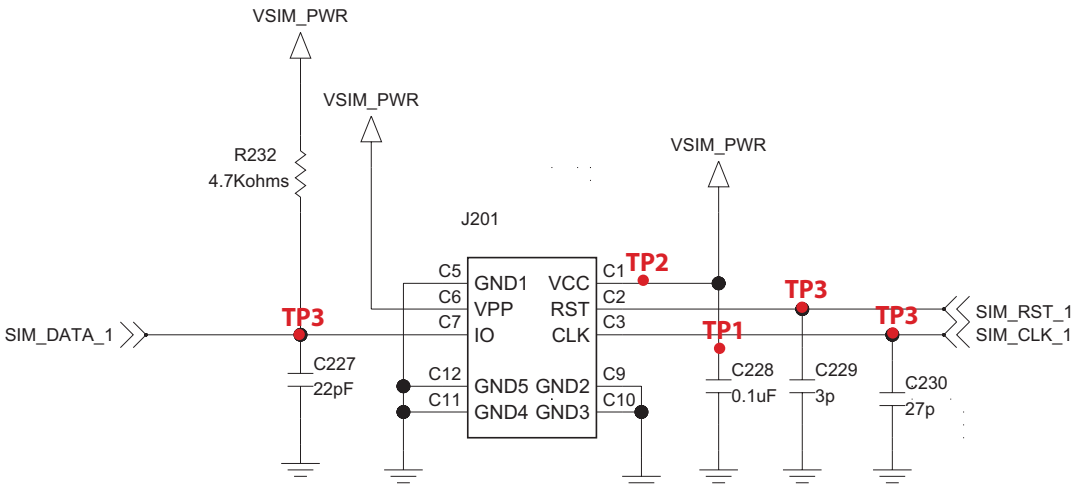


4.11 SIM Card Interface Trouble

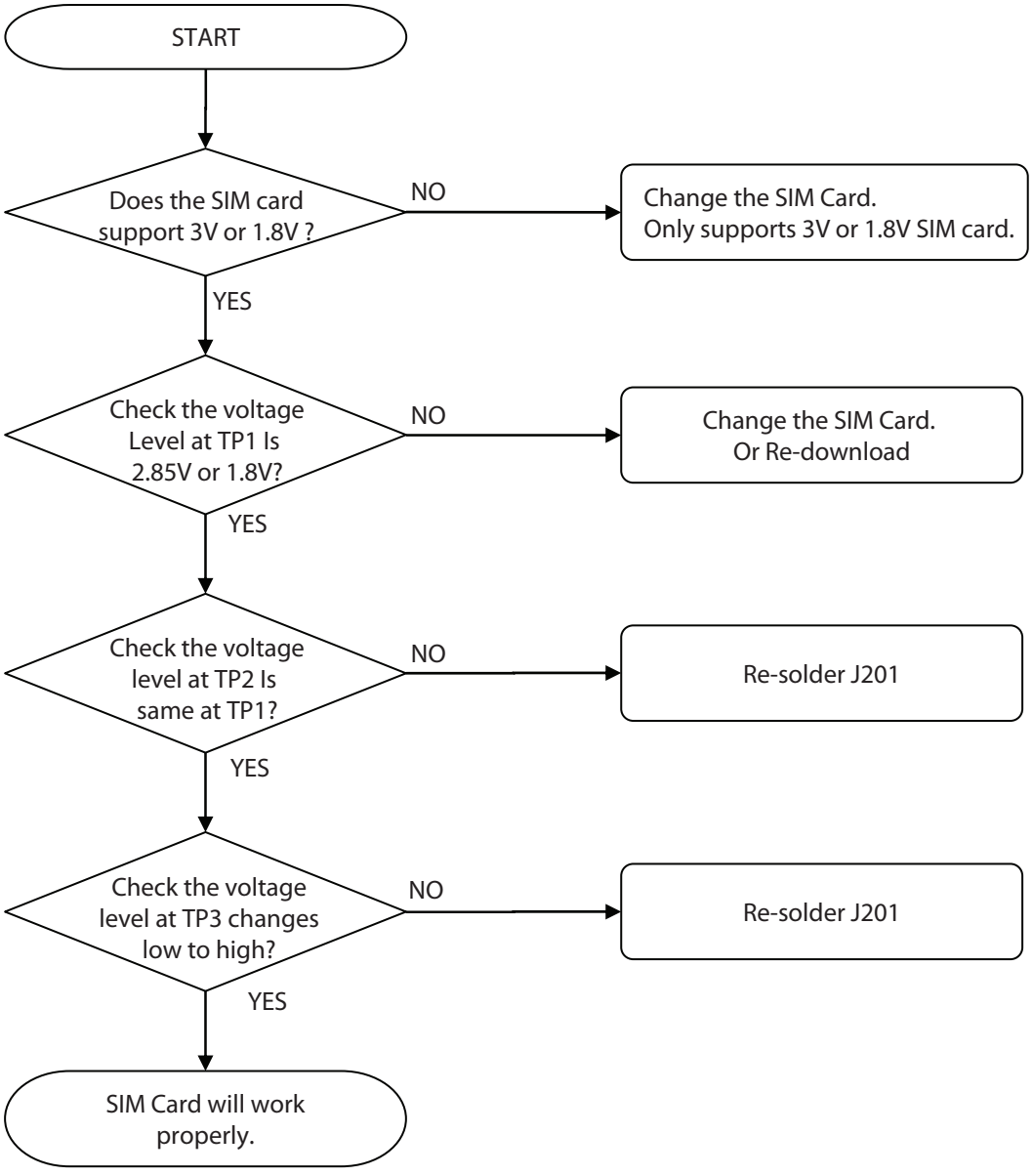
TEST POINT



CIRCUIT

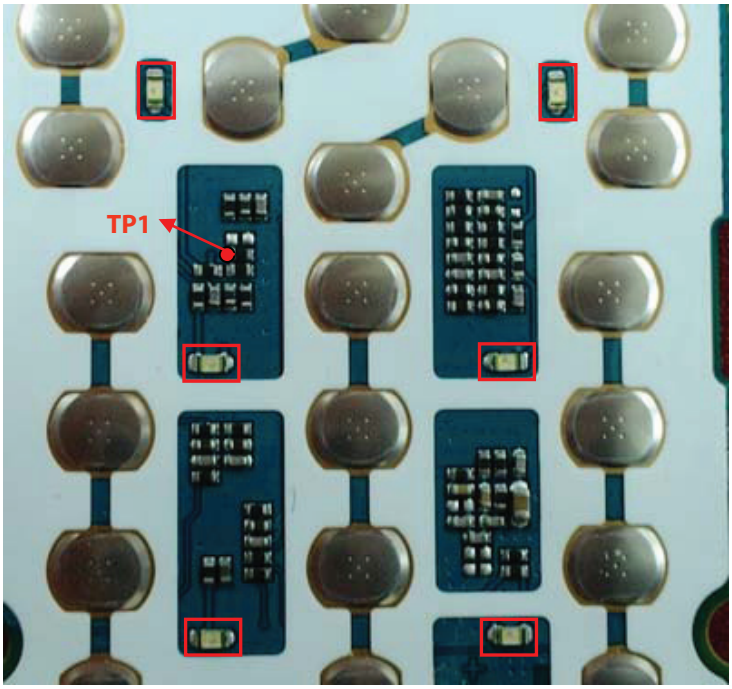


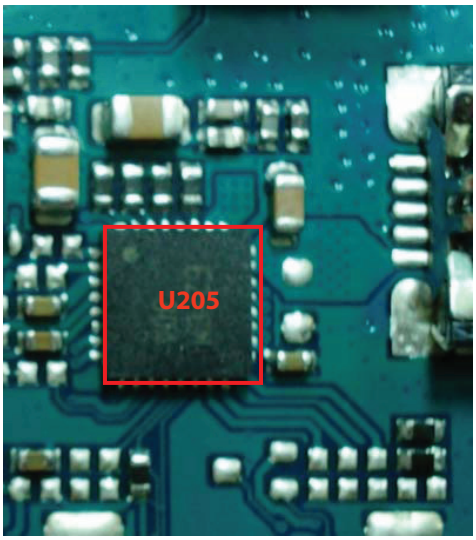
CHECKING FLOW



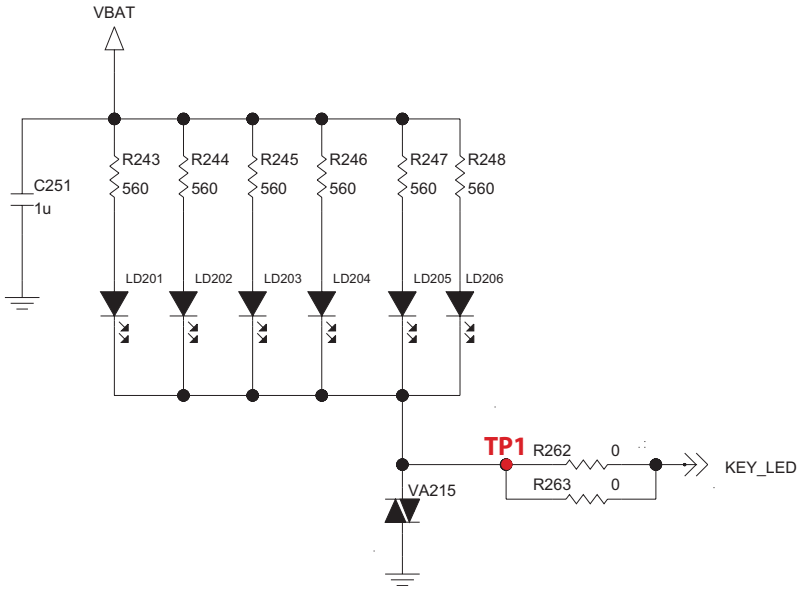
4.12 KEY backlight Trouble

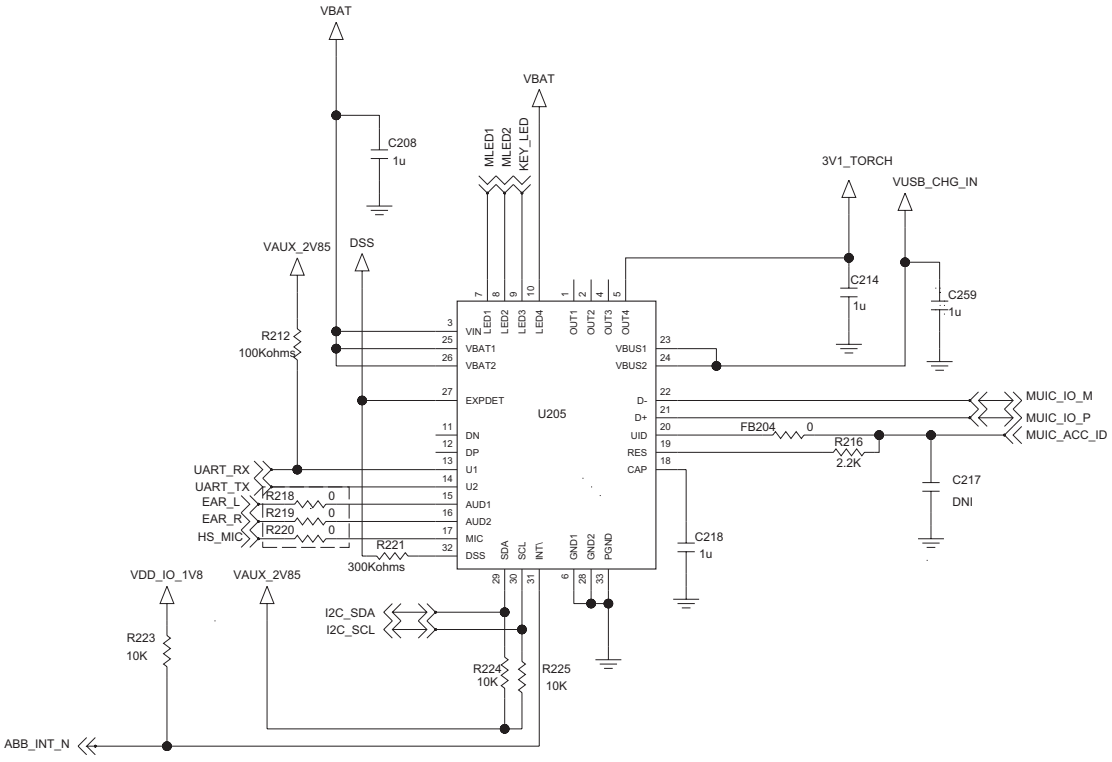
TEST POINT



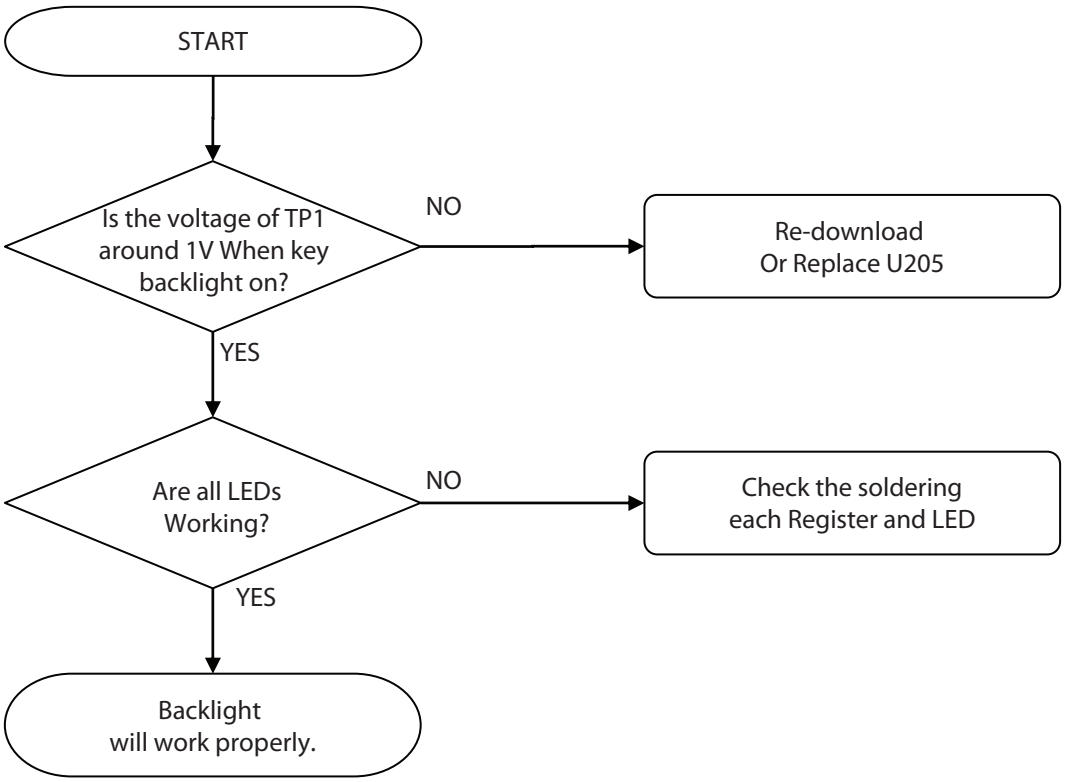


CIRCUIT

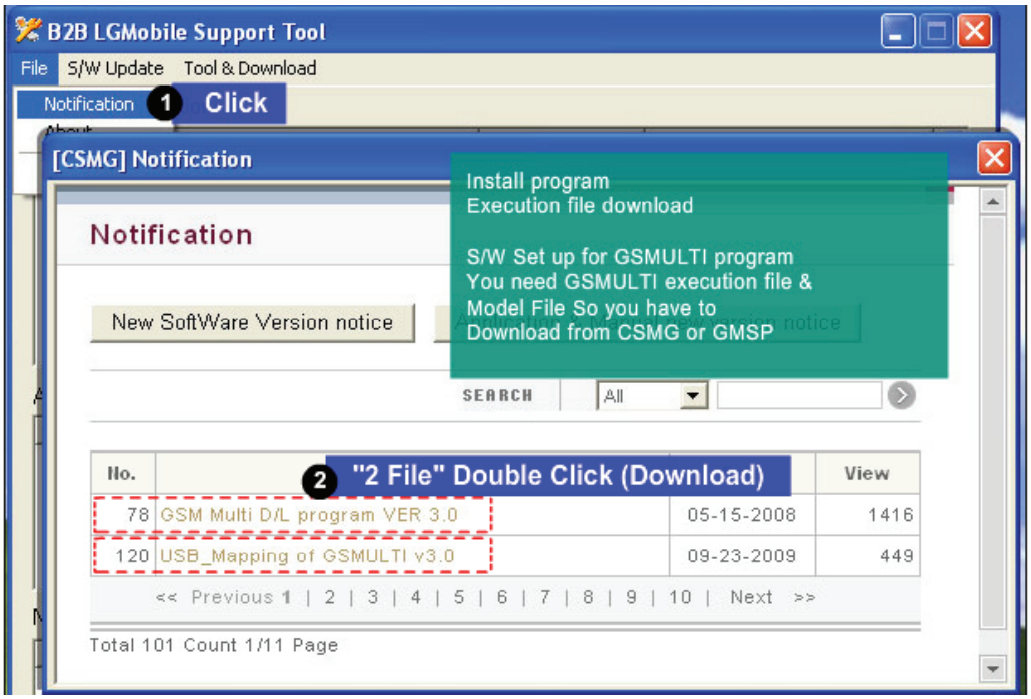


