



Service Manual

Service Manual

LG-A160



Model : LG-A160

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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.

1. INTRODUCTION

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
GPIO	General Purpose Interface Bus
GSM	Global System for Mobile Communications
IPUI	International Portable User Identity
IF	Intermediate Frequency
LCD	Liquid Crystal Display
LDO	Low Drop Output
LED	Light Emitting Diode
OPLL	Offset Phase Locked Loop

1. INTRODUCTION

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

2.1 H/W Features

Item	Feature	Comment
Standard Battery	Li-ion Polymer, 3.7V 950mAh	
Stand by TIME	Up to 200 hrs : Paging Period 5, RSSI 85dBm	
Talk time	Up to 200min : GSM Tx Level 7	
Stand by time	Up to 200 hours (Paging Period: 5, RSSI: -85 dBm)	
Charging time	Approx. 3 hours	
RX Sensitivity	GSM, EGSM: -109dBm, DCS: -109dBm	
TX output power	GSM, EGSM: 32.3dBm(Level 5), DCS , PCS: 29.5dBm(Level 0)	
GPRS compatibility	Class 10	
SIM card type	3V Small	
Display	MAIN : TFT 176 × 220 pixel 262K Color	
Status Indicator	Hard icons. Key Pad 0 ~ 9, #, *, Up/Down Navigation Key Menu Key, Clear Key, Back Key, Confirm Key Send Key, Soft Key(Left/Right) Volume Key(Up/Down), PWR Key, Camera Key	
ANT	Internal	
EAR Phone Jack	Yes	
PC Synchronization	Yes	
Speech coding	EFR/FR/HR	
Data and Fax	Yes	
Vibrator	Yes	
Loud Speaker	Yes	
Voice Recoding	Yes	
Microphone	Yes	

2. PERFORMANCE

Item	Feature	Comment
Speaker/Receiver	16Φ Speaker/ 12 x 7 Receiver	
Travel Adapter	Yes	
MIDI	SW MIDI (Mono SPK)	
Camera	0.3M	
Bluetooth / FM Radio	Bluetooth version 2.1 / 76~108MHz supported	

2.2 Technical Specification

Item	Description	Specification							
1	Frequency Band	GSM850 TX: 824 ~ 849 MHz RX: 869 ~ 894 MHz		EGSM TX: 880 ~ 915MHz RX: 925 ~ 960 MHz		DCS TX: 1710 ~ 1785 MHz RX: 1805 ~ 1880 MHz		PCS TX: 1850 ~ 1910 MHz RX: 1930 ~ 1990 MHz	
2	Phase Error	RMS < 5 degrees Peak < 20 degrees							
3	Frequency Error	< 0.1 ppm							
4	Power Level	GSM850/EGSM							
		Level	Power	Toler.	Level	Power	Toler.		
		5	33dBm	±2dB	13	17dBm	± 3dB		
		6	31dBm	±3dB	14	15dBm	± 3dB		
		7	29dBm	±3dB	15	13dBm	± 3dB		
		8	27dBm	±3dB	16	11dBm	± 5dB		
		9	25dBm	±3dB	17	9dBm	± 5dB		
		10	23dBm	±3dB	18	7dBm	± 5dB		
		11	21dBm	±3dB	19	5dBm	± 5dB		
		12	19dBm	±3dB					
		DCS/PCS							
		Level	Power	Toler.	Level	Power	Toler.		
		0	30dBm	±2dB	8	14dBm	± 3dB		
		1	28dBm	±3dB	9	12dBm	± 4dB		
		2	26dBm	±3dB	10	10dBm	± 4dB		
		3	24dBm	±3dB	11	8dBm	± 4dB		
		4	22dBm	±3dB	12	6dBm	± 4dB		
		5	20dBm	±3dB	13	4dBm	± 4dB		
		6	18dBm	±3dB	14	2dBm	± 5dB		
		7	16dBm	±3dB	15	0dBm	± 5dB		

2. PERFORMANCE

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

2. PERFORMANCE

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

2. PERFORMANCE

Item	Description	Specification			
		Frequency (Hz)	Max.(dB)	Min.(dB)	
13	Receiving Response	100	-12	-	
		200	0	-	
		300	2	-7	
		500	*	-5	
		1,000	0	-5	
		3,000	2	-5	
		3,400	2	-10	
		4,000	2		
		* Mean that Adopt a straight line in between 300 Hz and 1,000 Hz to be Max. level in the range.			
		14	STMR	13±5 dB	
15	Stability Margin	> 6 dB			
16	Distortion	dB to ARL (dB)		Level Ratio (dB)	
		-35		17.5	
		-30		22.5	
		-20		30.7	
		-10		33.3	
		0		33.7	
		7		31.7	
		10		25.5	
17	Side Tone Distortion	Three stage distortion < 10%			
18	System frequency (13 MHz) tolerance	≤ 2.5 ppm			
19	32.768KHz tolerance	≤ 30 ppm			
20	Ringer Volume	At least 65 dBspl under below conditions: 1. Ringer set as ringer. 2. Test distance set as 50 cm			

2. PERFORMANCE

Item	Description	Specification	
21	Charge Current	Fast Charge : Typ. 430 mA Slow Charge : Typ. 80mA Total Charging Time : < 3 hours	
22	Antenna Display	Bar Number	Power
		7	Over -93
		7 -> 5	-93 ± 2
		5 -> 4	-98 ± 2
		4 -> 2	-101 ± 2
		2 -> 1	-104 ± 2
		1 -> 0	-106 ± 2
		0 -> OFF	Under -106
23	Battery Indicator	Battery Bar Number	Voltage
		3	≥ 3.73 ± 0.05 V
		3 -> 2	3.72 ± 0.05 V
		2 -> 1	3.62 ± 0.05 V
		1 -> 0	3.45 ± 0.05 V
24	Low Voltage Warning (Blinking Bar)	≤ 3.45 ± 0.05V (Call), Once per 1 minute.(Receiver)	
		≤ 3.4 ± 0.05V (Standby), Once per 3 minute.(Speaker)	
25	Forced shut down Voltage	3.35 ± 0.05V	
26	Sustain RTC without battery	Over 50 hours	
27	Battery Type	Li-Ion Battery Standard Voltage = 3.7 V Battery full charge voltage = 4.2 V Capacity: 800mAh	
28	Travel Charger	Switching-mode charger Input: 100 ~ 350V, 50/60 Hz Output: 5.1 V, 400 mA	

3. TECHNICAL BRIEF

3. TECHNICAL BRIEF

3.1 Digital Main Processor

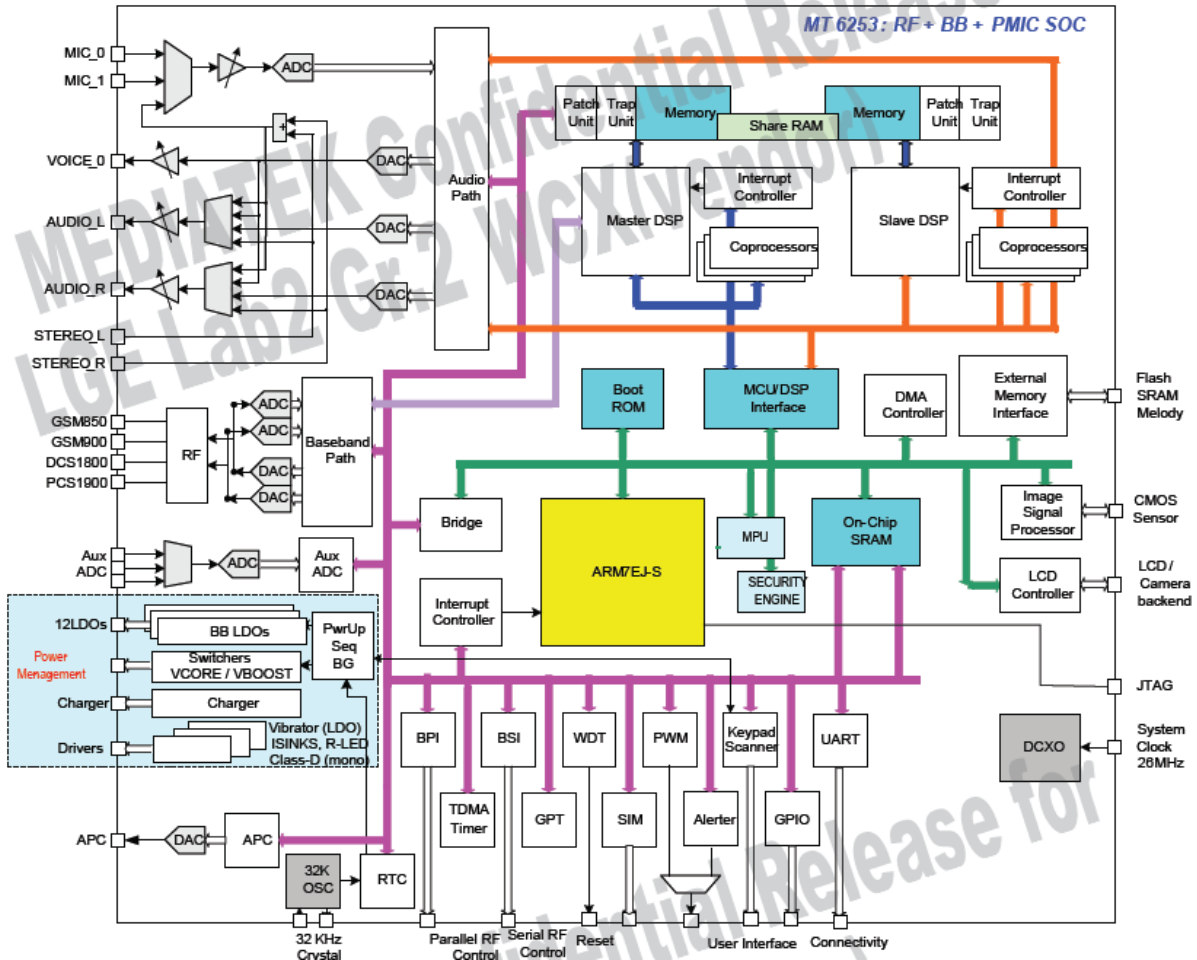


Figure. 3.1.1 MT6253 Hardware Block Diagram

3.1.1 General

- Integrated voice-band, audio-band and base-band analog front ends.
- Package:
 - aQFN, 11.5x11.5x0.85 mm
 - 0.47 mm pitch
 - 260balls, 0.47mm pitch package

3.1.2 MCU Subsystem

- ARM7EJ-S 32-bit RISC processor
- High performance multi-layer AMBA bus
- Operating frequency 52/104MHz
- Dedicated DMA bus, 7DMA channels
- 144KB On-chip SRAM
- On-chip boot ROM for Factory Flash Programming
- Watchdog timer for system crash recovery
- 3 sets of General Purpose Timer
- Circuit Switch Data coprocessor
- Division coprocessor

3.1.3 External Memory Interface

- Supports up to 3 external devices
- Supports 16-bit memory components with maximum size of up to 64M Bytes for each bank
- Supports Flash and SRAM/PSRAM with Burst Mode
- Support legacy industry standard parallel LCD Interface
- Support multi-media companion chips with 8/16 bits data width
- Configurable driving strength for memory interface

3.1.4 User Interface

- 6-row x 7-column keypad control with hardware scanner
- Support multi key press for gaming
- SIM/USIM Controller with hardware T=0/T=1 protocol control
- Real Time Clock(RTC) operating with a separate power supply
- General Purpose I/Os (GPIOs)
- 1 set of Pulse Width Modulation(PWM) Output
- Alerter Output with Enhanced PWM or PDM
- Maximum 7 external interrupt lines

3.1.5 Security

- Support security key and 128bit chip unique ID

3. TECHNICAL BRIEF

3.1.6 Connectivity

- 3 sets of UART with hardware flow control and speed up to 921600 bps
- IrDA modulator/demodulator with hardware framer supports SIR mode of operation
- HS/FS/LS USB 2.0 Device controller
- Multi Media Card/Secure Digital Memory Card/Memory Stick/Memory Stick Prto/SDIO host controller
- Supports SDIO interface for SDIO peripherals as well as WIFI connectivity
- DAI/PCM and I2S interface for Audio application

3.1.7 Low Power Schemes

- Power Down Mode for analog and digital circuits
- Processor Sleep Mode
- Pause Mode of 32KHz clocking at Standby State
- 3-channel Auxiliary 10-bit A/D Converter for application usage other than battery monitoring

3.1.8 Power and Supply Management

- 2.8V to 4.7V Input Range
- Charger Input up to 8V
- 11 sets of LDO Optimized Specific GSM Sub-systems
- One LDO for RF transceiver
- High Operation Efficiency and Low Stand-by Current
- Dual SIM Card Interface
- One boost regulator and Four Open-Drain Output Current Regulators to Supply/Control the LED
- LDO type Vibrator
- One NMOS switch to control R(GB) LED
- Thermal Overload Protection
- Under Voltage Lock-out Protection
- Over Voltage Protection

3.1.9 Integrated RF Receiver

- Direct conversion architecture
- Quad band differential input LNAs
- Quadrature RF mixers
- Fully integrated channel filter with $f_{3dB}=150kHz$
- 95dB gain with 60dB gain control range
- No IIP2 calibration

3.1.10 Integrated RF Transmitter

- Offset phase lock loop
- IQ modulator DC offset calibration by BB ADC/DAC
- Precise quadrature by IF divide-by-4
- Integrated loop filter

3.1.11 Integrated RF Frequency Synthesizer

- Programmable fractional-N synthesizer
- Integrated wide range RFVCO
- Integrated loop filter
- Fast setting time suitable for multi-slot SPRS applications

3.1.12 Integrated RF Digitally-Controlled Crystal Oscillator(DCXO)

- One-pin 26MHz crystal oscillator
- On-chip programmable capacitor array for cross tune

3.1.13 Radio Interface and Baseband Front End

- GMSK modulator with analog I and Q channel outputs
- 10-bit D/A Converter for uplink baseband I and Q signals
- 14-bit high resolution A/D Converter for downlink baseband I and Q signals
- Calibration mechanism of offset and gain mismatch for baseband A/D Converter and D/A Converter
- 10-bit D/A Converter for Automatic Power Control
- Programmable Radio RX filter with adaptive bandwidth control
- Dedicated Rx filter for FB acquisition
- 6-Pin Baseband Parallel Interface(BRI) with programmable driving strength
- Multi-band support

3.1.14 Voice and Modem CODEC

- Digital tone generation
- Voice Memo
- Noise Reduction
- Echo Suppression
- Advanced Sidetone Oscillation Reduction
- Digital sidetone generator with programmable gain
- Two programmable acoustic compensation filters
- GSM/GPRS quad vocoders for adaptive multirate(AMR), enhanced full rate(EFR), full rate(FR), and half rate(HR)
- GSM channel coding, equalization and A5/1, A5/2 and A5/3 ciphering
- GPRS GEA1, GEA2 and GEA3 ciphering

3. TECHNICAL BRIEF

3.1.15 Voice Interface and Voice Front End

- Two microphone inputs sharing one low noise amplifier with programmable gain and automatic gain control(AGC) mechanism
- Voice power amplifier with programmable gain
- 2nd order Sigma-delta A/D Converter for voice uplink path
- D/A Converter for voice downlink path
- Supporter for voice downlink path
- Supports half-duplex hands-free operation
- Compliant with GSM 03.05

3.1.16 LCD Interface

- Dedicated Parallel Interface supports 2 external 8/9 bit Parallel Interface, and Serial interface for LCM

3.1.17 LCD Controller

- Supports LCM format: RGB332, RGB444, RGB565, RGB666, RGB888
- Supports LCD module with maximum resolution up to 240x320 at 16bpp
- Capable of combining display memories with up to 4 blending layers
- Accelerated Gamma correction with programmable gamma table.
- Supports hardware display rotation for each layer

3.1.18 Audio CODEC

- Wavetable synthesis with up to 64 tones
- Advanced wavetable synthesizer capable of generating and 47 sets of percussions
- PCM Playback and Record
- Digital Audio Playback

3.1.19 Audio Interface and Audio Front End

- Supports I2S interface
- High resolution D/A Converters for Stereo Audio playback
- Stereo analog input for stereo audio source
- Analog multiplexer for Stereo Audio
- FM Radio Recording
- Stereo to Mono Conversion
- HE-AAC decode support

3.2 Power Management

Power management unit, so called PMU, is integrated into analog part. To facilitate software control and interface design, PMU control share the CCI interface along with other analog parts, such as BBTX, BBRX, VBI and ABI during FT.

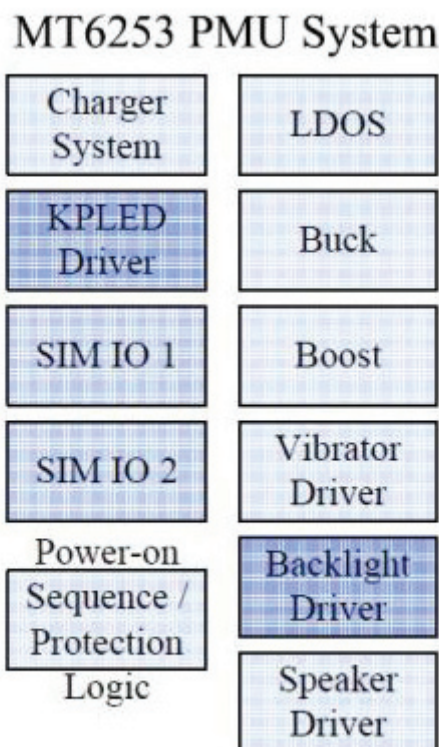


Figure. 3.2.1 PMU system block diagram

3.2.1 Low Dropout Regulators(LDOs), Buck converter and Reference

The PMU Integrates 12 LDOs that are optimized for their given functions by balancing quiescent current, dropout voltage, line/load regulation, and output noise.

- **RF LDO (Vrf)**

The RF LDO is a linear regulator that could source 180mA (max) with 2.8V output voltage. It supplies the RF circuitry of the handset. The LDO is optimized for high performance and adequate quiescent current.

3. TECHNICAL BRIEF

▪ **Digital Core Buck Converter (Vcore)**

The digital core regulator is a DC-DC step-down (Buck converter) that could source 200mA(max) with 1.2V to 0.9V programmable output voltage based on software register setting. It supplies the power for baseband circuitry of the SoC. The buck converter is optimized for high efficiency and low quiescent current.

▪ **Digital IO LDO (Vio)**

The digital IO LDO is a linear regulator that could source 100mA (max) with 2.8V output voltage. It supplies the the power for baseband circuitry of the SoC. The LDO is optimized for very low quiescent current and turns on automatically together with Vm/Va LDOs.

▪ **Analog LDO (Va)**

The analog LDO is a linear regulator that could source 100mA (max) with 2.8V output voltage. It supplies the analog sections of the SoC. The LDO is optimized for low frequency ripple rejection in order to reject the ripple coming from the burst at 217Hz of RF power amplifier.

▪ **TCXO LDO (Vtcxo)**

The TCXO LDO is a linear regulator that could source 20mA (max) with 2.8V output voltage. It supplies the temperature compensated crystal oscillator, which needs ultra low noise supply with very good ripple rejection.

▪ **Single-Step RTC LDO (Vrtc)**

The single-step RTC LDO is a linear regulator that can charge up a capacitor-type backup coin cell to 2.8V, which also supplies the RTC module even at the absence of the main battery. The single-step LDO features the reverse current protection and is optimized for ultra low quiescent current while sustaining the RTC function as long as possible.

▪ **Memory LDO (Vm)**

The memory LDO is a linear regulator that could source 200mA (max) with 1.8V or 2.8V output voltage selection based on the supply specification of memory chips. It supplies the memory circuitry in the handset. The LDO is optimized for very low quiescent current with wide output loading range.

▪ **SIM LDO (Vsim)**

The SIM LDO is a linear regulator that could source 80mA (max) with 1.8V or 3.0V output voltage selection based on the supply specs of subscriber identity modules (SIM) card. It supplies the SIM card and SIM level shifter circuitry in the handset. The Vsim LDO is controlled independently by the register named VSIM_EN.

▪ SIM2 LDO (Vsim2)

The SIM2 LDO is a linear regulator that could source 20mA (max) with 1.8V or 3.0V output voltage selection based on the supply specs of the 2nd subscriber identity modules (SIM) card. It supplies the 2nd SIM card and SIM level shifter circuitry in the handset. The Vsim2 LDO is controlled independently by the register named VSIM2_EN.

▪ USB LDO (Vusb)

The USB LDO is a linear regulator that could source 75mA (max) with 3.3V output dedicated for USB circuitry. It is controlled independently by the register named RG_VUSB_EN.

▪ Memory Card / Bluetooth LDO (Vbt)

The VBT LDO is a linear regulator that could source 150mA (max) with 1.5V, 1.8V, 2.5V or 2.8V output for memory card or Bluetooth module. It is controlled independently by the register named RG_VBT_EN.

▪ Camera Analog LDO (Vcama)

The Vcama LDO is a linear regulator that could source 150mA (max) with 1.5V, 1.8V, 2.5V or 2.8V output which is selected by the register named VCAMA_SEL[1:0]. It supplies the analog power of the camera module. Vcama is controlled independently by the register named RG_VCAMA_EN.

▪ Camera Digital LDO (Vcamd)

The Vcamd LDO is a linear regulator that could source 75mA (max) with 1.3V, 1.5V, 1.8V or 2.8V output which is selected by the register named VCAMD_SEL[1:0]. It supplies the digital power of the camera module. Vcamd is controlled independently by the register named RG_VCAMD_EN.

3. TECHNICAL BRIEF

Item	LDO	Voltage	Current	Description
1	VCORE	1.2V / 0.9V	200 mA	Digital core
2	VIO	2.8V	100 mA	Digital IO
3	VRF	2.8V	180 mA	RF chip
4	VA	2.8V	100 mA	Analog baseband
5	VRTC	2.8V	1 mA	Real-time clock
6	VM	1.8V / 2.8V	200 mA	External memory, selectable
7	VSIM	1.8V / 3.0V	80 mA	SIM card, selectable
8	VTCXO	2.8V	20 mA	13/26 MHz reference clock
9	VSIM2	1.8V / 3.0V	20 mA	SIM2 card, selectable
10	VUSB	3.3V	75 mA	USB
11	VBT	1.3V / 1.8V / 2.5V / 3V	150 mA	Memory card or Bluetooth
12	VCAM_A	1.5V / 1.8V / 2.5V / 2.8V	150 mA	Analog camera power
13	VCAM_D	1.3V / 1.5V / 1.8V / 2.8V	75 mA	Digital camera power

Table3.2.1. Power Supply Domains (Without RF)

3.2.2 Power On

Together with Power Management IC (PMIC), MT6253 offers both fine and coarse resolutions of power control through software programming. With this efficient method, the developer can turn on selective resources accordingly in order to achieve optimized power consumption. The operating modes of MT6253 as well as main power states provided by the PMIC are shown in Figure.3.2.1.

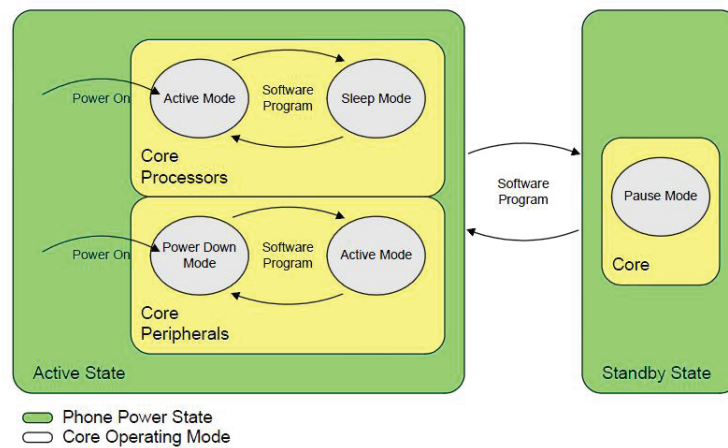


Figure 3.2.2. Major Phone Power States and Operating Modes for MT6253 based terminal

3. TECHNICAL BRIEF

3.3 FEM with integrated Power Amplifier Module (SKY77547, U303)

3.3.1 Internal Block Diagram

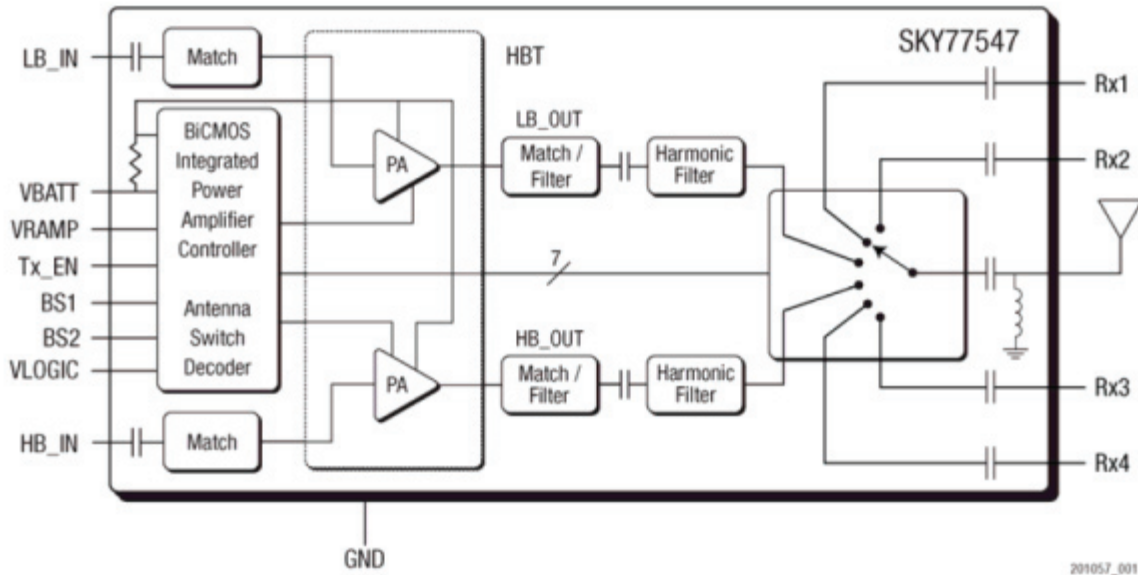


Figure. 3.3.1 SKY77547 FUNCTIONAL BLOCK DIAGRAM

3.3.2 General Description

The SKY77547 is a transmit and receive front-end module (FEM) with Integrated Power Amplifier Control (iPAC™) for quad-band cellular handsets comprising GSM850/900 and DCS1800/PCS1900 operation. Designed in a low profile, compact form factor, the SKY77547 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, impedance matching circuitry for 50 Ω input and output impedances, Tx harmonics filtering, high linearity and a low insertion loss PHEMT RF switch, and a Power Amplifier Control (PAC) block with internal current sense resistor. A custom BiCMOS integrated circuit provides the internal PAC function and decoder circuitry to control the RF switches. The two Hetero junction Bipolar Transistor (HBT) PA blocks 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 four receive pads are connected to the antenna pad through a PHEMT RF switch. The GaAs die, PHEMT die, Silicon (Si) die and passive components are mounted on a multi-layer laminate substrate. The assembly is encapsulated with plastic overmold.

Mode	VRF	PA_EN	BAND_SW1	BAND_SW2
Standby	0	—	—	—
PCS Rx	1	0	0	0
DCS Rx	1	0	0	1
EGSM Rx	1	0	1	1
GSM850 Rx	1	0	1	0
GSM_OUT	1	1	0	—
DCS_PCS_OUT	1	1	1	—

1. — = DON'T CARE

Table 3.3.1 Band SW Logic Table

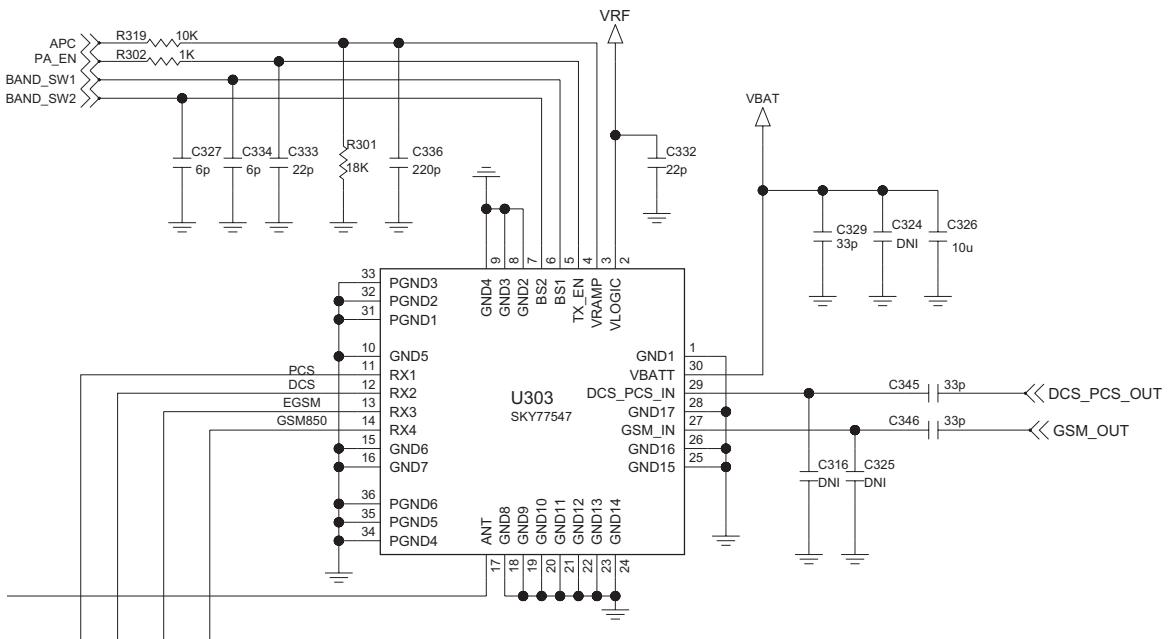


Figure 3.3.2 TX-module CIRCUIT DIAGRAM

3. TECHNICAL BRIEF

3.4 Clocks

There are two major time bases in the MT6253. For the faster one is the 26 MHz clock originated from the digital control oscillator(DCXO) of RF block. This is then converted to the square-wave signal through CLKSQ.

The other time base is the 32768 Hz clock generated by an on-chip oscillator connected to an external crystal.

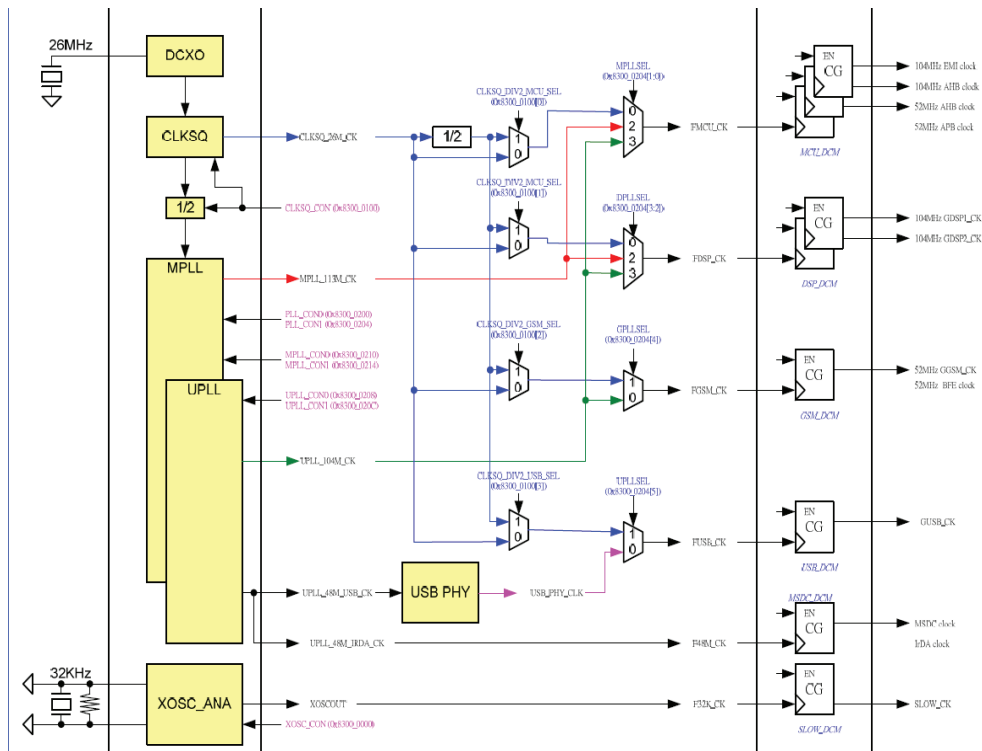


Figure 3.4.1 Clock distributions inside the MT6253.

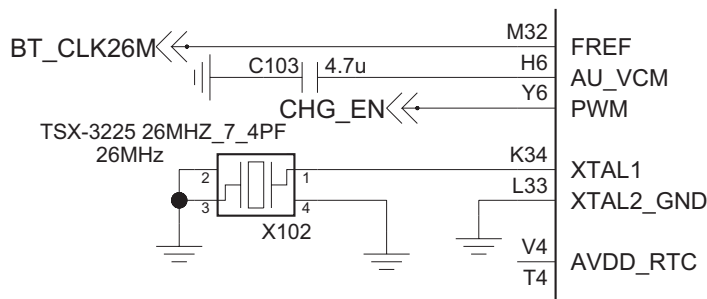


Figure 3.4.2 Crystal Oscillator External Connection

3.4.1 32.768KHz Time Base

The 32768 Hz clock is always running. It's mainly used as the time base of the Real Time Clock(RTC) module, which maintains time and date with counters. Therefore, both the 32768Hz oscillator and the RTC module is powered by separate voltage supplies that shall not be powered down when the other supplies do.

In low power mode, the 13Mhz time base is turned off, so the 32768Hz clock shall be employed to update the critical TDMA timer and Watchdog Timer. This time base is also used to clocks the keypad scanner logic

3.4.2 26MHz Time Base

Since PLL are based on 13MHz reference clock. There is an 1/2-dividers for PLL existing to allow using 26MHz DCXO.

There are 2 phase-locked loops(PLL) in MT6253. The UPLL generates 624Mhz clock output, then a frequency divider further divide 6, and 13 to generate fixed 103Mhz, and 48Mhz for GSM_CLOCK and USB_CLOCK and DSP_CLOCK. These four primary clocks then feed into GSM, USB, MCU and DSP Clock Domain, respectively.

These 2 PLLs require no off-chip components for operations and can be turn off in order to save power. After power-on, the PLLs are off by default and the source clock signal is selected through multiplexers. The software shall take cares of the PLL lock time while changing the clock selections. The PLL and usages are listed below.

- PLL supply four clock source : MCU_CLOCK(104~113Mhz), DSP_CLOCK(104~113Mhz), GSM_CLOCK(104Mhz) and USB_CLOCK(48Mhz)

- For DSP/MCU system clock, MCU_CLOCK and DSP_CLOCK. The outputted 104~113Mhz clock is controlled by MCU for 500Khz per step and settled time is under 100uS. The clock is also connected to DSP/MCU DCM (dynamic clock manager) for dynamically adjusting clock rate by digital clock divider.

MCU_CLOCK paces the operations of the MCU cores, MCU memory system, and MCU peripherals as well

- Modem system clock, GSM_CLOCK, which paces the operations of the GSM/GPRS hardware, coprocessors as well. The outputted 104Mhz clock is connector to GSM_DCM for dynamically adjusting clock rate by digital clock divider. Typically the GSM_DCM output clock no more than 52Mhz.

Note that PLL need some time to become stable after being powered up. The software shall take cares of the PLL lock time before switching them to the proper frequency. Usually, a software loop longer than the PLL lock time is employed to deal with the problem.

For power management, the MCU software program may stop MCU Clock by setting the Sleep Control Register. Any interrupt requests to MCU can pause the sleep mode, and thus MCU return to the running mode.

AHB also can be stop by setting the Sleep Control Register. However the behavior of AHB in sleep mode is a little different from that of MCU. After entering Sleep Mode, it can be temporarily waken up by any "hreq"(bus request), and then goes back to sloop automatically after all "hreqs" de-assert. Any transactions can take place as usual in sleep mode, and it can save power while there is no transaction on it. However the penalty is losing a little system efficiency for switching on and off bus clock, but the impact is small

3. TECHNICAL BRIEF

3.5 RFSYS of MT6253 (U102)

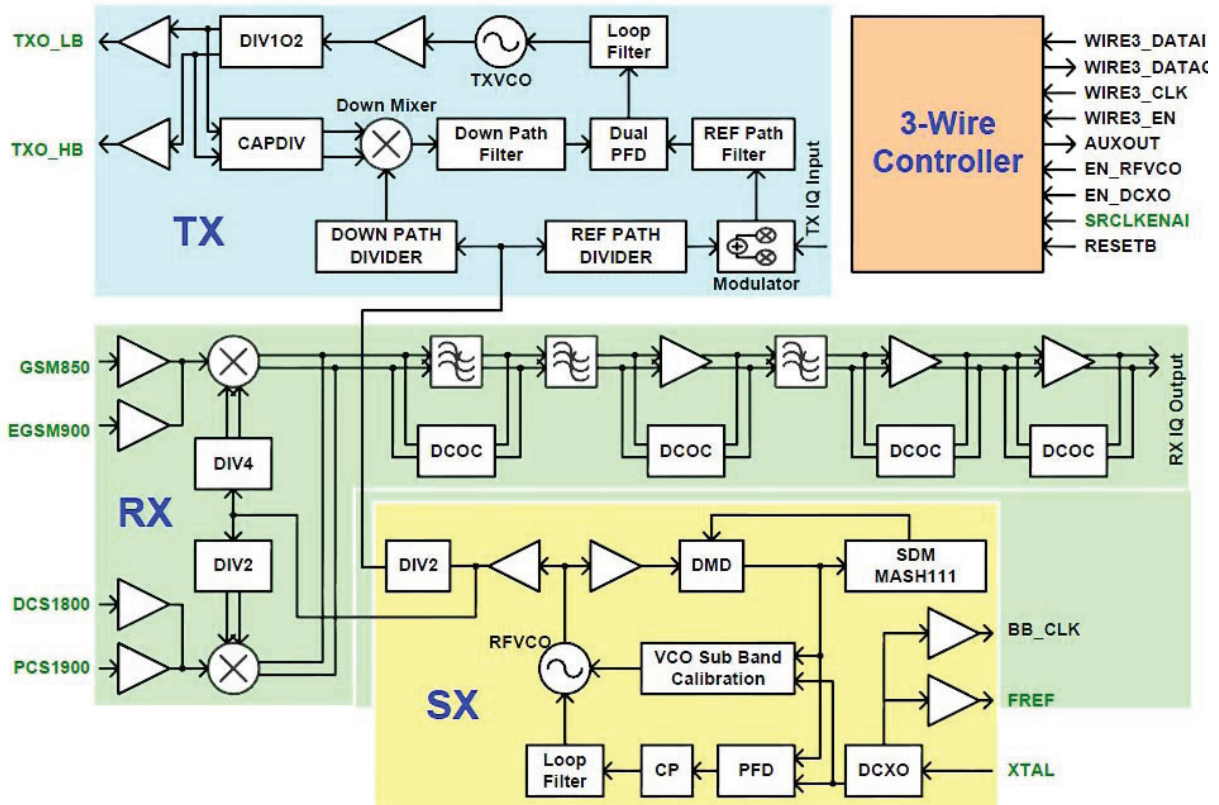


Figure. 3.5.1 Block DIAGRAM of RFSYS

3.5.1 GENERAL DESCRIPTION

RFSYS built in MT6253 SOC is a highly integrated RF transceiver for multi-band GSM and GPRS cellular systems. The features are listed as following.

▪ Receiver

- Direct conversion architecture
- Quad band differential input LNAs
- Quadrature RF mixers
- Fully integrated channel filter with $f_{3dB}=150kHz$
- 95 dB gain with 60 dB gain control range

▪ Transmitter

- Offset phase lock loop
- IQ modulator
- Integrated TX VCO
- Integrated loop filter

▪ Frequency Synthesizer

- Programmable fractional-N synthesizer
- Integrated wide range RFVCO
- Integrated loop filter
- Fast settling time suitable for multi-slot GPRS/EDGE applications

▪ Digitally-Controlled Crystal Oscillator (DCXO)

- One-pin 26 MHz crystal oscillator
- On-chip programmable capacitor array for coarse tune
- On-chip programmable capacitor array for fine tune

▪ RFSYS in a-QFN package

3. TECHNICAL BRIEF

3.6 MEMORY(PF38F4050M0Y3DE, U101)

3.6.1 Functional Description

The Numonyx™ StrataFlash® Cellular Memory (M18) device provides high read and write performance at low voltage on a 16-bit data bus.

The flash memory device has a multi-partition architecture with read-while-program and read-while-erase capability.

The device supports synchronous burst reads up to 108 MHz using ADV# and CLK address-latching (legacy-latching) on some litho/density combinations and up to 133 MHz using CLK address-latching only on some litho/density combinations. It is listed below in the following table

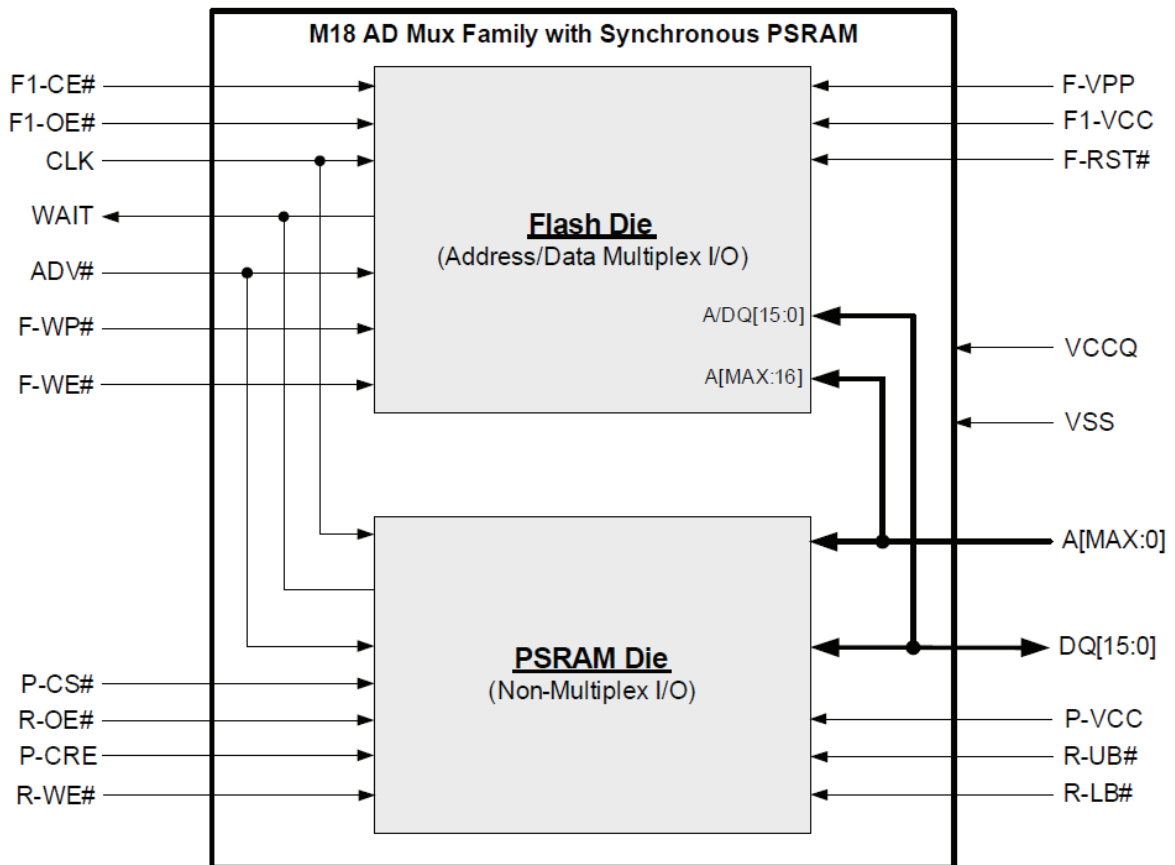


Figure. 3.6.1 MEMORY BLOCK DIAGRAM

Litho (nm)	Density (Mbit)	Supports frequency up to (MHz)	Sync read address-latching
90	256	133	CLK-latching
	512	108	ADV#- and CLK-latching
65	128	133	CLK-latching
	256	133	CLK-latching
	512	133	CLK-latching
	1024	108	ADV#- and CLK-latching
	1024	133	CLK-latching

Table 3_6_1 M18 Frequency combinations

In continuous-burst mode, a data Read can traverse partition boundaries.

Upon initial power-up or return from reset, the device defaults to asynchronous arrayread mode.

Synchronous burst-mode reads are enabled by programming the Read Configuration Register. In synchronous burst mode, output data is synchronized with a user-supplied clock signal. A WAIT signal provides easy CPU-to-flash memory synchronization.

Designed for low-voltage applications, the device supports read operations with VCC at 1.8 V, and erase and program operations with VPP at 1.8 V or 9.0 V. VCC and VPP can be tied together for a simple, ultra-low power design. In addition to voltage flexibility, a dedicated VPP connection provides complete data protection when VPP is less than VPPLK.

A Status Register provides status and error conditions of erase and program operations

One-Time-Programmable (OTP) registers allow unique flash device identification that can be used to increase flash content security. Also, the individual block-lock feature provides zero-latency block locking and unlocking to protect against unwanted program or erase of the array.

The flash memory device offers three power savings features:

- Automatic Power Savings (APS) mode: The device automatically enters APS following a read-cycle completion.
- Standby mode: Standby is initiated when the system deselects the device by deasserting CE#.
- Deep Power-Down (DPD) mode: DPD provides the lowest power consumption and is enabled by programming in the Enhanced Configuration Register. DPD is initiated by asserting the DPD pin.

3. TECHNICAL BRIEF

3.6.2 Features

▪ Device Architecture

- Flash Die Density: 256MB
- PSRAM Die Density: 64MB
- x16 Non-Mux or AD-Mux I/O Interface Options

▪ Device Voltage

- Core: VCC = 1.8 V
- I/O: VCCQ = 1.8 V

▪ Device Packaging

- Ballout: x16C with 107 Active Balls, QUAD+ with 88 Active Balls, or 56-ball NOR/PSRAM AD-Mux
- Area: 8x8 mm to 11x13 mm
- Height: 1.0 mm to 1.4 mm

▪ PSRAM Performance

- 70 ns Initial Read Access; 20 ns Asynchronous Page-Mode Read
- Up to 104 MHz with 7 ns Clock-to-Output Synchronous Burst-Mode Reads
- Configurable 4-, 8-, 16- and Continuous-Word Burst-Length Reads and Writes
- Partial-Array and Temperature Compensated Self Refresh
- Programmable Output Impedance

▪ Quality and Reliability

- Extended Temperature -25 °C to +85 °C
- Minimum 100K Flash Block Erase Cycles
- ETOX™ IX (Flash) and ETOX™ X (Flash)
- Technology on 128 Mbit, 256 Mbit, and 512Mbit M18 die; ETOX™ X (Flash) on 1 Gbit M18 die

▪ Flash Performance

- 96 ns Initial Read Access; 15 ns Asynchronous Page-Mode Read
- Up to 133 MHz with 5.5 ns Clock-to-Data Output Synchronous Burst-Mode Read
- Buffered Enhanced Factory and 1.8 V Low-Power Buffer Programming Modes: 2 µs/Byte (Typ)
- Deep Power-Down Mode: 2 µA (Typ)
- Configurable Output Driver

▪ Flash Architecture

- Multi-Level Cell Technology
- Hardware Read-While-Program/Erase
- Symmetrically Blocked Array
- Eight Partitions
- Configurable 8-, 16-, or Continuous-Words Burst Length Reads
- 2-Kbit One-Time Programmable User Protection Register Bits
- Zero-Latency Block Locking
- Automated Blank Check Mode

▪ Flash Software

- Numonyx™ FDI and Numonyx™ PSM
- Common Flash Interface
- Basic and Extended Flash Command Set

3.7 BT Module

The internal connection of the major physical blocks and their associated external interfaces are shown in Figure 3.7.1. The transceiver section of MT6612 incorporates the complete receive and transmit paths, including PLL, VCO, LNA, PA, modulator, demodulator.

The baseband signal processor incorporates hardware engines performing frequency hopping, error correcting, whitening, encrypting, data packet assembling and de-assembly to offload the embedded ARM7.

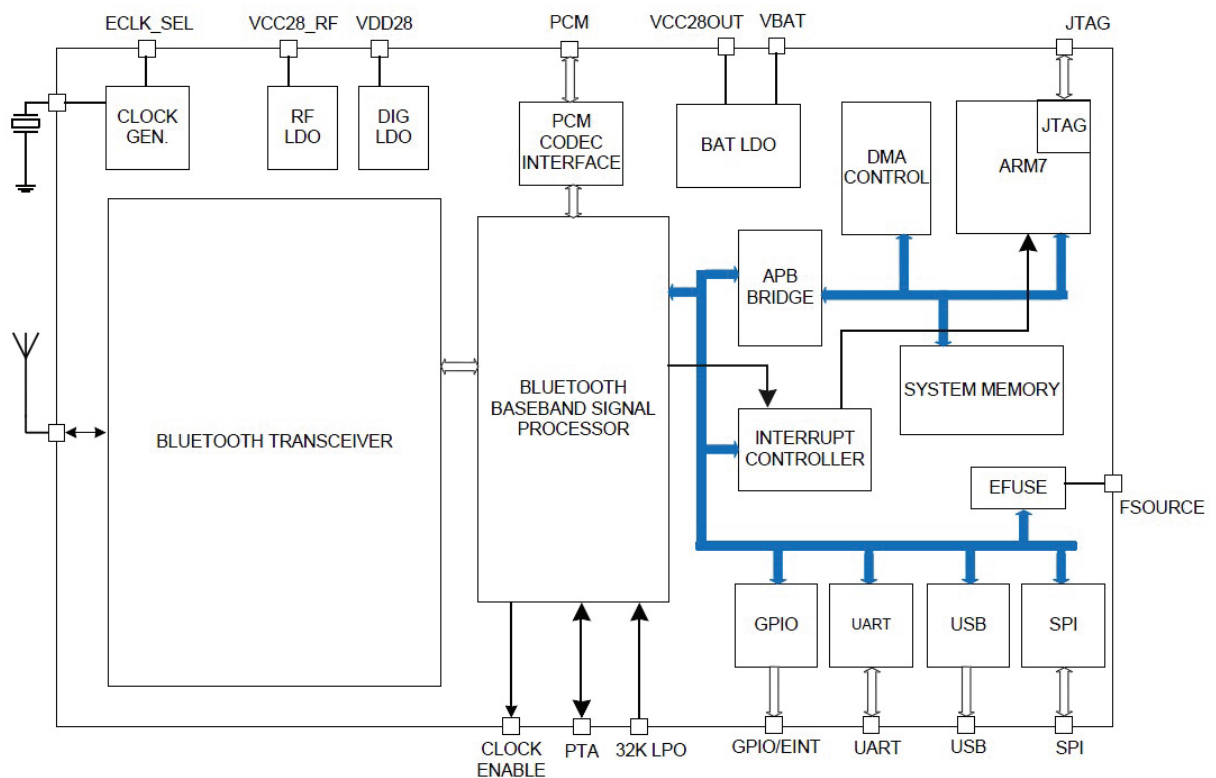


Figure 3.7.1. BT BLOCK DIAGRAM

3.7.1 General Description

Bluetooth is a low-cost wireless technology used to provide “ad hoc” networking between versatile portable devices such as cell phones, headsets, personal navigation device, and more.

MT6612 is a highly integrated Bluetooth platform IC. It includes powerful baseband processing capabilities with rich features and a high performance transceiver, all in a compact single package.

3. TECHNICAL BRIEF

3.7.2 Feature

▪ Radio features

- Fully compliant with Bluetooth specification 2.1 + EDR.
- Low out-of-band spurious emissions supports simultaneous operation with GPS, GSM/GPRS worldwide radio systems.
- Low-IF architecture with high degree of linearity and high order channel filter.
- Integrated T/R switch.

▪ Transmitter features

- Meets class1, class 2 and class 3 transmitting requirement.
- Fully integrated PA provides 9dBm output power. (antenna out)

▪ Receiver features

- -91dBm sensitivity with excellent interference rejection performance.
- Hardware AGC dynamically adjusts receiver performance in changing environments.

