

V822C Service Manual

Version No.:V1.0

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Issue Date April 13, 2007

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Modification Record

Series No.	Modification time	Version No.	Modified by	Cause of modification	Remark
1	2007-04-13	V1.0	Liu Changling	Creation	

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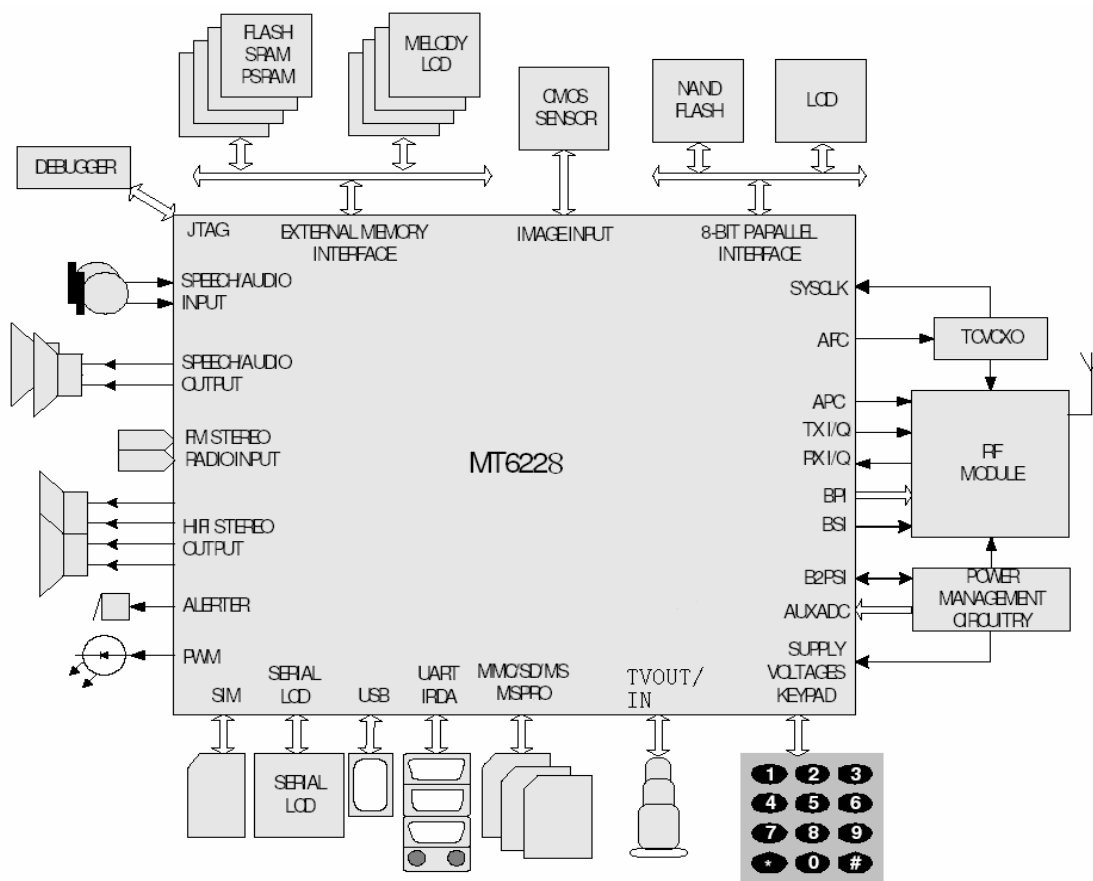
1. Introduction of V822C

1.1. Introduction of Model V822C Cellphone

Model V822C Cellphone is developed and designed based on the MTK platform. This model of phone is one of the ultra-thin straight plate appearances, with twice-frequency (EGSM900Hz/DCS1800Hz), built-in antenna, supporting Mp3, Mp4 player including record sound and other popular functions, and with an integrated 300 million pixels camera with auto focus and digital zoom, bluetooth with stereo and USB. The Cellphone is also compatible to FM design and has the functions such as OCR, TV - OUT, etc.

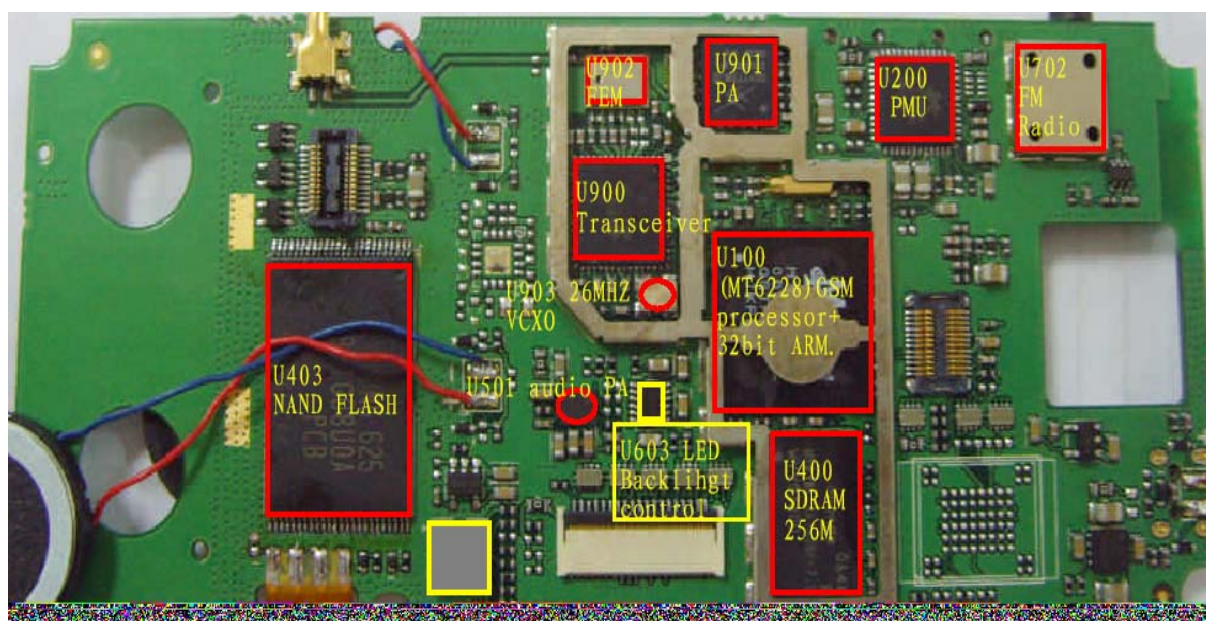
The functional system is composed of radio frequency (RF) (MT6129) and baseband (BB) (MT6228BA + MT6305). RF includes antenna interface, FEM, PA, Transceiver (power supply belongs to BB). BB includes baseband processor MT6228, power management MT6305, NAND FLASH, SDRAM, CMOS SENSOR, bluetooth, LCM, FM and keyboard.

The MT6129, which is the core IC in RF, adapts the zero intermediate frequency receiver scheme and supports EGSM/DCS and 26M VCTCXO as clock input, with integrated clock buffer, integrated LO VCO and TX VCO and integrated regulator. This chip could perform the required function when is connected to external VBAT/AVDD and is equipped with less peripheral circuit and signals. The GSM processor is the core part in the whole BB and in the whole system. It controls speech signal processing and normal operate of each part in the whole mainboard. The digital baseband MT6228 includes 32-bit ARM7EJ-STM kernel and 256Kbyte SRAM. MT6228 is an enhanced GSM processor, in which there are channel coder/decoder subsystem that is integrated with the channel coder/decoder, interweave/deinterweave, encryption & decryption, with additional TV in out function. It includes CODEC for two independent speech input/output channel and BZ output; including differential I, Q input/output, GMSK modulator and baseband coder/decoder with A/D, D/A; including accessorial components such as AFC DAC, RAMP DAC, AGC DAC and four-channel A/D; also equipped with built-in WATCHDOG interface to improve the stability of system.



1.2. Mainboard components layout





Main components:

U902	RF Front End Module (FEM) (twice-frequency) HWXP641-1
MTK	RF IC MT6129N/AR-L
U901	RF Power Amplifier (four-frequency) RPF08155B-TB
U100	MTK Baseband IC MT6228T/AV
U501	Audio Power Amplifier LM4888SQ
U200	MTK Baseband power management chip MT6305BN/CY-D
U403	NAND FLASH
U903	26MHz Crystal Oscillator
X100	32.768KHZ Crystal

2. Signal Flow and Fault Analysis

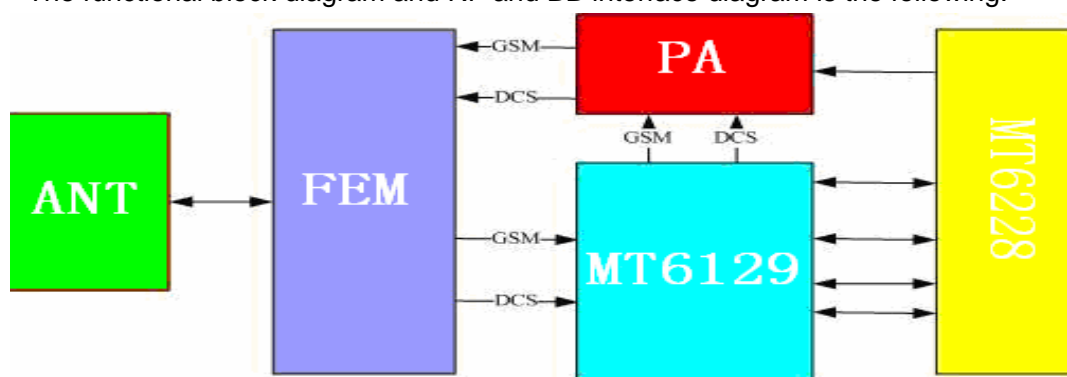
2.1. RF

2.1.1. Functional block diagram of RF

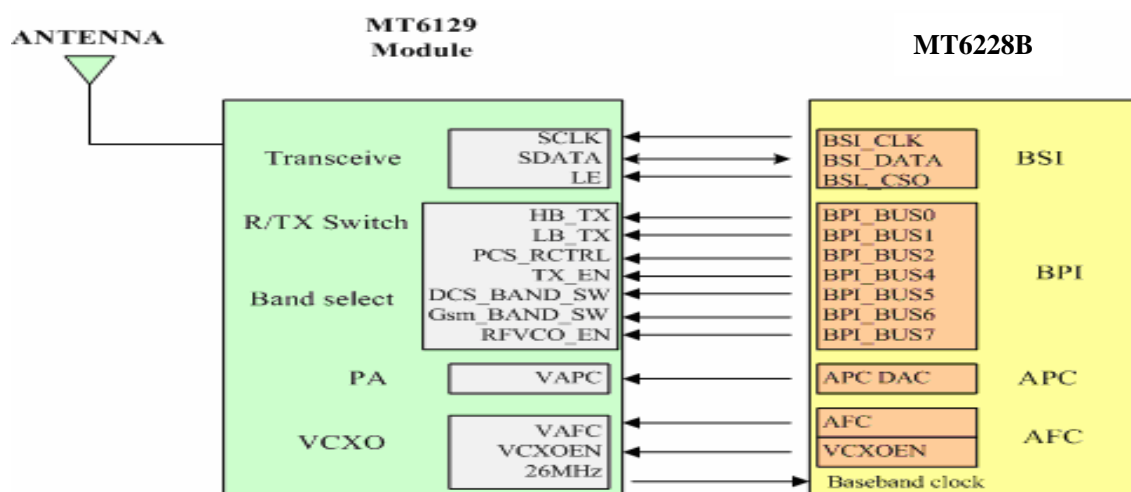
Functions of components: 1. Power Amplifier (PA) (RPF08155B-TB), supporting EGSM/DCS/PCS and being integrated to be an automatic power control, is used to amplify the TX signal power according to requirement through voltage control. The power is classified into different levels through VRAMP signal. The transient signal of GSM has 5 – 19 levels with 3.2Mw to 2W power; transmitted power of DCS is divided into 0 – 15 levels, power range is 1MW-1W. PA works with time sharing by controlling of TX-EN control chip and controls for output power control by VRAMP (APC) through voltage. PA works intermittently and frequency channel would be chose by BS; 2. RF Front End Module (FEM) is a select switch that could switch between RX/TX and BAND of GSM/DCS. This method would enhance separation to avoid signal-related crosstalk; 3. **Transceiver (MT6129)** has some functions such as modulating and demodulating of RF, frequency synthesis, clock buffer and so on, i.e. this is a complement that changes high-frequency to low-frequency and changes low-frequency to high-frequency.

- a. Transmit loop: The sound signal picked from MIC is sent into MT6228, the signal is changed to IQ signal through MT6228 after processing. And then it is sent into MT6129 for modulating, and is output from FEM to ANT after PA's amplifying.
- b. Receive loop: The signal from antenna enters to FEM to be filtered, and then it is sent into MT6129 to be amplified and decoded. The signal with IQ signal is sent to CPU (MT6228) for processing and finally is sent to earphone to be reverted to sound.

The functional block diagram and RF and BB interface diagram is the following:



Block diagram of RF

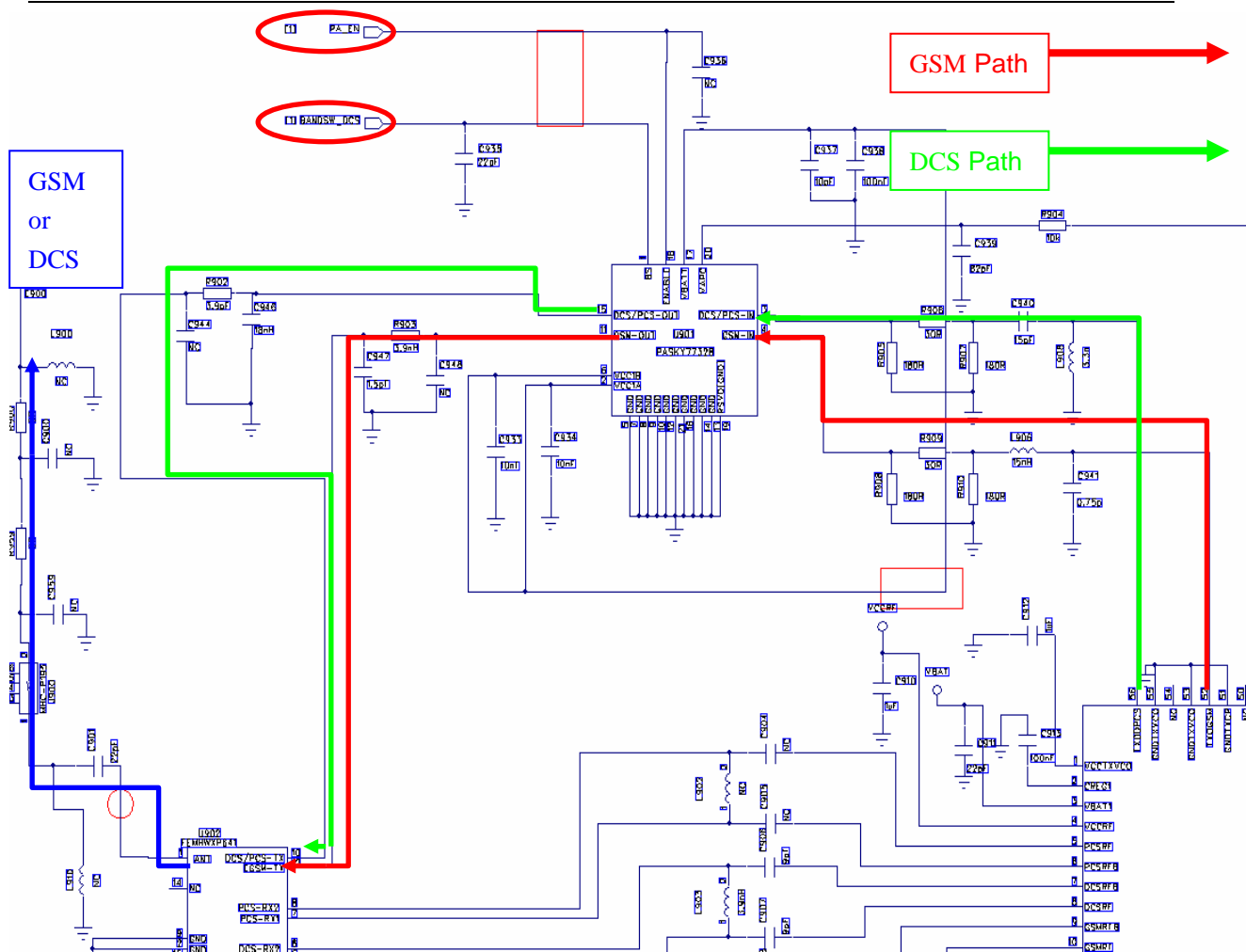


GSM RF and BB interface diagram

2.1.2.RF transmit signal flow

2.1.2.1. Transmit path construction

The transmit circuit is composed of modulating loop, power amplifier and antenna switch. TXVCO loop is located in MT6129. I/Q signal enters into MT6129 through pins 43 – 46 first, and it is processed and is sent to RF through TXVCO. It is outputted from pins 56 and 52 to PA, and enters to PA of RFMD (RPF08155B-TB) after amplifying. At last, it is sent back to antenna switch to be converted to electromagnetic wave for transmitting. The path from MT6129 to PA includes PI attenuation network build-up by resistances. The antenna switch chooses between RX and TX, as well as between GSM and DCS.