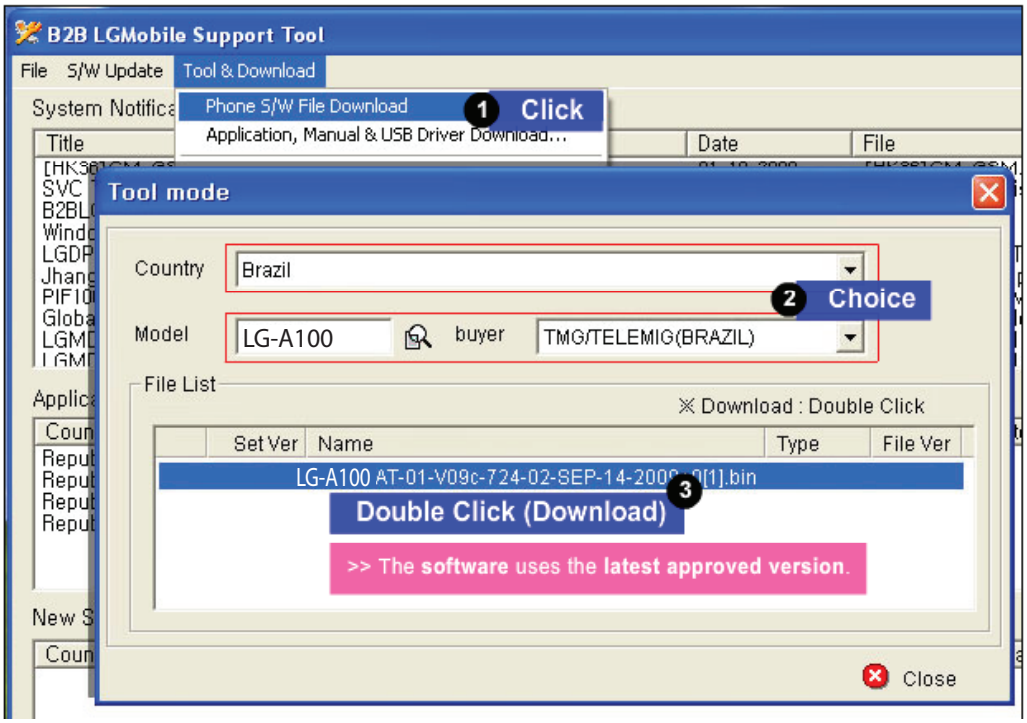


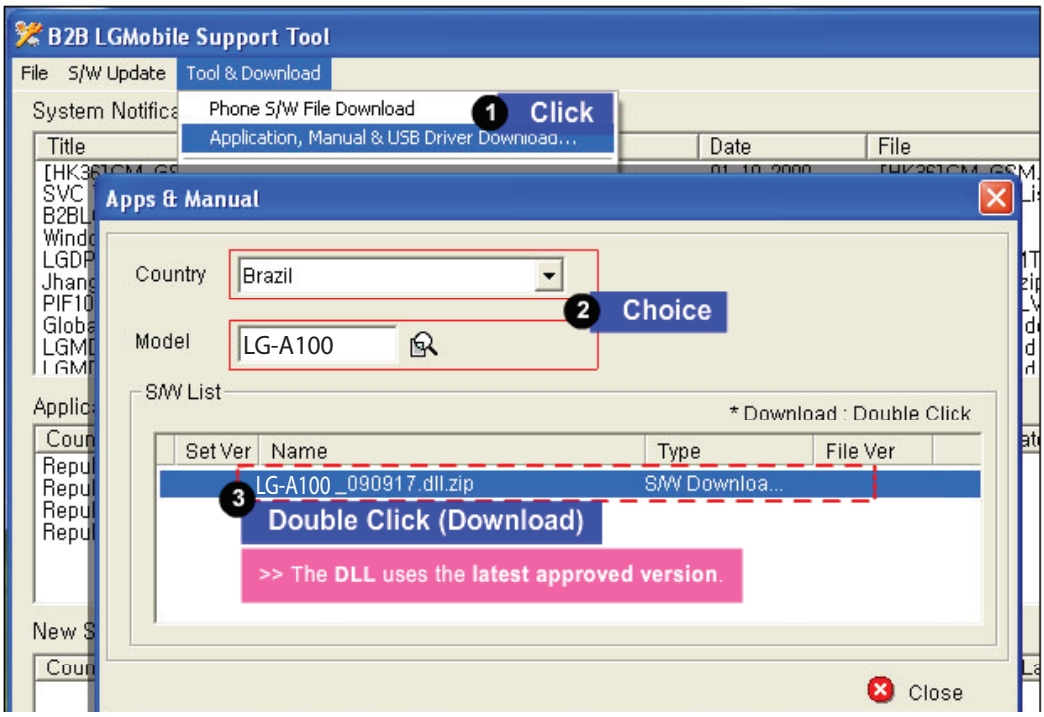
CHECKING FLOW

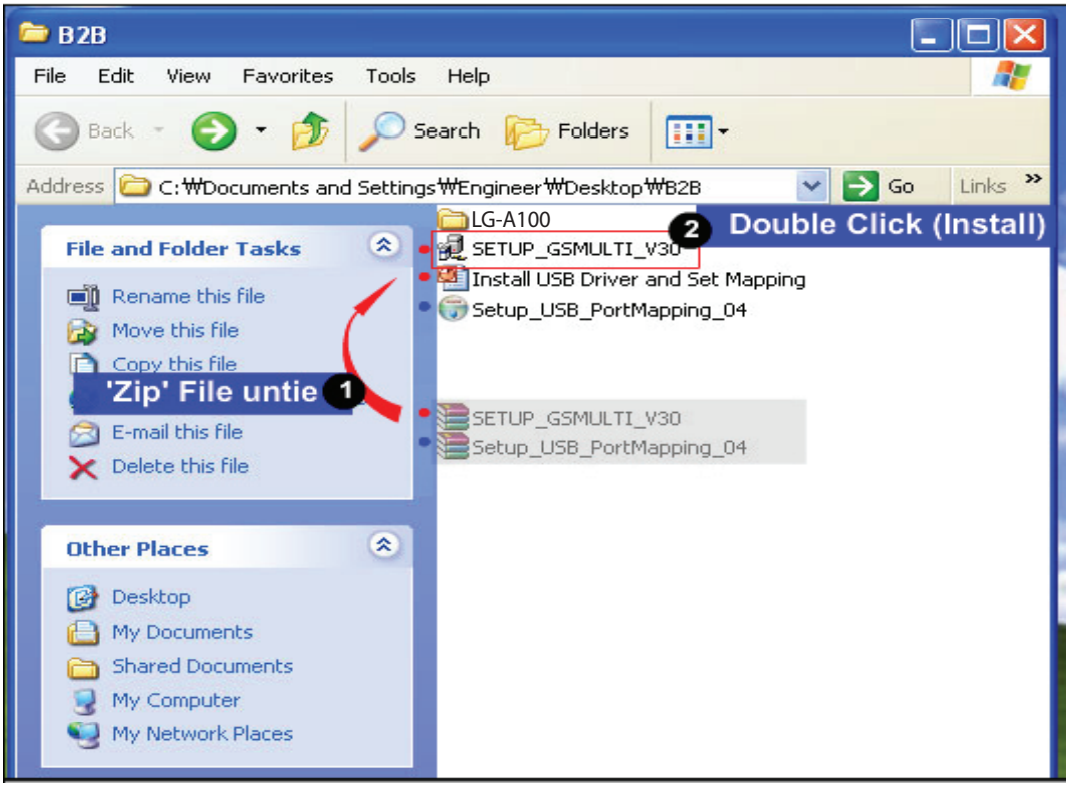


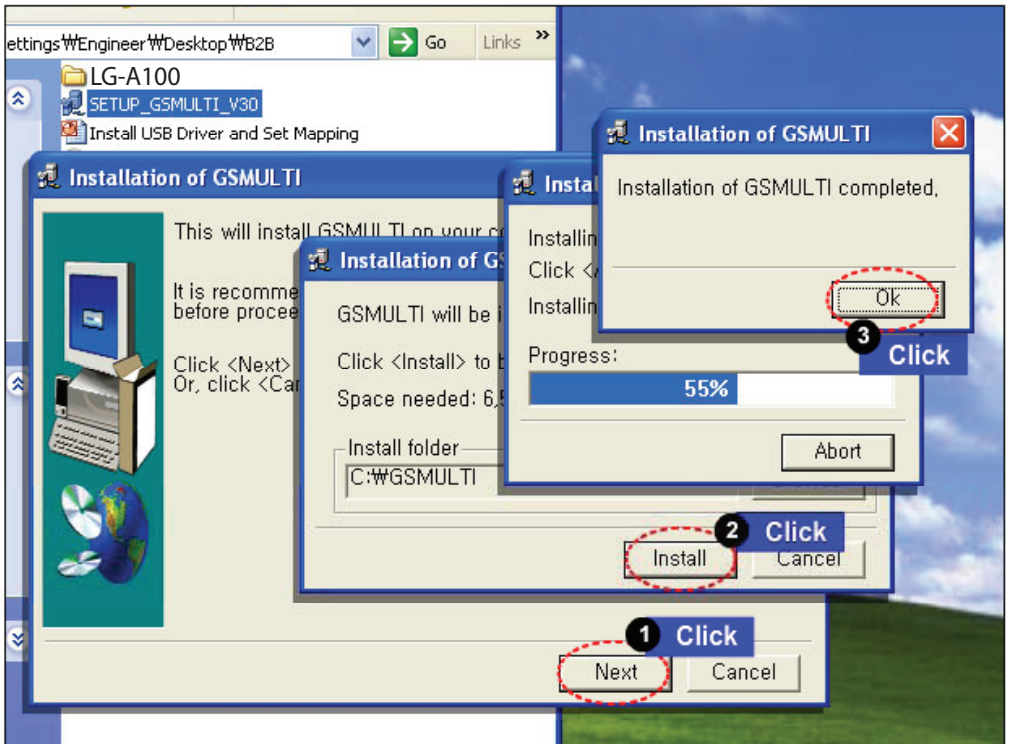
5. DOWNLOAD

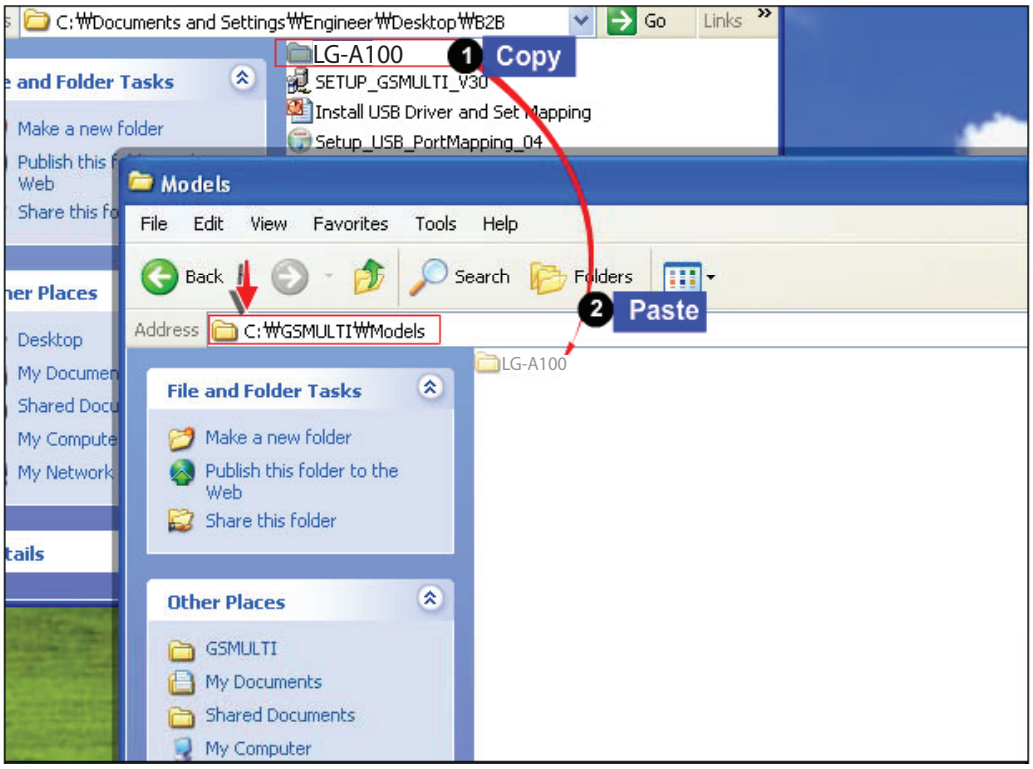


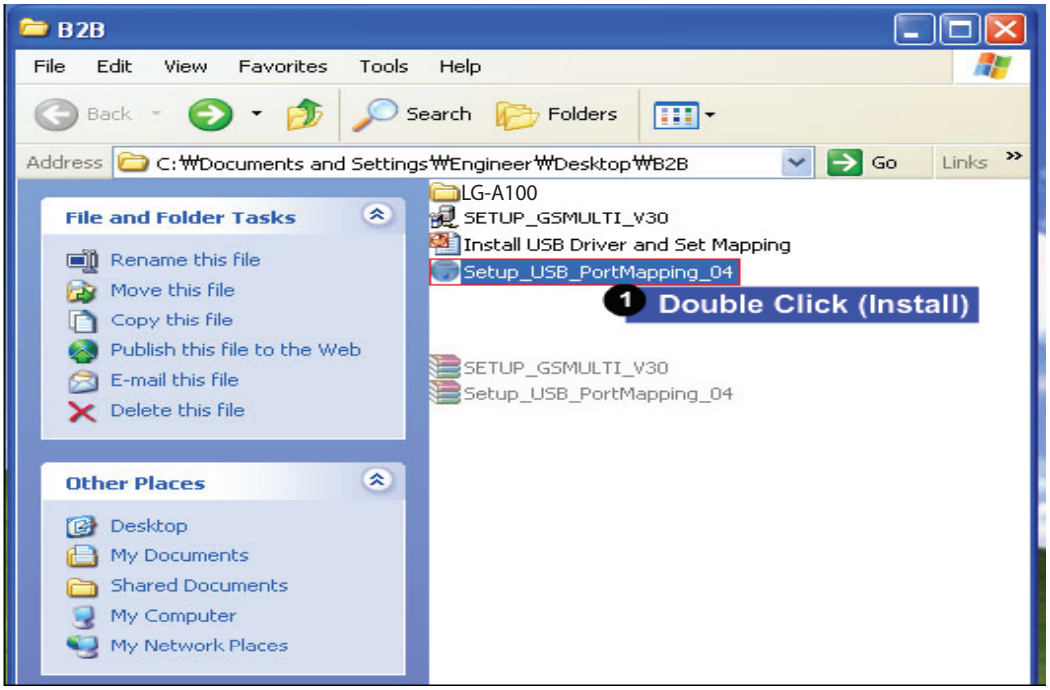


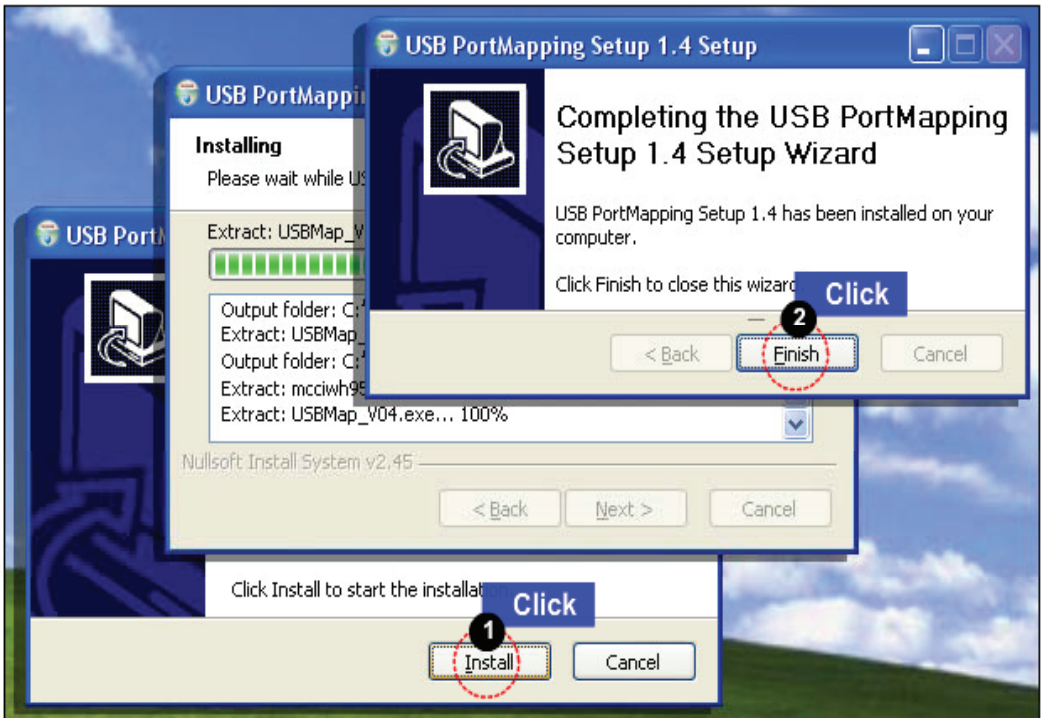


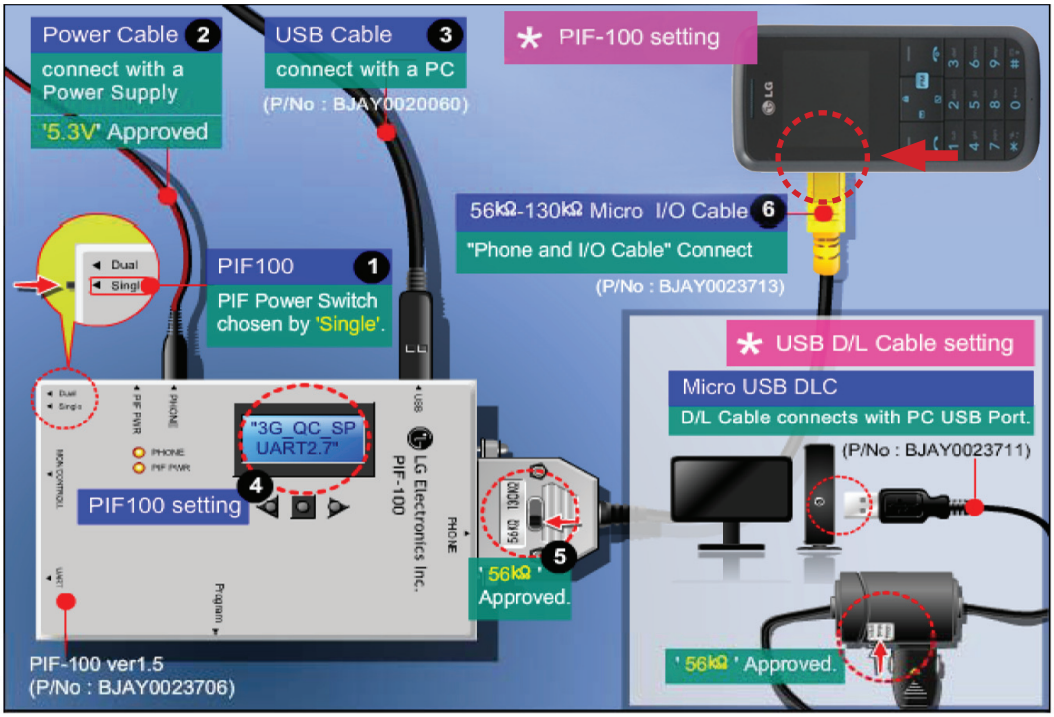


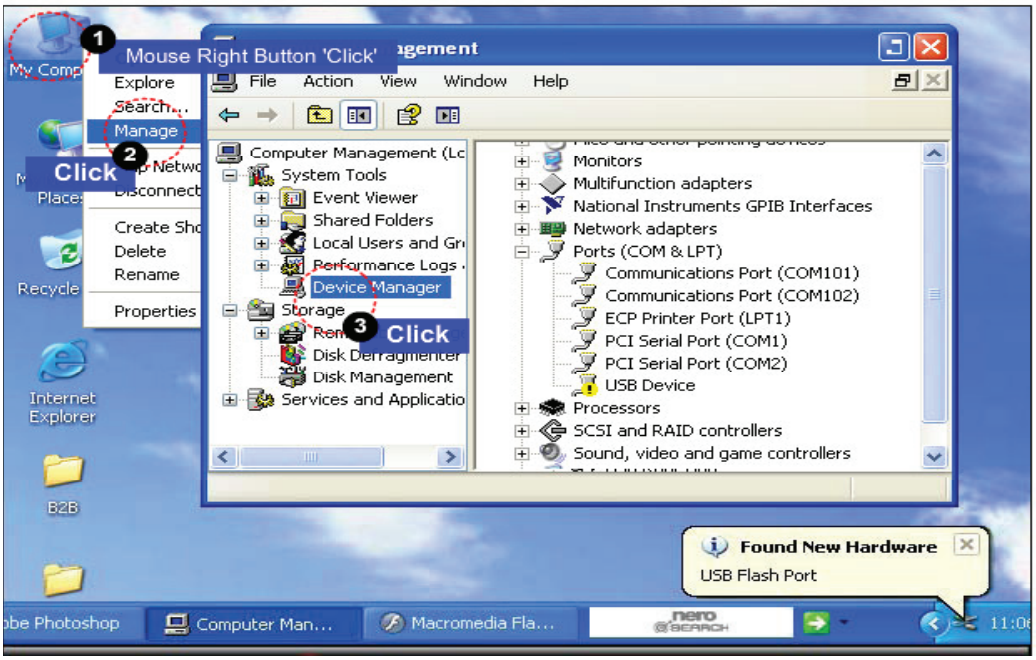


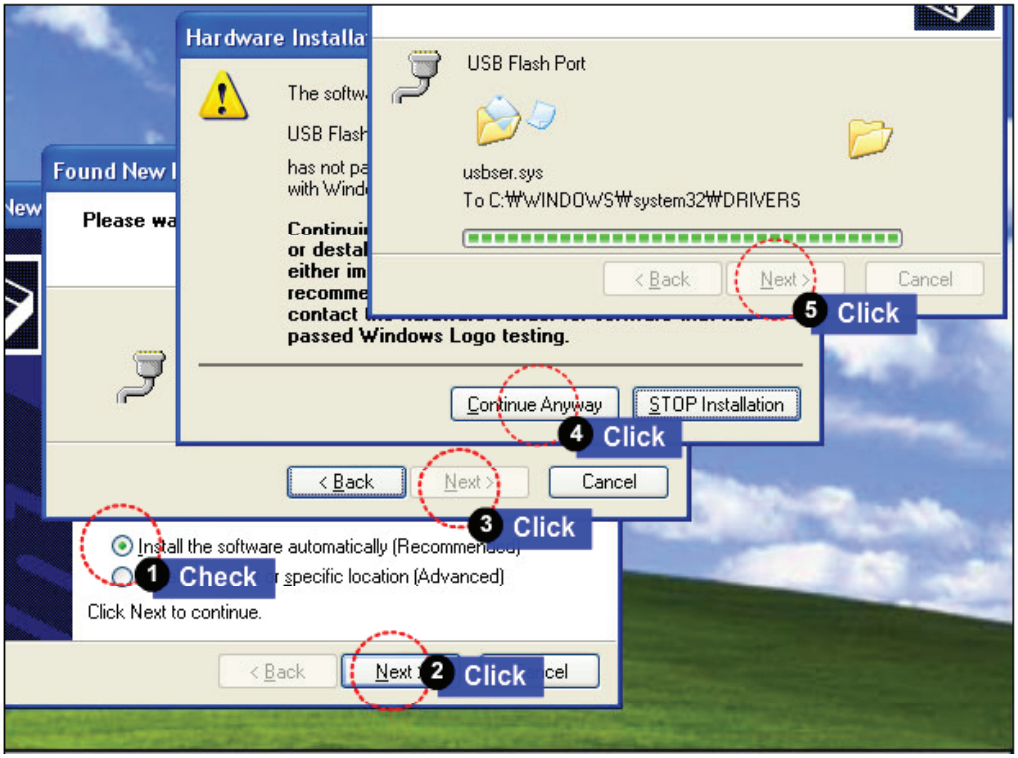


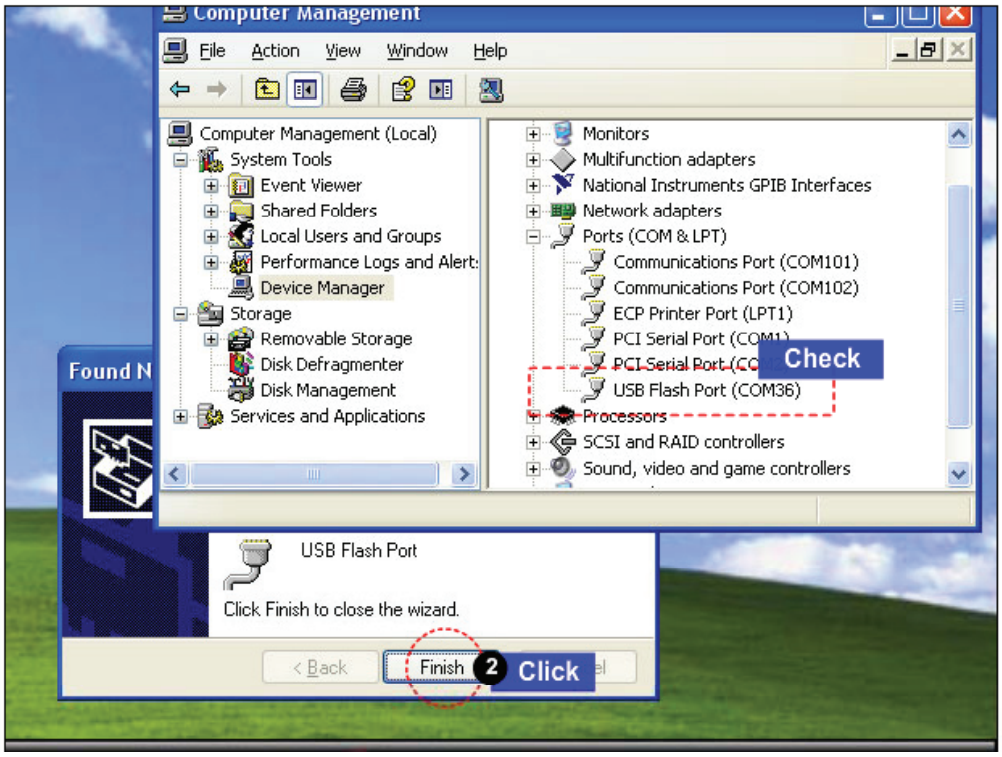