▪ Baseband features

- Up to 7 simultaneous active ACL links.
- Up to 3 simultaneous SCO and eSCO links with CVSD coding.
- eSCO support.
- Scatternet support: Up to 4 piconets simultaneously with background inquiry/page scan.
- Sniff mode, hold mode, and park mode support.
- AFH and PTA collaborative support for WLAN/BT coexistence.
- Idle mode and sleep mode enables ultra low power consumption
- PCM interface and built-in transcoders for A-law, μ -law and linear voice with re-transmission support.
- Built-in hardware modem engine for access code correlation, header error correction, forward error correction, CRC, whitening, and encryption.
- Channel quality driven data rate adaptation.
- Channel assessment for AFH.

▪ Platform features

- Integrated LDO enables direct connection to battery.
- Wide ranges of crystal and external reference clock support.
- High speed UART supports up to 3.2Mbps baud rate.
- Built-in RAM and ROM with patch system.
- External LPO clock support for sleep mode.
- Supports standard HCI interface.
- Capable to support Bluetooth 2.1 features.
- Provides USB full-speed device function.
- Supports a SPI interface to access external serial flash and EEPROM.
- Embedded 128-bit eFuse for Bluetooth Address use.

3.7.3 Functional Description

• Power Subsystem

MT6612 contains several LV (low voltage, 2.8V) linear regulators to provide power supply for every power domain, including RF circuitry and digital core circuitry. Besides, it has built in a BAT linear regulator which can be directly connected to battery. The BAT linear regulator is the power source for digital IO and those LV linear regulators. It supports the Li-ion battery. To keep it work properly, the battery voltage should be within the range from 3.2V to 4.3V.

The built-in LV linear regulators for RF circuitry are cap-less regulators. It provides high PSRR to keep excellent RF performance. MT6612 has internal enabling signals from the baseband to control different part of RF circuitry for optimized power control.

The DIG (digital) LV regulator requires an external capacitor. The main power control state machine is in the digital baseband circuitry. It requires no external enable signal for the DIG LV regulator. When the 1.2V power is supplied from the regulator on VDD12 pins, there will be an internal POR (Power-On Reset) to start the system. An external system reset to start the system is optional according to the application requirement.

The input pin LDO28EN is used by the host controller to turn on and off the BAT regulator. The host can control this pin to enable the whole MT6612 system. The enable voltage (V_{IH}) of pin LDO28EN is 1.4V. Be sure that the control signal meets the enable voltage requirement.

▪ Clock generation

There are two clock domains inside MT6612. The one is the System clock, which supports the RF and the major MODEM functions, while the other is the LPO clock, which keeps track the Bluetooth clock and could maintain the Bluetooth link in sleep mode.

MT6612 has two options for the System clock source. The one is for one-pin crystal input, and the other is for external clock source. The input pin ECLK_SEL is used to select between these two alternatives. If the crystal input is chosen, ECLK_SEL should be tied low, otherwise, it should be tied high.

▪ Chip power management

There are 4 power modes that MT6612 operates in when it is powered on: Normal mode, Active mode, Idle mode, and Sleep mode. The following are brief introduction to each mode.

- Power off : Power supply is not enabled or LDO28EN is low.
- Normal mode : When MT6612 is powered on, it firstly enters Normal mode. In this mode, an internal digital PLL is turned on to supply the clock for baseband circuit.
- Active mode : It is defined as the state that RF circuit will be turned on at the same time.
- Idle mode : When the firmware finishes its task and starts to wait for next hardware trigger, it forces the hardware to enter this mode. In this mode, Part of the logic, like MCU, will enter a low power mode. RF circuit might still be operation in the mode.
- Sleep mode : The baseband controller can determine to enter sleep mode to turn off most of the circuit in MT6612. In sleep mode, the system could be awakened after sleep time expired or by an external wake up signal from the host controller.

3. TECHNICAL BRIEF

▪ **MCU Subsystem**

The MCU (Micro-Controller Unit) subsystem contains ARM7 microprocessor, internal memory and the ROM patch function. It also contains the UART interface controller, USB full-speed device controller, serial flash interface controller and the power/clock management function.

▪ **Bluetooth Baseband Subsystem**

The Bluetooth baseband subsystem contains a baseband processor which supports the timing control, the bitstream processing, encryption, frequency hopping, and modulation/demodulation. It also contains the audio codec, Wi-Fi coexistence interface controller, and a sleep mode controller.

▪ **RF Subsystem**

MT6612 contains a fully integrated transceiver.

For TX path, the baseband transmit data is digitally modulated in the baseband processor, then up-converted to 2.4GHz RF channels through DA converter, filter, IQ up-converter, and the power amplifier.

The power amplifier is capable of transmitting 9dBm power for class 1 operation.

For RX path, MT6612 is a low IF receiver architecture. An image-reject mixer down-converts the RF signal to the IF with the LO from the synthesizer, which could support different clock frequencies as the reference clock as described in section "Clock Generation". The mixer output is then converted to digital signal, down-converted to baseband for demodulation. A fast AGC enables the effective discovery of device within the dynamic range of the receiver.

MT6612 features self calibration schemes to compensate the process and temperature variation to maintain high performance. Those calibrations are performed automatically right after system boot-up.

3.8 SIM Card Interface

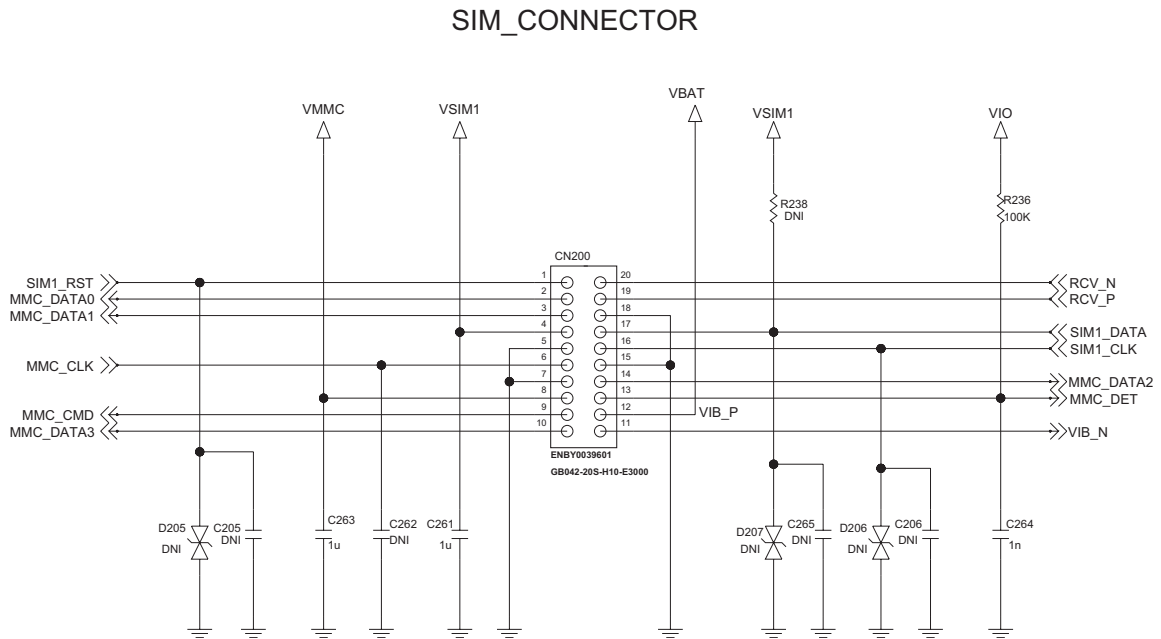


Figure 3.8.1 SIM Connector Circuit Diagram

3. TECHNICAL BRIEF

The Main Base Band Processor(MT6253) contains two dedicated smart card interfaces to allow the MCU to access the two SIM cards. Each interface can operator via 5 terminals. As shown is the Figure 3.8.2, SIMVCC, SIMSEL, SIMRST, SIMCLK and SIMDATA are for one SIM interface, while SIM2VEE, SIM2SEL, SIM2RST, SIM2CLK and SIM2DATA are for the other one.

The functions of the two SIM interfaces are identical; therefore, only first SIM interface will be described in this document.

The VSIM is used to control the external voltage supply to the SIM card and SIM SEL determines the regulated smart card supply voltage. SIMRST is used as the SIM card reset signal. Besides, SIMDATA and SIMCLK are used for data exchange purpose

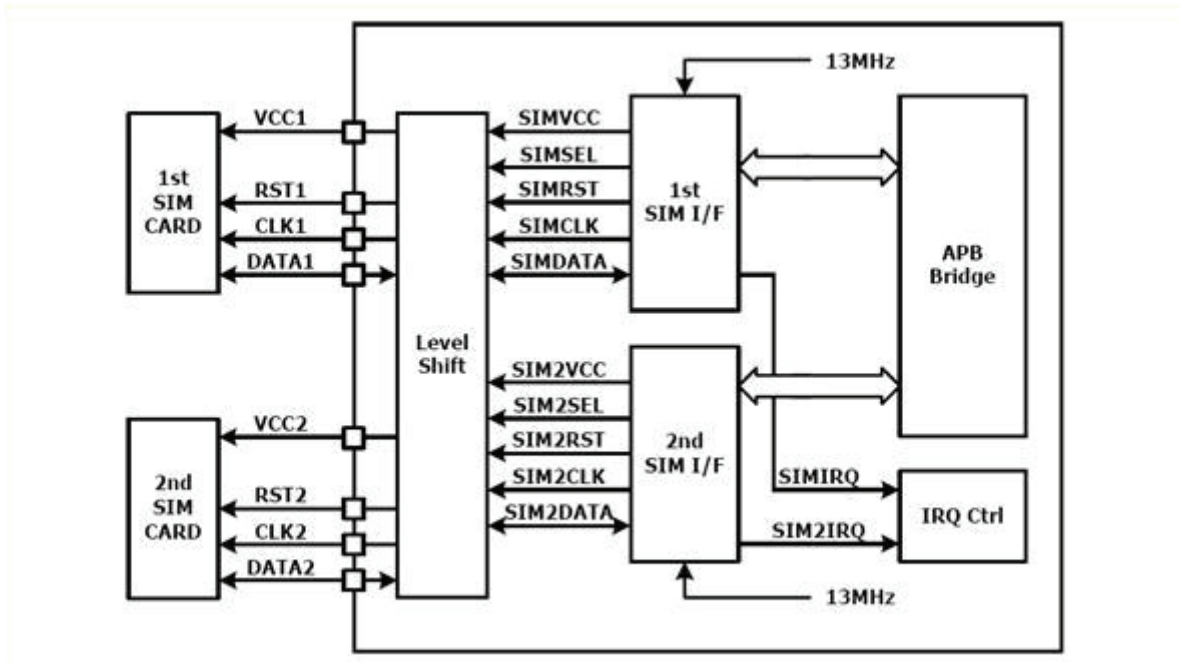


Figure 3.8.2 SIM Interface block diagram

3.9 Micro-SD Card Interface

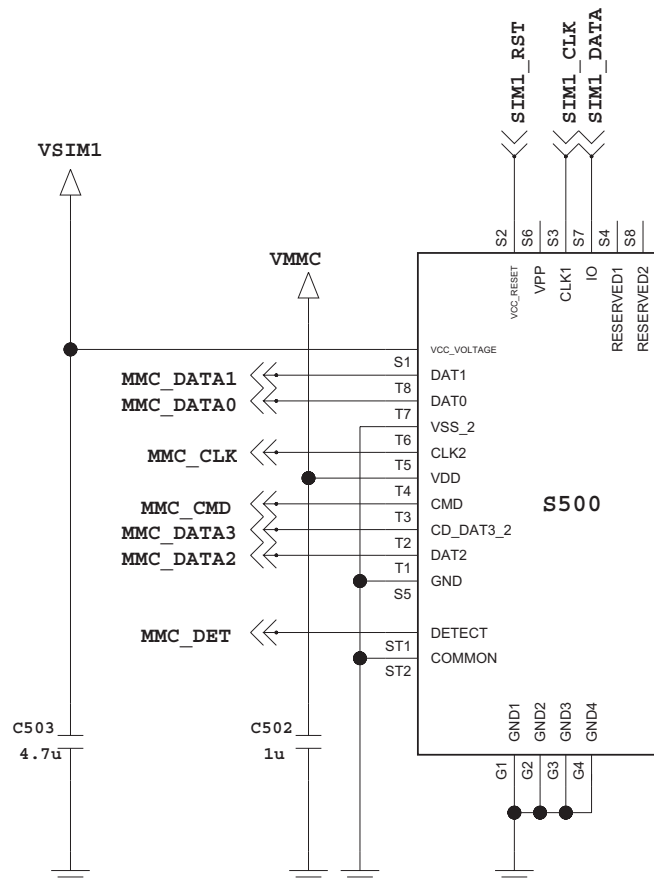


Figure 3.9.1 Micro-SD Card Interface

The controller fully supports the Memory Stick bus protocol as defined in Format Specification version 2.0 of Memory Stick Standard (Memory Stick PRO) and the SD Memory Card bus protocol as defined in SD Memory Card Specification Part 1 Physical Layer Specification version 2.0 as well as the Multi Media Card(MMC) bus protocol as defined in MMC system specification version 4.1. Since SD memory Card bus protocol is backward compatible to MMC bus protocol, the controller is capable of working well as the host on MMC bus under control of proper firmware. Furthermore, the controller also support SDIO card specification version 1.0 partially. However, the controller can only be configured as either the host controller.

3. TECHNICAL BRIEF

3.9.1 Pin Assignment

Since the controller can only be configured as either the host of Memory Stick or the host of SD/MMC Memory Card at one time, pins for Memory Stick and SD/MMC Memory Card are shared in order to save pin counts. The following lists pins required for Memory Stick and SD/MMC Memory Card. Figure 3.9.2 shows how they are shared. In Table 3.9.1, all I/O pads have embedded both pull up and pull down resistor because they are shared by both the Memory Stick and SD/MMC Memory Card. Pins 2,4,5,8 are only useful for SD/MMC Memory Card. Pull down resistor for these pins can be used for power saving. All embedded pull-up and pull-down resistors can be disabled by programming the corresponding control registers if optimal pull-up or pull-down resistor are required on the system board. The pin VDDPD is used for power saving. Power for Memory Stick or SD/MMC Memory Card can be shut down by programming the corresponding control register. The pin WP(Write Protection) is only valid when the controller is configured for SD/MMC Memory Card. It is used to detect the status of Write Protection Switch on SD/MMC Memory Card.

No.	Name	Type	MMC	SD	MS	MSPRO	Description
1	SD CLK	O	CLK	CLK	SCLK	SCLK	Clock
2	SD DAT3	I/O/PP		CD/DAT3		DAT3	Data Line [Bit 3]
3	SD DAT0	I/O/PP	DAT0	DAT0	SDIO	DAT0	Data Line [Bit 0]
4	SD DAT1	I/O/PP		DAT1		DAT1	Data Line [Bit 1]
5	SD DAT2	I/O/PP		DAT2		DAT2	Data Line [Bit 2]
6	SD CMD	I/O/PP	CMD	CMD	BS	BS	Command Or Bus State
7	SD PWRON	O					VDD ON/OFF
8	SD WP	I					Write Protection Switch in SD
9	SD INS	I	VSS2	VSS2	INS	INS	Card Detection

Table 3.9.1 Sharing of pins for Memory Stick and SD/MMC Memory Card controller

3.9.2 Card Detection

For SD/MMC Memory Card, detection of card insertion/removal by hardware is also supported. Because a pull down resistor with about $470\text{ K}\Omega$ resistance which is impractical to embed in an I/O pad is needed on the signal CD/DAT3, and it has to be capable of being connected or disconnected dynamically onto the signal CD during initialization period, an additional I/O pad is needed to switch on/off the pull down resistor on the system board. The scenario of card detection for SD/MMC Memory Card is shown in Figure 3.9.2. Before SD/MMC Memory Card is inserted or powered on, SW1 and SW2 shall be opened for card detection of the host side. Meanwhile, pull down resistor R_{CD} on system board shall attach onto the signal CD/DAT3 by the output signal RCDEN. In addition, SW3 on the card is default to be closed. Upon insertion of SD/MMC Memory Card the signal CD/DAT3 will have a transition from low to high. If SD/MMC Memory Card is removed then the signal CD/DAT3 will return to logic low. After the card identification process, pull down resistor R_{CD} on system board shall disconnect with the signal CD/DAT3 and SW3 on the card shall be opened for normal operation. Since the scheme above needs a mechanical switch such as a relay on system board, it is not ideal enough. Thus, a dedicated pin "INS" is used to perform card insertion and removal for SD/MMC. The pin "INS" will connect to the pin "VSS2" of a SD/MMC connector.

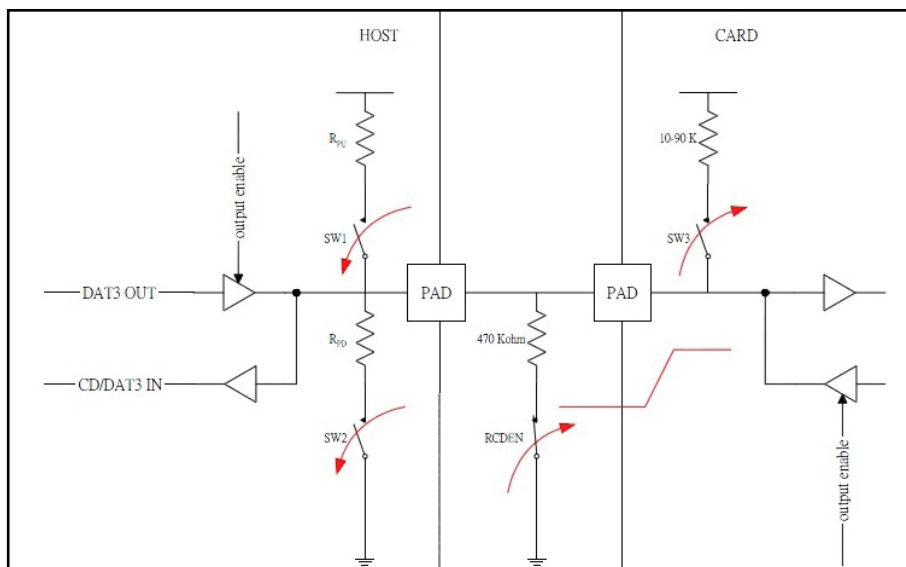


Figure 3.9.2 Card Detection for SD/MMC Memory Card

3. TECHNICAL BRIEF

3.10 LCD Interface

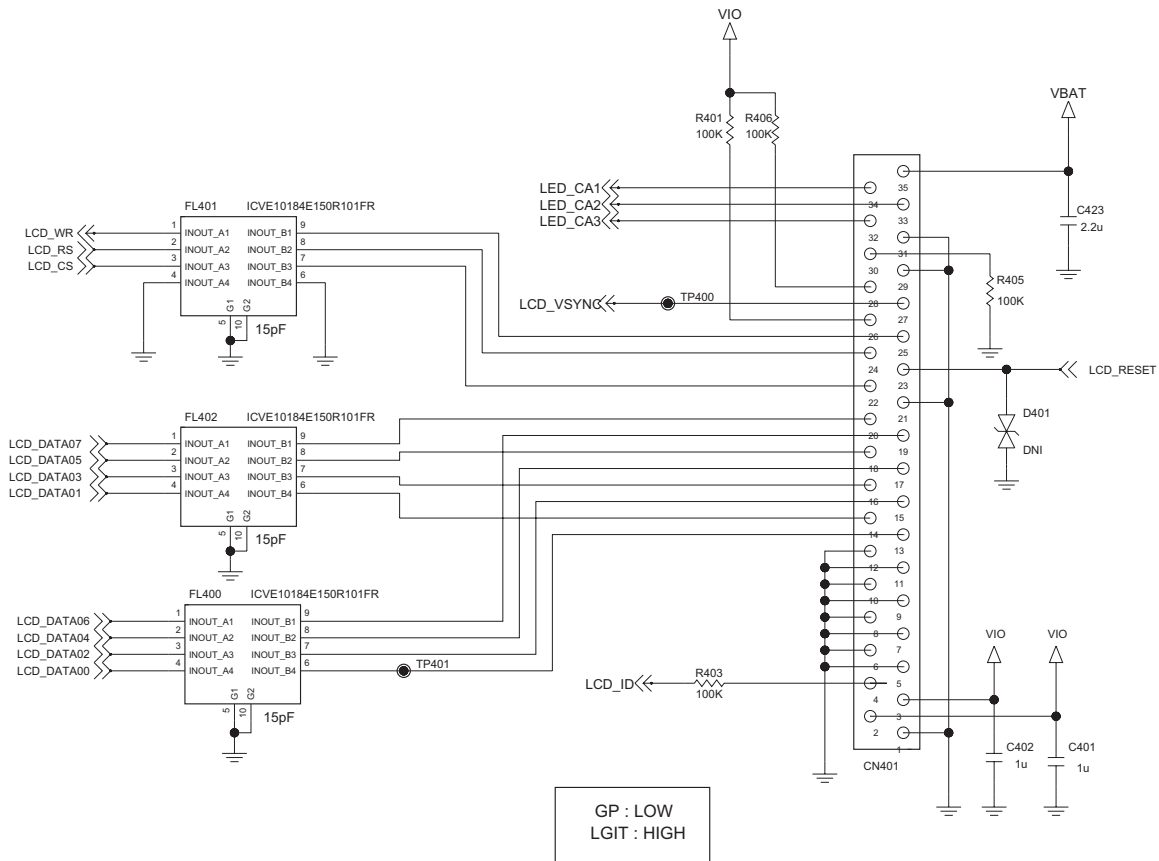


Figure 3.10.1 LCD Interface

ILI9225 is a 262,144-color one-chip SoC driver for a-TFT liquid crystal display with resolution of 176RGBx220 dots, comprising a 528-channel source driver, a 220-channel gate driver, 87120 bytes RAM for graphic data of 176RGBx220 dots, and power supply circuit.

ILI9225 can operate with low I/O interface power supply up to 1.65V, with an incorporated voltage follower circuit to generate voltage levels for driving an LCD.

The ILI9225 also supports a function to display in 8 colors and a standby mode, allowing for precise power control by software. These features make the ILI9225 an ideal LCD driver for medium or small size portable products such as digital cellular phones or small PDA, where long battery life is a major concern.

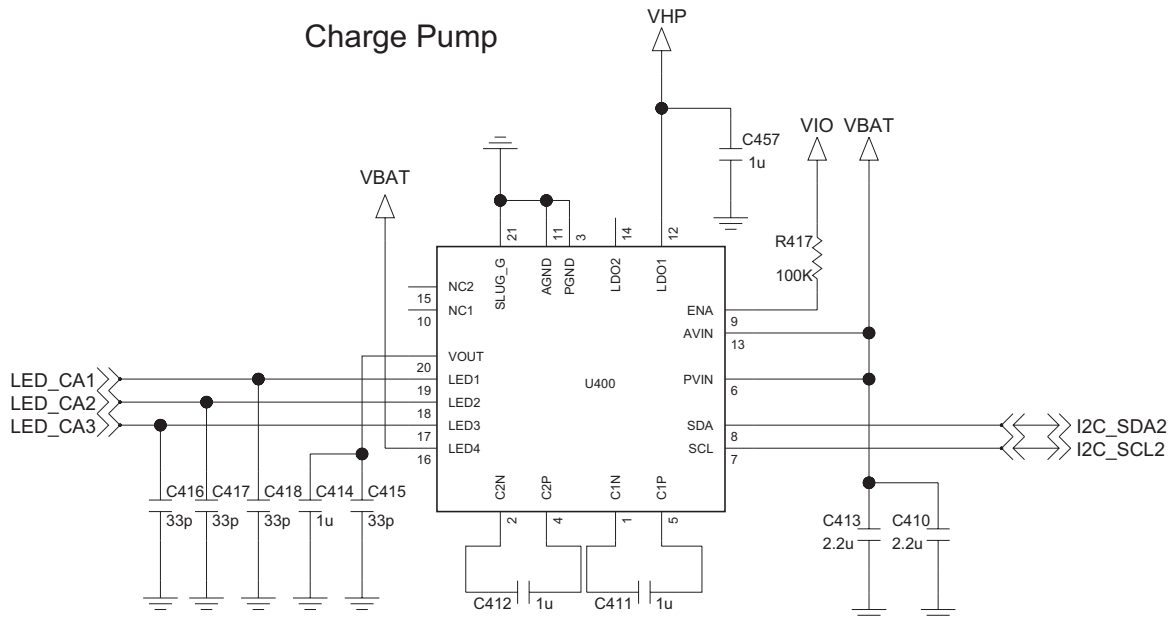


Figure 3.10.2 Charge Pump CIRCUIT DIAGRAM

The RT9367C is an integrated solution for backlighting and phone camera input supply. The part contains a charge pump white LED driver and dual low dropout linear regulators. This IC can be shut down by pulling EN low.

In the section of charge pump, The RT9367C can power up 4 white LEDs with regulated constant current for uniform intensity. Each channel (LED1-LED4) can support up to 25mA. The part maintains highest efficiency by utilizing a x1/x1.5/x2 fractional charge pump and low dropout current regulators. An internal 5-bit DAC is used for brightness control. Users can easily configure up to 32-step of LED current by I2C interface.

In the section of linear regulator, The RT9367C comprises a dual channel, low noise, and low dropout regulator sourcing up to 300mA at each channel. The range of output voltage can be configured from 1.1V to 3.3V by I2C interface. The outputs of LDO offer 3% accuracy and low dropout voltage of 250mV @ 300mA. The LDO also provides current limiting and output short circuit thermal folded back protection.

3. TECHNICAL BRIEF

3.11 Battery Charger Interface

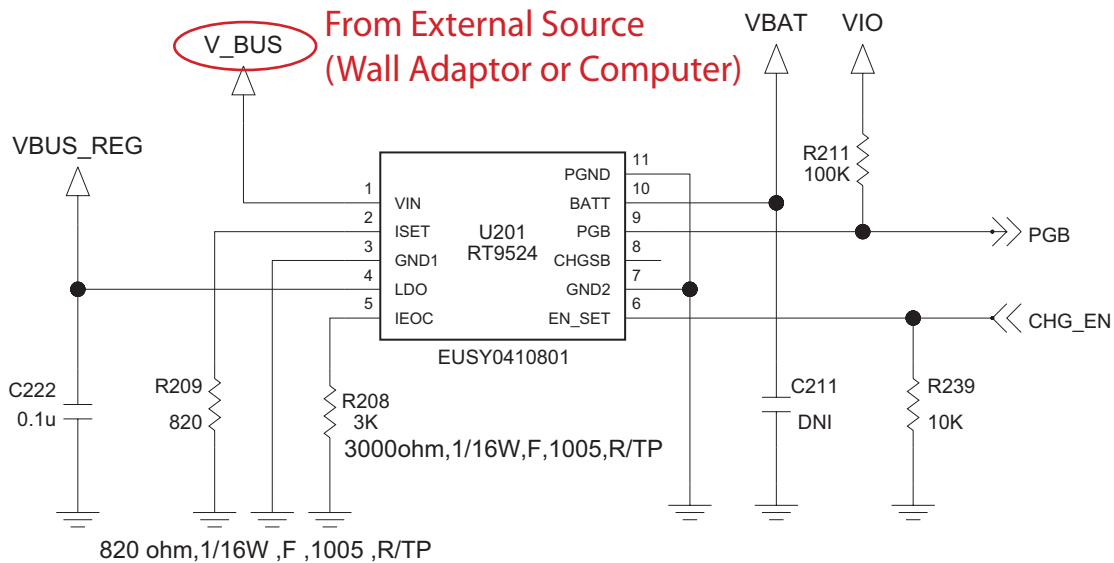


Figure 3.11.1 BATTERY CHARGER BLOCK

The RT9524 is a fully integrated single-cell Li-Ion battery charger IC ideal for portable applications. The RT9524 optimizes the charging task by using a control algorithm including pre-charge mode, fast charge mode and constant voltage mode. The input voltage range of the VIN pin can be as high as 30V. When the input voltage exceeds the OVP threshold, it will turn off the charging MOSFET to avoid overheating of the chip.

In RT9524, the maximum charging current can be programmed with an external resistor. For the USB application, user can set the current to 100mA/500mA through EN/SET pin. For the factory mode, the RT9524 can allow 4.2V/2.3A power pass through to support system operation. It also provides a 50mA LDO to support the power of peripheral circuit. The internal thermal feedback circuit regulates the die temperature to optimize the charge rate for all ambient temperatures. The RT9524 provides protection functions such as under voltage protection, over voltage protection for VIN supply and thermal protection for battery temperature.

The RT9524 is available in a WDFN-10L 2x3 package to achieve optimized solution for PCB space and thermal considerations.

3.12 Keypad Interface

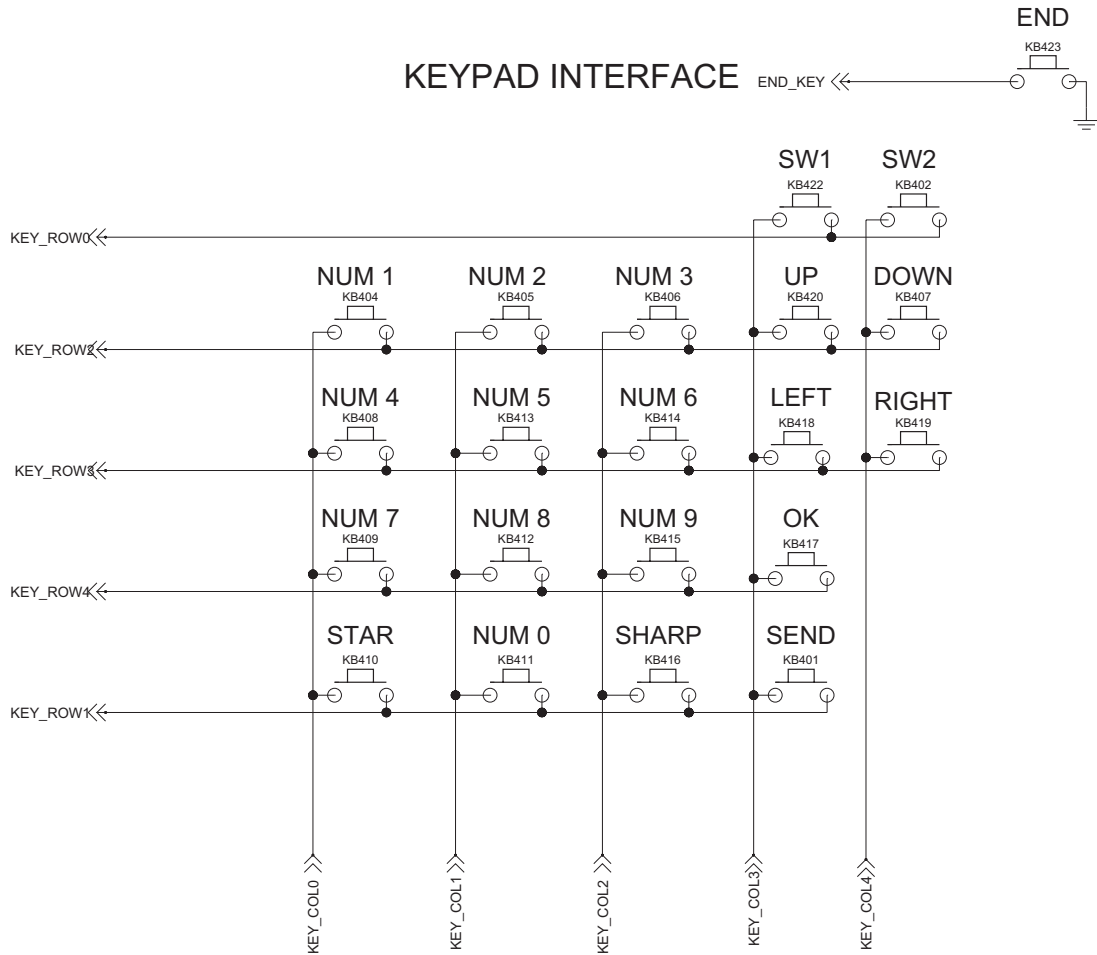


Figure 3.12.1 MAIN KEY STRUCTURE

3. TECHNICAL BRIEF

The keypad can be divided into two parts: one is the keypad interface including 7 columns and 6 rows with one dedicated power-key, as shown in Figure 3.12.2; the other is the key detection block which provides key pressed, key released and de-bounce mechanisms. Each time the key is pressed or released, i.e. something different in the 6 x 7 matrix or power-key, the key detection block senses the change and recognizes if a key has been pressed or released. Whenever the key status changes and is stable, a KEYPAD IRQ is issued. The MCU can then read the key(s) pressed directly in KP_MEM1, KP_MEM2, KP_MEM3, and KP_MEM4 registers. To ensure that the key pressed information is not missed, the status register in keypad is not read-cleared by APB read command. The status register can only be changed by the key-pressed detection FSM.

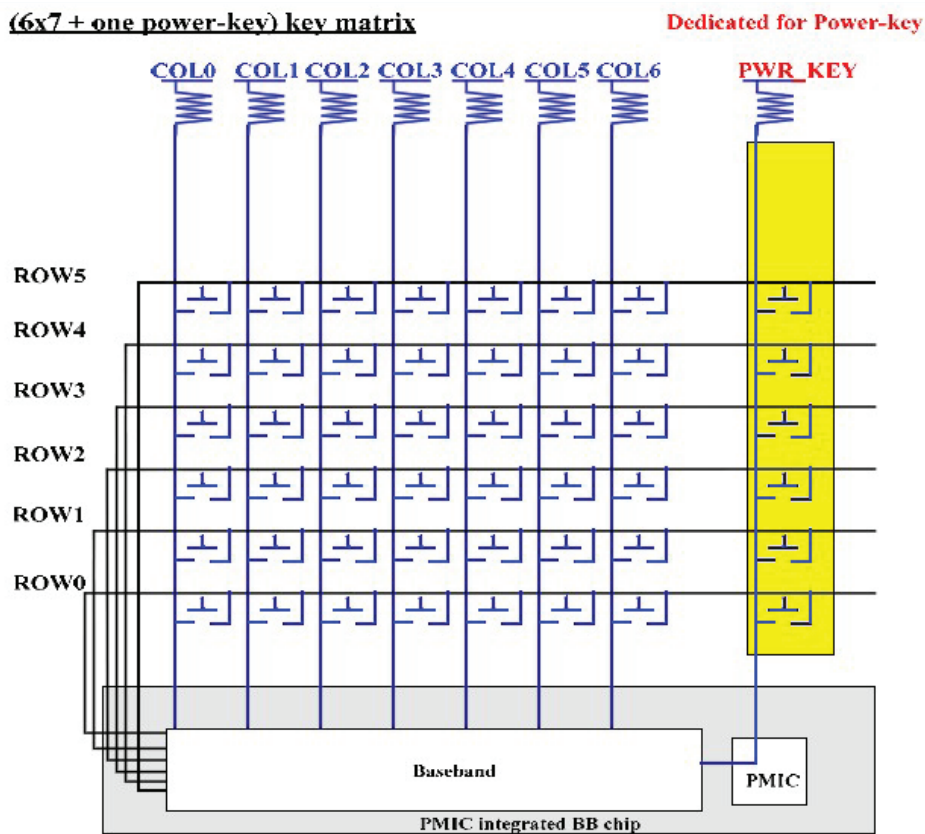


Figure 3.12.2 6x7 matrix with one power-key

This keypad can detect one or two key-pressed simultaneously with any combination. Figure 3.12.3 shows one key pressed condition. Figure 3.12.4(a) and Figure 3.12.4(b) illustrate two keys pressed cases. Since the key press detection depends on the HIGH or LOW level of the external keypad interface, if keys are pressed at the same time and there exists a key that is on the same column and the same row with the other keys, the pressed key cannot be correctly decoded. For example, if there are three key presses: key1 = (x1, y1), key2 = (x2, y2), and key3 = (x1, y2), then both key3 and key4 = (x2, y1) are detected, and therefore they cannot be distinguished correctly. Hence, the keypad can detect only one or two keys pressed simultaneously at any combination. More than two keys pressed simultaneously in a specific pattern retrieve the wrong information.

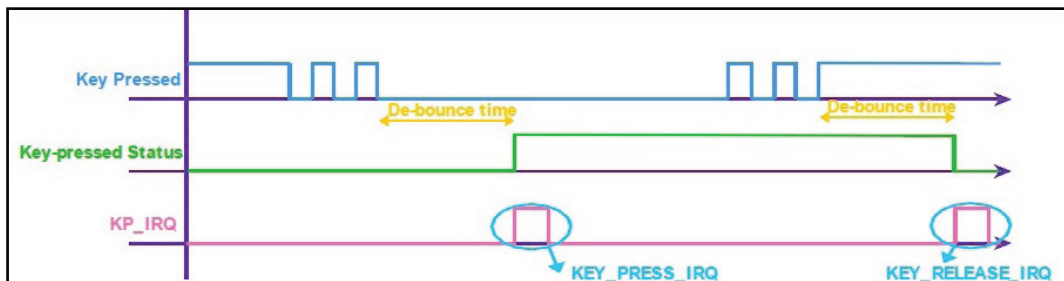


Figure 3.12.3 One key pressed with de-bounce mechanism denoted

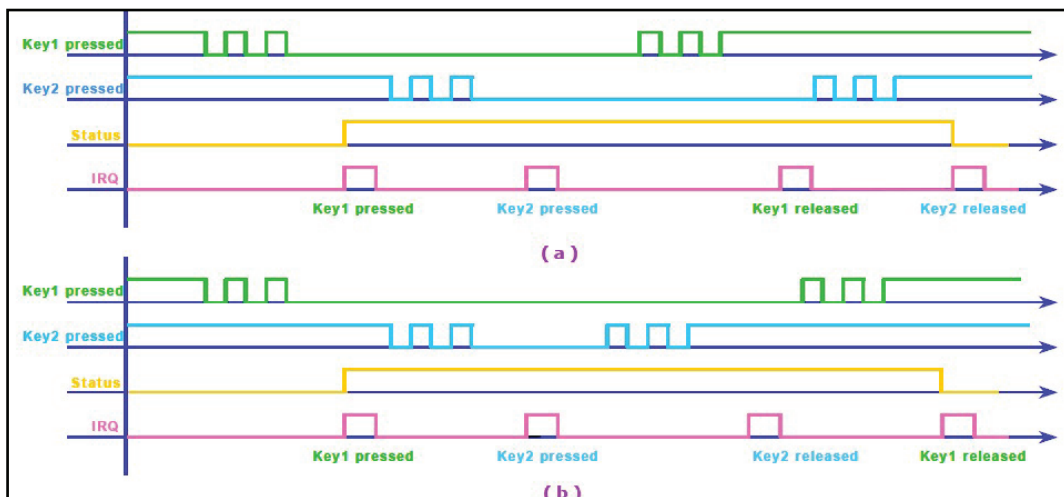


Figure 3.12.4 Two keys pressed, case 1 (b) Two keys pressed, case 2

3. TECHNICAL BRIEF

3.13 Audio Front-End

3.13.1 General Description

The audio front-end essentially consists of voice and audio data paths. Figure 3.13.1 shows the block diagram of the audio front-end. All voice band data paths comply with the GSM 03.50 specification. Mono hands-free audio or external FM radio playback paths are also provided. The audio stereo path facilitates CD-quality playback, external FM radio, and voice playback through a headset.

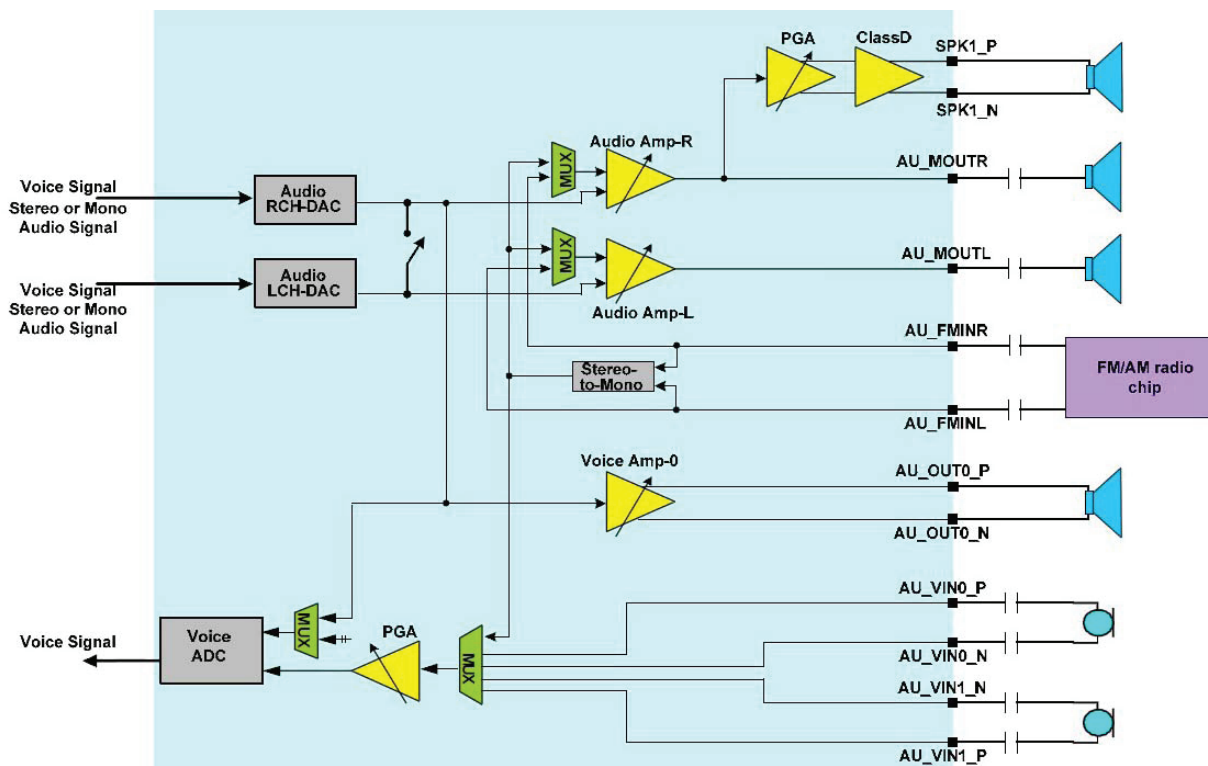


Figure 3.13.1 Block diagram of audio front end

Figure 3.13.2 shows the digital circuits block diagram of the audio front-end. The APB register block is an APB peripheral that stores settings from the MCU. The DSP audio port (DAP) block interfaces with the DSP for control and data communications. The digital filter block performs filter operations for voice band and audio band signal processing. The Digital Audio Interface (DAI) block communicates with the System Simulator for FTA or external Bluetooth modules.

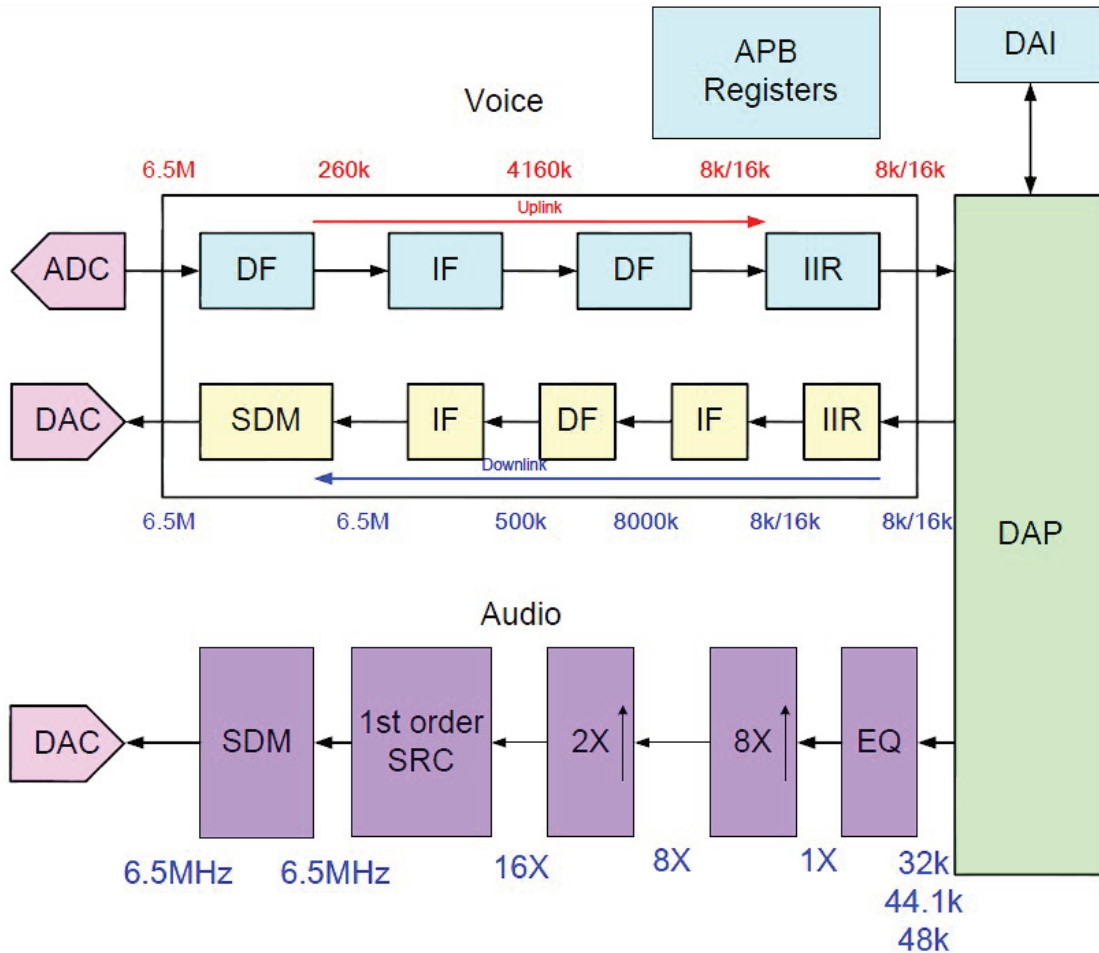


Figure 3.13.2 Block diagram of digital circuit of audio front end

To communicate with the external Bluetooth module, the master-mode PCM interface and master-mode I2S/EIAJ interface are supported. The clock of PCM interface is 256 kHz while the frame sync is 8 kHz. Both long sync and short sync interfaces are supported. The PCM interface can transmit 16-bit stereo or 32-bit mono 8 kHz sampling rate voice signal. Figure 3.13.3 shows the timing diagram of the PCM interface. Note that the serial data changes when the clock is rising and is latched when the clock is falling.

3. TECHNICAL BRIEF

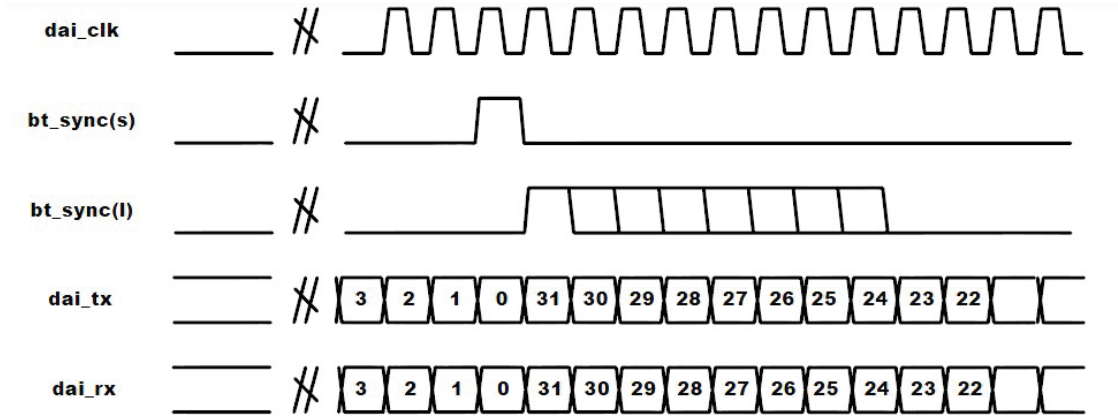


Figure 3.13.3 Timing diagram of Bluetooth application

I2S/EIAJ interface is designed to transmit high quality audio data. Figure 3.13.4 and Figure 3.13.5 illustrate the timing diagram of the two types of interfaces. I2S/EIAJ can support 32 kHz, 44.1 kHz, and 48 kHz sampling rate audio signals. The clock frequency of I2S/EIAJ can be $32 \times$ (sampling frequency), or $64 \times$ (sampling frequency). For example, to transmit a 44.1 kHz CD-quality music, the clock frequency should be $32 \times 44.1 \text{ kHz} = 1.4112 \text{ MHz}$ or $64 \times 44.1 \text{ kHz} = 2.8224 \text{ MHz}$.

I2S/EIAJ interface is not only used for Bluetooth module, but also for external DAC components. Audio data can easily be sent to the external DAC through the I2S/EIAJ interface. In this document, the I2S/EIAJ interface is referred to as EDI (External DAC Interface).

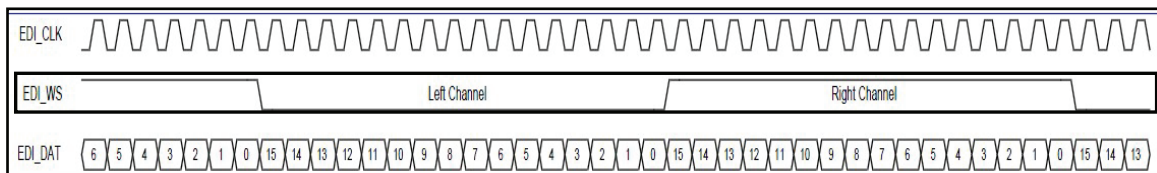


Figure 3.13.4 Block diagram of digital circuit of audio front end

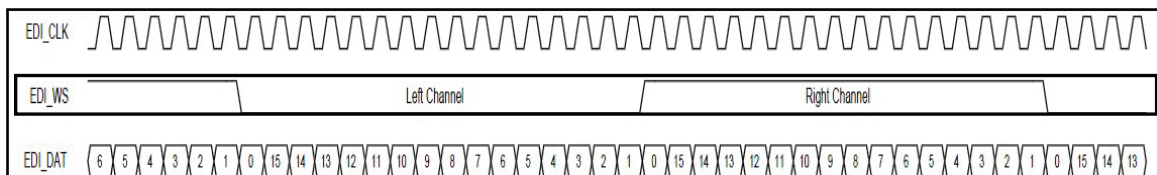


Figure 3.13.5 Block diagram of digital circuit of audio front end

3.14 Camera Interface

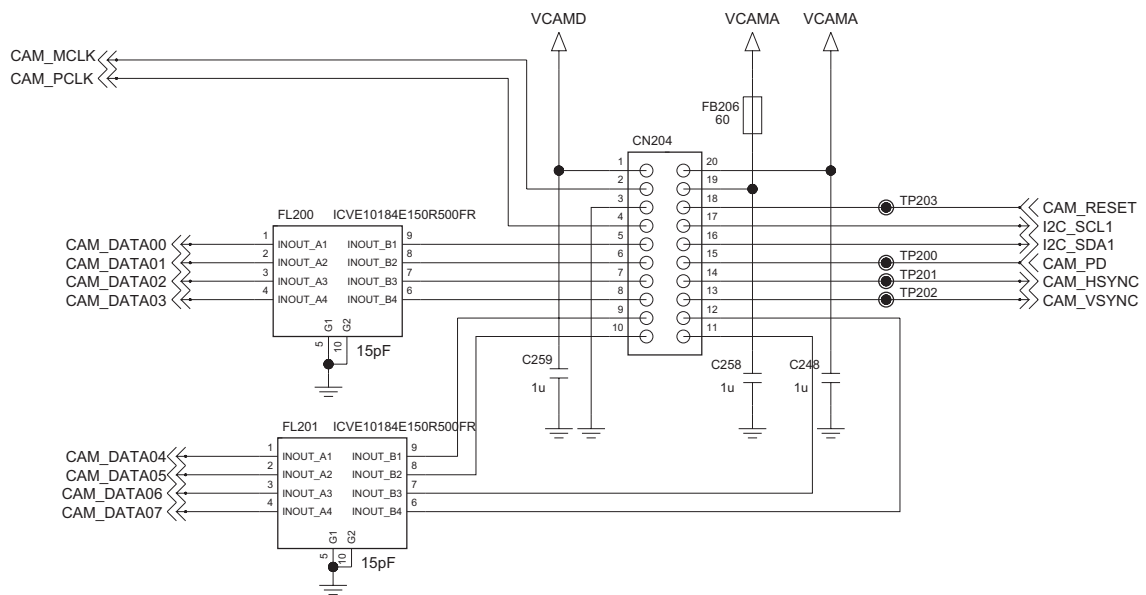


Figure 3.14.1 Camera Interface

The S5KA3DFX is a highly integrated VGA camera chip which includes CMOS image sensor (CIS) and Image Signal Processor (ISP). It is fabricated by SAMSUNG 0.13 μ m CMOS image sensor process developed for imaging application to realize high-efficiency and low-power photo sensor. The sensor consists of 640 x 480 effective pixels which meet with 1/10 inch optical format. The CIS has onchip 10-bit ADC arrays to digitize the pixel output and also on-chip Correlated Double Sampling (CDS) to reduce Fixed Pattern Noise (FPN) drastically. The ISP performs sophisticated image processing functions including color interpolation and correction, lens shading correction, edge enhancement, gamma correction, image scaling, noise reduction, auto exposure (AE), auto white balance (AWB), auto flicker correction, and auto defect correction. The AE and AWB functions are performed by an embedded 8-bit processor which uses to run built-in these sophisticated algorithms. The programmable functions are controlled by host processor via 2-wire I2C bus interface. The S5KA3DFX, which needs a single master clock, is suitable for low power camera module with 2.8V/1.8V or 2.8V/1.5V power supply.

