Professional wireless communication system solution supplier

TP660

Service Manual

V141217

Kirisun Communications Co.,Ltd.

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1. Overview

1.1. Scope

This manual applies to the service and maintenance of TP660 digital portable radios, and it is intended for use only by engineers and professional technicians trained by Kirisun. Data changes in this manual may occur with the improvement of technology. To get the latest technology information, please contact us or your local dealer.

Please read this manual before repairing the radio.

1.2. Safety Precaution

Electromagnetic Radiation

Radios generate and radiate electromagnetic energy. The security design of TP660 radio's electromagnetic radiation on human meets national and international standards. To ensure radio's optimal performance and safe electromagnetic radiation on human, please keep the radio vertical to the ground and 2-5 cms away from your mouth.

Electromagnetic Interference

To avoid electromagnetic interference, please turn off the radio wherever there are clear warnings, e.g. hospitals, health care centers, airports, where radios must be turned off.

Explosive and Harmful Gases

The radio should be turned off in areas with explosives and harmful gases, e.g. lower deck of the hull, fuel and chemical storage facilities, area where the air contains chemicals, particles, dust or metal dust.

Please turn off the radio when close to blasting area and electric blasting detonators.

Replacing or charging batteries in potentially explosive atmosphere is prohibited.

Antenna Damage

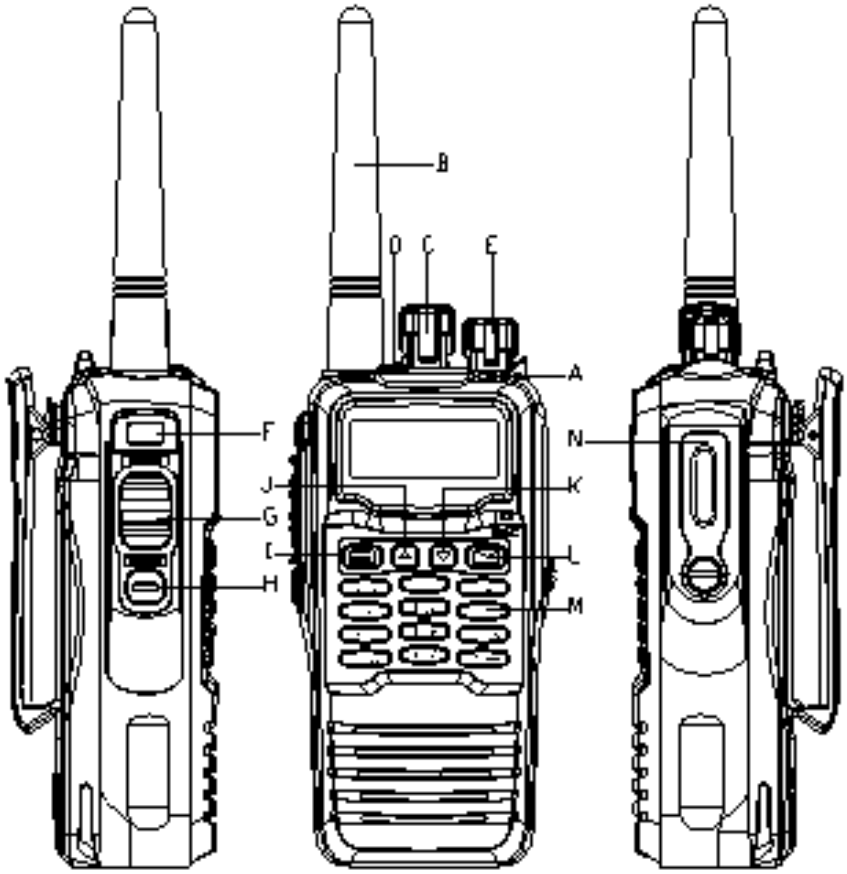
Do not use radios when the antenna is damaged. Damaged antenna may cause mild burning to human skin.

Replacing Components

When replacing components, please be aware of the model. Do not arbitrarily replace any components that do not match Kirisun's requirement.

2. Introduction

2.1. External Views and Functional Keys



No.	Part Name	No	Part Name
A	LED Indicator	H	Programmable Button (SK2)
B	Antenna	I	Return Key
C	Channel Selector Knob	J	Up Key/Menu
D	Emergency Button	K	Down Key
E	On/Off/ Volume Control Knob	L	Confirm Key
F	Programmable Button (SK1)	M	Keypad
G	PTT Button	N	Earphone/Programming Connector

2.2. LED Indicator

- The LED glows red: The radio is transmitting.
- The LED glows green: The radio is receiving (voice mail, message, data) or activities on the channel are

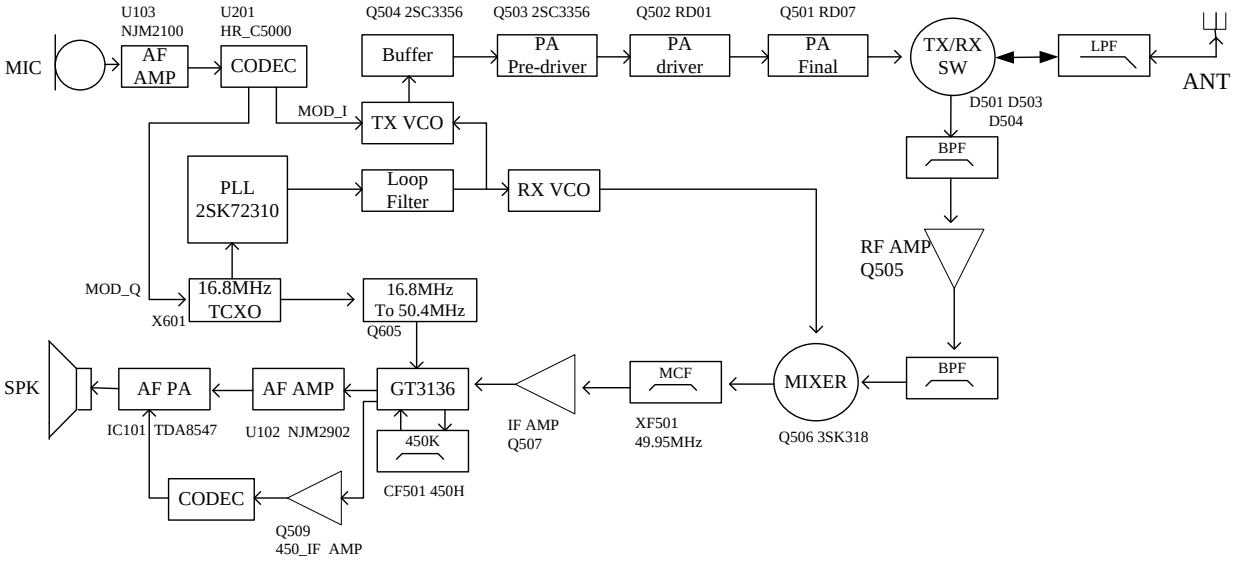
detected.

- The LED glows orange: The radio is scanning.

3. Circuit Description

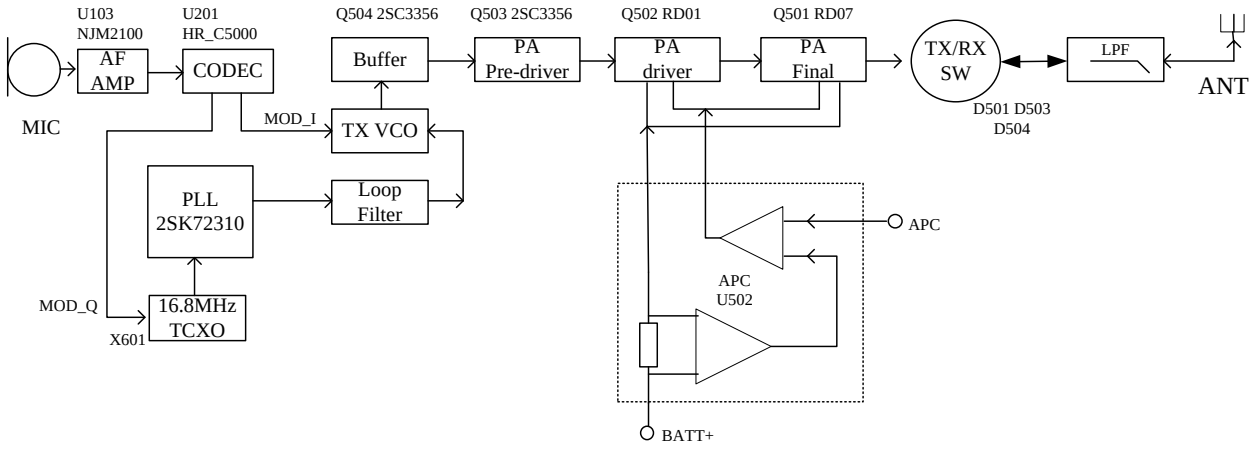
3.1. Tx/Rx Signal Procedure

Figure 3-1 RF Principle of Receiver



3.1.1. Tx Circuit

Figure 3-2 Tx Circuit Diagram



Tx circuit mainly includes four parts below:

- **RF Power Amplifier Circuit**

The carrier signal generated by VCO will be modulated and preliminarily amplified before entering Tx circuit. The signal will first pass a Π-type pure resistance attenuator R536 R537 R538 to realize the level isolation between the power amplifier circuit and Tx VCO; then the modulation signal will enter the first

level pre-drive amplifier (Q504) for preliminary amplification, and generate a certain level isolation from the next level amplifier; the amplified signal will then enter the next level pre- drive amplifier (Q503 and drive amplifier (Q502 RD01)) for further power amplification so as to ensure that enough drive power signal can be offered to the end-level power amplifier (Q501 RD07) for final power amplification. After being processed by the a set of amplifiers at several levels, the Tx signal will complete the output impedance match through a microstrip line at the output terminal of the end-level power amplifier, so the output power loss caused by impedance mismatch can be avoided. The Tx signal will enter the low pass filter through the Rx/Tx switch.

- **Low Pass Filter Circuit for Harmonic Suppression**

Low pass filter which suppress harmonic is a high order low pass filter consisting of lumped inductor and capacitor. With this filter , the out-of-band harmonic wave and spurious signal can be further suppressed on the condition that the certain in-band fluctuation is satisfied.

- **Auto Power Control Circuit (APC)**

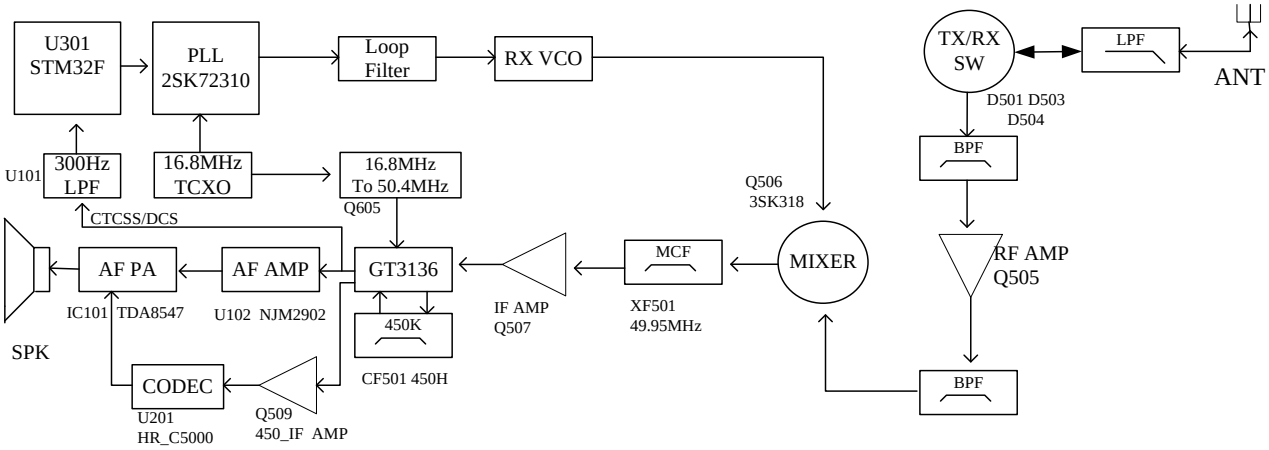
The drain current from the drive power amplifier and end-level power amplifier passes the sampling resistor (R559 R560 R561) where the drain current completes the conversion from current to voltage with the subtraction circuit composed of the first operational amplification. The voltage will be compared with the PAC control voltage value output by DAC (U301 pin 29) at the second operational amplifier, and the deviation voltage will change the Tx power strength by controlling the grid bias voltage of power amplifier tube(including drive level and end level).

- **Audio Processing**

The microphone convert the speech signal to speech electric signal, and the signal will be amplified by U103 before being input into ADC of codec (U201 HR_C5000) for sampling; it will then be output into DSP after audio being digitally processed, and sent to DAC for modulation signal conversion; the modulation signal will be separated into path I and Q for modulating VCO, TCXO.

3.1.2. Rx Circuit

Figure 3-3 Rx Circuit Diagram



Rx circuit mainly includes:

RF band-pass filter, low noise amplifier, frequency mixer, IF filter, IF amplifier, IF processor and audio

circuit.

- **Rx Circuit RF Part**

The high frequency signal from low-pass filter passes the front stage electrically tunable band-pass filter controlled by electric level and output by DAC (U301 PIN29) so as to filter out the out-of-band interference signal, sending effective band-pass signal into the low noise amplifier (Q505). The amplified signal passes again the band-pass filter controlled by electric level and output by DAC so as to filter out the out-of-band interference signal caused by amplification, sending effective high frequency signal into frequency mixer (Q506).

The effective signal passes RF band-pass filter and low noise amplification and enters the frequency mixer Q506, meanwhile, the first local oscillation generated by VCO passes the low-pass filter and enters Q506 for making frequency difference with effective signal so as to generate the first IF signal. The signal passes the frequency selector network which consists of LC; it further suppresses the other carrier waves other than the first IF, and increase the isolation between the frequency mixer and IF filter. The IF signal will be filtered by the XF501 crystal filter, and then sent to the first IF amplifier（Q507） for amplification before being sent to the IC for IF processing (U501, GT3136).

The third harmonic frequency 50.4MHz produced by TCXO(X601 16.8MHz) is amplified by frequency selector and become the second local oscillation signal source. The second local oscillation (50.4MHz) mixes with the first IF signal in U501, generating the second IF (450kHz). The second IF will be amplified, limiting amplitude inside U501, and filtered by the ceramic filter CF501 450kHz before going back to U501 for demodulating and outputting the audio signal.

- **Rx Circuit Audio Section**

A. Digital Channel Audio Access: The second IF signal output from the eleventh pin of U501 is amplified by Q509 and sent to U201 for ADC sampling and being converted to digital signal; after the digital audio signal is compressed, decompressed and decoded by U301, U201 will complete DA conversion and output audio signal from the 10th pin, and the audio signal will be amplified by U203 and sent to the audio power amplifier IC101.

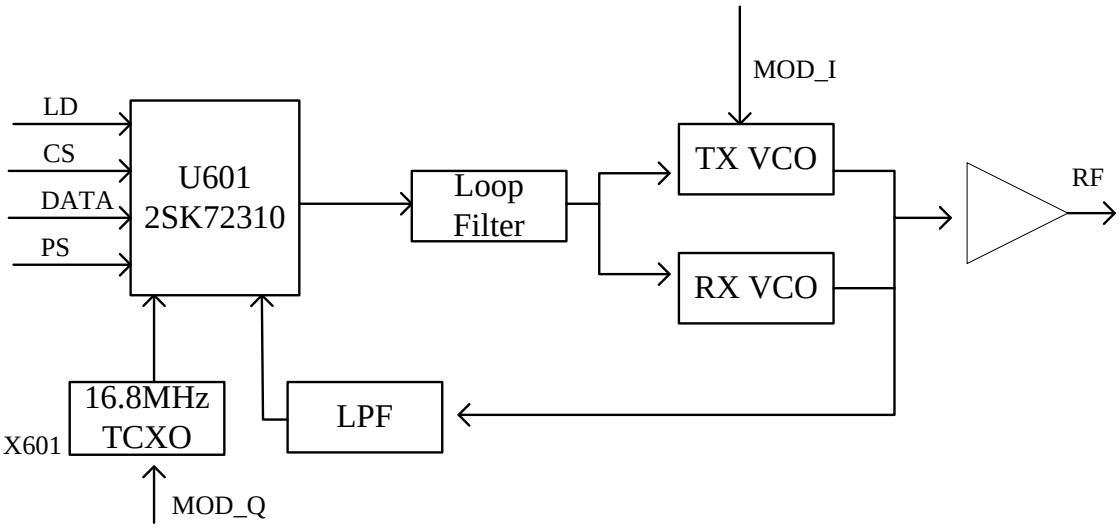
B. Analog Channel Audio Access: The audio signal output from the 9th pin of U501 is amplified by U102 and its unit circuit. The high frequency and low frequency will be removed from the audio signal, keeping only the voice component between 300 Hz to3000Hz. The voice component will be adjusted by volume potentiometer and sent to audio power amplifier IC101.

C. Analog Channel CTCSS/DCS Signaling Access: The audio signal output from the 9th pin of U501 may include CTCSS/DCS signal. The 300Hz low-pass filter circuit composed of U101 filters out the signals out of the CTCSS/DCS spectrum. After CTCSS/DCS is amplified, it will be sent to the 25th pin of U301.

D. Analog Channel Squelch Circuit: The modulated output from U501 is sent to the frequency selector noise amplifier which is composed of U501 internal noise amplifier and C555，R525，R524，C554，C553，R527; the noise will be selected from the modulation signal and detected internally before being outputting by the 14th pin and transformed as direct electric level to reach MCU U301; MCU identifies the electric level strength and controls squelch.

3.1.3. Frequency Synthesizer Circuit

Figure 3-4 Frequency Synthesizer Circuit Diagram



Frequency synthesizer circuit is composed of VCO and PLL, and it is the kernel module of the whole TRx system. When transmitting, the circuit supplies accurate carrier frequency; when receiving, it supplies stable local oscillation signal. The circuit directly influences some of the important functions in the system.