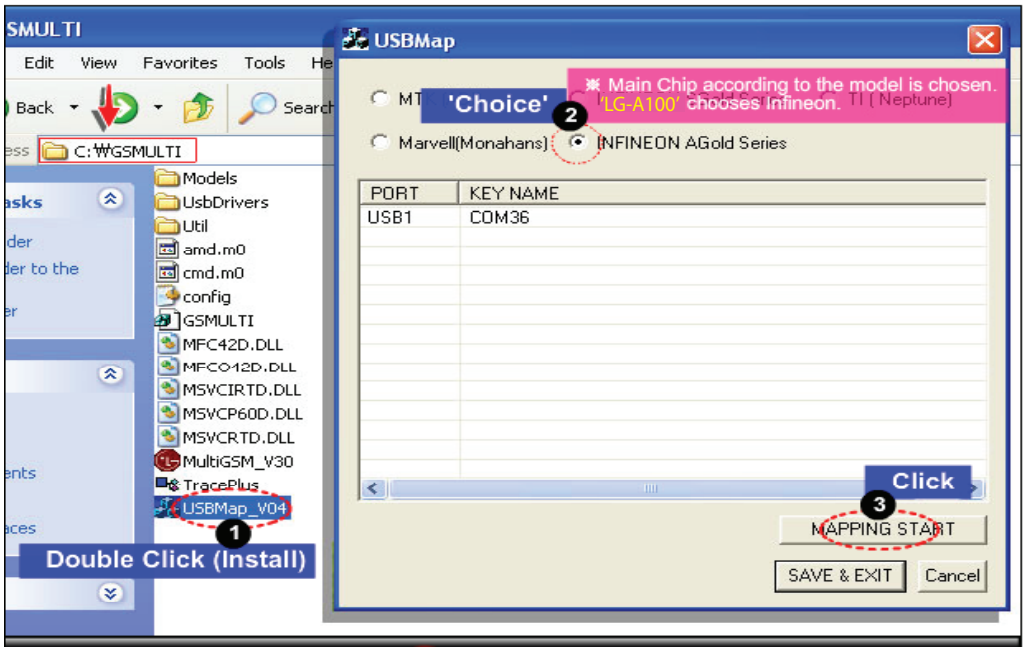


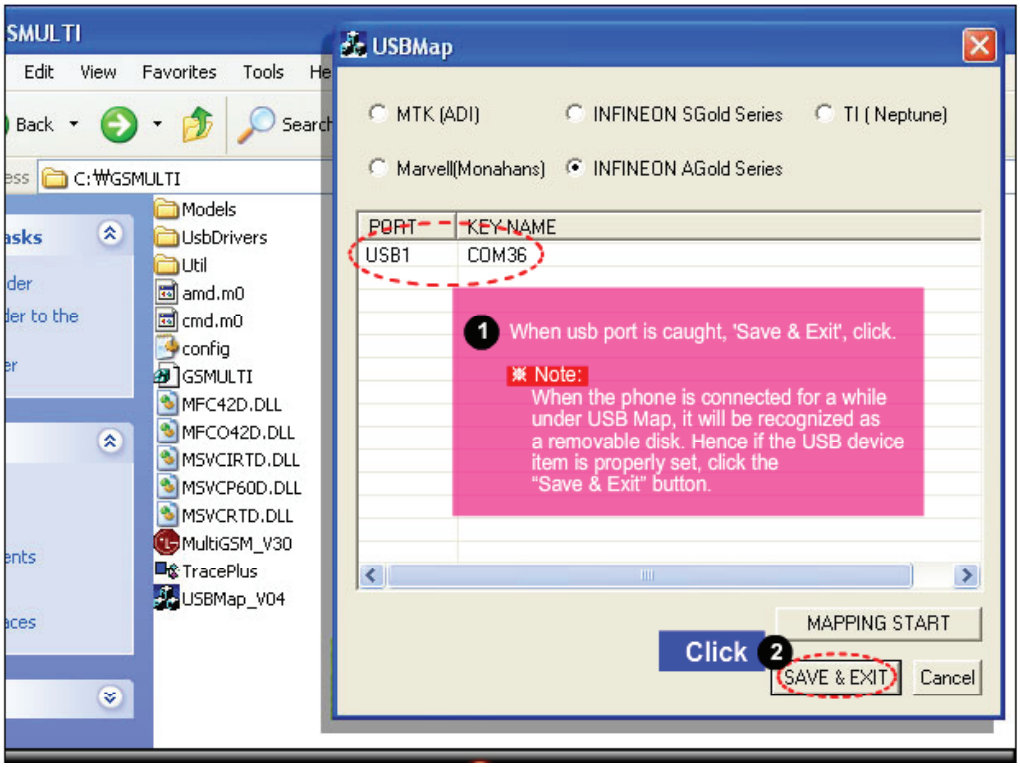


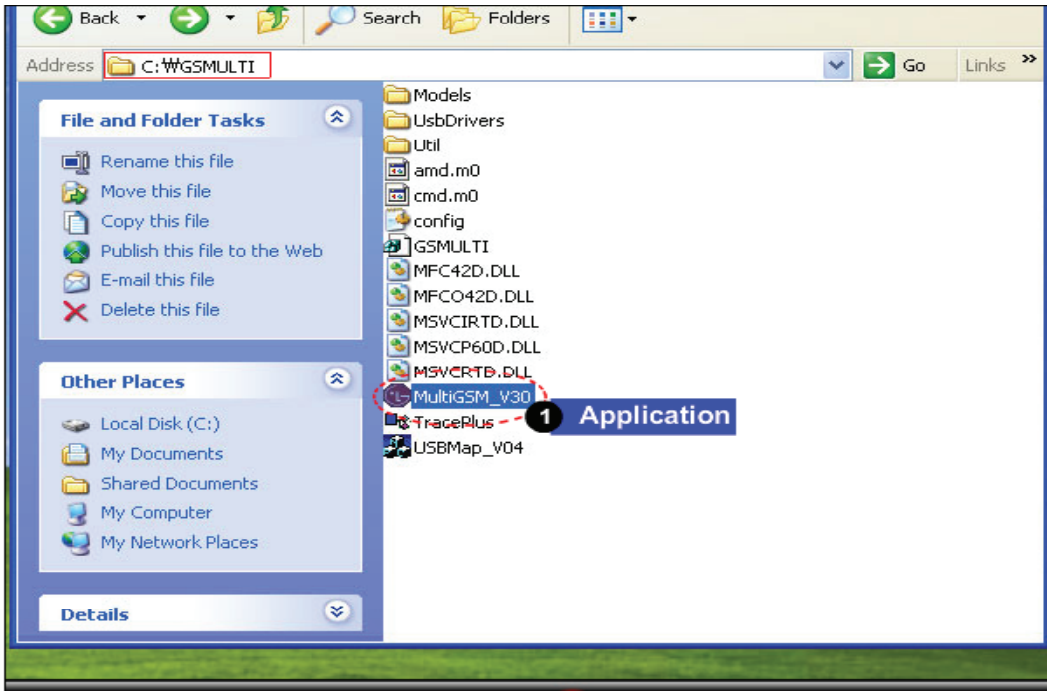


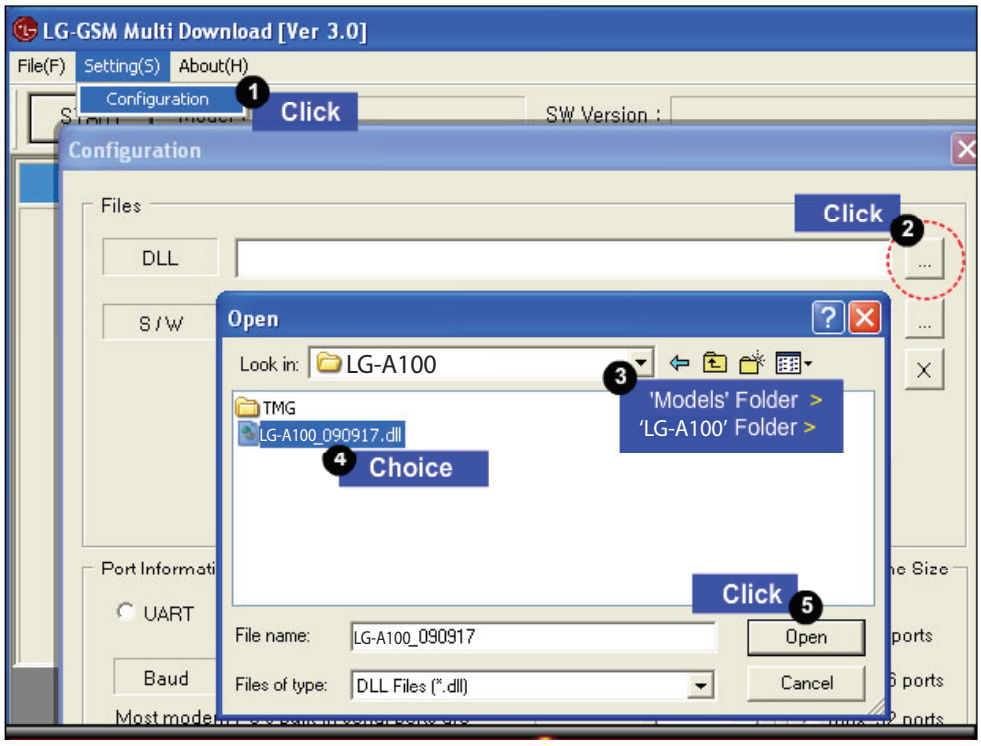


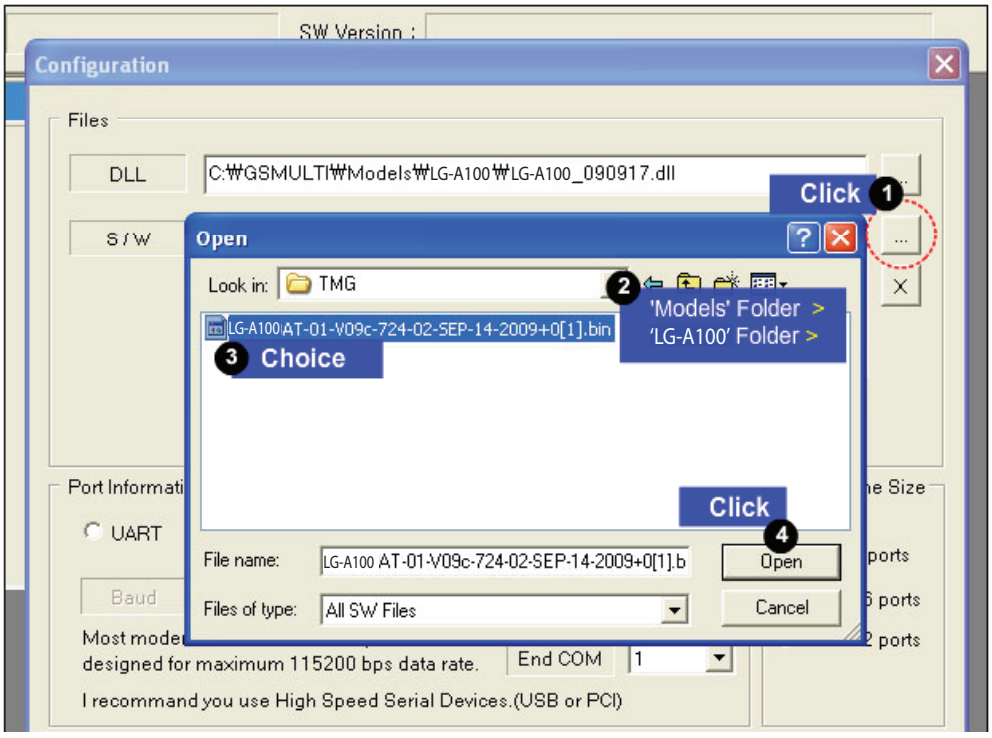


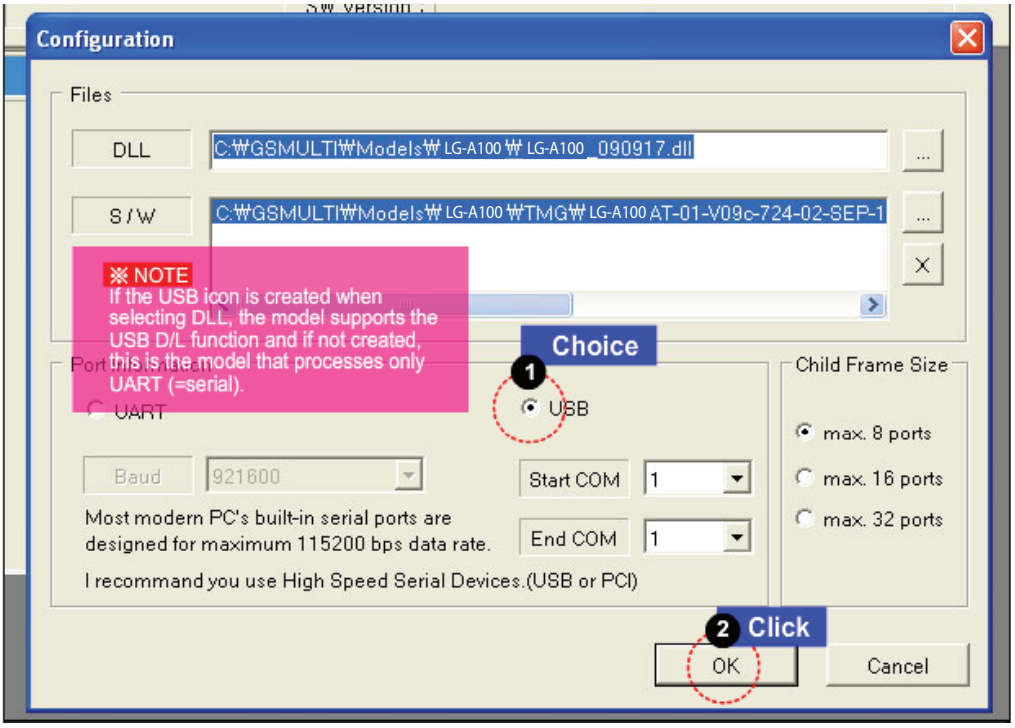


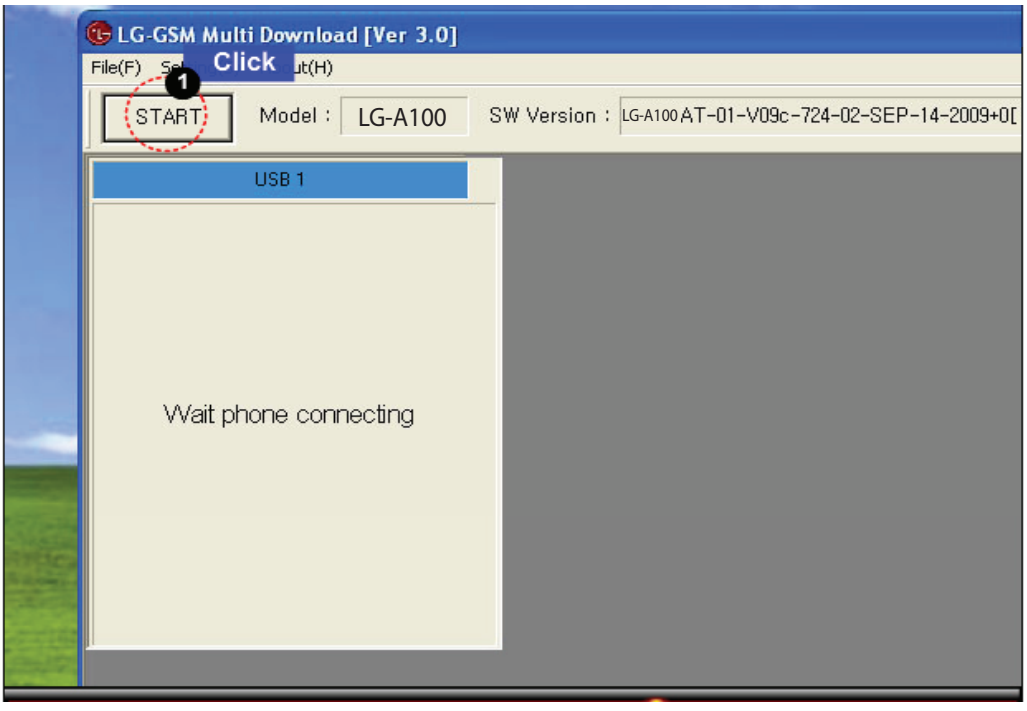


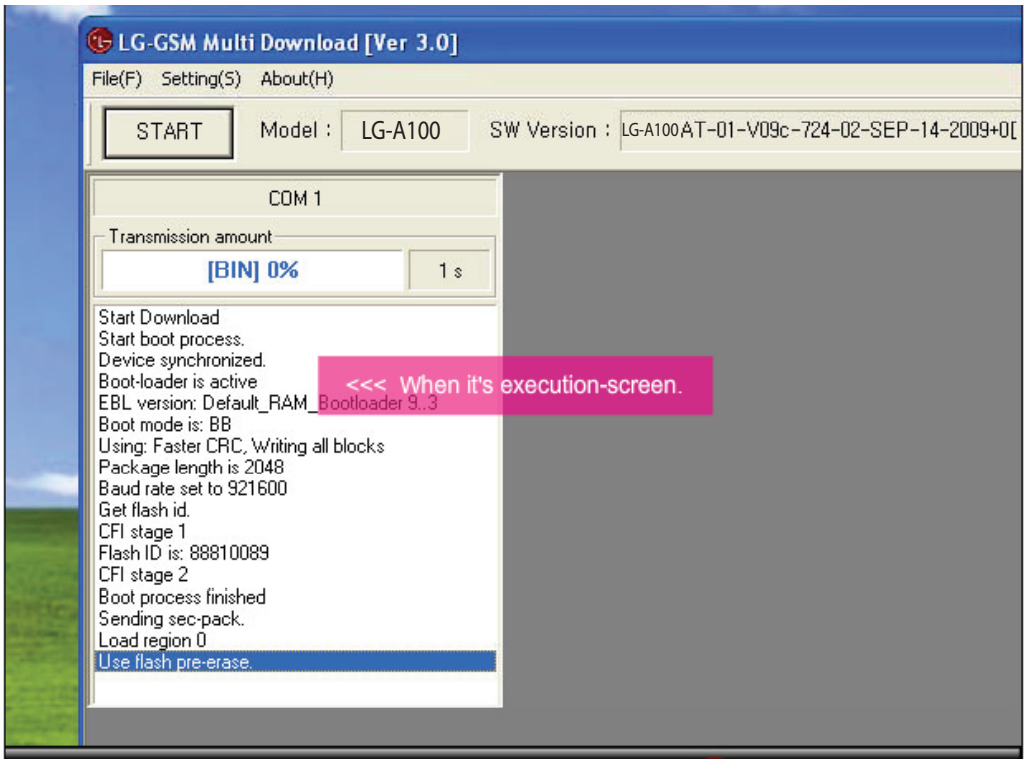


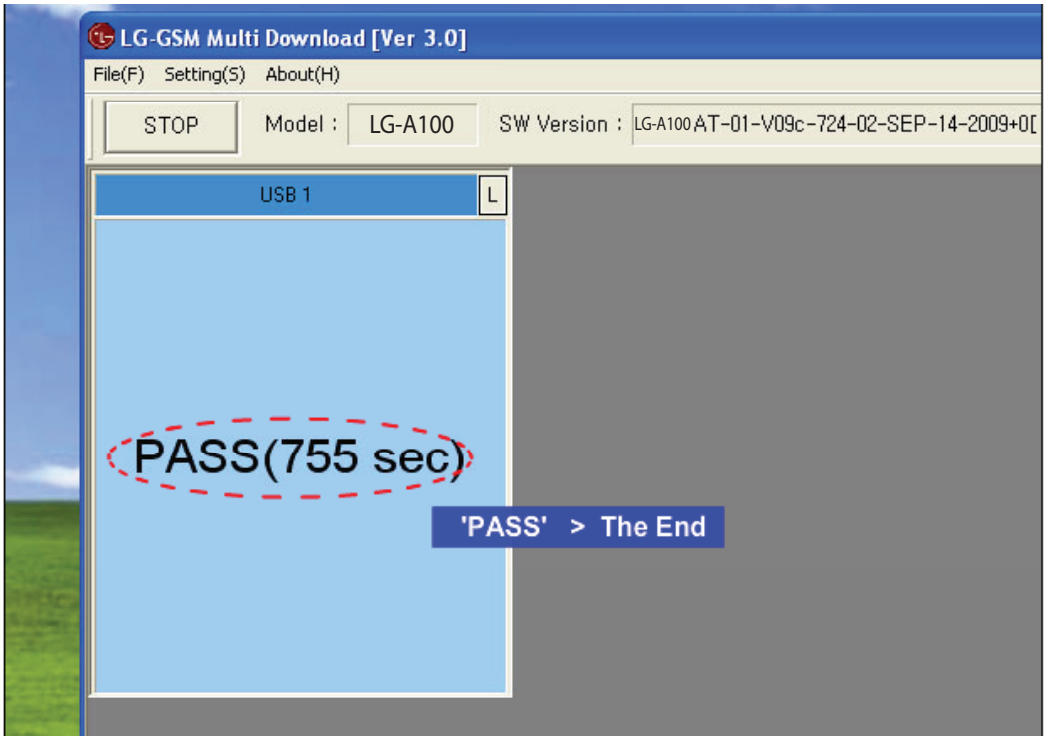




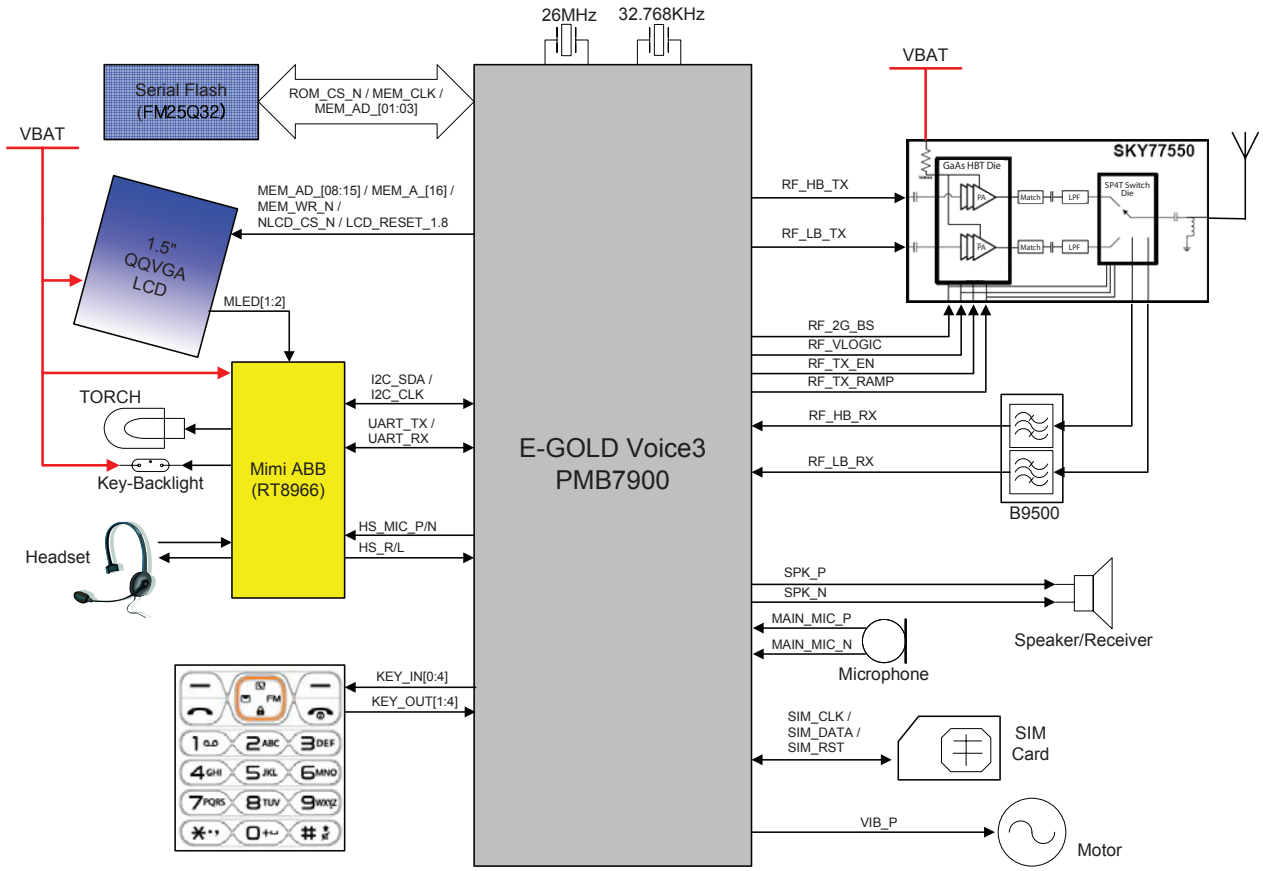






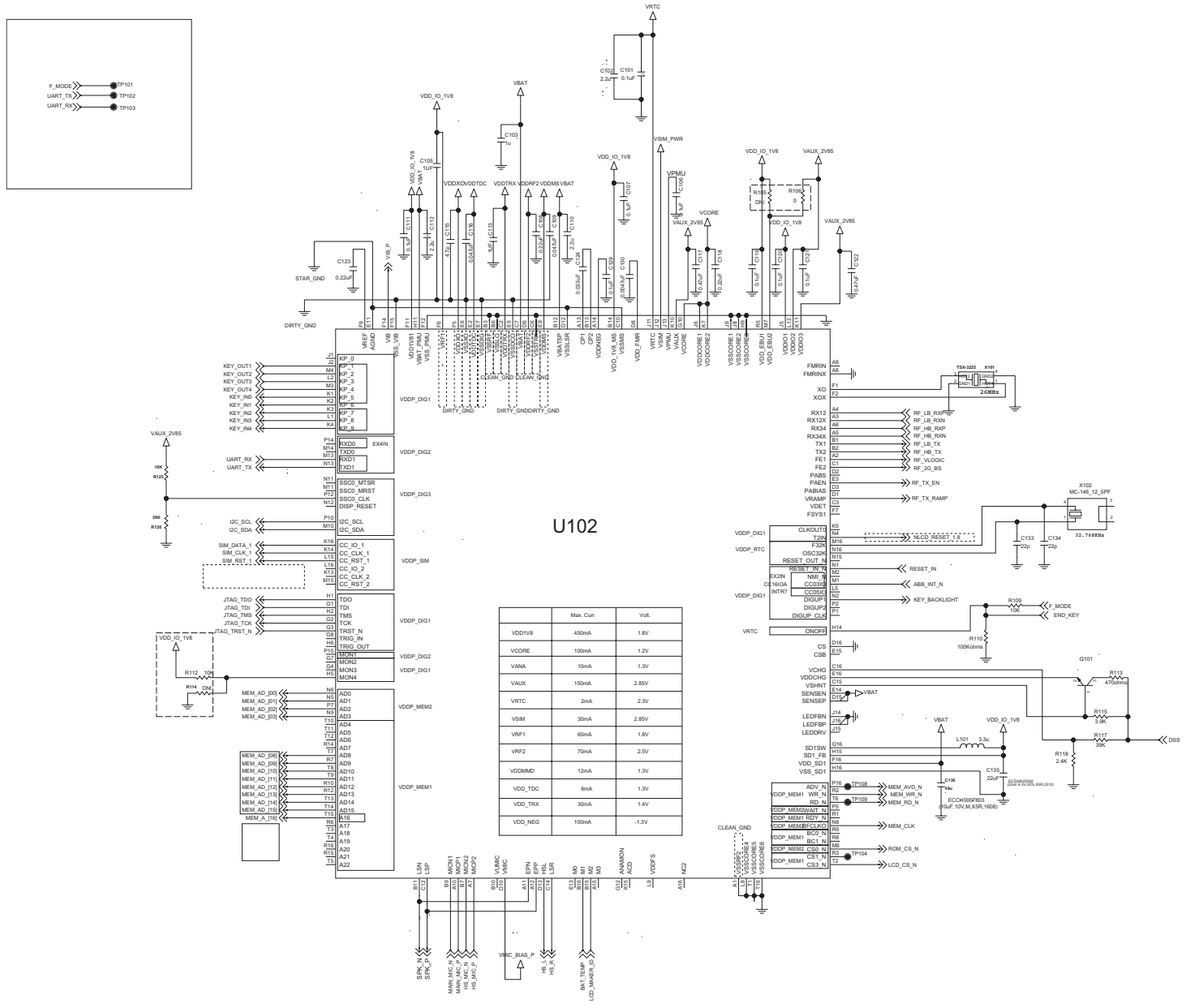