3. TECHNICAL BRIEF

3.14.1 FEATURES

- Optical size : 1/10 inch
- Unit pixel size : 2.25 μm x 2.25 μm
- Effective resolution : 656 (H) x 496 (V), VGA
- Color filter : RGB Bayer Pattern
- Shutter type : Electronic Rolling Shutter
- Scan mode : Line Progressive Readout
- Output format : Parallel 10/9/8-Bit (ITU-R.601/656 YUV422, RGB565, RGB444, and RAW10)
Serial CCP-1 (YUV422, 565RGB, 444RGB, and RAW10)
- Frame rate : 15fps@VGA, 13MHz (30fps@VGA, 26MHz)
- ADC resolution : 10-Bit
- Lens shading correction
- Color interpolation and color correction
- Noise reduction
- Edge enhancement
- Gamma correction
- Image effect: sepia, negative, gray, red, green, blue
- Image scaling: CIF(352x288), QVGA(320x240), QCIF(176x144), QQVGA(160x120), and SubQCIF(128x96)
- Auto bad pixel replacement (defect correction, continuous 2x2 cluster removable)
- Auto flicker correction
- Auto exposure (AE)
- Auto white balance (AWB)
- Programmable functions:
 - WOI (Window of Interest) panning, cropping, sizing and sub-sampling
 - Vertical flip and horizontal mirror
 - Exposure, gain, and frame rate control
- Host interface: I2C bus interface
- Internal PLL
- Internal regulator for 1.8V core supply voltage
- 8-bit parallel data interface
- Built-In test image generation
- Stand-by mode for power saving
- Operating temperature: -20°C to +60°C
- Supply voltage: 2.8V for analog, 1.8V or 1.5V for digital core and 1.8-2.8V for I/O
- Maximum pixel (data output) clock : 26MHz
- External master clock : up to 26MHz

3.15 KEY BACKLIGHT LED Interface

Key Backlight LED is controlled by KEYPAD_LED signal of MT6253. The built-in open drain output switch drives the Keypad LED in the handset. This switch is controlled by baseband with the enable register. The keypad LED can sink 150mA and will become high impedance as disabled.

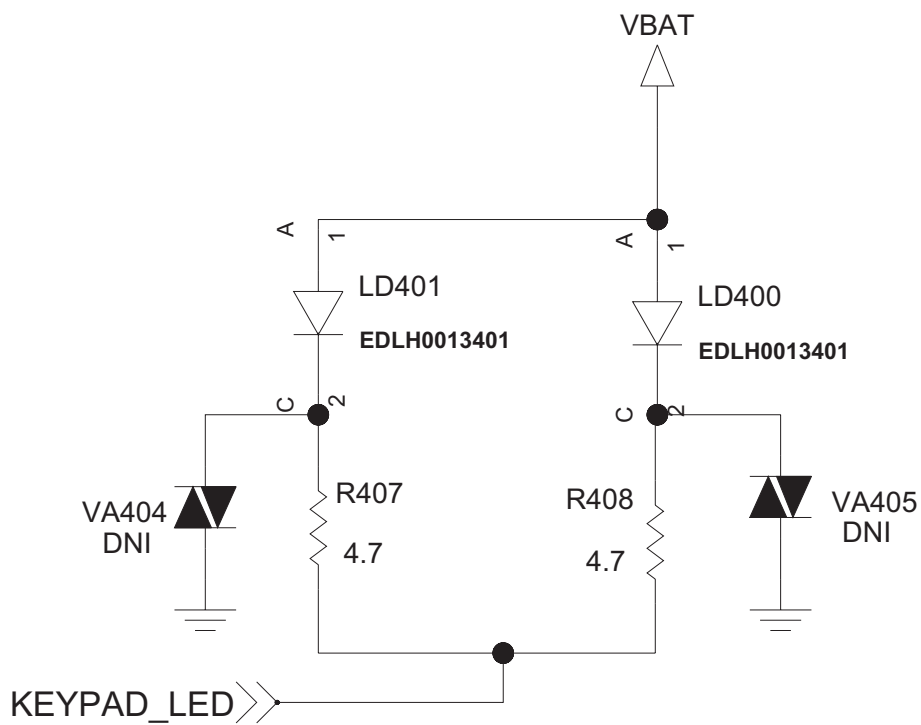


Figure 3.15.1 Key Backlight Block

3. TECHNICAL BRIEF

3.16 Vibrator Interface

Vibrator is driven by BJT with bias resistor.

VBAT is connected with + terminal of vibrator and – terminal is connected with VIB_N. It is controlled by VIBRATOR signal of MT6253 with only ON/OFF function.

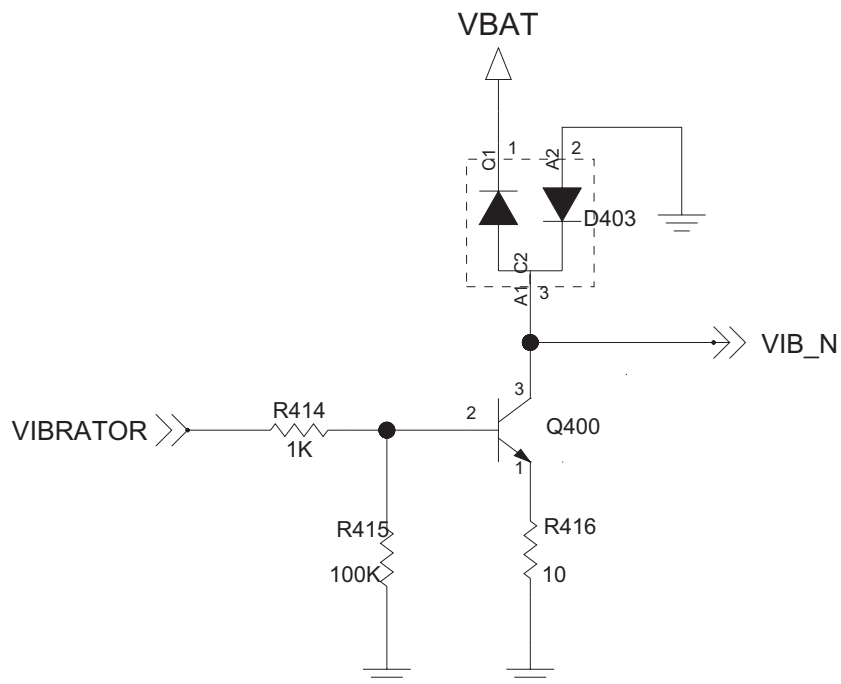


Figure 3.16.1 Vibrator Driver Block

4. TROUBLE SHOOTING

4.1 RF Component

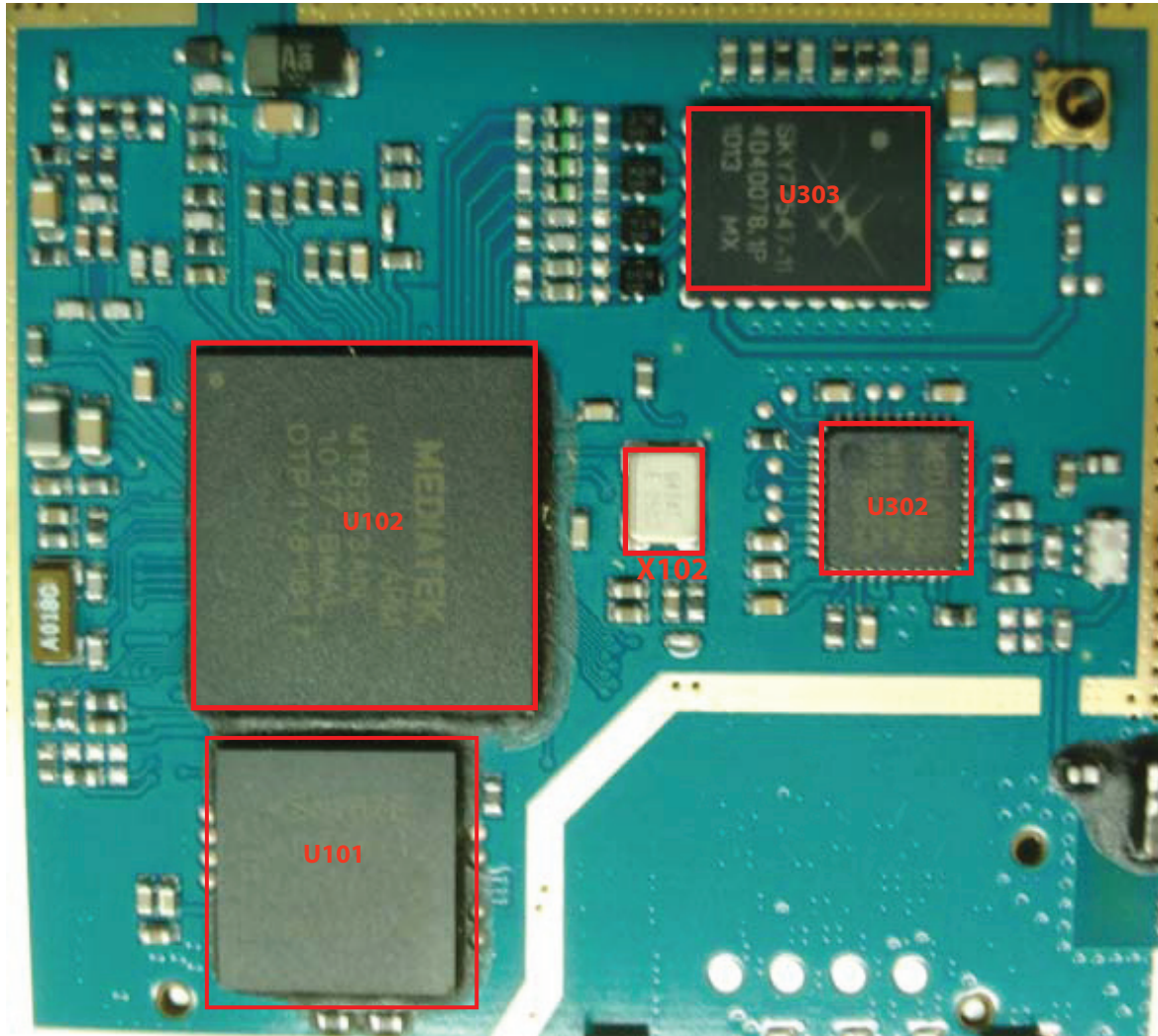


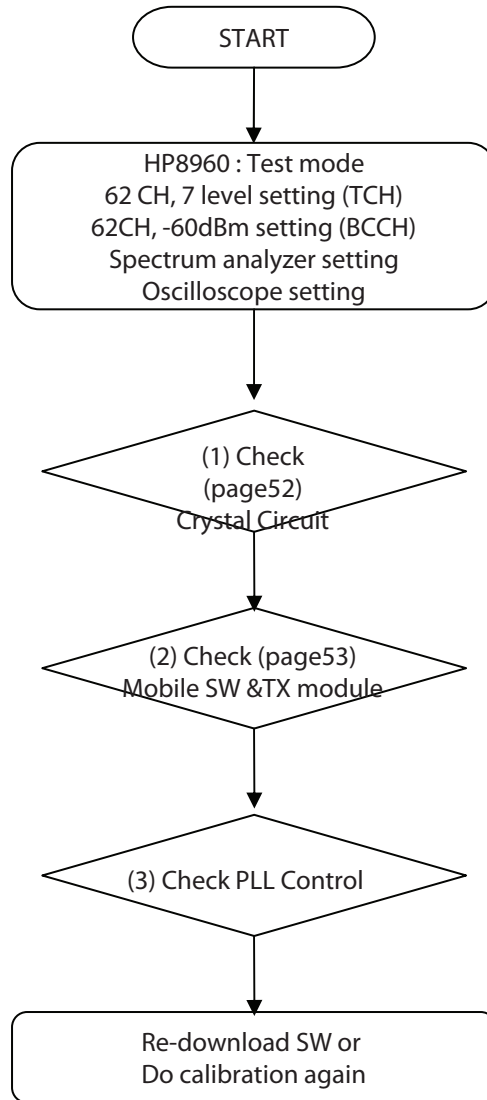
Figure 4.1

U101	Memory(256NOR/648pSDRAM) PF38F4050M0Y3DF
U102	Main Chip (MT6253)
U302	Bluetooth Chip (MT6612)
U303	TX Module (SKY77547)
X102	Crystal, 26MHz Clock

4. TROUBLE SHOOTING

4.2 RX Trouble

CHECKING FLOW



(1) Checking Crystal Circuit

TEST POINT

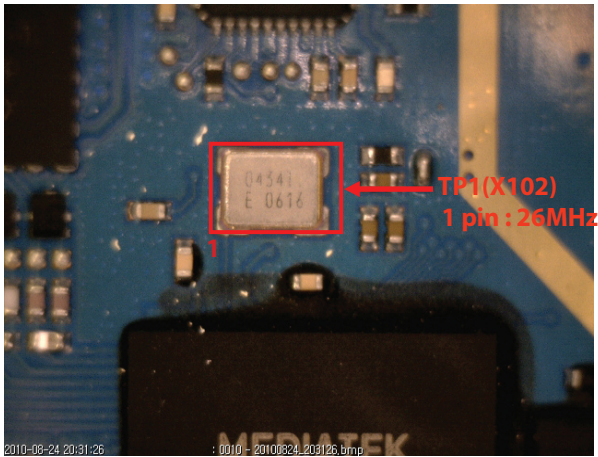
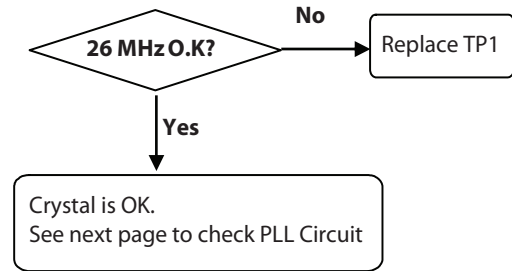
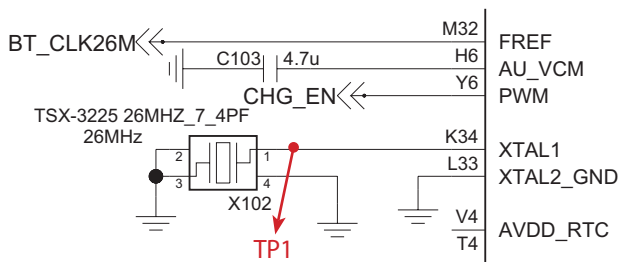


Figure 4.2.1

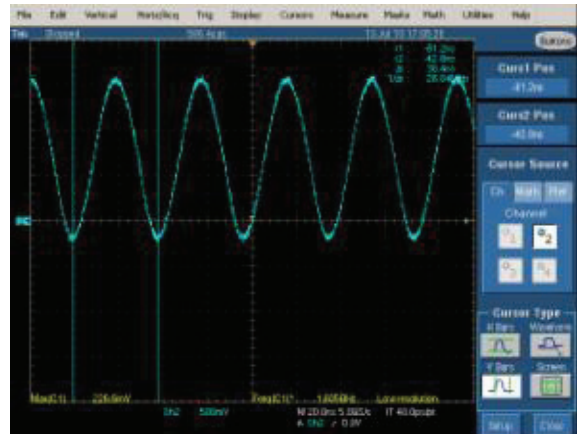
CHECKING FLOW



CIRCUIT



WAVEFORM



4. TROUBLE SHOOTING

(2) Checking Mobile SW &Tx module

TEST POINT

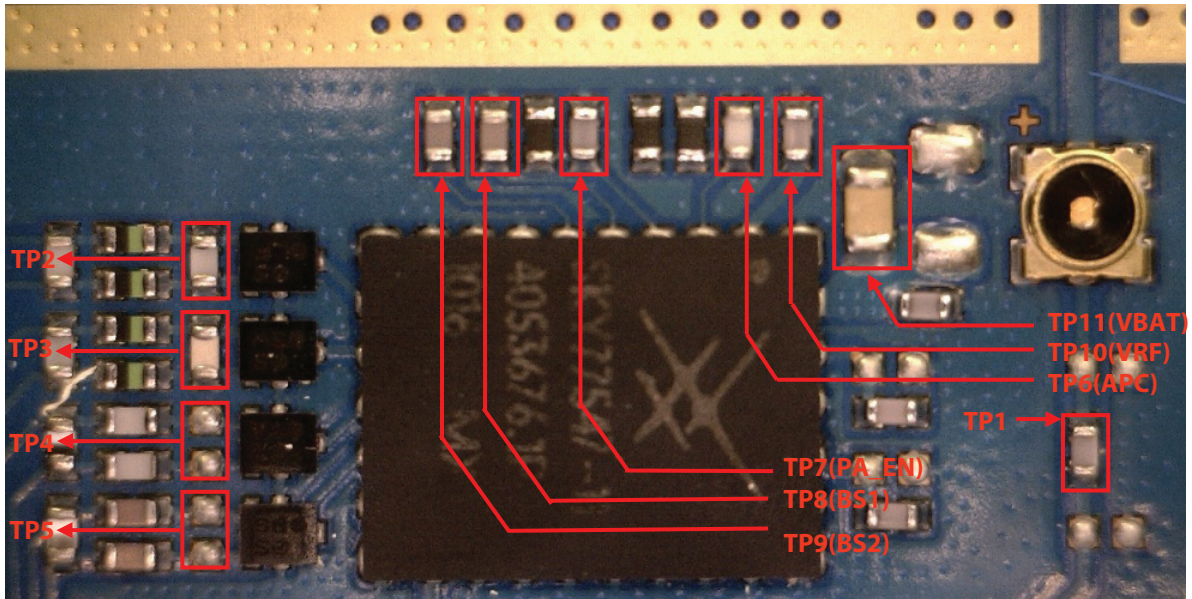
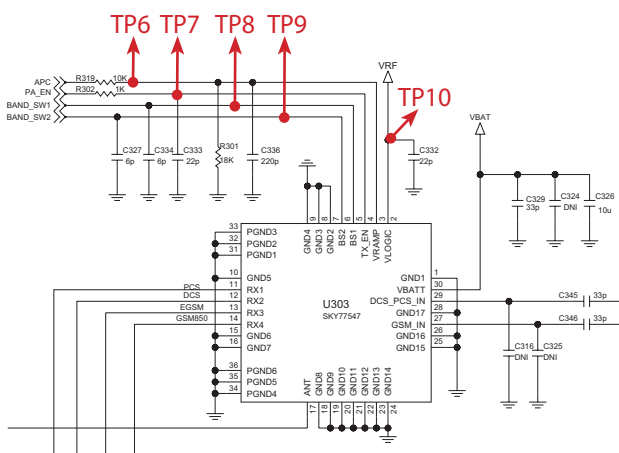


Figure 4.2.4

CIRCUIT

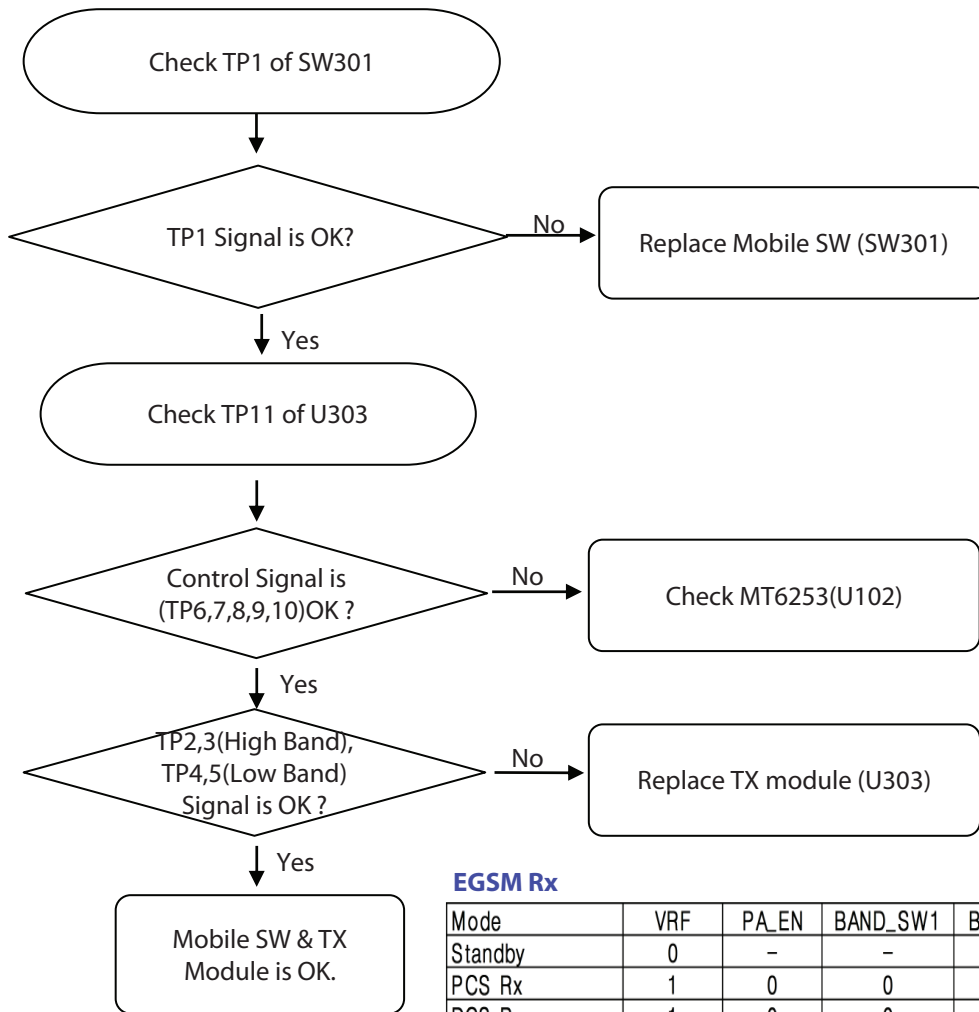


CONTROL LOGIC

EGSM Rx



CHECKING FLOW



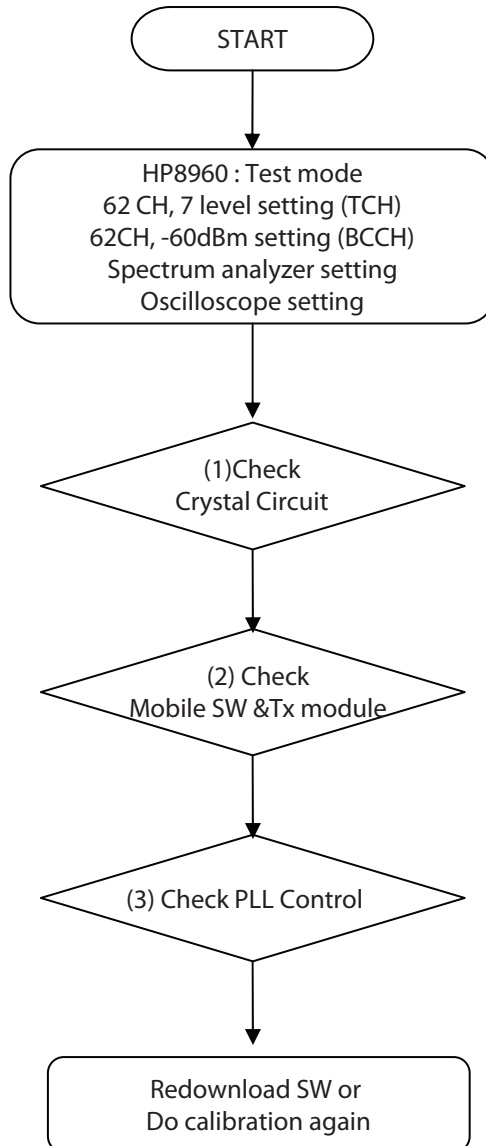
EGSM Rx

Mode	VRF	PA_EN	BAND_SW1	BAND_SW2
Standby	0	-	-	-
PCS Rx	1	0	0	0
DCS Rx	1	0	0	1
EGSM Rx	1	0	1	1
GSM850 Rx	1	0	1	0
GSM_OUT	1	1	0	-
DCS_PCS_OUT	1	1	1	-

4. TROUBLE SHOOTING

4.3 TX Trouble

CHECKING FLOW



(1) Checking Crystal Circuit

TEST POINT

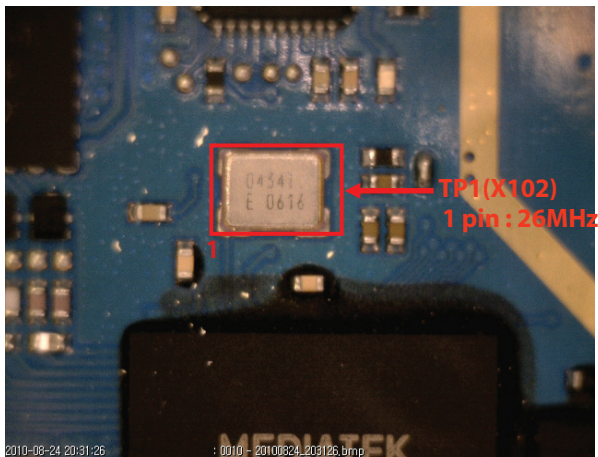
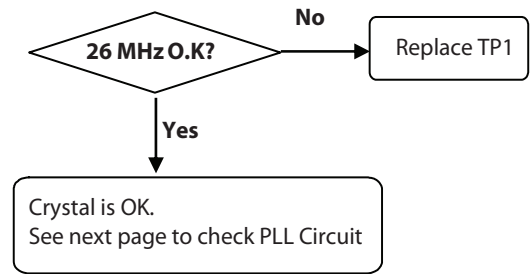
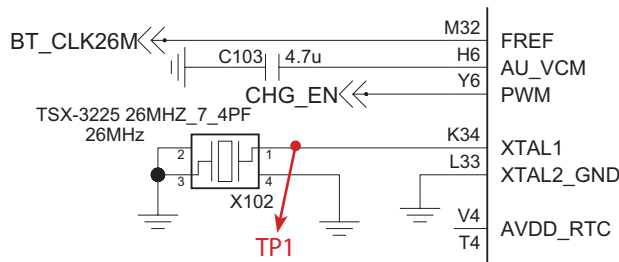


Figure 4.3.1

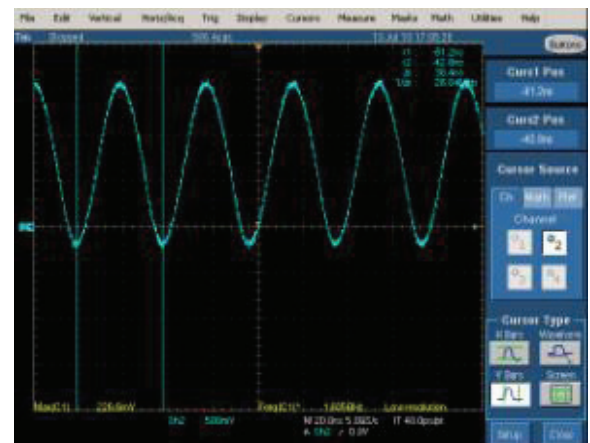
CHECKING FLOW



CIRCUIT



WAVEFORM



4. TROUBLE SHOOTING

(2) Checking Mobile SW & TX Module

TEST POINT

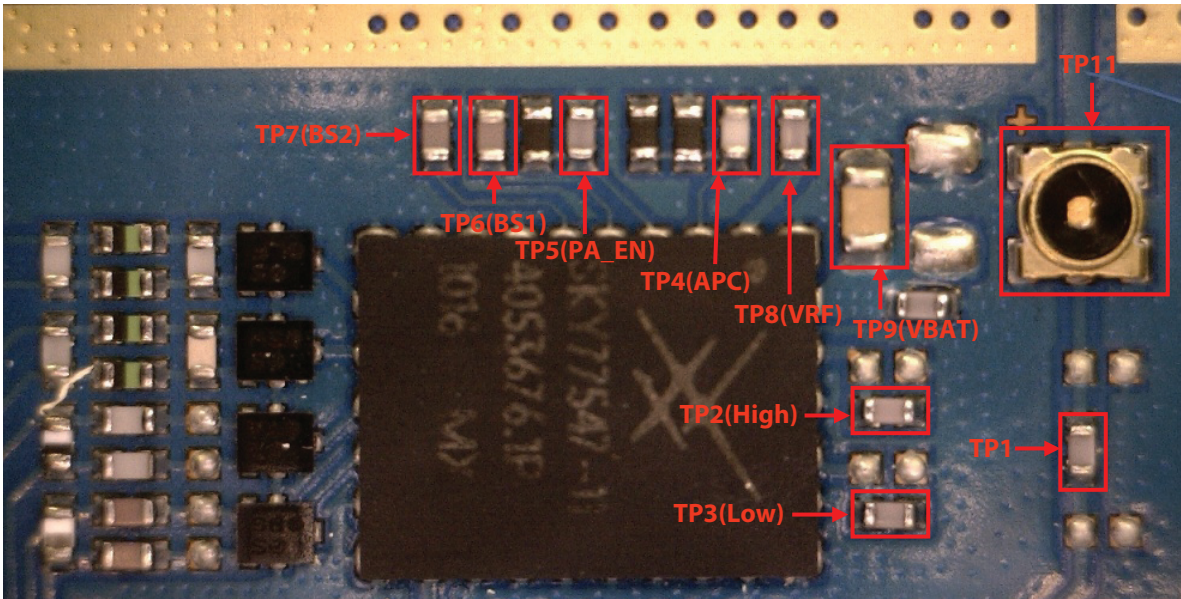
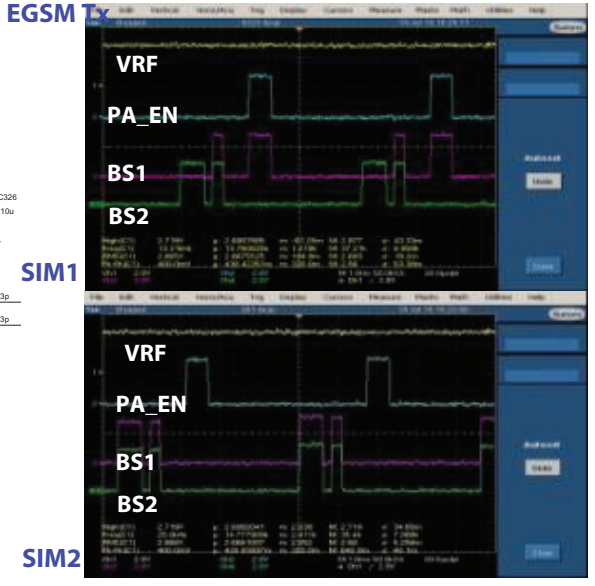
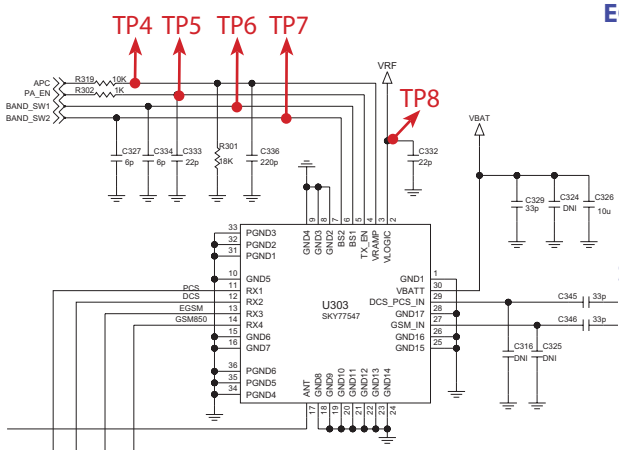


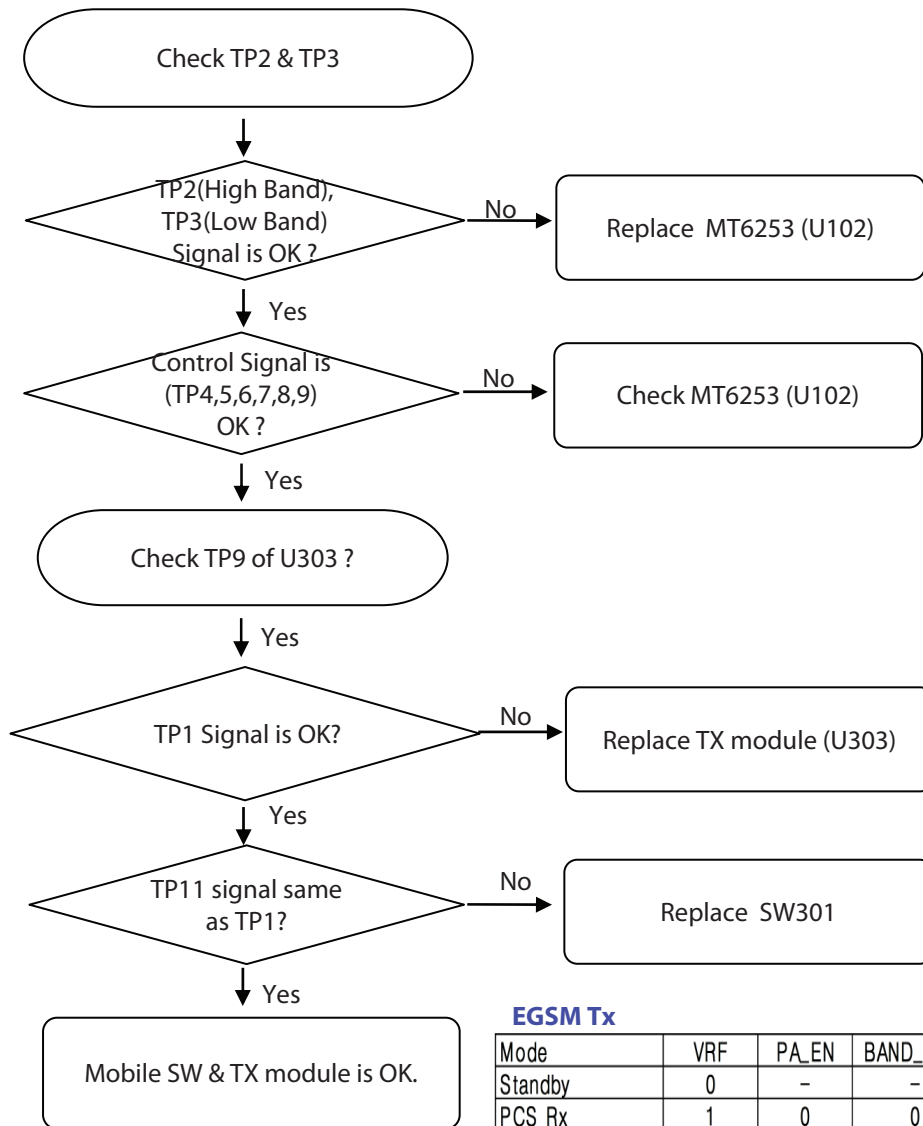
Figure 4.3.4

CIRCUIT

CONTROL LOGIC



CHECKING FLOW



EGSM Tx

Mode	VRF	PA_EN	BAND_SW1	BAND_SW2
Standby	0	-	-	-
PCS Rx	1	0	0	0
DCS Rx	1	0	0	1
EGSM Rx	1	0	1	1
GSM850 Rx	1	0	1	0
GSM_OUT	1	1	0	-
DCS_PCS_OUT	1	1	1	-

4. TROUBLE SHOOTING

4.4 Power On Trouble

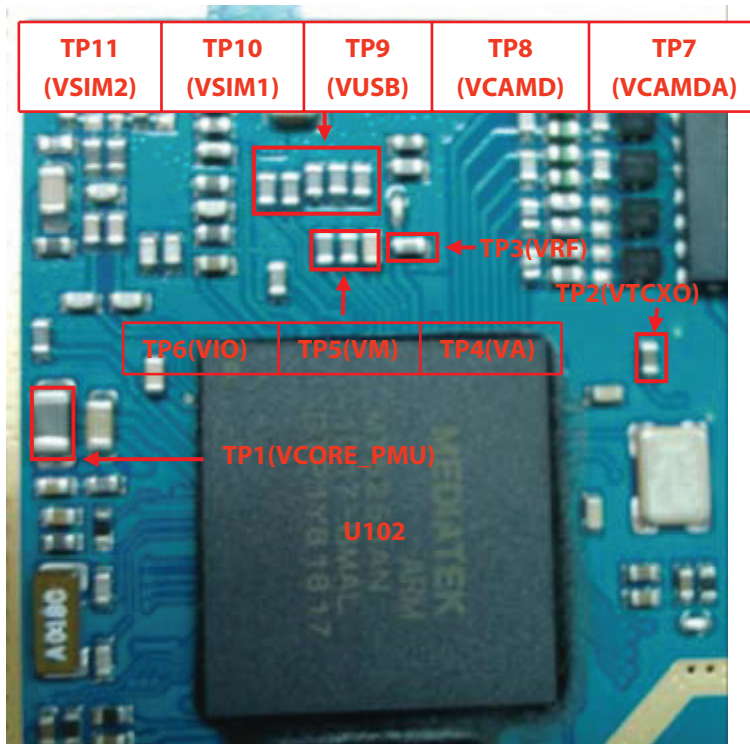


Figure 4.4.1

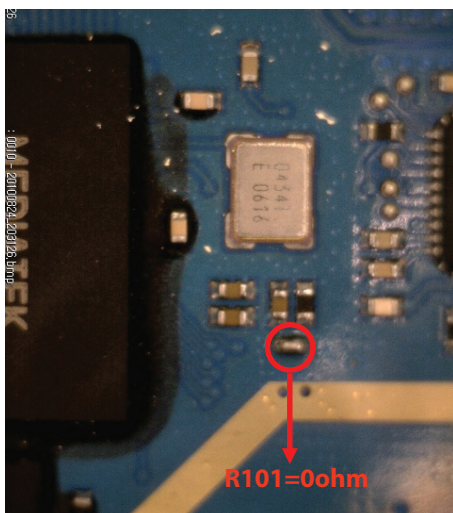


Figure 4.4.2

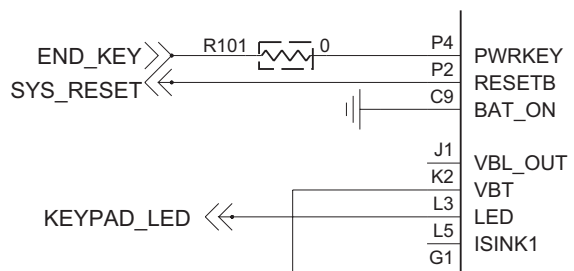


Figure 4.4.3 Remote power on

4. TROUBLE SHOOTING

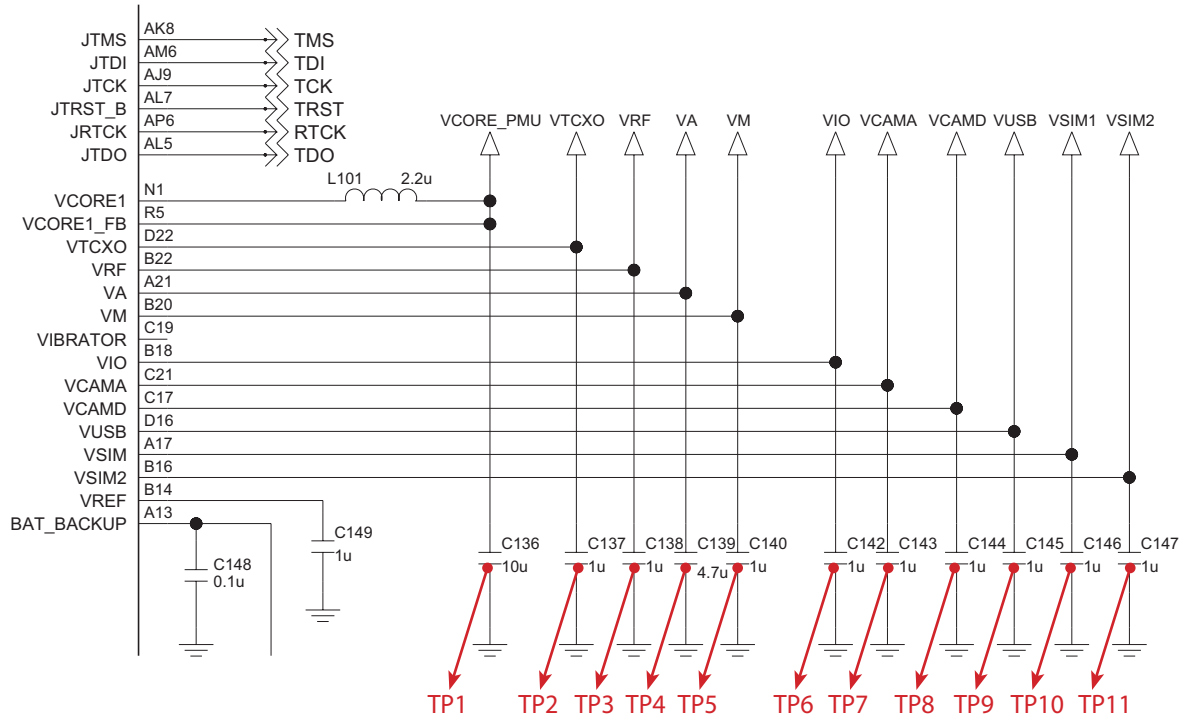
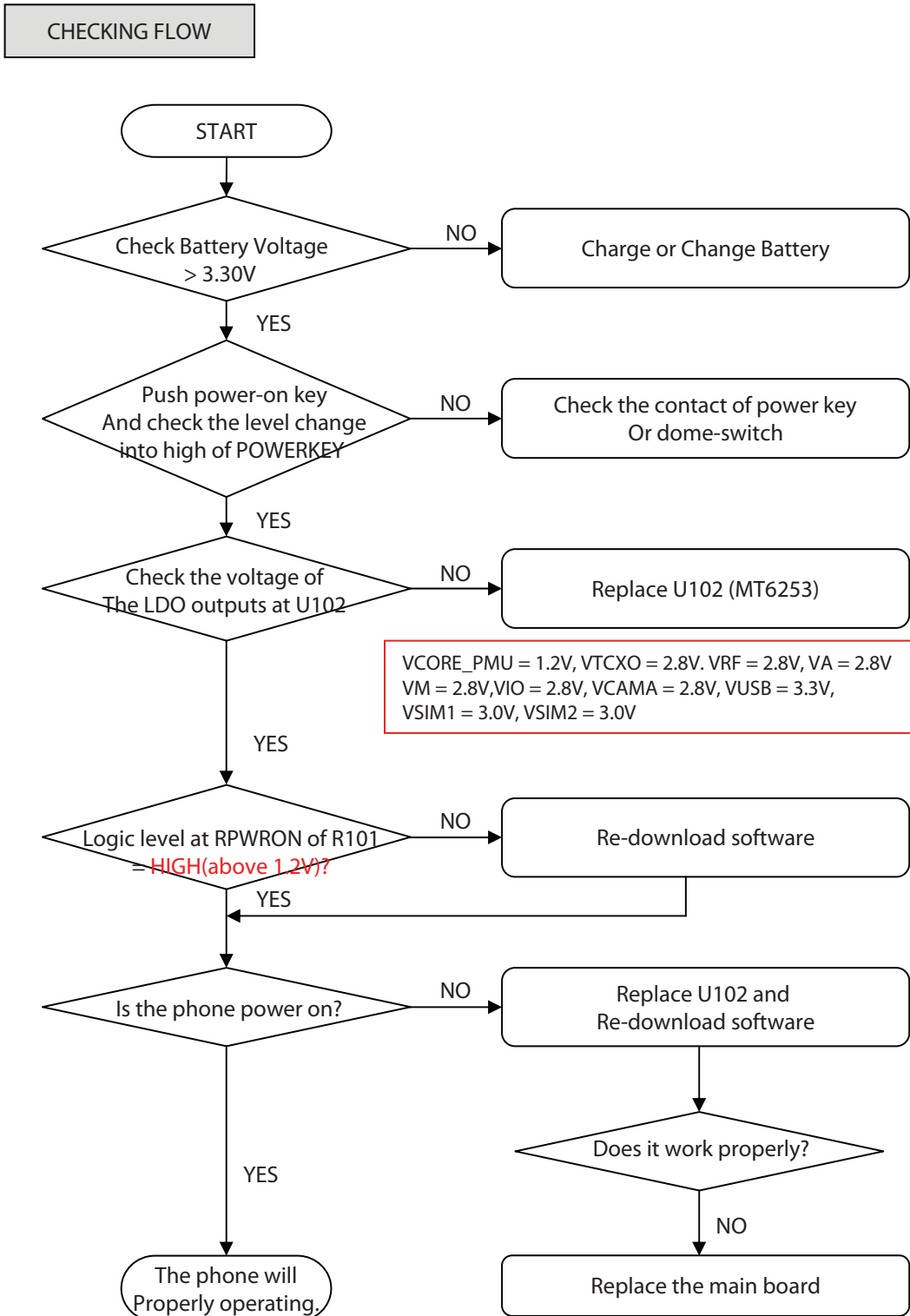


Figure 4.4.4 Power Block of LG-A160

4. TROUBLE SHOOTING



4.5 Charging Trouble

TEST POINT

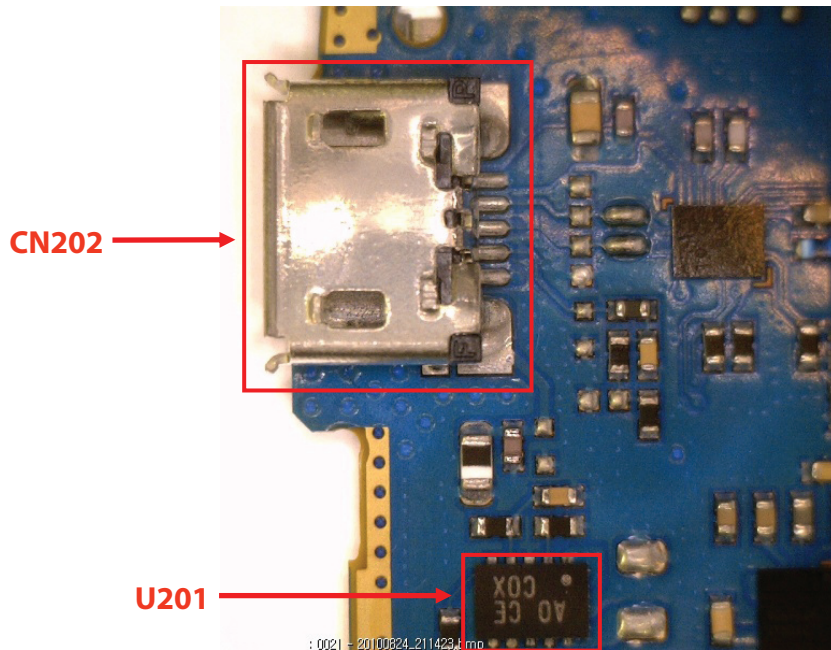
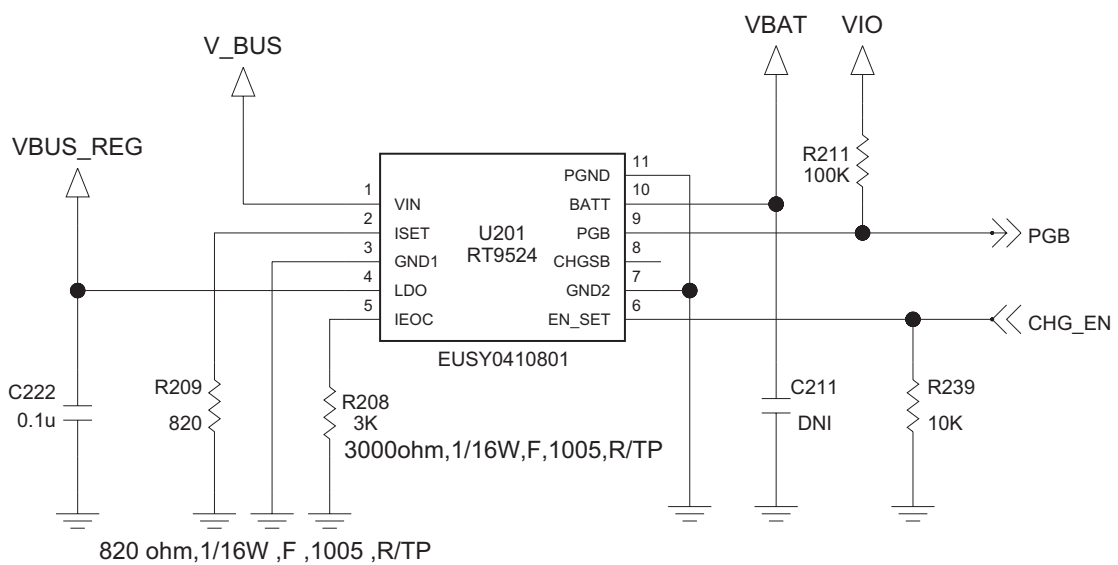
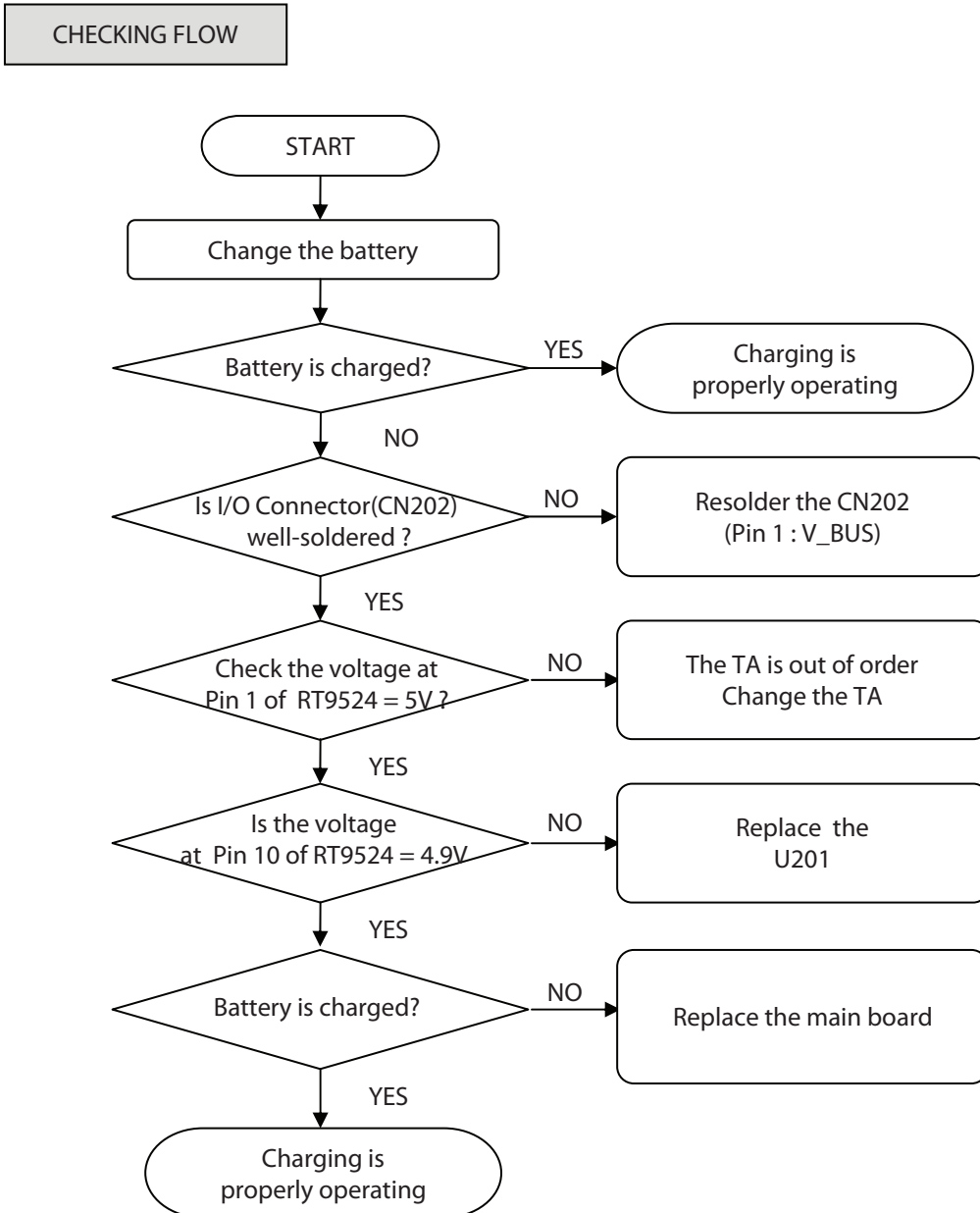