- **PLL Working Principle**

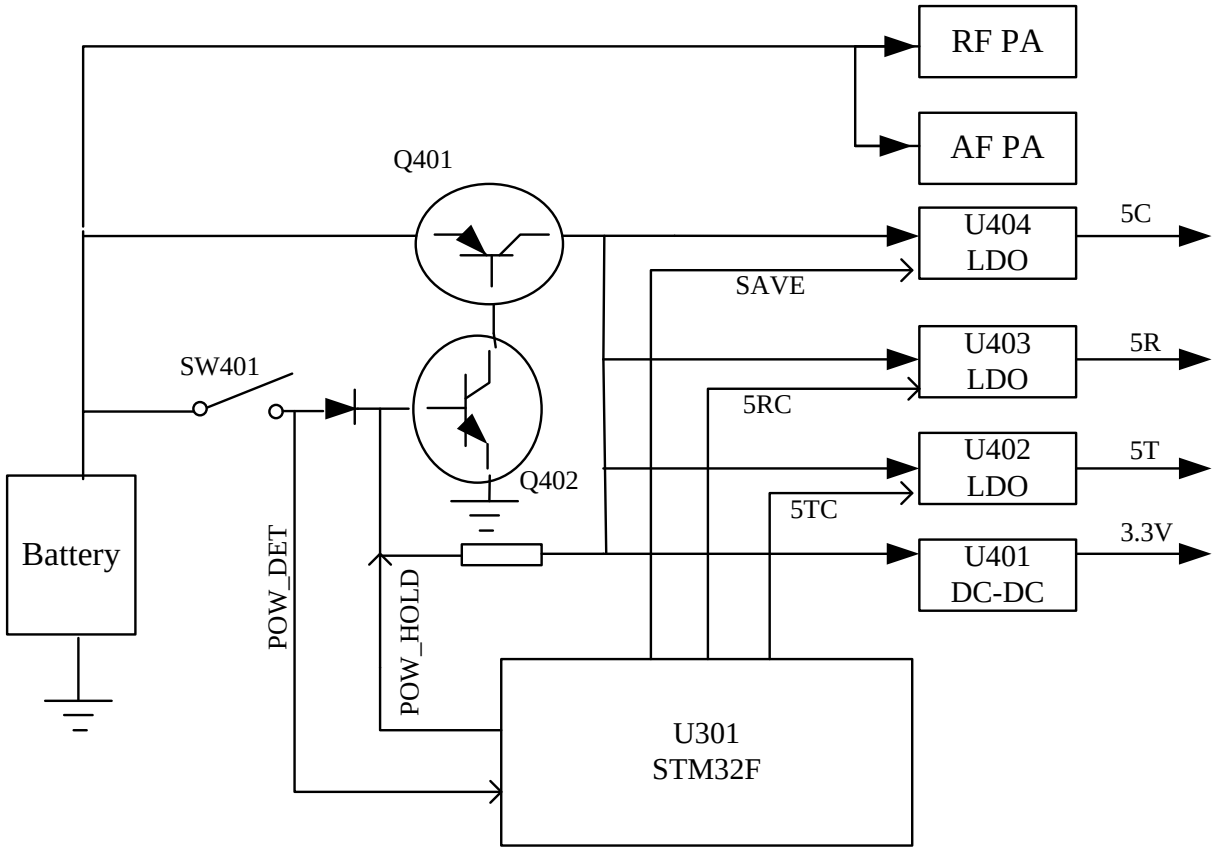
The 16.8MHz frequency generated by the reference crystal oscillator enters the frequency divider of PLL chip, and becomes reference frequency (i.e. step frequency f1). The frequency generated by VCO passes LPF for filtering out the second harmonic wave and enters PLL chip for frequency division and gets frequency f2. The frequency f2 compared with f1 on phase difference in phase comparator, producing continuous pulse current. When the pulse current passes the loop filter, it starts to accumulate RC and converts to CV voltage. The CV voltage is sent to the VCO varactor, directly controlling and adjusting the VCO output frequency until CV becomes constant. PLL will be currently locked, and the stable frequency output from VCO passes two buffer amplifiers before entering the TRx access.

- **The Working Principle of Voltage Controlled Oscillator**

The voltage controlled oscillator applies oscillation mode of three point capacitor. It changes the control voltage of varactor to get different output frequency. Rx VCO is composed of oscillator circuit and Q603. Tx VCO is composed of oscillator circuit and Q601, supplying carrier wave of TX signal.

3.2. Power Section

Figure 3-5 Power Structure Diagram



This radio applies 7.4V, 2000mAh lithium battery, RF power amplification (Q501, Q502), AF power amplification (IC101) , and direct battery power supply.

The power circuit is composed of power-on/off circuit, 5C, 5R, 5T, and 3.3V DC-DC voltage stabilizing circuit.

Power-on Circuit: When SW401 is closed, the B level of Q402 becomes high electrical level, and the switch tube Q401 becomes conductive. The power supplies electricity for every power module through Q401, when MCU is powered on, POW_HOLD will output high electric level to keep Q401 constantly conductive so as to turn on the radio.

Power-off Circuit: When SW401 is cut off, POW_DET test pin becomes low electric level, and POW_HOLD pin of MCU will first stays on high electric level for a while before outputting low electric level. The Q402 B level thus becomes low electric level, cutting off the switch tube Q401 and the power to turn off the radio.

5C voltage stabilizing circuit: U404 applies 5V LDO voltage stabilizer and supply 5v power for PLL circuit. Meanwhile, the 67th pin of U301 outputs high and low electric level to control the enable pin of U404, making the voltage stabilizer switches between 5V and 0V so as to realize the functions such as energy saving and Tx/Rx switch.

5R voltage stabilizing circuit: U403 applies 5V LDO voltage stabilizer, and supplies 5V power for Rx circuit. Meanwhile, the 66th pin of U301 outputs high and low electric level to control the enable pin of U403, making the voltage stabilizer switches between 5V and 0V so as to realize the functions such as energy saving and Tx/Rx switch.

5T voltage stabilizing circuit: U402 applies 5V LDO voltage stabilizer, and supplies 5V power for Tx circuit. Meanwhile, the 34th pin of U301 outputs high and low electric level to control the enable pin of U402,

making the voltage stabilizer switches between 5V and 0V so as to realize the functions such as energy saving and Tx/Rx switch.

voltage stabilizing circuit:U401 applies 3.3V DC-DC voltage stabilizer，and supplies 3.3V power for U201、U301、U302、U307.

4. Function Description and Parameter Settings

4.1. Conventional Functions

- Supports private call, group call, all call in digital mode
- Supports end-to-end voice encryption, data encryption
- Supports short message
- Supports radio check, remote monitor, radio disable and radio enable digital signaling in DMR standard.
- Supports CTCSS/CDCSS on analog mode
- Supports DTMF system on analog mode
- Supports emergency alarm feature
- Supports digital channel scanning, analog channel scanning, and digital/analog mix scanning.
- Supports a maximum of 1000 channels
- Supports a maximum 250 regions with each region containing 128 channels.
- Supports a maximum of 512 contacts.
- Supports LED, and alert tone which indicates option
- Supports programmable selection between 12.5 kHz and 25 kHz channel spacing.
- Strength indication for real time signal
- Battery power indication

4.2. Function Parameter Settings

The radios are set with default value when they are out of the factory. But due to the different requirements by the users, the radio may be reset with operational frequency, channel parameter, scanning, encryption, etc. Therefore, Kirisun specially designs a user programmable software which is interface-friendly, operation-easily and display-visually to complete the parameter settings for the radio.

- **Steps for parameter settings are as below:**

Step 1. Confirm that the right version of TP660 user programmable software is installed on the computer.

Step 2. Confirm that the right version of TP660 USB driver software is installed on the computer.

Step 3. Use TP660 programmable lead supplied by Kirisun to connect the radio with computer USB port.

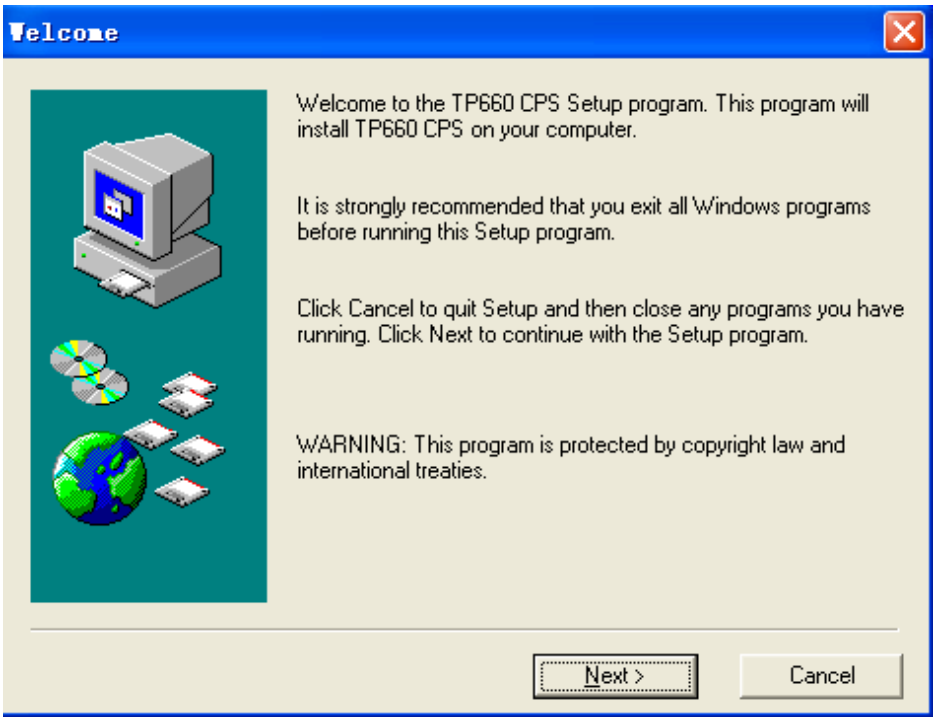
Step 4. Confirm that the radio is powered on.

Step 5. Operate TP660 user programming software.

- **Steps for installing TP660 user programmable software are as below:**

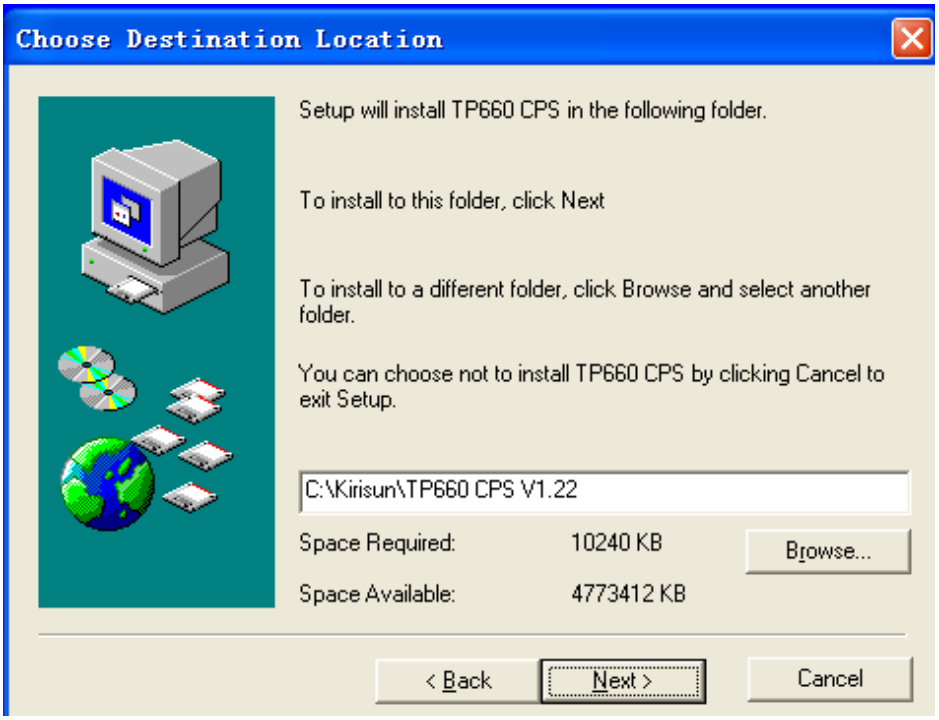
Step 1. Double click the installation file, and the interface in Figure 4-1 pops up.

Figure 4-1



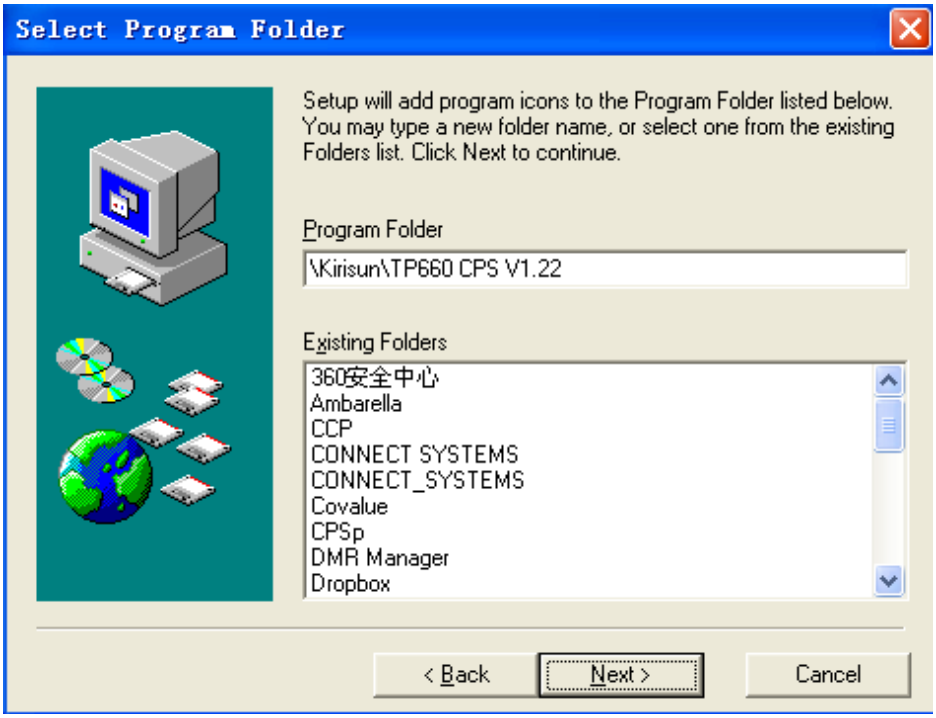
Step 2. Click “Next” to enter the next interface for selecting software installation path.

Figure 4-2



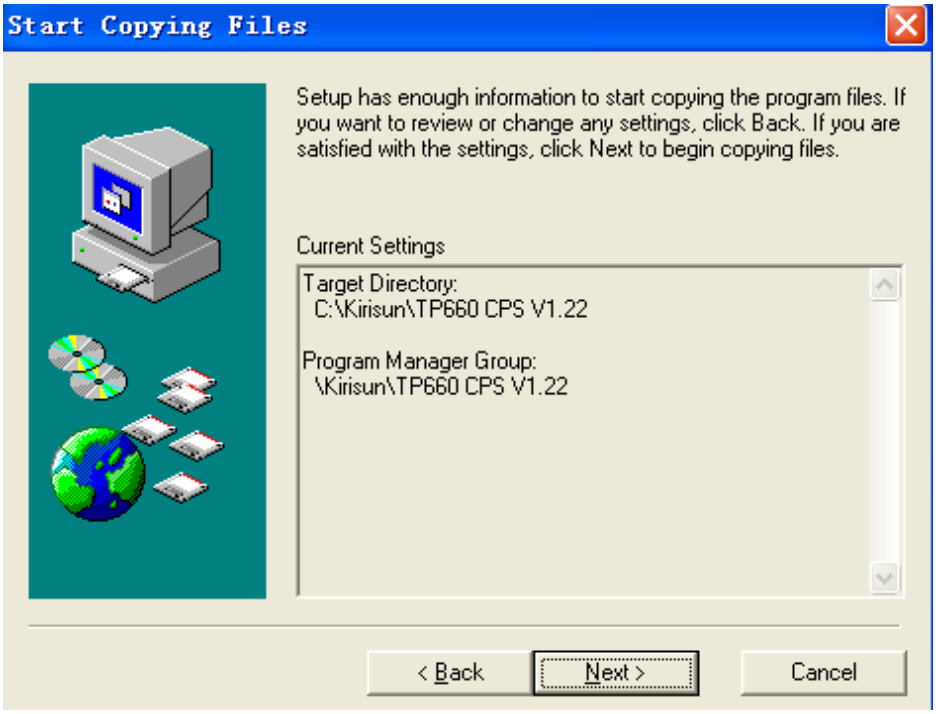
Step 3. As shown in figure 4-2, the user can click “Browse” to select the software installation path or the default installation path. Click “Next” to enter the installation confirmation interface.

Figure 4--3



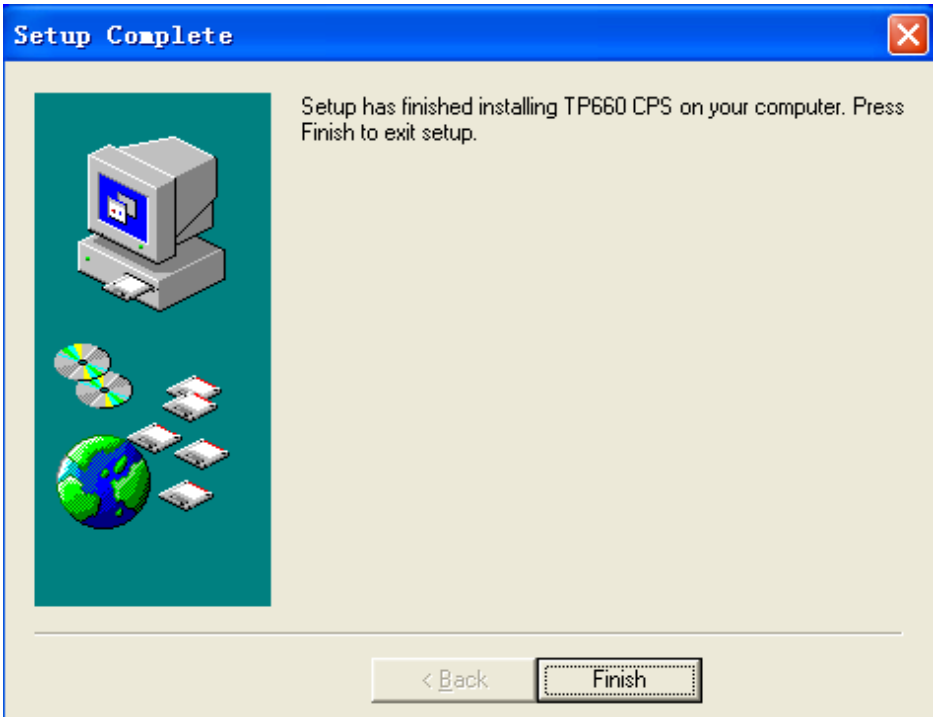
Step 4. Click “Next” to enter the installation completion interface.

Figure 4-4



Step 5. Click “Finish” to complete the software installation.

Figure 4-5



Step 6. After the installation, double click TP660 user programmable software. See figure 4-6.

Figure 4-6

The user can read the current parameter settings from the radio through TP660 user programmable software, and the parameter can also be reset.

Note:

1. Wrong parameter settings may cause malfunction. Normally, rewrite the correct parameter settings can solve the problem.
2. Before rewriting the parameter settings, reading the parameter settings out of the radio for back-up is strongly recommended in case that the recovery is needed once the radio becomes faulty.

5. Assemble and Disassemble Instructions

This radio is sophisticated communication equipment with compact, precise mechanism. Please be careful during the attaching and detaching.