6.Block diagram

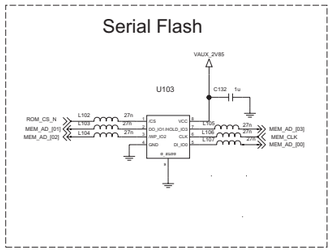


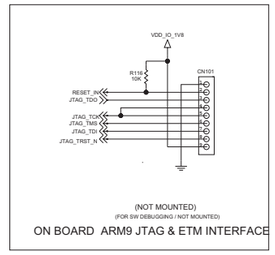
7. CIRCUIT DIAGRAM

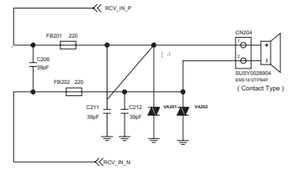
2-6-1_1_IFX_EGV3_BASIC

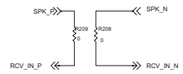


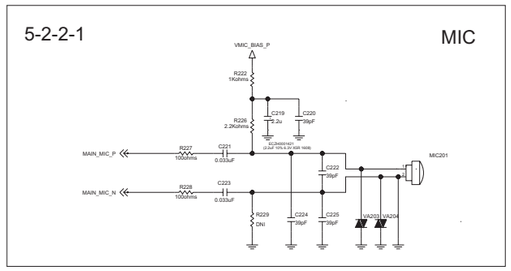
	Max. Curr	Volt.
VDDTVB	450mA	1.8V
VCORE	100mA	1.2V
VANA	10mA	1.3V
VAUX	150mA	2.85V
VRTC	2mA	2.3V
VSIM	30mA	2.85V
VRF1	60mA	1.8V
VRF2	70mA	2.5V
VDDMMD	12mA	1.3V
VDD_TDC	6mA	1.3V
VDD_TRX	30mA	1.4V
VDD_NEG	100mA	-1.3V