Figure 4.5.1

CIRCUIT



4. TROUBLE SHOOTING



4.6 Vibrator Trouble

TEST POINT

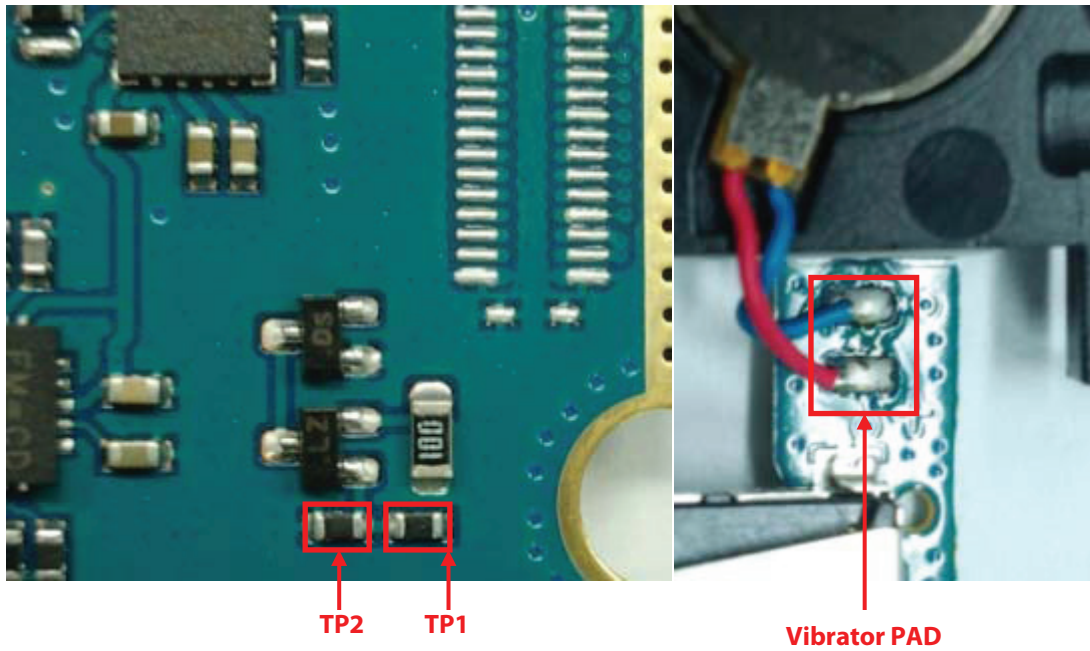
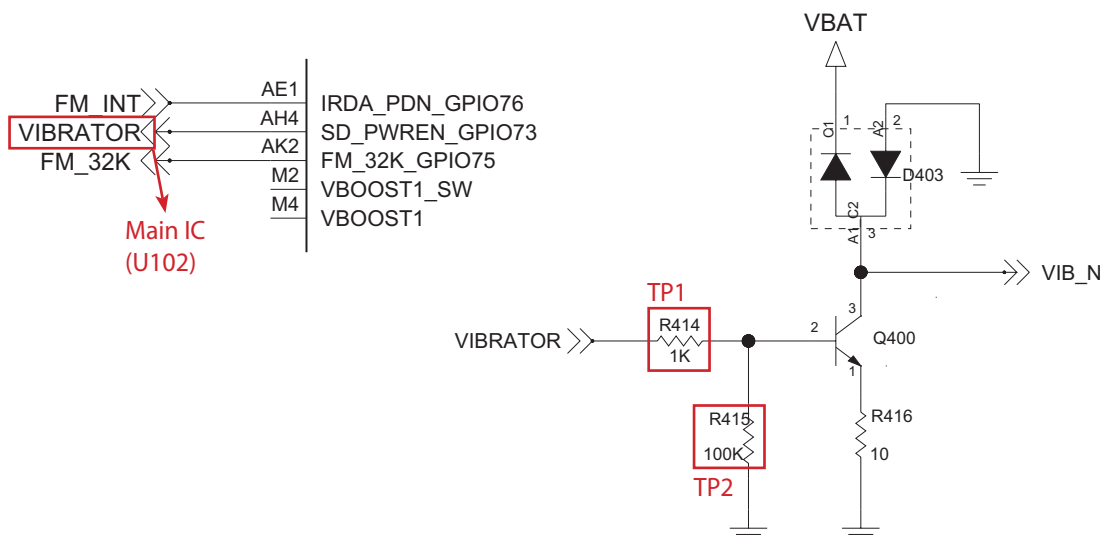


Figure 4.6

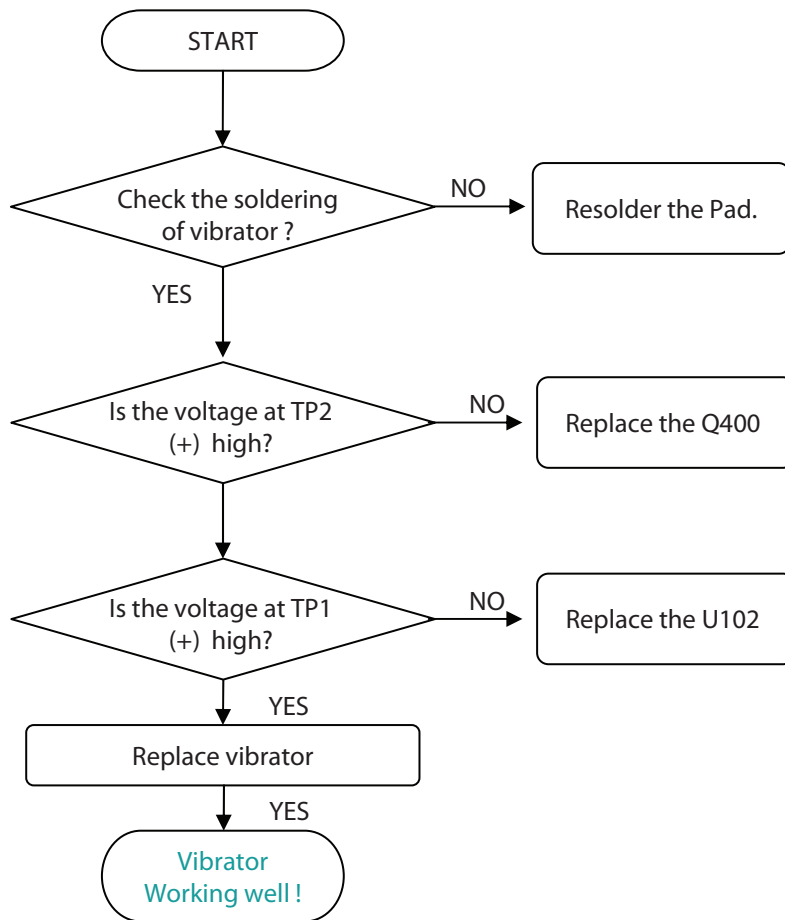
CIRCUIT



4. TROUBLE SHOOTING

CHECKING FLOW

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



4.7 LCD Trouble

TEST POINT

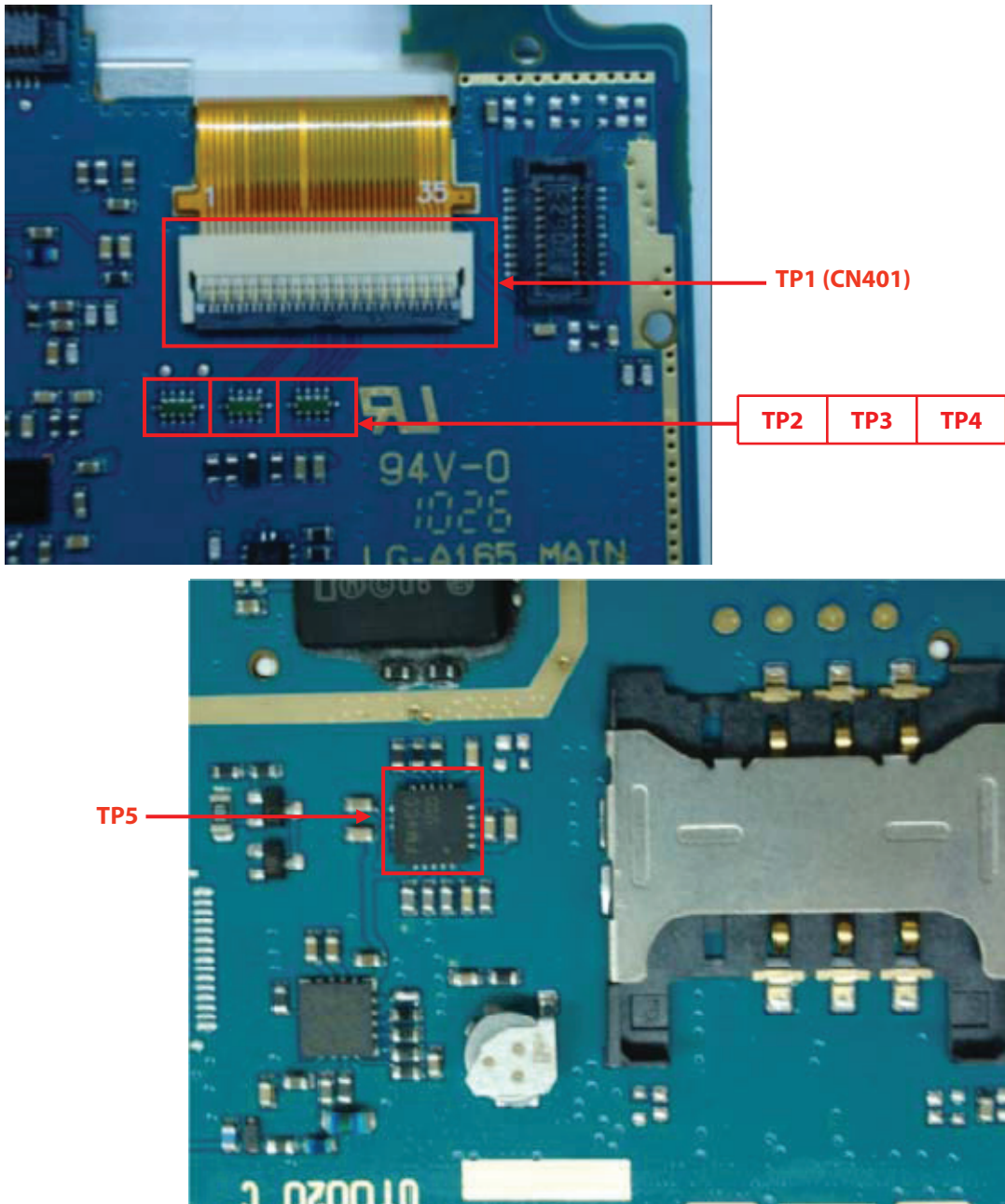
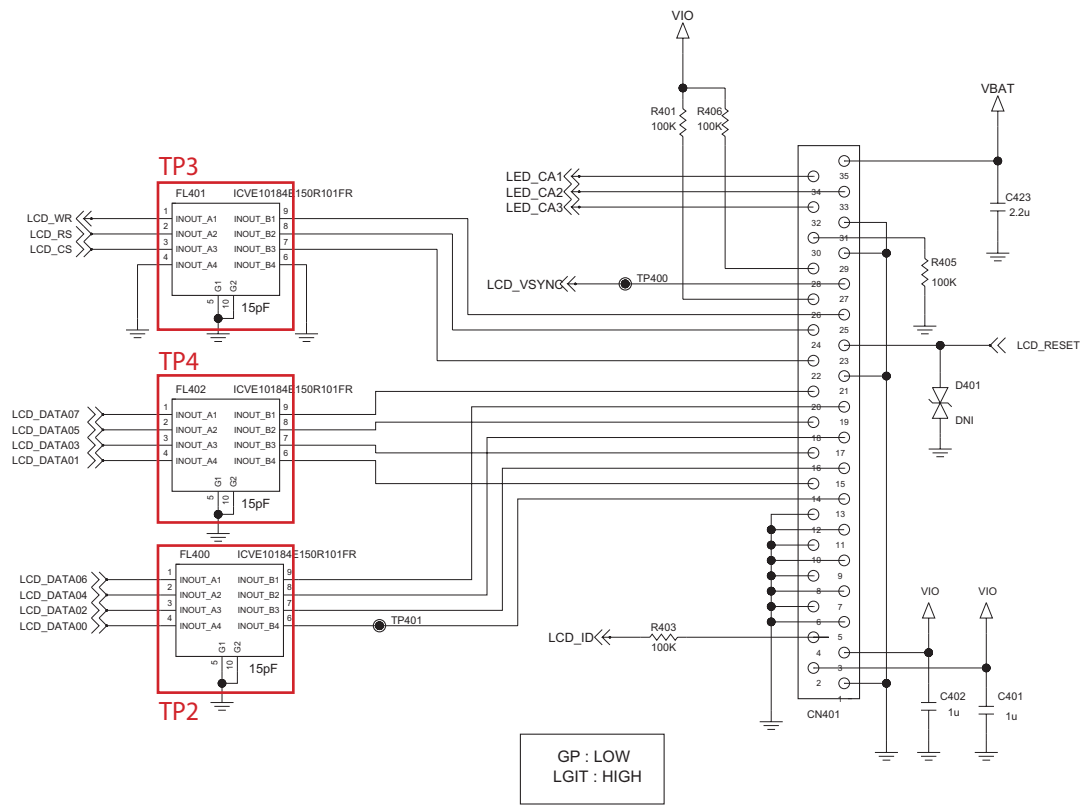


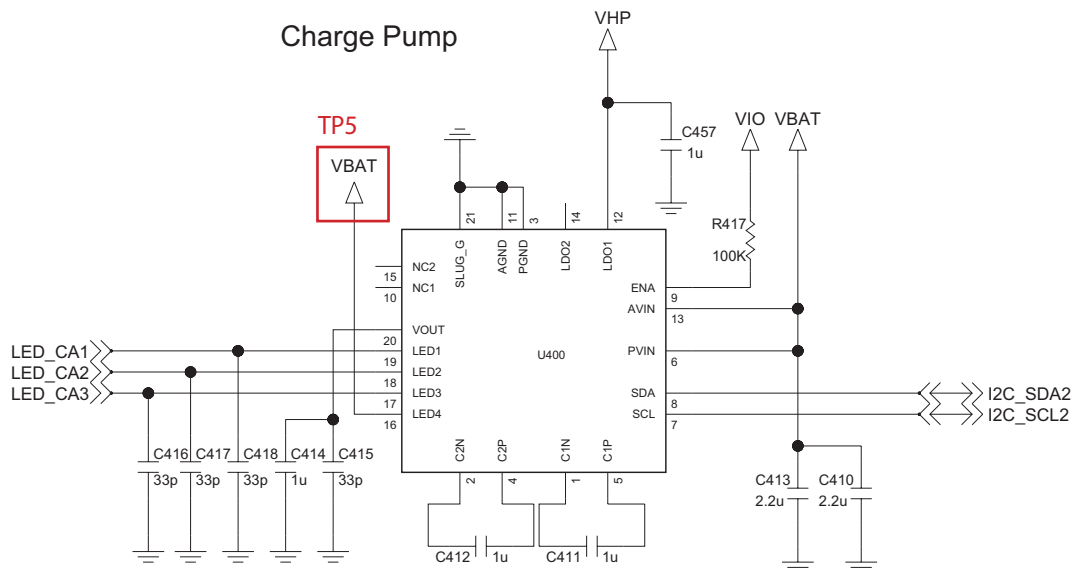
Figure 4.7.1

4. TROUBLE SHOOTING

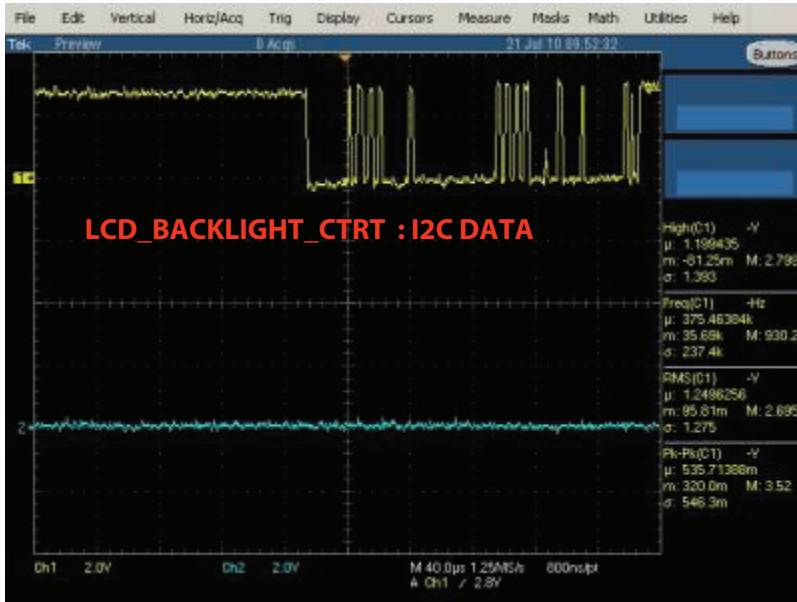
CIRCUIT



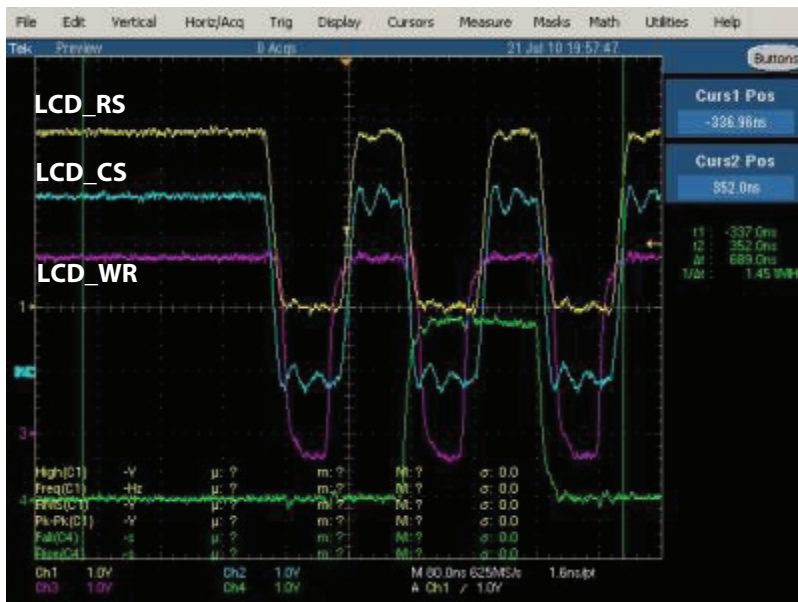
Charge Pump



Waveform



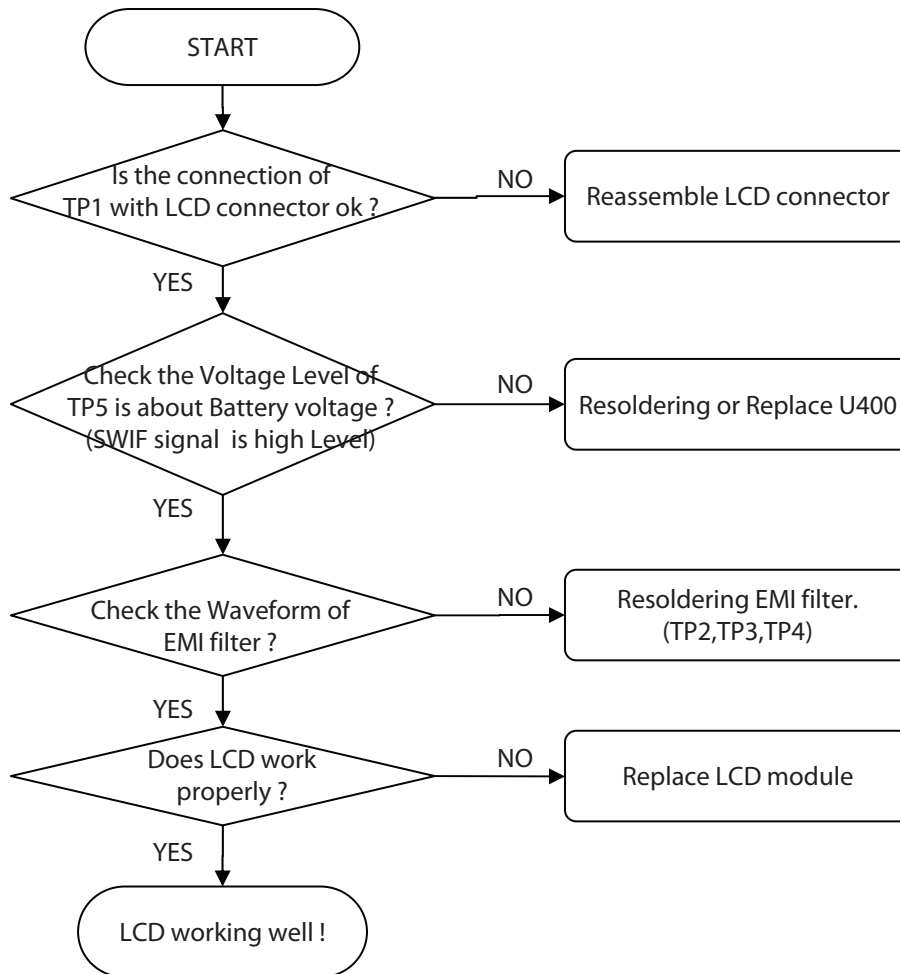
Graph 4.7.1. LCD Backlight Control Signal Waveform



Graph 4.7.2. LCD Data Waveform

4. TROUBLE SHOOTING

CHECKING FLOW



4.8 Camera Trouble

TEST POINT

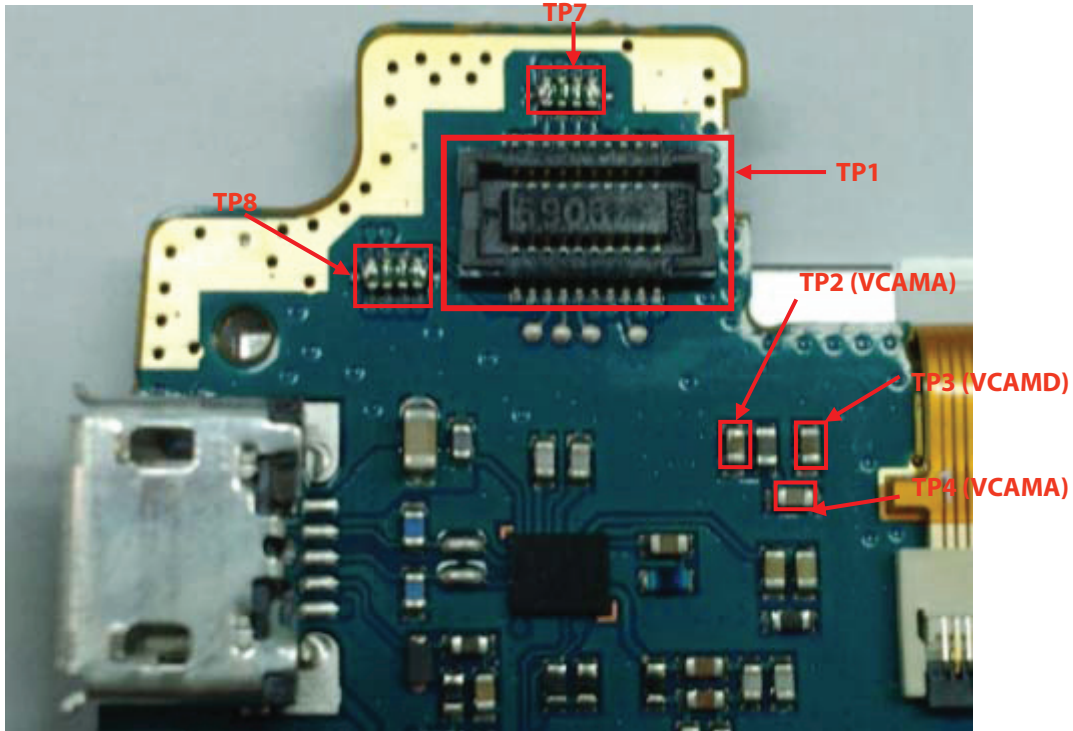


Figure 4.8.1

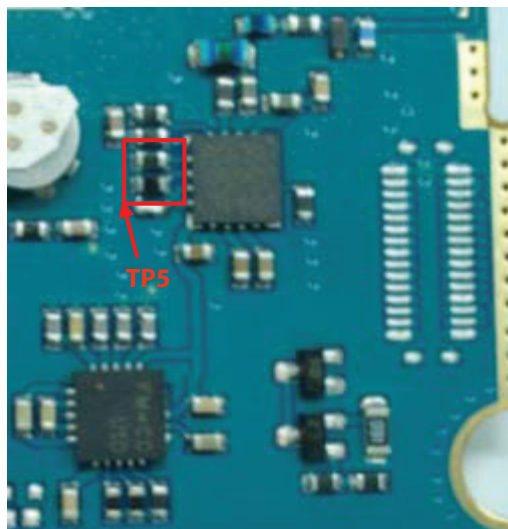
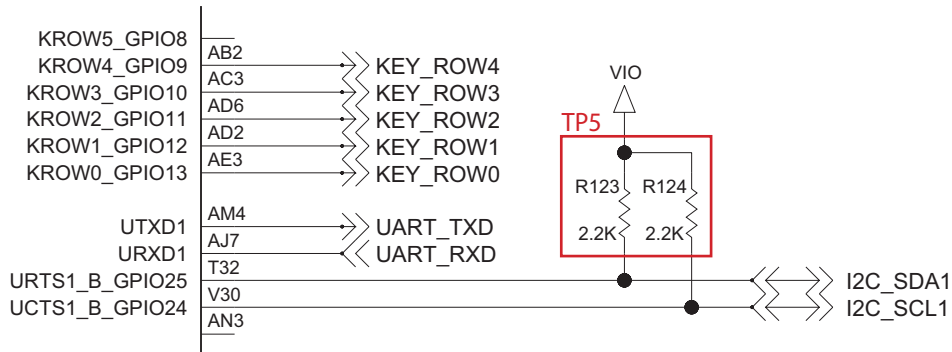
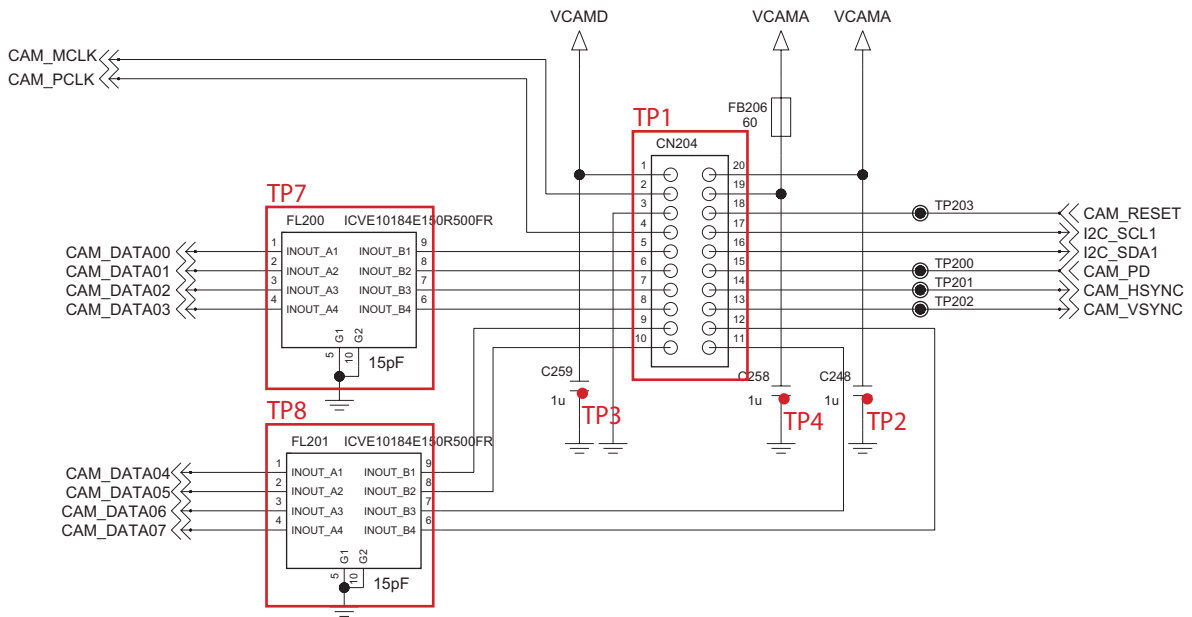


Figure 4.8.2

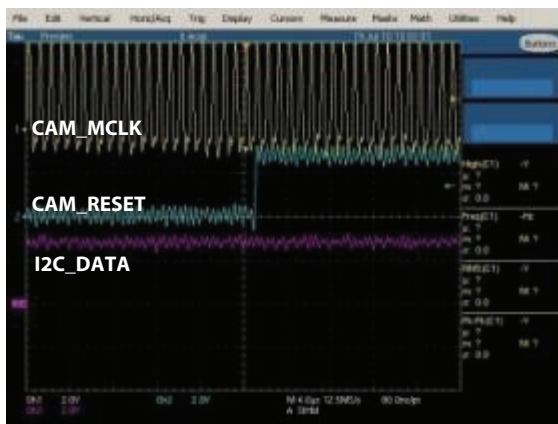
4. TROUBLE SHOOTING

CIRCUIT



4. TROUBLE SHOOTING

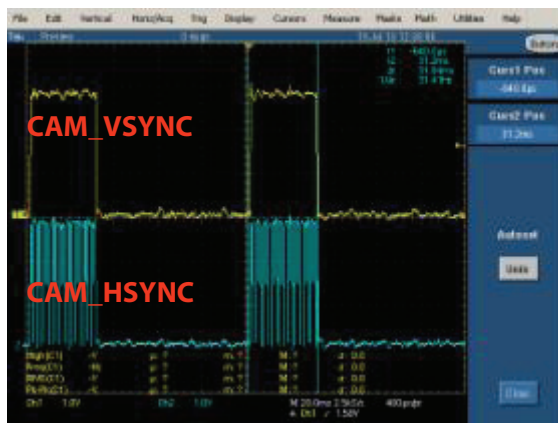
Waveform



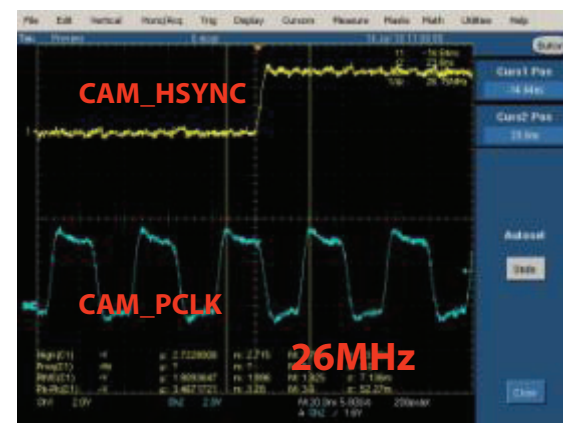
Graph 4.8.1. I2C Data Waveform



Graph 4.8.2. MCLK Waveform



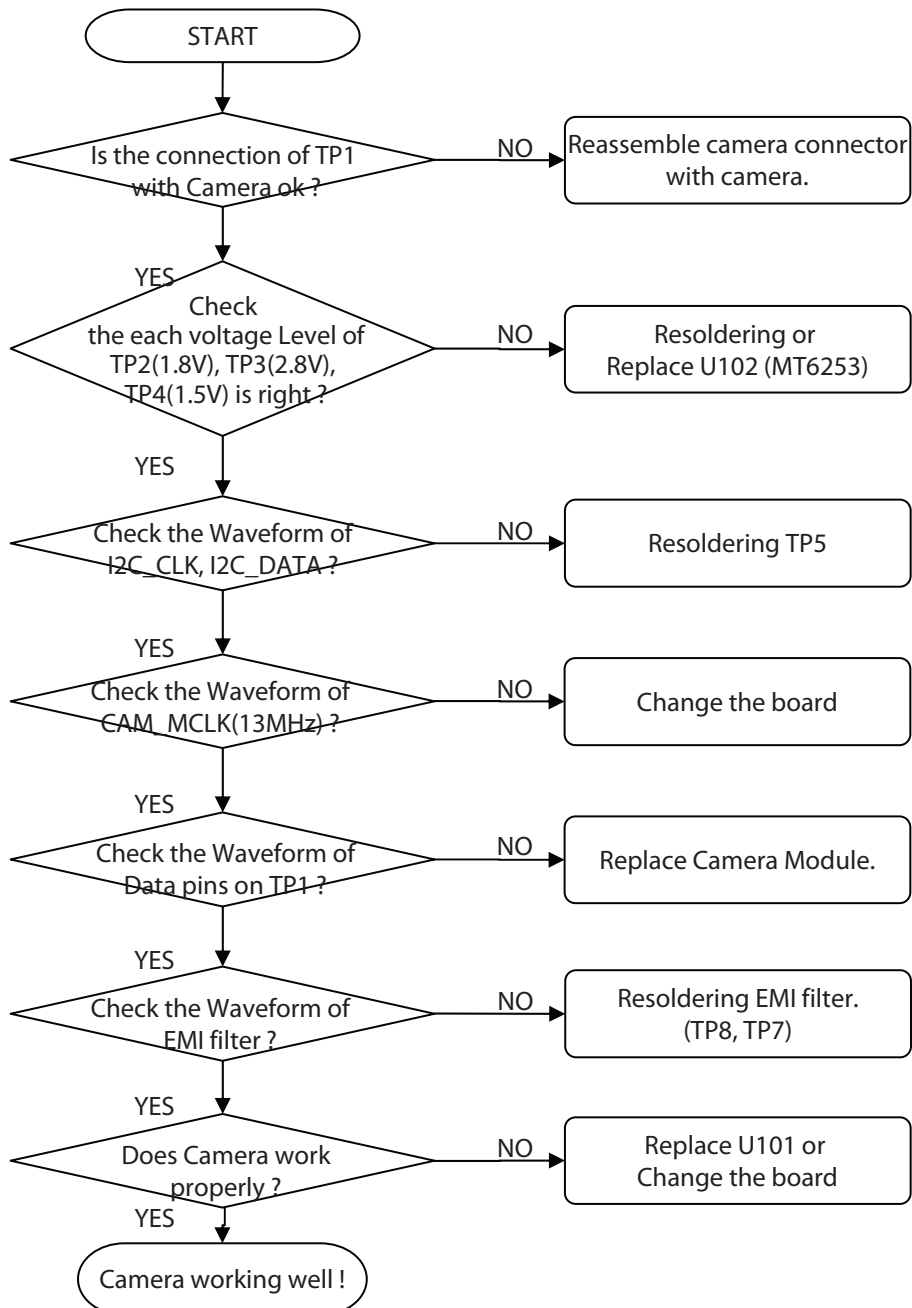
Graph 4.8.3. CAM_VSYNC vs. CAM_HSYNC Waveform



Graph 4.8.4. CAM_HSYNC vs. CAM_PCLK Waveform

4. TROUBLE SHOOTING

CHECKING FLOW



4.9 Speaker Trouble

TEST POINT

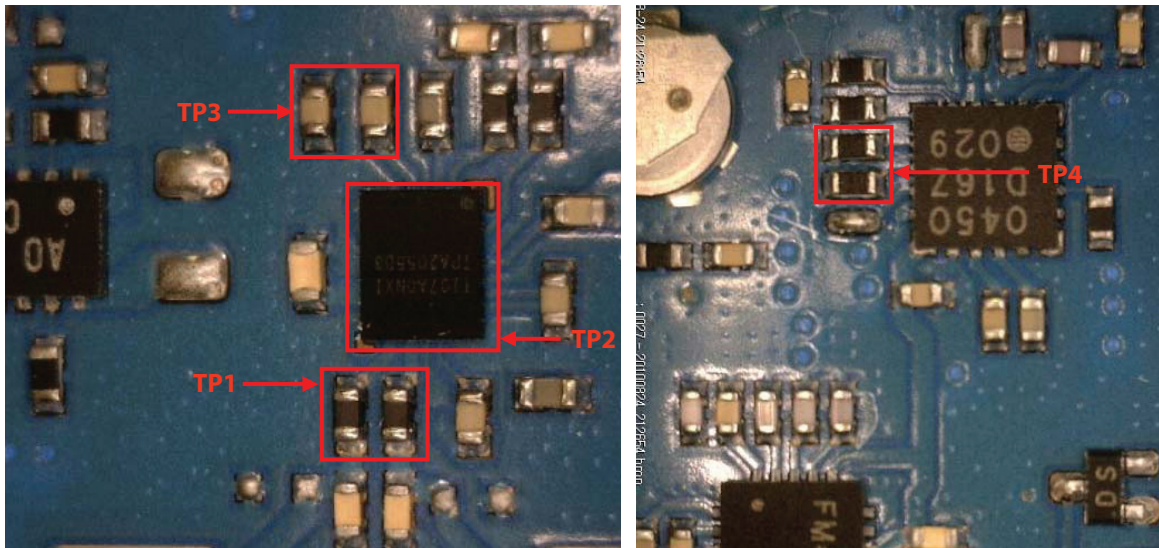
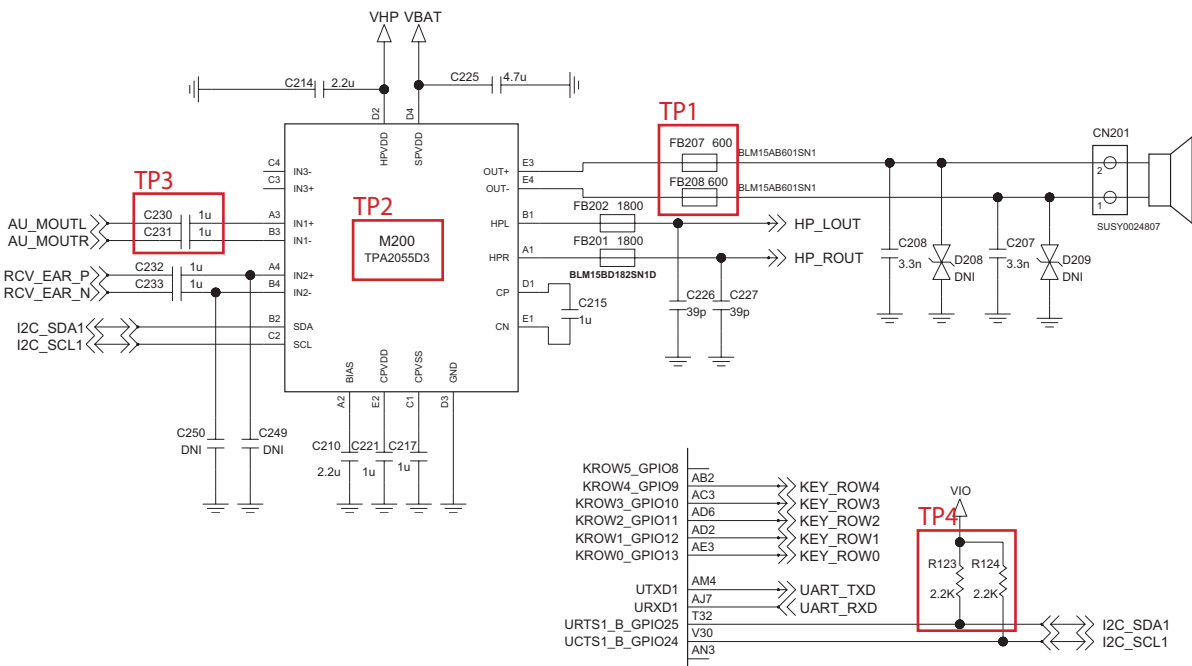


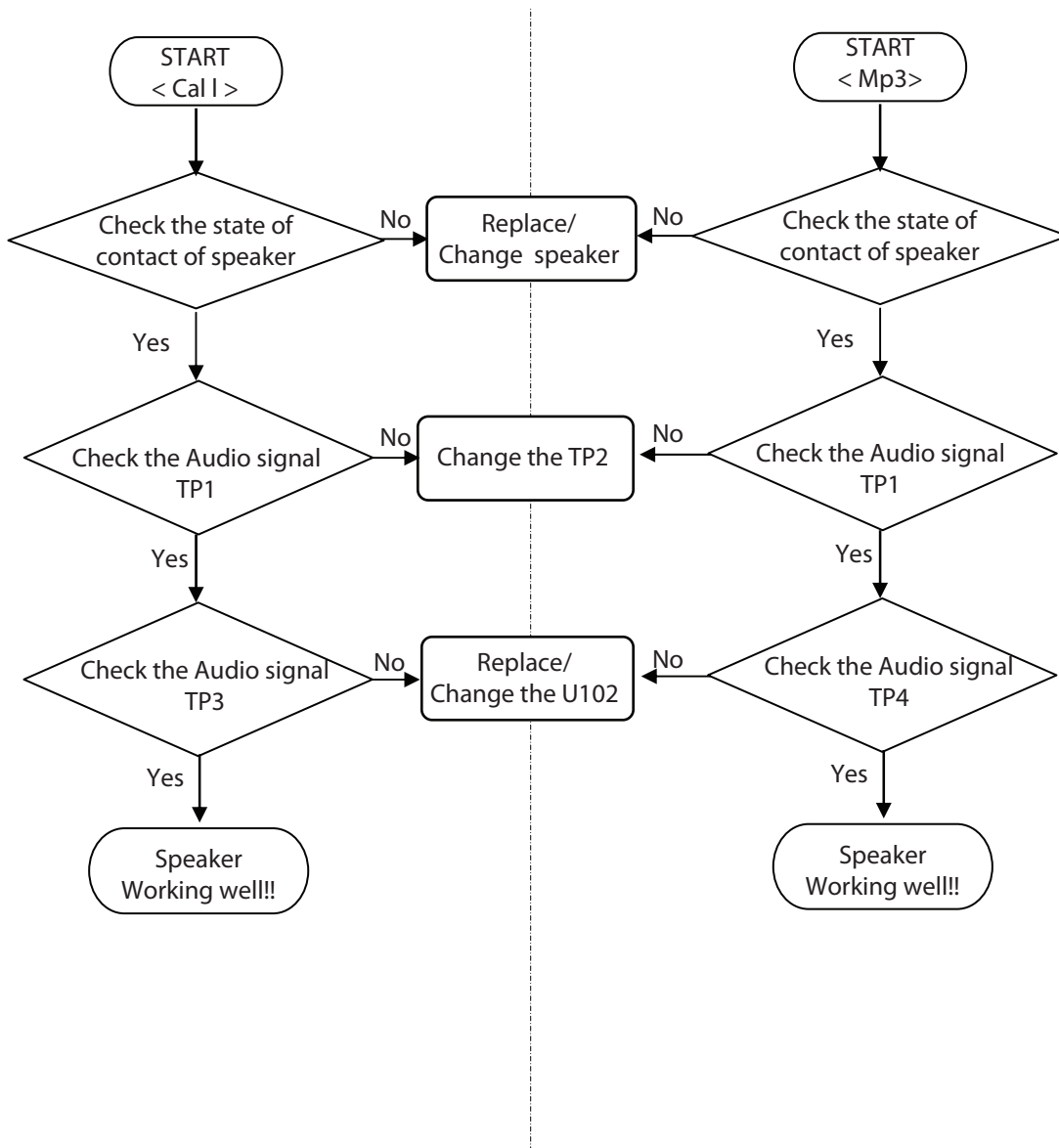
Figure 4.9.1

CIRCUIT



4. TROUBLE SHOOTING

CHECKING FLOW



4.10 Earphone Trouble

TEST POINT

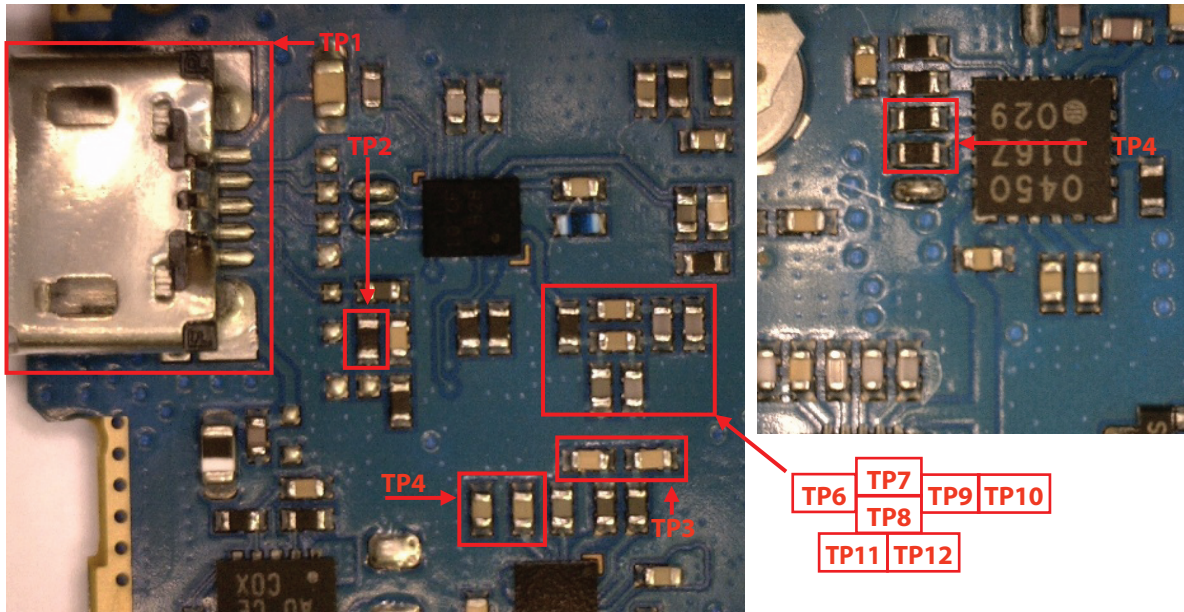
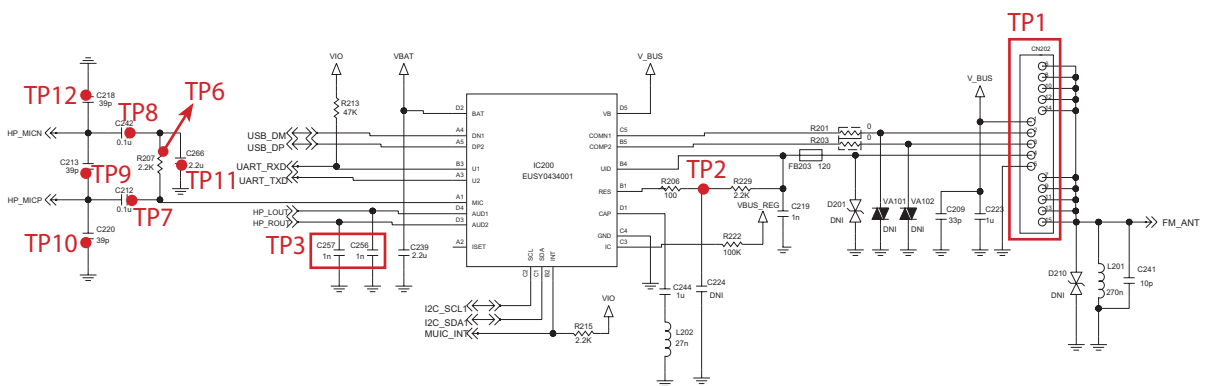
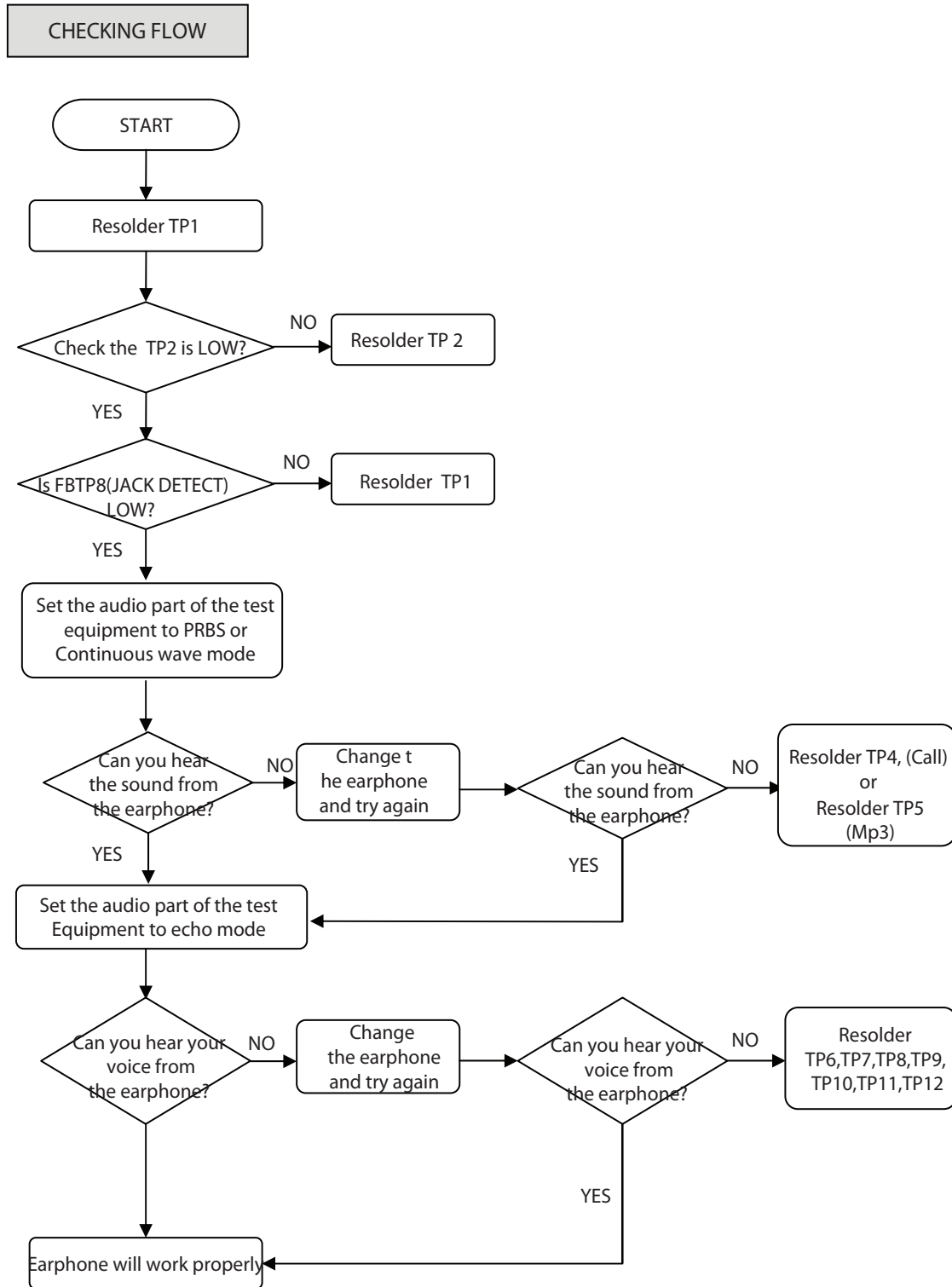


Figure 4.10.1

CIRCUIT



4. TROUBLE SHOOTING



4.11 Receiver Trouble

TEST POINT

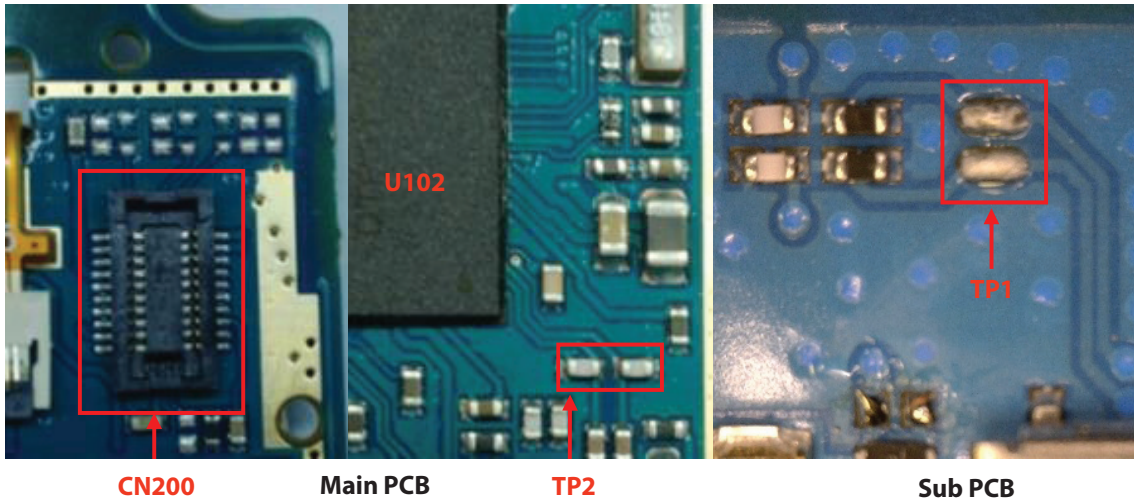
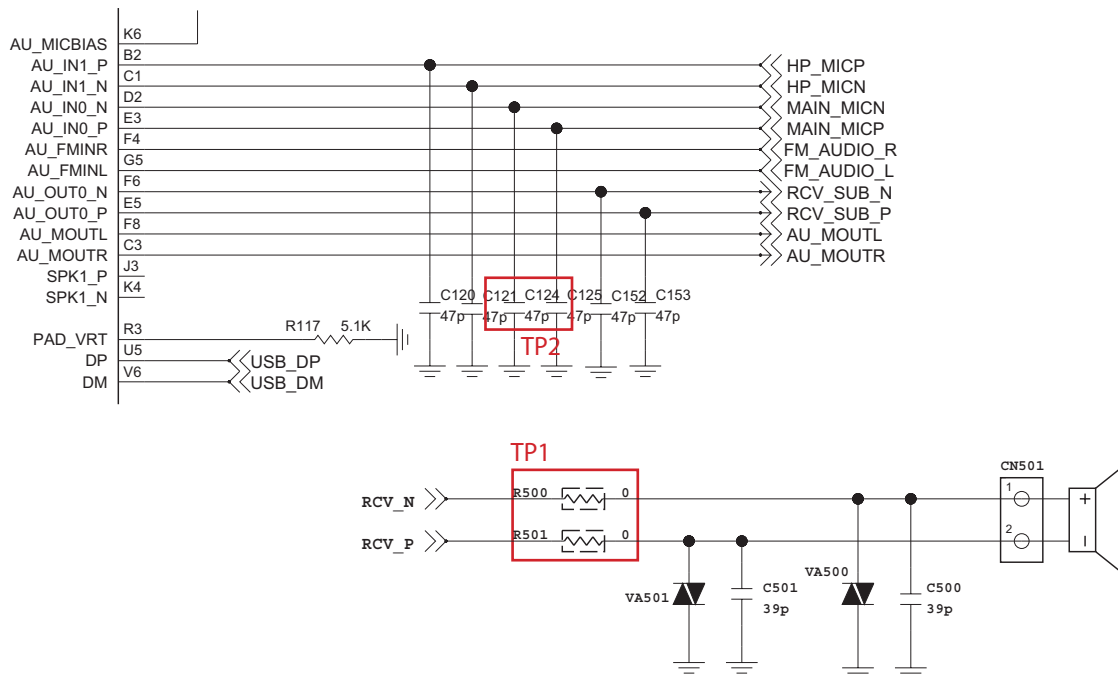


Figure 4.11.1

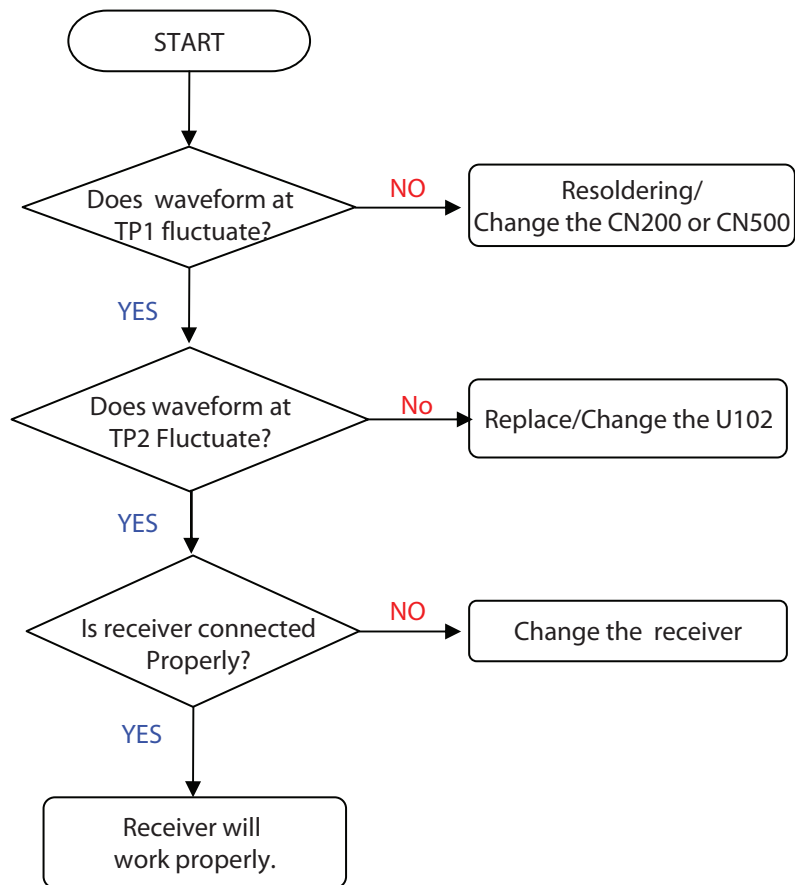
CIRCUIT



4. TROUBLE SHOOTING

CHECKING FLOW

SETTING : After initialize Agilent 8960, Test EGSM900, DCS mode (or GSM850, PCS mode)
Set the property of audio as PRBS or continuous wave. Set the receiving volume of mobile as Max.