2.1.2.2. Maintenance flow of transmission section

2.1.2.2.1. Maintenance flow of transmission section

Preparation of repair

Test conditions 1 : Vbatt=3.8v~4.2v

Test conditions 2 : GSM Band

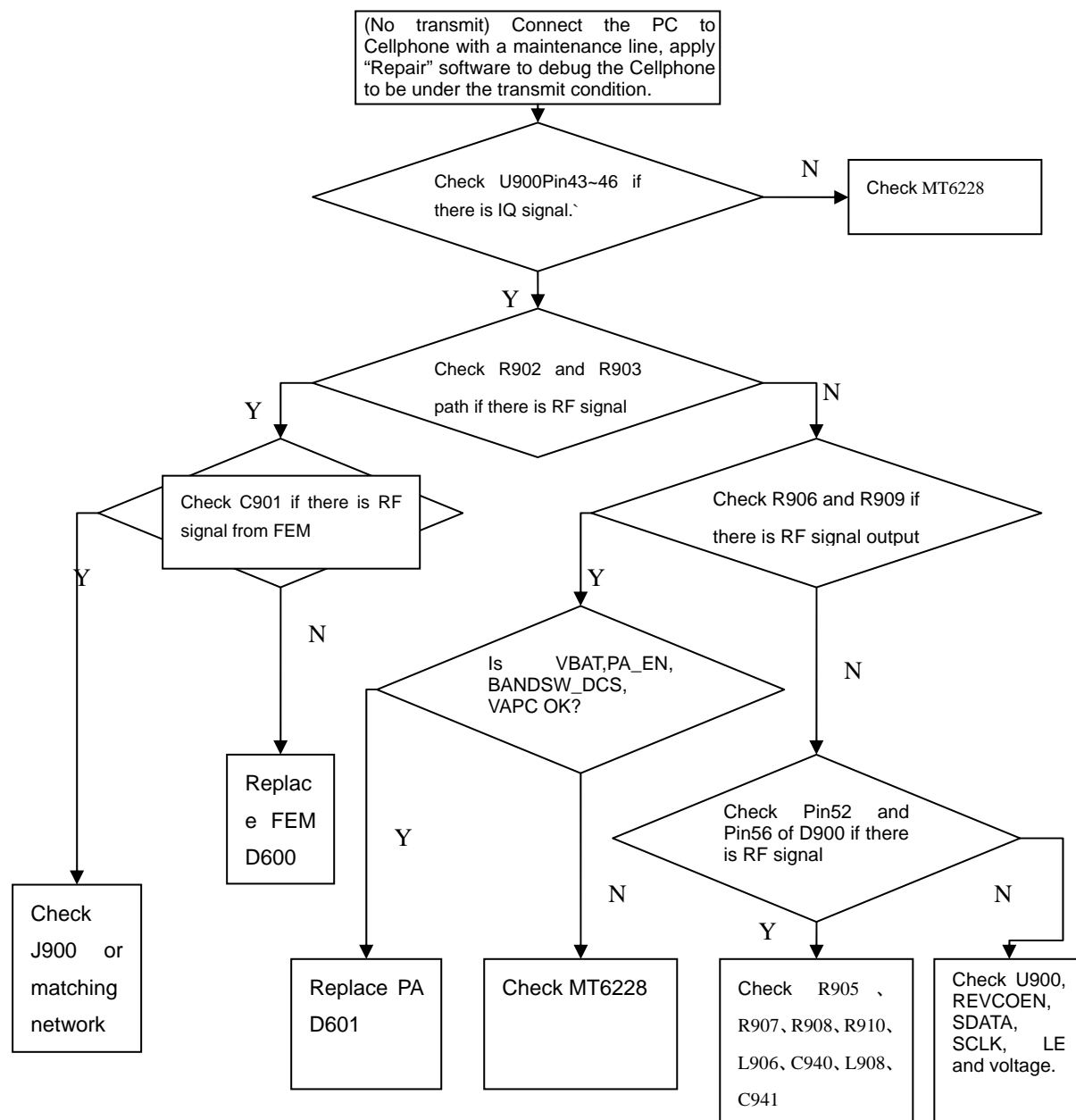
Tx Mode CH62 Freq=902。 4MHz Power Level : 5

Test conditions 3 : DCS Band

Tx Mode CH700 Freq=1747。 8MHz Power Level:0

Test Equipment: CMU60100, oscillograph, spectrum analyzer

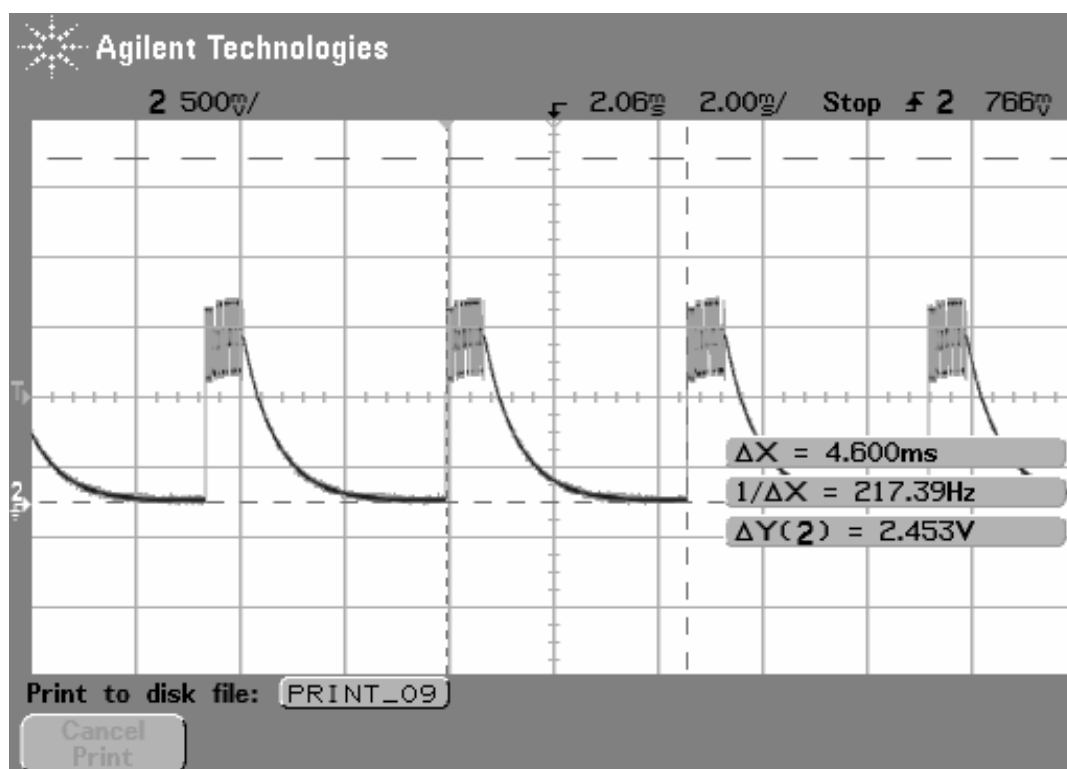
2.1.2.2.2. Troubleshooting flow chart on transmission



2.1.2.2.3. Repair process:

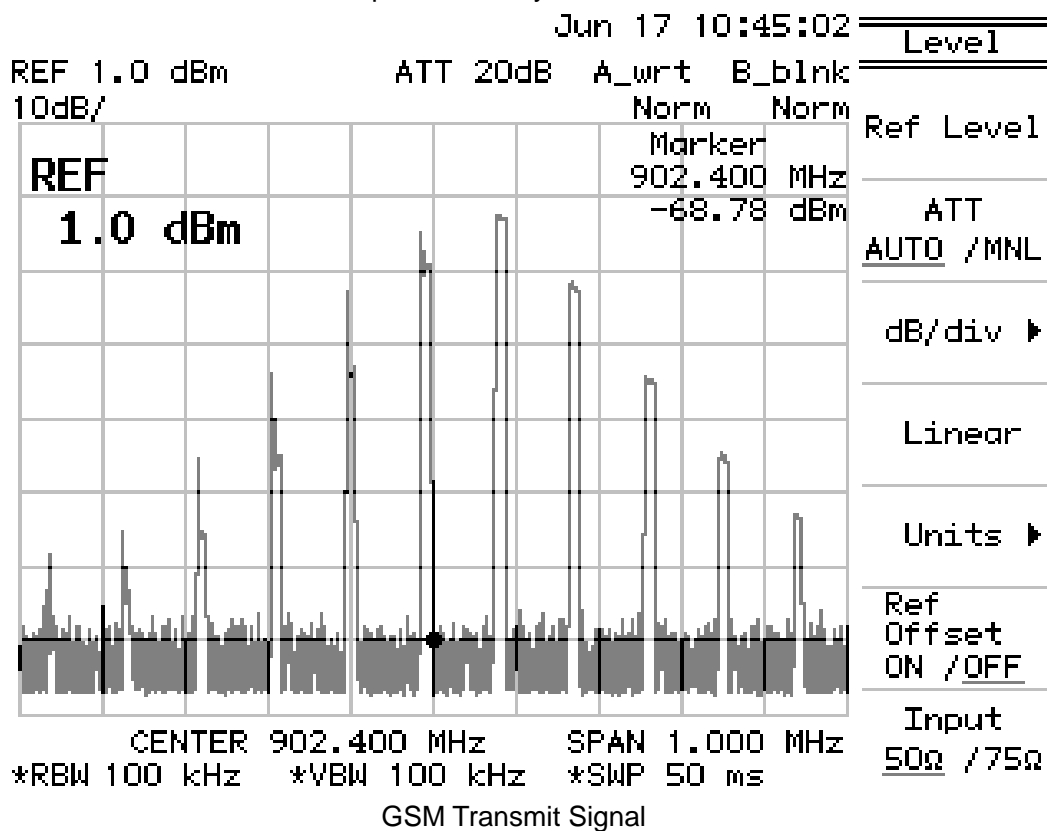
Apply "Repair" software to debug the Cellphone to be under the transmit condition. Chose 62CH on the GSM frequency channel, 5 for POWERLEVEL; when DCS is 700CH, POWERLEVEL is set as 0. Observe if the current increases, and check the signal above flow diagram describes with spectrum analyzer and oscillograph. The specific signal waveform is as follows:

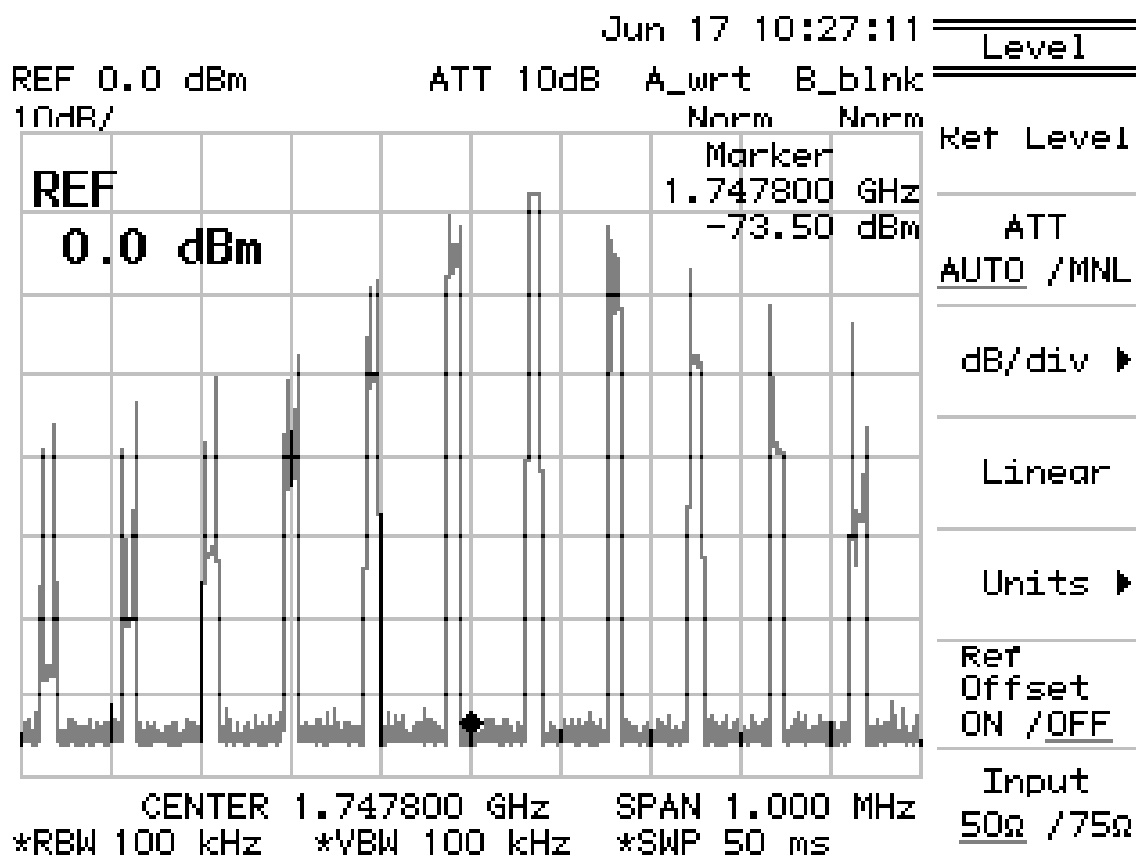
2.1.2.2.4. Transmission state U900 IQ signal waveform on pin43/44/45/46



3.10 I/Q

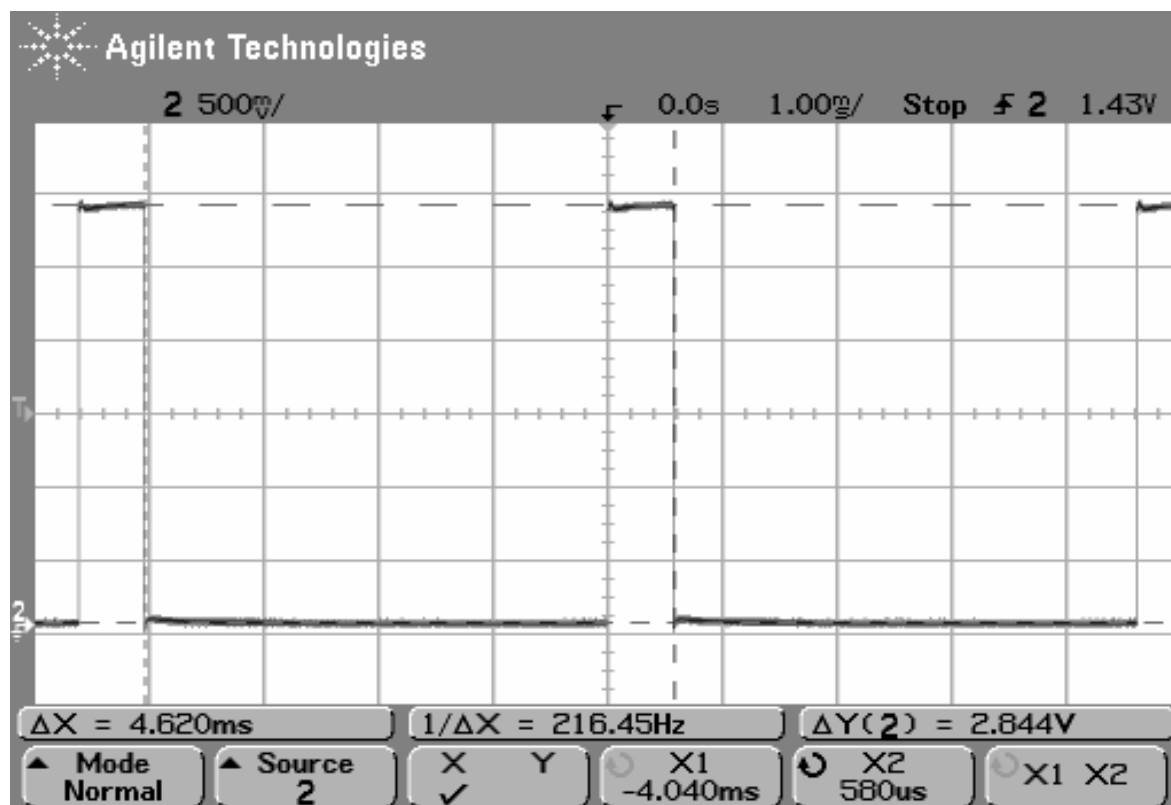
2.1.2.2.5. RF Path checked with spectrum analyzer





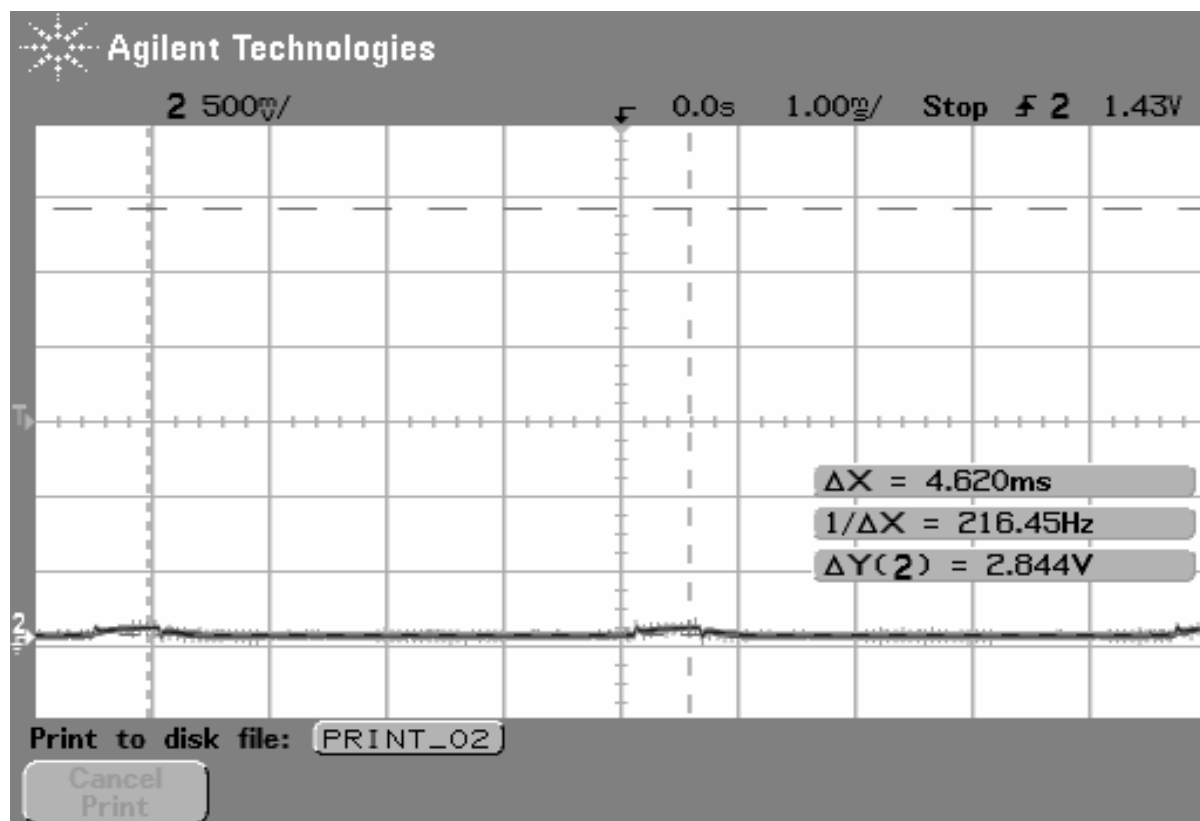
DCS Transmit Signal

2.1.2.2.6. Transmission state U901 PA-EN waveform

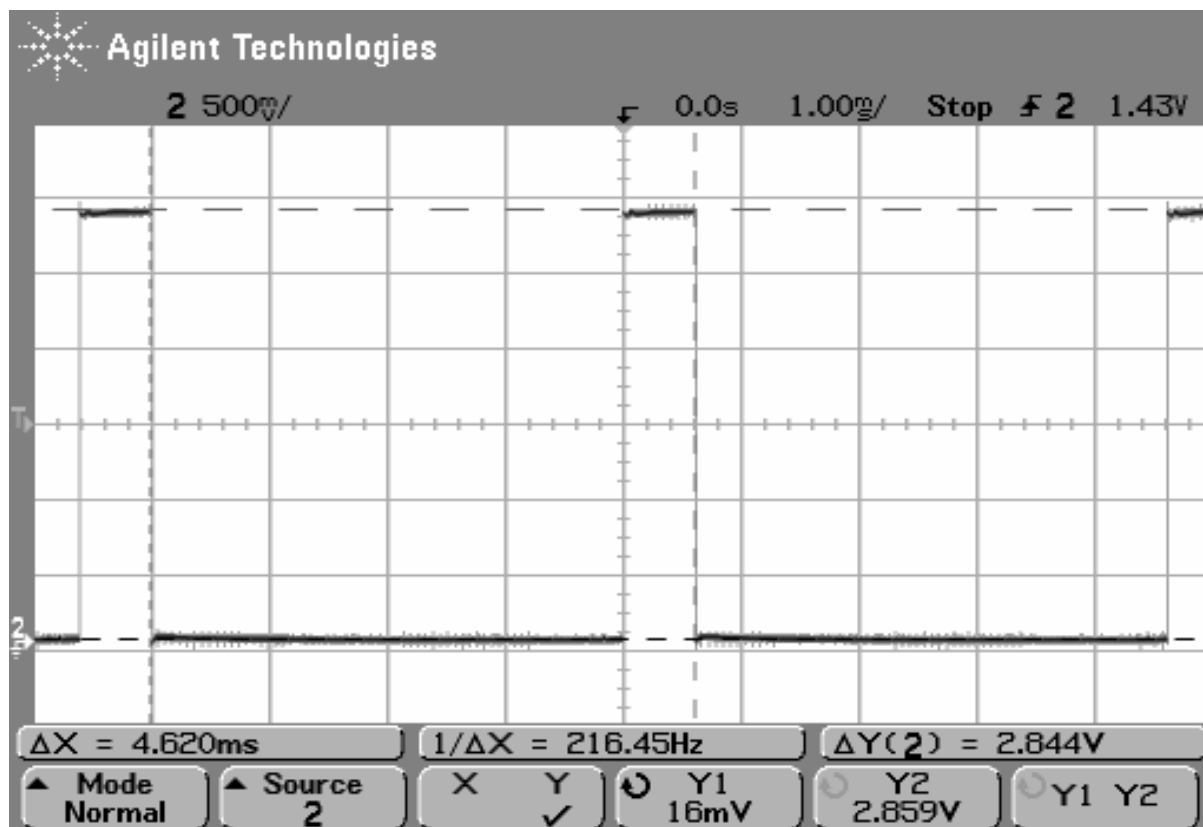


PA-EN

2.1.2.2.7. U901 PA.BAND-SW waveform

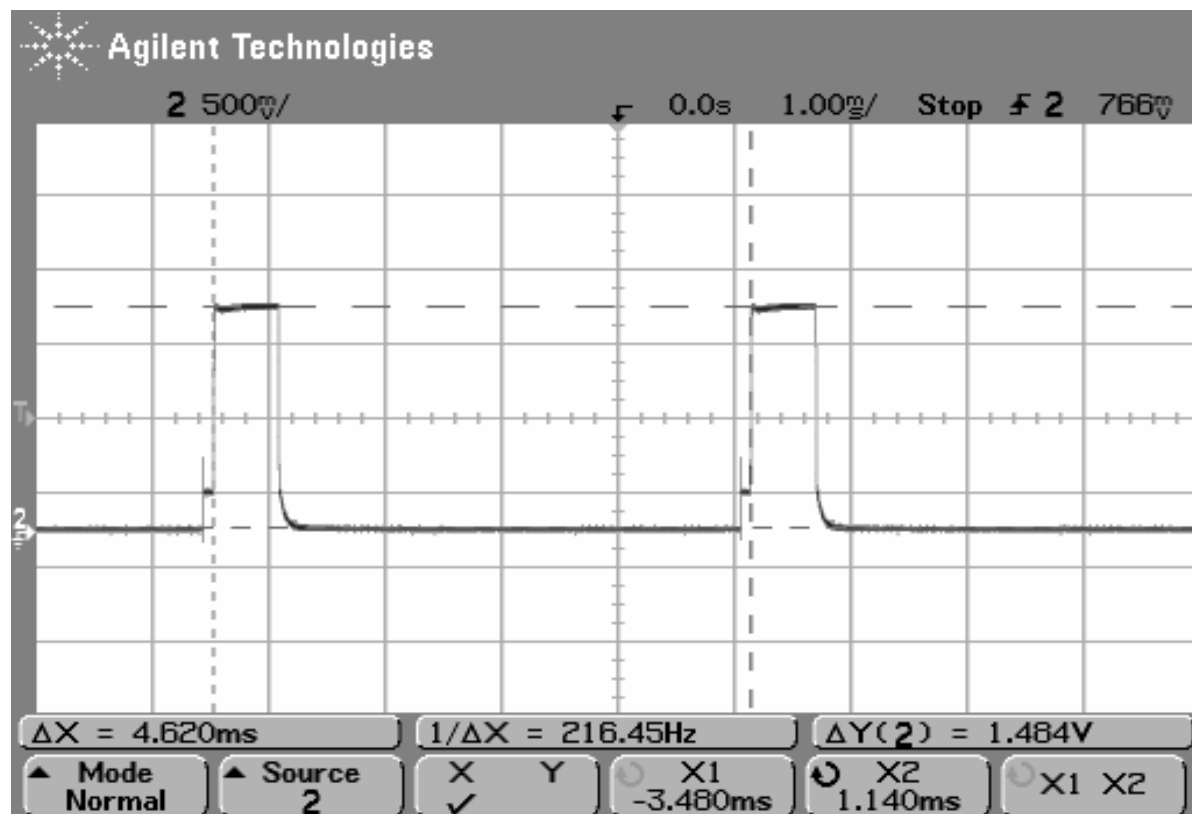


PA.BAND-SW (GSM)