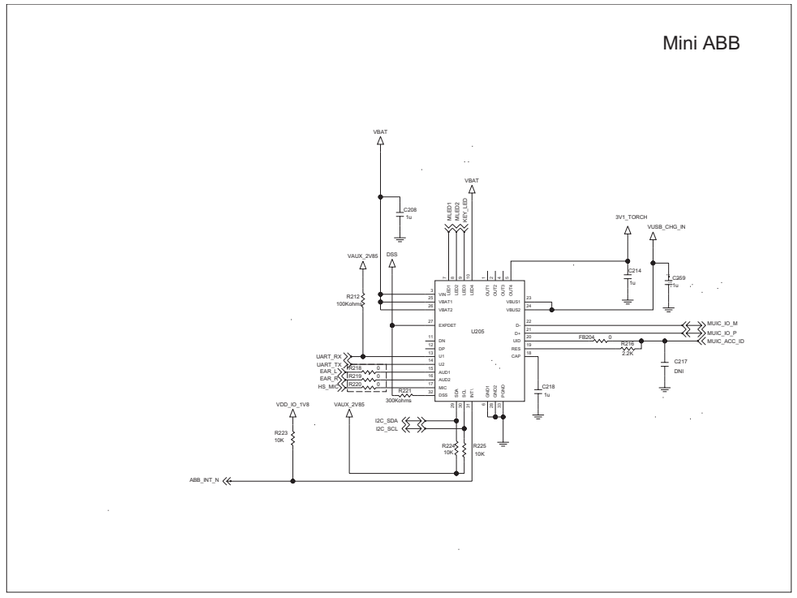


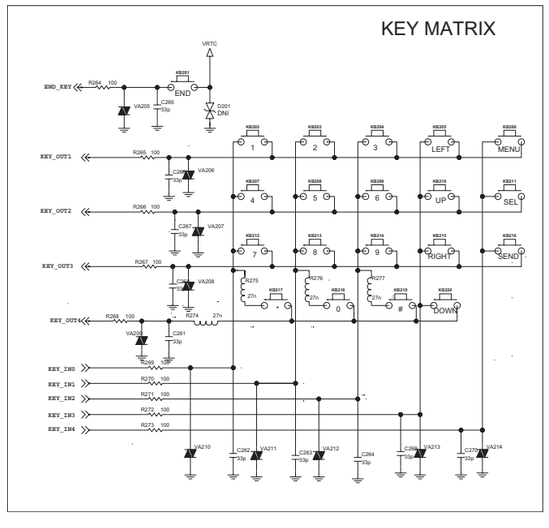


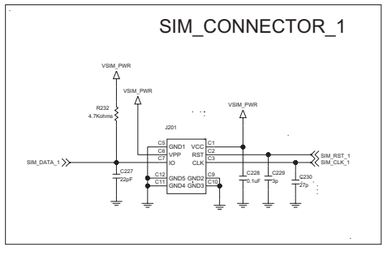


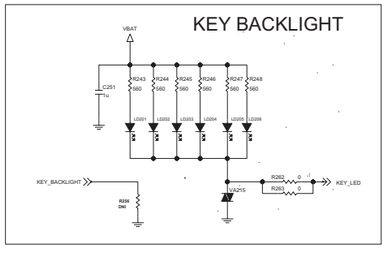


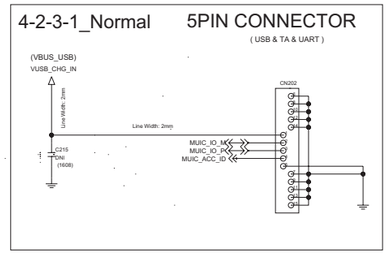


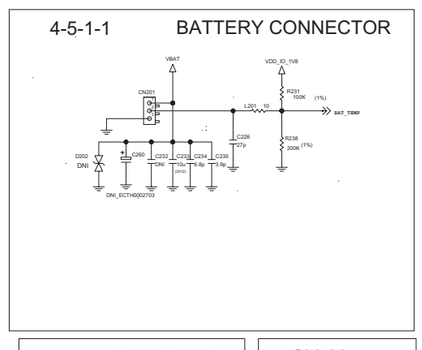


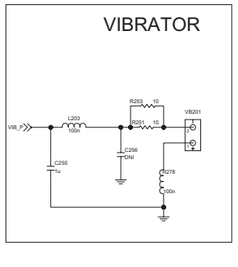


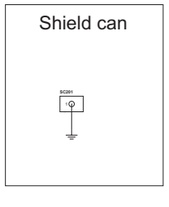


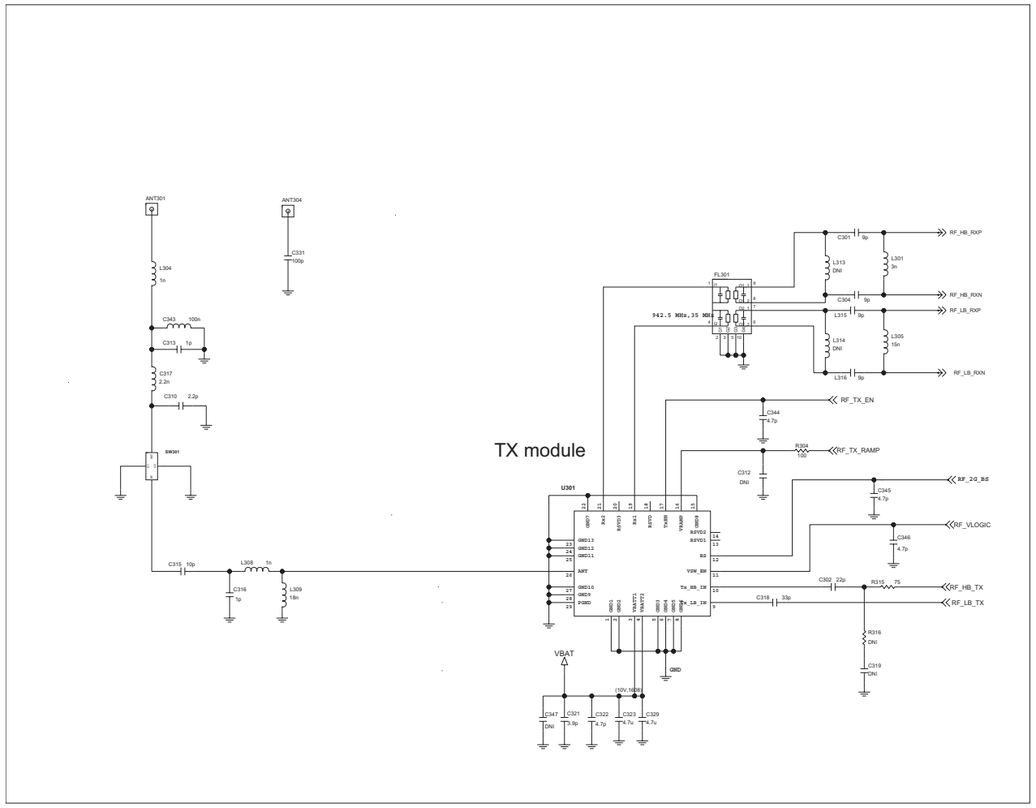






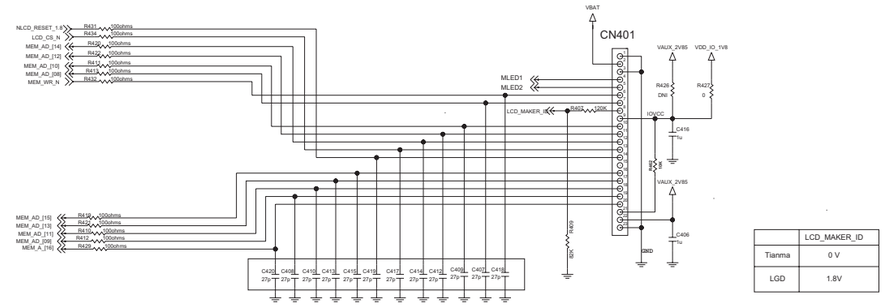




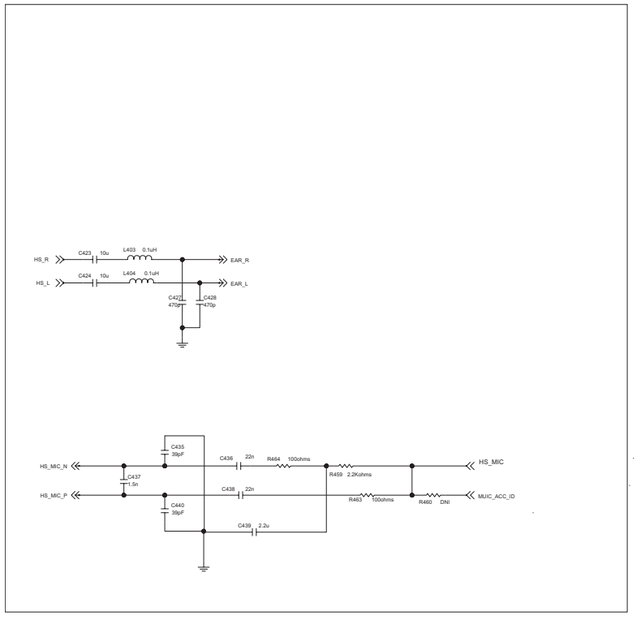


R312
0
DNI

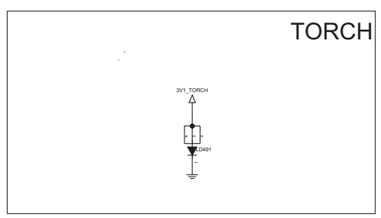
LCD Connector



	LCD_MAKER_ID
Tianma	0 V
LGD	1.8V



TORCH



8. BGA PIN MAP

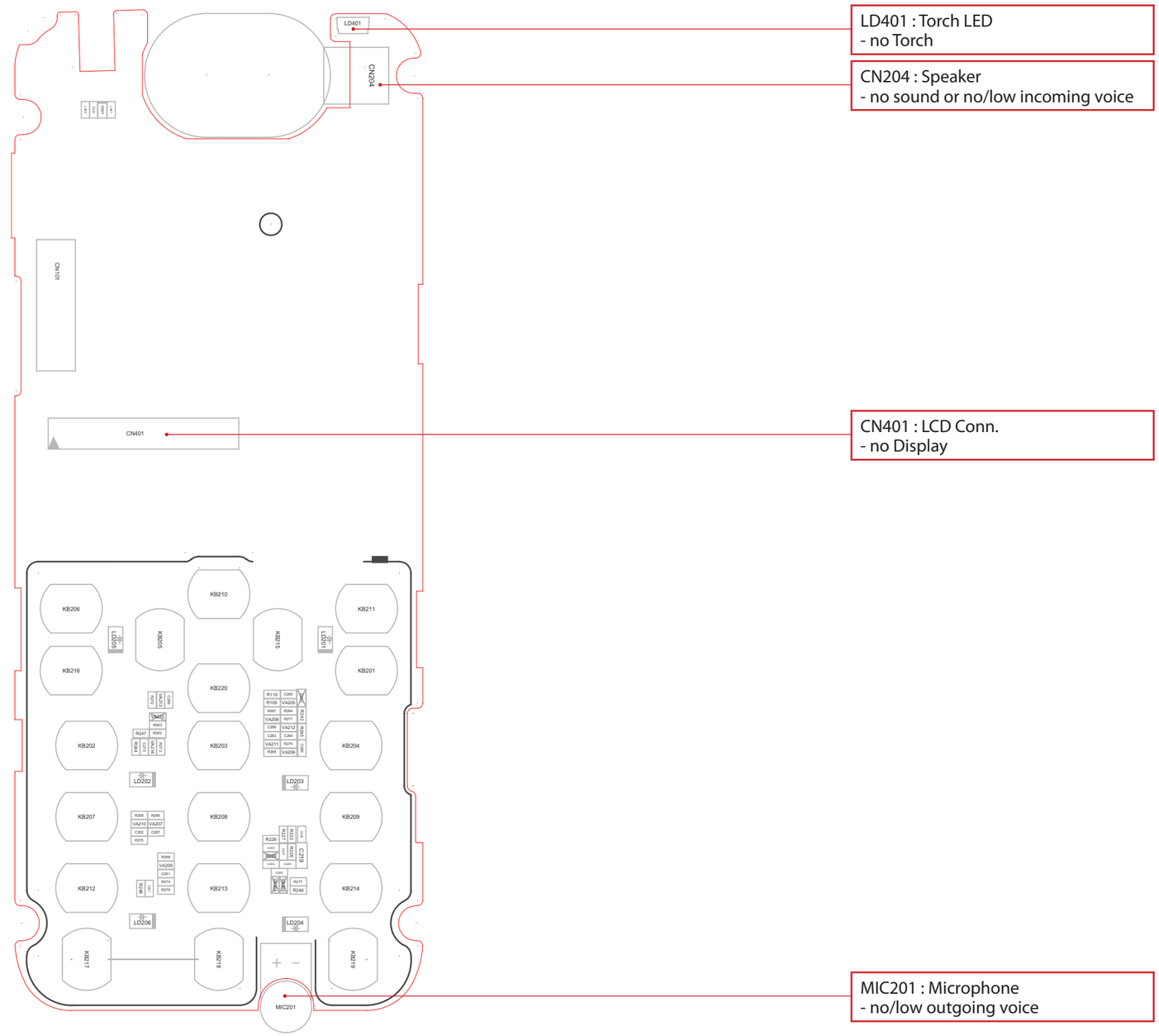
BGA IC pin check (U102)

• Ball Diagram (Top View), PMB7900(E-GOLDVoice 3)

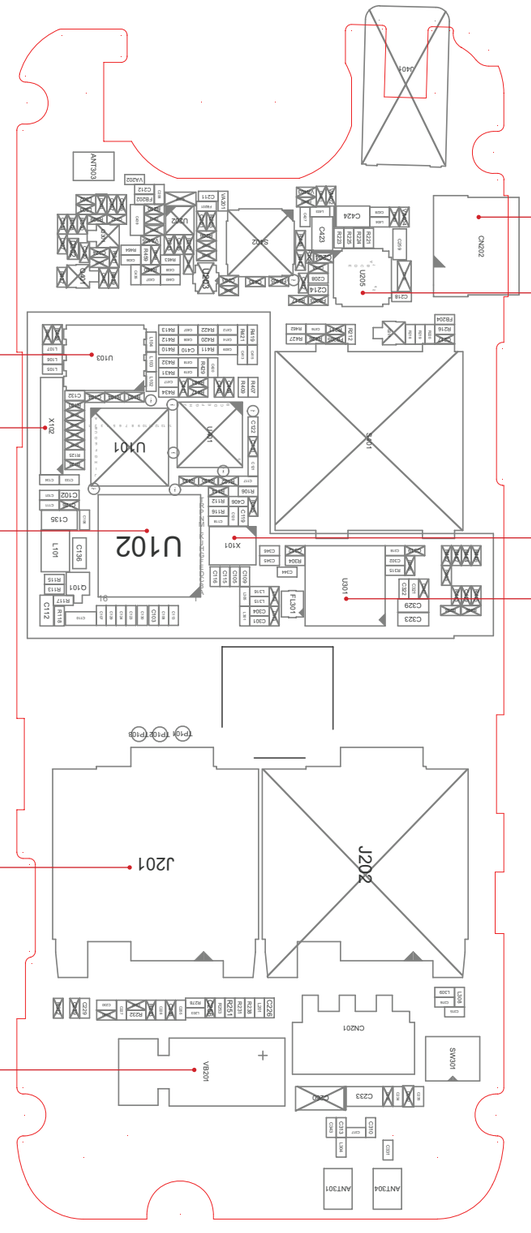
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
A	VSSRF2	FE1	RX12X	RX12	RX34X	RX34	MICP2	FMRINX	FMRIN	MICP1	EPN	EPP	CP1	VDDNEG	M3	NC2	A
B	TX1	TX2	VSSRF			VSSLO	MICN2		MICN1	VUMIC	LSN	VBATSP	CP2	VDD_1V8_MS	M2	M1	B
C	FE2	VDDTRX	VDET			VSSTRX	VBAT			VSSMS		LSP		HSR	VSHNT	VCHG	C
D	VRAMP	PABS	PABIAS			VDDRF2		VDD_FMR		VMIC		VSSLSR	HSL		SENSEP	CS	D
E		VDDTDC	PAEN		VSSDCO	VSSXO	VSSDIG		VDDMS		AGND		M0	SENSEN	CSB	VDDCHG	E
F	XO	XOX			VDDXO	VRF1	FSYS1		VREF		VDD1V81	VSS_PMU		VIB	VSS_VIB	VDD_SD1	F
G	TDI	TCK	TRST_N	MON3			MON2	TRIG_N		VCORE		ANAMON				SD1SW	G
H	TDO	TMS			MON4	TRIGOUT			VSSCORE3		VBATPMU			ONOFF	SD1 FB	VSS SD1	H
J	KP_0	KP_1			VDDIO1	VDDCORE1		VSSCORE2	VSSCORE1		VRTC	VSIM	VPMU	LEDFBN	LEDDRV	LEDFBP	J
K	KP_5	KP_6	KP_7	KP_9	CLKOUT0		VDDCORE2			VAUX	VDDIO3		CC_CLK_2	CC_CLK_1	ACD	CC_IO_1	K
L	KP_8	KP_3			CC05IO			VSSCORE4	VDDFS			VDDIO2			CC_RST_1	CC_IO_2	L
M	CC03IO	NMI_N	KP_4	KP_2		CS0_N	VDD_EBU2			I2C_SDA	SSC0_MRST		RXD1	TXD0	CC_RST_2	F32K	M