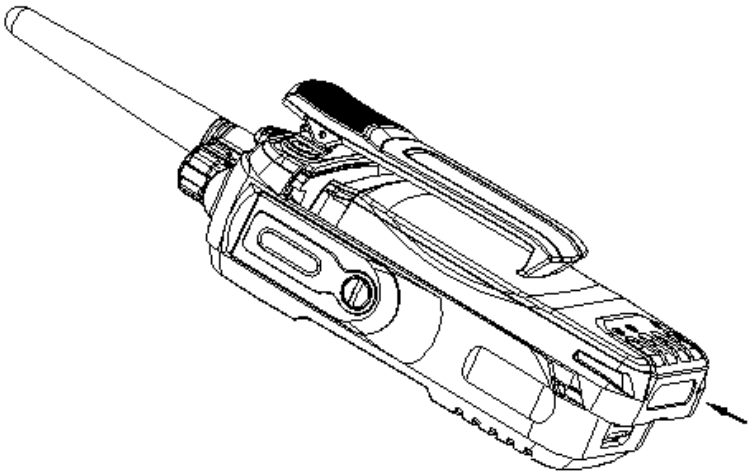
The attaching and detaching instructions are as below:

5.1. Attaching and Detaching the Battery

Attaching the battery

Press the belt clip and push the battery pack forwards in the arrow direction until a click is heard, which indicates that the battery pack is properly fixed. (see figure 5-1)

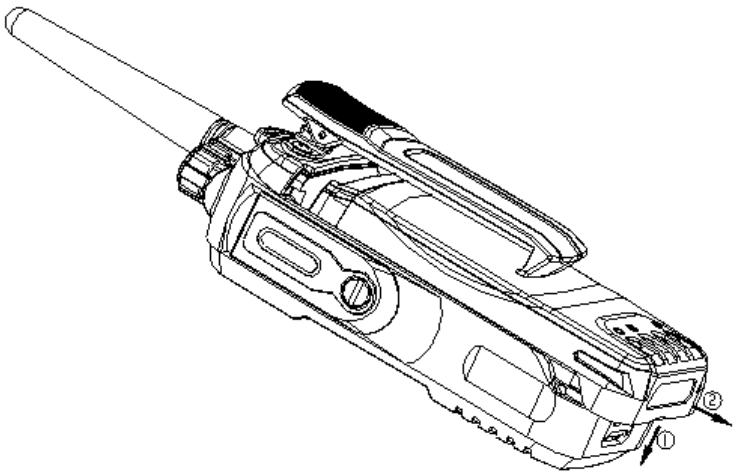
Figure 5-1



Detaching the battery

When detaching the battery, press the latch in the direction shown in figure 5-2, and use other hand to push the battery backwards until it is separated from the radio.

Figure 5-2

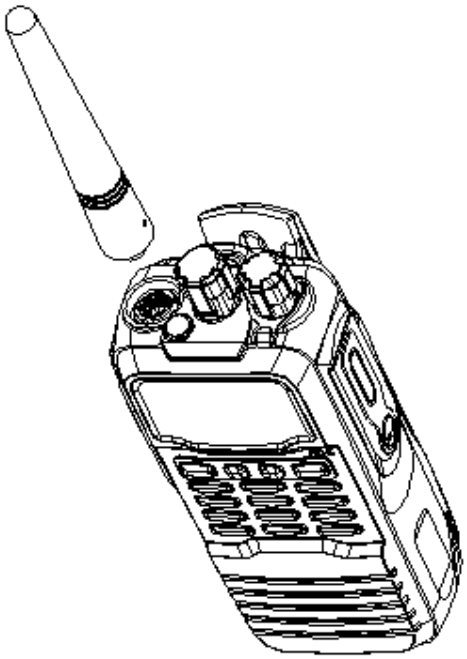


5.2. Attaching the Antenna

Hold the antenna base, turn the antenna clockwise into the interface on the radio top until it is fastened.

(see figure 5-3)

Figure 5-3

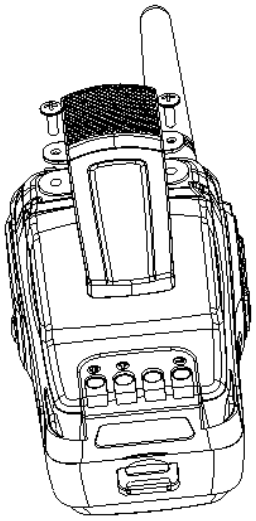


5.3. Attaching the Belt Clip

Step 1. Press the belt clip and align the two screw holes with those on the back aluminum shell. (See figure 5-4)

Step 2. Fasten the two screws.

Figure 5-4



5.4. Separating the Shell from the Chassis

Step 1. Detaching the antenna. (see figure5-5 and 5-6)

Step 2. Remove the knob and snap ring.

Step 3. Remove the two knob nut and antenna nut.

Step 4. Remove the four screws as shown in the figure below.

Step 5. Insert a flat screw driver into the seal groove of the aluminum bracket, and push it upwards to remove the zinc cover; push the aluminum bracket backwards to make it out of the shell, and take out the flex cable from the socket.

Figure 5-5

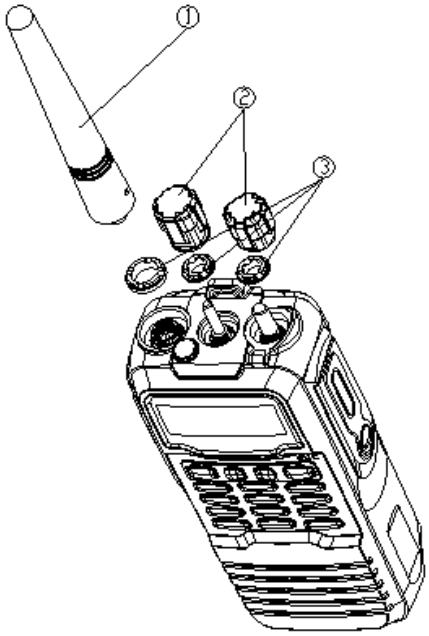
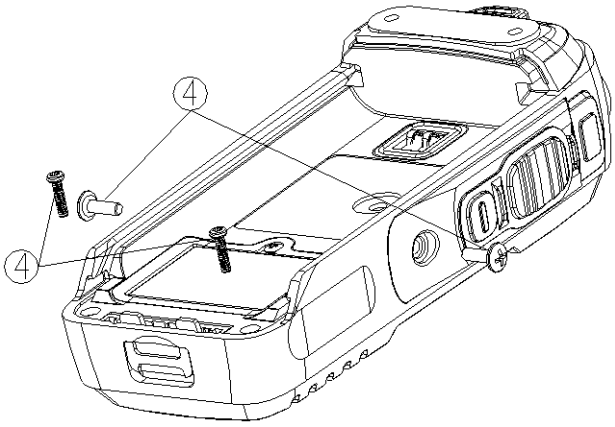


Figure 5-6

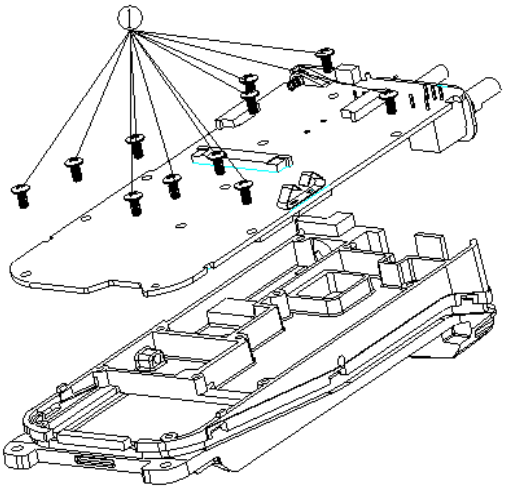


5.5. Disassemble the Main Board from the Chassis

Step 1. Remove the main board screws and PTT, PCB screws.(see figure 5-7)

Step 2. Remove the top waterproof ring and use a soldering iron to solder off the antenna, then the main board can be separated from the aluminum bracket.

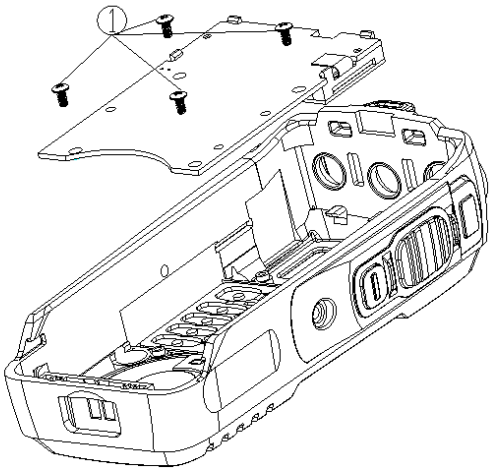
Figure 5-7



5.6. Separating the Keyboard from the Front Cover

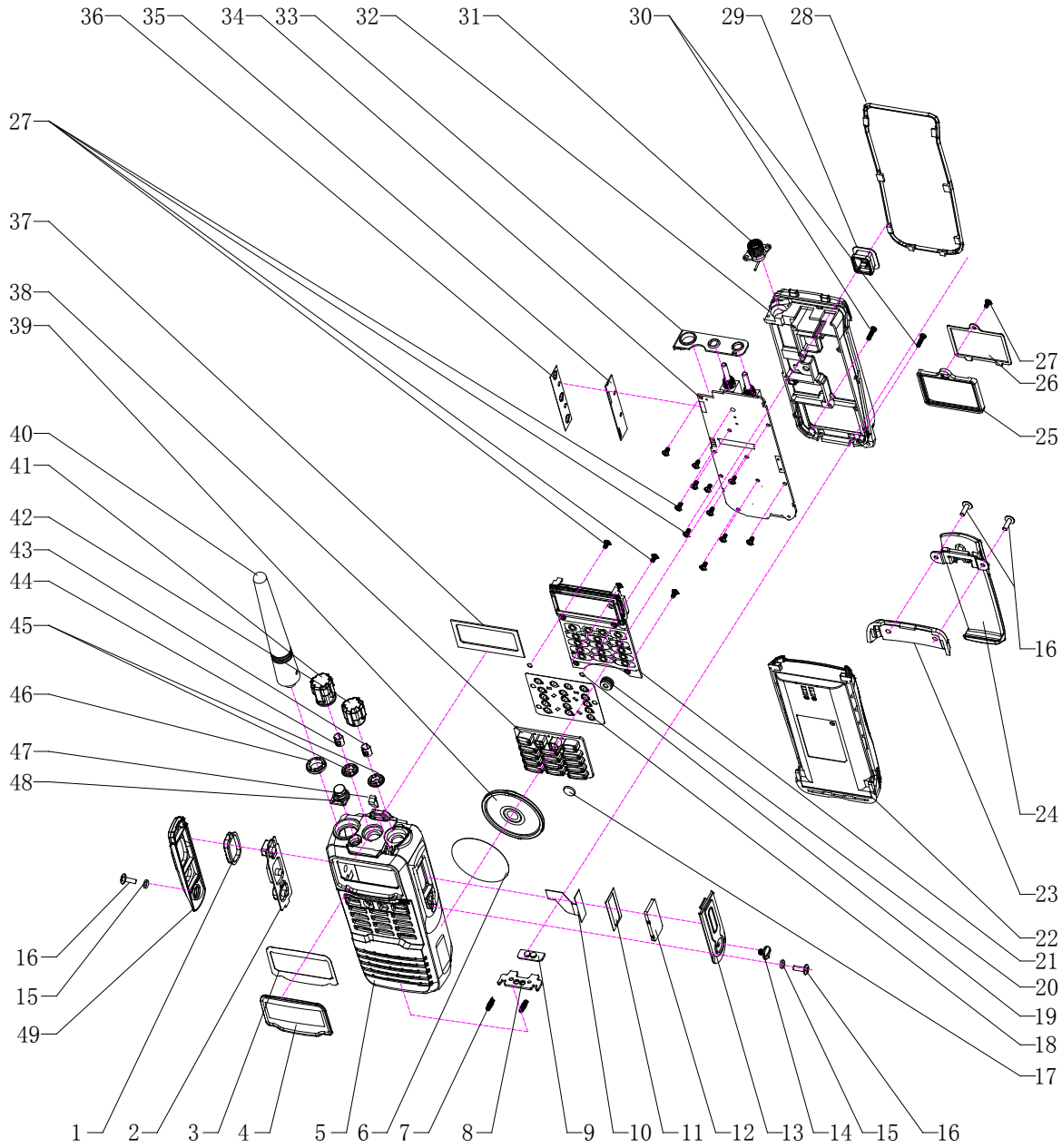
Remove the four front cover screws to separate the keyboard from the front cover.(see figure 5-8)

Figure 5-8



After the detachment above, the maintenance and adjustment can be done accordingly.

5.7. Exploded View



No.	Part Name, Specification and Model Number	Unit
1	PT7800 PTT cover(cover die) PC+ABS, black, 2010B, pb-free	1
2	PT7800PTT keypad silica gel, black, hardness 60 degrees, supplier: Mingkun, pb-free	1
3	PT7800 lens double-sided adhesive NITTO57120,43.4*28.2MM, supplier: Xinlongda, pb-free	1
4	PT7800 TP660 lens PC, transparent, screen printing KIRISUN+ black, pb-free	1

5	TP660 shell PC+ABS, black, 2008B, #4-40 nut，pb-free	1
6	PT7800 horn net material: black 250+nitto57120b,diameter φ36mm* 0.3mm thickness, with two-sided adhesive	1
7	PT3208 spring material: spring steel, nikle-plated, wire diameter 0.2,D external diameter 2,H length 9.5,circling 11	2
8	PT7800 1.2MM,IP vacumm plating, supplier: Junyu, pb-free	1
9	PT7800 battery latch (cover die) PC+ABS, embedded latch baffle, black, 2008B, pb-free	1
10	TP660-02 accessory FPC TP660-02_ACC_FPC_140819; 0.1MM thick； flexible board, ;27.5X24.3MM;2 layers, pb-free	1
11	TP660 earphone PCB board, double-sided adhesive 0.4mm thick, NITTO 57120B double-sided adhesive	1
12	TP660-02 interface board, TP660-02_IO_140818, 2.0MM thick; FR4,12.5X25MM； four layers，pb-free	1
13	PT7800 earphone cover (cover die) PC+ABS, black, 2008B,1405mode changing，pb-free	1
14	R M3*4 earphone cover screws 、SUS303、＃4-40 thread、vacuum plating, IP black、pb-free	1
15	O-type ring, D2.4X1.0MM, pb-free	2
16	M2.5*8 cross round flat machine screw. material: hardened iron,Φ2.5mm*8mm. Cross round flat black zinc-plated machine thread, metric coarse thread.	4
17	PT7800 mic-head waterproof pad. Material: DY-E002A; breathable film, φ6.6xφ4.4, pb-free	1
18	PT7800 digital keypad. METAL DOME sixteen D6 square metal dome, pb-free	1
19	spacer，φ3.0*5.0*0.3mm	2
20	R 558 mic cover; material: silica gel, hardness 40,orange, no surface processing	1
21	TP660 keyboard jacking, pb-free	1
22	KB-78B battery, lithium polymer battery, 7.4V，2000mAh, pb-free	1
23	PT7800top cover (cover die) PC+ABS, black,s 2008B, pb-free	1
24	KBJ-09 belt clip, 568 belt clip (end item),PC+ABS, black, pb-free	1
25	PT7800 roof waterproof ring, silica gel, orange, hardness 60 degrees, pb-free	1
26	PT7800 roof cover 0.5MM,SUS304,pb-free	1
27	M2*4 cross round flat machine screw. material: hardened iron, Φ2mm*4mm cross round flat nickel-plated machine thread, metric coarse thread	19
28	PT7800 big waterproof ring, silica gel, black, hardness 40 degrees, pb-free	1
29	PT7800pedestal waterproof pad, silica gel, black, hardness 60 degrees, pb-free	1
30	M2*8 plum-type thick-headed machine screw. material: hardened iron, Φ2mm*8mm plum-type thick-headed nickel-plated machine thread, metric	2

	coarse thread	
31	RF coaxial connector analog radio SMA-J, flange plate (558,hole14mm, chip length10.5mm)	1
32	PT7800aluminum alloy bracket; aluminum alloy (ADC12),grinding, polishing, pb-free	1
33	PT7800top waterproof pad silica gel, black, hardness 60 degrees, pb-free	1
34	TP660 mainboard jacking, pb-free	1
35	TP660 PTT board TP660-02_PTT_131127.PCB；9.6X46.6MM；0.6MM；FR-4, two layers, pb-free	1
36	PT7800 PTT button metal dome. three D6 square metal dome,pb-free	1
37	R 6500LCDdust-proof pad. material: black foam	1
38	PT7800 keypad black +637C + white(laser carving), hardness 60 degrees, pb-free	1
39	7800 horn PT7800-05 Φ40,H=17±0.1mm,impedance16Ω, power 1.5W. pb-free	1
40	Antenna. R antenna 400-470MHZ，length：140mm.` SMA-K,TPEE black	1
41	PT7800 channel knob ABS, black , 2012B, pb-free	1
42	PT7800 volume knob ABS, black, 2012B, pb-free	1
43	R 3118/3208 knob snap ring. material: spring steel	1
44	PT7800 programming knob snap ring. 0.3MM,stainless steel, pb-free	1
45	Switch nut. material: brass, internal diameter M6mm, external diameter φ10mm, 3.5mm thick, black passivation	2
46	Antenna nut. internal diameter M8.7mm, external diameterφ12mm, 3.6mm thick, black zinc plated,	1
47	PT7800 guide beam PC, transparent, pb-free	1
48	PT7800emergency keypad silica gel,orange, hardness 60 degrees, pb-free	1
49	PT7800 PTT side cover PC+ABS, black, 2008B/2010B, pb-free	1

6. Adjustment

During the maintenance, it is necessary to test and adjust the radio's technical parameters after changing components.