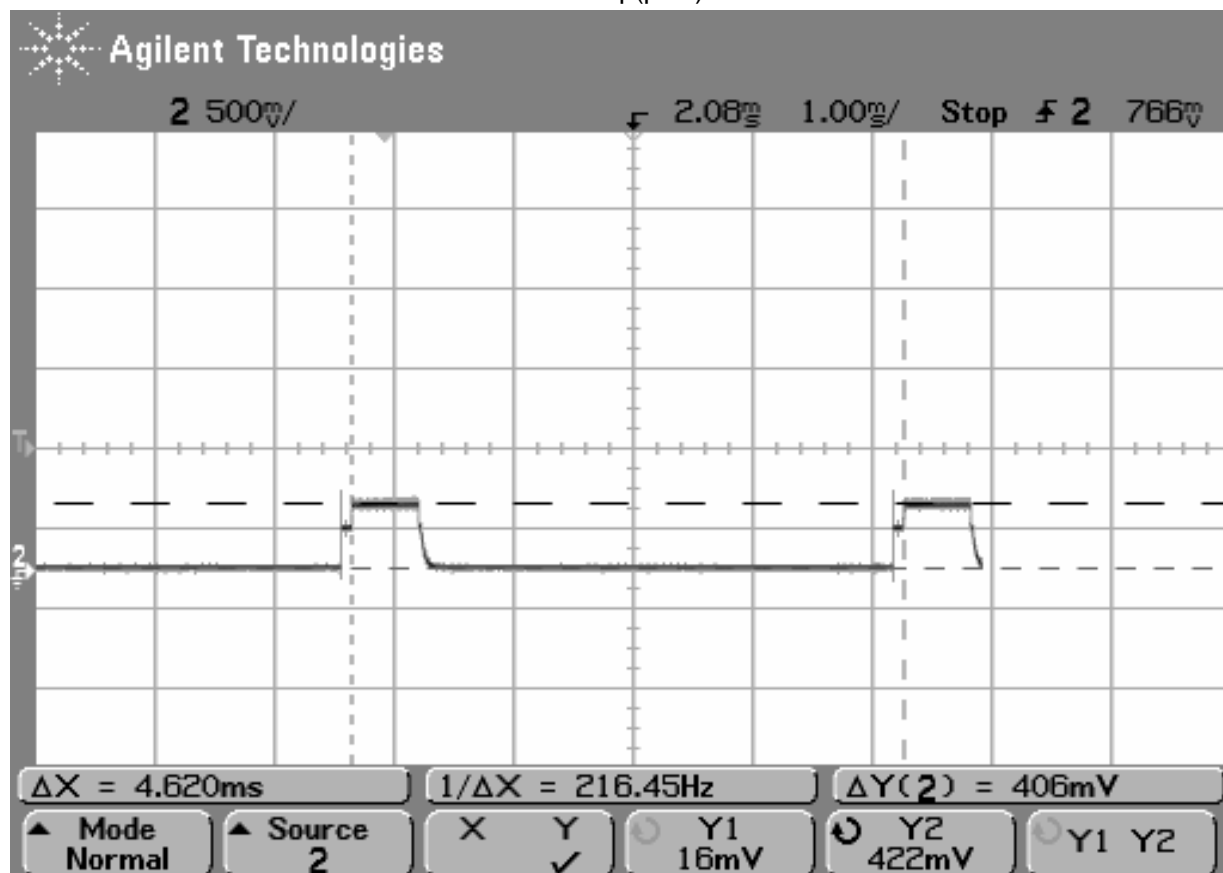


PA.BAND-SW (DCS)

2.1.2.2.8. U901 Vram waveform



Vram(pcl5)

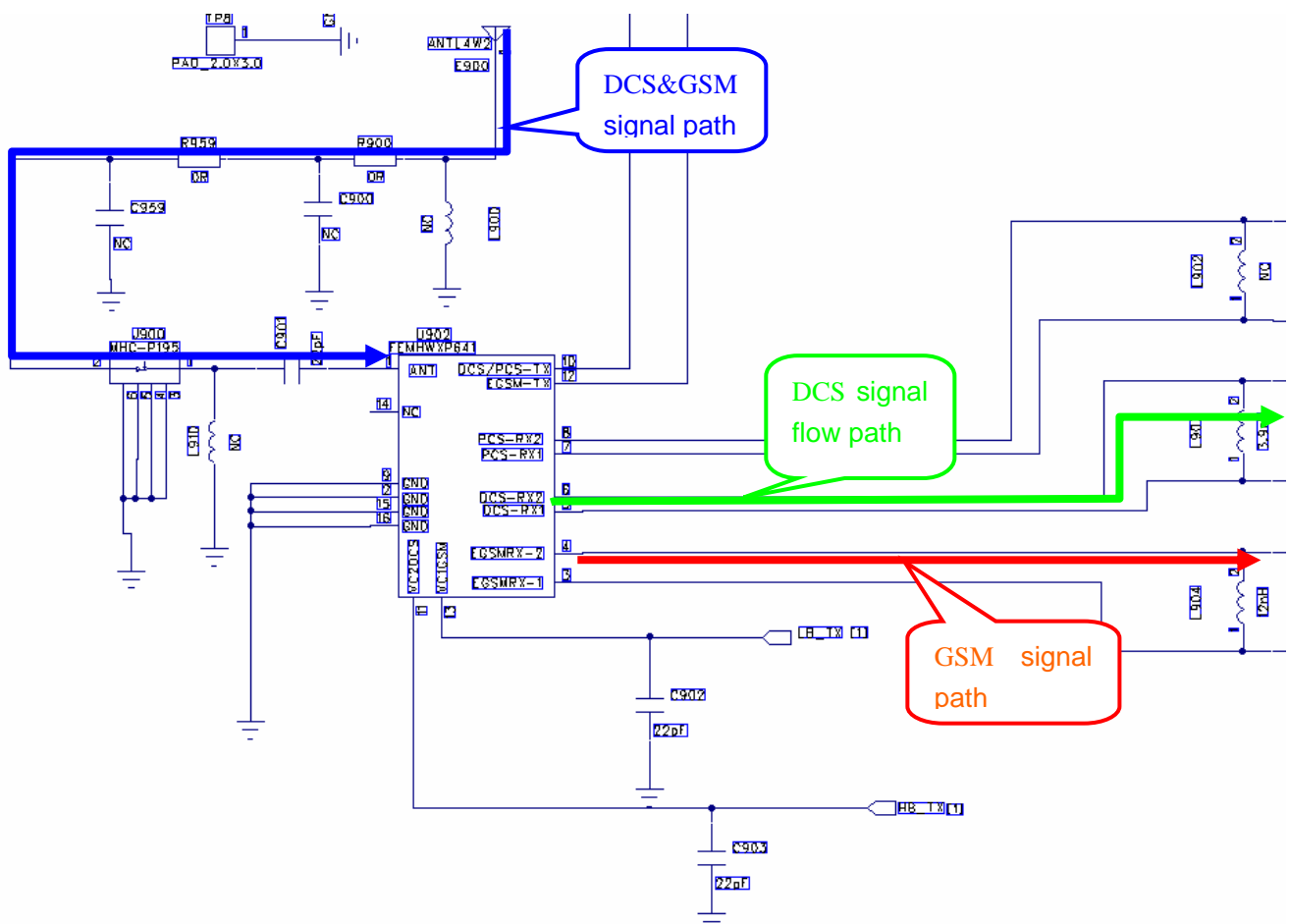


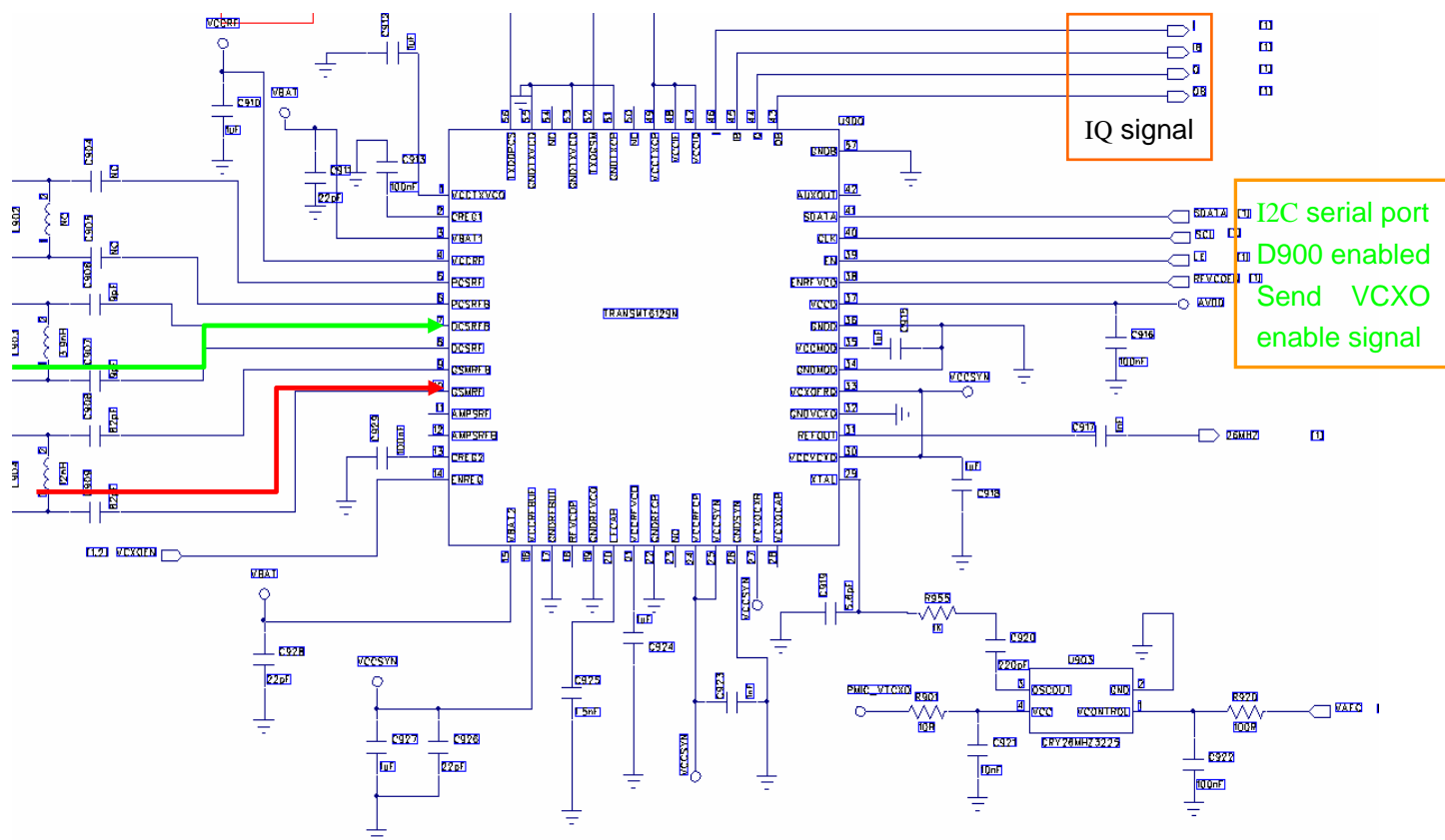
2.1.3.RF receiving signal flow

2.1.3.1. Receive path construction

The GSM signal is received by antenna is sent to MT6129C through Front End Module after being filtered by surface acoustic wave filter. It should be amplified and converted to I/Q signal on 100KHz carrier wave, and then would pass bandpass, should be amplified (gain control), filtered, amplified (gain control), mixed, sent to baseband channel 4 I/Q to be filtered, finally, output to CPU to be processed. SDATA and SCLK in the circuit diagram is 12C serial signal for the communication between MT6228 and MT6129; LE is the signal by which MT6228 enables MT6129; RFVCOEN is the enable signal for local oscillators signal VCO. VAFC is the automatic frequency control signal of Crystal Oscillator.

The red and green line in the following figure represents receive path: red line represents GSM receiving signal flow path; green line DOC receiving signal flow path. The PCS receive flow is not drawn here because of no PCS receive function in this Cellphone. Blue line may be the path of GSM or DCS.