4.12 Microphone Trouble

TEST POINT

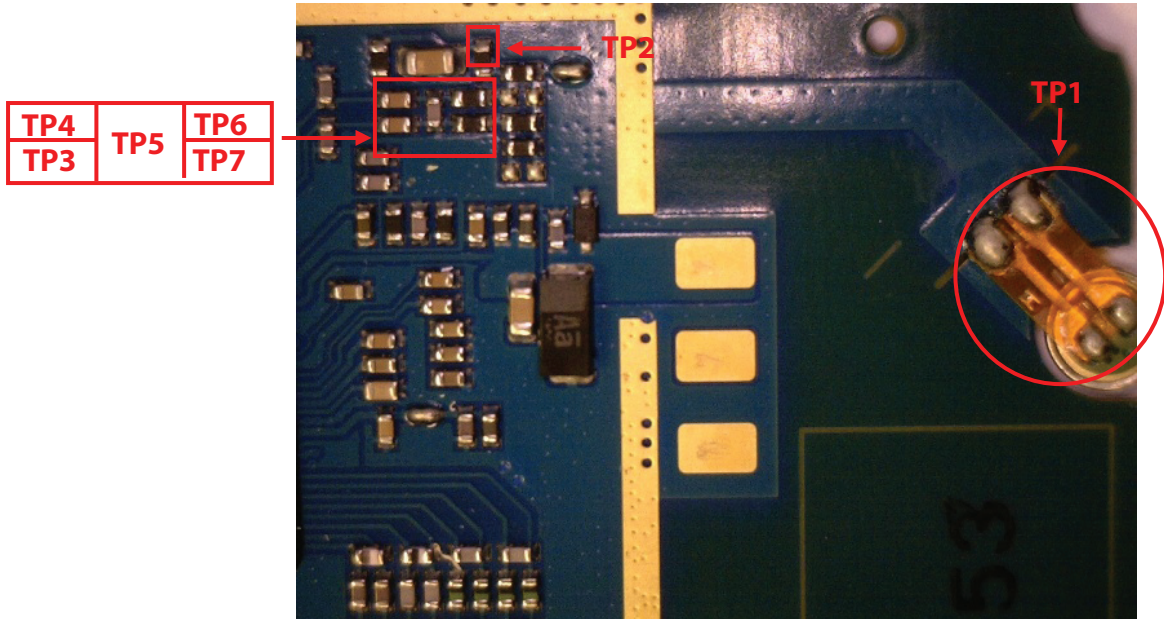
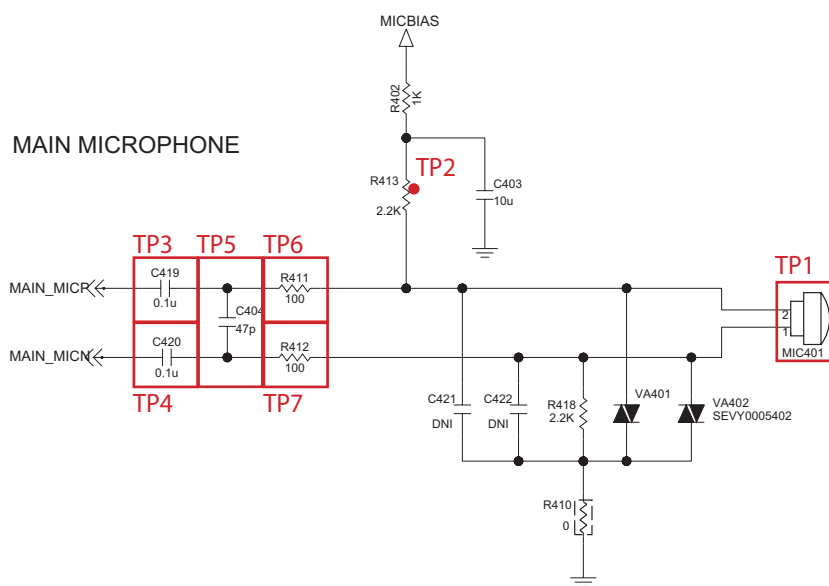


Figure 4.12.1

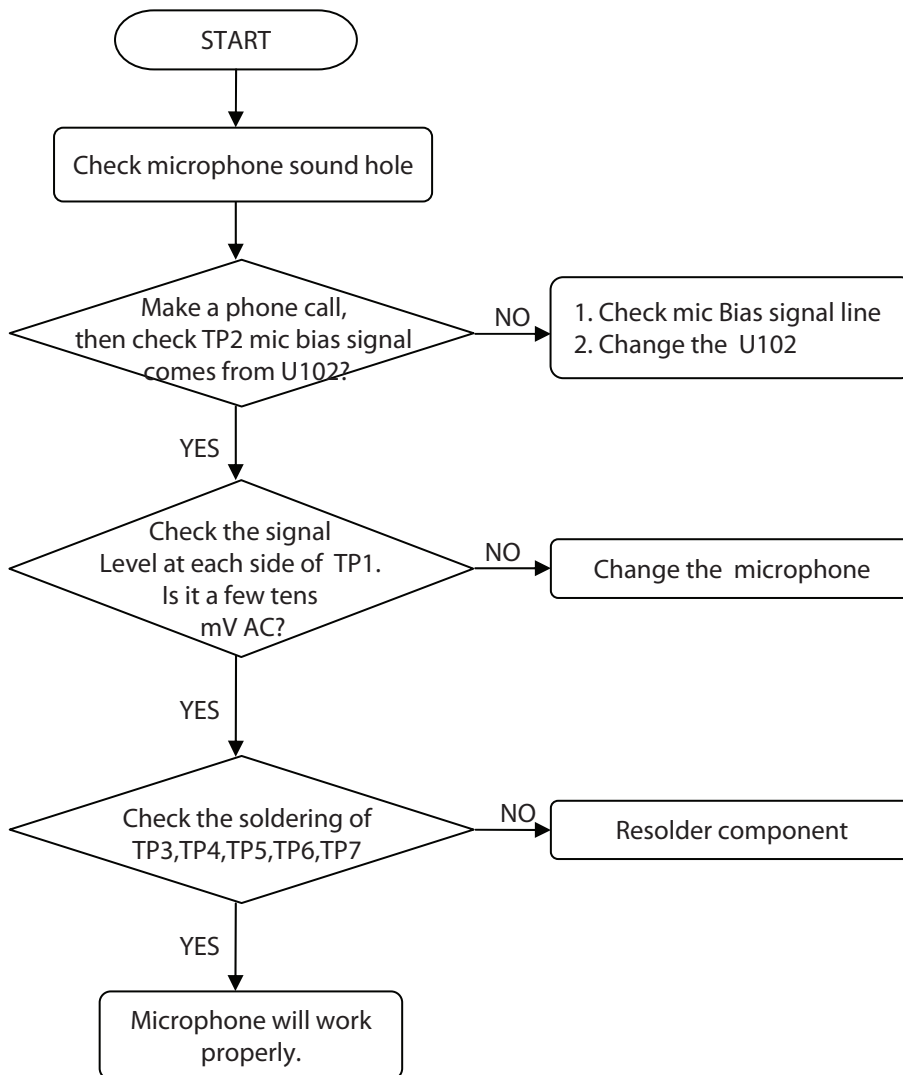
CIRCUIT



4. TROUBLE SHOOTING

CHECKING FLOW

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



4.13 SIM Card Interface Trouble

TEST POINT

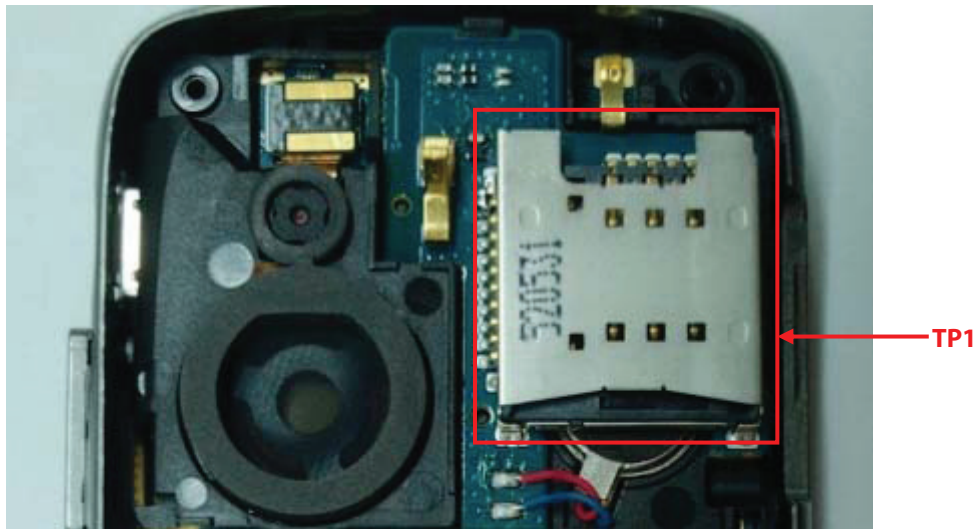
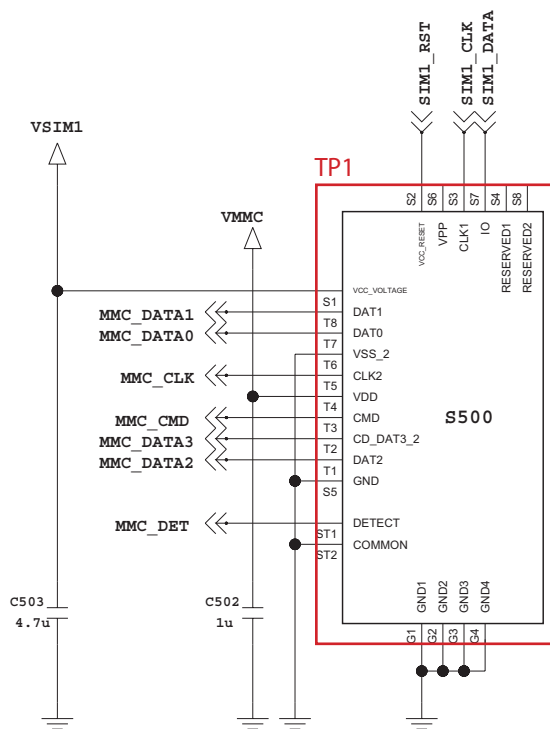
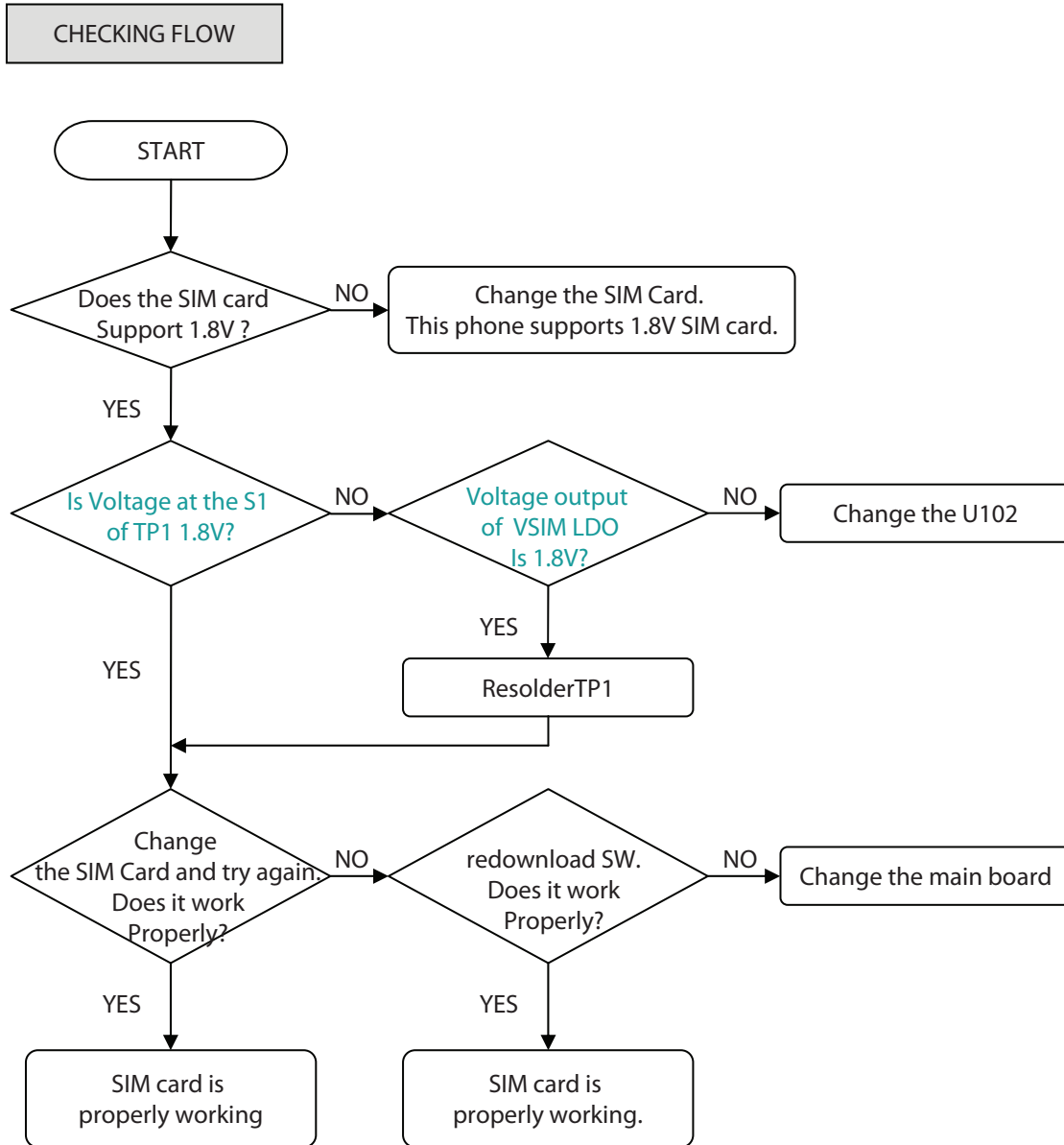


Figure 4.13.1

CIRCUIT



4. TROUBLE SHOOTING



4.14 KEY backlight Trouble

TEST POINT

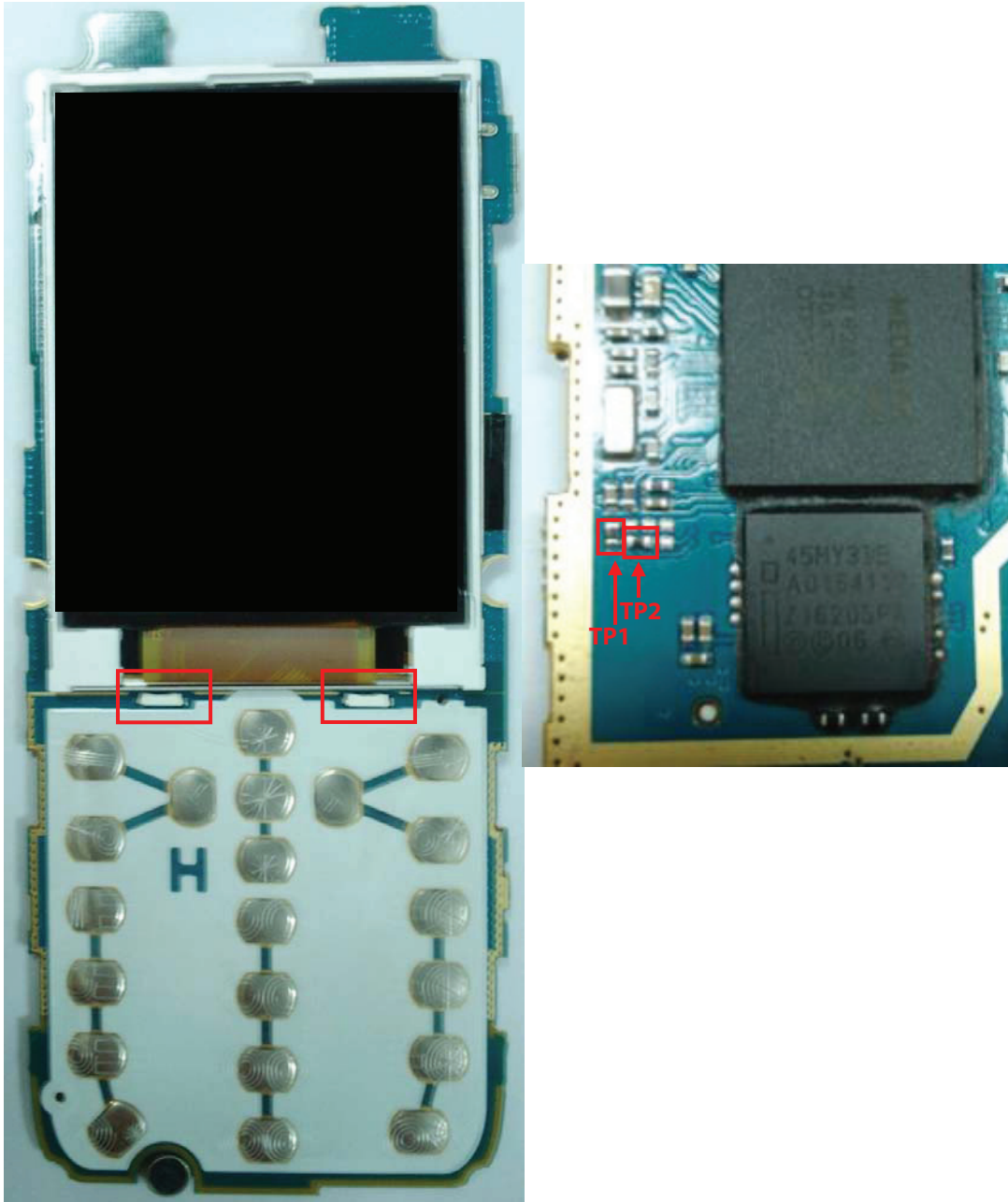
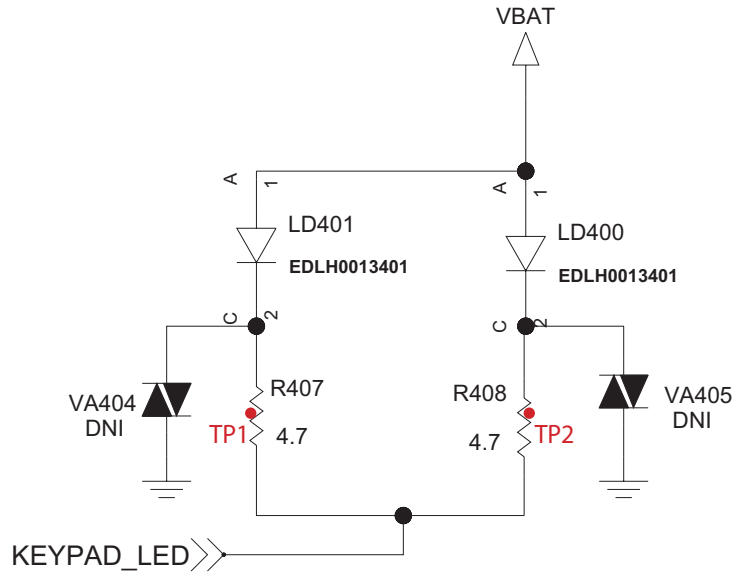


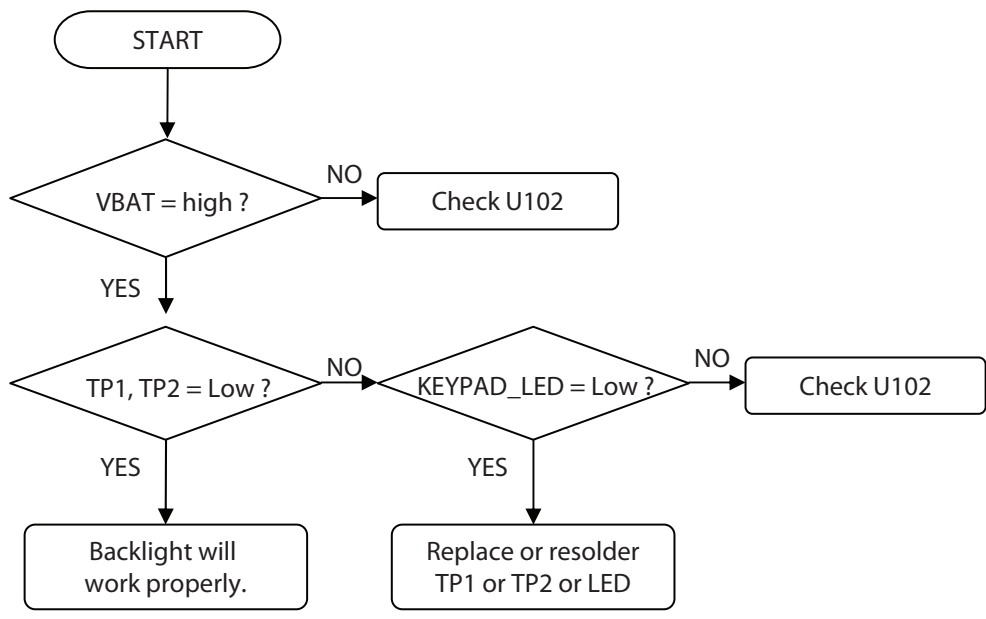
Figure 4.14.1

4. TROUBLE SHOOTING

CIRCUIT



CHECKING FLOW



4.15 Micro SD Trouble

TEST POINT

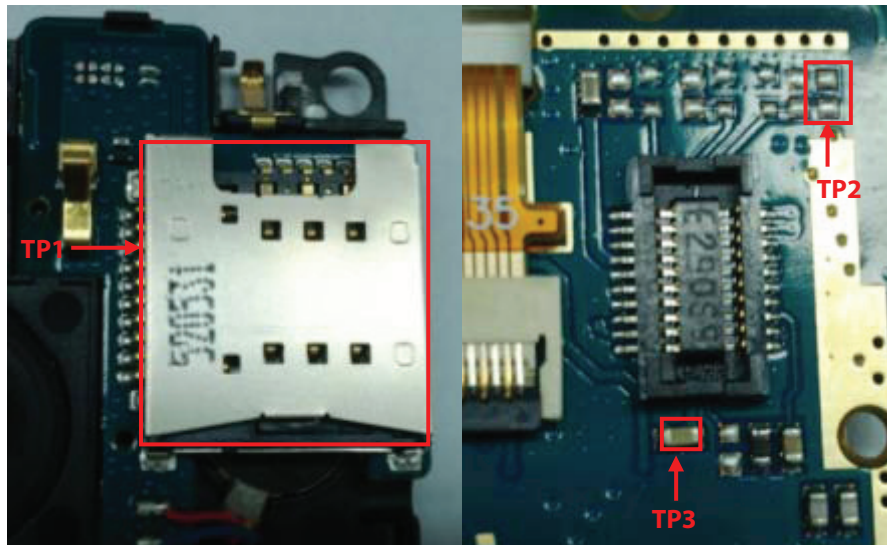
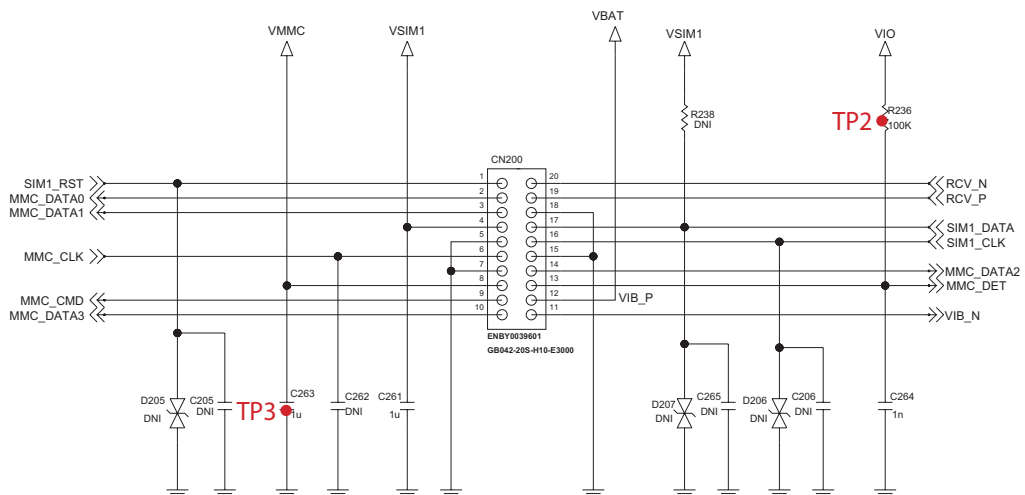
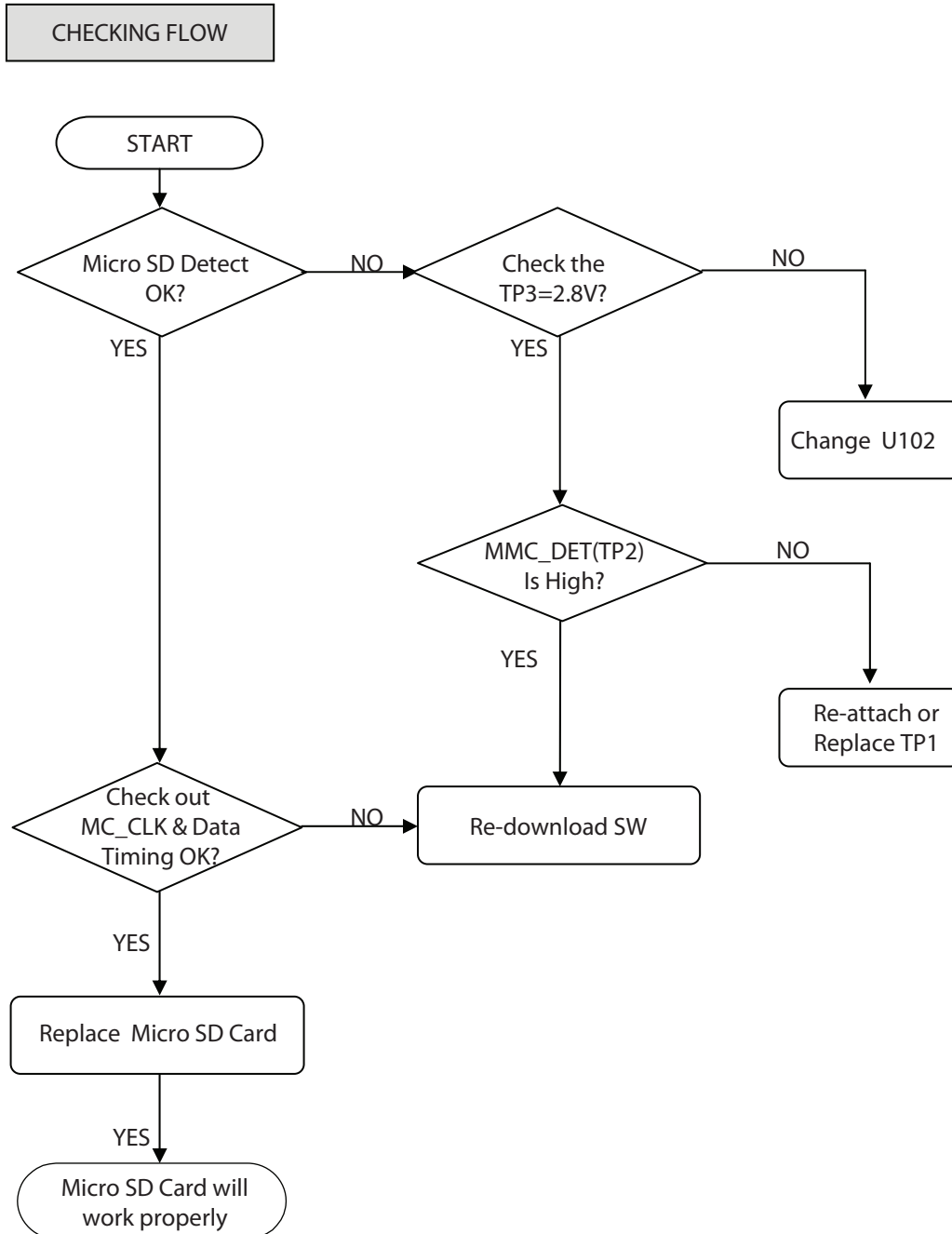


Figure 4.15.1

CIRCUIT



4. TROUBLE SHOOTING



4.16 Bluetooth Trouble

TEST POINT

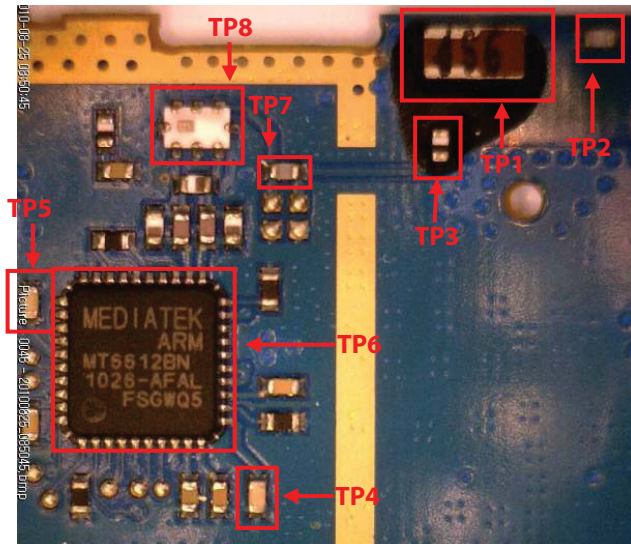
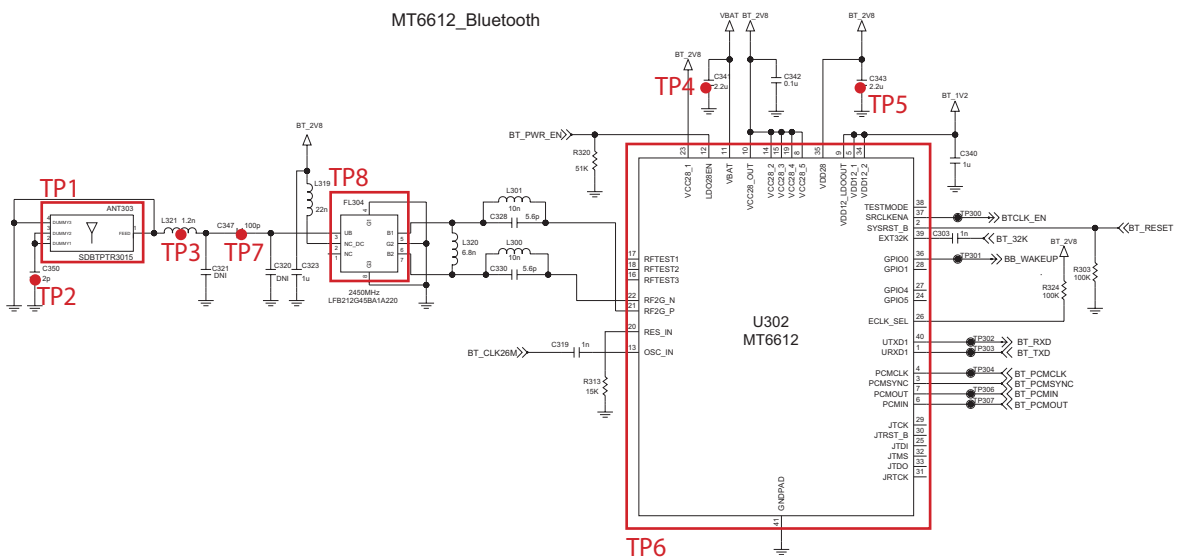


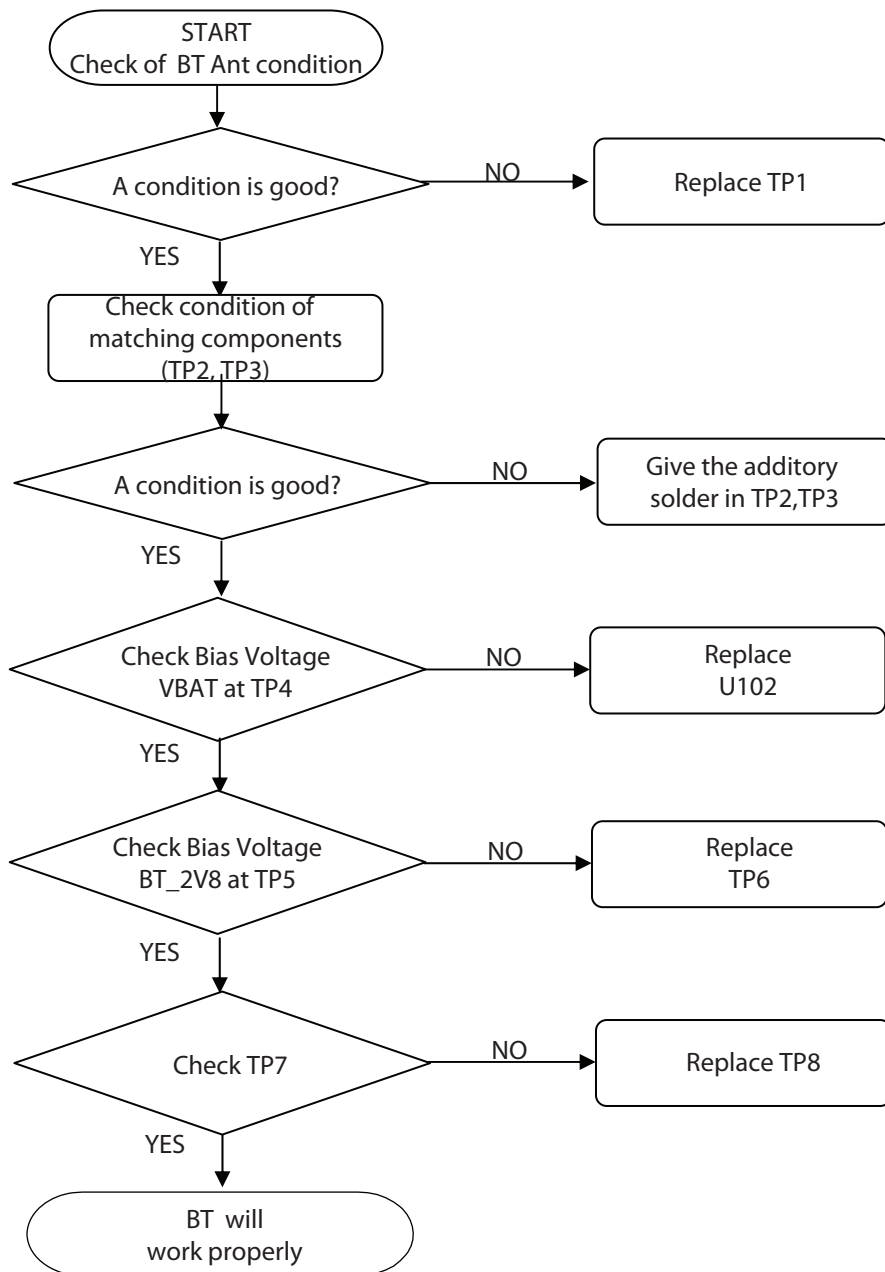
Figure 4.16.1

CIRCUIT



4. TROUBLE SHOOTING

CHECKING FLOW



4.17 FM Radio Trouble

TEST POINT

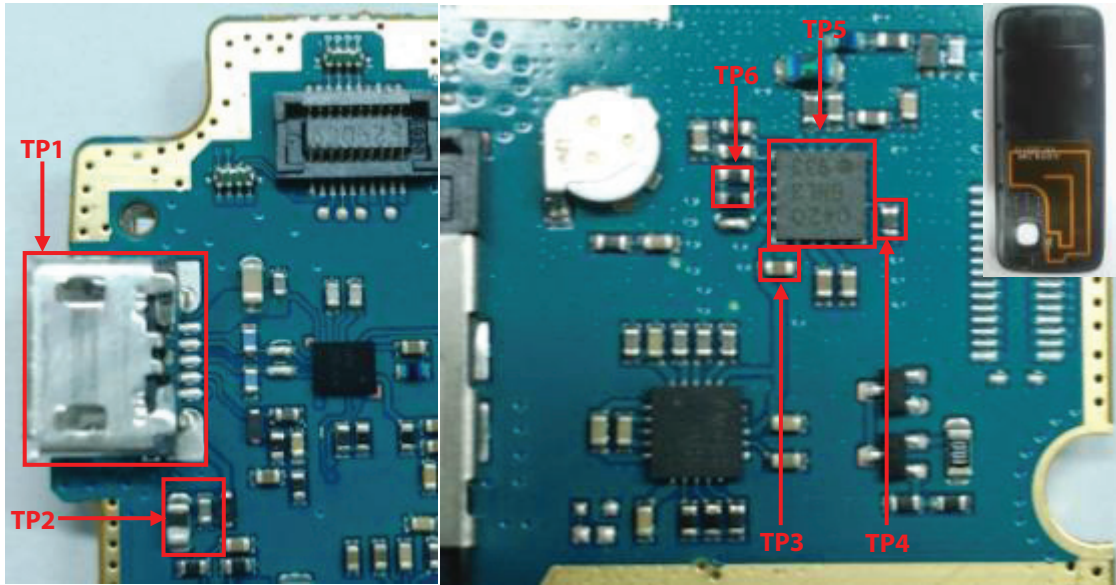
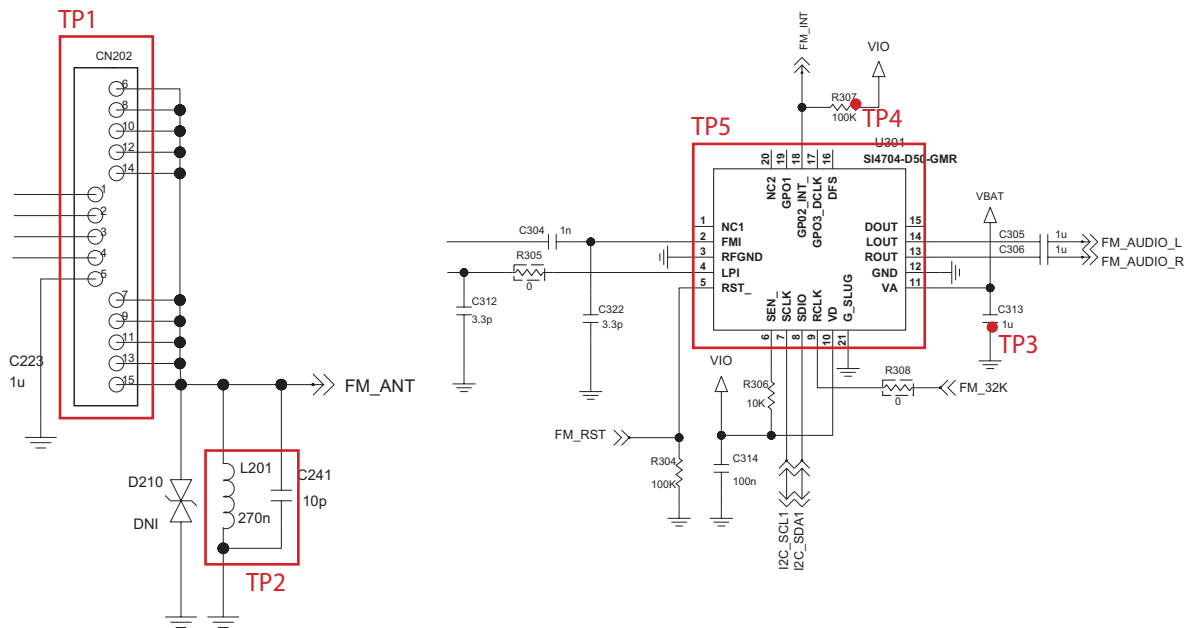
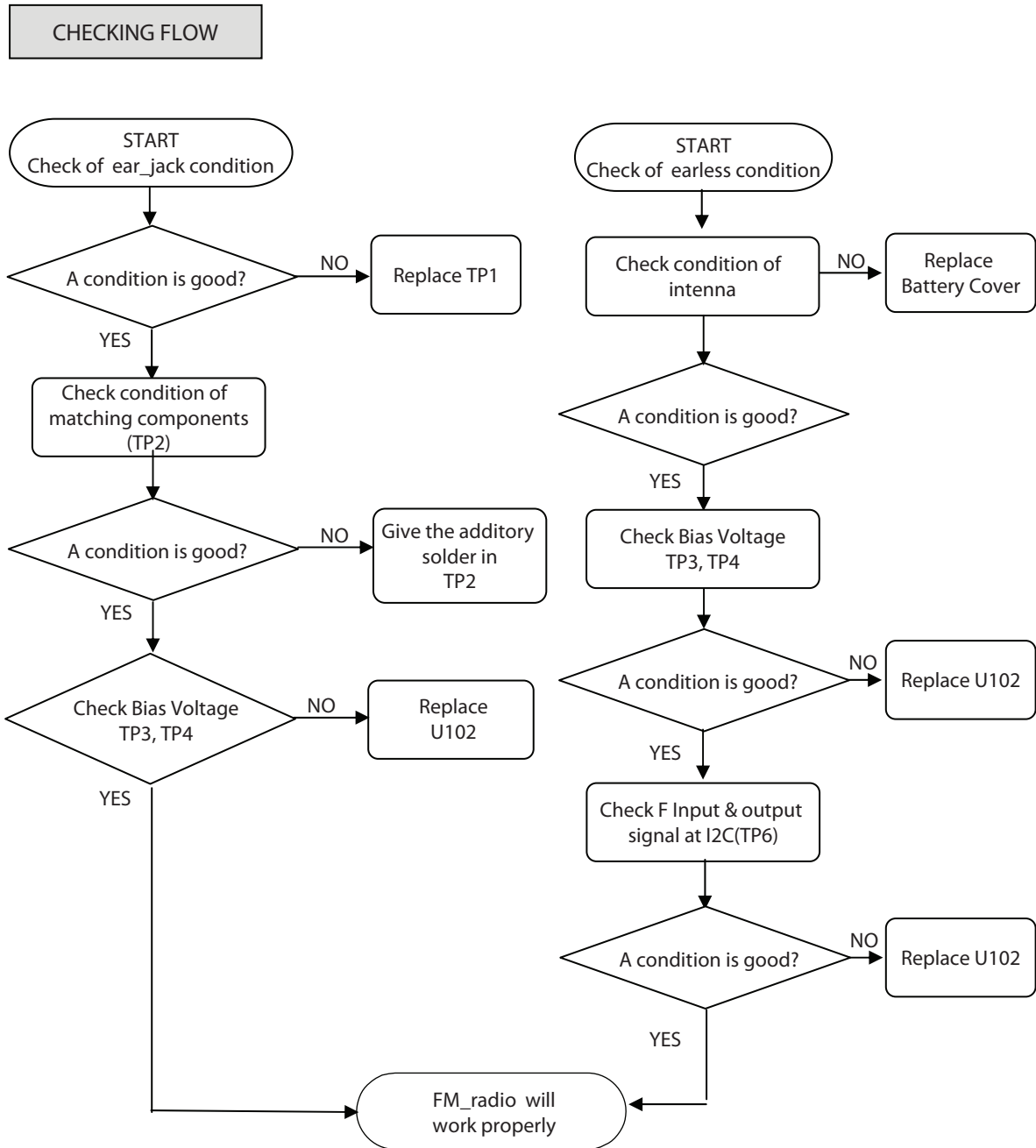


Figure 4.17.1

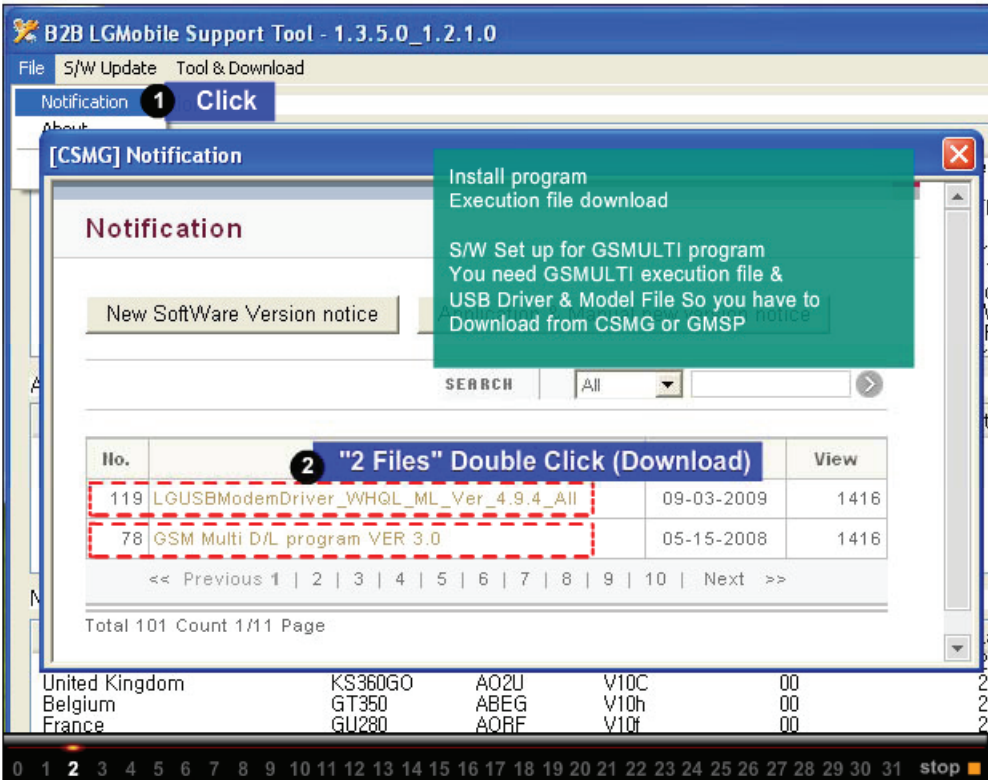
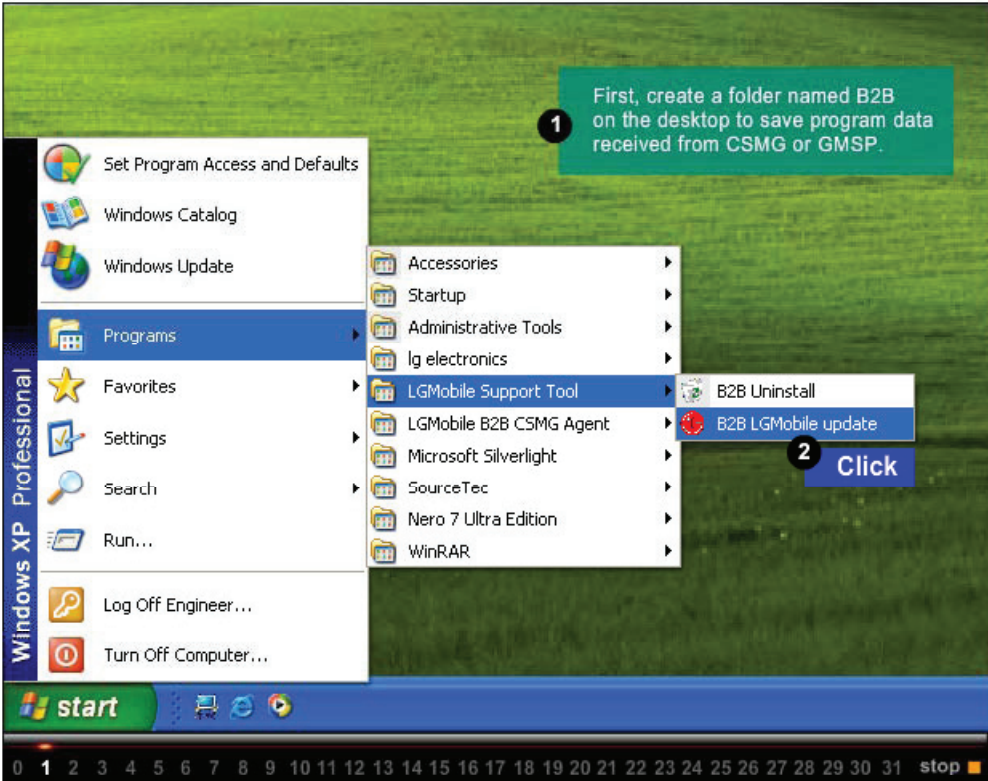
CIRCUIT