6.1. Components for Adjustment

(1) Antenna connector converter

(2) Universal connector

6.2. Adjustment Test Method

6.2.1. Frequency Description

Model	TP660(400-470)				
Channel	Low frequency	Intermediate/low frequency	Intermediate frequency	Intermediate/high frequency	high frequency
Tx frequency（MHz）	400.025	417.025	435.025	452.025	469.975
Rx frequency（MHz）	400.25	417.25	435.25	452.25	469.95

Model	TP660(134-176)				
Channel	Low frequency	Intermediate/low frequency	Intermediate frequency1	Intermediate/high frequency	high frequency
Tx frequency（MHz）	136.025	145.025	155.025	162.025	173.975
Rx frequency（MHz）	136.25	145.25	155.25	162.25	173.95

6.2.2. Test Tools

- Integrated tester
- Programming lead
- AEROFLEX 3920
- Spectrum analyzer FSU

6.2.3. Tx Test and Modulation

Item	Steps	Specification Requirement
Frequency stability	1.Enter computer adjustment mode 2.Enter “RF stability adjustment”, 3.Adjust PC software value, and observe integrated tester frequency value. 4.Adjust to nominal frequency ±100Hz	≤0.5ppm

Tx high power	1. Enter computer adjustment mode. 2. Enter adjustment mode “Tx high power” 3. Adjust PC software value, observe integrated tester frequency value.. 4. Adjust to the nominal test power. UHF:4.2±0.2W. VHF:5W±0.2W 5. Adjust the frequencies by turns	UHF:3.8-4.5W current: less than 1.8A VHF: 4.5-5.2W current: less than 1.8A.8A
Tx low power	1. Enter computer adjustment mode. 2. Enter modulation mde “Tx low power”, 3. Adjust PC software value; observe integrated tester power value. 4. Adjust to nominal test power 1±0.2W. 5. Adjust the frequencies by turns.	0.8-1.2W current: less than1A
I path and Q path amplitude adjustment for analog transmit	1. Enter computer adjustment mode； 2. Enter “analog Tx I path amplitude and Q path amplitude” to adjust I oath value. 3.Observe FM Deviation as 1.95±0.05kHz； 5. Click “OK” to save	1.9KHZ~2.0KHZ
I path and Q path amplitude adjustment for digital transmit	1. Enter computer adjustment mode； 2. Enter “digital Tx I path amplitude and Q path amplitude ”. 3. Click digital adjustment item, and adjust Q path(see figure 6) to adjust the digital frequency deviation in the range between 1.9KHZ and 2KHZ; adjust the bit error rate through the I path adjustment, and the I path which adjusts the bit error rate also adjusts frequency deviation; the Q path which adjusts digital frequency deviation also adjusts bit error rate. When the Q path is turned up, the I path also needs to be turned up or turned down. Adjust the channel 1 within the specified range and click ok before clicking the next channel for adjustment. （Channel 3. 5. 7. 9 can be adjusted in turn based on the methods above）.	1.9KHZ~2KHZ FSK EER≤5%Hz
CTCSS frequency deviation and wave	1. Enter computer adjustment mode. 2. Enter the adjustment mode one by one “CTCSS(67Hz)”, “CTCSS(51.4Hz)” “CTCSS(254.1Hz)” 3. Adjust PC software value and observe integrated tester frequency deviation value. 4. Adjust to the nominal frequency deviation: 350±50Hz. 5. Adjust the frequencies in turn. 6. Check the frequencies in turn.	200±200Hz. < 15mV

DCS frequency deviation and wave	1. Enter computer adjustment mode.. 2. Enter the adjustment mode “DCS frequency deviation”, 3. Adjust PC software value and observe integrated tester frequency deviation value. 4. Adjust to nominal frequency deviation: 350±50Hz. 5. Adjust the frequencies in turn. 6. Check the frequencies in turn.	350±150Hz
Modulation distortion	Observe distortion form value	＜3%
Tx SNR	Observe SNR form value	N:＞40dB.
4FSK Tx error	1.Select 3920 and put it on the DMR test interface; set the receiver frequency as the low frequency of the radio Tx frequency， Press PTT button to transmit and read the FSK Error on the apparatus. （select the test average value）; 2.Test the intermediate frequency and high frequency channel with the same method.	<5%
Analog & digital ACP	Observe adjacent channel power display value	N:＜-60dB.narrow band）
Spurious emission	Observe spectrum analyzer display value	＜1GHz:＜-36dBm; ＞1GHz:＜-30dBm.

6.2.4. Rx Test and Modulation

Item	Steps	Specification Requirement
RF Rx Sensitivity	1. Enter the computer modulation mode. 2. Enter the modulation mode”Rx sensitivity”, click frequency 1、3、5、7、9 one by one. 3. Observe the integrated tester spectrum analyzer property; adjust PC software value, Rx SINAD＞12d. 4.Setting: Rx frequency -24.975MHz（*1、*2、*3、*4）; set the signal ass -40dBm，SINAD＜7dB.	SINAD>=12dB N：-118dBm

Squelch level9 on	1. Enter the computer modulation mode. 2. Set the channel as current test frequency. 3. Enter the modulation mode ”SQL9 on”, click start and switch to the next frequency when the number is stable. 4. Adjust frequency 1、3、5、7、9、one by turns.	Input -115dBm to turn it on,-120dm to turn it off
Squelch level9 off	1. Enter the computer modulation mode. 2. Set the channel as current test frequency. 3. Enter the modulation mode ” SQL9 off ” , click start and switch to the next frequency when the number is stable. .4. Adjust frequency 1、3、5、7、9、one by turns.	
Squelch level1 on	1. Enter the computer modulation mode. 2. Set the channel as current test frequency. 3. Enter the modulation mode ”SQL1 on ”, click start and switch to the next frequency when the number is stable. 4. Adjust frequency 1、3、5、7、9、one by turns.	Input -115dBm and turn on,-120dm and turn off
Squelch level1 off	1. Enter the computer modulation mode. 2. Set the channel as current test frequency. 3. Enter the modulation mode ” SQL1 off ” ”, click start and switch to the next frequency when the number is stable. 4. Adjust frequency 1、3、5、7、9、one by turns.	
Rx Distortion	Observe SNR form value.	＜3% (4 bars)
Rx SNR	Observe SNR form value.	
CTCSS/CDCSS Decoding		Decoded successfully and no interrupter
BER Test	1.Set the output of 3920 as -118dBm. 2.Enter bit error rate test item; click start and observe bit error rate.	EER≤5%

7. Technical Functions and Index

General Specification	
Frequency Range	UHF1: 400-470MHz　VHF：　136-174MHz
Channel Capacity	1000
Channel Spacing	12.5kHz/25kHz
Weight	280 kg（with battery and antenna）

Measurement （H*W*T）	113mm*54mm*34mm
Battery Capacity	7.4V 2000mAH lithium-ion battery
Working hour （5-5-90）	analog：13.5 hours digital：15 hours
Environment Specification	
Working Temperature	-30 ℃~+60℃
Storage Temperature	-40 ℃~+85℃
Waterproof and Dust-proof	IP67
Statics Prevention	IEC 61000-4-2 ±4kV±8kV （air）
American Military Standard	MIL-STD-810 C/D/E/F/G
Damp proof	MIL-STD-810 C/D/E/F/G
Shock and Oscillation	MIL-STD-810 C/D/E/F/G
Receiver Specification	
Frequency Stability	±1.5ppm
Analog Rx Sensitivity	0.3uV（12dB SINAD）/0.22uV（12dB SINAD，typical）
Digital Rx Sensitivity	0.3uV（5% bit error rate）
Intermodulation	ETSI：65dB TIA603：70dB
Adjacent Channel Selectivity	ETSI/TIA603：60dB@12.5kHz，70dB@25kHz
Spurious Response Suppression	ETSI/TIA603：70dB
Conductive Spurious Radiation	-57dBm
Block	ETSI：84dB TIA603：80dB
Rated Audio Power	0.5W
Rated Audio Distortion	<3%（typical）
Hum and Noise	-40dB@12.5kHz/-45dB@25kHz

Audio Response	+1dB ~ -3dB
Transmitting Specification	
Frequency Stability	±1.5ppm
Tx Power	UHF: 1W/4W; VHF:1W/5W
Hum and Noise	-40dB@12.5kHz/-45dB@25kHz
Conductive Radiation Spurious	-36dBm@<1GHz，-30dBm@>1GHz
Adjacent Channel Power	60dB@12.5kHz，70dB@25kHz
FM Modulation	11K0F3E@12.5kHz,16K0F3E@25kHz
4FSK Modulation	12.5kHz（data only）：7K60FXD 12.5kHz（data + voice）：7K60FXE
Modulation Limit	±2.5kHz@12.5kHz,±5kHz@25kHz
Audio Response	+1dB~-3dB
Audio Distortion	3%（typical）
Vocoder Type	AMBE++
Digital Communication Protocol	ETSI TS 102 361-1, -2, -3

8. Maintenance and Test Equipment

During maintenance and adjustment, the major equipment and apparatus below will be used.

Equipment	**Major Specification**
RF Signal Generator	Frequency Range 10MHz-3GHz Modulation Frequency modulation and external modulation Output -127dBm/0.1uV-> 47dBm/1mV
Power Meter	Input Impedance 50Ω Operation Frequency 100MHz-1000MHz Measurement Range About 10W
Frequency Deviation Meter	Frequency Range 100MHz -1000MHz
Digital Voltmeter	Test Range DC 10Mv-10V Input Impedance The minimum circuit load high input impedance
Oscilloscope	30-100MHz
High Sensitivity	Frequency Range 100-1000MHz

Frequency Counter	Frequency Stability ±0.2ppm or lower
Ammeter	5A
Audio Voltmeter	Frequency Range 50Hz-10kHz Voltage Range 1mV-10V
Audio Signal Generator	Frequency Range 50Hz-5kHz or higher Output 0 V-1V
Distortion Tester	capacity 3％ or lower at 1kHz Input Electric Level 50mV-0Vms
Spectrum Analyzer	Test Range 100-3GHz or highe
16Ω Dummy Load	About 16Ω，3W
Voltage Stabilizing Power	Output Voltage 5V-30V，Current：5A

9. Troubleshooting

No.	Problem	Cause and Solution
1	Failed to turn on the radio	A．Check if the battery is in low power. If the battery is low, please charge it or change it. B．Check if there is poor contact in the power-on knob. Please change the knob and try again. C．The power connecting wire is in poor contact with the battery. Please reinstall it and try again. D．The reverse power connection leads to the power prot ective tube F401 being turned on. Please change the protective tube and try again.
3	Failed to communicate with each other	A．The frequencies between the two radios differ. Please select the same channel with frequency. B．The CTCSS/CDCSS signaling of the two radios differ. Please reset with your computer. C．Beyond the communication scope.
4	Failed to receive the signal	A．Poor contact of the antenna. Please fasten the antenna. B．The Tx frequency and Rx frequency differ. Please select the same Tx/Rx frequency again. C．Beyond the communication scope.
5	The Rx green indicator lights up without any voice	A．Check if the volume is at its lowest level. If so, turn on the volume. B．Check if the speaker is broken. If so, please change the speaker.
6	The programming is abnormal	A．Wrong wire connection. Please check if the connection is right. B．Check if the computer USB drive is installed. If not, please install it properly. C．Poor contact in earphone interface board. If so, please change the interface board.

Appendix

List 1 Material List（Electronic Section 400-470MHz）

Keyboard

No	Part No.	Specification	Quantity	Location
1	2CC1-10-C0G500-101J	1005,100P±5%,50V,C0G	14	C126, C111, C119 ,C121,C124,C125,C150,C151,C152,C153,C154,C155,C156, C180
2	2CC1-10-X7R500-103K	1005,10nF±10%,50V,X7R	3	C133,C157,C162
3	2CC1-10-X7R160-104K	1005,100nF±10%,16V,X7R	7	C104, C110, C130 ,C145 ,C160 ,C170,C118
4	2CC1-10-C0G500-221J	1005,220P±5%,50V,C0G	5	C143,C144,C147,C190,C191
5	2CC1-10-C0G500-271J	1005,270P±5%,50V,C0G	6	C100,C103,C108,C109,C127,C128
6	2CC1-10-X7R500-471K	1005,470P±10%,50V,X7R	6	C117, C129 ,C132 ,C146 ,C148,C159
7	2CC1-10-X5R6R3-105K	1005,1uF±10%,6.3V,X5R	6	C101,C102,C131,C166,C167,C181
8	2CC1-10-X7R500-332K	1005,3300P±10%,50V,X7R	2	C192,C193
9	3FW1-S0603-501032	S0603-S-0.5A,32V,SART	1	F101
10	3CF1-BL112-14RL	Interval 0.5mm,14 core, BL112-14RL	1	CN102
11	3CF1-BL112-10RL	Interval 0.5mm,10 core, BL112-10RL	1	CN103
12	3CF1-BL112-38RU	interval 0.5mm,38 core, BL112-38RU	1	CN101
13	1DP1-BV08C	BV08C	11	D111,D112,D113,D114,D115,D116 ,D117,D118,D119,D120,D121
14	2CT1-TP20-100-4R7M	2012,4.7μF±20%,10V,TP series (level P)	2	EC120, EC131
15	2CT1-TS32-100-220M	3216,22μF±20%,10V,TSTP series (level A)	1	C105
16	5FE1-BLM11A221SPT	1608,BLM11A221SPT/BLM18AG221S(0138-05)	6	L101,L105,L107,L102,L103,L104
17	5FE1-BLM21P300S	2012,BLM21P300S/BLM21PG300S(0149-05)	1	L106

18	4PE1-16-F3	1608, orange light (on),19-213/Y2C-ANQB/3T	6	LED1,LED2,LED3,LED4,LED5,LED6
19	1TF1-2SJ243	2SJ243-SMD	1	Q102
20	1TT1-DTC144EE	Digital triode DTC144EE(26),SOT323	5	Q101, Q103 ,Q104,Q105,Q106
21	1TT1-FMMT717TA	FMMT717A,PNP,SOT23	1	Q107
22	2RS1-10-000O	1005,0Ω	1	R123
23	2RS1-10-220J	1005,22Ω±5%	2	R134,R135
24	2RS1-10-104J	1005,100K±5%	1	R108
25	2RS1-10-331J	1005,330Ω±5%	6	R119,R120,R121,R130,R131,R133
26	2RS1-10-103J	1005,10K±5%	5	R136,R101,R102, R125, R132
27	2RS1-10-100J	1005,10Ω±5%	2	R107,R129
28	2RS1-10-154J	1005,150K±5%	2	R105,R106
29	2RS1-10-102J	1005,1K±5%	2	R3, R110
30	2RS1-10-222J	1005,2.2K±5%	1	R137
31	2RS1-10-272J	1005,2.7K±5%	4	R114,R116,R117,R118
32	2RS1-10-471J	1005,470Ω±5%	1	R109
33	2RS1-10-101J	1005,100Ω±5%	1	R124
34	1IL1-TDA8547TS	Audio power amplification ,TDA8547TS,SSOP20,pb-free	1	IC101
35	6PD7-4078-EDC	TP660-KEY-V3.0-20140507,board thickness 1.2mm,material FR-4 size 46*71mm	1	
36	2RS1-10-473J	1005,47K±5%	1	R138
37	2CC1-16-X5R160-105K	1608,1μF±10%,16V,X5R	1	C188
38	4SM7-6027-A40B	Φ6.0mm,height2.7mm,-40dB±2dB,omnidirectional ,2.2KΩ,2V(B6027AP402-65)	1	

Mainboard

No.	Part No.	Specification	Quantity	Location
1	5XC1-16R8-6800CFA	1XTV16800CFA 16.8MHz 3225 VC-TCXO KDS	1	X601
2	5XC1-29R5-29491CAA	1XTW29491CAA 29.4912MHz 3225	1	X201

		TCXO KDS		
3	1DR1-1SR154-400	1SR154-400,4532	1	D402
4	1TT1-2SC3356-R24	2SC3356-R24,SOT23, NPN	6	Q503,Q504, Q507, Q509, Q601, Q603
5	1TF1-2SK1824	2SK1824(B1)	1	Q104
6	5FT1-LTWC450H	LTWC450Hs,SMD 4 legs package narrowband	1	CF501
7	1IS1-SKY72310	SKY72310,24 pin QFN 4mmX4mm pb-free（QFN-N24_B4x4-P0_5）, pb-free	1	U601
8	1IP1-HRV3000S	HR_V3000S, DVSI encrypted chip	1	U307
9	1TT1-AT41511	SOT143-EEBC-B3X1_4-P1_9, pb-free	1	Q505
10	1IM1-W25Q80DVSIG	W25Q80DVSIG ，SOIC,8M bits，pb-free	1	U302
11	7MHP-7042-12A-W	3600 568 567 7800	1	J401
12	5FE1-BLM21PG221SN1	2012,220Ω[domestic product]	3	L104, L522, L525
13	2CC1-10-C0G500-R50C	1005,0.5P±0.25P,50V, C0G	1	C609
14	2CC1-10-C0G500-101J	1005,100P±5%,50V,C0G	20	C100,C404,C108,C152,C153,C154 ,C155,C156,C157,C158,C159, C525, C529, C580, C656,C657,C658,C659, C678 ,C681
15	2CC1-10-X7R500-102K	1005,1000P±10%,50V, X7R	17	C105, C125 ,C233, C248, C256 ,C314,C315 ,C410, C523, C555, C584, C594, C639, C649, C711,C720, C512
16	2CC1-10-X7R500-103K	1005,10nF±10%,50V,X7R	57	C102,C585， C126, C141,C144,C145, C161,C162,C163, C191, C227, C237, C257, C270 C272, C276 ,C278 , C282, C284 ,C312,C313, C316,C317,C318,C319 ,C339 ,C341 C345 , C422 ,C427, C430 ,C433 C436 ,C439,C440 ,C532 C534,C535,C536,C537, C540, C544,C142,C546，C557，C597，

				C644，C646，C655，C672，C675，C706，C713，C718，C724 C424 C654
17	2CC1-10-X7R160-104K	1005,100nF±10%,16V,X7R	64	C115, C117, C130, C133 ,C135 ,C160, C225,C226, C230, C232 ,C235, C239,C240 C252, C273,C274 ,C290, C305,C306,C307 ,C310,C311 ,C320, C338, C346, C360,C361,C362, C405,C406,C407 ,C413, C428, C432 ,C435, C438 ,C520 C547,C548, C551,C552 ,C559 ,C571,C170、C171,C583，C595，C577, C596，C610，C613，C615，C627，C630，C637，C638，C663，C665，C676，C682，C690，C709 C416 C350
18	2CC1-10-X5R6R3-105K	1005,1uF±10%,6.3V,X5R	42	C722,C445,C692,C114， C118,C119,C120,C121, C129, C132, C134 ,C136,C137,C138,C146 C149 ,C190 C224, C238 C249,C250 C269 ,C271 ,C279 ,C281, C283, C308, C337, C340 ,C343,C344, C352 ,C412 ,C415,C419 ,C666 ,C674 ,C680 ,C683, C685 ,C710 C712
19	2CC1-10-C0G500-100D	1005,10P±0.5P,50V,C0G	4	C231,C635,C636, C716
20	2CC1-10-X7R250-123K	1005,12nF±10%,25V,X7R	1	C124
21	2CC1-10-C0G500-120J	1005,12P±5%,50V,C0G	3	C574,C542,C543
22	2CC1-10-X7R500-153K	1005,15nF±10%,50V,X7R	2	C332, C686
23	2CC1-10-X7R500-183K	1005,18nF±10%,50V,X7R	4	C139 ,C333, C336, C677
24	2CC1-10-C0G500-1R5C	1005,1.5P±0.25P,50V,C0G	3	C614 ,C631,C617
25	2CC1-10-C0G500-221J	1005,220P±5%,50V,C0G	3	C128, C241, C244
26	2CC1-10-X7R500-222K	1005,2200P±10%,50V,X7R	1	C123
27	2CC1-10-X7R25	1005,22nF±10%,25V,X	6	C408,C107 ,C112, C150,