2.1.3.2. Maintenance flow of receive section

2.1.3.2.1. Preparation of repair

Test conditions

Test condition 1 : Vbatt=3.8v~4.2v

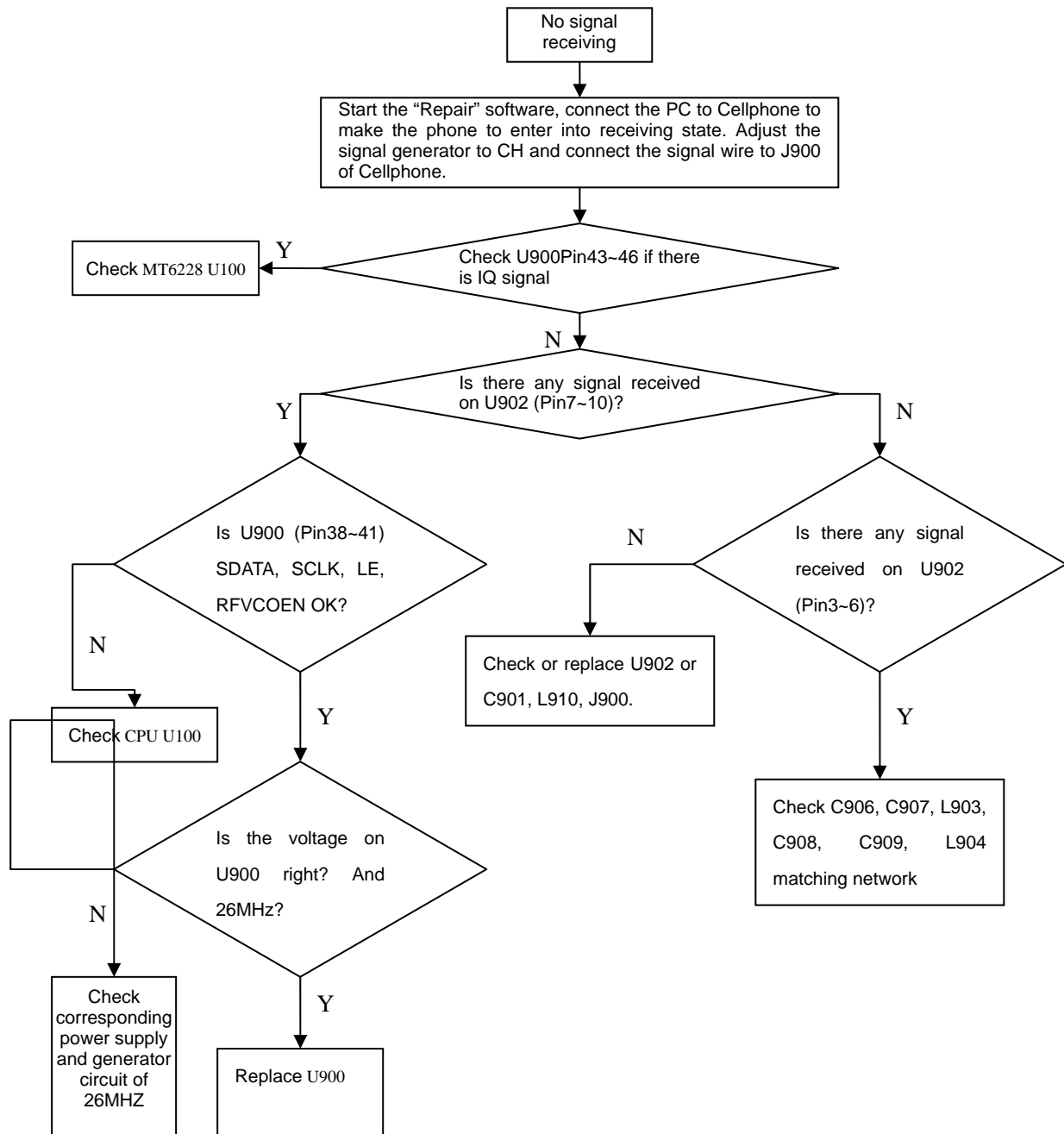
Test condition 2 : GSM Band

Rx Mode CH62=947.4MHZ Input power:-60dbm

Test condition3 : DCS Band

Rx Mode CH698=1842.4MHZ Input power:-60dbm

2.1.3.2.2. Troubleshooting flow chart on signal receiving failure

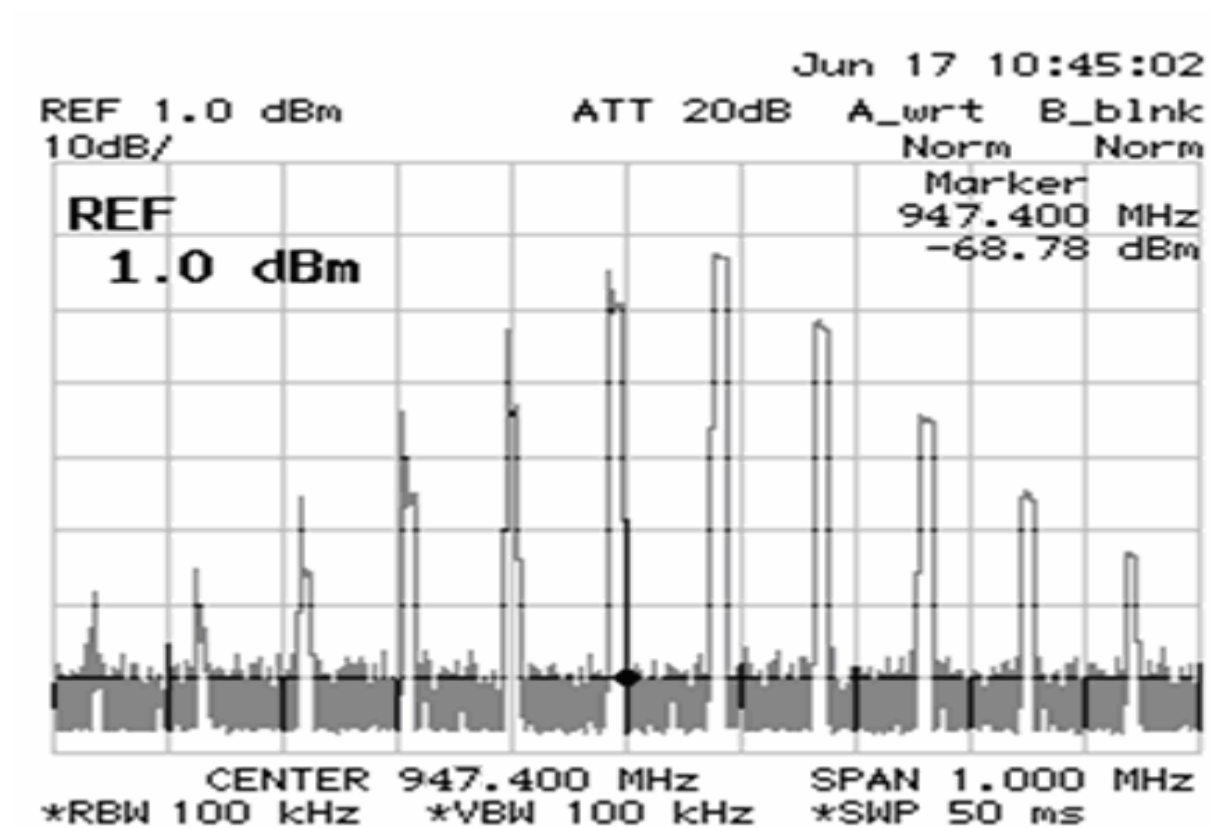


2.1.3.2.3. Repair process:

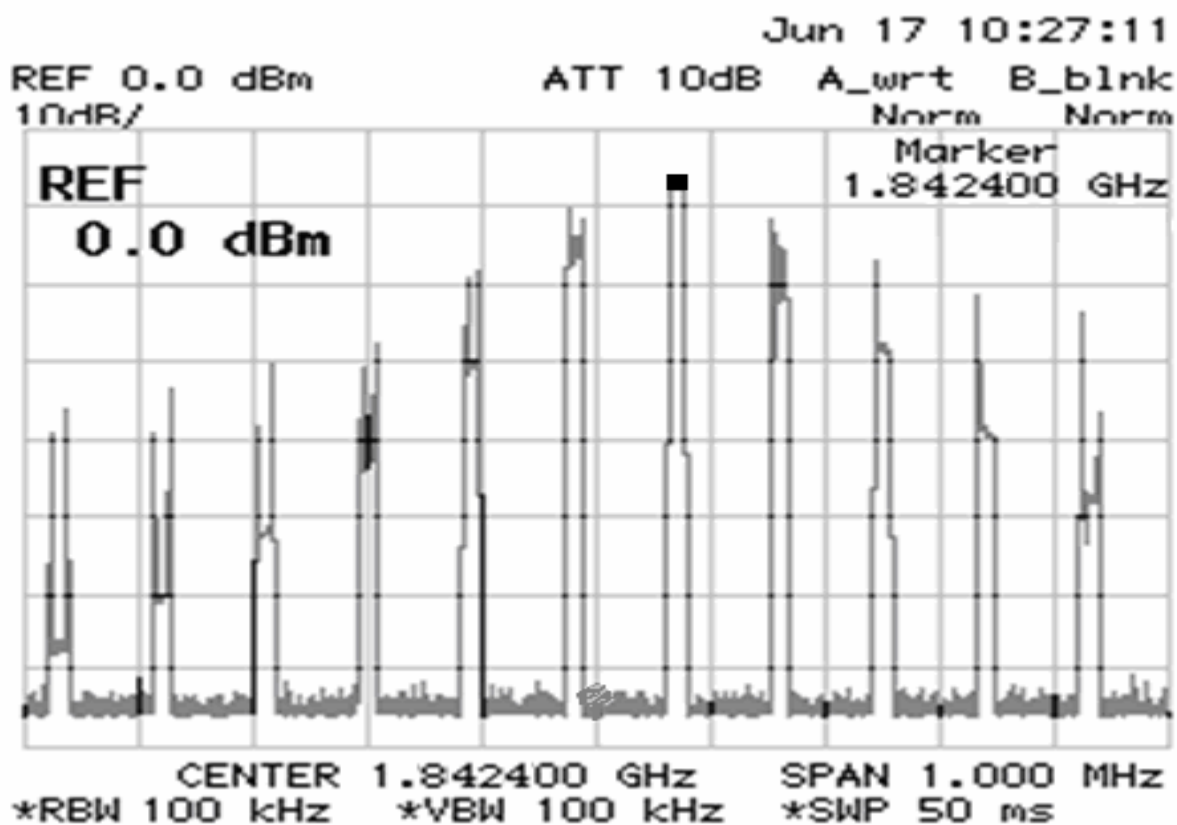
At first, apply "Repair" software to debug the Cellphone to be under the receiving state. Chose 62CH on the GSM frequency channel, Rx Mode CH62=947.4MHZ, Input power:-60dbm ; Adjust signal generator to CH, connect signal wire to RF Cable, and measure the essential signals with spectrum analyzer and oscillograph. Firstly, check Pin43~46 of U900 for proper IQ signal to have been sent to CPU, if it exists, check CPU (MT6228); if not, check Pin7~10 of U900 if there is related CH signal input, if it exists, check Pin38~41 of U900 if there is proper control signal and

check further if the voltage provided is proper, and if so, it proves that U900 is damaged; if not, check CPU. if Pin7~10 of U900 has not related CH signal input, check U920 and front path. Refer to the following figures for relevant signal waveform:

2.1.3.2.4. Output signal of signal generator (input end)

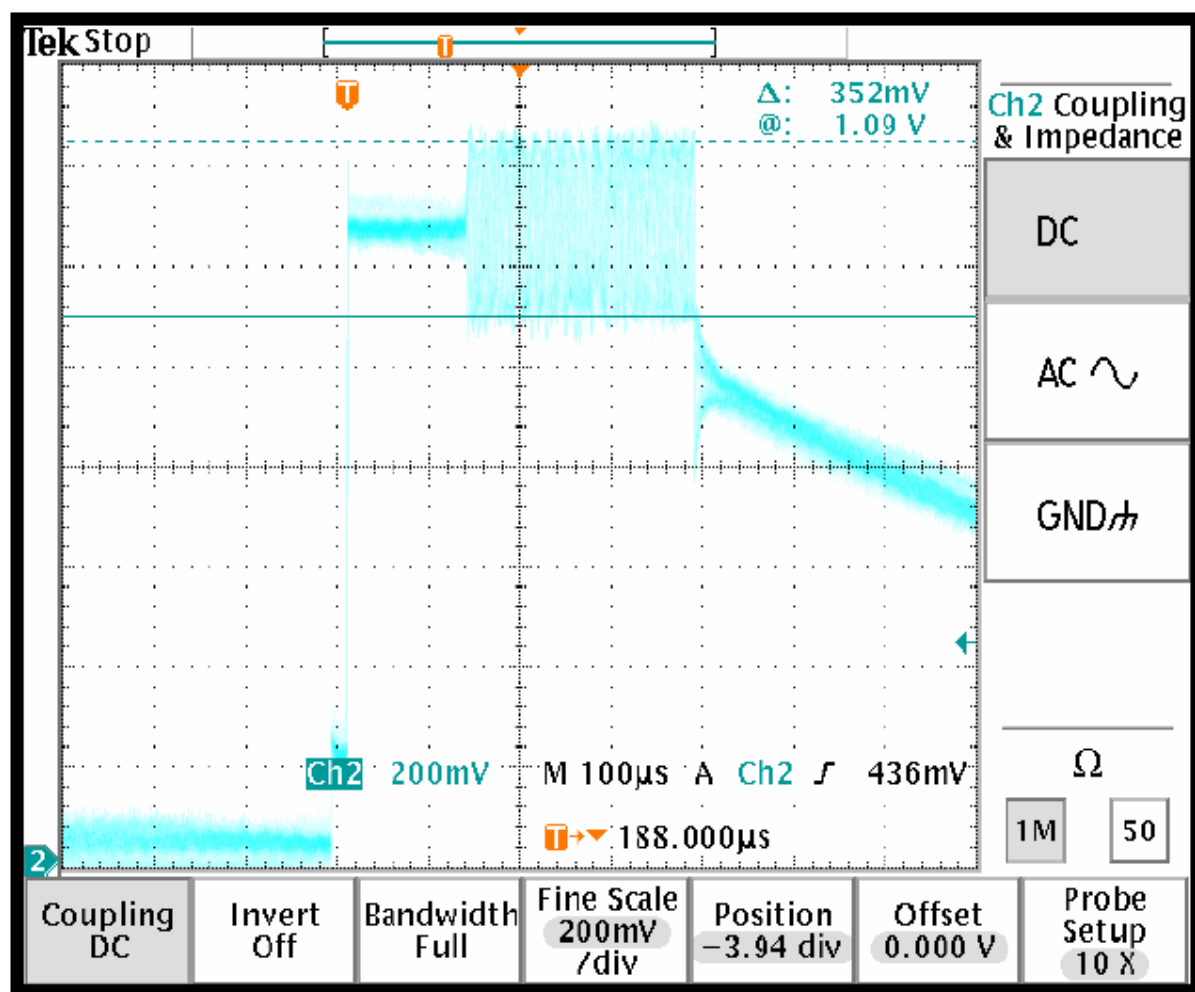


GSM CH62 channel receiving signal

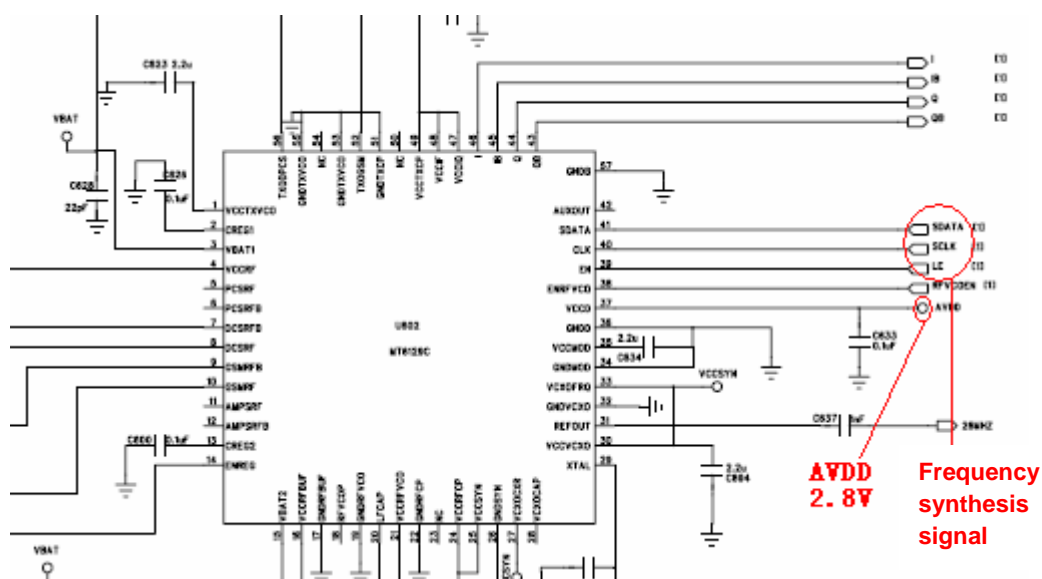


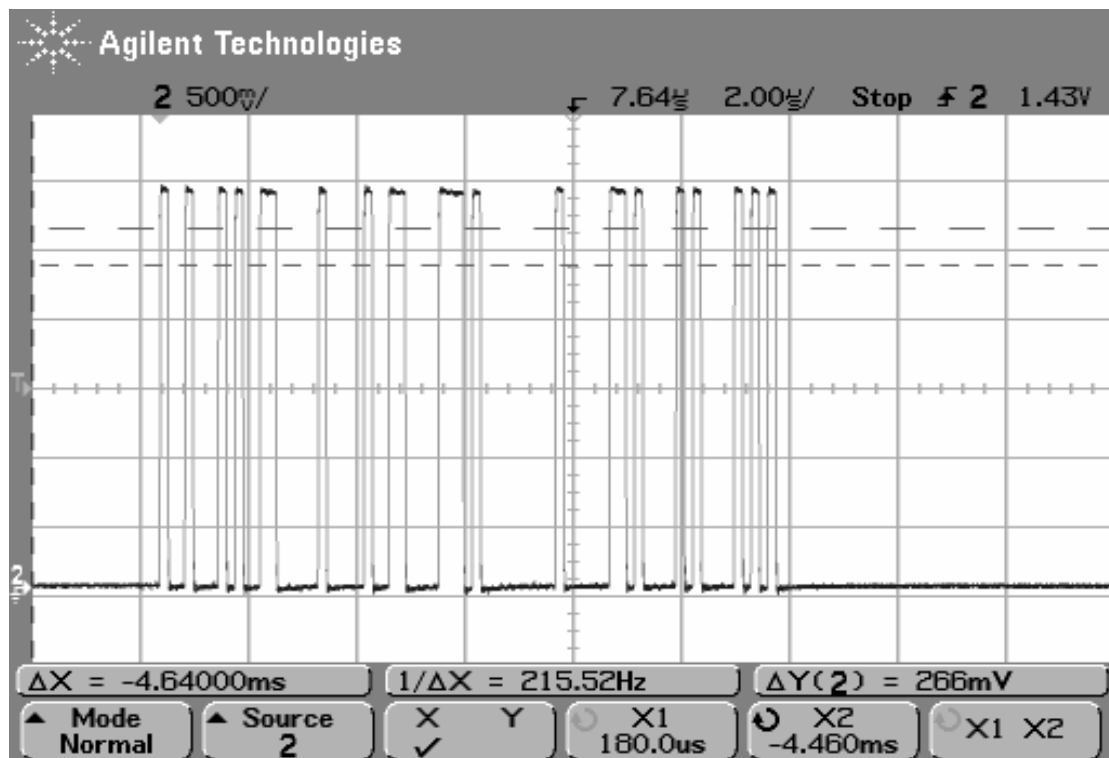
DCS CH 698 channel receiving signal

2.1.3.2.5. U900 Pin43~46 Receiving state IQ signal

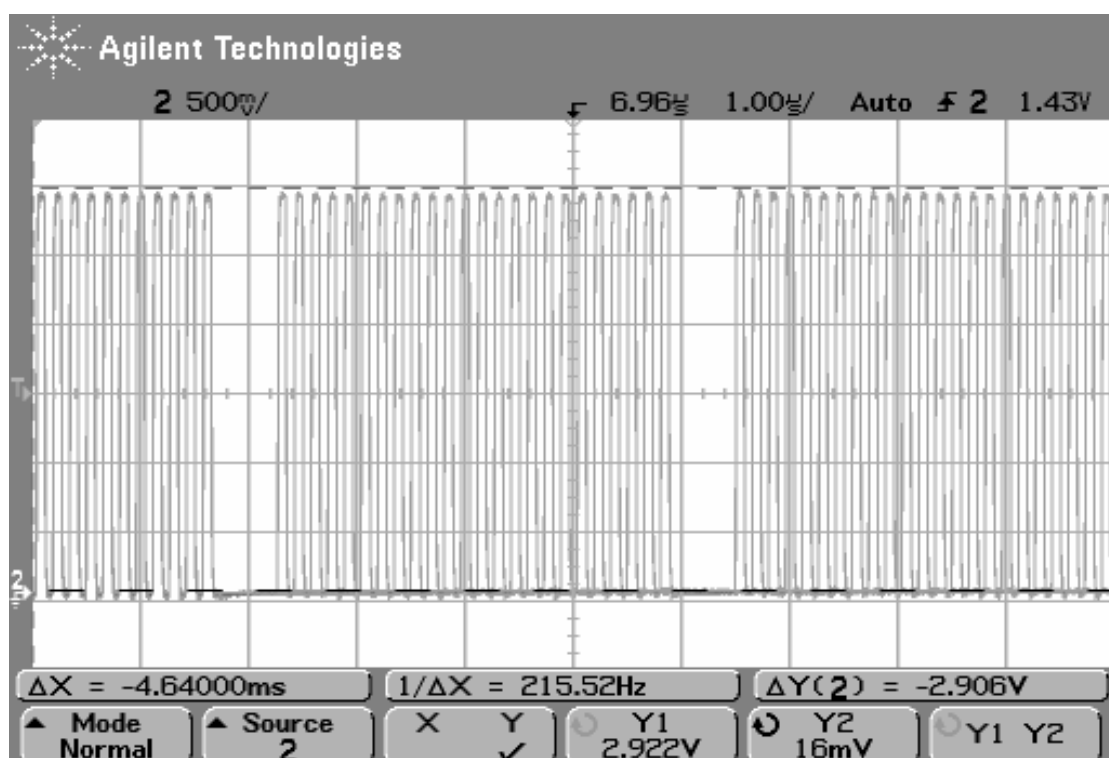


2.1.3.2.6. The 3 output signal from CPU is sent to U900 Pin39/40/41 for accessing and setting internal register in U900. 2.8V voltage should be measured on pin 37 AVDD. The corresponding waveform on Pin39/40/41 is as follows:

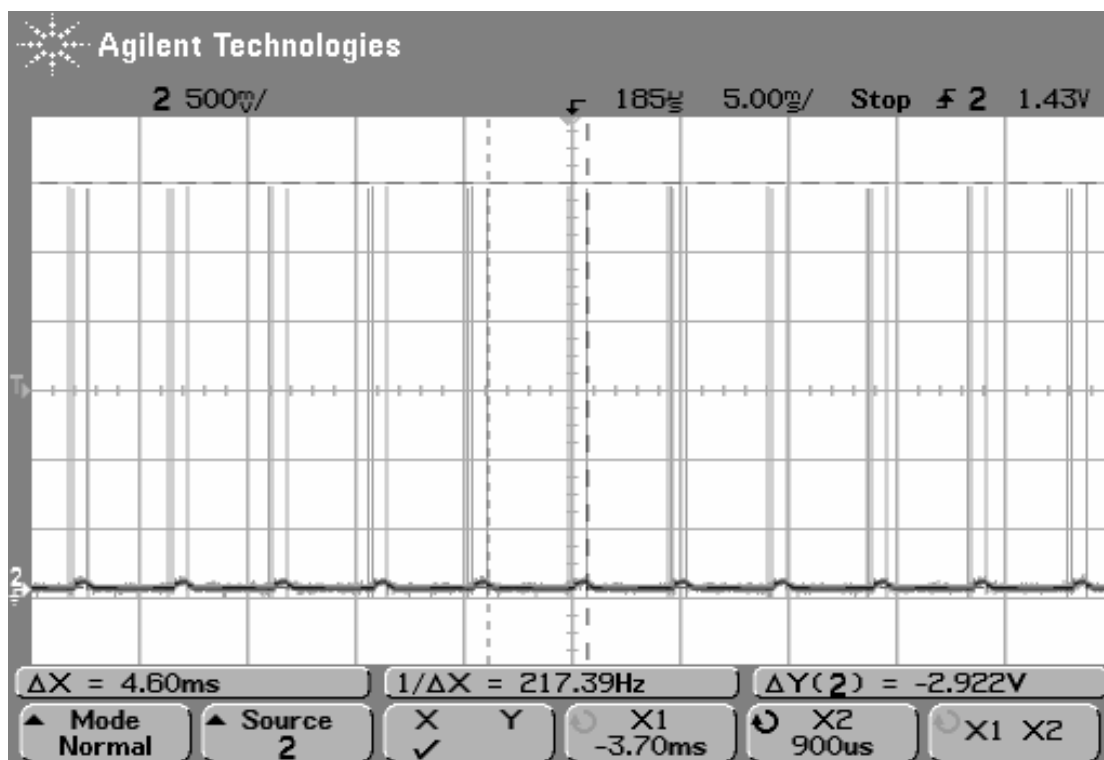




3W (SDATA)