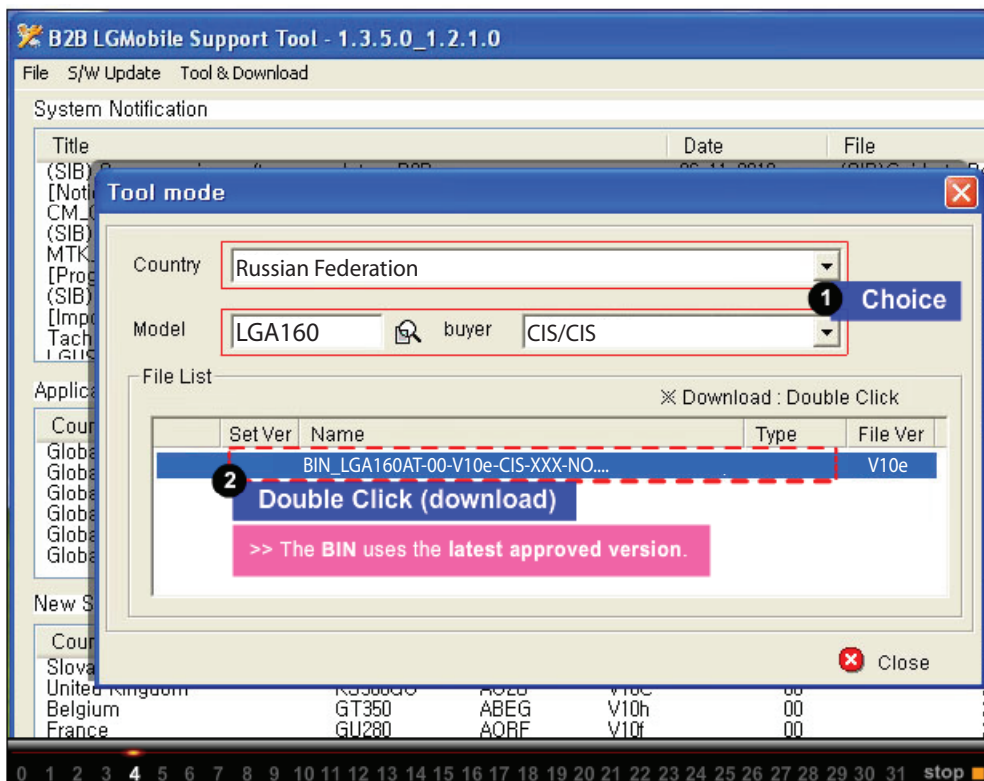
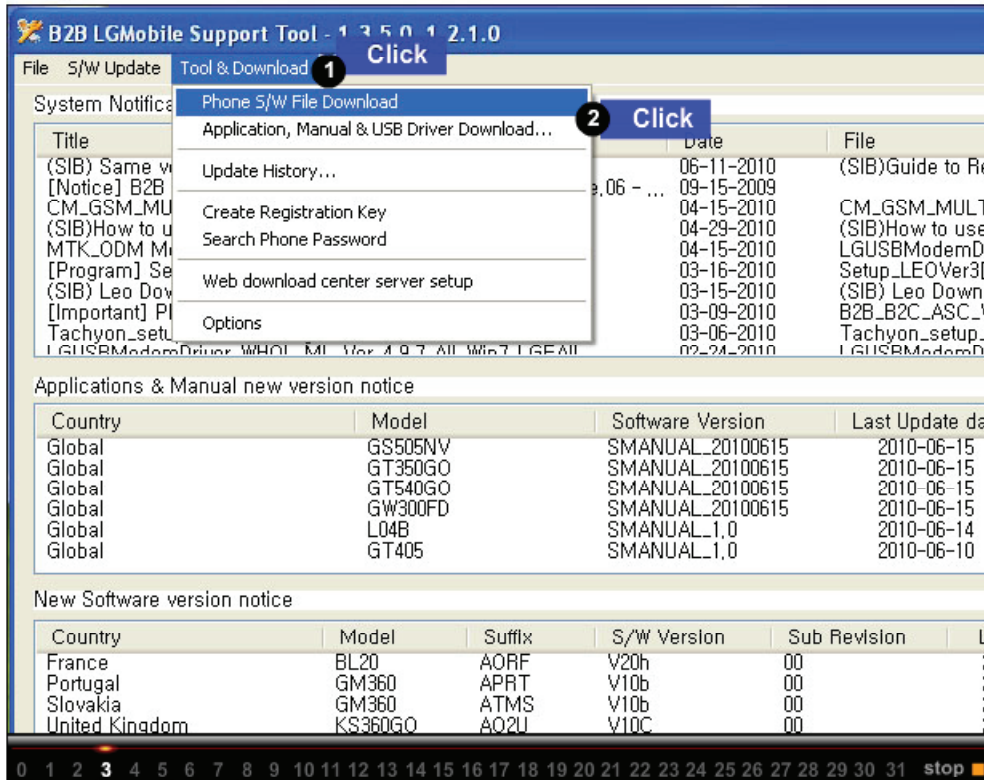
4. TROUBLE SHOOTING



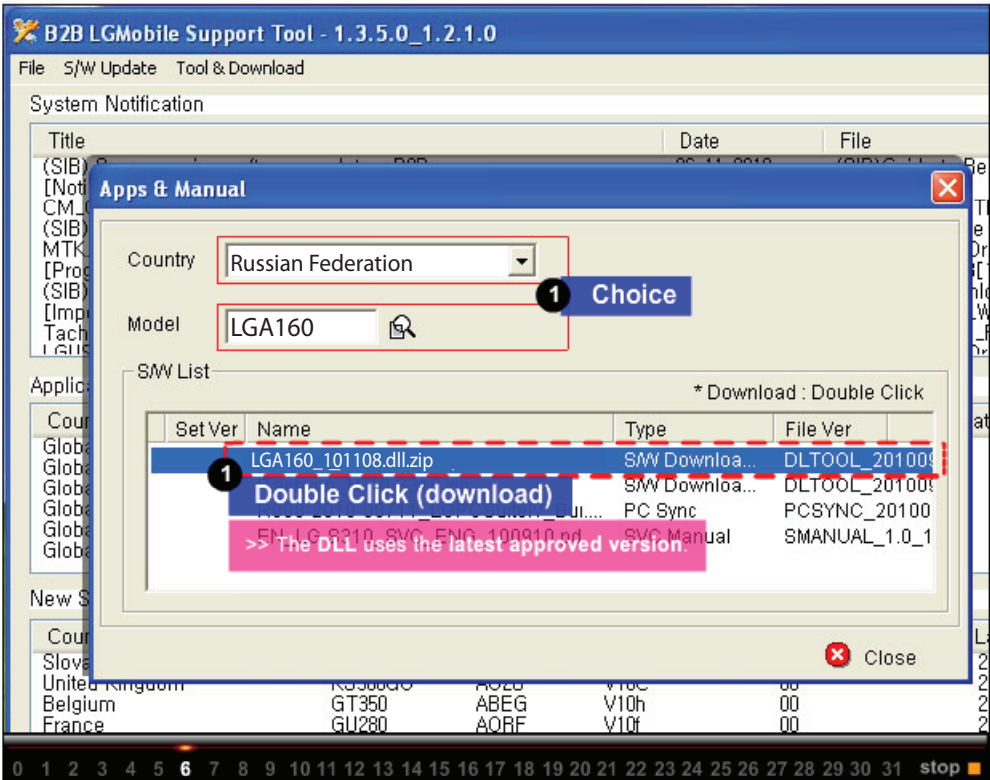
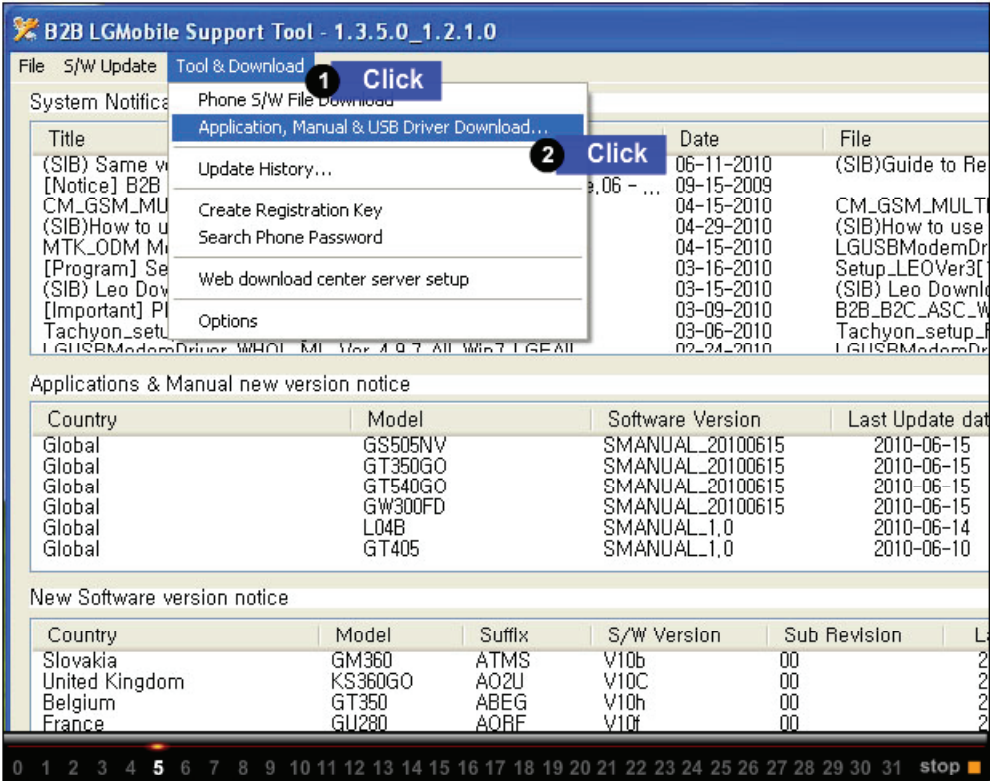
5. DOWNLOAD



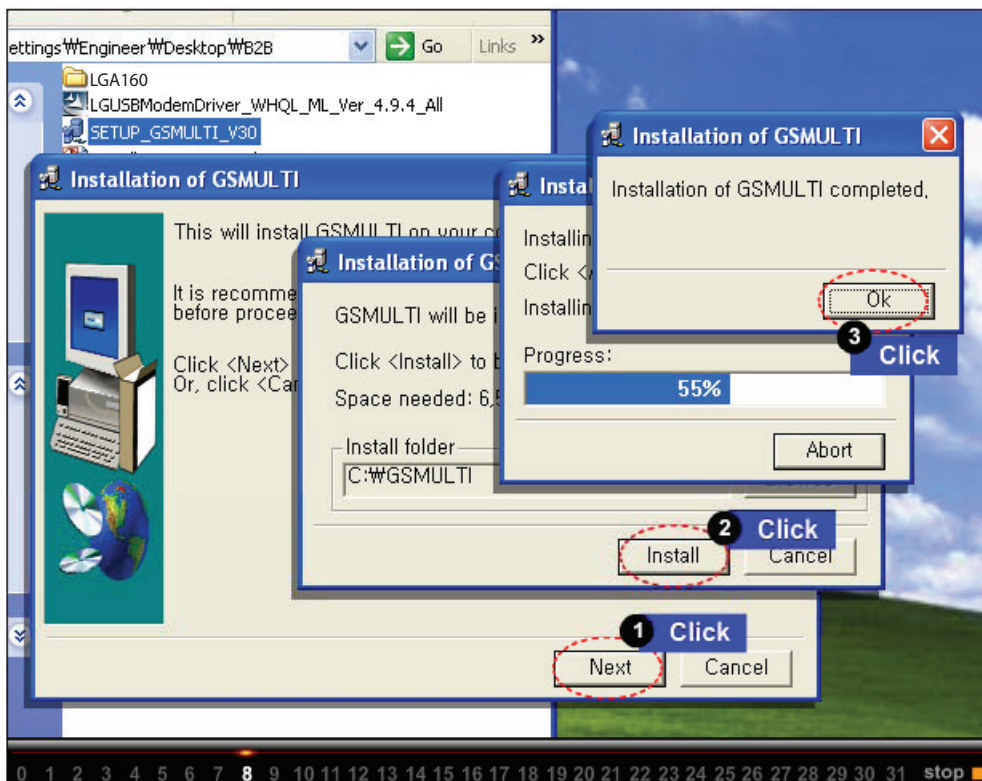
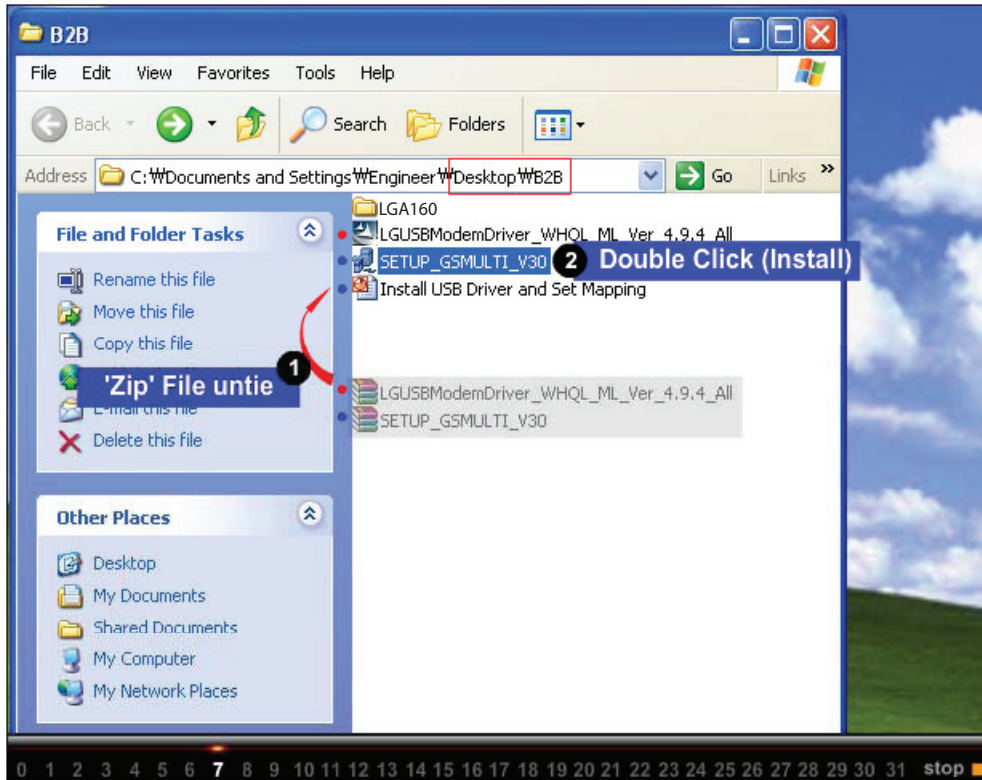
5. DOWNLOAD



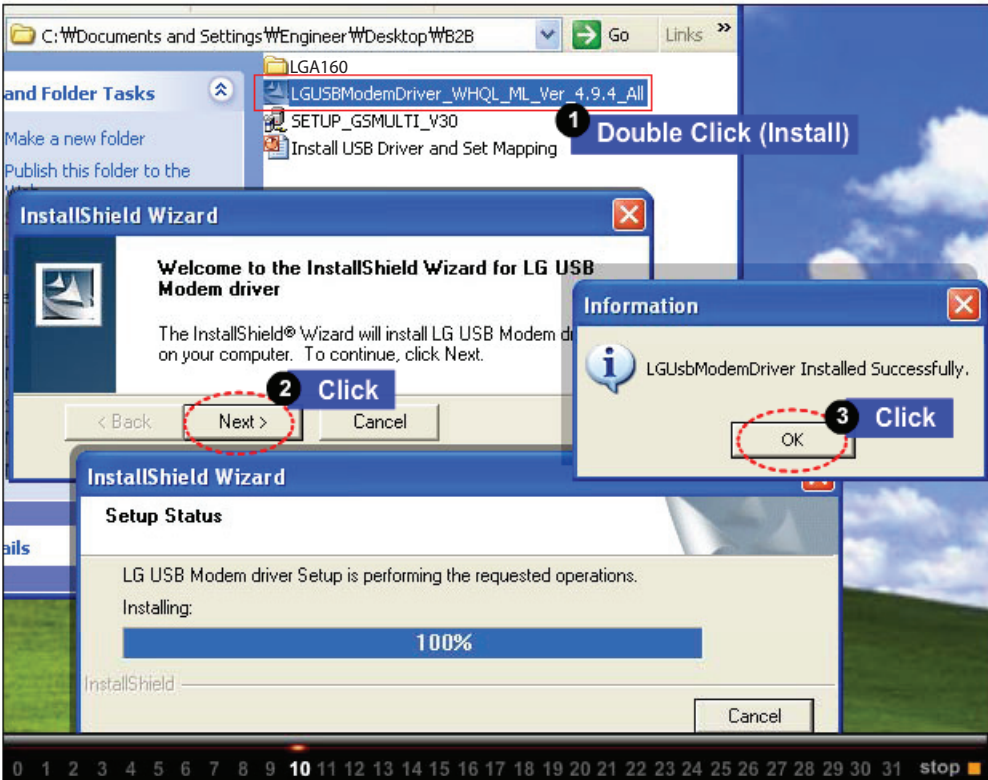
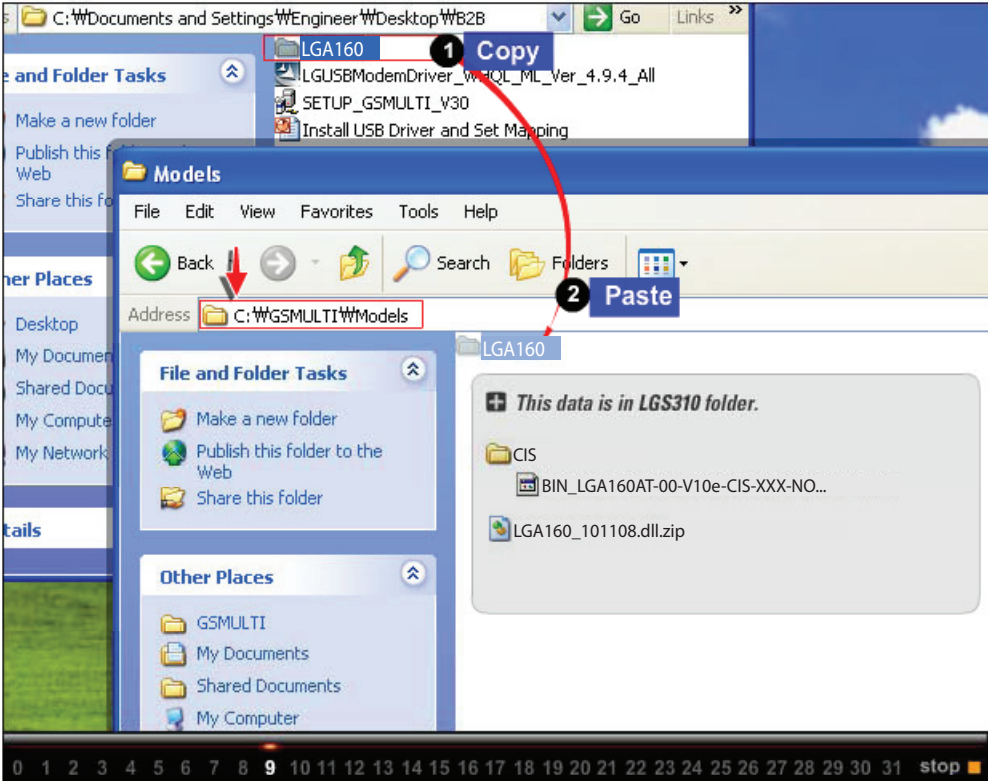
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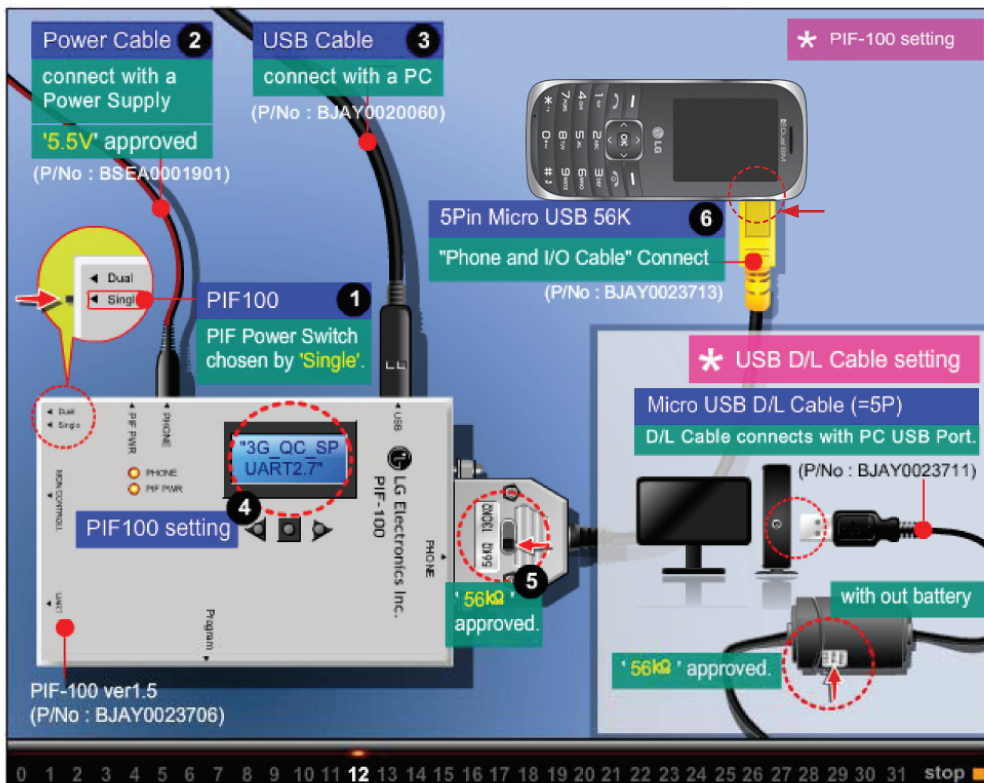
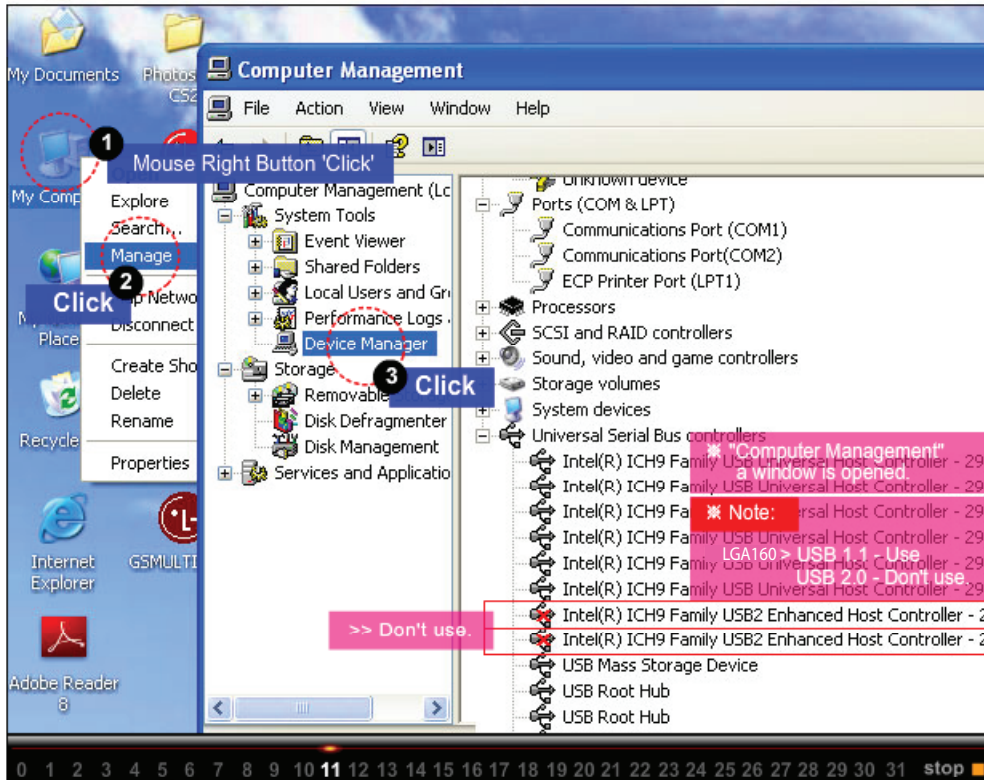
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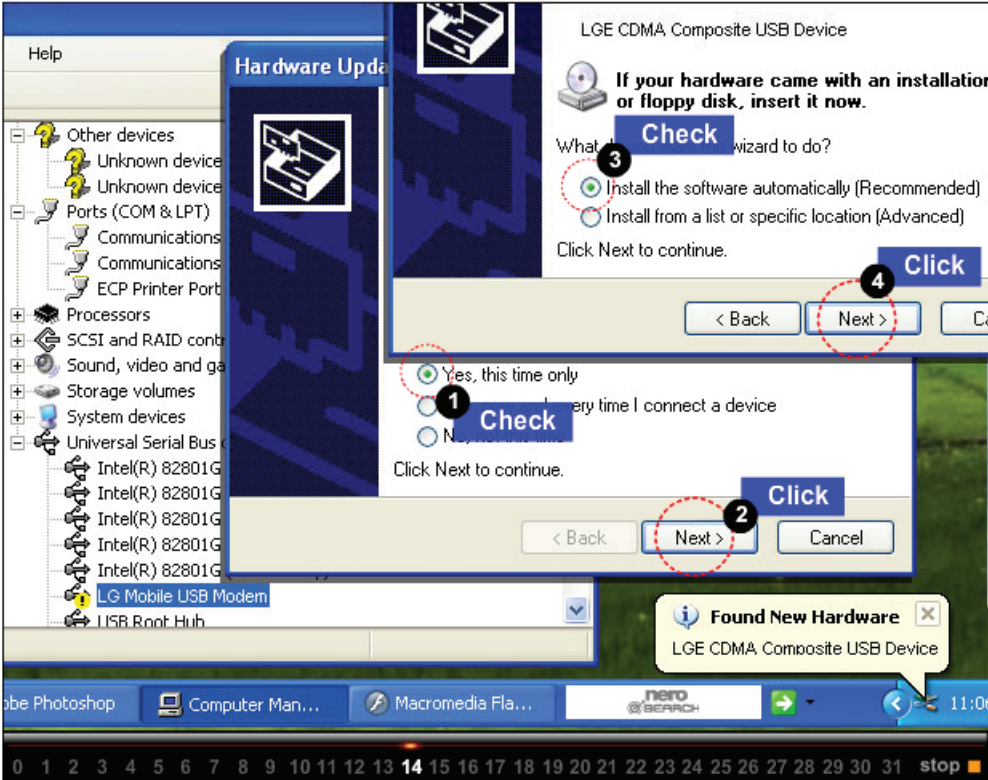
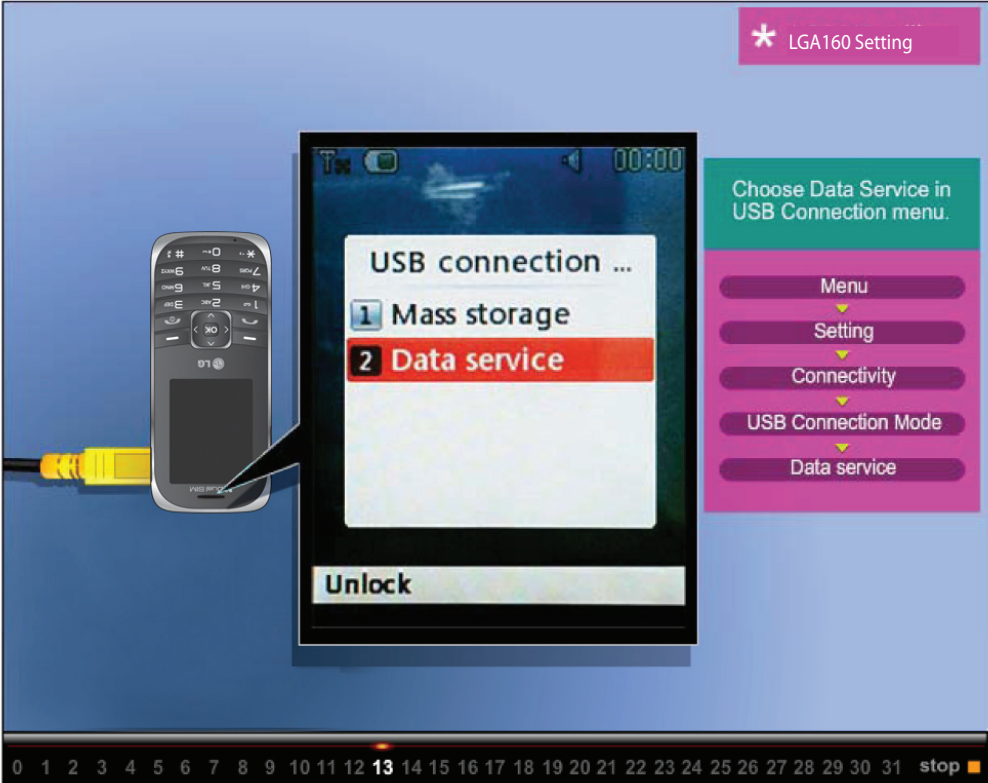


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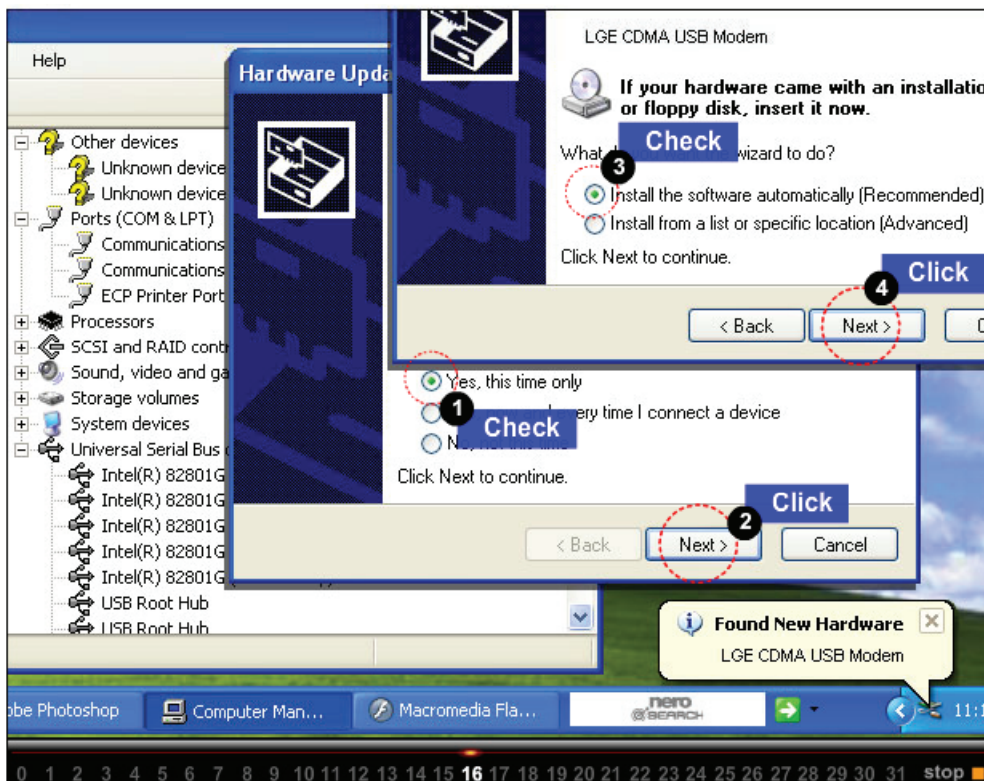
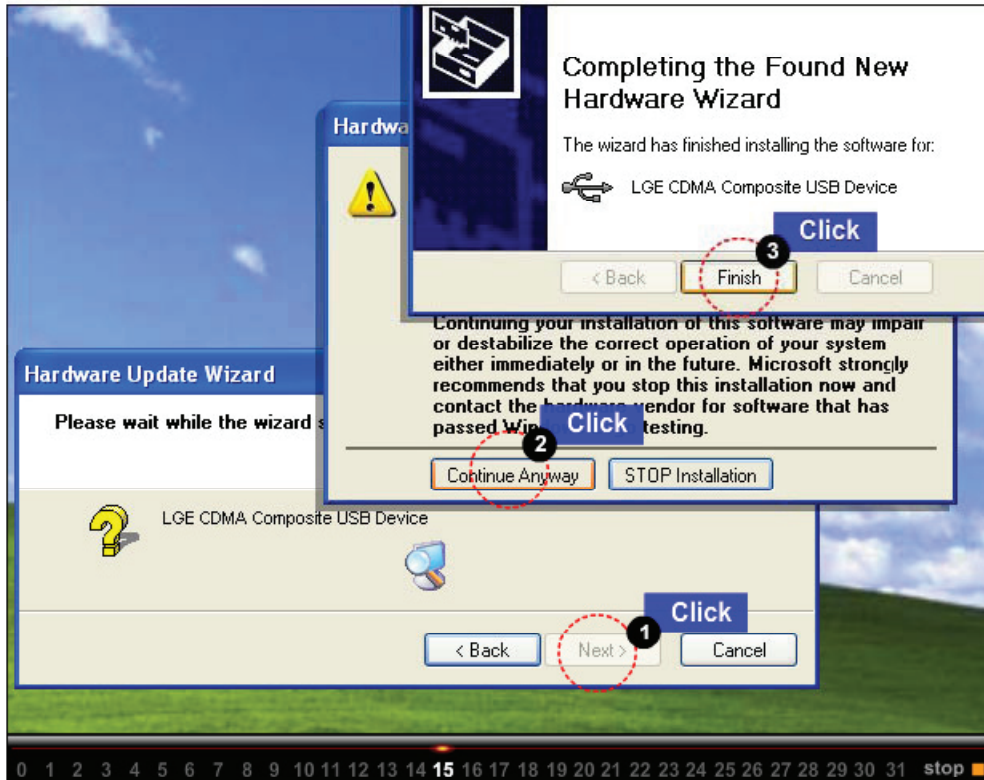


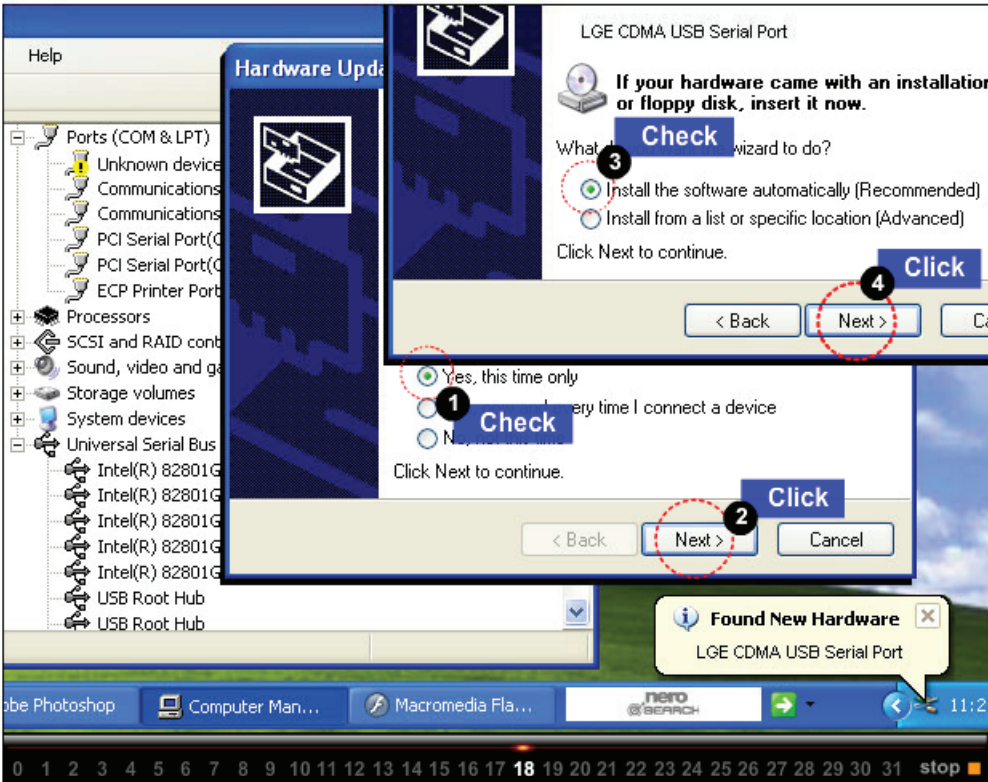
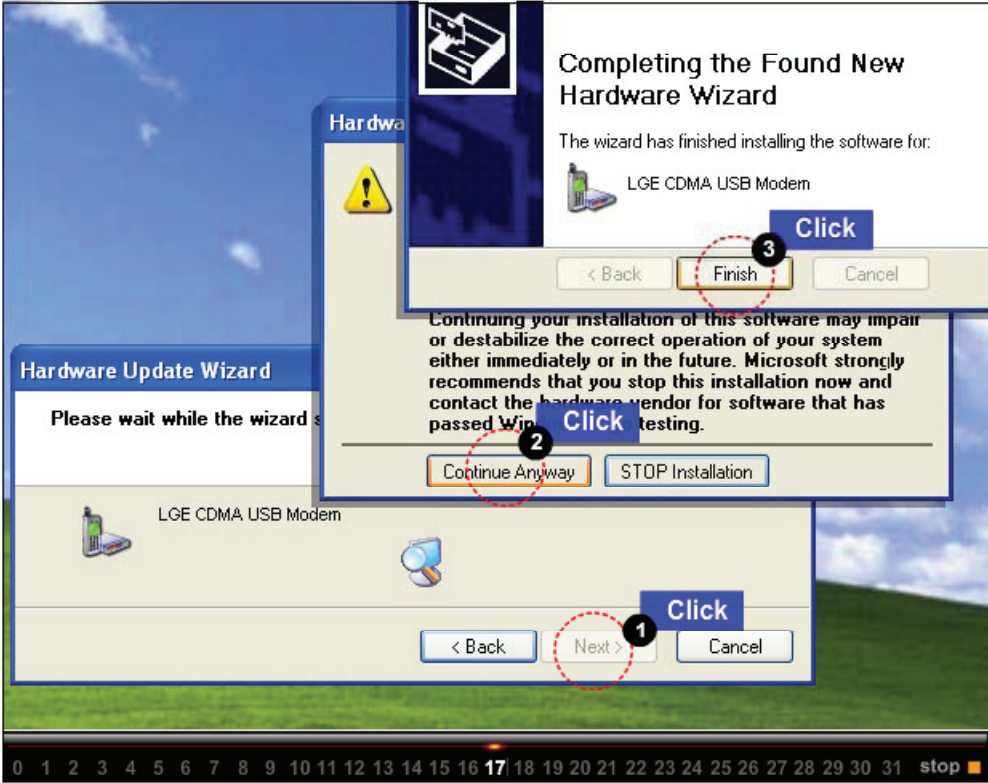
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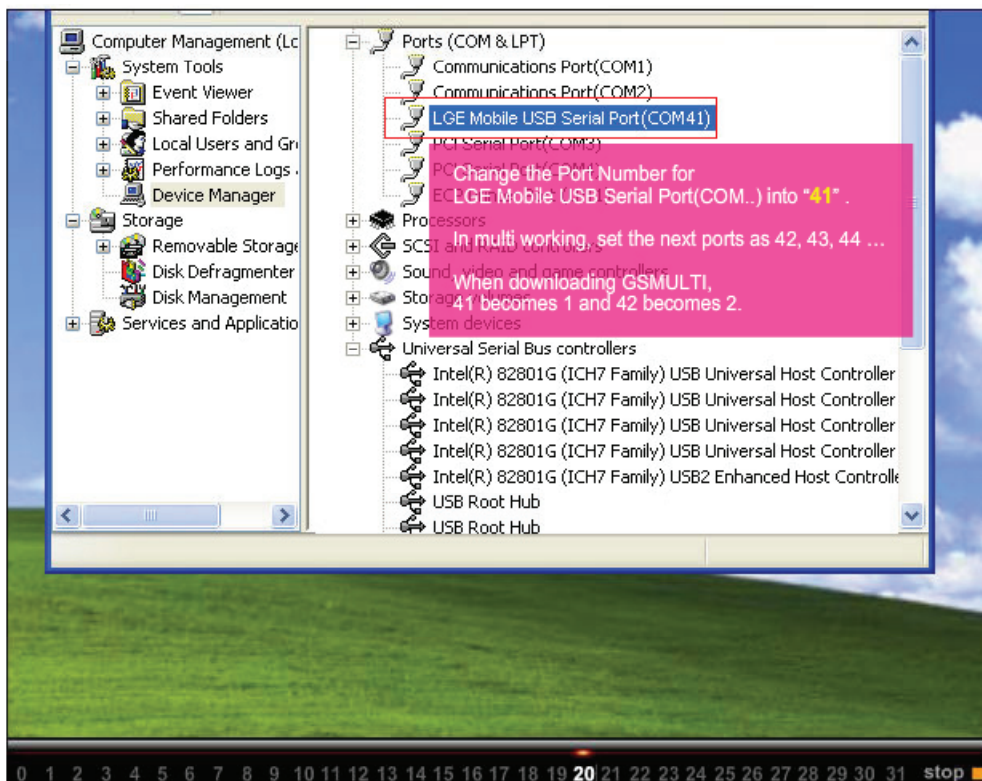
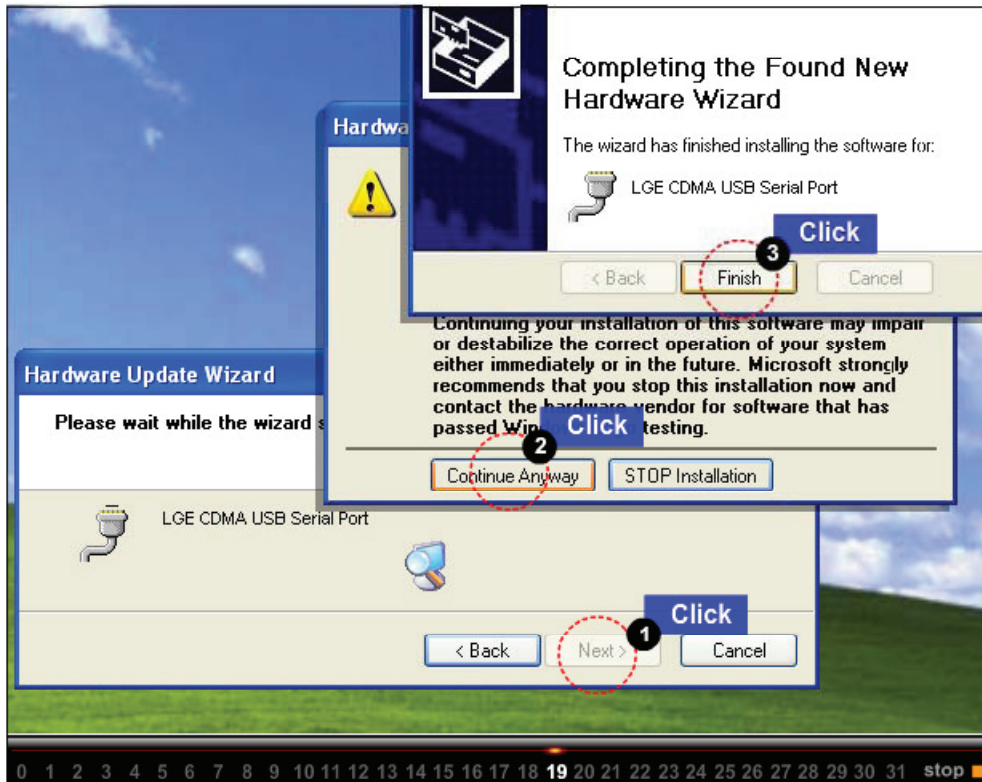


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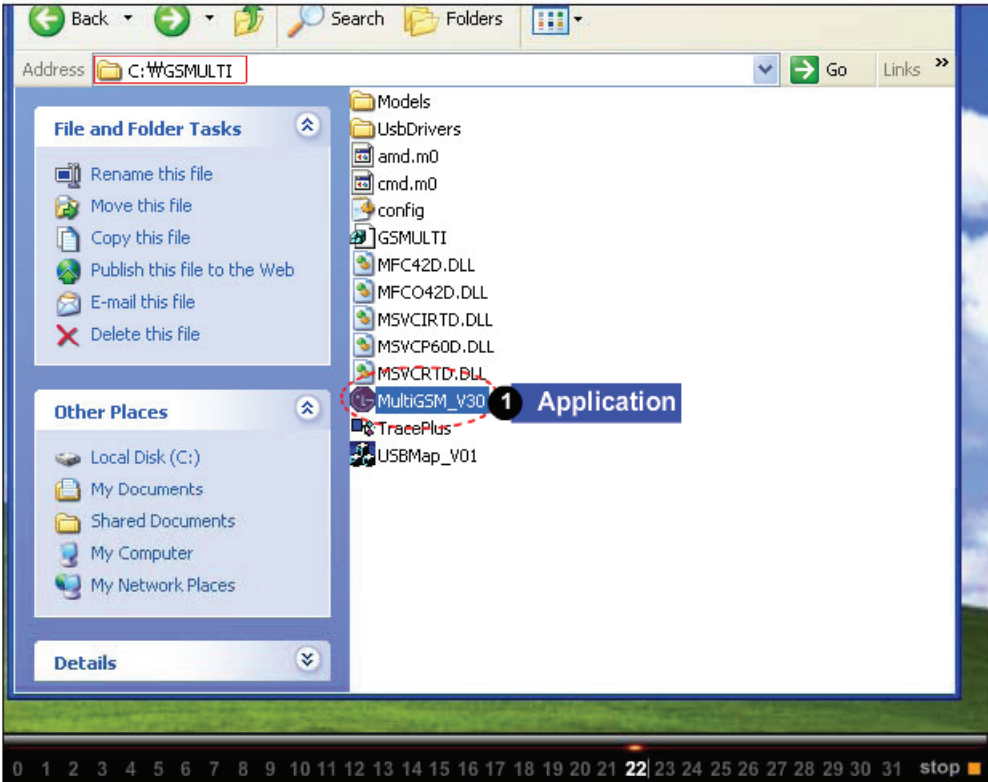




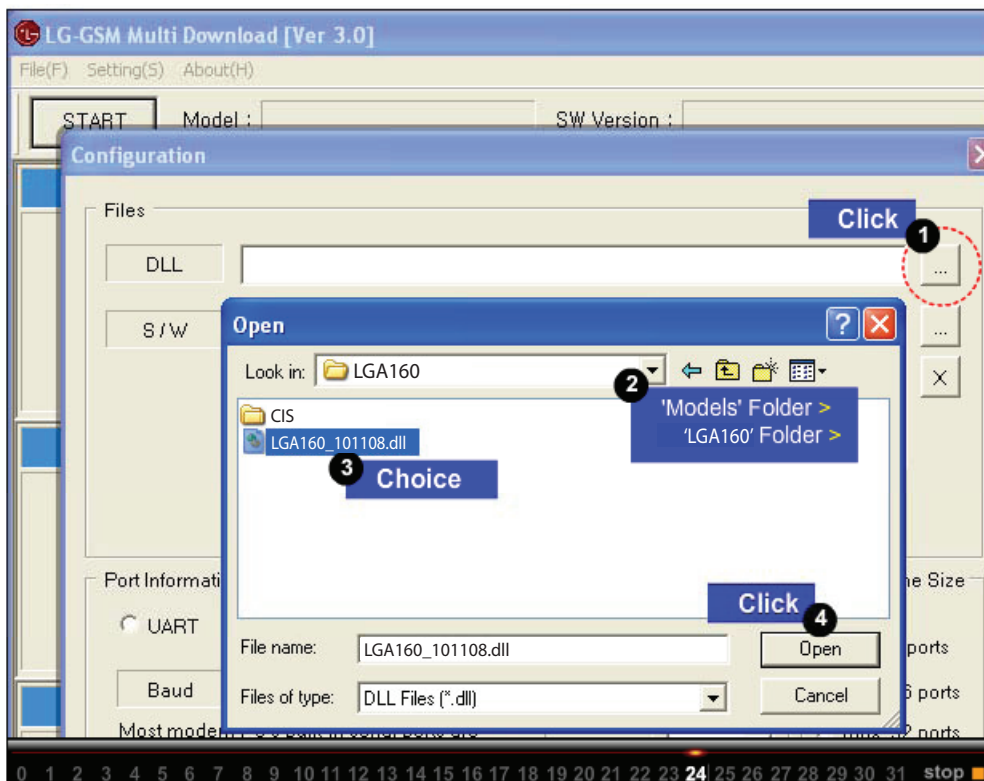
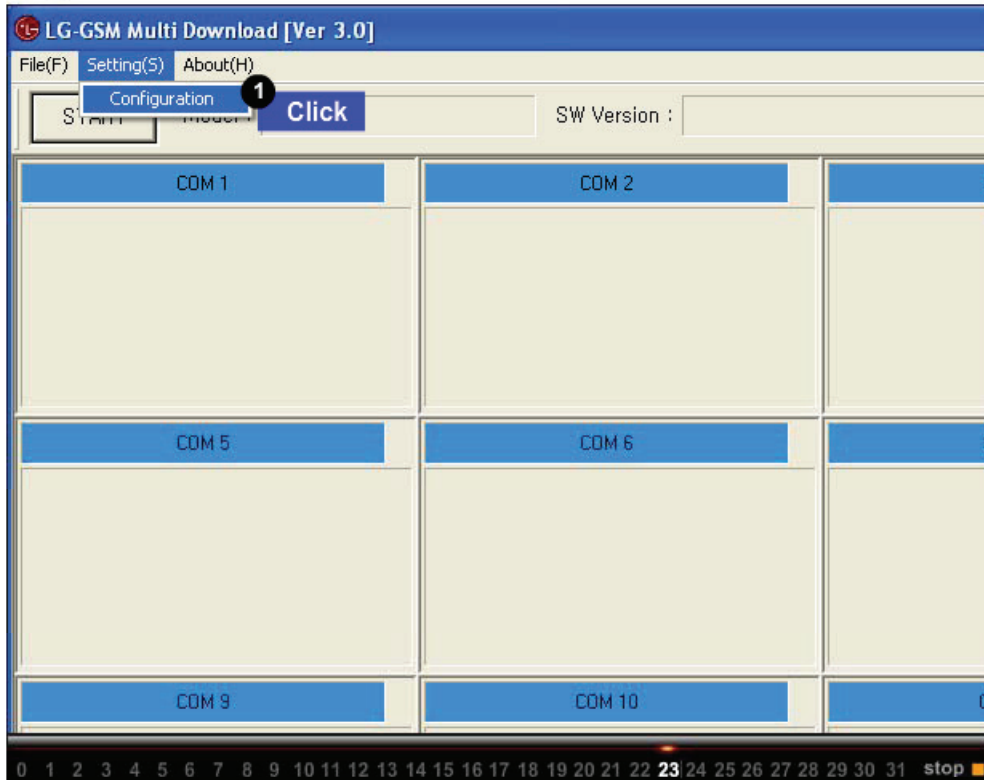
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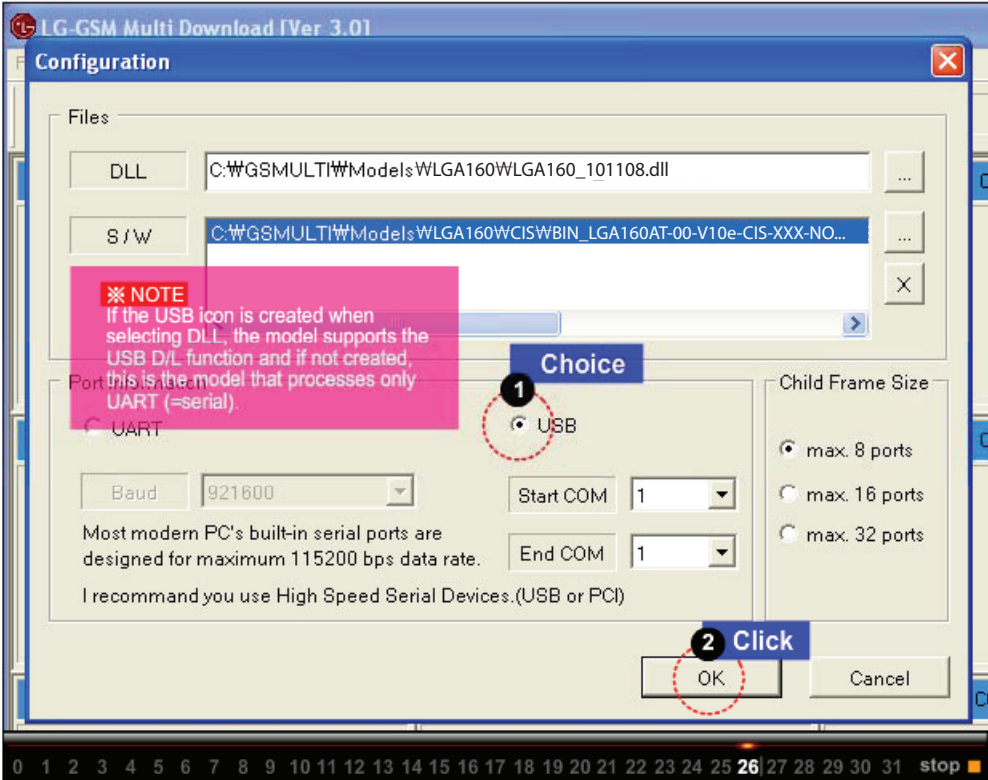
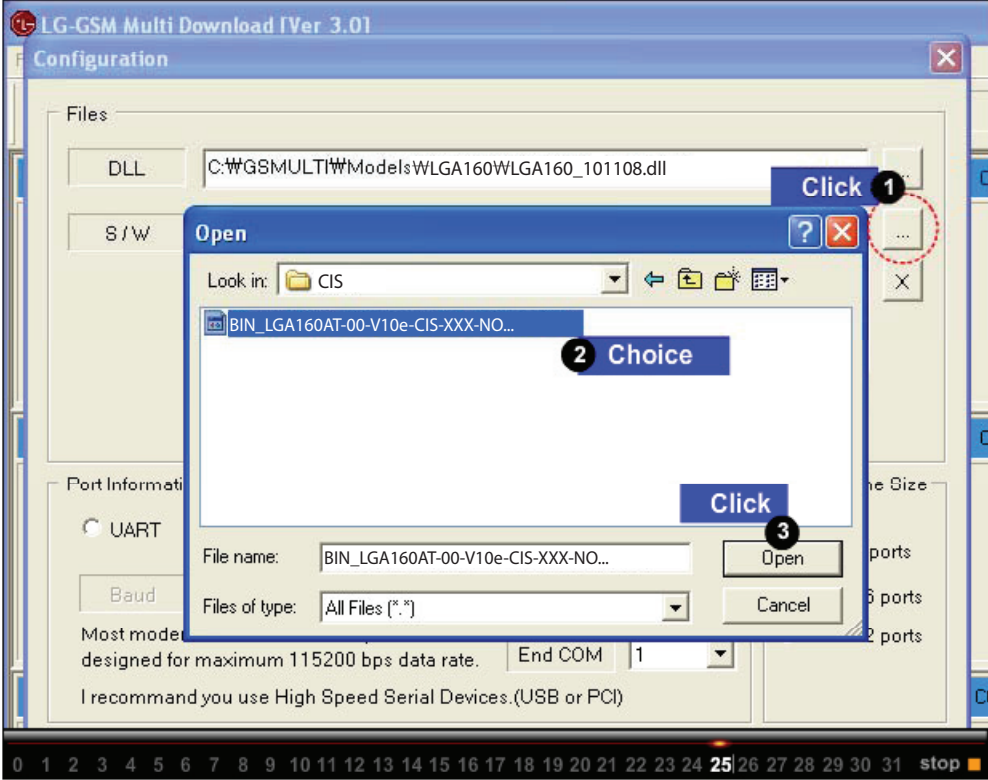