	0-223K	7R		C549 ,C556
28	2CC1-10-X7R50 0-332K	1005,3300P±10%,50V, X7R	2	C640,C687
29	2CC1-10-C0G50 0-330J	1005,33P±5%,50V,C0 G	4	C518 C545 C579 C647
30	2CC1-10-X7R50 0-392K	1005,3900P±10%,50V, X7R	1	C335
31	2CC1-10-X7R10 0-393K	1005,39nF±10%,10V,X 7R	1	C127
32	2CC1-10-C0G50 0-3R0C	1005,3P±0.25P,50V,C 0G	3	C515 ,C528 ,C699
33	2CC1-10-C0G50 0-2R0C	1005,2P±0.25P,50V,C 0G	3	C524, C527,C689
34	2CC1-10-C0G50 0-471J	1005,470P±5%,50V,C 0G	43	C106,C554,C101， C553,C653,C113, C164,C165,C166 ,C172, C253 ,C442 ,C521, C533, C538 C560,C561,C562,C563, C566, C570, C572,C573 ,C578, C582 ,C598 C611,C612 ,C616, C619, C628,C629, C634 ,C662, C667, C669,C670 ,C673, C693,C684, C704 C707, C719
35	2CC1-10-X7R16 0-473K	1005,47nF±10%,16V,X 7R	1	C705
36	2CC1-10-C0G50 0-470J	1005,47P±5%,50V,C0 G	5	C147, C519 ,C643，C401，C721
37	2CC1-10-C0G50 0-4R0C	1005,4P±0.25P,50V,C 0G	2	C514 ,C516
38	2CC1-10-C0G50 0-560J	1005,56P±5%,50V,C0 G	1	C708
39	2CC1-10-X7R16 0-683K	1005,68nF±10%,16V,X 7R	1	C122
40	2CC1-10-C0G50 0-7R0C	1005,7P±0.25P,50V,C 0G	2	C539, C700
41	2CC1-10-X7R16 0-822K	1005,8200P±10%,16V, X7R	2	C140,C143
42	2CC1-10-C0G50 0-121J	1005,120P±5%,50V,C 0G	1	C550
43	2CC1-10-C0G50 0-8R0C	1005,8P±0.25P,50V,C 0G	4	C633,C513,C302,C303
44	2CC1-10-C0G50 0-9R0C	1005,9P±0.25P,50V,C 0G	2	C564 ,C698
45	2CC1-20-X7R16 0-224K	2012,220nF±10%,16V, X7R	2	C650, C652
46	2CC1-20-Y5V16	2012,10uF+80%/-20%,	5	C104, C148, C228, C236, C291

	0-106Z	16V,Y5V		
47	2CC1-16-C0G500-100D	1608,10P±0.5P,50V,C0G	3	C606,C623,C604
48	2CC1-16-C0G500-121J	1608,120P±5%,50V,C0G	1	C507
49	2CC1-16-C0G500-120J	1608,12P±5%,50V,C0G	5	C592, C601, C620, C587, C588
50	2CC1-16-C0G500-150J	1608,15P±5%,50V,C0G	2	C625, C590
51	2CC1-16-C0G500-180J	1608,18P±5%,50V,C0G	2	C605, C624
52	2CC1-16-C0G500-1R5B	1608,1.5P±0.1P,50V,C0G	1	C503
53	2CC1-16-C0G500-2R0C	1608,2P±0.25P,50V,C0G	2	C505,C506
54	2CC1-16-C0G500-390J	1608,39P±5%,50V,C0G	1	C607
55	2CC1-16-C0G500-470J	1608,47P±5%,50V,C0G	2	C586, C626
56	2CC1-16-C0G500-4R0C	1608,4P±0.25P,50V,C0G	1	C502
57	2CC1-16-C0G500-680J	1608,68P±5%,50V,C0G	1	C593
58	2CC1-16-C0G500-6R0C	1608,6P±0.25P ,50V,C0G	2	C504,C591
59	2CC1-10-C0G500-6R0C	1005,6P±0.25P,50V,C0G	8	C510, C530,C526，C568，C618，C632，C660，C661
60	3FW1-42932-302320	429003/433003/466003,3216,3A/32V	1	F401
61	3CF1-BL112-38RU	Interval 0.5mm,38 pins,BL112-38RU	1	CN101
62	5XC1-50R0-49910GQ9	1D49910GQ9 49.95MHz 7*5 KDS	1	XF501
63	1DS1-HSC277	HSC277,1608	4	D503,D504, D510,D511
64	1DS1-DA2S10100L	DA2S10100L	3	D403,D404, D601
65	1DS1-1SS372	Dual diode	3	D101, D114,D115
66	1DV1-HVC350B	HVC350B(B0),SOD523	5	D505,D506,D507,D508, D513
67	1DV1-1SV305	1SV305	8	D602,D603,D604,D605,D606,D607,D608,D609
68	1DV1-1SV278	1SV278(T1)	1	D610
69	1TT1-DTC144EE	Digital triode DTC144EE(26),SOT323	5	Q206, Q301,Q302, Q402,Q510

70	2CT1-TP20-100-100M	2012,10μF±20%,10V,TP series (level P)	5	EC431, EC434, EC558, EC668, EC671
71	2CT1-TP20-100-1R0M	2012,1μF±20%,10V, TP series (level P)	2	EC167,EC168
72	2CT1-TP20-100-2R2M	2012,2.2μF±20%,10V, TP series (level P)	2	EC151, EC651
73	2CT1-TP20-100-4R7M	2012,4.7μF±20%,10V, TP series (level P)	1	C664
74	2CT1-TS32-160-100M	3216,10μF±20%,16V,TS series(level A)	1	EC403
75	2CT1-TS32-100-220M	3216,22μF±20%,10V, TS series(level A)	4	C409, C425, C441, C599
76	2LL1-16-3R3K	1608,3.3μH±10%(MLF1608A3R3K TA00)	1	L601
77	2LL1-16-R47K	1608,0.47μH±10%(MLF1608DR47K)	1	L608
78	2LL1-16-R56K	1608,560nH±10%(MLF1608DR56K)	2	L607,L513
79	5XT1-JTBM450CX24	Frequency detector	1	FD501
80	1IS1-HRC5000	Chip IC, HR_C500080Pin LQFP	1	U201
81	1DS1-HVU131	HVU131(P1),2012	1	D501
82	2RS1-16-000O	1608,0Ω	1	L520
83	2LG1-VLS3012ET-100M	VLS3012ET-100M power inductor , 10uH+20% 3*3*1.2MM	1	L404
84	2LW1-16UC-120G	1608,12nH±2%, ceramic core(C1608CB-12NG)	1	L626
85	2LW1-16UC-180G	1608,18nH±2%, ceramic core (C1608CB-18NG)	1	L602
86	2LL1-16-2N7S	1608,2.7nH±2%(MLG1608B2N7S)	1	L523
87	2LW1-16UC-331J	1608,330nH±5%, ceramic core (high frequency)	1	L609
88	2LW1-16UC-820G	1608,82nH±2%,C1608CB82NG	1	L509
89	2LL1-16-22NJ	1608,22nH±5%(MLG1608B22NJ)	4	L508, L518, L519, L515
90	2LI1-1608-R39G	0603,390nH±2%, LQW18ANR39G00	8	L611,L619,L614,L615,L616, L622,L623,L624
91	2LW1-16UC-330	1608,33nH±2%,	2	L612, L620

	G	ceramic core (C1608CB-33NG)		
92	2LG1-VLS3012ET-470M	VLS3012ET-470M power inductor , 470uH+20% 3*3*1.2MM	1	L203
93	5FE1-BLM11A601S	1608,BLM11A601S/BLM18AG601S(0138-05)	14	L401，L110，L111,L101,L102,L105, L202, L208, L528, L531, L603, L610, L630,L600
94	2LL1-16-R47KA	1608,0.47μH±10%(LQM18NNR47K)	1	L514
95	2LI1-2012-10NJ	0805,10nH±5%, LQW2BHN10NJ032	1	L613
96	2LI1-2012-15NJ	0805,15nH±5%, LQW2BHN15NJ032	1	L621
97	2LW1-20UC-102J	2012,1μH±5%, ceramic core (C2012C-1R0J)	1	L521
98	2LW1-20UC-221JA	2012,220nH±5%, ceramic core (C2012C-R22J)	1	L527
99	2LH1-R401R5-R02-05	Wire diameter φ0.40, internal diameterφ1.5,2 circles, winding forward, high pin	1	L526
100	2LW1-33UF-1R0M	3225,1μH±20%, ferrite core (LQH32MN1R0M23L/LQH3N1R0M04)	1	L501
101	2LH1-R401R5-R03-05	Wire diameterφ0.40, internal diameterφ1.5,3 circles, pin height 0.5mm, winding forward	3	L504,L505,L502,
102	2LH1-R401R5-R04-05	Wire diameterφ0.40, internal diameterφ1.5,4 circles, pin height 0.5mm, winding forward	6	L503, L506,L507, L511,L512, L530
103	2LH1-R401R5-R08-05	Wire diameterφ0.40, internal diameter φ1.5,8 circles, winding forward ,high pin	1	L524
104	4PE1-16-F5	1608,green light ,H19-213SYGC	2	LED301,LED302
105	4PE1-16-F2-A	1608, red light,19-213/R6C-AP1	1	LED303

		Q2B/3T,0.6mm high, pb-free		
106	1TF1-RD01MUS2		1	Q502
107	1TF1-RD07MUS2B	MITSUBISHI, RD07MUS2B，pb-free	1	Q501
108	1TF1-3SK318	3SK318(YB-)	1	Q506
109	1TF1-2SJ243	2SJ243-SMD	1	Q607
110	1IL1-NJM2100V	Dual operational amplification NJM2100V,TSSOP-8	1	U103
111	1IL1-NJM2904V	Dual operational amplification NJM2904V,TSSOP-8	2	U502, U603
112	1TT1-2SC4116-GR	2SC4116-GR	1	Q103
113	1TT1-2SC4617-R	2SC4617-R(BR),EMT3	1	Q606
114	1TT1-2SC5066-Y	2SC5066-Y(M2),NPN, SOT323	4	Q602,Q604,Q605,Q608
115	1TT1-2SA1586	2SA1586	1	Q105
116	1TT1-FMMT717TA	FMMT717A,PNP,SOT23	1	Q401
117	1IS1-PST9124NR	Reset IC,PST9124NR	1	U303
118	2RS1-10-000O	1005,0Ω	5	R263,R160,R320，R334，R655
119	2RS1-10-104J	1005,100K±5%	25	R659,R113,R114, R118, R121, R128,R129, R133, R154, R244, R310, R402 R418, R501,R502,R503,R504, R510, R513, R581, R599, R644,R645, R650,R651
120	2RS1-10-101J	1005,100Ω±5%	10	R517,R518, R604, R614, R571, R627, R629,R642,R643
121	2RS1-10-103J	1005,10K±5%	26	R638,R311,R233,R549,R652,R115, R117, R132, R135, R150,R151, R231,R232,R234, R240,R306, R313 R321, R342, R360,R361, R419,R422 R631,R632, R637
122	2RS1-10-100J	1005,10Ω±5%	5	R229, R528, R609, R630, R634,
123	2RS1-10-121J	1005,120Ω±5%	2	R603 ,R613
124	2RS1-10-123J	1005,12K±5%	1	R143
125	2RS1-10-154J	1005,150K±5%	4	R124, R138, R621,R566
126	2RS1-10-153J	1005,15K±5%	3	R241, R335, R605
127	2RS1-10-150J	1005,15Ω±5%	1	R537

128	2RS1-10-184J	1005,180K±5%	4	R527,R126,R127, R525
129	2RS1-10-181J	1005,180Ω±5%	2	R314, R512
130	2RS1-10-183J	1005,18K±5%	2	R134, R648
131	2RS1-10-102J	1005,1K±5%	28	R680,R370,R308,R309,R332,R351 ,R352, R353, R355, R356, R357, R358,R149, R153, R225, R236, R238, R253, R301, R391, R520, R530 R533, R535, R542, R545, R608, R628
132	2RS1-10-152J	1005,1.5K±5%	2	R411, R551
133	2RS1-10-105J	1005,1M±5%	1	R141
134	2RS1-10-204J	1005,200K±5%	1	R401
135	2RS1-10-224J	1005,220K±5%	4	R606,R131, R147, R243
136	2RS1-10-221J	1005,220Ω±5%	1	R315
137	2RS1-10-223J	1005,22K±5%	9	R111, R125, R148, R336, R340, R425, R539, R574, R615
138	2RS1-10-220J	1005,22Ω±5%	2	R543，R548
139	2RS1-10-274J	1005,270K±5%	1	R145
140	2RS1-10-271J	1005,270Ω±5%	1	R568
141	2RS1-10-273J	1005,27K±5%	3	R524,R569,R701
142	2RS1-10-222J	1005,2.2K±5%	7	R540， R341, R406, R515,R258，R541，R570
143	2RS1-10-272J	1005,2.7K±5%	1	R156
144	2RS1-10-334J	1005,330K±5%	2	R639,R112
145	2RS1-10-331J	1005,330Ω±5%	1	R508
146	2RS1-10-333J	1005,33K±5%	2	R123,R552
147	2RS1-10-394J	1005,390K±5%	1	R146
148	2RS1-10-391J	1005,390Ω±5%	2	R556, R595
149	2RS1-10-332J	1005,3.3K±5%	2	R142, R526
150	2RS1-10-392J	1005,3.9K±5%	1	R617
151	2RS1-10-474J	1005,470K±5%	3	R136, R144, R155
152	2RS1-10-471J	1005,470Ω±5%	5	R619,R521, R531, R640,R658
153	2RS1-10-473J	1005,47K±5%	10	R122, R312, R316,R317,R318,R319, R354, R405, R408, R550
154	2RS1-10-470J	1005,47Ω±5%	3	R516, R554, R635
155	2RS1-10-472J	1005,4.7K±5%	13	R338,R339, R362,R363, R412, R523, R547, R588, R602, R612, R623,R646, R620
156	2RS1-10-564J	1005,560K±5%	2	R641,R519
157	2RS1-10-563J	1005,56K±5%	2	R511, R514
158	2RS1-10-560J	1005,56Ω±5%	1	R636
159	2RS1-10-562J	1005,5.6K±5%	7	R139,R140, R505, R575, R601, R611, R616
160	2RS1-10-683J	1005,68K±5%	3	R137, R410, R622

161	2RS1-10-682J	1005,6.8K±5%	2	R506, R546
162	2RS1-10-754J	1005,750K±5%	1	R529
163	2RS1-10-824J	1005,820K±5%	1	R116
164	2RS1-10-821J	1005,820Ω±5%	1	R152
165	2RS1-10-823J	1005,82K±5%	2	R130, R553
166	2RS1-10-822J	1005,8.2K±5%	2	R536, R538
167	2RS1-10-912J	1005,9.1K±5%	1	R649
168	2RS1-32-R39J	3216,0.39Ω±5%	3	R559,R560,R561
169	1IP1-STM32F405VGT6	STM32F405VG T6 LQFP100 , MCU,14*14MM	1	U301
170	3ST1-SKRTLBE010	SKRTLBE010,4.5*3.55*3.3mm(ALPS)	1	SW301
171	1IS1-GT3136	GT3136,SSOP16	1	U501
172	1IS1-TC75S51F	TC75S51F,SSOP5-P-0.95	1	U203
173	1IL1-NJM2902V	Quartet operational amplification NJM2902V-SMD	2	U101,U102
174	1TC1-UMC4	UMC4,NPN/PNP compound tube	4	U104,U503,U505,U604
175	1IS1-XC6204B332MR	Voltage stabilizing integration 3.3V,SOT-23-5,150mA	1	U602
176	1IS1-XC6204B502MR	Voltage stabilizing integration 5V,SOT-23-5	4	U105, U402,U404,U403
177	5XC1-8R0-MML08-2530	DSX321G-8MHZ,8MHZ±30PPm,8PF,-40 ℃ 85 ℃ N	1	X301
178	1IS1-LN8259	DC-DC power supply IC,SMD,SOP8,DC23V 1.8A, ,LN8259,pb-free	1	U401
179	6PM7-4078-HMC	TP660-UHF-V3.0-20140508,8 laminates,1.2mm,FR-4,47*109mm	1	
180	1DR1-NSR1020MW2T1G	NSR1020MW2T1G , pb-free	1	D405
181	2CC1-10-C0G500-181J	1005,180P±5%,50V,C0G	1	C645
182	2CC1-10-C0G500-680J	1005,68P±5%,50V,C0G	1	C648
183	2LL1-16-33NJ	1608,33nH±5%(MLG1	2	L617,L625

		608B33NJ)		
184	2RS1-10-155J	1005,1.5M±5%	2	R567,R700
185	2RS1-10-182J	1005,1.8K±5%	2	R555,R522
186	2CC1-16-C0G500-3R0C	1608,3P±0.25P,50V,C0G	1	C501
187	1DS1-RB706F-40	Schottky diode RB706F-40,SOT-323	1	D512
188	2CC1-10-C0G500-5R0C	1005,5P±0.25P,50V,C0G	1	C517
189	1TT1-DTA143ZE	Digital triode DTA143ZE-SMD	1	Q511
190	2CC1-20-Y5V160-225Z	2012,2.2uF+80%/-20%,16V,Y5V	1	C437
191	2CC1-10-C0G500-200J	1005,20P±5%,50V,C0G	1	C531
192	2CC1-16-C0G500-220J	1608,22P±5%,50V,C0G	1	C589
193	2RS1-10-4R7J	1005,4.7Ω±5%	2	R507，R598
194	2RS1-10-561J	1005,560Ω±5%	1	R157
195	2CC1-10-C0G500-1R0B	1005,1P±0.1P,50V,C0G	1	C608
196	2RE1-10-1503	1005,150KΩ±1%	3	R562、R564、R702
197	2LL1-16-18NJ	1608,18nH±5%(MLG1608B18NJ)	1	L533

List 2　Material List（Electronic Section 136-174MHz）

No	Part No.	Specification	Quantity	Location
1	2RW3-RP08110SNBX-V02	RP08110SNBX-V02-0854,IP67	1	SW401
2	3SE3-RE08110HX-V02	RE08110HX-V02-0414，P67	1	SW302
3	2CC1-10-X7R500-103K	1005,10nF±10%,50V,X7R	59	C102,C126,C141,C142,C144,C145,C161,C162,C163,C191,C227,C237,C257,C270,C272,C276,C278,C282,C284,C312,C313,C316,C317,C318,C319,C339,C341,C345,C422,C424,C427,C430,C433,C436,C439,C440,C534,C535,C536,C537,C540,C544,C546,C557,C585,C597,C706,C713,C718,C722,C724,C644,C646,C654,C655,C672,C675,C691,C695

4	2CC1-20-Y5V160-106Z	2012,10uF+80%/-20%,16V,Y5V	5	C104,C148,C228,C236,C291
5	2CC1-10-X7R500-102K	1005,1000P±10%,50V,X7R	23	C105,C125,C233,C248,C256,C314,C315,C350,C410,C517,C523,C555,C580,C584,C594,C711,C720,C639,C649,C684,C690,C805,C806
6	2CC1-10-C0G500-471J	1005,470P±5%,50V,C0G	38	C106,C164,C165,C166,C172,C253,C442,C521,C533,C538,C553,C554,C560,C561,C562,C563,C566,C570,C572,C573,C578,C582,C598,C707,C719,C611,C612,C616,C619,C628,C629,C634,C662,C667,C669,C670,C673,C693
7	2CC1-10-X7R250-223K	1005,22nF±10%,25V,X7R	5	C107,C112,C408,C549,C556
8	2CC1-10-X7R500-331K	1005,330P±10%,50V,X7R	1	C108
9	2CC1-10-X5R6R3-105K	1005,1uF±10%,6.3V,X5R	41	C114,C118,C119,C120,C121,C129,C132,C134,C136,C137,C138,C146,C149,C190,C224,C238,C249,C250,C269,C271,C279,C281,C283,C308,C337,C340,C343,C344,C352,C412,C415,C419,C445,C710,C712,C666,C674,C680,C683,C685,C692
10	2CC1-10-X7R160-104K	1005,100nF±10%,16V,X7R	61	C115,C117,C130,C133,C135,C160,C225,C226,C230,C232,C235,C239,C240,C252,C273,C274,C290,C310,C311,C305,C306,C307,C320,C338,C346,C360,C361,C362,C405,C406,C407,C413,C416,C428,C432,C435,C438,C520,C532,C547,C548,C551,C552,C559,C571,C577,C583,C595,C596,C709,C610,C613,C615,C627,C630,C637,C638,C663,C665,C676,C682
11	2CC1-10-X7R160-683K	1005,68nF±10%,16V,X7R	1	C122
12	2CC1-10-X7R500-222K	1005,2200P±10%,50V,X7R	1	C123
13	2CC1-10-X7R250-123K	1005,12nF±10%,25V,X7R	1	C124
14	2CC1-10-X7R100-393K	1005,39nF±10%,10V,X7R	2	C127,C150
15	2CC1-10-C0G500-221J	1005,220P±5%,50V,C0G	4	C128,C241,C244,C525