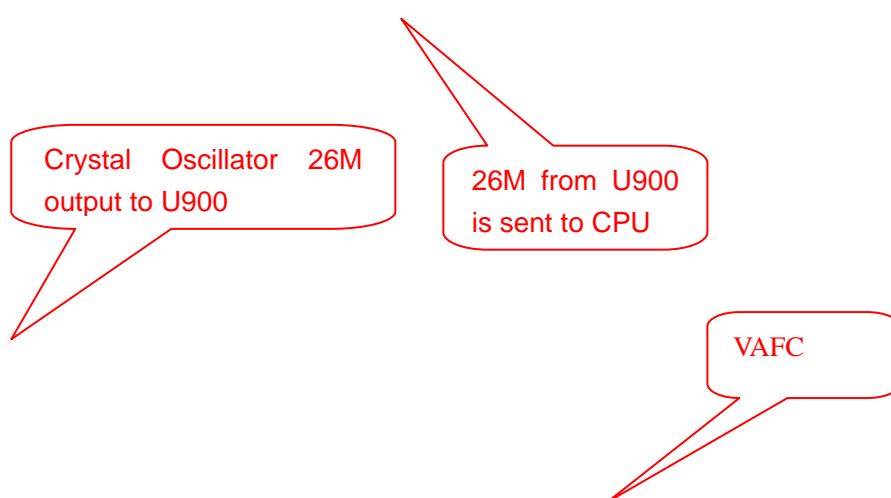
3W (SCLK)

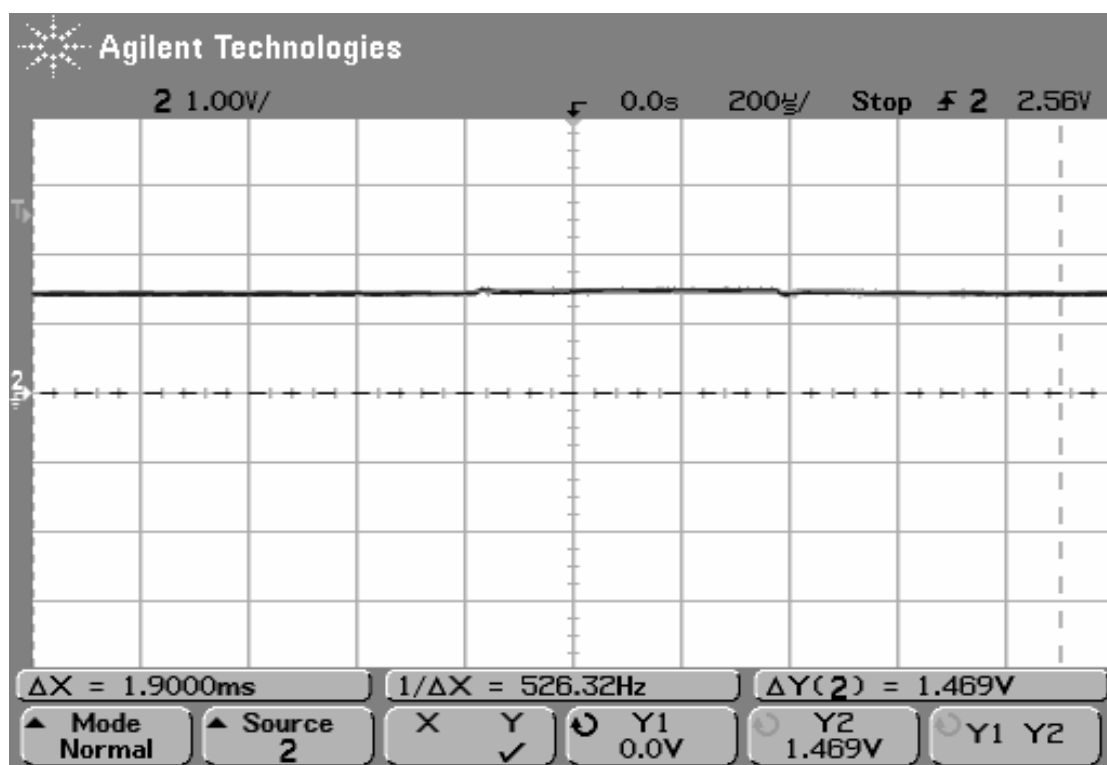
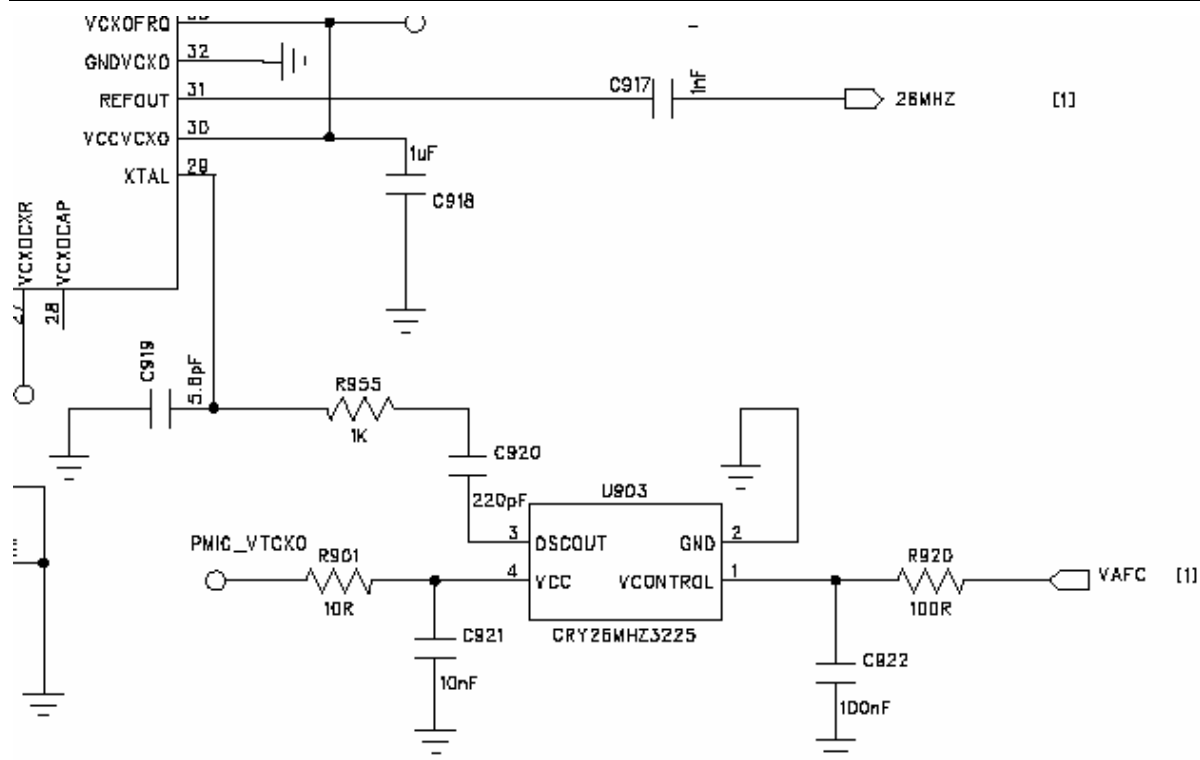


3W (SCLK)

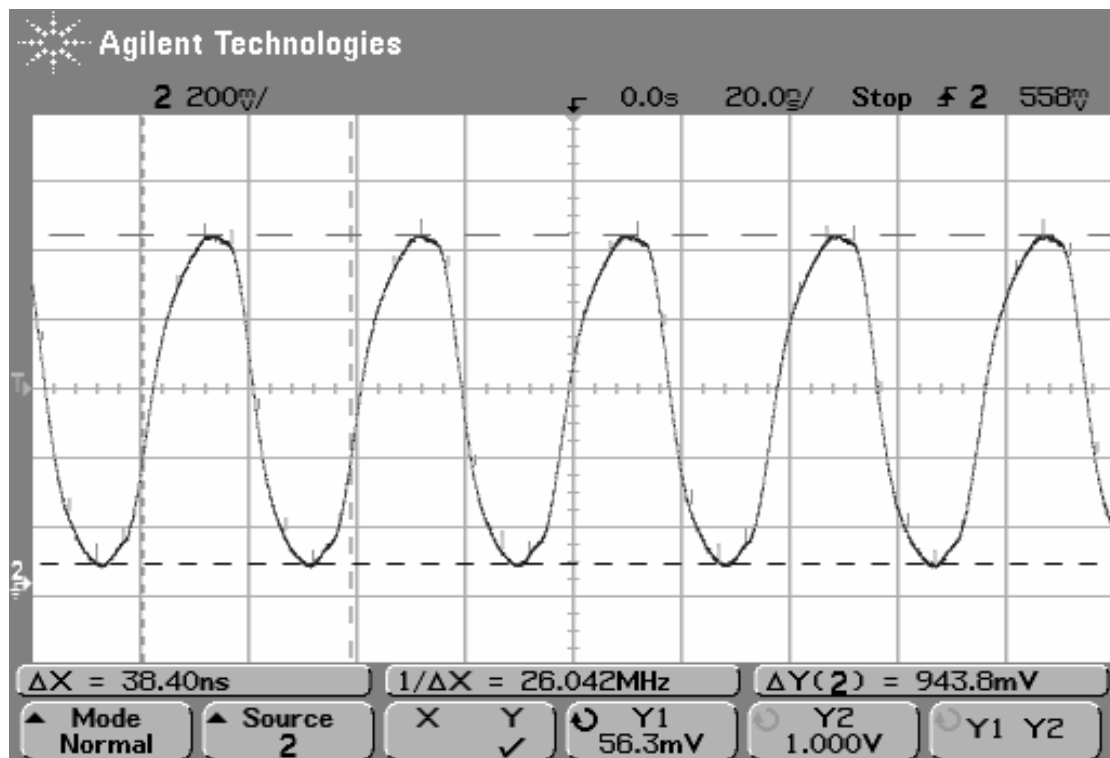
2.1.3.2.7. 26M Clock (Could be measured through ac coupling)

AFC (automatic frequency control) signal from CPU enters clock crystal U903 to make it to output 26MHZ to U900.





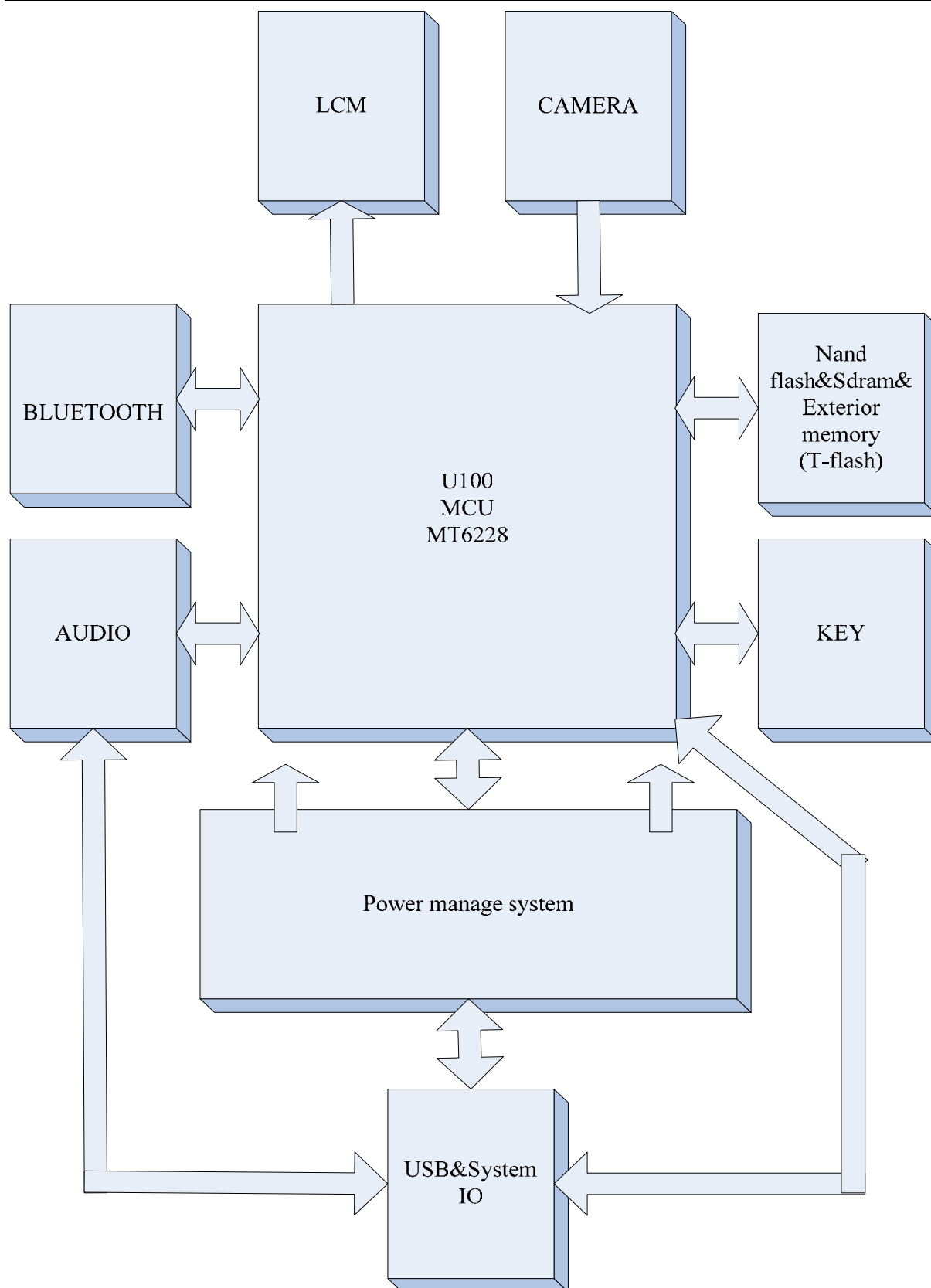
VAFC



TCXO Output (26MHZ)

2.2. Baseband component

2.2.1. Functional block diagram of baseband component



2.2.2. Power management component

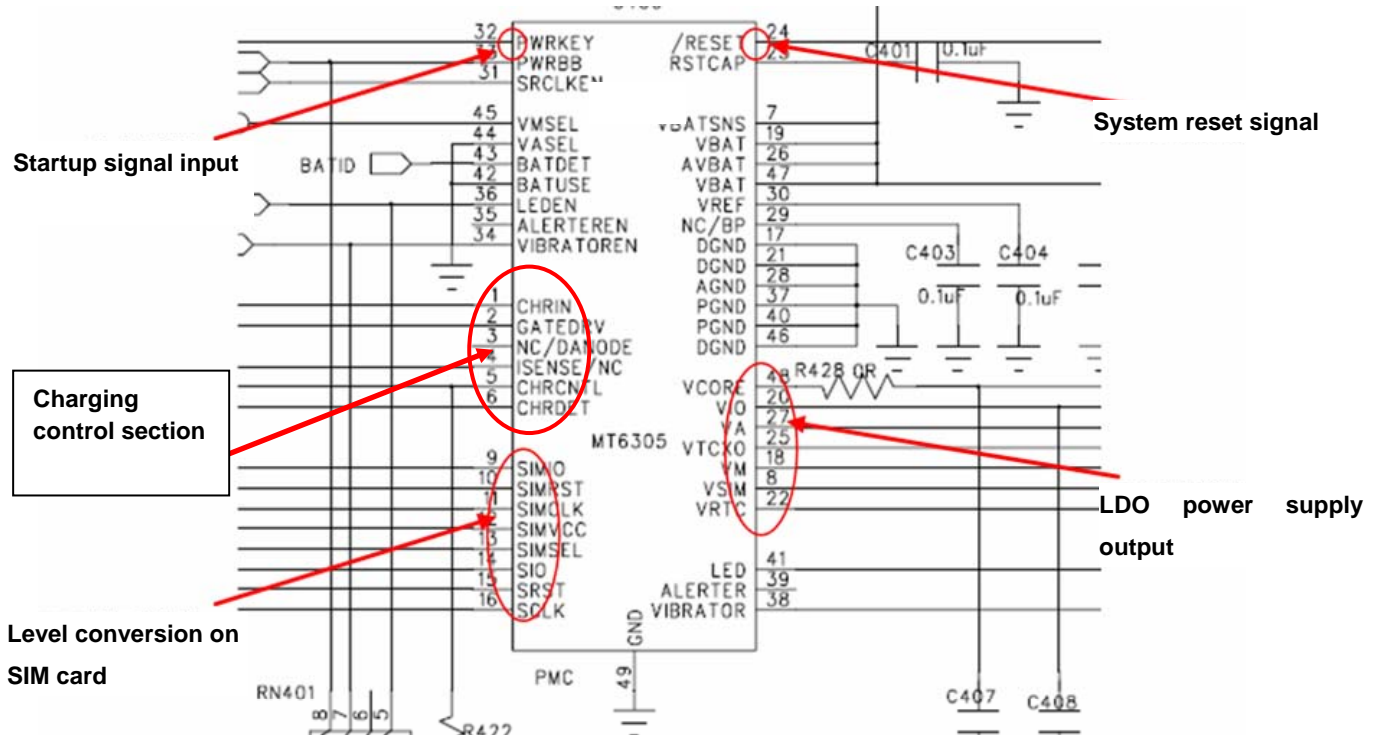
The power management component is mainly composed of MTK management chip MT6305 and peripheral charging circuit. In this section, logic level translation of SIM is completed. The

2.2.2.1. Charging circuit



Voltage	voltage	Max(mA)
Vcore	1.2V	200mA
VIO	2.8V	100mA
VA	2.8V	150mA
VTCXO	2.8V	20mA
VRTC	1.2V	200uA
VMEM	2.8V/1.8V	150mA
VSIM	1.8V/2.8V	20mA

There are some voltage that exist firstly in the Cellphone, including VCORE=1.2V, VADD=2.8V (keep MT6129 working properly and outputting 26MHZ buffer), real time clock voltage VRTC=1.2V, PMIC_VTCXO = 2.8V, which provide the power energy, conversion between different types of signals and charging supply.



U200 原理图

Schematic diagram of U200

2.2.2.3. Startup process of power supply component:

Usually, press power button to start the phone, i.e. draw the level of PWRKEY low. After the power button is pressed, all LDO would be enabled except for VSIM. When RESET timer is enabled by VCORE, and time is out, level of RESET would be drawn high, this would enable digital baseband chip, i.e. MT6228B and MT6228B begin checking ROWX pins of MT6305 alternately and drawing PWRONIN of MT6305 high. Once the level of PWRONIN becomes high, the power button would be released. The steps above describe the original startup process through pressing button.