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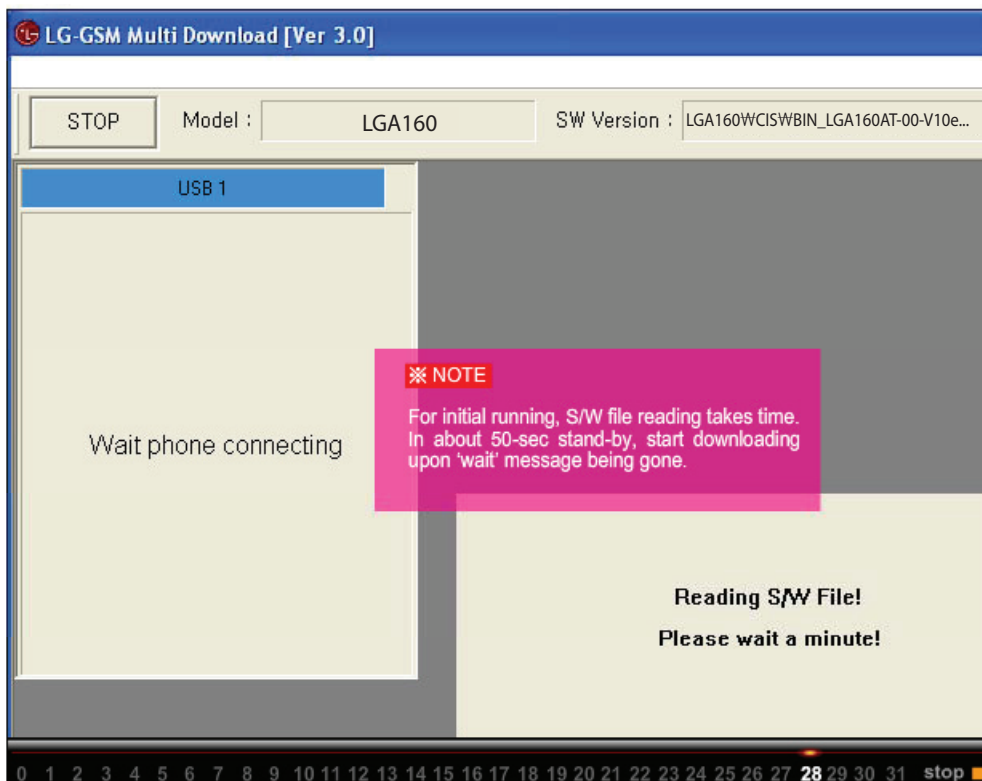
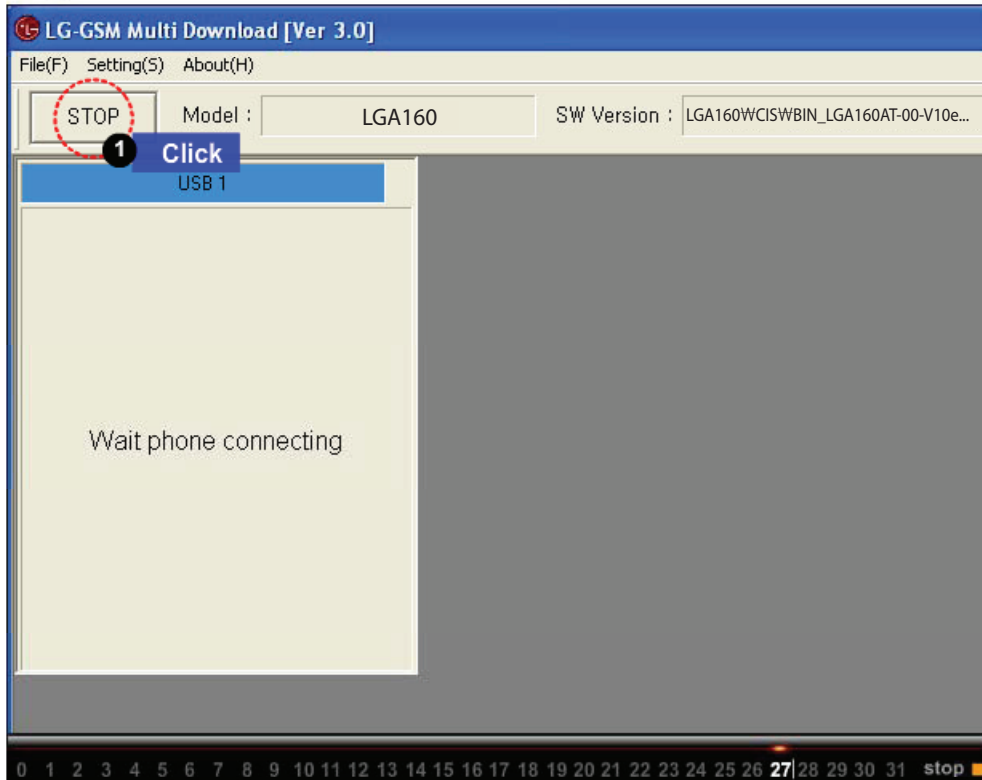


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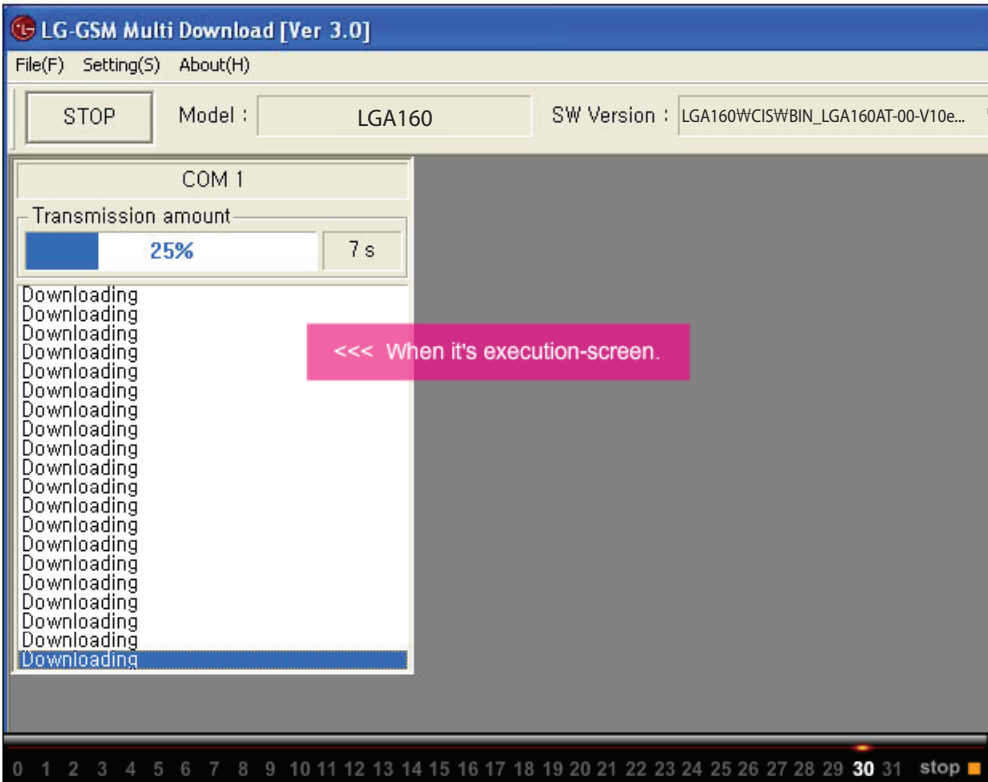




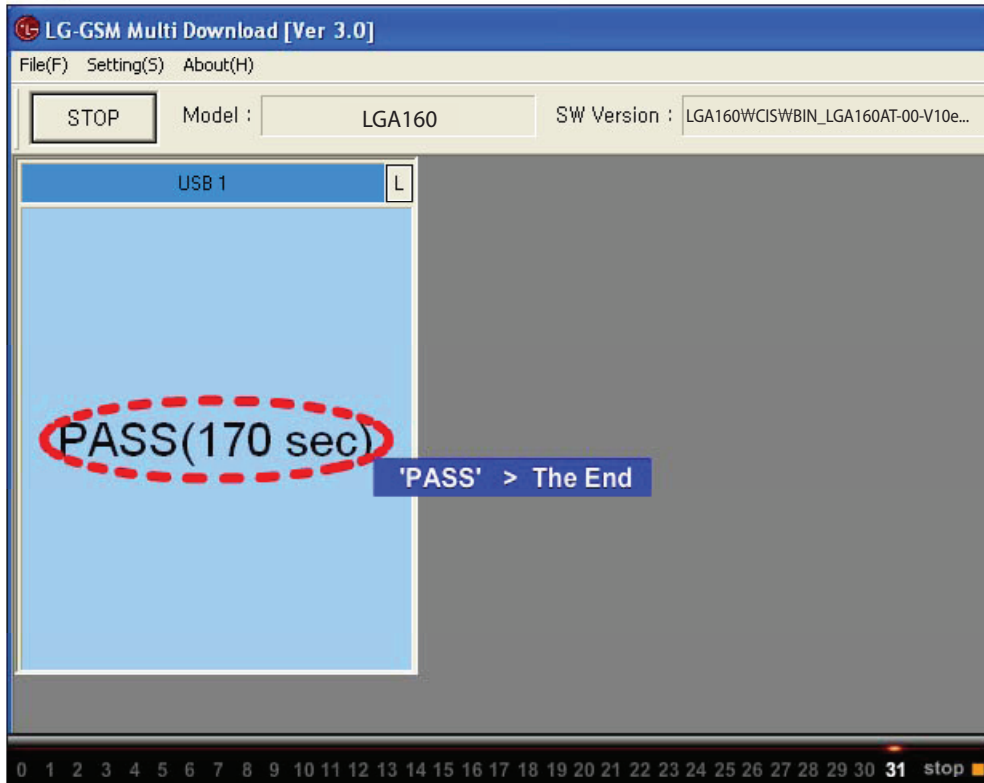
5. DOWNLOAD



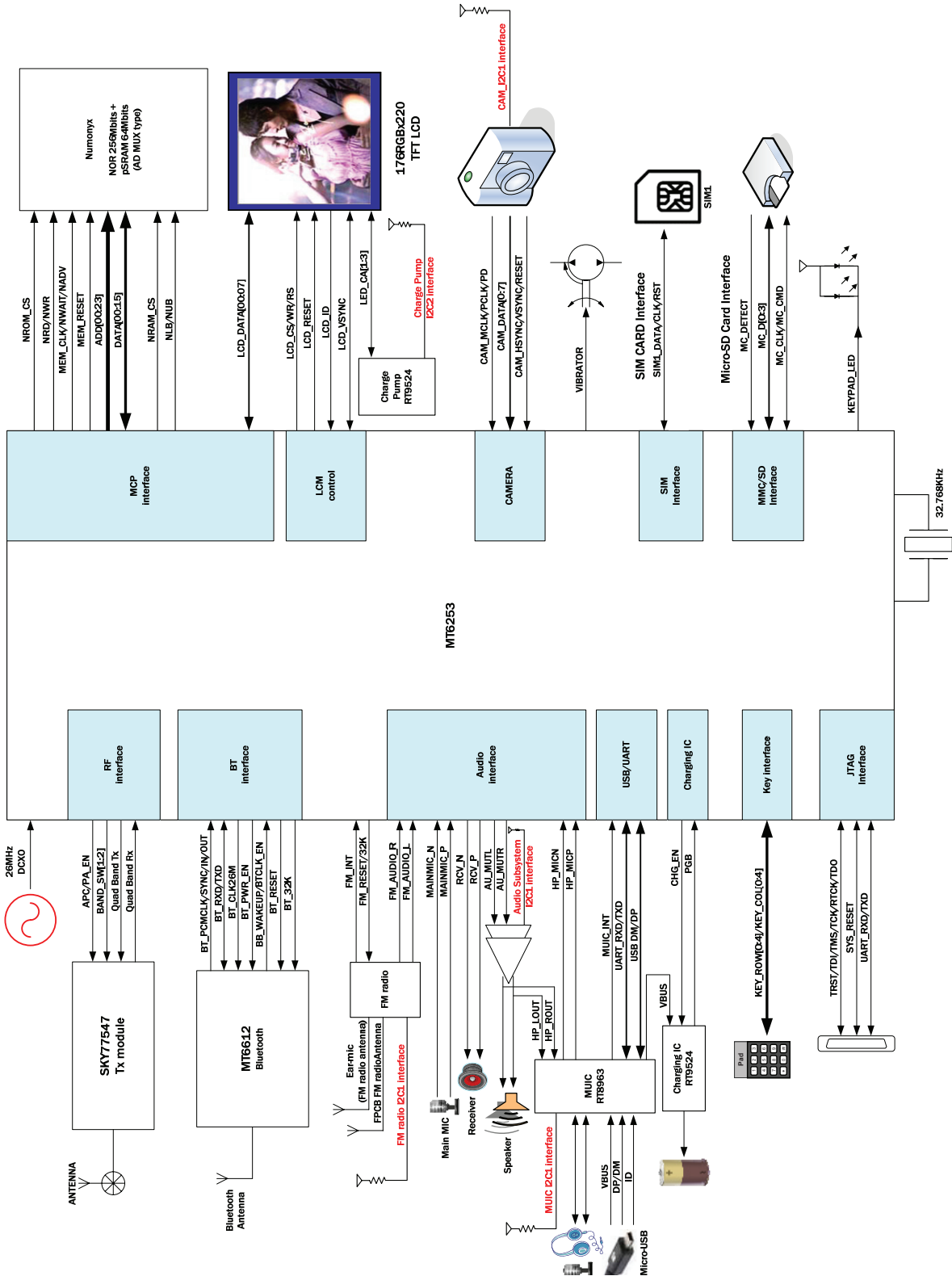
5. DOWNLOAD



5. DOWNLOAD

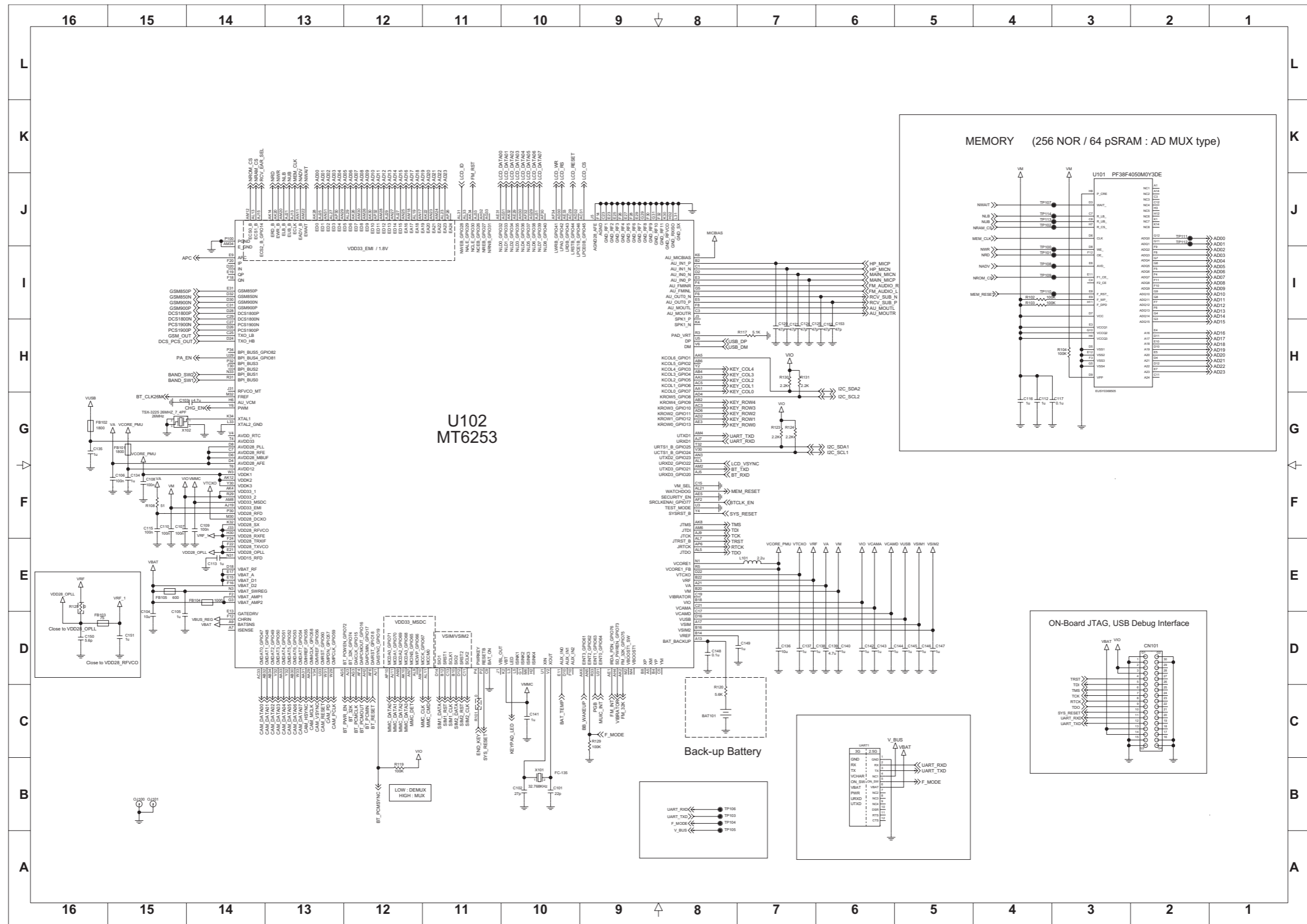


6. BLOCK DIAGRAM

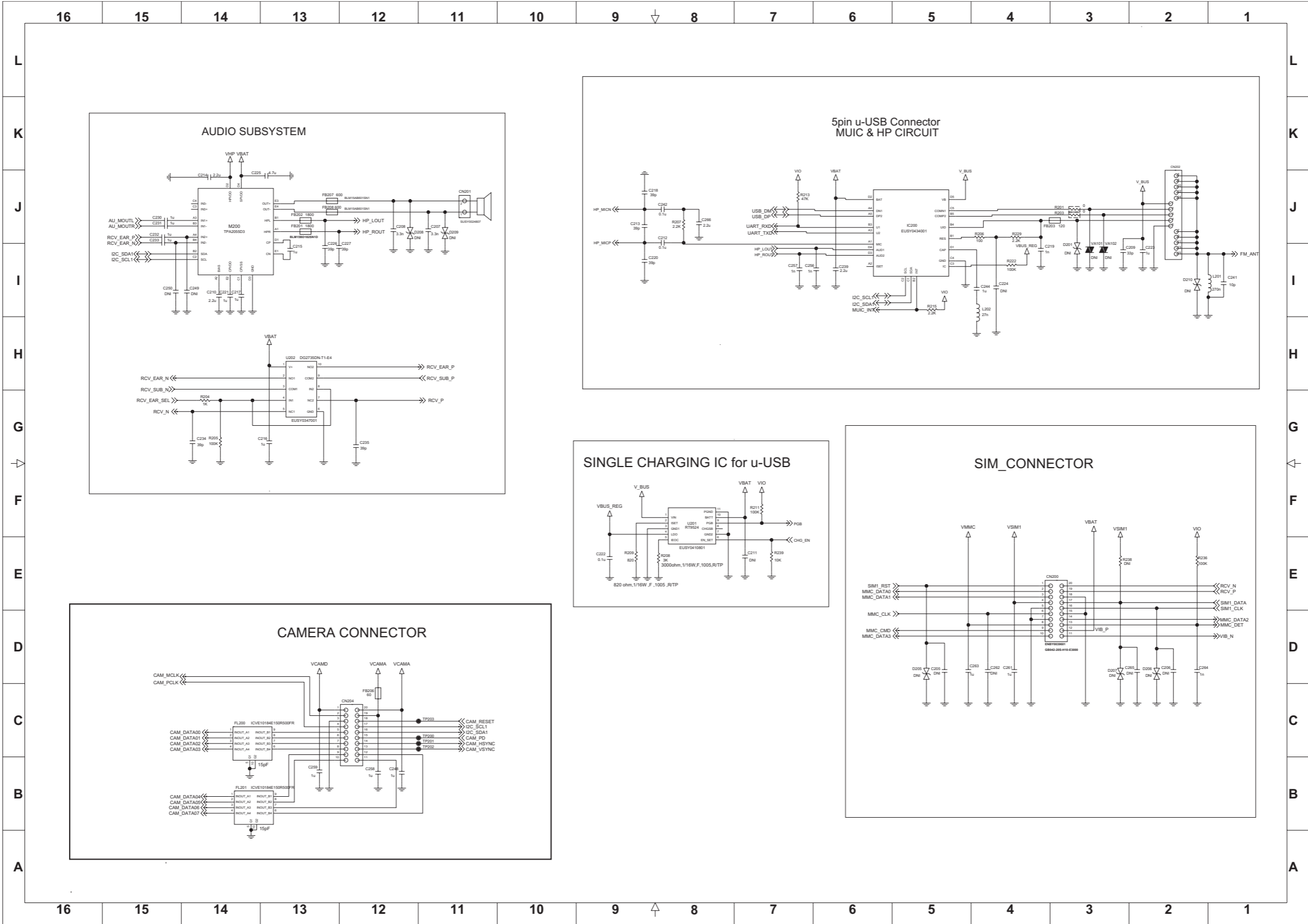




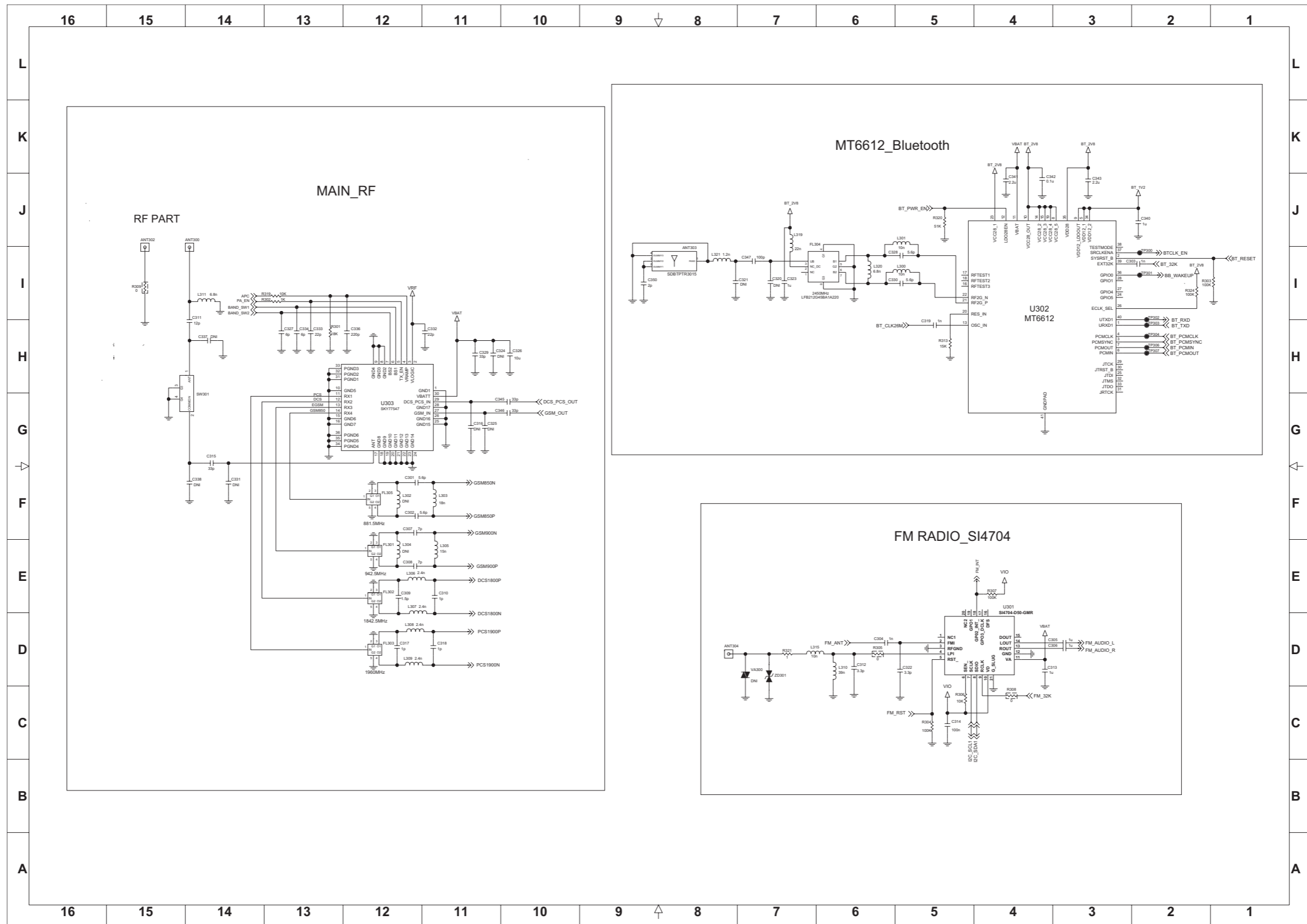
7. CIRCUIT DIAGRAM



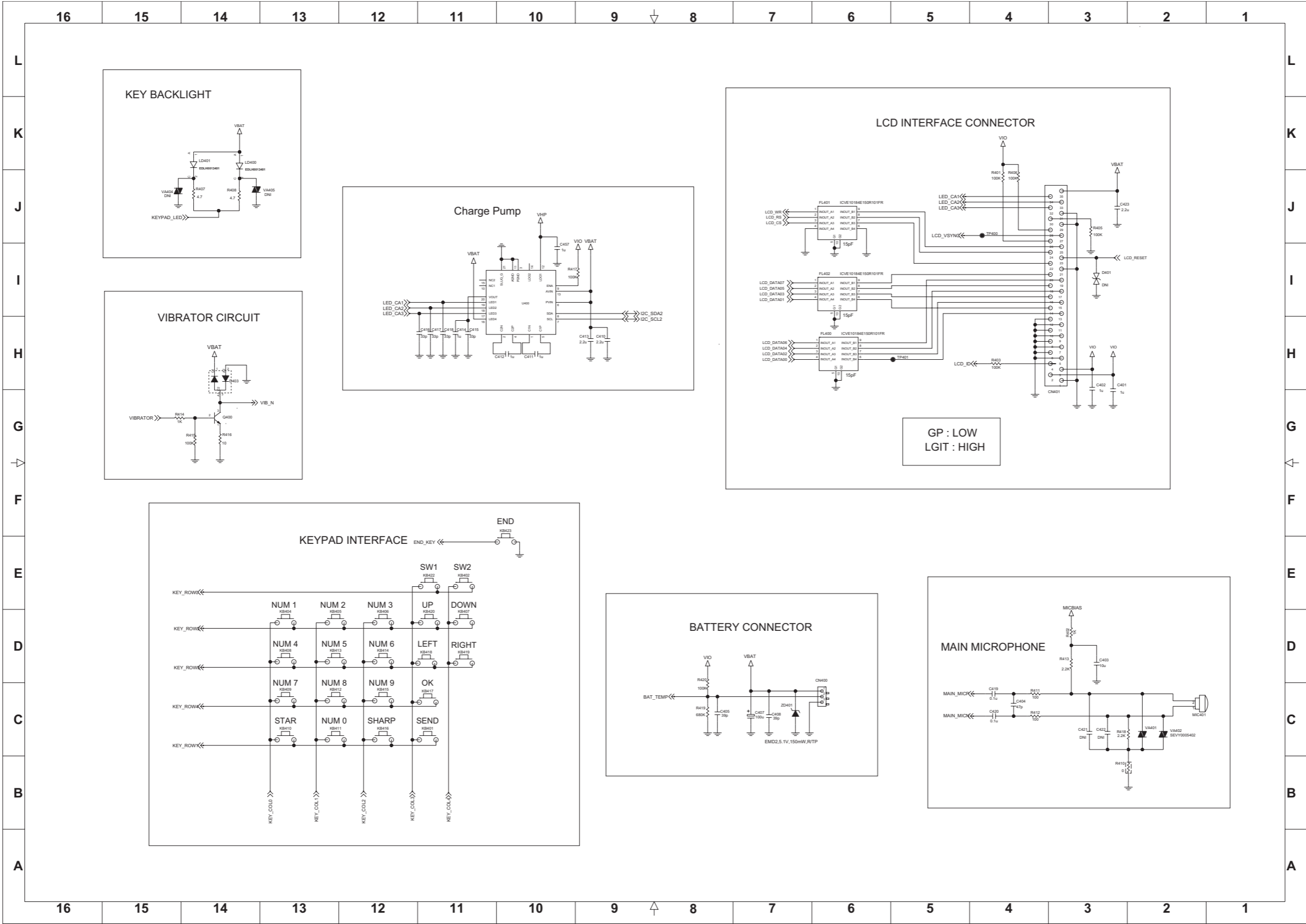
7. CIRCUIT DIAGRAM



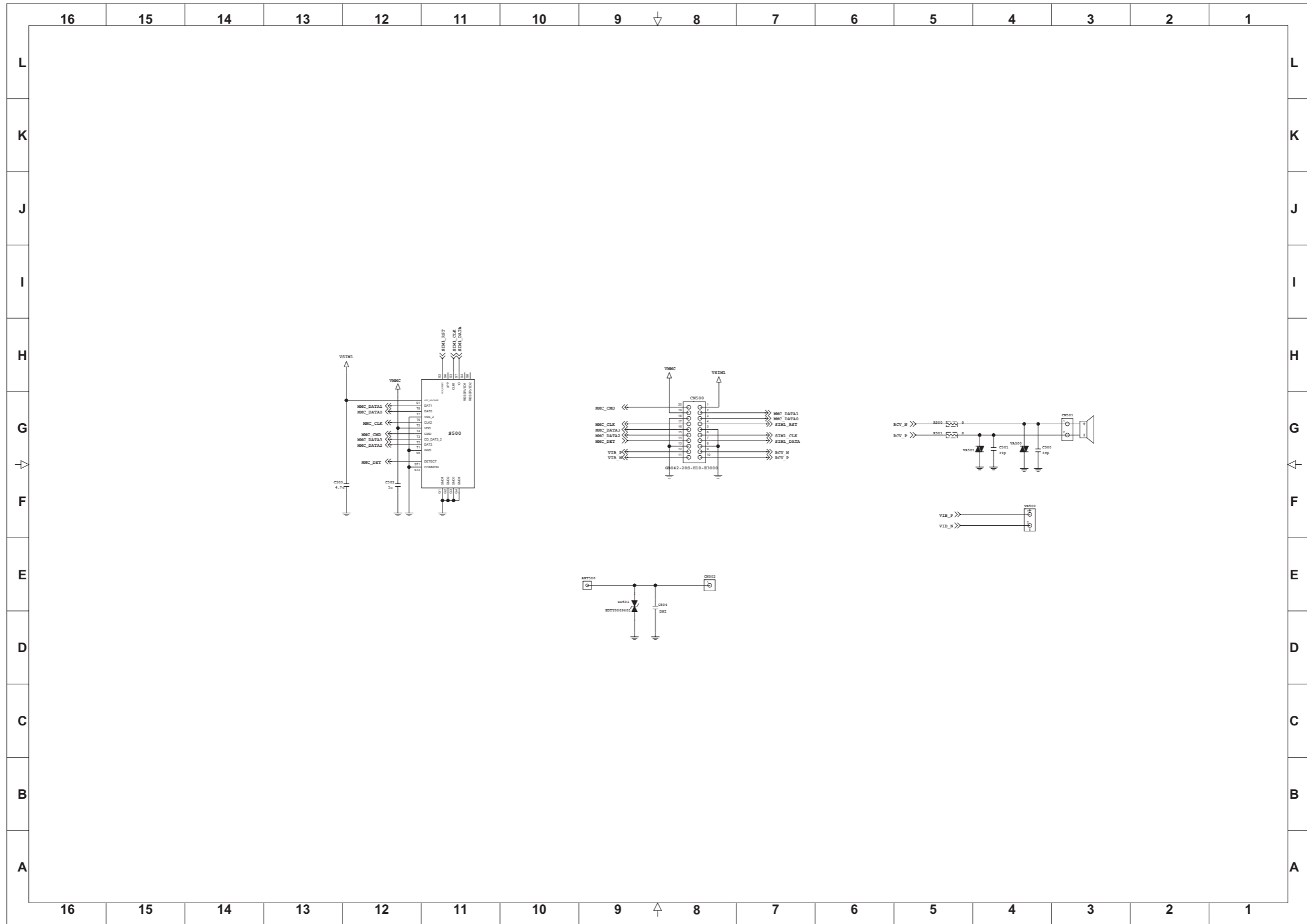
7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM



7. CIRCUIT DIAGRAM



8. BGA PIN MAP

BGA IC pin check (U102)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34				
A										BATSNS				BAT_B ACKUP			VBM			VA															A			
B		AUXIN J								BDI	SRST1		VREF		VBM2		VIO	VN		VRF															B			
C		AUXIN N	AUXMO UTR					AVDD08 RFE		BATON		SCLK2	SCLK1		VMSL L	VCAMB			VCAMA		GND		TKO L	TKO R	PC190 ON	DC190 ON	OSM90 SP		OSM85 ON						C			
D		AUXIN N		AVDD08 AFE	AVDD08 MBUF		AVDD08 PLL			SRST2		BDI	VMSB		VBM2		VBAT RF				VTCKO		TKO H		PC190 SP	DC190 SP	OSM90 ON	OSM85 ON							D			
E		AUXIN J		AUXDU TRJ				APC		AUXIN S			VBAT DRSTA L	VBAT ANKLO G							VDD08 OPLL		GND	GND	GND	GND	OSM85 SP								E			
F		VBAT AMP		AUXFN NR	AUXDU TRN			AUXMO UTL			CHRN		AGND		VBAT DRSTA L							VDD08 TRVCO		VDD08 TRKSP		GND	GND	GND	GND	GND	GND	GND	GND	GND	F			
G			VBAT AMP		AUXFN NR																							GND	GND							G		
H																												VDD08 RFE		GND R XBG						H		
J																																					J	
K			VBT																																		K	
L			LED																																		L	
M																																						M
N		VDD08 V		VBAT SWREG																																	N	
P		RESET B			PWRKE Y																																	P
R			PAD_V RT			VDD08 LFB																																R
T					AVDD03		AVDD02																															T
U	XN		TEST MODE			DP																															U	
V		XOUT																																				V
W			VDDK																																			W
Y		KCOL4		SYSTRS T_B		PWM																																Y
AA		KCOL8		KCOL2		KCOL6																															AA	
AB			KROW4		KCOL3																																	AB
AC				KROW2		KCOL1																																AC
AD				KROW1		KROW5		KROW2																														AD
AH		BDA_P DN		KROW6		SECURE TY_EN																																AH
AF			BRCLK ENM		DMPC MOUT		DARST																															AF
AG				DACLK		BT_PO WEN																																AG
AH			DMPC MN		SD_PW REN																																	AH
AJ	DASYN C		BT_2K		URXD3		URXD1		JTCK		MCD41		ECLK		EC52_B		VDD03 EM		EURS																		AJ	
AK		FM_3K		VDD03		ENT3		JTMS		MCD43		VDDK		ERD_B				EWL_B		EA21																	AK	
AL			URXD2		JTDO		JTRST B				MCD40		EC1_B					EA18		WATCH DOG		EA21															AL	
AM		UTXD3		UTXD1		JTDI		VDD03 MSDC		MCDK		EC8_B					EA18		ELB_B		EWAT		EA23														AM	
AN						ENT2		MCN5		MCD42		EADV B				EA20						EA22															AN	
AP							JRTCK				MCD48																											AP
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34				

GND_PAD

Figure 3 Top View of MT6253A aQFN 11.5mm * 11.5mm 0.47mm pitch package

 : not in use

8. BGA PIN MAP

BGA IC pin check (U101)

▪ Ball Diagram (Top View), PF38F4050M0Y3DF

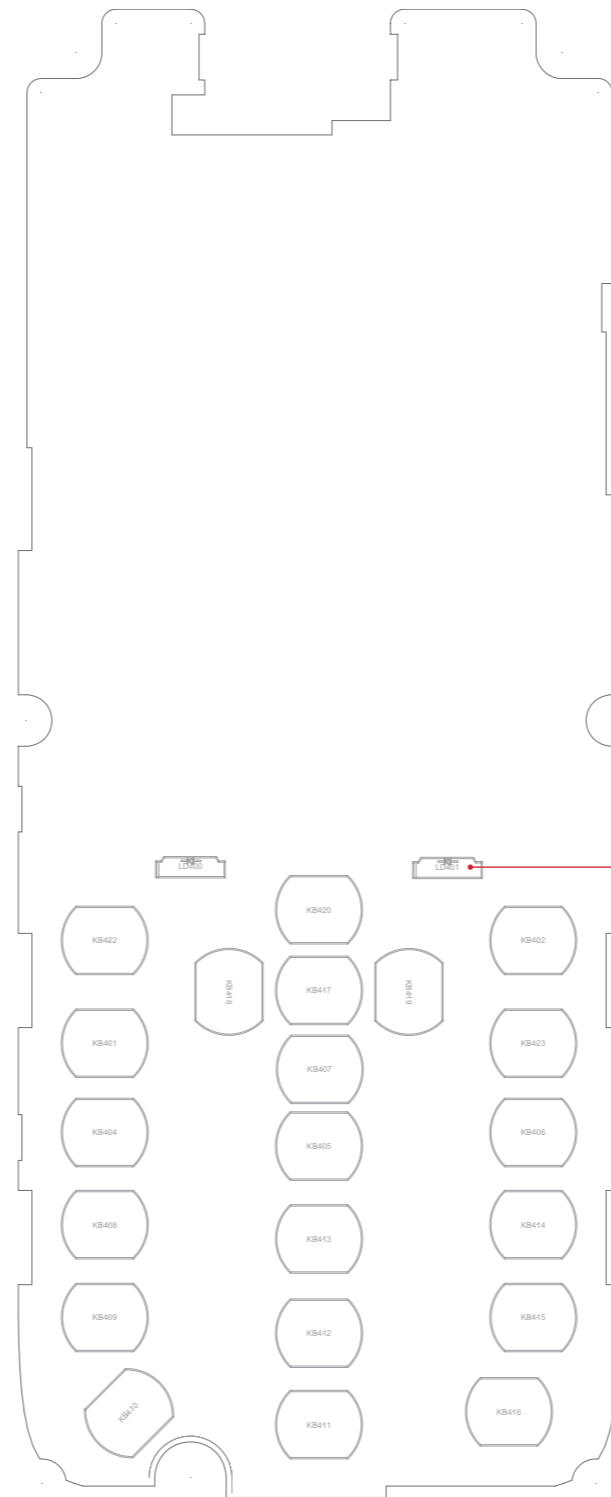
Pin 1	1	2	3	4	5	6	7	8	9	
A		A4	A6	A7	A19	A23	A24	A25		A
B	A2	A3	A5	A17	A18	F-DPD	A22	A26	A16	B
C	A1	VSS	VSS	VSS	D-VCC	VSS	VSS	VSS	A15	C
D	A0	S-VCC	D-VCC	F1-VCC	ADV#	F2-VCC	D-VCC	N-ALE	A14	D
E	F-WP1#	WE#	D2-CS#	Depop (Index)	N-CLE	F4-CE# / A27	A21	A10	A13	E
F	F-WP2#	D1-CS#	D-CAS#	D-RAS#	Depop (RFUs)	N-RE# / S-CS1#	A20	A9	A12	F
G	RFU	F2-CE#	F1-CE#	D-BA0	Depop (RFUs)	D-CKE	F-RST#	A8	A11	G
H	N-RY/BY#	N-WE# / S-CS2	F3-CE#	D-BA1	D-CLK#	D-WE#	OE#	D-DM1 / R-UB#	D-DM0 / R-LB#	H
J	F-VPP	VCCQ	VCCQ	F1-VCC	D-CLK	F2-VCC	VCCQ	VCCQ	F-WAIT	J
K	AD2	VSS	VSS	VSS	F-CLK	VSS	VSS	VSS	AD13	K
L	AD1	AD3	AD5	AD6	AD7	AD9	AD11	AD12	AD14	L
M		AD0	D-LDQS	AD4	AD8	AD10	D-UDQS	AD15		M
	1	2	3	4	5	6	7	8	9	

Top View - Ball Side Down

Legend:		Active Balls
		De-Populated Balls
		Reserved for Future Use
		Do Not Use

 : not in use

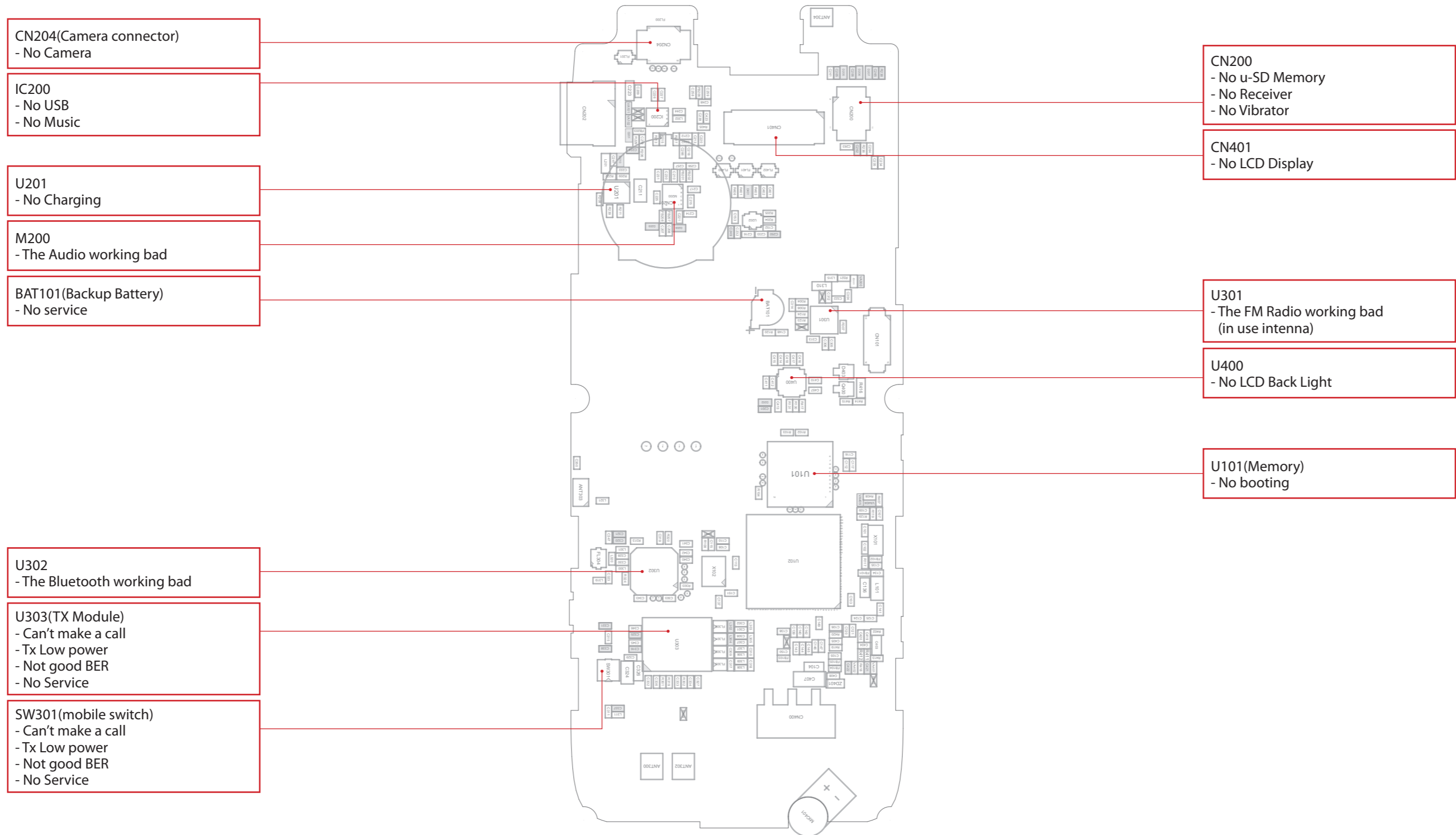
9. PCB LAYOUT



LD400 & LD401
- No Key Backlight

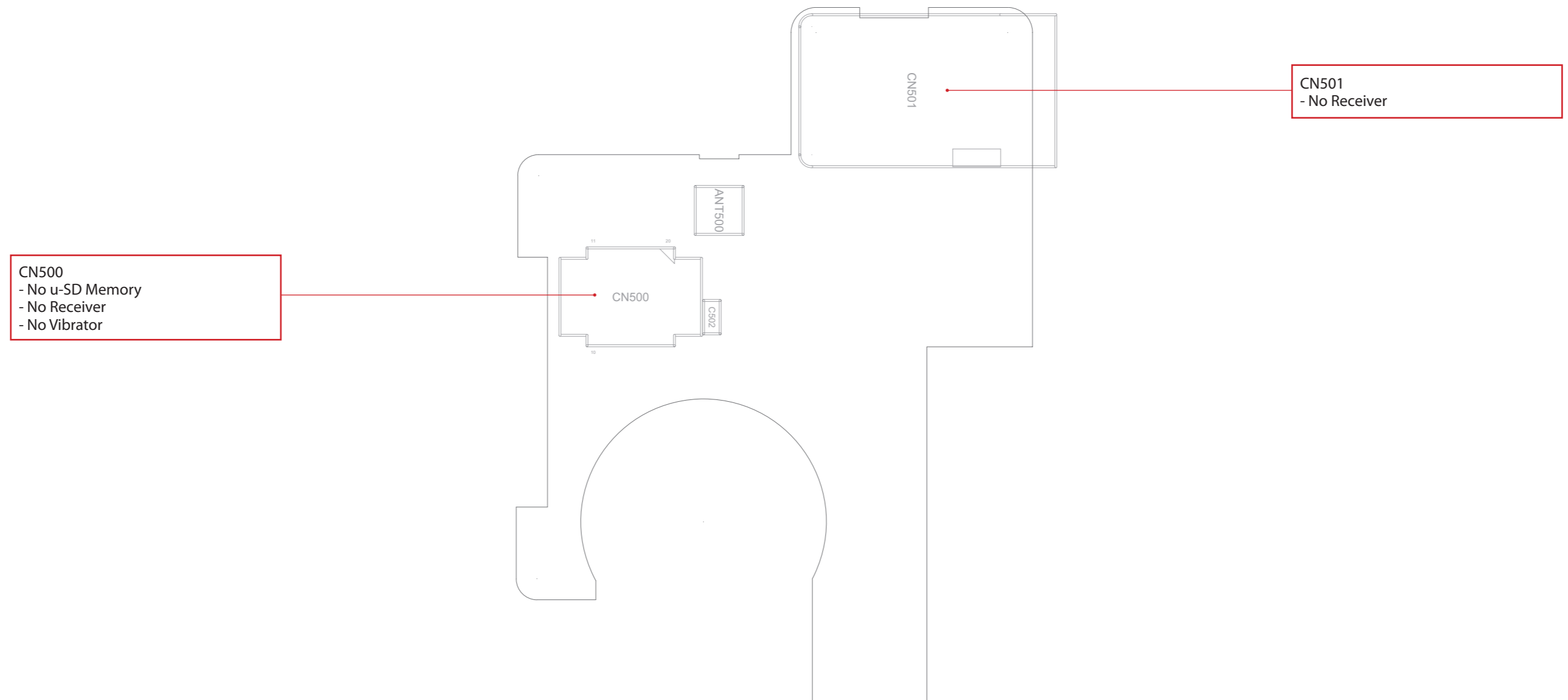
LG-A160_MAIN_SPFY0236101-1.0_TOP

9. PCB LAYOUT



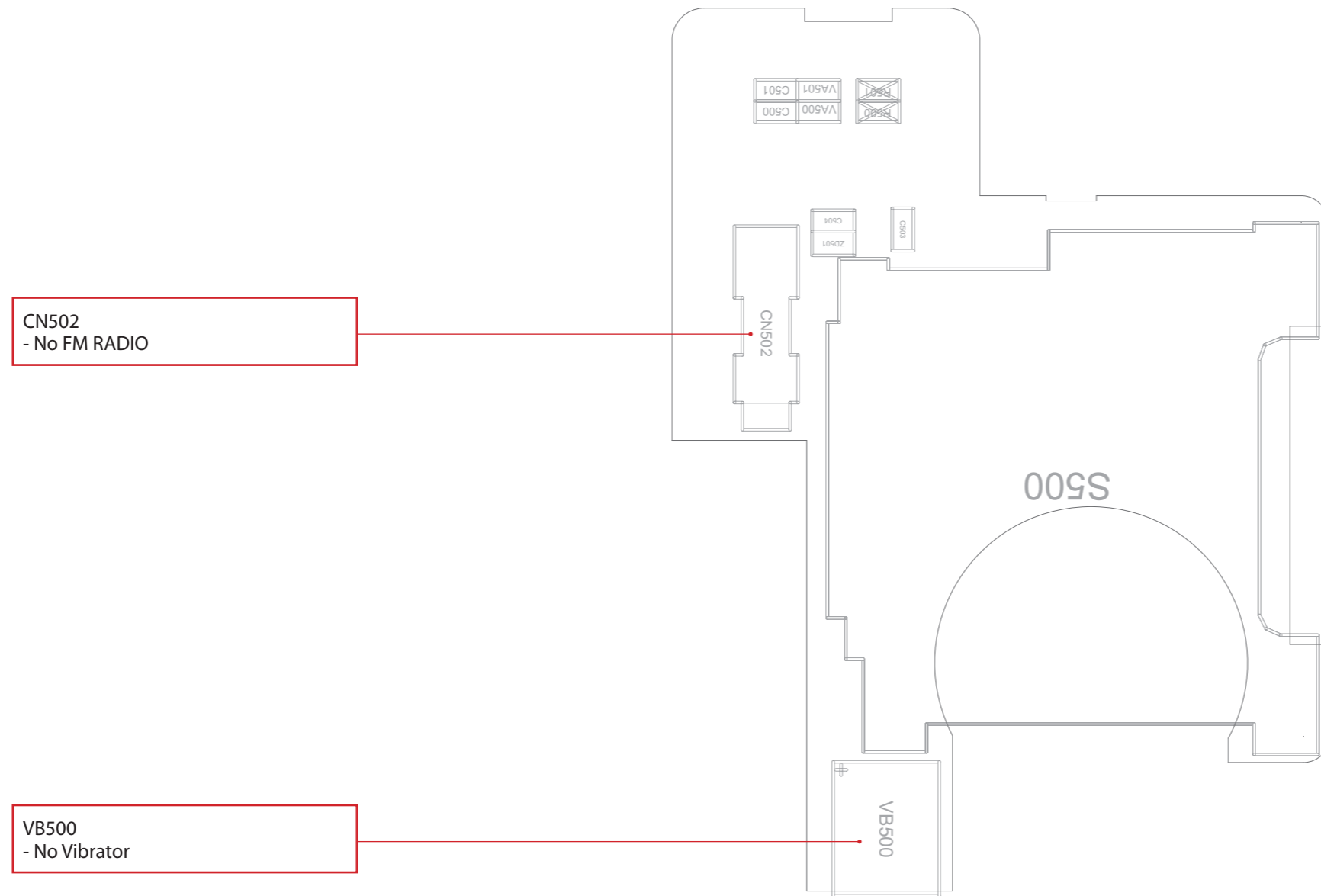
LG-A160_MAIN_SPFY0236101-1.0_BOT

9. PCB LAYOUT



LG-A160_SUB_SPJY0086501-1.0_PLACE_TOP

9. PCB LAYOUT



LG-A160_SUB_SPJY0086501-1.0_PLACE_BOT

9. PCB LAYOUT



LG-A160_FPCB_SPCY0261001-1.0_PLACE_TOP



LG-A160_FPCB_SPCY0261001-1.0_PLACE_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#*160#" "Select. Pressing END will switch back to non-engineering mode operation. Use Up and Down key to select a menu and press 'select' key to progress the test. Pressing 'back key will switch back to the original test menu.