16	2CC1-10-X7R500-183K	1005,18nF±10%,50V,X7R	4	C139,C333,C336,C677
17	2CC1-10-X7R160-822K	1005,8200P±10%,16V,X7R	2	C140,C143
18	2CC1-10-C0G500-470J	1005,47P±5%,50V,C0G	6	C113,C147,C401,C518,C581,C643
19	2CC1-10-C0G500-101J	1005,100P±5%,50V,C0G	19	C152,C153,C154,C155,C156,C157,C158,C159,C404,C519,C524,C529,C653,C656,C657,C658,C659,C678,C681
20	2CC1-10-X7R160-682K	1005,6800P±10%,16V,X7R	2	C170,C171
21	3CF1-BL112-38RU	0.5mm,38pin,BL112-38RU	1	CN101
22	1DS1-1SS372	Dual diode	3	D101,D114,D115
23	2CT1-TP20-100-2R2M	2012,2.2μF±20%,10V,TP	1	EC651
24	2CT1-TP20-100-1R0M	2012,1μF±20%,10V,TP	2	EC167,EC168
25	5FE1-BLM11A601S	1608,BLM11A601S/BLM18AG601S(0138-05)	14	L101,L102,L105,L202,L208,L401,L528,L531,L603,L610,L629,L630,L631,L632
26	5FE1-BLM21PG221SN1	2012,220Ω	3	L104,L522,L525
27	1TT1-2SC4116-GR	2SC4116-GR	1	Q103
28	1TF1-SSM3K15AFS	SSM3K15AFS（D1）	1	Q104
29	1TT1-2SA1586	2SA1586	1	Q105
30	2RS1-10-223J	1005,22K±5%	9	R111,R125,R148,R336,R340,R425,R539,R574,R615
31	2RS1-10-334J	1005,330K±5%	2	R112,R639
32	2RS1-10-104J	1005,100K±5%	23	R569,R113,R114,R118,R121,R128,R129,R133,R154,R244,R310,R402,R418,R501,R502,R503,R504,R510,R513,R581,R599,R645,R650
33	2RS1-10-103J	1005,10K±5%	26	R115,R117,R132,R135,R150,R151,R231,R232,R233,R234,R240,R306,R311,R313,R321,R342,R360,R361,R419,R422,R549,R631,R632,R637,R638,R652
34	2RS1-10-824J	1005,820K±5%	1	R116
35	2RS1-10-473J	1005,47K±5%	10	R122,R312,R316,R317,R318,R319

				,R354,R405,R408,R550
36	2RS1-10-333J	1005,33K±5%	3	R123,R241,R552
37	2RS1-10-154J	1005,150K±5%	4	R124,R138,R621,R651
38	2RS1-10-184J	1005,180K±5%	5	R126,R127,R525,R527,R644
39	2RS1-10-823J	1005,82K±5%	2	R130,R553
40	2RS1-10-224J	1005,220K±5%	3	R131,R147,R243
41	2RS1-10-183J	1005,18K±5%	2	R134,R648
42	2RS1-10-474J	1005,470K±5%	3	R136,R144,R155
43	2RS1-10-683J	1005,68K±5%	3	R137,R410,R622
44	2RS1-10-562J	1005,5.6K±5%	5	R139,R140,R601,R611,R616
45	2RS1-10-105J	1005,1M±5%	1	R141
46	2RS1-10-332J	1005,3.3K±5%	2	R142,R526
47	2RS1-10-123J	1005,12K±5%	1	R143
48	2RS1-10-274J	1005,270K±5%	1	R145
49	2RS1-10-394J	1005,390K±5%	1	R146
50	2RS1-10-102J	1005,1K±5%	29	R149,R153,R225,R236,R238,R253,R301,R308,R309,R332,R351,R352,R353,R355,R356,R357,R358,R370,R391,R520,R530,R533,R535,R542,R545,R571,R606,R628,R680
51	2RS1-10-821J	1005,820Ω±5%	1	R152
52	2RS1-10-272J	1005,2.7K±5%	1	R156
53	2RS1-10-561J	1005,560Ω±5%	1	R157
54	2RS1-10-000O	1005,0Ω	5	R249,R160,R263,R320,R334
55	1IL1-NJM2902V	NJM2902V-SMD	2	U101,U102
56	1IL1-NJM2100V	NJM2100V,TSSOP-8	1	U103
57	1TC1-UMC4	UMC4,NPN/PNP	4	U104,U503,U505,U604
58	1IS1-XC6204B502MR	5V,SOT-23-5	4	U105,U402,U403,U404
59	2CC1-10-C0G500-100D	1005,10P±0.5P,50V,C0G	9	C231,C515,C527,C528,C728,C635,C636,C700,C807
60	2LG1-VLS3012ET-470M	VLS3012ET-470M ，470uH+20% 3*3*1.2MM	1	L203

61	1TT1-DTC144EE	DTC144EE(26),SOT323	5	Q206,Q301,Q302,Q402,Q510
62	2RS1-10-100J	1005,10Ω±5%	6	R229,R528,R609,R610,R630,R634
63	2RS1-10-222J	1005,2.2K±5%	5	R258,R341,R406,R515,R570
64	1IS1-HRC5000	HR_C5000 80Pin LQFP	1	U201
65	1IS1-TC75S51F	TC75S51F,SSOP5-P-0.95	1	U203
66	5XC1-29R5-29491CAA	1XTW29491CAA 29.4912MHz 3225 TCXO KDS	1	X201
67	2CC1-10-C0G500-8R0C	1005,8P±0.25P,50V,C0G	3	C302,C303,C526
68	2CC1-10-X7R500-153K	1005,15nF±10%,50V,X7R	2	C332,C686
69	2CC1-10-X7R500-392K	1005,3900P±10%,50V,X7R	1	C335
70	4PE1-16-F5	1608,green light,H19-213SYGC	2	LED301,LED302
71	4PE1-16-F2-A	1608 red light,19-213/R6C-AP1Q2B/3T,0.6mm,	1	LED303
72	2RS1-10-181J	1005,180Ω±5%	2	R314,R512
73	2RS1-10-221J	1005,220Ω±5%	1	R315
74	2RS1-10-153J	1005,15K±5%	2	R335,R605
75	2RS1-10-472J	1005,4.7K±5%	19	R338,R339,R362,R363,R412,R505,R523,R541,R547,R575,R588,R602,R608,R612,R620,R623,R646,R658,R659
76	3ST1-SKRTLBE010	SKRTLBE010,4.5*3.55*3.3mm(ALPS)	1	SW301
77	1IM1-W25Q80DVSIG	W25Q80DVSIG ，SOIC,8M	1	U302
78	1IS1-PST9124NR	reset IC,PST9124NR	1	U303
79	1IP1-HRV3000S	)HR_V3000S	1	U307
80	5XC1-8R0-MML08-2530	DSX321G-8MHZ,8MHZ±30PPm,8PF,-40 ℃ ~+85 ℃,2.5mm*3mm,4PIN	1	X301
81	2CT1-TS32-100-220M	3216,22 μF±20%,10V,TS	3	C409,C425,C441
82	2CC1-20-Y5V160-225Z	2012,2.2uF+80%/-20% ，16V,Y5V	1	C437

83	1DR1-1SR154-400	1SR154-400,4532	1	D402
84	1DS1-DA2S10100L	DA2S10100L	3	D403,D404,D601
85	1DR1-NSR1020MW2T1G	NSR1020MW2T1G	1	D405
86	2CT1-TS32-160-100M	3216,10μF±20%,16V,TS	1	EC403
87	2CT1-TP20-100-100M	2012,10μF±20%,10V,TP	5	EC431,EC434,EC558,EC668,EC671
88	3FW1-42932-302320	429003/433003/466003,3216,3A/32V	1	F401
89	7MHP-7042-12A-W	3600 568 567 7800	1	J401
90	2LG1-VLS3012ET-100M	VLS3012ET-100M 10uH+20% 3*3*1.2MM	1	L404
91	1TT1-FMMT717TA	FMMT717A,PNP,SOT23	1	Q401
92	2RS1-10-204J	1005,200K±5%	1	R401
93	2RS1-10-152J	1005,1.5K±5%	1	R411
94	1IS1-LN8259	DC-DC IC,SMD,SOP8,DC23V1.8A,LN8259	1	U401
95	2CC1-16-C0G500-100D	1608,10P±0.5P,50V,C0G	6	C591,C500,C505,C601,C623,C625
96	2CC1-16-C0G500-120J	1608,12P±5%,50V,C0G	3	C501,C506,C604
97	2CC1-16-C0G500-200J	1608,20P±5%,50V,C0G	1	C502
98	2CC1-16-C0G500-7R0D	1608,7P±0.5P,50V,C0G	2	C503,C586
99	2CC1-16-C0G500-270J	1608,27P±5%,50V,C0G	1	C504
100	2CC1-16-C0G500-102J	1608,1000P±5%,50V,C0G	1	C507
101	2CC1-10-C0G500-220J	1005,22P±5%,50V,C0G	5	C509,C510,C715,C721,C723
102	2CC1-10-C0G500-150J	1005,15P±5%,50V,C0G	5	C513,C516,C564,C731,C618
103	2CC1-10-C0G500-7R0C	1005,7P±0.25P,50V,C0G	2	C514,C539
104	2CC1-10-C0G500-3R0C	1005,3P±0.25P,50V,C0G	3	C530,C541,C617
105	2CC1-10-C0G50	1005,18P±5%,50V,C0G	1	C568

	0-180J			
106	2CC1-10-C0G500-120J	1005,12P±5%,50V,C0G	6	C660,C661,C542,C574,C725,C633
107	2CC1-10-C0G500-330J	1005,33P±5%,50V,C0G	2	C545,C647
108	2CC1-10-C0G500-121J	1005,120P±5%,50V,C0G	1	C550
109	2CC1-10-C0G500-5R0C	1005,5P±0.25P,50V,C0G	2	C575,C698
110	2CC1-16-C0G500-3R0C	1608,3P±0.25P,50V,C0G	1	C590
111	2CC1-16-C0G500-560J	1608,56P±5%,50V,C0G	1	C587
112	2CC1-16-C0G500-300J	1608,30P±5%,50V,C0G	1	C592
113	2CC1-16-C0G500-151J	1608,150P±5%,50V,C0G	1	C593
114	2CC1-32-Y5V100-226Z	3216,22μF+80%/-20%,10V,Y5V(C3216Y5V1A226ZT)	1	C599
115	2CC1-10-X7R500-271K	1005,270P±10%,50V,X7R	1	C704
116	2CC1-10-X7R160-473K	1005,47nF±10%,16V,X7R	1	C705
117	2CC1-10-C0G500-560J	1005,56P±5%,50V,C0G	4	C708,C727,C729,C730
118	5FT1-LTWC450G	LTWC450G	1	CF501
119	1DS1-HVU131	HVU131(P1),2012	1	D501
120	1DS1-HSC277	HSC277,1608	6	D503,D504,D510,D511,D611,D612
121	1DV1-HVC362	HVC362，UFP	5	D505,D506,D507,D508,D513
122	1DS1-RB706F-40	Schottky diode RB706F-40,SOT-323	1	D512
123	5XT1-JTBM450CX24	Frequency detector	1	FD501
124	2LW1-33UF-1R0M	3225,1μH±20%,(LQH32MN1R0M23L/LQH3N1R0M04)	1	L501
125	2LH1-R401R5-R06-05	φ0.40,*φ1.5,6T	2	L502,L504
126	2LH1-R401R5-R07-05	φ0.40*φ1.5,7T	1	L503
127	2LH1-R401R5-R	φ0.40,*φ1.5,8T	2	L505,L524

	08-05			
128	2LW1-20UC-270J	2012,27nH±5%,(C2012C-27NJ)	5	L506,L507,L511,L512,L530
129	2LL1-16-56NJ	1608,56nH±5%(MLG1608B56NJ)	1	L508
130	2LI1-1608-R39G	0603,390nH±2% murata LQW18ANR39G00	9	L509,L611,L614,L615,L616,L619,L622,L623,L624
131	2LL1-16-R56K	1608,560nH±10%(MLF1608DR56K)	2	L513,L607
132	2LL1-16-R47K	1608,0.47μH±10%(MLF1608DR47K)	2	L514,L608
133	2LL1-16-68NJ	1608,68nH±5%(MLG1608B68NJ)	3	L518,L519，L515
134	2LL1-16-39NJ	1608,39nH±5%(MLG1608B39NJ)	2	L520,L533
135	2LW1-25UC-102JA	2520,1μH±5%,(FHW1008UC1R0J)	1	L521
136	2LL1-16-27NJ	1608,27nH±5%(MLG1608B27NJ)	2	L523,L536
137	2LH1-R301R5-L05-05	线径φ0.30 内径φ1.55T	1	L535
138	2LW1-25UC-222J	2520,2.2μH±5%(NL252018T-2R2J/NLV25T-2R2J)	1	L527
139	2LW1-16UC-R12J	1608,120nH±5%	1	L532
140	2LH1-R401R5-R03-05	φ0.40,*φ1.5,3T,	2	L534,L526
141	2LL1-16-4N7S	1608,4.7nH±0.3nH(MLG1608B4N7S)	1	L548
142	1TF1-RD07MUS2B	RD07MUS2B，	1	Q501
143	1TF1-RD01MUS2		1	Q502
144	1TT1-2SC3356-R24	2SC3356-R24,SOT23,NPN	6	Q503,Q504,Q507,Q509,Q601,Q603
145	1TT1-AT41511	SOT143-EEBC-B3X1_4-P1_9	1	Q505
146	1TF1-3SK318	3SK318(YB-)	1	Q506
147	1TT1-DTA143ZE	DTA143ZE-SMD	1	Q511
148	2RS1-10-682J	1005,6.8K±5%	2	R506,R546

149	2RE1-10-2R70	0402 2.7Ω±1%,1005.	1	R507
150	2RS1-10-331J	1005,330Ω±5%	1	R508
151	2RS1-10-563J	1005,56K±5%	2	R511,R514
152	2RS1-10-470J	1005,47Ω±5%	2	R516,R548
153	2RS1-10-101J	1005,100Ω±5%	10	R517,R518,R554,R604,R614,R627,R629,R635,R642,R643
154	2RS1-10-564J	1005,560K±5%	2	R519,R641
155	2RS1-10-471J	1005,470Ω±5%	4	R521,R531,R619,R640
156	2RS1-10-392J	1005,3.9K±5%	2	R522,R617
157	2RS1-10-273J	1005,27K±5%	2	R524,R701
158	2RS1-10-754J	1005,750K±5%	1	R529
159	2RS1-10-822J	1005,8.2K±5%	2	R536,R538
160	2RS1-10-150J	1005,15Ω±5%	1	R537
161	2RS1-10-220J	1005,22Ω±5%	1	R543
162	2RS1-10-151J	1005,150Ω±5%	1	R551
163	2RS1-10-242J	1005,2.4K±5%	1	R555
164	2RS1-10-391J	1005,390Ω±5%	2	R556,R595
165	2RS1-32-R39J	3216,0.39Ω±5%	3	R559,R560,R561
166	2RE1-10-1503	1005,150KΩ±1%	4	R562,R564,R566,R702
167	2RS1-10-155J	1005,1.5M±5%	2	R567,R700
168	2RS1-10-271J	1005,270Ω±5%	1	R568
169	1IS1-GT3136	GT3136,SSOP16	1	U501
170	1IL1-NJM2904V	NJM2904V,TSSOP-8	2	U502,U603
171	5XC1-50R0-49910GQ9	1D49910GQ9 49.95MHz 7*5 KDS	1	XF501
172	2CC1-16-C0G500-180J	1608,18P±5%,50V,C0G	2	C605,C624
173	2CC1-16-C0G500-150J	1608,15P±5%,50V,C0G	1	C606
174	2CC1-16-C0G500-390J	1608,39P±5%,50V,C0G	2	C607,C588
175	2CC1-10-C0G500-1R0C	1005,1P±0.25P,50V,C0G	1	C608
176	2CC1-10-C0G50	1005,0.5P±0.25P,50V,C	2	C609，C622

	0-R50C	0G		
177	2CC1-10-C0G500-1R5C	1005,1.5P±0.25P,50V,C0G	4	C603，C614,C631,C804
178	2CC1-16-C0G500-8R0C	1608,8P±0.25P,50V,C0G	2	C620,C508
179	2CC1-16-C0G500-330J	1608,33P±5%,50V,C0G	1	C626
180	2CC1-10-C0G500-6R0C	1005,6P±0.25P,50V,C0G	1	C632
181	2CC1-10-X7R500-332K	1005,3300P±10%,50V,X7R	2	C640,C687
182	2CC1-10-C0G500-181J	1005,180P±5%,50V,C0G	1	C645
183	2CC1-10-C0G500-680J	1005,68P±5%,50V,C0G	1	C648
184	2CC1-20-X7R500-224K	2012,220nF±10%,50V,X7R	2	C650,C652
185	2CC1-20-X7R160-475K	2012,4.7μF±10%,16V,X7R,GRM21BR61C475KA88L	1	C664
186	1DV1-HVC350B	HVC350B(B0),SOD523	4	D602,D603,D608,D609
187	1DV1-HVC376B	HVC376B(B9)	4	D604,D605,D606,D607
188	1DV1-1SV278	1SV278(T1)	1	D610
189	2RS1-16-000O	1608,0Ω	1	L600
190	2LL1-16-3R3K	1608,3.3μH±10%(MLF1608A3R3K TA00)	1	L601
191	2LW1-16UC-150J	1608,15nH±5% C1608CB-15NJ)	1	L602
192	2LL1-16-R33K	1608,0.33μH±10%(MLF1608DR33K)	1	L609
193	2LW1-16UC-270G	1608,27nH±2%,(C1608CB-27NG)	1	L612
194	2LW1-20UC-220J	2012,22nH±5%,(C2012C-22NJ)	1	L613
195	2LL1-16-82NJ	1608,82nH±5%(MLG1608B82NJ)	2	L617,L625
196	2LW1-16UC-270J	1608,27nH±5%,C1608CB-27NJ)	1	L620
197	2LW1-20UC-150J	2012,15nH±5%,(C2012C-15NJ)	1	L621
198	2LW1-16UC-390J	1608,39nH±5%,(C1608CB-39NJ)	1	L626