2.2.3. Minimum system component

2.2.3.1. MCU (U100)

MT6228 is mBGA package that is integrated and includes seven modules following:

Baseband receiver: used to baseband A/D conversion of I/Q signal;

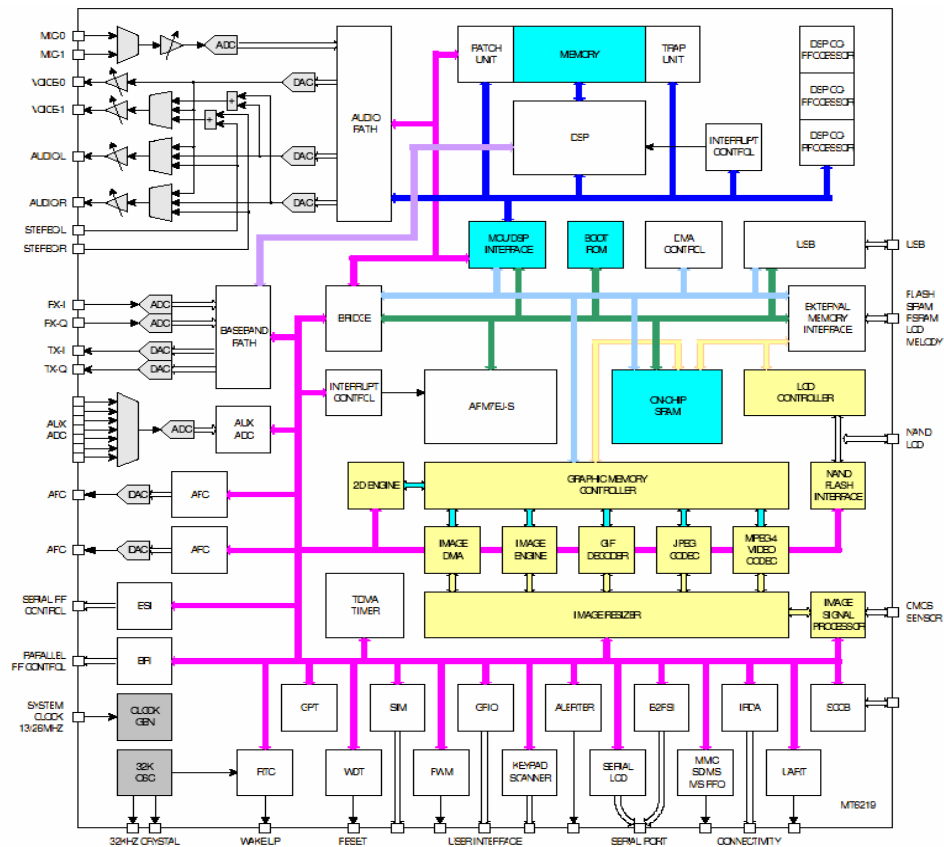
Baseband transmitter: used to baseband D/A conversion of I/Q signal and smooth filter of signal, etc;

RF control: Two DAC converters that are used for automatic power control and automatic frequency control;

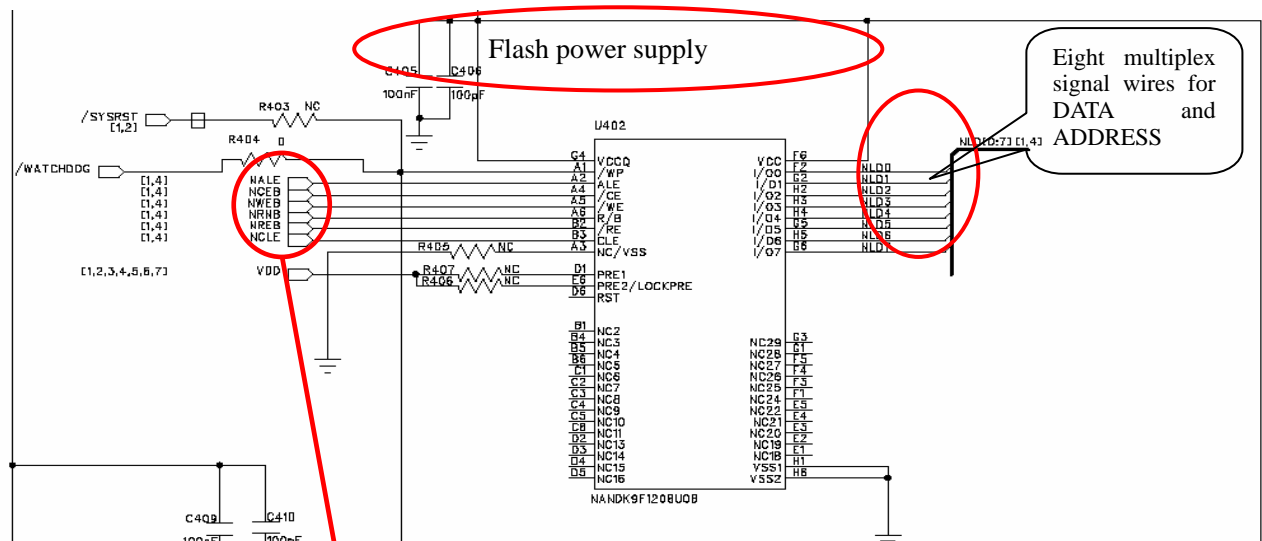
Auxiliary ADC: one ADC converter that is used to monitor battery and other analog functions;

Audio frequency module: provides complete analog audio signal handling, including microphone amplifying, A/D and D/A conversion, earphone driver, and so on.

Clock generator: one square wave map system clock, three phase locked loop that provide the clock for MCU, DSP, USB unit; 32K Crystal Oscillator: 32KHz Crystal Oscillator loop for RTC;



2.2.3.2. NAND FLASH (the Cellphone is designed to be compatible to two packages of NAND FLASH of BGA&TSOP).



Nand flash read/busy status input

Nand flash command latch enable output

Nand flash address latch enable output

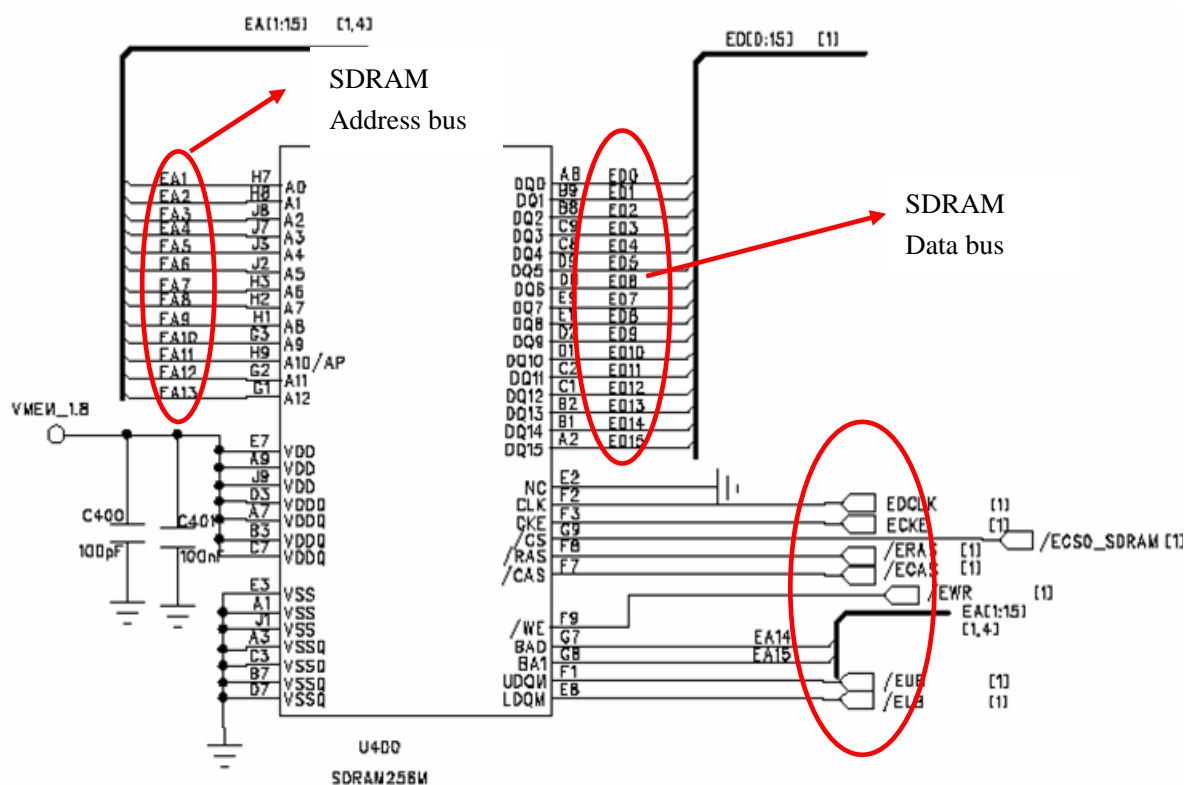
Nand flash write enable output

Nand flash read enable output

Nand flash chip enable output

NLD0
NRNB
NCLE
NALE
NWEB
NREB
NCEB

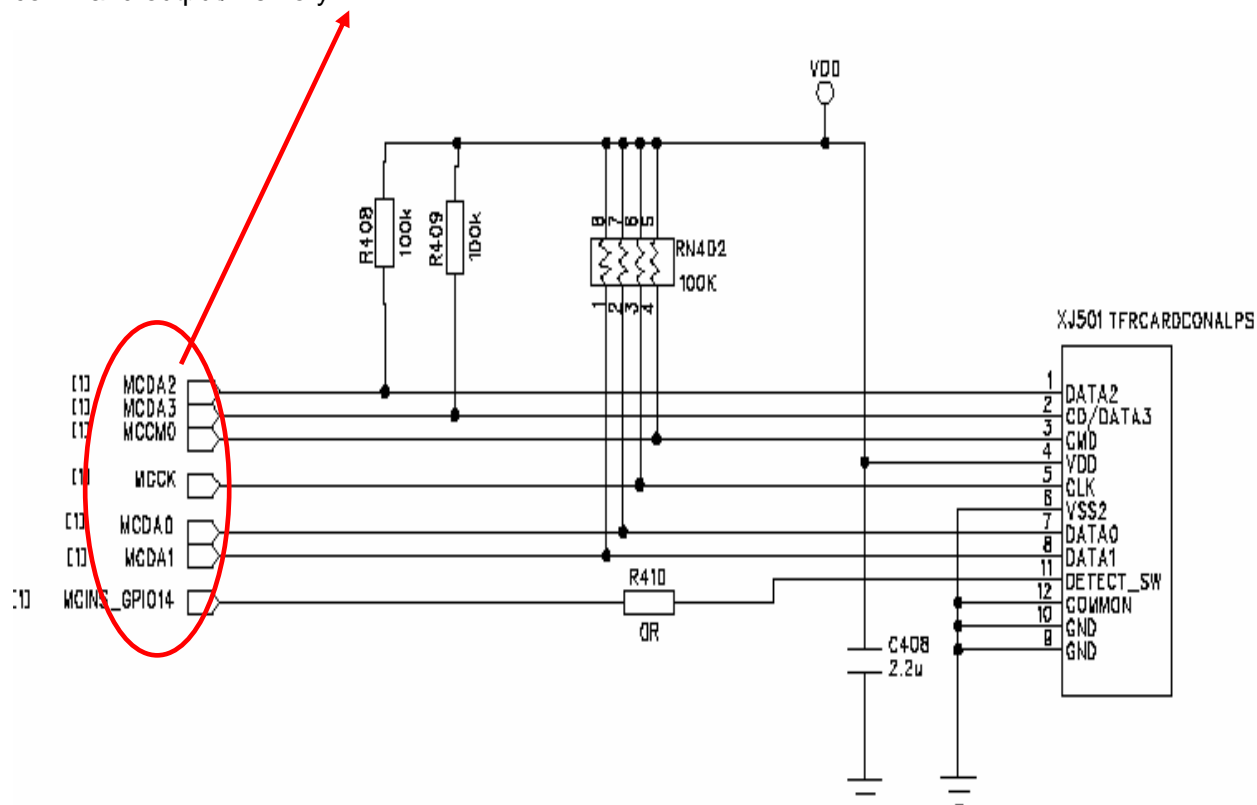
2.2.3.3. SDRAM



2.2.3.4. T - Flash card

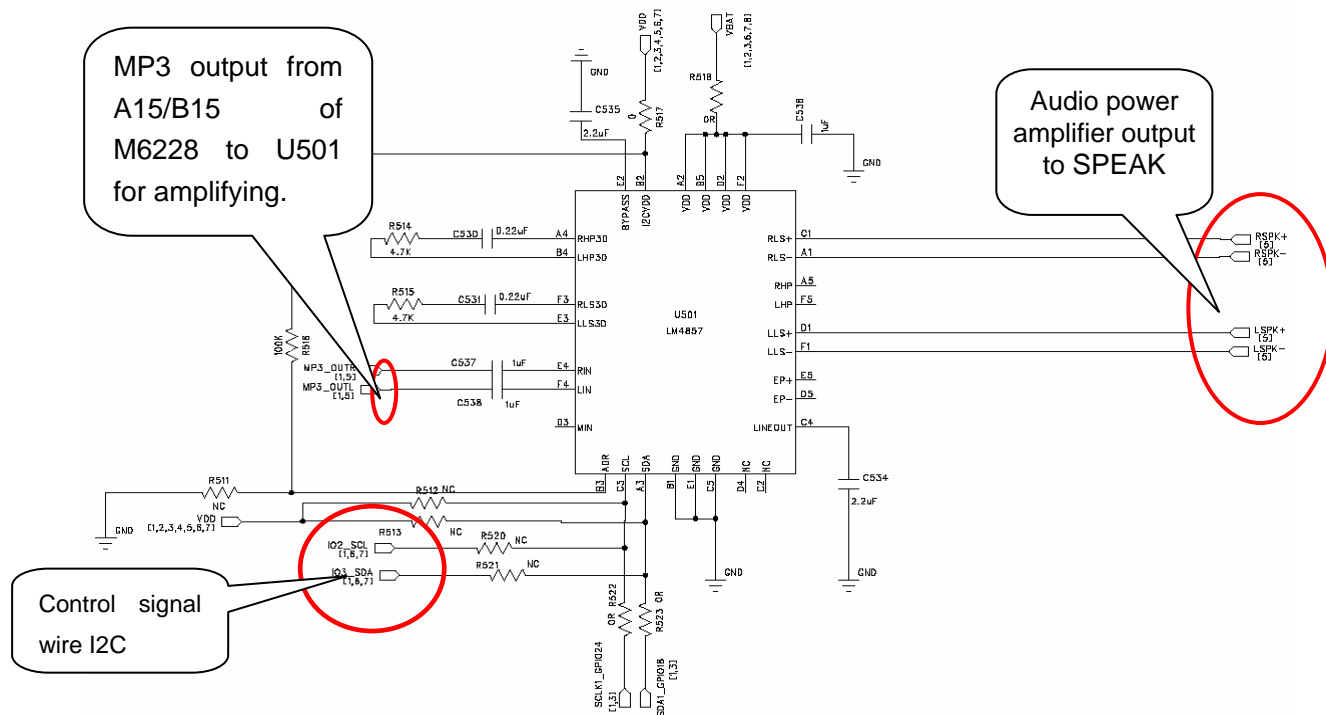
MCDA0~3 为 SD(or memory) serial data I/O , MCCK 为 SD(or memory) serial clock, MCCM0 为 SD command output / memory。

MCDA0~3 is SD(or memory) serial data I/O, MCCK 为 SD(or memory) serial clock, MCCM0 is SD command output/memory.



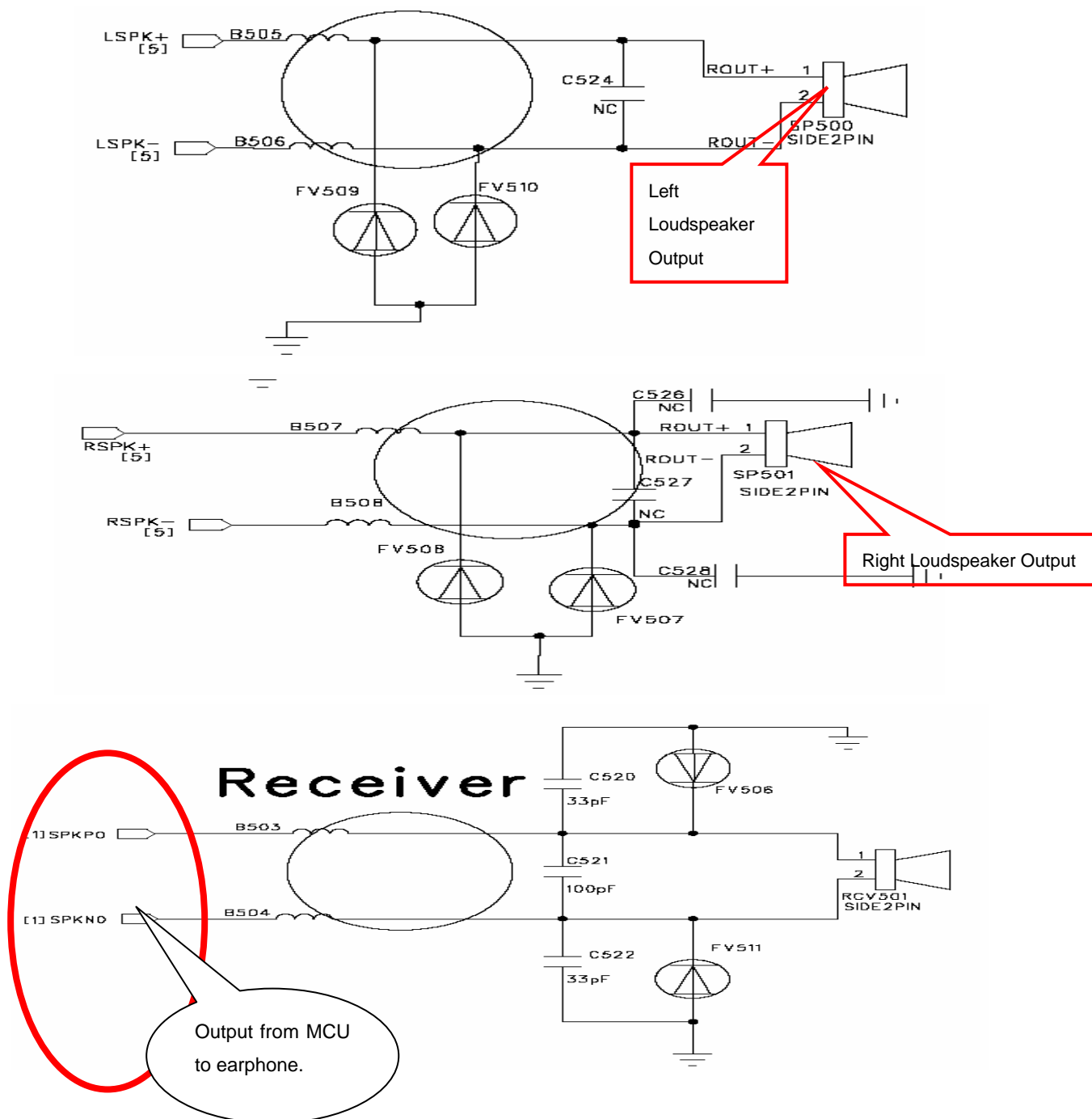
2.2.4. Audio frequency section

2.2.4.1. Audio power amplifier circuit



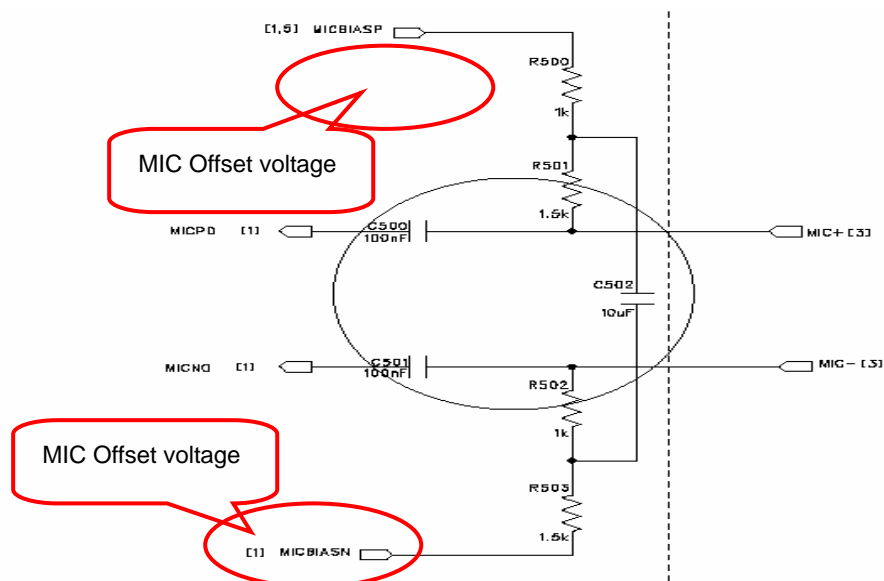
See the following list for the definitions of specific pins:

name	Pin Description	name	Pin Description
RLS+	Right Loudspeaker Positive Output	RLS-	Right Loudspeaker Negative Output
V _{DD}	Power Supply	NC	No Connect
SDA	Data	SCL	Clock
RHP3D	Right Headphone 3D	LINEOUT	Mono Line Output
RHP	Right Headphone Output	LLS-	Left Loudspeaker Negative Output
GND	Ground	MIN	Mono Input
I ₂ CV _{DD}	I ₂ C Interface Power Supply	EP+	Mono Earpiece Positive Output
ADR	I ₂ C Address Select	BYPASS	Half-supply bypass
LHP3D	Left Headphone 3D	LLS3D	Left Loudspeaker 3D
R _{IN}	Right Stereo Input	EP-	Mono Earpiece Negative Output
LLS+	Left Loudspeaker Positive Output	RLS3D	Right Loudspeaker 3D
L _{IN}	Left Stereo Input	LHP	Left Headphone Output



2.2.4.2. MIC Loop

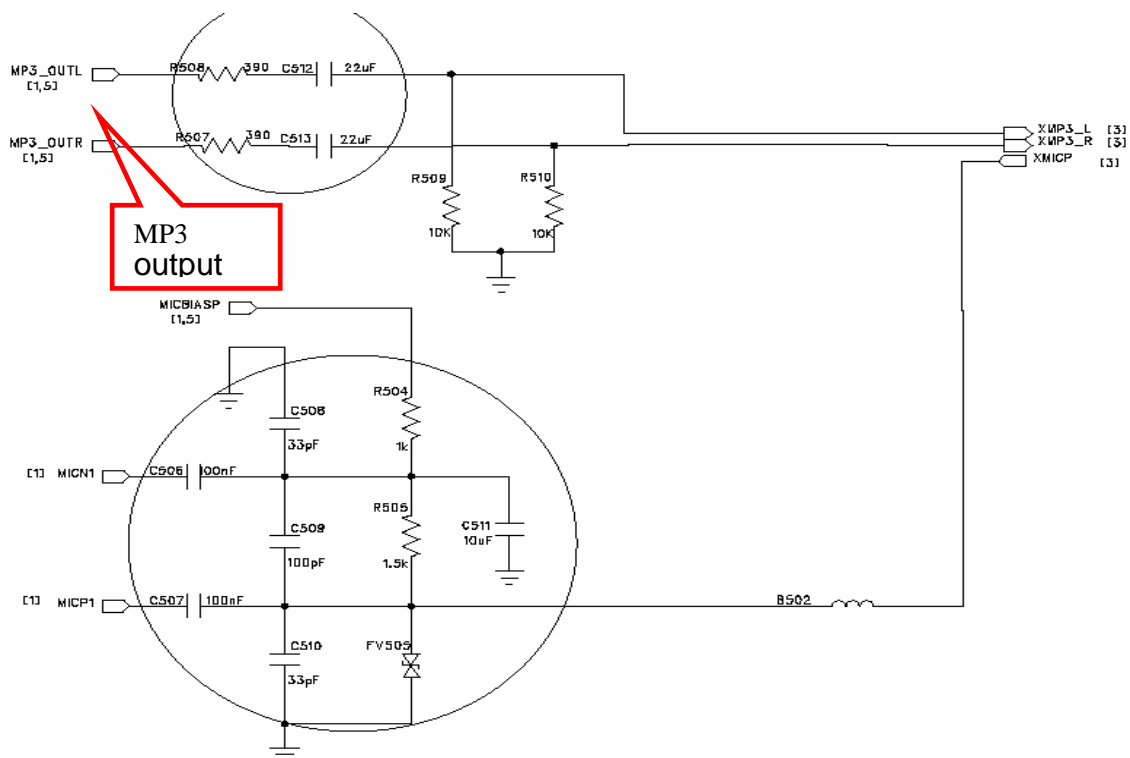
Check LOOP MIC if there is aftersound, if not and MIC works properly, then check the base offset voltage signal of MICBIASP and MICBIASN, X302, FV307/FV308 and speech signal of MIC.