N	RESET_IN_N	DIGUP1		T2IN	AD1	AD0		BFCLKO	AD3		SSC0_MTSR	DISP_RESET	TXD1		RESET_OUT_N	OSC32K	N
P	DIGUP_CLK	DIGUP2			WAIT_N		AD2			I2C_SCL		SSC0_CLK		RXD0	MON1	ADV_N	P
R	RDY_N	WR_N	CS1_N		VDD_EBU1	A17	AD9	BC1_N	BC0_N	AD12		AD13		AD7	A21	A20	R
T	VSSCORE5	CS3_N	A18	A19	A22	RD_N	AD8	AD10	AD11	AD4	AD5	AD6	AD14	AD15	A16	VSSCORE6	T
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

Not use

9. PCB LAYOUT



A100_MAIN_EAX63969001_1.0_TOP



A100_MAIN_EAX63969001_1.0_BOT

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 “1809#*100# “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.

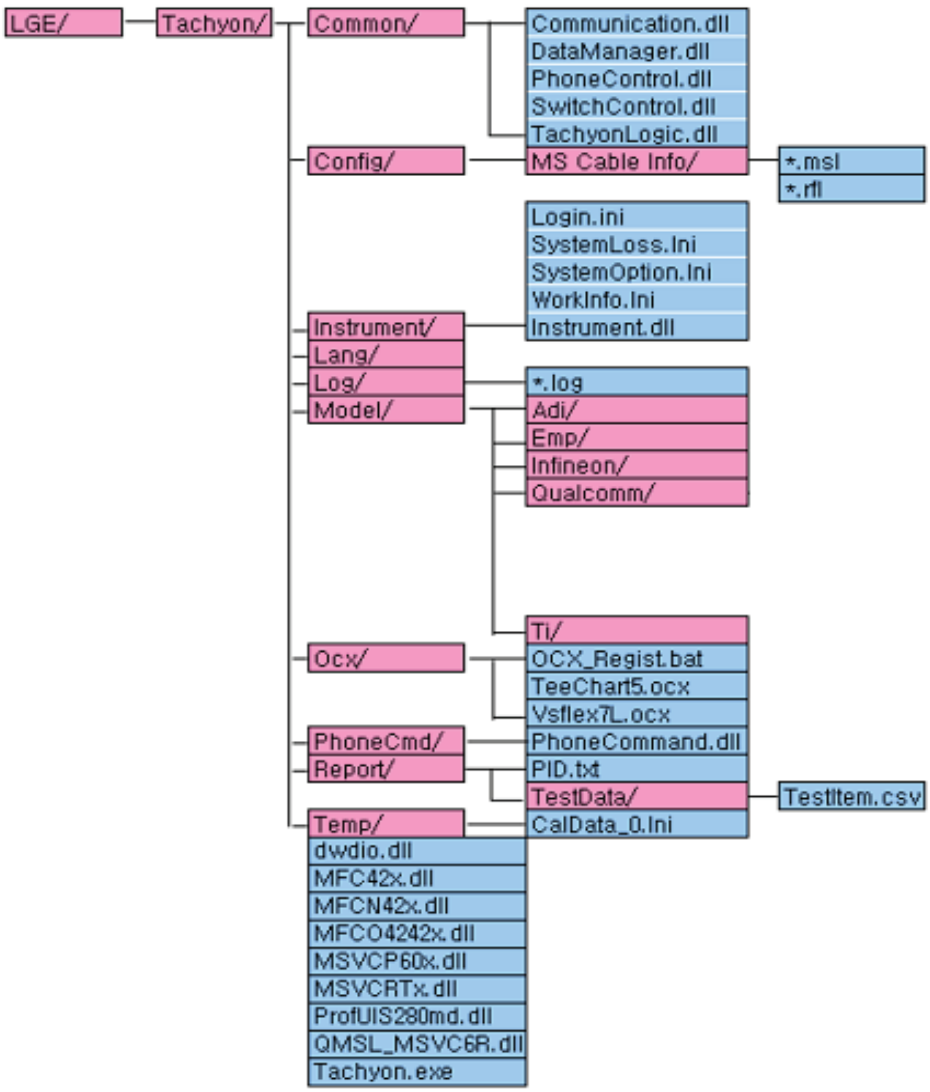
11.AUTO CALIBRATION

11.1 Overview

Auto-cal (Auto Calibration) is the PC side Calibration tool that perform Tx, Rx and Battery Calibration with Agilent 8960(GSM call setting instrument) and Tektronix PS2521G (Programmable Power supply).
Auto-cal generates calibration data by communicating with phone and measuring equipment then write it into calibration data block of flash memory in GSM phone.

11.2 Directory structure of Tachyon

"C₩LGE₩Tachyon"



11.3 Description of Folder & File.

11.3.1. Folder Explain

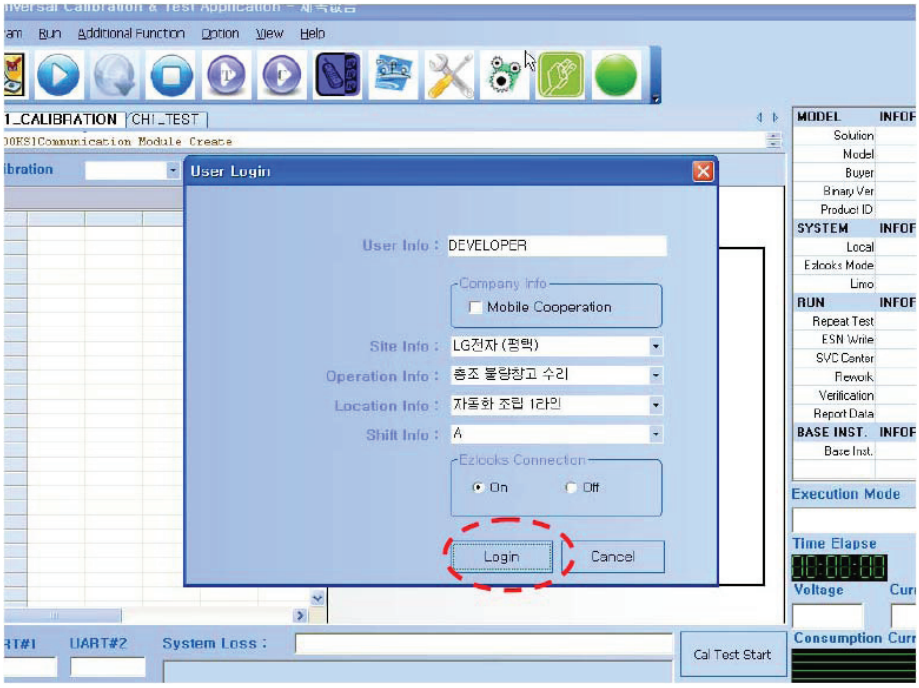
- **-. Tachyon :** exist tachyon execute file, dll for MFC, dll for UI
- **-. Common** : common files(XML Data I/O , Auto Test Logic, Tachyon Logic Control), dll for communication with system.
- **-. Config** : *.ini configuration files for port setting and cable loss.
- **-. Model** : configuration filess for each model.
- **-. OCX** : component files for Tachyon.
- **-. PhoneCmd** : files for communication with phone.
- **-. Report** : test result files.
- **-. Temp** : store calibration value.