199	2LW1-16UC-180J	1608,18nH±5%,C1608CB-18NJ)	1	L633
200	1TT1-2SC5066-Y	2SC5066-Y(M2),NPN,SOT323	2	Q604,Q605
201	1TT1-2SC4617-R	2SC4617-R(BR),EMT3	1	Q606
202	1TF1-2SJ243	2SJ243-SMD	1	Q607
203	2RS1-10-121J	1005,120Ω±5%	2	R603,R613
204	2RS1-10-560J	1005,56Ω±5%	1	R636
205	2RS1-10-912J	1005,9.1K±5%	1	R649
206	1IS1-SKY72310	SKY72310,24 pin QFN 4mmX4mm （QFN-N24_B4x4-P0_5）,	1	U601
207	1IS1-XC6204B332MR	3.3V,SOT-23-5,150mA	1	U602
208	1IS1-UPB1509GV	UPB1509GV,SSOP	1	U605
209	5XC1-16R8-6800CFA	1XTV16800CFA 16.8MHz 3225 VC-TCXO KDS	1	X601
210	6PM7-4119-HMB	TP660-VHF-V1.0-150127,8 layer,1.2mm,FR-4,47*109mm	1	
211	2CC1-10-C0G500-200J	1005,20P±5%,50V,C0G	2	C716，C531
212	2CC1-10-C0G500-270J	1005,27P±5%,50V,C0G	2	C802，C803
213	2CC1-10-C0G500-4R0C	1005,4P±0.25P,50V,C0G	1	C699
214	1IP1-00TP660-R01	STM32F405VG T6 LQFP100,MCU,14*14MM	1	U301

List 3 Material List (structure material)

No	Part No.	Description	Position mark	Quantity
1	7MHP-7069-02A-W0	PT7800 top cover (cover die), PC+ABS, black, 2008B, pb-free		1
2	7MHP-7069-07A-W0	PT7800 channel knob, ABS, black, 2012B, pb-free		1

3	7MHP-7069-08A-W0	PT7800volume knob ABS, black, 2012B, pb-free		1
4	7MHR-7069-04A-W0	PT7800big o ring silica gel, black, hardness 40 degrees, pb-free		1
5	7MHR-7069-05A-W3	PT7800skylight o ring, silica gel,orange, , pb-free		1
6	7MHR-7069-06A-W0	PT7800 top o ring, silica gel, black, hardness 60 degrees,, pb-free		1
7	7MHR-7069-07A-W0	PT7800 pedestal o ring. silica gel, black, hardness 60 degrees , pb-free		1
8	7MHR-1727-09A-W3	R 558mic cover,material: hardness 60 degrees, hardness 40 degrees, orange, without surface processing		1
9	7MHR-7042-06B-W0	R thermally conductive silica gel spacer, hardness 60 degrees, black,3*6*9mm,softer than A version. pb-free		1
10	3CR7-SMA-50JFB-4	R for RF coaxial connector analog radio. SMA-J, Flange plate installation(558, hole distance14mm, chip length 0.5mm)		1
11	7NRC-060100035-B1A	Switch nut, material: brass, internal diameter M6mm, external diameter φ10mm, thickness 3.5mm, black passivation,		2
12	7NRC-087120036-Z1	R antenna nut, material: :copper, internal diameter M8.7mm, external diameter φ12mm,, thickness 3.6mm, black zinc-plated,		1
13	7MHL-7069-01A-W	PT7800aluminum bracket. aluminum alloy(ADC12),ground,polished, , pb-free		1
14	7MHF-7069-02A-W	PT7800 skylight cover 0.5MM,SUS304, , pb-free		1
15	7MHS-7069-02A-W	PT7800 channel knob circlip 0.3MM,stainless steel, pb-free		1
16	7MHS-7069-03A-W	PT7800digital keypad, metal dome of 16 D6 , pb-free		1
17	7MHS-7069-04A-W	PT7800 PTT button METAL DOME of 3 D6 , pb-free		1
18	7MHS-1140-01A-W	R 3118/3208knob circlip, material: spring steel		1
19	7SMF-020040M-SZYB-N	R M2*4 cross round flat machine screw, material: hardened iron, Φ2mm*4mm cross round flat nickel-plated machine thread, metric coarse thread,		19
20	7SMF-020080M-MHHT-N1	R M2*8 blossom type thick-headed machine screw, material: hardened iron, Φ2mm*8mm blossom type thick-headed nickel-plated machine thread, metric coarse thread		2
21	7SMF-025080M-SZYB-Z1	R M2.5*8 cross round flat machine screw, machine: hardened iron, Φ2.5mm*8mm cross round flat black zinc-plated machine thread, metric coarse thread		4
22	7MHR-7069-08A-W0	O ring D2.4X1.0MM, pb-free		2
23	7GCB-070045005-J	DP770，PT567 radio Φ7mic cloth, diameter		1

		φ7*φ4.5* thickness 0.1mm with tape on one side		
24	7MHP-7069-11A-W0	PVC 片 4.0X4.0 MM , pb-free		0
25	6MD7-S7069A	E PT7800 LCD display model group CMF1N5333-E,FSTN,TAB,VA(39*16),A/A(35.8*12.5),		1
26	7MBP-4078-01A-W0	TP660 front cover PC+ABS, black, 2008B,embedded with #4-40 nut， pb-free		1
27	7MHP-7069-03A-W0	PT7800 PTT side cover PC+ABS, black, 2008B/2010B, pb-free		1
28	7MHP-7069-04A-W0	PT7800 PTT cover board (cover die) PC+ABS, black, 2010B, pb-free		1
29	7MHP-7069-06A-W0	PT7800 battery latch (cover die), PC+ABS, embedded latch baffle, black,2008B, pb-free		1
30	7MHF-7069-01A-N	PT7800 latch baffle outsourcing parts 1.2MM,IP, vacuum electric plating, pb-free		1
31	7MHP-7069-09A-WCA	PT7800 TP660 lens PC, transparent, screen printing, KIRISUN+ black, pb-free		1
32	7MHP-7069-10A-WC	PT7800 guide beam, PC, transparent, transparent, pb-free		1
33	7MHR-7069-01A-W0	PT7800 key, black +637C+wgite(laser carving), hardness 60 degrees, , pb-free		1
34	7MHR-7069-02A-W0	PT7800PTT key, silica gel, black, hardness 60 degrees, , pb-free		1
35	7MHR-7069-03A-W3	PT7800 emergency keypad , silica gel, orange, hardness 60 degrees, pb-free		1
36	4SS7-4017-016-150	7800 speakerPT7800-05 Φ40,H=17±0.1mm, impedance16Ω, power 1.5W,, pb-free		1
37	7MHS-1010-02A-N	PT3208 spring, material: spring steel, nickel-plated, wire diameter 0.2,D,external diameter2, length 9.5, 11 circles		2
38	7GCB-360003-J	PT7800speaker net, material: black 250, +nitto57120b,diameter φ36mm* ,thickness 0.3mm, with double-sided tape		1
39	7MHB-7069-01A-W0	PT7800mic head dust-proof pad, material: DY-E002A breathable film,φ6.6xφ4.4, pb-free		1
40	7GCM-S1871-JA	R 6500LCD dust-proof pad, material: black foam PVC pad , with tape on one side		1
41	7MHJ-4078-01A-W	TP660 earphone PCB board, double-sided tape, thickness 0.4mm NITTO 57120B double-sided tape		1
42	7MHJ-7069-01A-W	PT7800 mirror double-sided tape, NITTO57120,43.4*28.2MM, pb-free		1
43	7MHP-7069-11A-W0	PVC chip 4.0X4.0 MM pb-free		0
44	7GCM-360075040	KB-36Lflame retardant sponge pad, black bubble, 36*7.5*4mm, single-sided tape（flame retardant）;		0.33

		pb-free		
45	7GCM-04007003-J	Spacer,，φ3.0*5.0*0.3mm，		2
46	7SSF-030040M-YXHP-BA	R M3*4 earphone cover screw, SUS303、＃4-40、vacuum-plated IP ,black、pb-free		1
47	7MHP-7069-05B-W0	PT7800 ear mic cover plate(cover die) PC+ABS, black, 2008B,1405，pb-free		1

Figure 1 TP660 Main Board Top Side PCB View (400-470MHz)

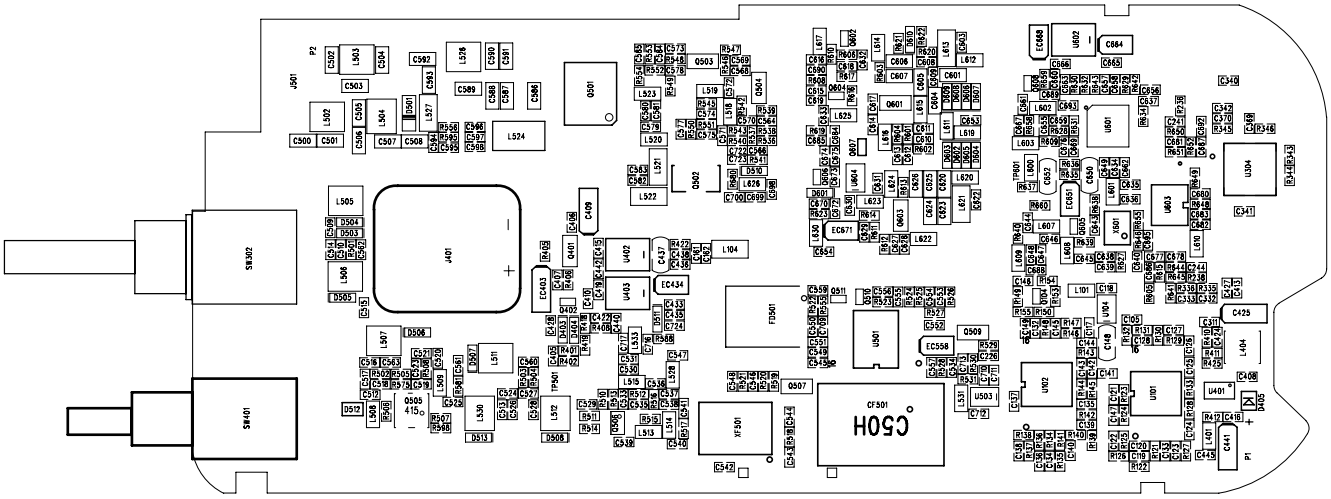


Figure 2 TP660 Main Board Bottom Side PCB View (400-470MHz)

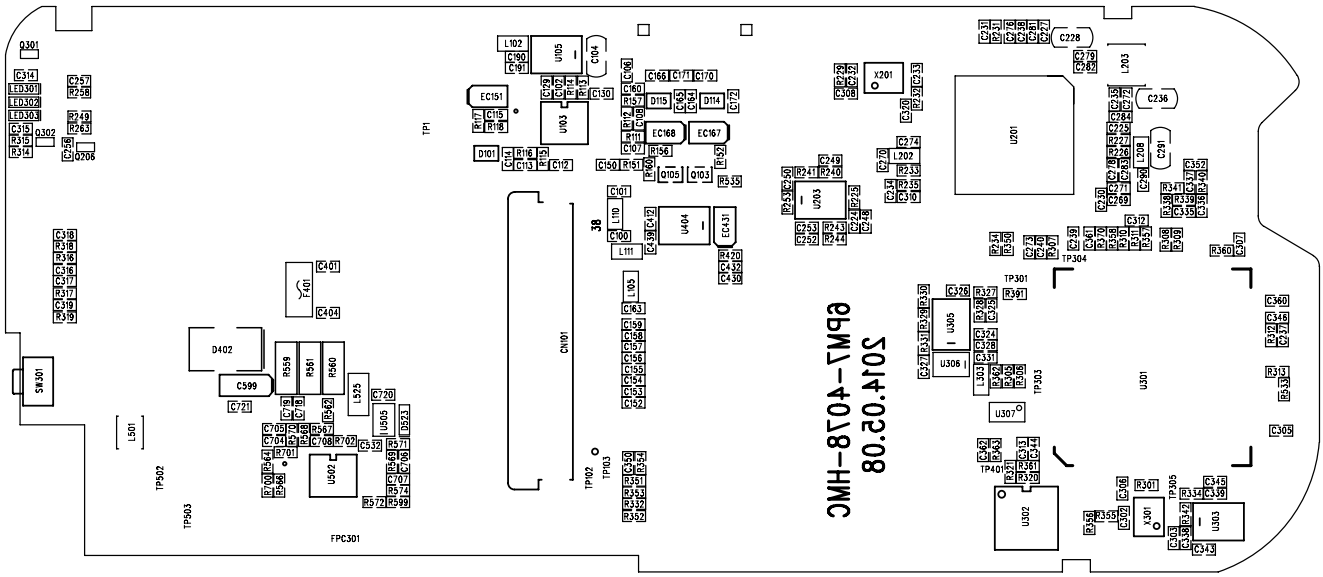


Figure 3 TP660 Main Board Top Side PCB View (136-174MHz)

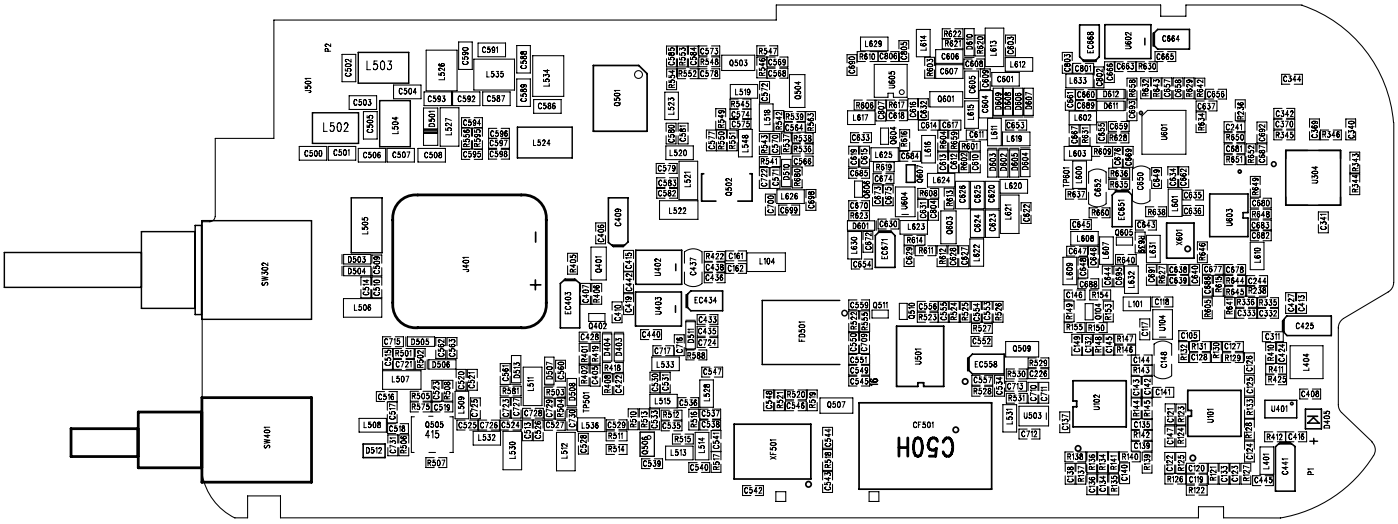


Figure 4 TP660 Main Board Bottom Side PCB View (136-174MHz)