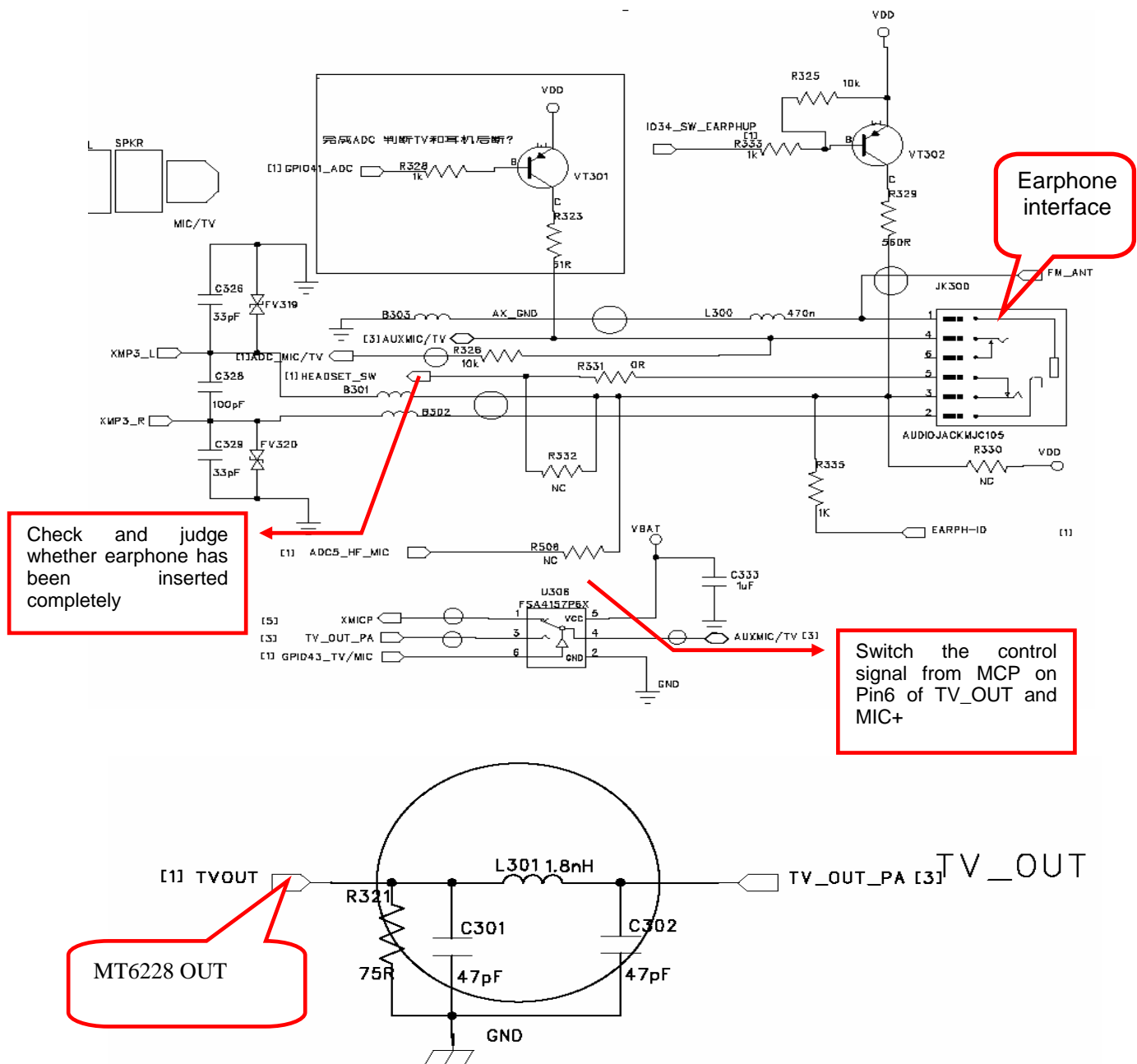


2.2.4.3. TV-OUT and earphone loop

There are loudspeaker and MIC signal in the earphone loop. When earphone accessories are good and the earphone is inserted, some unusual circumstances occur: no sound in loudspeaker and MIC does not work, etc. Check the path in the figure above.

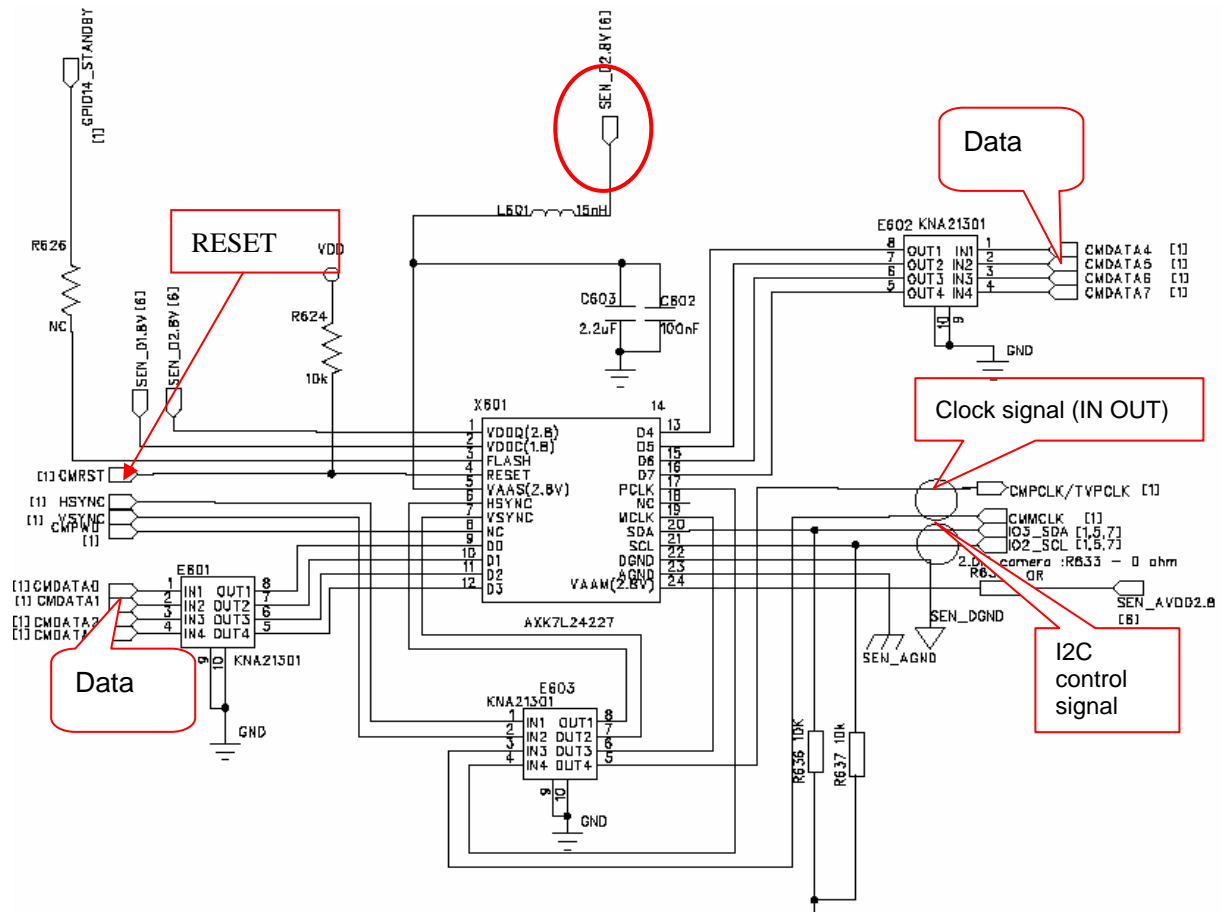
When the earphone is inserted, some unusual circumstances occur, check V822C earphone interface and welding of JK300.





2.2.5. Camera circuit

The camera circuit could be regarded as one camera sensor interface and one sensor, as MT6228B includes DSP function. The following figure shows this interface circuit. If it makes sure the camera is good, check E601/E602/E603/X601 if there is false welding or short or open circuit during the maintenance, so CPU may be fault.



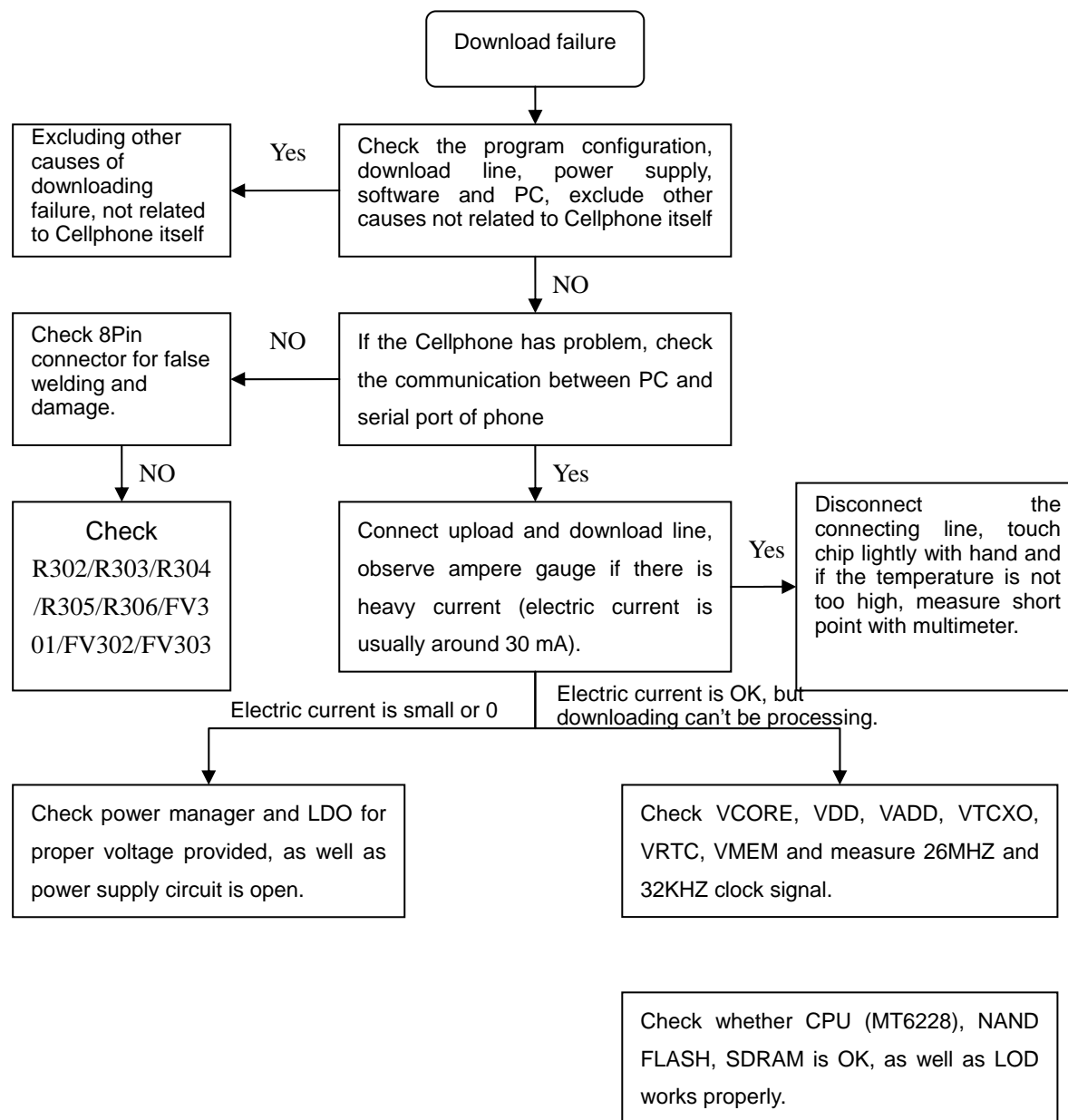
2.2.6. General problems of baseband

2.2.6.1. NOR Flash downloading failure

To download the software, the following data lines are required: VBAT, TX, RX, GND, CHARGE; in general, the causes are that there are false and link weld on mainboard. Firstly, check the serial port connection between PC and Cellphone. If unconnected, there could be something wrong on power supply chip MT6305 (U200), connector X301 and pin of R302/R303/R304/R305/R306/FV301/FV302/FV303. The TX and RX signal could be measured with ac coupling on oscillograph easily. Track the signals flow, if there is not signal on some segments, the reason may be that AC is short to ground or there is short and open part.

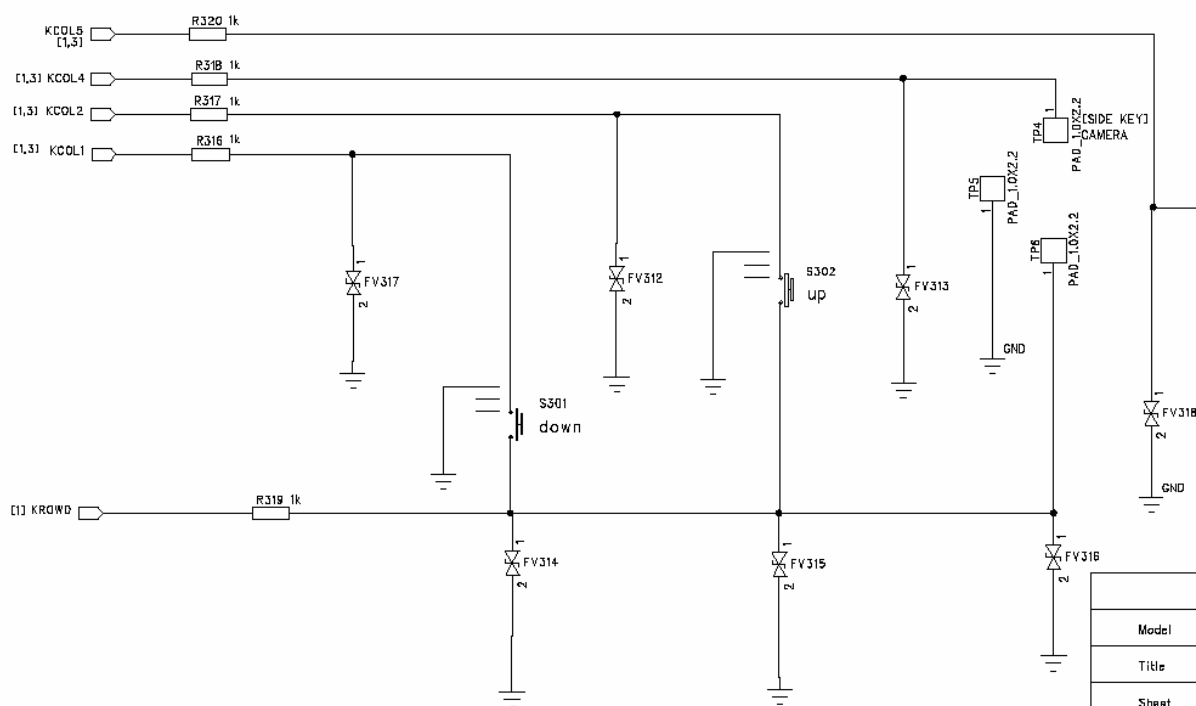
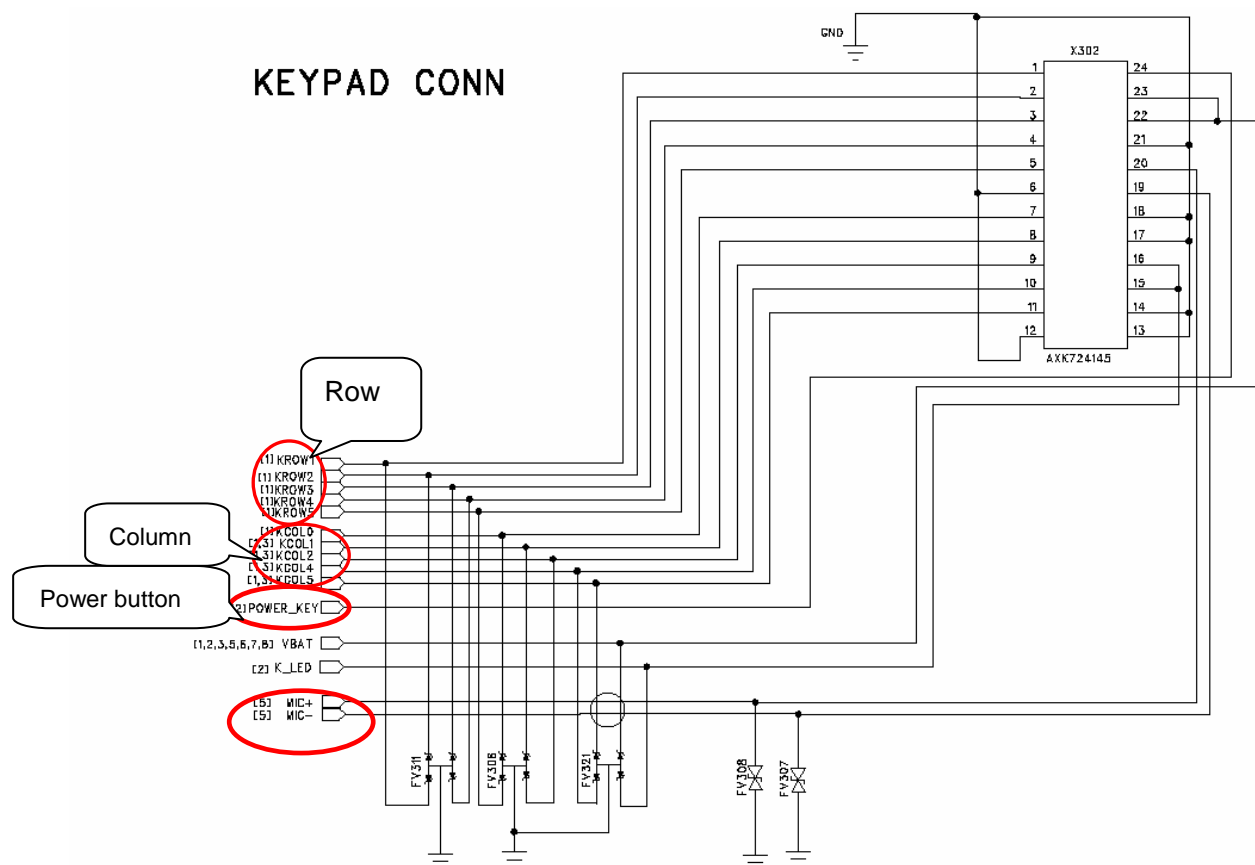
Observe the welding of those components with magnifier before checking faults. Insert the download line, observe the electric current, if it is strong, it means there is short to ground on VCHG or VBAT, cut off power at once, and then find the short dot; if the electric current is more than nominal value (about 30 mA or above) but not excess, the stabilized voltage supply of any path may output improperly, check the voltages such as VCORE (1.2V), VDD (2.8V), VADD (2.8V), VTCXO (2.8V) VRTC (1.2V), VMEM (2.8V), if problems are found, check the imperfect welding point; If the electric current is small or 0, check U200 and X301 for their welding. Otherwise, connector plug of download line could have poor contact problem as it had not be used for a long time. Pull out the plug again and check it; 26KHz clock signal would be required for downloading except for mentioned power supplies. Check the 26KHz signal if it is output to CPU properly with oscillograph.