- [1]Device test
 - [1-1]All auto
 - [1-2]Key press
 - [1-3]Sound
 - [1-4]Vibrator
 - [1-5]External memory
 - [1-6]SIM
 - [1-7]Camera
 - [1-8]Audio loopback
- [2]ELT mode
 - [2-1]Automatic
 - [2-1-1]1Time
 - [2-1-2]2Times
 - [2-1-3]3Times
 - [2-1-4]4Times
 - [2-1-5]5Times
 - [2-1-6]25Times
 - [2-1-7]100Times
 - [2-1-8]Infinite Times
 - [2-2]Manual
 - [2-2-1]LCD backlight
 - [2-2-2]Ringtone
 - [2-2-3]Vibrator
 - [2-2-4]Camera
 - [2-2-5]Audio loopback
- [3]SW sanity test
 - [3-1]E serial NO
 - [3-2]UA string
 - [3-3]Unlock SIM
 - [3-4]DB check
- [4]Factory reset
- [5]Version
 - [5-1]Main SW
- [6]Usage info
 - [6-1]Call timer
- [7] ERS
 - [7-1] Client status
 - [7-1-1] Active
 - [7-1-2] Active + File save
 - [7-1-3] Inactive
 - [7-1-4] Inactive + File save
 - [7-1-5] Light mode
 - [7-1-6] Full mode
 - [7-1-7] Retry
 - [7-2] ERS test
 - [7-2-1] QM test
 - [7-2-2] Watch dog
 - [7-2-3] Divide by zero
 - [7-2-4] SWI
 - [7-2-5] Fatal
 - [7-3] Carrier setting

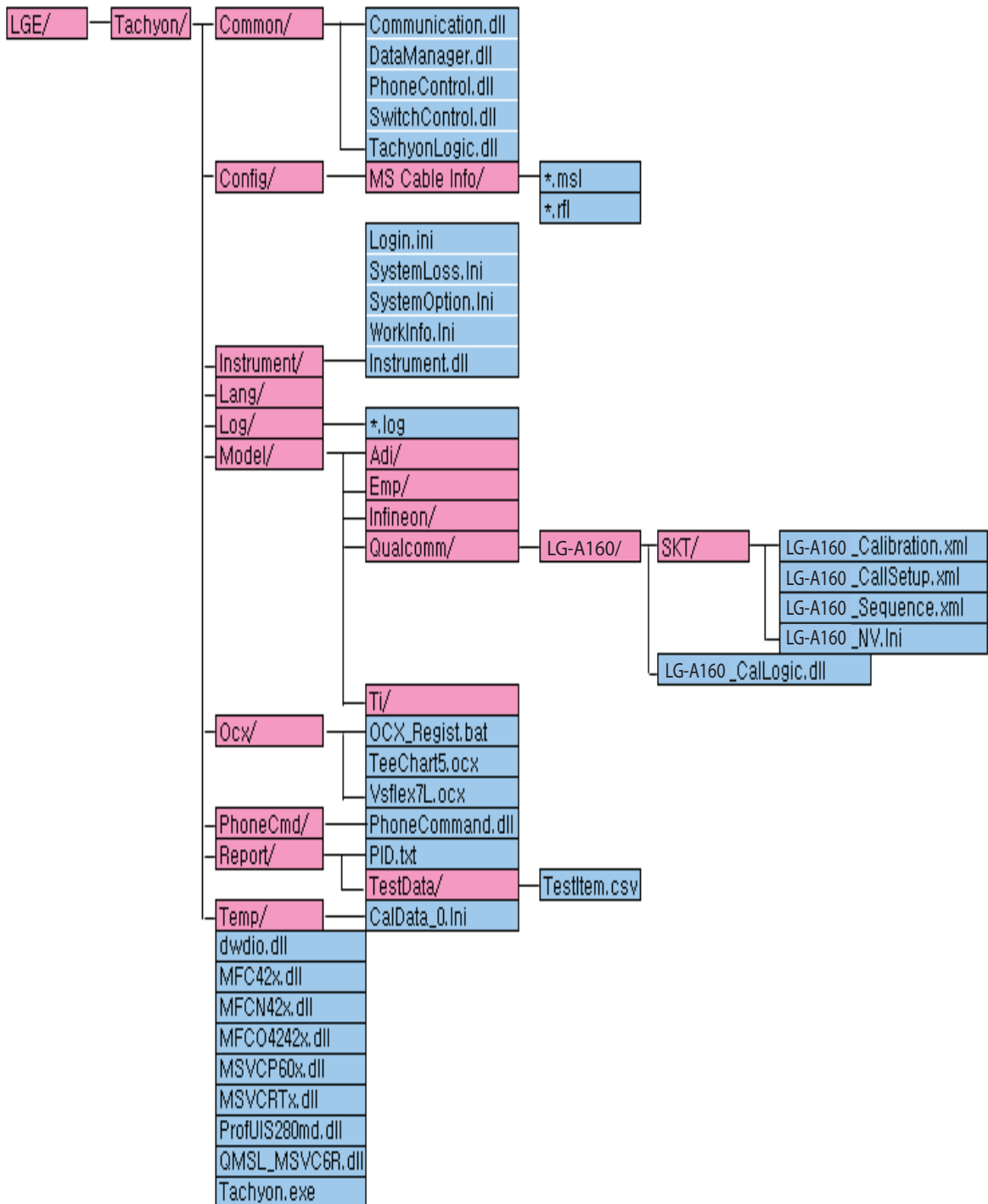
11. RF CALIBRATION

- [8] Engineer mode
 - [8-1] FPRI test
 - [8-2] User pattern test
 - [8-3] PS
 - [8-3-1] Band selection
 - [8-3-1-1] SIM1
 - [8-3-1-1-1] Auto
 - [8-3-1-1-2] GSM850
 - [8-3-1-1-3] GSM900
 - [8-3-1-1-4] DCS1800
 - [8-3-1-1-5] PCS1900
 - [8-3-1-2] SIM2
 - [8-3-1-2-1] Auto
 - [8-3-1-2-2] GSM850
 - [8-3-1-2-3] GSM900
 - [8-3-1-2-4] DCS1800
 - [8-3-1-2-5] PCS1900
 - [8-4] MMS
 - [8-5] DRM
 - [8-6] RF(BER)
 - [8-6-1] Review
 - [8-6-2] LCD
 - [8-6-3] Vibrator
 - [8-7] Baseband
 - [8-7-1] Charging info
 - [8-7-2] Battery info
 - [8-7-3] LCD(Main)
 - [8-8] Audio tuning
 - [8-9] Bluetooth
 - [8-9-1] Set BT address
 - [8-9-2] BT Audio/RF test
 - [8-9-2-1] Audio test
 - [8-9-2-2] RF test
 - [8-9-3] Test menu
 - [8-10] Aging test
- [9] Wise debug
- [10] MTK debug
 - [10-1] Catcher
 - [10-1-1] Port
 - [10-1-1-1] NULL
 - [10-1-1-2] UART(microUSB)
 - [10-1-1-3] UART(Debug)
 - [10-1-1-4] UART(COM)
 - [10-1-2] Baudrate
 - [10-1-2-1] 921600
 - [10-1-2-2] 460800
 - [10-1-2-3] 115200
 - [10-2] Sleep mode
 - [10-2-1] Enable
 - [10-2-2] Disable
 - [10-3] DCM
 - [10-3-1] Enable
 - [10-3-2] Disable
 - [10-4] Memory dump
 - [10-4-1] Enable
 - [10-4-2] Disable
 - [10-5] Buffer monitor
 - [10-5-1] Disable
 - [10-5-2] All
 - [10-5-3] 8Bytes
 - [10-5-4] 16Bytes
 - [10-5-5] 32Bytes
 - [10-5-6] 64Bytes
 - [10-5-7] 128Bytes
 - [10-5-8] 256Bytes
 - [10-5-9] 512Bytes
 - [10-5-10] 1024Bytes
 - [10-5-11] 2048Bytes
 - [10-6] FS trace mode
 - [10-6-1] Disable
 - [10-6-2] Error
 - [10-6-3] API + Error
 - [10-7] Watch dog
 - [10-7-1] Enable
 - [10-7-2] Disable

11. RF CALIBRATION

11.1 Configuration of Tachyon

11.1.1 Configuration of directory



11. RF CALIBRATION

11.1.2 Description of basic folders

Folder	Description
Tachyon	Exe file and MFC dll, UI dll is present.
Common	Common dll files. (XML Data I/O , Auto Test Logic, Tachyon Logic Control, Communication)
Config	Envirement files. (Port configuration, Loss adjust)
Instrument	Tester control dll.
Model	Model files is present. (Model -> Solution (Qualcomm, EMP, ADI, INFINEON) -> MODEL NAME(LGGM630, LGSH470, ..) -> BUYER NAME(SKT, TEL, VIVO, ...)
OCX	Component files.
PhoneCmd	Phone communication file
Report	Report Files is present. (Cal data, test data)

11.1.3 Description of configuration files

File	Description
'MODEL NAME'_Calibration.XML	There are imformations to calibrate. It consist of calibration items.
'MODEL NAME'_CallSetup.XML	There are imformations to call.
'MODEL NAME'_NV.INI	It consists of default values. It is written when 'cal&auto' is begun.
'MODEL NAME'_Sequence.XML	It is described a testing procedures.

11.2 How to use Tachyon

11.2.1 Model selection

Follow the procedure before start calibration & auto test

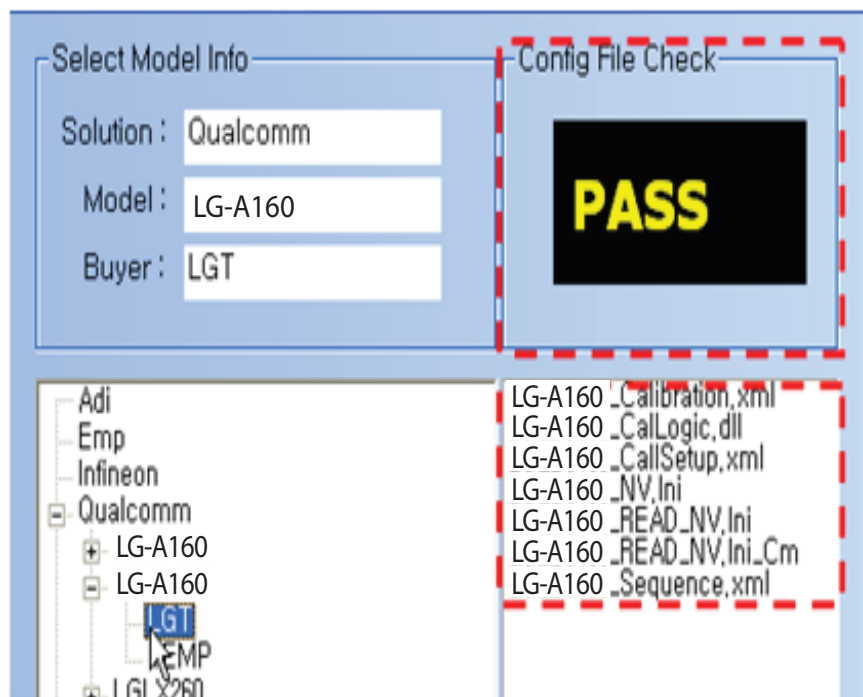


a. Click the icon,  in tool bar.

Then, You can make a choice of LG-A160 for loading cfg files before run.

b. Select model name and then do double-click the buyer name.


You will see configuration files loaded in the right window with PASS information above

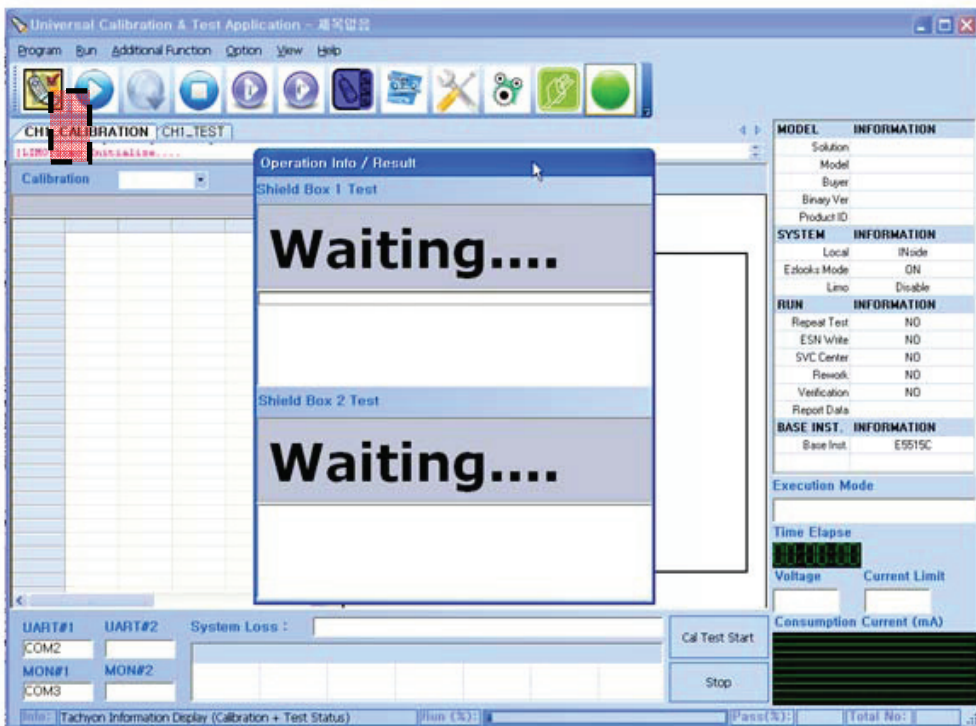


< Example of selection of model name >

11. RF CALIBRATION

11.2.2 Start cal & auto

a. Click calibration & autotest button,  in Tool bar

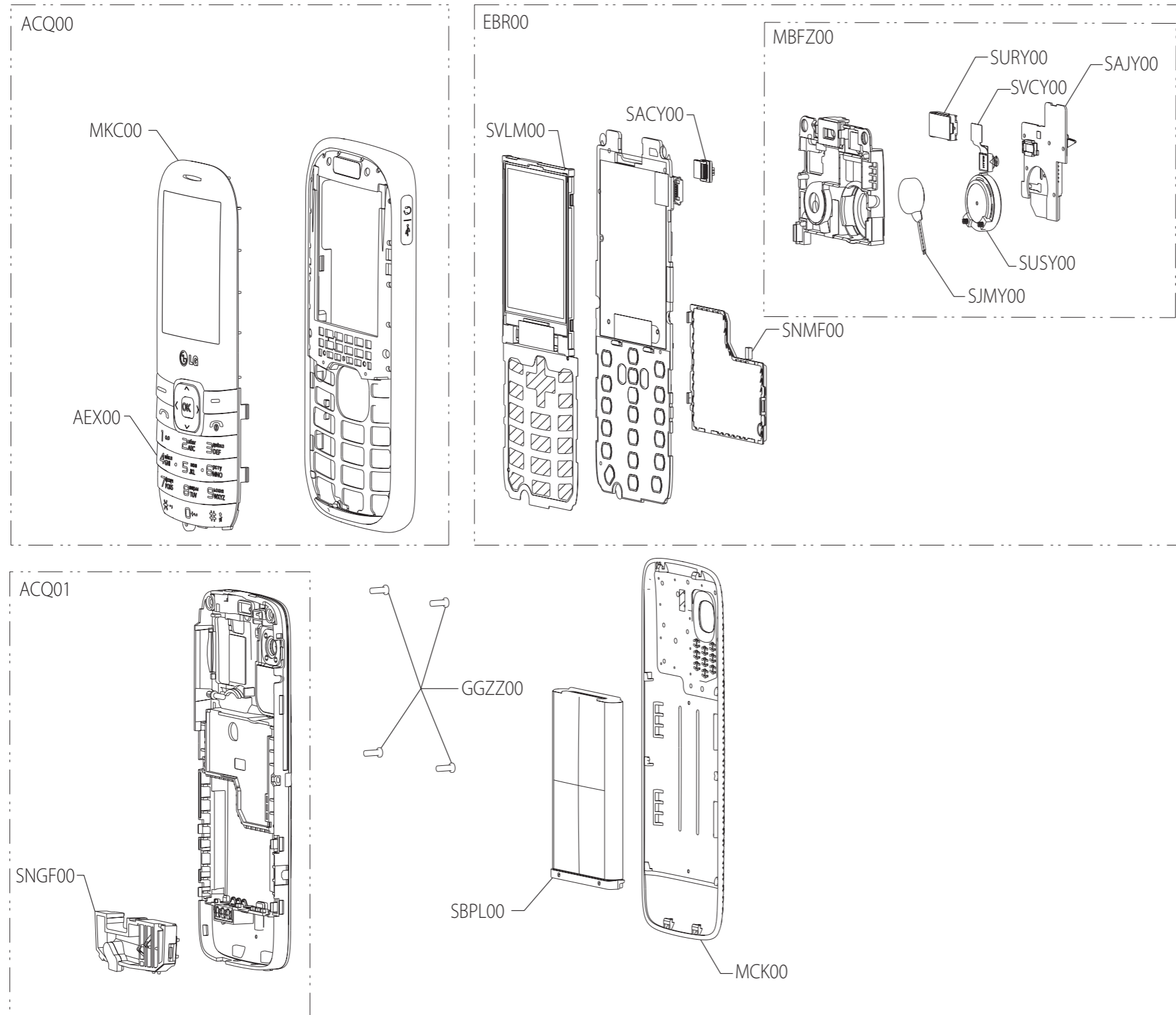


b. Calibration & autotest will be executed in order.

- 1) Precede Action.
 - NV write
 - Test command send.
- 2) RF Calibration
- 3) RF Auto test
- 4) After action
 - Phone reset
 - Change UE to AMSS

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.1 EXPLODED VIEW



Location No.	Description
ACQ00	Cover Assembly,Front
AEX00	Keypad Assembly,Main
MKC00	Window,LCD
ACQ01	Cover Assembly,Rear
EAA010	Antenna,Helical
EBR00	PCB Assembly,Main
SNMF00	Antenna,Helical
SAJY00	PCB Assembly,Sub
SJMY00	Motor,DC
MBFZ00	Bracket
SURY00	Receiver
SVCY00	Camera Module
SUSY00	Speaker Module
SACY00	PCB Assembly,Flexible
SVLM00	LCD Module
GGZZ00	Screw,Tapping
SBPL00	Mobile Phone Battery Li-Ion
MCK00	Cover,Battery

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.2 Replacement Parts <Mechanic component>

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

Level	Location No.	Description	Part Number	Spec	Remark
1	AAD000000	Addition Assembly	AAD85596201 7	LGA160.ACISKV ZZ:Without Color -	
2	AFN053800	Manual Assembly, Operation	AFN75273701 2	LGA160.ACISKV ZZ:Without Color -	
3	MBM087200	Card,Warranty	MCDF0011303	COMPLEX GD350 CISBK ZZ:Without Color -	
3	MFL053800	Manual,Operation	MFL66984701	COMPLEX LGA160.ACISKV ZZ:Without Color -	
2	MCK004100	Cover,Battery	MCJA0119501	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
1	AGQ000000	Phone Assembly	AGQ86295601	LGA160.ACISKV KV:BLACK_SILVER POINT -	
2	ACQ100400	Cover Assembly,EMS	ACQ85322401 7	LGA160.ACISKV KV:BLACK_SILVER POINT -	
3	ACQ032700	Cover Assembly, Front	ACQ85297401 9	LGA160.ACISKV KV:BLACK_SILVER POINT -	
4	AEX046800	Keypad Assembly, Main	AEX73637801	LGA160.ACISKV KV:BLACK_SILVER POINT -	
4	MBL063800	Cap,Receptacle	MCCE0061401	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
4	MCK032700	Cover,Front	MCJK0134601	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
4	MCR000000	Decor	MDAY0084901	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
4	MDJ000000	Filter	MFBZ0025501	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MKC043300	Window,LCD	MKC63880601	MOLD PMMA LGA160.ACISKV ZZ:Without Color -	
4	MCQ043300	Damper,LCD	MPBG0113301	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MJN020800	Tape,Decor	MTAA0230301	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MJN089300	Tape,Window	MTAD0134101	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
3	ACQ063300	Cover Assembly,Rear	ACQ85297501 11	LGA160.ACISKV ZZ:Without Color -	
4	MBL051100	Cap,Multimedia Card	MCCG0025801	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
4	MCK063300	Cover,Rear	MCJN0132501	MOLD PC LGA160.ACISKV@WWZ.EKHQ KV:BLACK_SILVER POINT MOLD, PC LUPOY SC-1004A, , ,	
4	MCR000000	Decor	MDAY0085001	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
4	MDJ000000	Filter	MFBZ0025601	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
4	MEZ000900	Label,After Service	MLAB0004801	COMPLEX LG-LB3300 LGT ZZ:Without Color -	
4	MCQ000000	Damper	MPBZ0346901	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MJN000000	Tape	MTAZ0345201	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MJN000001	Tape	MTAZ0345301	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
4	MKC009400	Window,Camera	MWAE0064801	COMPLEX LG-A165 INDKV ZY:Color Unfixed CUTTING,PMMA MR 200,	
5	MEZ000000	Label	MLAZ0038301	COMPLEX LG-VX6000 ZZ:Without Color PID Label 4 Array PRINTING,	
5	ABFZ00	Bracket Assembly	ABFZ0025501 13	LG-A165 INDKV ZY:Color Unfixed -	
6	MBFZ00	Bracket	MBFZ0053701	COMPLEX LG-A165 INDKV ZY:Color Unfixed MOLD,PC LUPOY SC-1004A,	
6	MCIZ00	Contact	MCIZ0006801	COMPLEX LG-A165 INDKV ZZ:Without Color PRESS,BeCu,	
6	MPBN00	Damper,Speaker	MPBN0091601	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MPBT00	Damper,Camera	MPBT0099801	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MPBZ00	Damper	MPBZ0323501	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MPBZ02	Damper	MPBZ0325401	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MTAK00	Tape,Camera	MTAK0042101	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MTAZ00	Tape	MTAZ0345401	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MTAZ01	Tape	MTAZ0345501	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
6	MTAZ02	Tape	MTAZ0345601	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
5	ADCA00	Dome Assembly, Metal	ADCA0117801	LG-A165 INDKV ZZ:Without Color -	
5	MBK070300	Can,Shield	MCBA0085801	COMPLEX LG-A165 INDKV ZZ:Without Color PRESS,STS,	
5	MEV000001	Insulator	MEV63651401	COMPLEX LGA165.AINDKV ZY:Color Unfixed -	
5	MIDZ00	Insulator	MIDZ0270401	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
5	MTAZ00	Tape	MTAZ0346601	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
5	MTAZ0	Tape	MTAZ0372901	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
7	MPBJ00	Damper, Motor	MPBJ0078401	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
8	CN502	Contact	MCIZ0009501	COMPLEX LG-A165 INDKV ZZ:Without Color PRESS, BeCu,	
3	FAB020000	Screw, Tapping	GGZZ0005101	GGZZ0005101 CH + - 1.6mM 4.5mM MSWR FZB SERVEONE CO., LTD.	
3	MCE000000	Contact	MCIZ0009501	COMPLEX LG-A165 INDKV ZZ:Without Color PRESS, BeCu,	
3	MCK004100	Cover, Battery	MCJA0124701	COMPLEX LG-A165 INDKV KV:BLACK_SILVER POINT MOLD, PC LUPOY SC-1004A, , , ,	
3	MCQ049800	Damper, Motor	MPBJ0078401	COMPLEX LG-A165 INDKV ZZ:Without Color COMPLEX, (empty), , , ,	
1	AGF000000	Package Assembly	APAY0151404 7	LGA160.ACISKV ZZ:Without Color LG-A160 CIS(EU1/CIS UB/CIS LB_CH/CIS Body/720ea)	
2	AGJ000001	Pallet Assembly	APLY0003911 3	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 -	
2	MAY084000	Box, Unit	MAY64849004	BOX Paper 120 56 90 4 COLOR LGA160.ACISKV ZZ:Without Color LG-A160 CIS(EU1/Russian)	
2	MBAD00	Bag, Vinyl	MBAD0005204	COMPLEX LG-LX260 SPRAG ZZ:Without Color -	
2	MBEE00	Box, Master	MBEE0061001	COMPLEX GD510 CZESV ZZ:Without Color -	
2	MLAJ00	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	MLAZ01	Label	MLAZ0050901	COMPLEX KU990 GBRBK ZZ:Without Color -	

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.2 Replacement Parts <Main component>

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

Level	Location No.	Description	Part Number	Spec	Remark
5	RAB040100	Film,Inmold	BFAA0128701	BFAA0128701 ; ,BLACK , , , BLACK , , , NISSHA PRINTING CO., LTD	
4	EAG110200	Connector, Terminal Block	ENZY0015701	HSBC-3P-65 3P 3.00MM STRAIGHT SMD R/TP - HAN SHIN TERMINAL CO., LTD.	
4	EAA010400	Antenna,Helical	SNGF0063802	LS01-I-10V33-A0 3.0,-2 dBd,LG-A165 Main Internal GSM850+GSM900+DCS+PCS,QUAD,-2.0,50ohm,3.0 LS Mtron Ltd.	
3	EBR071900	PCB Assembly,Main	EBR72780501 2	LGA160.ACISKV MAIN 1.0	
4	EBR071800	PCB Assembly, Main,SMT	EBR72769601 4	LGA160.ACISKV MAIN 1.0	
5	EBR071600	PCB Assembly, Main,SMT Bottom	EBR72779901 101	LGA160.ACISKV MAIN 1.0	
6	C327,C334	Capacitor,Ceramic, Chip	ECCH0000107	MCH155A060DK 6pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C307,C308	Capacitor,Ceramic, Chip	ECCH0000108	MCH155A070DK 7pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C241	Capacitor,Ceramic, Chip	ECCH0000110	MCH155A100D 10pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C101,C332, C333	Capacitor,Ceramic, Chip	ECCH0000115	MCH155A220JK 22pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C102	Capacitor,Ceramic, Chip	ECCH0000117	CL05C270JB5NNNC 27pF 5% 50V NP0 -55TO+125C 1005 R/TP 0.5 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C213,C218, C220,C226, C227,C234, C235,C405, C408	Capacitor,Ceramic, Chip	ECCH0000120	MCH155A390J 39pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C120,C121, C124,C125, C152,C153, C404	Capacitor,Ceramic, Chip	ECCH0000122	MCH155A470JK 47pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C219,C256, C257,C264, C303,C304, C319	Capacitor,Ceramic, Chip	ECCH0000143	MCH155CN102KK 1nF 10% 50V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C207,C208	Capacitor,Ceramic, Chip	ECCH0000149	MCH155CN332KK 3.3nF 10% 50V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C312,C322	Capacitor,Ceramic, Chip	ECCH0000180	GRM1555C1H3R3C 3.3pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	
6	C314,C342	Capacitor,Ceramic, Chip	ECCH0000182	GRM155R61A104K 0.1uF 10% 10V X5R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
6	C150,C301, C302,C328, C330	Capacitor,Ceramic, Chip	ECCH0000185	GRM1555C1H5R6C 5.6pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	
6	C210,C214, C239,C266	Capacitor,Ceramic, Chip	ECCH0000198	CL05A225MQ5NSNC 2.2uF 20% 6.3V X5R -55TO+85C 1005 R/TP . SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C222	Capacitor,Ceramic, Chip	ECCH0002001	C1005JB0J104KT000F 0.1uF 10% 6.3V Y5P -30TO+85C 1005 R/TP - TDK CORPORATION	
6	C112,C116, C134,C135, C215,C216, C217,C221, C230,C231, C232,C233, C244,C248, C258,C259, C305,C306, C313,C323, C340	Capacitor,Ceramic, Chip	ECCH0004904	GRM155R60J105K 1uF 10% 6.3V X5R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	
6	C104,C136, C326,C403	Capacitor,Ceramic, Chip	ECCH0005604	GRM188R60J106M 10000000 pF,6.3V,M,X5R,TC,1608,R/TP,0.8 mm MURATA MANUFACTURING CO.,LTD.	
6	C341,C343, C410,C413, C423	Capacitor,Ceramic, Chip	ECCH0007804	CL05A225MP5NSNC 2.2uF 20% 10V X5R -55TO+85C 1005 R/TP 0.5MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C103,C139, C225	Capacitor,Ceramic, Chip	ECCH0017601	CL05A475MQ5NRNC 4.7uF 20% 6.3V X5R -55TO+85C 1005 R/TP 0.5MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C407	Capacitor,TA, Conformal	ECTH0002703	TCTAL1A107M8R 0.0001F 20% 10V 50UA -55TO+125C 00HM 3.2x1.6x1.1 NONE SMD R/TP ROHM CO.,LTD.	
6	C336	Capacitor,Ceramic, Chip	ECZH0000801	C1005C0G1H221JT000F 220pF 5% 16V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C310,C317, C318	Capacitor,Ceramic, Chip	ECZH0000802	C1005C0G1H010CT 1pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C350	Capacitor,Ceramic, Chip	ECZH0000803	C1005C0G1H020CT000F 2pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C347	Capacitor,Ceramic, Chip	ECZH0000813	C1005C0G1H101JT 100pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C311	Capacitor,Ceramic, Chip	ECZH0000816	C1005C0G1H120JT000F 12pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C309	Capacitor,Ceramic, Chip	ECZH0000822	C1005C0G1H1R5CT000F 1.5pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C209,C315, C329,C345, C346,C415, C416,C417, C418	Capacitor,Ceramic, Chip	ECZH0000830	C1005C0G1H330JT000F 33pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
6	C105,C113, C137,C138, C140,C141, C142,C143, C144,C145, C146,C147, C149,C151, C261,C263, C401,C402, C411,C412, C414,C457	Capacitor,Ceramic, Chip	ECZH0001215	C1005X5R1A105KT000F 1uF 10% 10V X5R -55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C117,C148, C212,C242, C419,C420	Capacitor,Ceramic, Chip	ECZH0003103	GRM36X7R104K10PT 100nF 10% 10V X7R -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	
6	C223	Capacitor,Ceramic, Chip	ECZH0003503	GRM188R61E105K 1uF 10% 25V X5R -55TO+85C 1608 R/TP - MURATA MANUFACTURING CO.,LTD.	
6	C106,C107, C108,C109, C110,C115	Capacitor,Ceramic, Chip	ECZH0004402	MCH153C104ZK 0.1uF 10% 16V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	ZD401	Diode,Zener	EDNY0013602	EDZTE615.1B EDZTE615.1B,EMD2 ,5.1 V,150 mW,R/TP , ROHM Semiconductor KOREA CORPORATION	
6	D403	Diode,Switching	EDSY0014001	KDS221E-RTK 1.1V 20V 200mA 300mA 0SEC 100mW ESM R/TP 3P 2 KEC CORPORAITION	
6	ZD301	Diode,TVS	EDTY0009601	Rclamp0521P.TCT 5V 6 5V 4A 100W - R/TP 2P 1 SEMTECH CORPORATION	
6	L300,L301	Inductor,Multilayer, Chip	ELCH0001048	1005GC2T10NJLF 10NH 5% 0V 250mA 0.42OHM 2.5GHZ 8 NON SHIELD 1 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	L311,L320	Inductor,Multilayer, Chip	ELCH0001049	1005GC2T6N8JLF 6.8NH 5% 0V 250mA 0.32OHM 3GHZ 8 NON SHIELD 1 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	L303	Inductor,Multilayer, Chip	ELCH0001052	1005GC2T18NJLF 18NH 5% 0V 200mA 0.65OHM 1.6GHZ 8 NON SHIELD 1 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	L305	Inductor,Multilayer, Chip	ELCH0001401	LL1005-FHL15NJ_15NH 5% 0V 300mA 0.5OHM 2.5GHZ 9 NON SHIELD 1 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	L321	Inductor,Multilayer, Chip	ELCH0001411	LL1005-FHL1N2S 1.2NH 0.3NH 0V 500mA 0.1OHM 16GHZ 8 NON SHIELD 1 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	L319	Inductor,Multilayer, Chip	ELCH0001413	LL1005-FHL22NJ 22NH 5% 0V 300mA 0.7OHM 2.1GHZ 10 NON SHIELD 1 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	L201	Inductor,Multilayer, Chip	ELCH0001556	LL1608-FSLR27J LL1608-FSR27J,270 nH,J ,1608 ,R/TP , TOKO, INC.	
6	L306,L307, L308,L309	Inductor,Multilayer, Chip	ELCH0003828	LQG15HS2N4S02D 2.4NH 0.3NH 0V 300mA 0.15OHM 6GHZ 8 NON SHIELD 1 1X0.5X0.5MM R/TP MURATA MANUFACTURING CO.,LTD.	
6	L202	Inductor,Multilayer, Chip	ELCH0012501	LQW15AN27NG00D 27NH 2% 0V 280mA 0.52OHM 3.5GHZ 25 NON SHIELD 1 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO.,LTD.	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
6	L315	Inductor,Multilayer, Chip	ELCH0012502	LQW15AN10NG00D 10NH 2% - 500mA 0.17OHM 5.5KHZ - NON SHIELD 1 1.0X0.5X0.55MM R/TP MURATA MANUFACTURING CO.,LTD.	
6	L310	Inductor,Multilayer, Chip	ELCH0025601	LQW18AN39NG0 39NH 2% - 400mA 0.26OHM 2.8GHZ - NON SHIELD 0 1.6X0.8X0.8MM R/TP MURATA MANUFACTURING CO.,LTD.	
6	L101	Inductor,Wire Wound, Chip	ELCP0008017	CIG21L2R2MNE 2.2UH 30% - 1.3A 0.08OHM - - SHIELD 2X1.25X1MM NONE - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	CN101	Connector,BtoB	ENBY0029001	AXT430164 30P 0.40MM STRAIGHT HEADER SMD R/TP 1.5M - Panasonic Corporation	
6	CN200, CN204	Connector,BtoB	ENBY0039601	GB042-20S-H10-E3000 20P 0.4MM STRAIGHT SOCKET SMD R/TP 1M - LS Mtron Ltd.	
6	CN401	Connector, FFC/FPC/PIC	ENQY0014901	GF032-35S-E2000 35P 0.30MM FPC STRAIGHT BOTH SMD R/TP LOCKING - LS Mtron Ltd.	
6	CN202	connector,I/O	ENRY0008801	GU073-5P-SD-E1500 GU073-5P-SD-E1500,5,mm,ANGLE LS Mtron Ltd.	
6	SW301	Connector,RF	ENWY0008701	MS-156C NONE STRAIGHT SOCKET SMD T/REEL AU 50OHM 400mDB HIROSE KOREA CO.,LTD	
6	Q400	TR,Bipolar	EQBN0007101	2SC5585 NPN 6V 15V 12V 500mA 100mA 680 150mW EMT3 R/TP 3P ROHM.	
6	R108	Resistor,Chip	ERHY0000105	MCR01MZP5F51R0 51OHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R313	Resistor,Chip	ERHY0000128	MCR01MZP5F1502 15KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R301	Resistor,Chip	ERHY0000129	MCR01MZP5F1802 18KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R209	Resistor,Chip	ERHY0000185	MCR01MZP5F8200 820OHM 1% 1/16W 1005 R/TP - ROHM.	
6	R302,R402, R414	Resistor,Chip	ERHY0000241	MCR01MZP5J102 1KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R206,R411, R412	Resistor,Chip	ERHY0003301	MCR01MZP5J101 100OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R415,R417, R420	Resistor,Chip	ERHZ0000204	MCR01MZP5F1003 100KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R229	Resistor,Chip	ERHZ0000243	MCR01MZP5F2201 2.2KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R208	Resistor,Chip	ERHZ0000264	MCR01MZP5F3001 3000 ohm,1/16W,F,1005,R/TP ROHM Semiconductor KOREA CORPORATION	
6	R117	Resistor,Chip	ERHZ0000294	MCR01MZP5F5101 5.1KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R320	Resistor,Chip	ERHZ0000295	MCR01MZP5F5102 51KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R204	Resistor,Chip	ERHZ0000404	MCR01MZP5J102 1KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
6	R239,R306, R319	Resistor,Chip	ERHZ0000405	MCR01MZP5J103 10KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R102,R103, R104,R119, R129,R205, R211,R222, R236,R303, R304,R307, R324,R401, R403,R405, R406	Resistor,Chip	ERHZ0000406	MCR01MZP5J104 100KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R321	Resistor,Chip	ERHZ0000434	MCR01MZP5J1R0 10HM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R123,R124, R130,R131, R207,R215, R413,R418	Resistor,Chip	ERHZ0000443	MCR01MZP5J222 2.2KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R213	Resistor,Chip	ERHZ0000486	MCR01MZP5J473 47KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R407,R408	Resistor,Chip	ERHZ0000488	MCR01MZP5J4R7 4.7OHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R120	Resistor,Chip	ERHZ0000499	MCR01MZP5J562 5.6KOHM 5% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R419	Resistor,Chip	ERHZ0000537	MCR01MZP5F6803 680KOHM 1% 1/16W 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	R416	Resistor,Chip	ERHZ0000702	MCR03EZP5J100 10OHM 5% 1/10W 1608 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	U400	IC,Charge Pump	EUSY0344402	RT9367C QFN,20,R/TP,4CH,2LDO,3X3,IC,Sub PMICIC,Sub PMIC RICHTEK TECHNOLOGY CORP.	
6	U202	IC,Analog Switch	EUSY0347001	DG2735DN-T1-E4 MiniQFN-10L ,10 PIN,R/TP ,1.8X1.4X0.55,0.6 Dual SPDT Analog Switch ; ,IC,Analog Switch VISHAY INTERTECHNOLOGY ASIA PTE LTD	
6	U101	IC,MCP,NOR	EUSY0368505	PF38F4050M0Y3DE NOR/256MBIT + PSRAM/64MBIT 1.7VTO1.9V 8 \times 8 \times 1.0 TR 56P - - - Numonyx Asia Pacific Pte Ltd.	
6	U302	IC,Bluetooth	EUSY0395001	MT6612 3VTO4.8V 108.9mW QFN R/TP 40P - MEDIATEK INC.	
6	U102	IC,Digital Signal Processors	EUSY0409701	MT6253 0 0 0 NONE NONE BGA R/TP 263P - MEDIATEK SINGAPORE PTE.LTD.	
6	U201	IC,Voltage Reference	EUSY0410801	RT9524 DFN,10,R/TP,DFN Cal Test Mode Single Charger IC for Micro USB,IC,ChargerIC,Charger RICHTEK TECHNOLOGY CORP.	
6	M200	IC,Audio Sub System	EUSY0420001	TPA2055D3 1.6~5.5V 0W WLCSP R/TP 20P - TEXAS INSTRUMENTS INCO.	
6	U301	IC,Tuner	EUSY0430601	SI4704-D50-GMR QFN ,20 ,R/TP ,FM Tuner(No RDS),Internal FM Ant,3*3*0.6,110nm,0.5p ; ,IC,Tuner SILICON LABORATORIES	
6	IC200	IC,Analog Switch	EUSY0434001	RT8968WSC WLCSP ,20 ,R/TP ,WLCSP ,20 ,R/TP ,MUIC-Basic ; ,IC,Analog Switch RICHTEK TECHNOLOGY CORP.	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
6	X101	Crystal	EXXY0018701	FC-135(12.5PF, +-20PPM) 32.768KHZ 20PPM 12.5PF 32*15 SMD R/TP SEIKO EPSON CORP	
6	X102	Crystal	EXXY0027401	X1E000021043400 26MHZ 10PPM 0F NONE SMD R/TP EPSON TOYOCOM CORP	
6	R101,R125, R201,R203, R305,R308, R309,R410	Wire Pad,Short	SAFP0000501	LG-VS760 VRZ	
6	VA401, VA402	Varistor	SEVY0005402	ICVS0505500FR 5.6V 0% 50F 1.0*0.5*0.55 - SMD R/TP INNOCHIPS TECHNOLOGY	
6	FB206	Filter,Bead	SFBH0000909	HB-1M1005-600JT 60 ohm 1.0*0.5*0.5 SMD R/TP 2P CERATECH CORPORATION	
6	FB203	Filter,Bead	SFBH0007101	BLM15AG121PN1 120ohm 1.0x0.5x0.55 SMD R/TP 2P MURATA MANUFACTURING CO.,LTD.	
6	FB103	Filter,Bead	SFBH0007103	BLM15BB750SN1J 75ohm 1.0x0.5x0.55 SMD R/TP 2P MURATA MANUFACTURING CO.,LTD.	
6	FB105, FB207, FB208	Filter,Bead	SFBH0008101	BLM15AG601SN1 600ohm 1.0x0.5x0.55 SMD R/TP 2P MURATA MANUFACTURING CO.,LTD.	
6	FB104	Filter,Bead	SFBH0008103	BLM15BD102SN1 1000 1.0x0.5x0.5MM SMD R/TP 2P MURATA MANUFACTURING CO.,LTD.	
6	FB101, FB102, FB201, FB202	Filter,Bead	SFBH0008105	BLM15BD182SN1D 1800ohm ;1.0x0.5x0.55 SMD R/TP 2P MURATA MANUFACTURING CO.,LTD.	
6	FL304	Filter,Dielectric	SFDY0002601	LFB212G45BA1A220 BPF 2.45KHZ 100 SMD R/TP - MURATA MANUFACTURING CO.,LTD.	
6	FL400, FL401, FL402	Filter,EMI/Power	SFEY0010501	ICVE10184E150R101FR ESD/EMI 0HZ 15pF 0H SMD R/TP INNOCHIPS TECHNOLOGY	
6	FL200, FL201	Filter,EMI/Power	SFEY0011601	ICVE10184E150R500FR ESD/EMI 0HZ 15pF 0H SMD R/TP INNOCHIPS TECHNOLOGY	
6	FL301	Filter,Saw	SFSY0024301	SAFEB942MFL0F00 942.5 1.4*1.1*0.6 SMD R/TP 5P MURATA MANUFACTURING CO.,LTD.	
6	FL302	Filter,Saw	SFSY0024302	SAFEB1G84FA0F00 1842.5 1.4*1.1*0.6 SMD R/TP 5P MURATA MANUFACTURING CO.,LTD.	
6	FL303	Filter,Saw	SFSY0024303	SAFEB1G96FA0F00 1960 1.4*1.1*0.6 SMD R/TP 5P MURATA MANUFACTURING CO.,LTD.	
6	FL305	Filter,Saw	SFSY0030003	SAFEB881MFL0F55 881.5MHz 1.4*1.1*0.6 SMD R/TP 5P MURATA MANUFACTURING CO.,LTD.	
6	U303	RF Module	SMRH0005601	SKY77547 MHz,MHz,GSM Quad Tx Module 6x8, SKYWORKS SOLUTIONS INC.	
6	BAT101	Module,Assembly	SMZY0026701	EECEP0F333YD GM750 SFRTN Backup Capacitor,0.03F,3.8pi,Module Assembly PANASONIC INDUSTRIAL KOREA CO., LTD	
6	ANT303	Antenna,Helical	SNMF0051501	SDBTPTR3015 SINGLE -5DB 500HM 5 PARTRON COMPANY LIMITED	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
5	EBR071700	PCB Assembly, Main,SMT Top	EBR72780001 2	LGA160.ACISKV MAIN 1.0	
6	LD400, LD401	LED,Chip	EDLH0013401	SWAA07 WHITE 3.0~3.2 20mA 1200~1400mcd 0.285~0.31 120mW 1005 R/TP 2P - SEOUL SEMICONDUCTOR CO.,LTD	
6	SPFY	PCB,Main	SPFY0236101	SPFY0236101 FR-4 Multi MULTI-6 0.8 LG-A165 INDKV,MAIN,D,FR-4,0.8 mm,MULTI-6 UNITECH PRINTED CIRCUIT BOARD CORP.	
5	SAD010000	Software,Mobile	SAD32763101	V09c - EUROPE MTK -	
4	EBR071500	PCB Assembly, Main,Insert	SAFB0121801 11	LG-A165 MAIN 1.0	
6	SURY00	Receiver	SURY0010118	EMR1207SPB2P ASSY,dB,ohm,1207*2.5T,PIN, EM-TECH	
6	SUSY00	Speaker Module	SUSY0024807	ISDR-1634-08C-01 ASSY,8 ohm,91 dB,16 mm,3.4T spring,CONTACT GoerTek Inc.	
6	SVCY00	Camera Module	SVCY0026401	HSIS-LM08SSFF HSIS-LM08SSFF VGA, Samsung(1/10"), 5x5x2.5t, FPCB 5mm HANSUNG ELCOMTEC CO.,LTD.	
5	SACY00	PCB Assembly, Flexible	SACY0124101	LG-A165 INDKV FLEXIBLE 1.0	
6	SACE00	PCB Assembly, Flexible,SMT	SACE0112001 2	LG-A165 INDKV FLEXIBLE 1.0	
7	SACC00	PCB Assembly, Flexible,SMT Bottom	SACC0084901	LG-A165 INDKV FLEXIBLE 1.0	
8	CN600, CN601	Connector,BtoB	ENBY0039501	GB042-20P-H10-E3000 20P 0.40MM STRAIGHT PLUG SMD R/TP 1M - LS Mtron Ltd.	
7	SPCY00	PCB,Flexible	SPCY0261001	LG-A165 INDKV,FLEXIBLE,C,POLYI,0.15 mm,DOUBLE	
5	SAJY00	PCB Assembly,Sub	SAJY0052101 2	LG-A165 INDKV SUB 1.0	
6	SAJB00	PCB Assembly, Sub,Insert	SAJB0024201 2	LG-A165 INDKV SUB 1.0	
7	SJMY00	Motor,DC	SJMY0007104	3V 80mA 0A 12KRPM 0RPM 0SEC 0GF.CM 0OHM	
6	SAJE00	PCB Assembly, Sub,SMT	SAJE0042601 3	LG-A165 INDKV SUB 1.0	
7	SAJC00	PCB Assembly, Sub,SMT Bottom	SAJC0041301 7	LG-A165 INDKV SUB 1.1	
8	C500,C501	Capacitor,Ceramic, Chip	ECCH0000120	MCH155A390J 39pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
8	C503	Capacitor,Ceramic, Chip	ECCH0017601	CL05A475MQ5NRNC 4.7uF 20% 6.3V X5R -55TO+85C 1005 R/TP 0.5MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
8	ZD501	Diode,TVS	EDTY0009601	Rclamp0521P.TCT 5V 6 5V 4A 100W - R/TP 2P 1 SEMTECH CORPORATION	
8	S500	Card Socket	ENSY0022801	49619-1611 49619-1611,16,ANGLE mm HANKOOK MOLEX	
8	R500,R501	Wire Pad,Short	SAFP0000501	LG-VS760 VRZ	

12. EXPLODED VIEW & REPLACEMENT PART LIST

Level	Location No.	Description	Part Number	Spec	Remark
8	VA500, VA501	Varistor	SEVY0005201	EVLC5S02050 5.5V 0% 50F 1.0*0.5*0.6 - SMD R/TP AMOTECH CO., LTD.	
7	SAJD00	PCB Assembly, Sub,SMT Top	SAJD0044201 2	LG-A165 INDKV SUB 1.0	
8	C502	Capacitor,Ceramic, Chip	ECCH0004904	GRM155R60J105K 1uF 10% 6.3V X5R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO.,LTD.	
8	CN500	Connector,BtoB	ENBY0039601	GB042-20S-H10-E3000 20P 0.4MM STRAIGHT SOCKET SMD R/TP 1M - LS Mtron Ltd.	
7	SPJY00	PCB,Sub	SPJY0086501	SPJY0086501 FR-4 Multi MULTI-2 - LG-A165 INDKV,SUB,D,FR-4mm,MULTI-2 UNITECH PRINTED CIRCUIT BOARD CORP.	
5	SUMY00	Microphone, Condenser	SUMY0003815	B4010AL443-49 -44DB 2.2KOHM OMNI 1.1TO10V 4x1.0t FPCB GoerTek Inc.	
5	SVLM00	LCD Module	SVLM0031401	GPM945A0 GPM945A0,Main,2.0,176*220,37.5*53.4*1.9,262K,TFT,TM,IL I9225 GIANTPLUS TECHNOLOGY CO., LTD.	

12. EXPLODED VIEW & REPLACEMENT PART LIST

12.3 Accessory

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

Level	Location No.	Description	Part Number	Spec	Remark
2	EAC020100	Mobile Phone Battery Li-Ion	SBPL0090501	KU250-553450-LGC-EU KU250-553450-LGC-EU,3.7 V,950 mAh,1 CELL,PRISMATIC ,KU250 Europe BATT, IP, Pb-Free LG CHEMICAL	
2	EAB010200	Earphone,Stereo	SGEY0003218	EMB-LGE011STKC 3mW 16OHM 115DB 85HZTO126HZ 1M BLACK 5PIN 5 CRESYN CO.,LTD	
2	EAY060000	Adapters	SSAD0032701	STA-U34RD STA-U34RD,100-240V,5060 Hz,5.1 V,7 A,CE / GOST,AC-DC ADAPTOR DONG DO ELECTRONICS CO., LTD	
2	EAY060000	Adapters	*S*SSAD0032702	STA-U34RV 150Vac~350Vac 5.1V 700mA 5060 GOST NONE NONE - Power Systems Technologies Far East Ltd	