11.3.2. File Explain

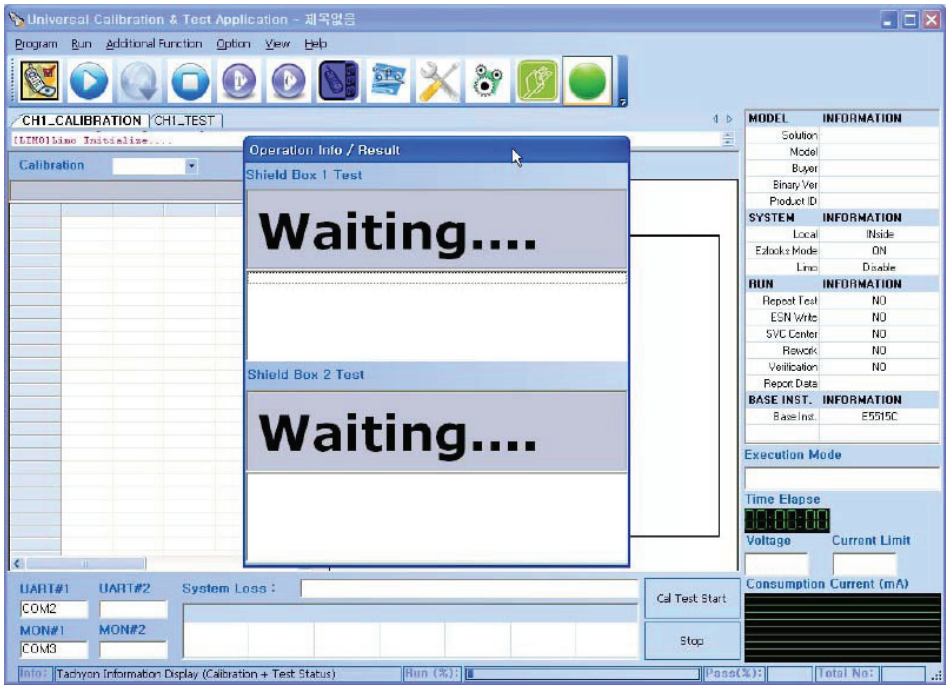
- **-. Model_Calibration.xml** : stored data for calibration.
- **-. Model_CallSetuo.xml** : stored equipment setting data for auto test.
- **-. Model_NV.ini** : default NV data.
- **-. Model_Sequence.xml** : stored calibration and auto test procedure.

11.4 Procedure

1. Execute "/LGE/Tachyon/Tachyon.Exe" and Click Login button.

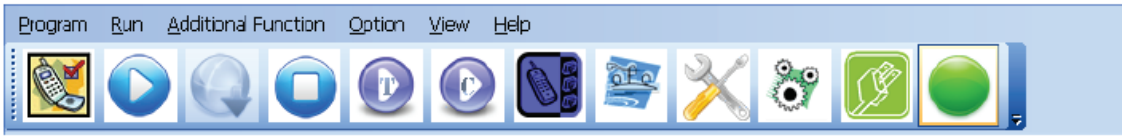


2. Tachyon execute ready display



11.5 Tachyon Main UI

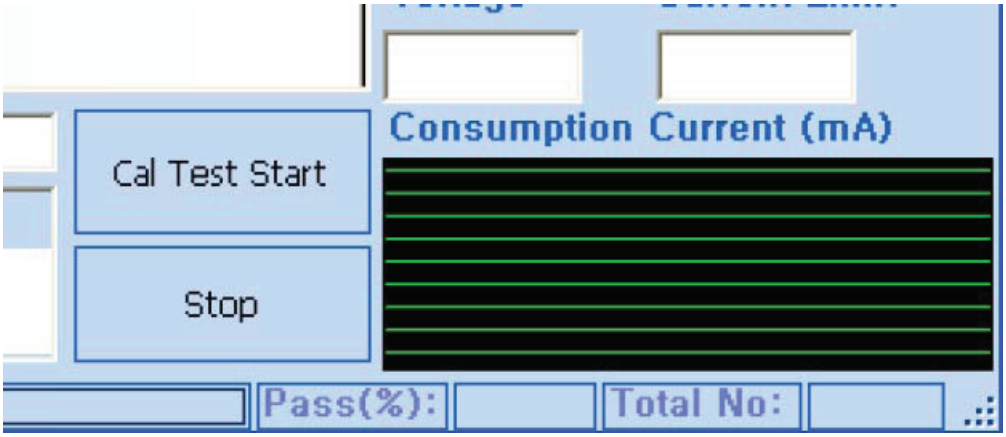
11.5.1. Tool bar



1. Model Selection
2. Calibration + Test
3. Not Support
4. Stop
5. Test Only
6. Calibration Only
7. Phone Control
8. Loss Adjustment
9. System Option
10. Run Option
11. Voltage / Current Setting
12. Show Result

11.5.2. Command button

Only support Calibration Test and Stop button.



11.6 AGC

This procedure is for Rx calibration.
In this procedure, We can get RSSI correction value. Set band EGSM and press Start button the result window will show correction values per every power level and gain code and the same measure is performed per every frequency.

11.7 APC

This procedure is for Tx calibration.
In this procedure you can get proper scale factor value and measured power level.

11.8 ADC

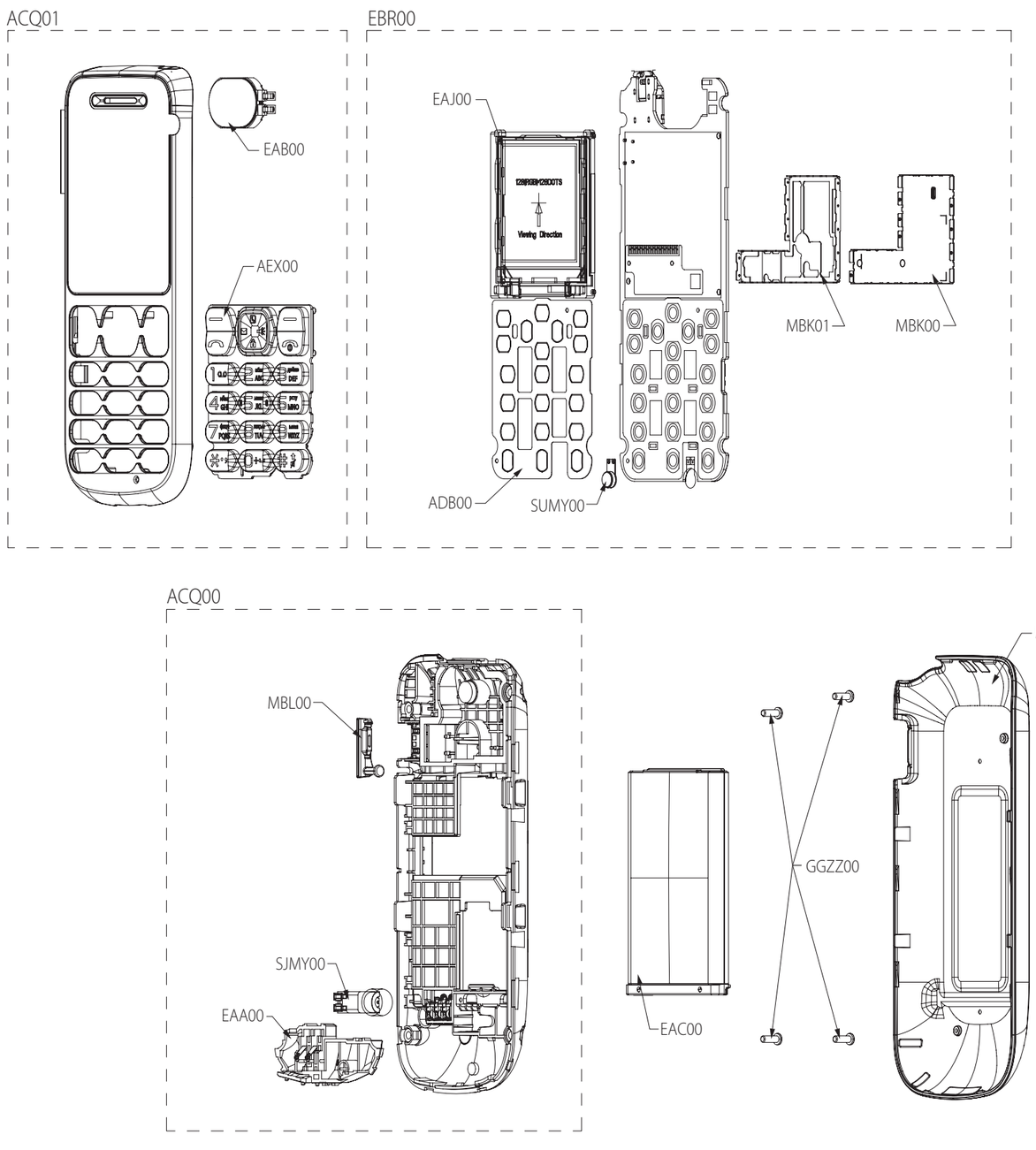
This procedure is for battery calibration.
You can get main Battery Config Table and temperature Config Table will be reset.

11.9 Target Power

BAND	Description	Low	Middle	High
GSM 850	Channel	128	191	251
	Frequency	824.2 MHz	836.8 MHz	848.8 MHz
	Max power	32.5 dBm	32.5 dBm	32.5 dBm
EGSM 900	Channel	975	37	124
	Frequency	880.2 MHz	897.4 MHz	914.8 MHz
	Max power	32.5 dBm	32.5 dBm	32.5 dBm
DCS1800	Channel	512	699	885
	Frequency	1710.2 MHz	1747.6 MHz	1784.8 MHz
	Max power	29.5 dBm	29.5 dBm	29.5 dBm
PCS 1900	Channel	512	661	810
	Frequency	1850.2 MHz	1880 MHz	1909.8 MHz
	Max power	29.5 dBm	29.5 dBm	29.5 dBm

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.1 EXPLODED VIEW



Location	Description
GGZZ00	Screw,Tapping
ACQ01	Cover Assembly,Front
EAB00	Speaker,Dual Mode
AEX00	Keypad Assembly,Main
ACQ00	Cover Assembly,Rear
EAA00	PIFA Antenna,RF
MBL00	Cap,Receptacle
SJMY00	Motor,DC
EBR00	PCB Assembly,Main
ADB00	Dome Assembly,Metal
EAJ00	LCD,Module-TFT
MBK00	Can,Shield
SUMY00	Microphone,Condenser
MBK01	Can,Shield
MCK00	Cover,Battery
EAC00	Rechargeable Battery,Lithium Ion

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	PartNumber	Spec	Remark
1	AGQ000000	Phone Assembly	AGQ86489301	LGA100.ACISDG ZY:Color Unfixed -	
2	MEZ002100	Label, Approval	MLAA0062305	COMPLEX KB770 DEUBK ZZ:Without Color -	
2	ACQ100400	Cover Assembly, EMS	ACQ85555801	LGA100.ACISDG ZY:Color Unfixed -	
3	FAB020000	Screw, Tapping	GGZZ0004901	GGZZ0004901 BH + - 1.6mM 4mM SWCH FZB SERVEONE CO., LTD.	
3	ACQ032700	Cover Assembly, Front	ACQ85574105	LGA100.ACISDG ZY:Color Unfixed -	
4	EAB010100	Speaker, Dual Mode	EAB62294801	1812-8D-01PP Nd-Fe-B 700mW 8OHM 89DB 950HZ 1812*3.0t Pin 1 magnet PIN KIRYN TELECOM CO., LTD	
4	MCK032700	Cover, Front	MCK66699001	MOLD PC+ABS LGA100.ACISDG ZY:Color Unfixed -	
4	MKC043300	Window, LCD	MKC63901302	CUTTING ACRYL LGA100.ACISDG ZZ:Without Color -	
4	MJN061100	Tape, Protect	MJN67897601	COMPLEX LGA180.ATHADG ZZ:Without Color -	
4	MJN061101	Tape, Protect	MJN67708802	COMPLEX LGA100.APAKDG ZZ:Without Color -	
4	MJN089300	Tape, Window	MJN67692501	COMPLEX LGA180.AMORBK ZZ:Without Color -	
4	MFB029600	Lens, Flash	MFB62473501	MOLD ACRYL LGA180.AMORBK ZY:Color Unfixed -	
4	MDJ000001	Filter	MDJ63026201	COMPLEX LGA180.AMORBK ZZ:Without Color -	
4	MDJ000000	Filter	MDJ63026101	COMPLEX LGA180.AMORBK ZZ:Without Color -	
4	MCQ074201	Damper, Speaker	MCQ66645201	COMPLEX LGA180.AMORBK ZZ:Without Color -	
4	MCQ074200	Damper, Speaker	MCQ66474501	COMPLEX LGA180.AMORBK BK:Black -	
4	MCQ043300	Damper, LCD	MCQ66471601	COMPLEX LGA180.AMORBK ZZ:Without Color -	
3	AEX00	Keypad Assembly, Main	AEX73797401	LGA100.ACISDG DG:Dark Gray -	
3	ACQ00	Cover Assembly, Rear	ACQ85557501	LGA100.ACISDG ZY:Color Unfixed -	
4	MCK063300	Cover, Rear	MCK66699101	MOLD PC+ABS LGA100.ACISDG ZY:Color Unfixed -	
4	EAA00	PIFA Antenna, RF	EAA62406601	LS01-I-10077-A0 DUAL -2DB 5 - - LS Mtron Ltd.	
4	MEZ000900	Label, After Service	MLAB0001102	COMPLEX C2000 CGRSV WA:White C2000 USASV DIA 4.0 PRINTING,	

Level	Location No.	Description	PartNumber	Spec	Remark
4	MCQ000000	Damper	MCQ66508001	COMPLEX LGA180.AMORBK BK:Black -	
4	MCQ074201	Damper, Speaker	MCQ66505501	COMPLEX LGA180.AMORBK BK:Black -	
4	MCQ074200	Damper, Speaker	MCQ66471701	COMPLEX LGA180.AMORBK ZZ:Without Color -	
4	MBL00	Cap, Receptacle	MBL64976901	MOLD URETHANE LGA100.ACISDG ZY:Color Unfixed -	
4	SJMY00	Motor, DC	SJMY0007905	DM-YK407-6F2 3V 80mA 0A 11KRPM 0RPM 0SEC 0GF.CM 0OHM DONGYANG CHENGJI CO.	
4	EAG110200	Connector, Terminal Block	ENZY0019901	HSBC-3P-58 3P 3.00MM STRAIGHT SMD R/TP - HAN SHIN TERMINAL CO., LTD.	
3	EBR00	PCB Assembly, Main	EBR73495501	LGA100.ACISDG 1.0 MAIN	
4	EBR071500	PCB Assembly, Main, Insert	EBR72678001	LGA180.AMORBK 1.0 MAIN	
5	ADB00	Dome Assembly, Metal	ADB73558801	LGA180.AMORBK WA:White -	
5	EAJ00	LCD, Module-TFT	EAJ61750101	TM015EDH03 SQQVGA 1.52INCH 128x128 250CD COLOR 50% 1/1 400:1 60Hz Inverter N - Shanghai Tianma Micro-Electronics Co., Ltd.	
5	MBK00	Can, Shield	MBK62854701	PRESS STS 304 0.15 LGA180.AMORBK SV:Silver -	
5	SUMY00	Microphone, Condenser	SUMY0003816	OBM-410L44-RC1882 -44DB 2.2KOHM OMNI 1TO10V 4x1.0t FPCB BSE CO., LTD.	
5	RAA050100	Resin, PC	BRAH0001301	UF-1060	
4	EBR071800	PCB Assembly, Main, SMT	EBR73498101	LGA100.ACISDG 1.0 MAIN	
5	MEZ000000	Label	MLAZ0038301	COMPLEX LG-VX6000 ZZ:Without Color PID Label 4 Array PRINTING,	
5	EBR071700	PCB Assembly, Main, SMT Top	EBR72677702	LGA100.ACISDG 1.0 Main	
6	EAX010000	PCB, Main	EAX63969001	EAX6396001 LGA180.AMORBK 1.0 FR-4 SBL 4 0.8 MAIN UNITECH PRINTED CIRCUIT BOARD CORP.	
5	EBR071600	PCB Assembly, Main, SMT Bottom	EBR72677802	LGA100.ACISDG 1.0 Main	
6	MBK01	Can, Shield	MBK62834101	PRESS NICKEL 0.2 LGA180.AMORBK SV:Silver SHIELD FRAME	
1	AAD000000	Addition Assembly	AAD85771701	LGA100.ACISDG ZY:Color Unfixed -	
2	MEZ000000	Label	MEZ63828501	COMPLEX LGP520.ACISBK ZZ:Without Color -	

Level	Location No.	Description	PartNumber	Spec	Remark
2	MEZ002100	Label, Approval	MEZ63927701	COMPLEX LGP500.ACISBK ZZ:Without Color Label (Kazakhstan KST Mark)	
2	MCK00	Cover, Battery	MCK66540301	MOLD PC+ABS LGA180.AMORBK ZY:Color Unfixed -	
1	AGF000000	Package Assembly	AGF76159503	LGA100.ACISDG ZZ:Without Color LGA100 CIS(CIS UB/CIS CH Label/720ea)	
2	MAY084000	Box, Unit	MAY65072703	COMPLEX LGA100.ACISDG ZZ:Without Color LGA100 CIS Unitbox	
2	MAF086500	Bag, Vinyl	MBAD0005204	COMPLEX LG-LX260 SPRAG ZZ:Without Color -	
2	MAY047100	Box, Master	MBEE0061001	COMPLEX GD510 CZESV ZZ:Without Color -	
2	MEZ047200	Label, Master Box	MLAJ0004402	COMPLEX CG300 CGR ZZ:Without Color LABEL, MASTER BOX(for CGR TDR 2VER. mbox_label)	
2	MEZ084100	Label, Unit Box	MLAQ0018301	COMPLEX GS200 CISBK ZZ:Without Color PRINTING, Unit Box Label(CIS USE-LGE-Peel-90*40)	
2	MEZ000000	Label	MLAZ0050901	COMPLEX KU990 GBRBK ZZ:Without Color -	
2	AGJ000000	Pallet Assembly	APLY0003911	GT540.ACISBK ZZ:Without Color EU1 TYPE_CIS_CIS Body(SW)+Cap(EU)+AL_720ea	
3	MAY010800	Box, Carton	MBEC0003604	COMPLEX GX300.ACISWR ZZ:Without Color EU1 CIS Body(720ea/H:605mm)	
3	MCCL00	Cap, Box	MCCL0002501	COMPLEX GD510 CZESV ZZ:Without Color -	
3	MPCY00	Pallet	MPCY0012403	COMPLEX KG800 FRABK DB:DARK BLUE -	