2.2.6.1.1. Troubleshooting flow chart on downloading failure



2.2.6.2. Problem analysis on keyboard

The scanning monitor is adopted in keyboard circuit. When any button is pressed, scanning signal would be triggered, the corresponding row and column would be monitored, and then the function of related button could be recognized through software definition of system.



2.2.6.2.1. All buttons disabled after start-up

In general, this kind of situation is resulted from one button that has short circuit, it means the button has been pressed permanently, the following items should be

considered:

- A、Check the resistance networks from bottom board to low board FPC if the short circuit exists
- B、Then check side-button if welding point is short.

2.2.6.2.2. One button disabled

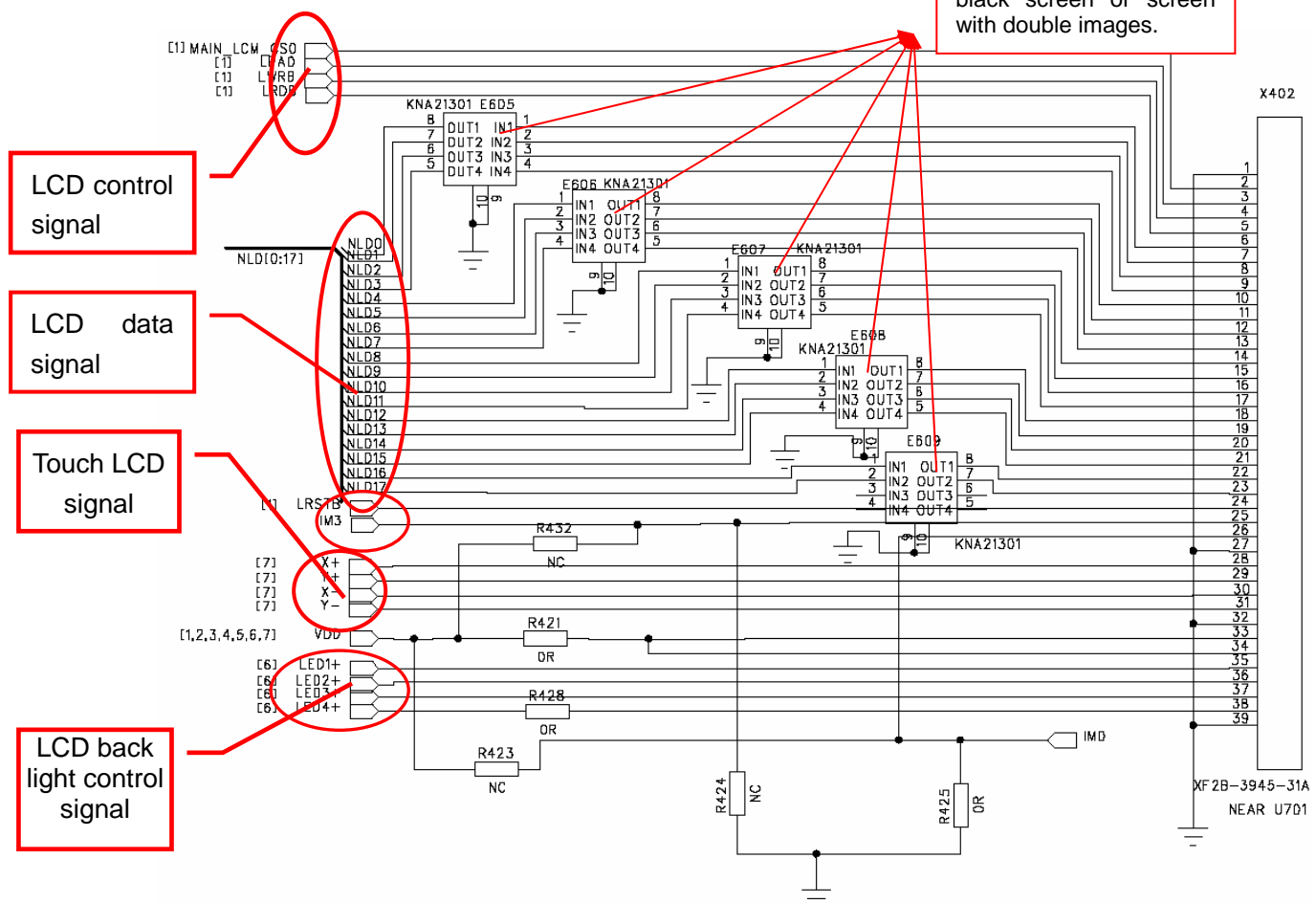
When one button is disabled, check the part under DOME if it is dirty. If the problem still occurs, check the circuit for short circumstance.

2.2.6.2.3. Some buttons disabled

When some buttons are disabled, one raw or column may be short. Check mainly interfaces circuit for open or false welding and disconnected resistance circumstance.

2.2.6.3. X402 LCM Connector analysis

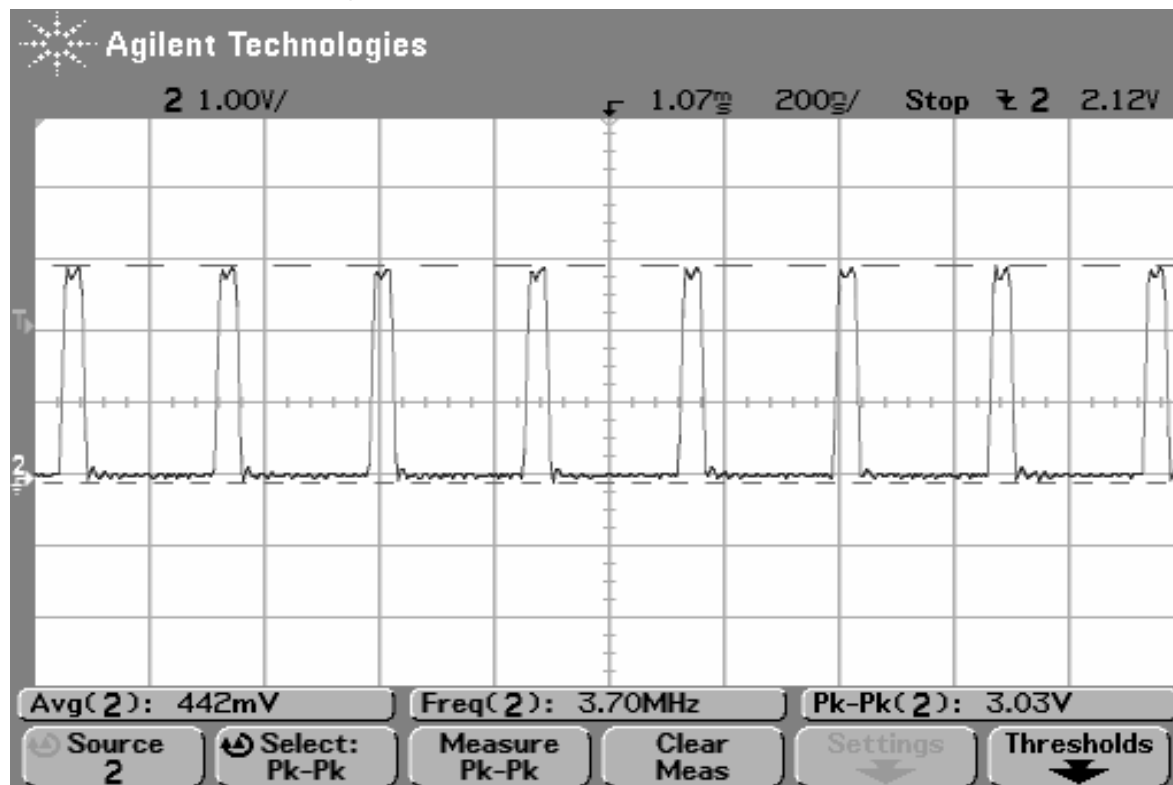
Pay attention to resistance network or bead, if the false welding exists, this will cause black screen or screen with double images.



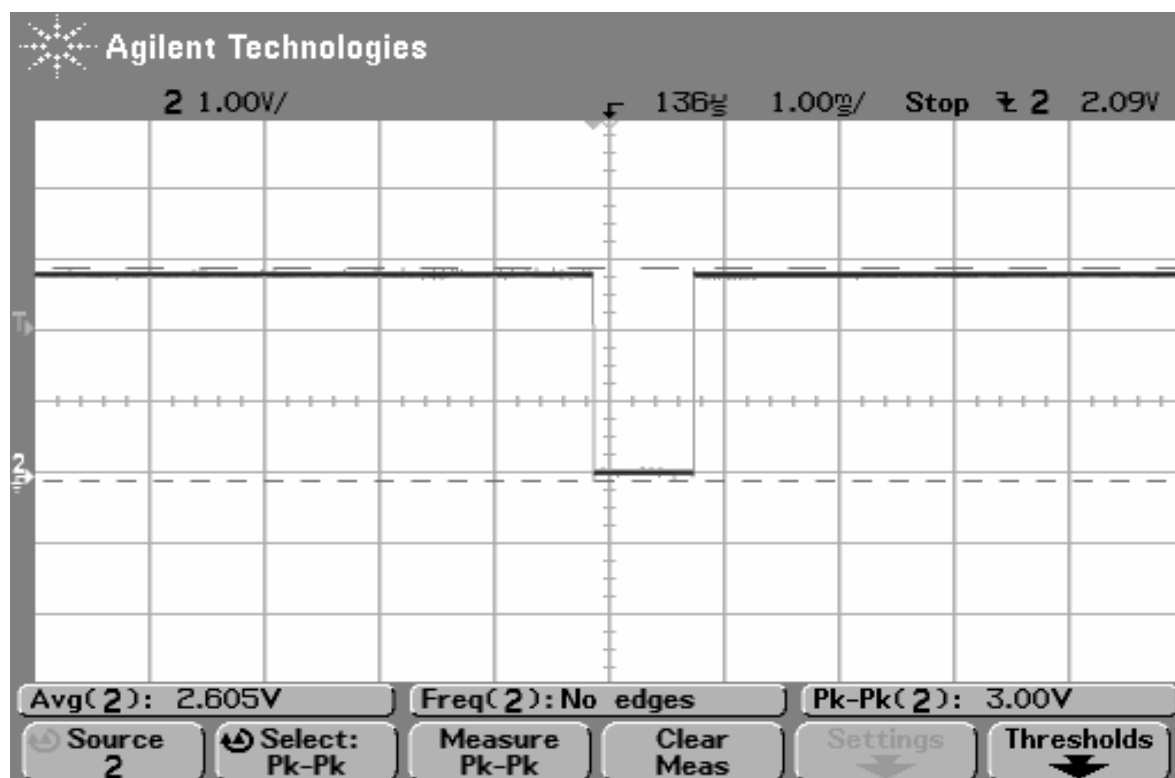
Schematic diagram of FPC connector of LCD module

2.2.6.3.1. Signals waveform graph

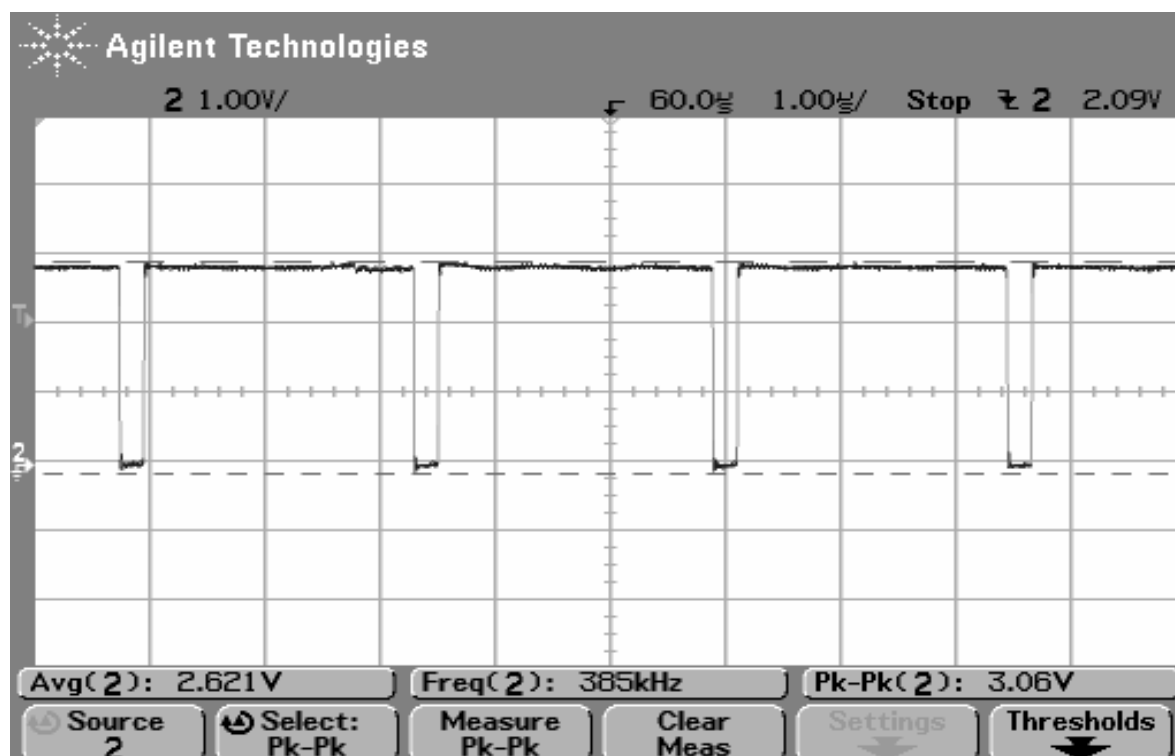
2.2.6.3.1.1. Chip select signal (CS)



2.2.6.3.1.2. Screen-reset signal (LRST):

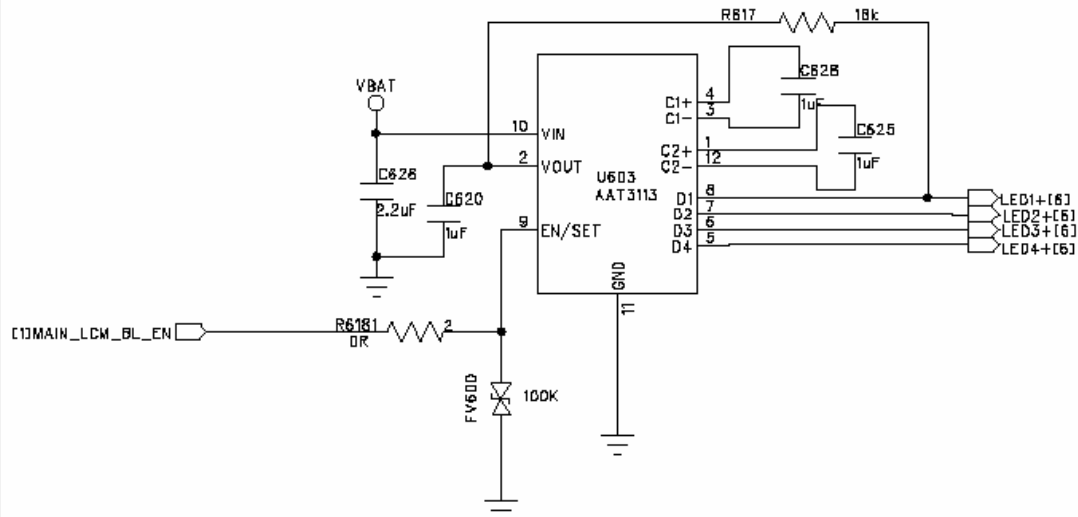


2.2.6.3.1.3. Write signal on screen (LWR):



If there are some problems with screen, judge whether the cause would be related to the mainboard or screen through replacement. Check X402 welding. Backlight signal is sent from U603 LED driver chip. The input voltage VBAT and enable control signal could be measured.

Backlight control



Repair reference

No signal

General components to have troubles: U900, U903, U902 (because there are 2 filters that are damaged easily in D600).

Startup failure

This circumstance is usually resulted by false welding on components. At first, measure the completeness of 26MHZz and 32.768KHz signal and on off of signal path, and then check supply voltage for fullness and related paths for the good condition. In general, CPU would not be damaged easily. Sometimes, LDO could not be started up, voltage is normal and current is small (the fact is hiding, so it is needed to measure this circumstance with replacement method.). Welding for more times and rewelding would cause startup failure. The Cellphone could be started without NAND FLASH, but damaged NAND FLASH would also cause startup failure.

No display

Display interface has been welded and repairing welding. There are welding around resistor network. Check NAND FLASH for operation, if it worked improperly, unmount it and check bonding pad for short circuit (FLASH and display data shares the same address).

No ringtone

V822C audio works in CPU. In general, CPU would not be damaged easily. It is needed to check U501 regularly. The two components are used to amplify the audio. When no ringtone or noisy ringtone occurs, check this component; If the sound of ringtone is low, check U501, because the welding spot of this component is very small. SMT usually fails easily. Build up a joint or replace it for repair, try this method for some times to resolve the problem.

Downloading failure

Distinguish between NOR FLASH (storing system data) and NAND FLASH (storing user data, i.e. U disc). The erase/write action of NAND FLASH is performed repeated by user, if this repetition action is operated improperly, it would cause internal NAND FLASH damage. Use 48-programmer to erase/write this component (and NOR FLASH), if available. This would restore damaged FLASH.

Button disabled

If one button fails, the reason could be the wrong writing connection between this button's connecting finger and the circuit. If a group of buttons or all buttons are disabled, please check resistor network or bonding pad of CPU for short circuit.

Note that actual waveforms may vary with different setting and units, comparing with this manual.

Operating instruction of tools

Operating instruction of LCT software download

Please refer to “Operating Instruction of Cellphone Software download _MTK_After-sales Version”

Operating instruction of LCT_Repair tool

Please refer to “Operating Instruction of Repair Software _MTK_”

Operating instruction of LCT Unlocking software

Please refer to “Operating Instruction of Unlocking Software _MTK_”

Operating instruction of LCT write SN number

Please refer to “Operating Instruction of Write Production Series Number _MTK_”

Operating instruction of LCT double-loop calibration system

Please refer to “Operating Instruction of Double-loop Calibration System _MTK_”

Operating instruction of LCT double-loop automatic test and calibrate system

Please refer to “Operating Instruction of Double-loop Automatic Test and Calibrate System _MTK_”

Operating instruction of LCT mainboard function test software

Please refer to “Operating Instruction of Mainboard Function Test Software _MTK_”