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	PartNumber	Spec	Remark
6	R274, R275, R276, R277	Inductor, Multilayer, Chip	ELCH0005005	HK1005 27NJ 27NH 5% - 300mA 0.7OHM 1.6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	R243, R244, R245, R246, R247, R248	Resistor, Chip	ERHZ0000496	MCR01MZP5J561 560OHM 5% 1/16W 1005 R/TP - ROHM.	
6	LD201, LD202, LD203, LD204, LD205, LD206	LED, Chip	EDLH0015101	19-217/BHC-ZM1N2QY/3T BLUE 2.7~3.2 25mA 18~45mcd 465~475nm 95mW 1608 R/TP 2P - EVERLIGHT ELECTRONICS CO., LTD.	
6	R226	Resistor, Chip	ERHZ0000443	MCR01MZP5J222 2.2KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	C221, C223	Capacitor, Ceramic, Chip	ECCH0000161	MCH153CN333KK 33nF 10% 16V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R110	Resistor, Chip	ERHZ0000406	MCR01MZP5J104 100KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	C261, C262, C263, C264, C265, C266, C267, C268, C269, C270	Capacitor, Ceramic, Chip	ECZH0000830	C1005C0G1H330JT000F 33pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C220, C222, C224, C225	Capacitor, Ceramic, Chip	ECCH0000120	MCH155A390J 39pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R262, R263	Resistor, Chip	ERHZ0000401	MCR01MZSJ000 0OHM 5% 1/16W 1005 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	VA205, VA206, VA207, VA208, VA209, VA210, VA211, VA212, VA213, VA214	Varistor	SEVY0003901	EVL5M02200 5.5V 0% 480F 1.0*0.5*0.6 NONE SMD R/TP AMOTECH CO., LTD.	
6	R227, R228, R264, R265, R266, R267, R268, R269, R270, R271, R272, R273	Resistor, Chip	ERHY0003301	MCR01MZP5J101 100OHM 5% 1/16W 1005 R/TP - ROHM.	
6	C251	Capacitor, Ceramic, Chip	ECZH0001215	C1005X5R1A105KT000F 1uF 10% 10V X5R -55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	R109	Resistor, Chip	ERHZ0000405	MCR01MZP5J103 10KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R222	Resistor, Chip	ERHZ0000404	MCR01MZP5J102 1KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	C219	Capacitor, Ceramic, Chip	ECZH0001421	C1608X5R0J225KT000N 2.2uF 10% 6.3V X5R - 55TO+85C 1608 R/TP - TDK KOREA COOPERATION	
6	LD401	LED, Chip	EDLH0015202	99-216UTC/TR8-1 WHITE 2.95~3.3 30mA 1440~1720mcd x, y 110mW - R/TP 2P - EVERLIGHT ELECTRONICS CO., LTD.	
6	C315	Capacitor, Ceramic, Chip	ECCH0000110	MCH155A100D 10pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C437	Capacitor, Ceramic, Chip	ECCH0000145	MCH155CN152KK 1.5nF 10% 50V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C317	Inductor, Multilayer, Chip	ELCH0005001	HK1005 2N2S 2.2NH 0.3NH - 300mA 0.13OHM 6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	L309	Inductor, Multilayer, Chip	ELCH0001402	LL1005-FHL18NJ 18NH 5% - 300mA 0.6OHM 2.8GHZ 10 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	C427, C428	Capacitor, Ceramic, Chip	ECZH0001121	C1005X7R1H471KT000F 470pF 10% 50V X7R - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C226, C230, C407, C408, C409, C410, C412, C413, C414, C415, C417, C418, C419, C420	Capacitor, Ceramic, Chip	ECCH0000117	CL05C270JB5NNNC 27pF 5% 50V NP0 -55TO+125C 1005 R/TP 0.5 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R262, R263	Resistor, Chip	ERHZ0000401	MCR01MZSJ000 0OHM 5% 1/16W 1005 R/TP - ROHM.	
6	C234	Capacitor, Ceramic, Chip	ECCH0001001	C1005C0G1H6R8CT000F 6.8pF 0.5PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C105, C113, C132, C214, C406, C416	Capacitor, Ceramic, Chip	ECCH0004904	GRM155R60J105K 1uF 10% 6.3V X5R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	R212, R231	Resistor, Chip	ERHZ0000204	MCR01MZP5F1003 100KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	C101, C106, C107, C111, C119, C120, C121, C129, C228	Capacitor, Ceramic, Chip	ECZH0003103	GRM36X7R104K10PT 100nF 10% 10V X7R -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C261, C262, C263, C264, C265, C266, C267, C268, C269, C270	Capacitor, Ceramic, Chip	ECZH0000830	C1005C0G1H330JT000F 33pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	R204	PCB ASSY, MAIN, PAD SHORT	SAFP0000401	LG-LU3000 LGTBK, MAIN, A,	
6	R109	Resistor, Chip	ERHZ0000405	MCR01MZP5J103 10KOHM 5% 1/16W 1005 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C108, C118, C123	Capacitor, Ceramic, Chip	ECZH0001216	C1005X5R1A224KT000E 220nF 10% 10V X5R - 55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C115, C322, C344, C345, C346	Capacitor, Ceramic, Chip	ECZH0000839	C1005C0G1H4R7CT000F 4.7pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	R227, R228, R264, R265, R266, R267, R268, R269, R270, R271, R272, R273	Resistor, Chip	ERHY0003301	MCR01MZP5J101 100OHM 5% 1/16W 1005 R/TP - ROHM.	
6	C343, L403, L404	Inductor, Multilayer, Chip	ELCH0005009	HK1005 R10J 100NH 5% - 150mA 1.5OHM 600MHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	R232	Resistor, Chip	ERHZ0000485	MCR01MZP5J472 4.7KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	FB201, FB202	Filter, Bead	EAM62131101	CIM05U221NC 220 ohm 1.0X0.5X0.5 25% 0.35 ohm 0.5A SMD R/TP 2P 0 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C229	Capacitor, Ceramic, Chip	ECCH0000104	MCH155A030C 3pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C301, C304, L315, L316	Capacitor, Ceramic, Chip	ECZH0000810	C1005C0G1H090DT000F 9pF 0.5PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	U103	IC, Serial Flash Memory	EAN61977101	FM25Q32A-1AIA4Y 32MBIT 32Mb Serial NOR Flash 2.7VTO3.6V 150USEC UNIFORM SECTOR 8-SOP TR 8P - FIDELIX CO., LTD.	
6	C109, C116	Capacitor, Ceramic, Chip	ECCH0002002	C1005X7R1A473KT000F 47000pF 10% 10V Y5P - 30TO+85C 1005 R/TP - TDK CORPORATION	
6	C133, C134, C227, C302	Capacitor, Ceramic, Chip	ECCH0000115	MCH155A220JK 22pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R226	Resistor, Chip	ERHZ0000443	MCR01MZP5J222 2.2KOHM 5% 1/16W 1005 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C220, C222, C224, C225	Capacitor, Ceramic, Chip	ECCH0000120	MCH155A390J 39pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R113	Resistor, Chip	ERHZ0000484	MCR01MZP5J471 470OHM 5% 1/16W 1005 R/TP - ROHM.	
6	C323, C329	Capacitor, Ceramic, Chip	ECCH0007802	CL10A475KP8NNNC 4.7uF 10% 10V X5R -55TO+85C 1608 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R315	Resistor, Chip	ERHZ0000509	MCR01MZP5J750 75OHM 5% 1/16W 1005 R/TP - ROHM.	
6	U102	IC, Digital Baseband Processor, GSM	EAN61969701	PMB7900 OM 1.5VTO2.8V, 1.6VTO2.85V, 1.65VTO2.9V 100mW 280P . WLB P/TP 280P INFINEON TECHNOLOGIES (ASIA PACIFIC) PTE LTD.	
6	C136	Capacitor, Ceramic, Chip	ECCH0007803	CL10A106MP8NNNC 10uF 20% 10V X5R -55TO+85C 1608 R/TP 0.8MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C110, C112	Capacitor, Ceramic, Chip	ECCH0005603	GRM188R61A225K 2.2uF 10% 10V X5R -55TO+85C 1608 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C259	Capacitor, Ceramic, Chip	ECZH0003503	GRM188R61E105K 1uF 10% 25V X5R -55TO+85C 1608 R/TP - MURATA MANUFACTURING CO., LTD.	
6	VA205, VA206, VA207, VA208, VA209, VA210, VA211, VA212, VA213, VA214	Varistor	SEVY0003901	EVL5M02200 5.5V 0% 480F 1.0*0.5*0.6 NONE SMD R/TP AMOTECH CO., LTD.	
6	C331	Capacitor, Ceramic, Chip	ECZH0000813	C1005C0G1H101JT 100pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C219	Capacitor, Ceramic, Chip	ECZH0001421	C1608X5R0J225KT000N 2.2uF 10% 6.3V X5R - 55TO+85C 1608 R/TP - TDK KOREA COOPERATION	
6	C251	Capacitor, Ceramic, Chip	ECZH0001215	C1005X5R1A105KT000F 1uF 10% 10V X5R -55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C313, C316	Capacitor, Ceramic, Chip	ECZH0000802	C1005C0G1H010CT 1pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C436, C438	Capacitor, Ceramic, Chip	ECCH0000179	GRM155R71C223K 22nF 10% 16V X7R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	L203, R278	Inductor, Multilayer, Chip	ELCH0001430	LL1005-FHLR10J 100NH 5% - 150mA 2.2OHM 1.03GHZ 10 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	U205	IC, CMOS	EUSY0426701	RT8966GQW 1.65~5.5V 60uA SWITCH/MULTIPLEXER QFN R/TP 32P Mini ABB MUIC, Charger IC, Current Sink 4Ch, LDO 4Ch RICHTEK TECHNOLOGY CORP.	
6	C117, C122	Capacitor, Ceramic, Chip	ECZH0001217	GRM155R60J474K 470nF 10% 6.3V X5R -25TO+70C 1005 BK-DUP - MURATA MANUFACTURING CO., LTD.	
6	FL301	Filter, Saw, Dual	SFSB0002801	B9500 942.5 MHz, 35 MHz, 2.8 dB, 15 dB, 1842.5 MHz, 75 MHz, 2.7 dB, 10 dB, 1.8*1.4*0.74, SMD, 925M~960M, 1805M~1880M, 10p, B, 150_56, 150_13, HL, EGSM+DCS RX, 942.5, 1842.5, 1.8*1.4*0.74, SMD, R/TP EPCOS PTE LTD.	
6	C233	Capacitor, Ceramic, Chip	ECCH0003002	C2012Y5V1A106ZT000N 10uF -20TO+80% 10V Y5V -30TO+85C 2012 R/TP - TDK CORPORATION	
6	C135	Capacitor, Ceramic, Chip	ECZH0025502	GRM219R60J226M 0.000022F 20% 6.3V X5R -55TO+85C 2012 R/TP 0.85MM MURATA MANUFACTURING CO., LTD.	
6	C310	Capacitor, Ceramic, Chip	ECCH0000901	C1005C0G1H2R2CT000F 2.2pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	R221	Resistor, Chip	ERHY0000290	MCR01MZP5J304 300KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	U301	Module, Tx Module	SMRH0007101	SKY77550 33DBM, 33DBM, 31DBM, 31DBM 30DB, 30DB, 28DB, 28DB 39%, 39%, 37%, 37% 50UA 1.46A, 970mA -33DB, -33DB -45DBM -1.3DBM 28P 6.0x6.0x1.0MM - SKYWORKS SOLUTIONS INC.	
6	L304, L308	Inductor, Multilayer, Chip	ELCH0004703	1005GC2T1N0SLF 1NH 0.3NH - 300mA 0.12OHM 10GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	R274, R275, R276, R277	Inductor, Multilayer, Chip	ELCH0005005	HK1005 27NJ 27NH 5% - 300mA 0.7OHM 1.6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	L101	Inductor, Wire Wound, chip	ELCP0009410	LQM2HPN3R3MG0 LQM2HPN3R3MG0, 3.3 uH, N, 2x2.5x1.0, R/TP, chip power MURATA MANUFACTURING CO., LTD.	
6	X101	Crystal	EXXY0025701	TSX- 3225 TSX- 3225, 26 MHz, 10 PPM, 8 pF, 40 ohm, SMD, 32X25X0.6, X-Tal (Infinion chip), Pb-Free EPSON TOYOCOM CORP	
6	C423, C424	Capacitor, Ceramic, Chip	ECCH0006501	GRM21BR60J106K 10uF 10% 6.3V X5R -55TO+85C 2012 R/TP - MURATA MANUFACTURING CO., LTD.	
6	J201	Card Socket	ENSY0022102	GCA26A-6S-H16-M-E1000 SIM 6P ANGLE SMD R/TP - LS Mtron Ltd.	
6	L201, R251, R253	Resistor, Chip	ERHZ0000402	MCR01MZP5J100 10OHM 5% 1/16W 1005 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	R409	Resistor, Chip	ERHY0000278	MCR01MZP5J823 82KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R118	Resistor, Chip	ERHY0000248	MCR01MZP5J242 2.4KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	L301	Inductor, Multilayer, Chip	ELCH0003820	LQG15HS3N0S02D 3NH 0.3NH - 300mA 0.17OHM 6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	
6	C102	Capacitor, Ceramic, Chip	ECCH0000198	CL05A225MQ5NSNC 2.2uF 20% 6.3V X5R -55TO+85C 1005 R/TP . SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	Q101	TR, Bipolar	EBK61572201	LSCR523EBFS8 NPN 5V 50V 50V 100mA 100NA 120~560 150mW EMT3 R/TP 3P ROHM Semiconductor KOREA CORPORATION	
6	R115	Resistor, Chip	ERHZ0000475	MCR01MZP5J392 3.9KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	C221, C223	Capacitor, Ceramic, Chip	ECCH0000161	MCH153CN333KK 33nF 10% 16V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C130	Capacitor, Ceramic, Chip	ECCH0000151	CL05B472KB5NNNC 4.7nF 10% 25V X7R -55TO+125C 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	SW301	connector, RF	ENWY0004501	RF500 - STRAIGHT SOCKET SMD T/REEL AU 50OHM 360mDB DONG EUN	
6	C235, C321	Capacitor, Ceramic, Chip	ECCH0000195	GRM1555C1H3R9C 3.9pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	R117	Resistor, Chip	ERHZ0000476	MCR01MZP5J393 39KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	X102	Crystal	EXXY0004602	MC-146(12.5PF, +/-20PPM) 32.768KHZ 20PPM 12.5PF 69*14 SMD R/TP SEIKO EPSON CORP	
6	R407	Resistor, Chip	ERHZ0000414	MCR01MZP5J124 120KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R238	Resistor, Chip	ERHY0000161	MCR01MZP5F2003 200KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	L305	Inductor, Multilayer, Chip	ELCH0001031	HK1005 15NJ-T 15NH 5% - 300mA 0.46OHM 2.3GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	CN202	Connector, I/O	ENRY0010801	04-5151-005-100-883 5P 0.65MM ANGLE RECEPTACLE DIP R/TP - KYOCERA ELCO KOREA SALES CO., LTD.	

12.3 Accessory

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

Level	Location No.	Description	PartNumber	Spec	Remark
2	EAY060000	Adapters	EAY62389801	STA-U35ED2 100-240V 4.8V 400mA 50-60Hz CB, CE WALL 2P USB - DONGDO ELECTRONICS CO., LTD	
2	AFN053800	Manual Assembly, Operation	AFN75474801	LGA100.ACISDG ZZ:Without Color LGA100 manual assy for CIS	
3	MBM087200	Card, Warranty	MCDF0011303	COMPLEX GD350 CISBK ZZ:Without Color -	
3	MFL053800	Manual, Operation	MFL67206601	PRINTING LGA100.ACISRD ZZ:Without Color -	
2	EAC00	Rechargeable Battery, Lithium Ion	EAC61578801	LGIP-531A-LI-EU PRISMATIC 3.7V 950AH 950mAH 5.5X34X50 5.7*34.15*53.55 BLACK INNERPACK - Tianjin Lishen Battery Joint-Stock Co., Ltd	