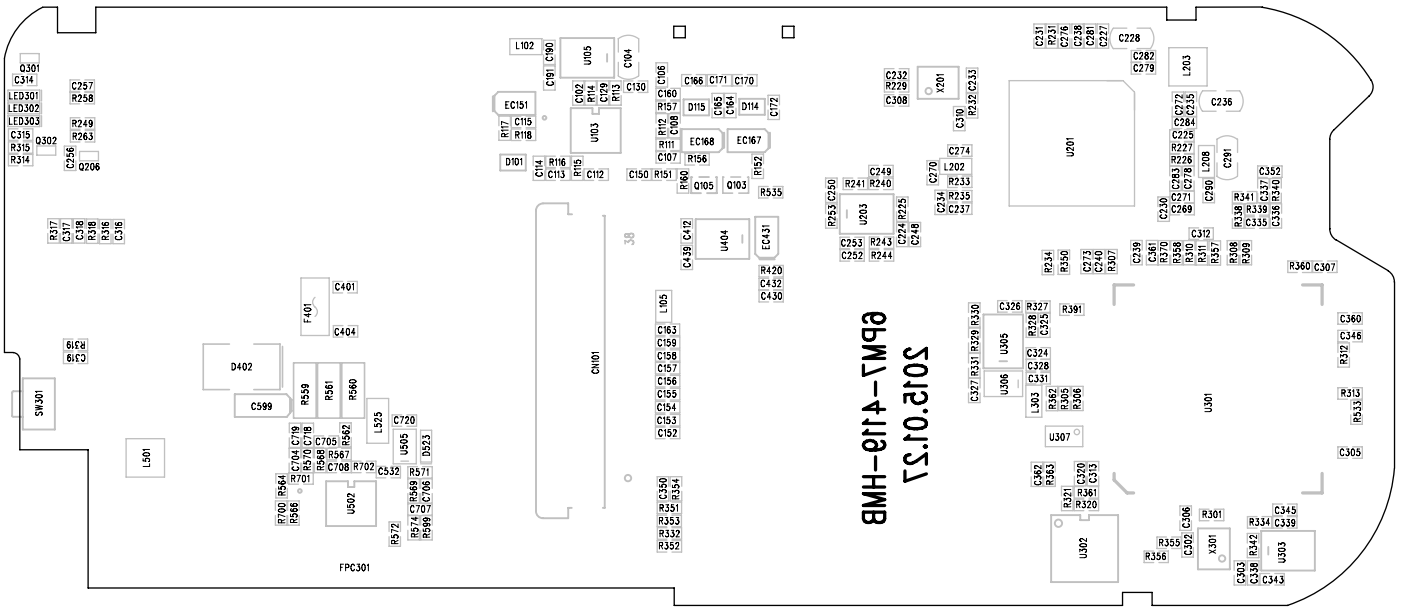


Figure 3 TP660 keypad Top Side PCB View

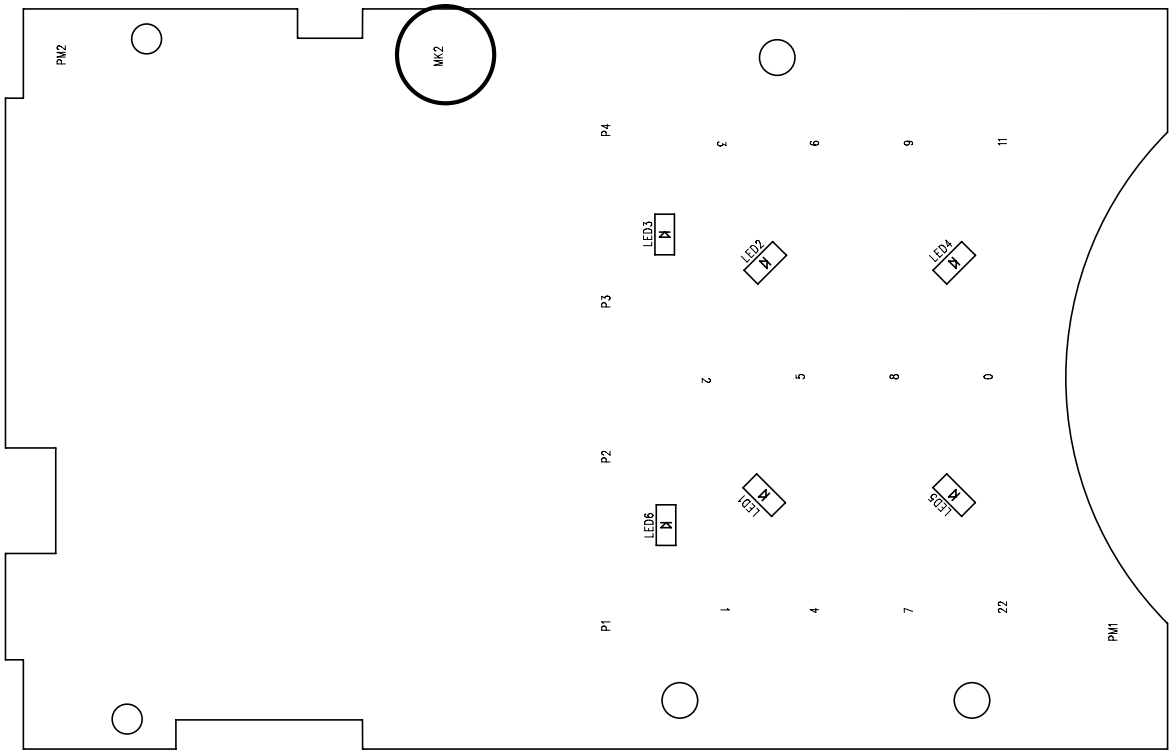


Figure 4 TP660 keypad Bottom Side PCB View

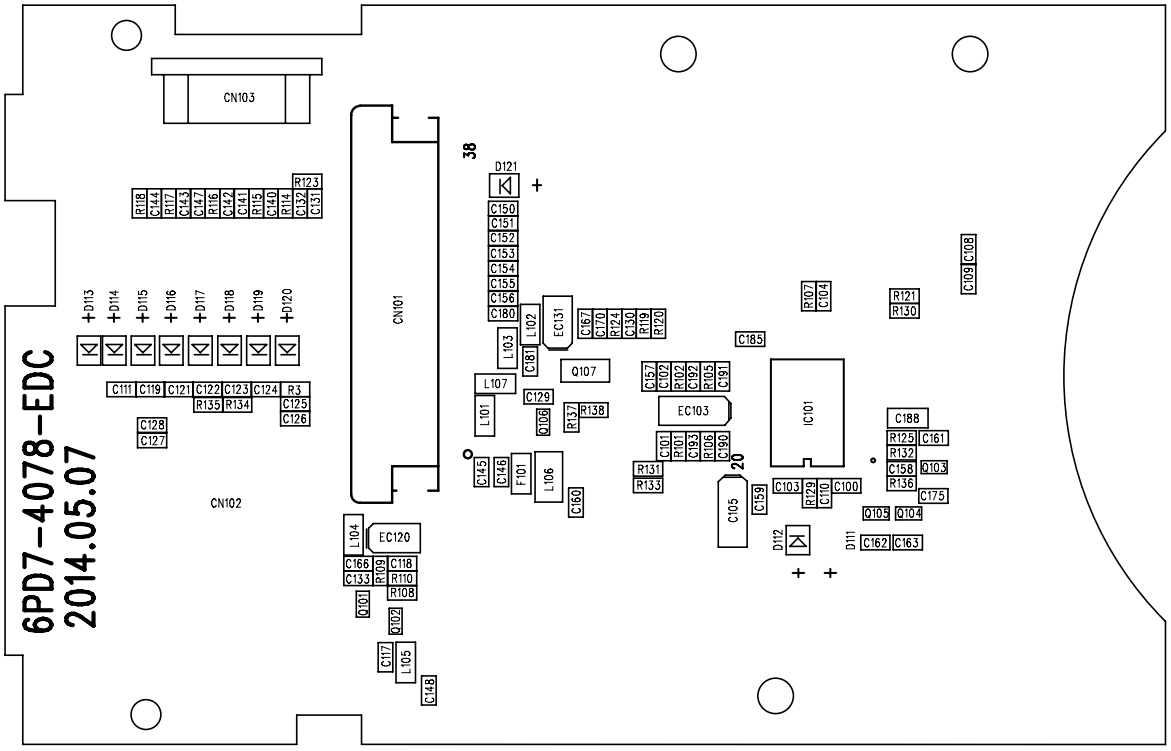
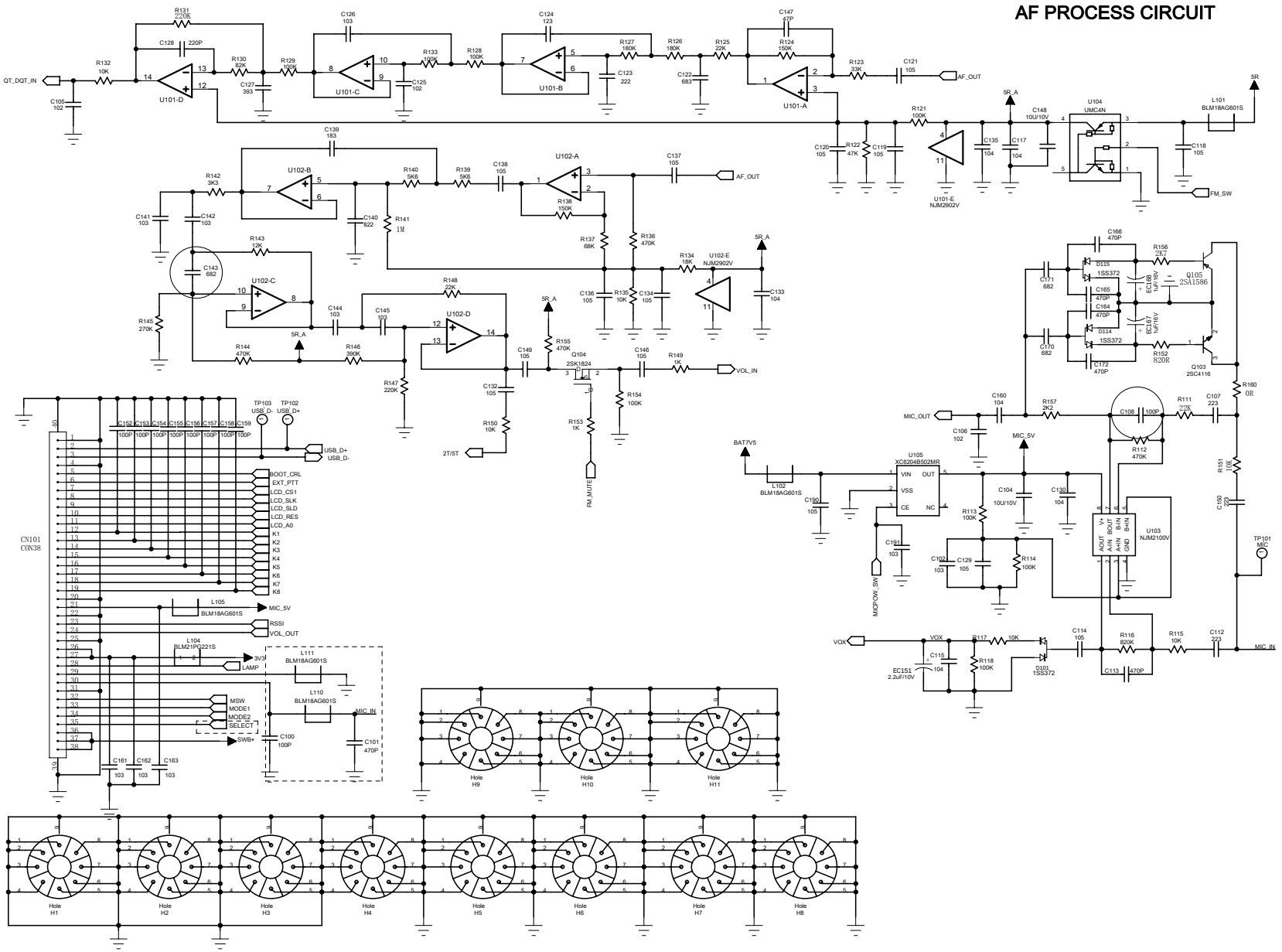
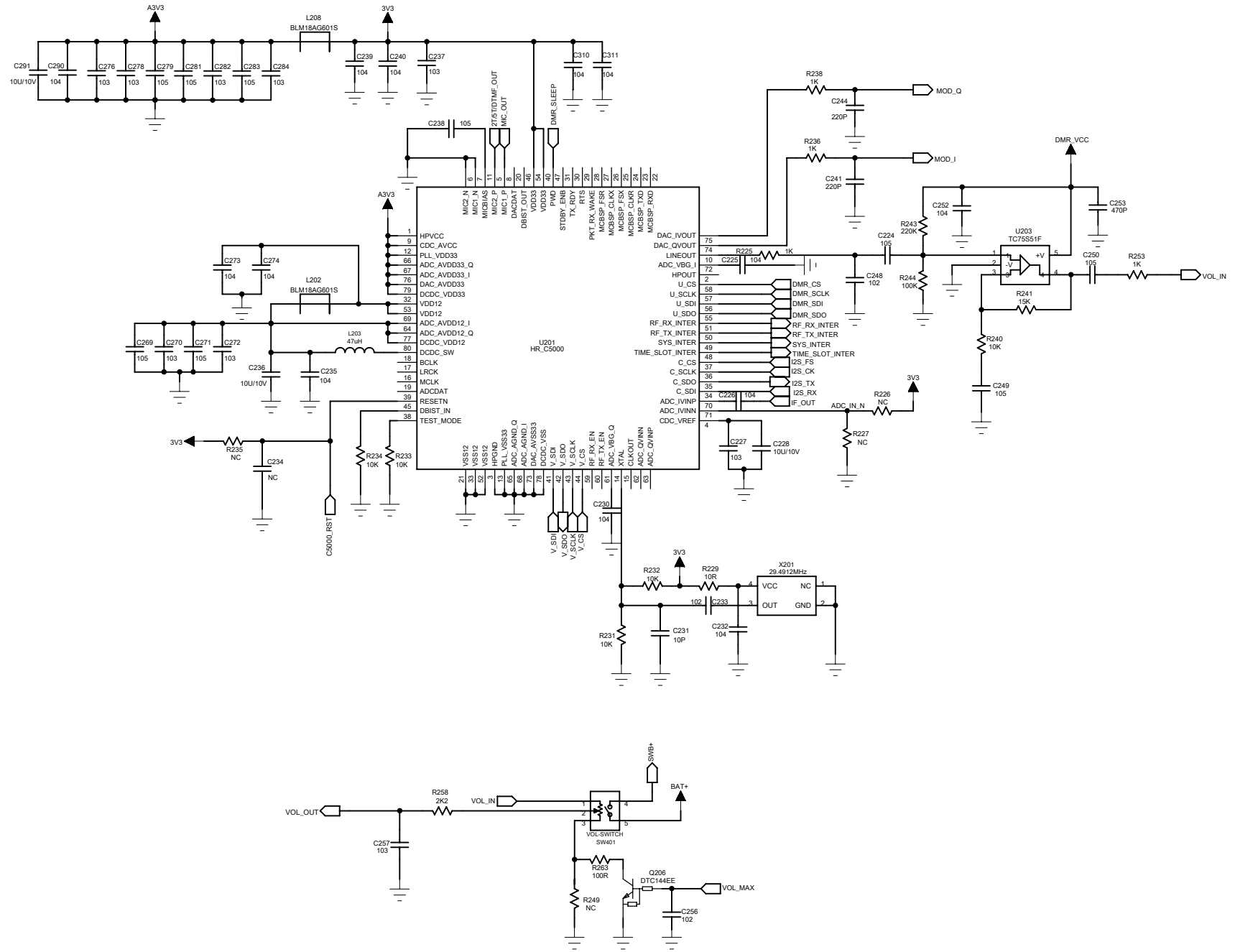
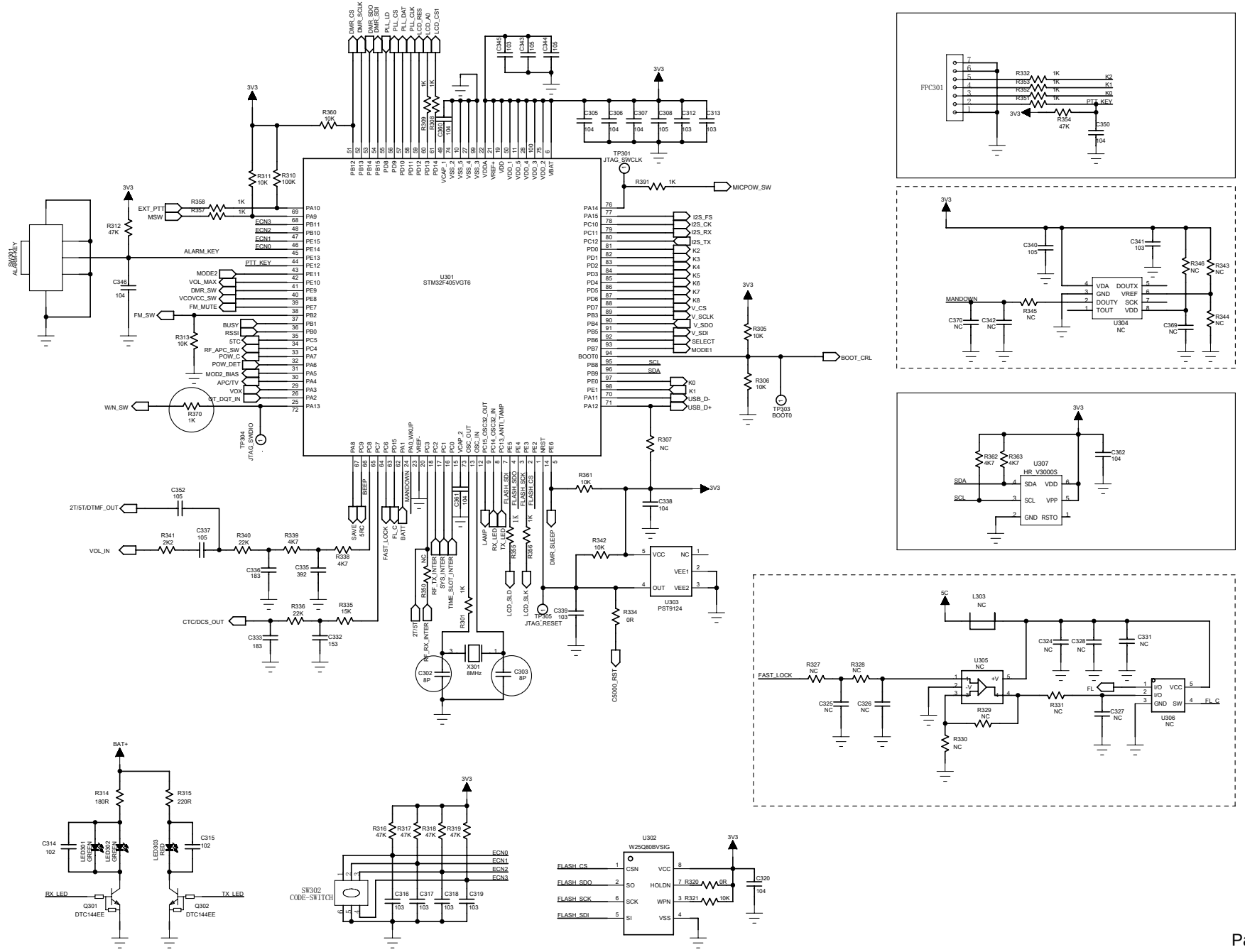


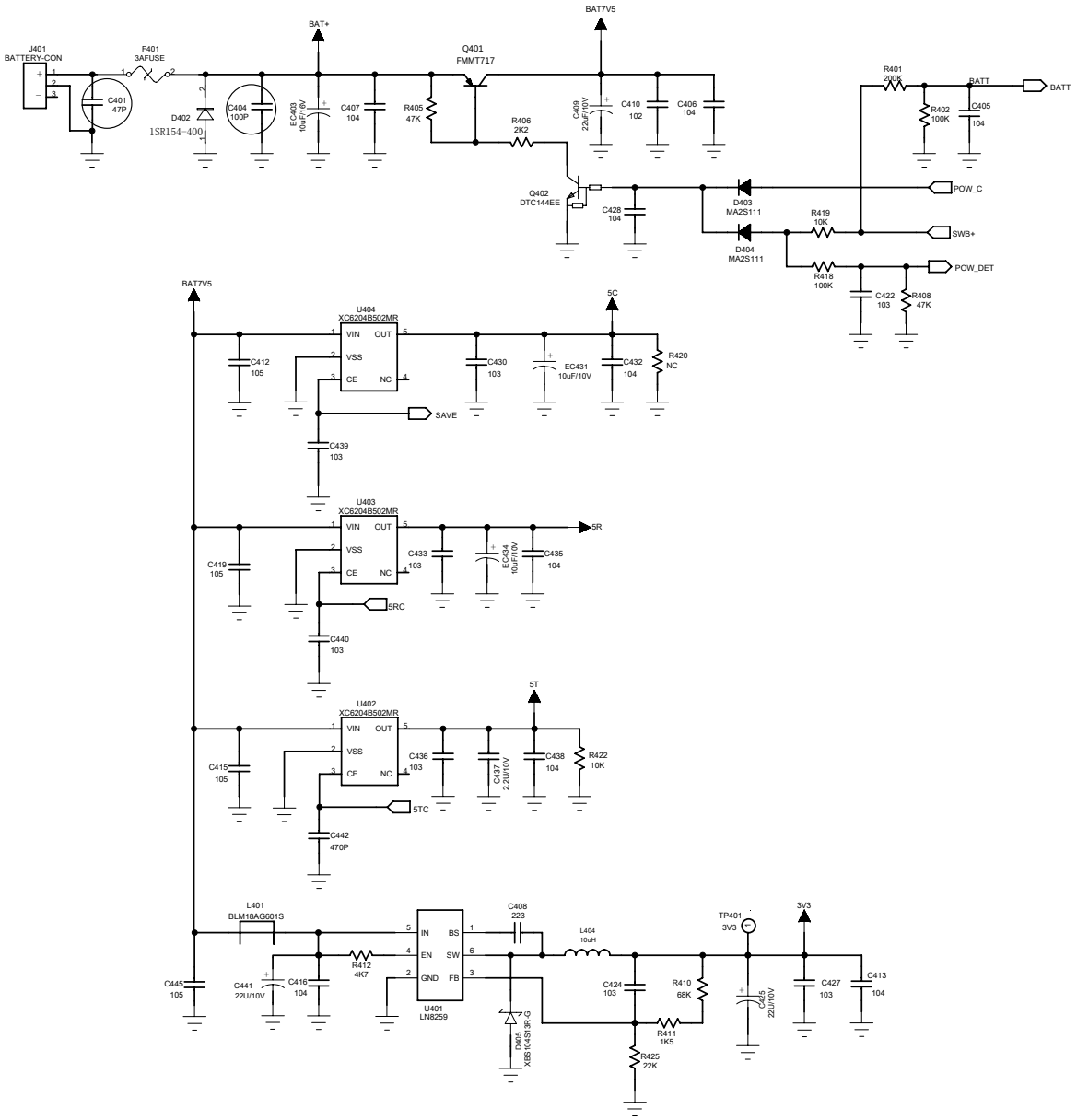
Figure 5 TP660 Mainboard Schematic Diagram(400-470MHz)

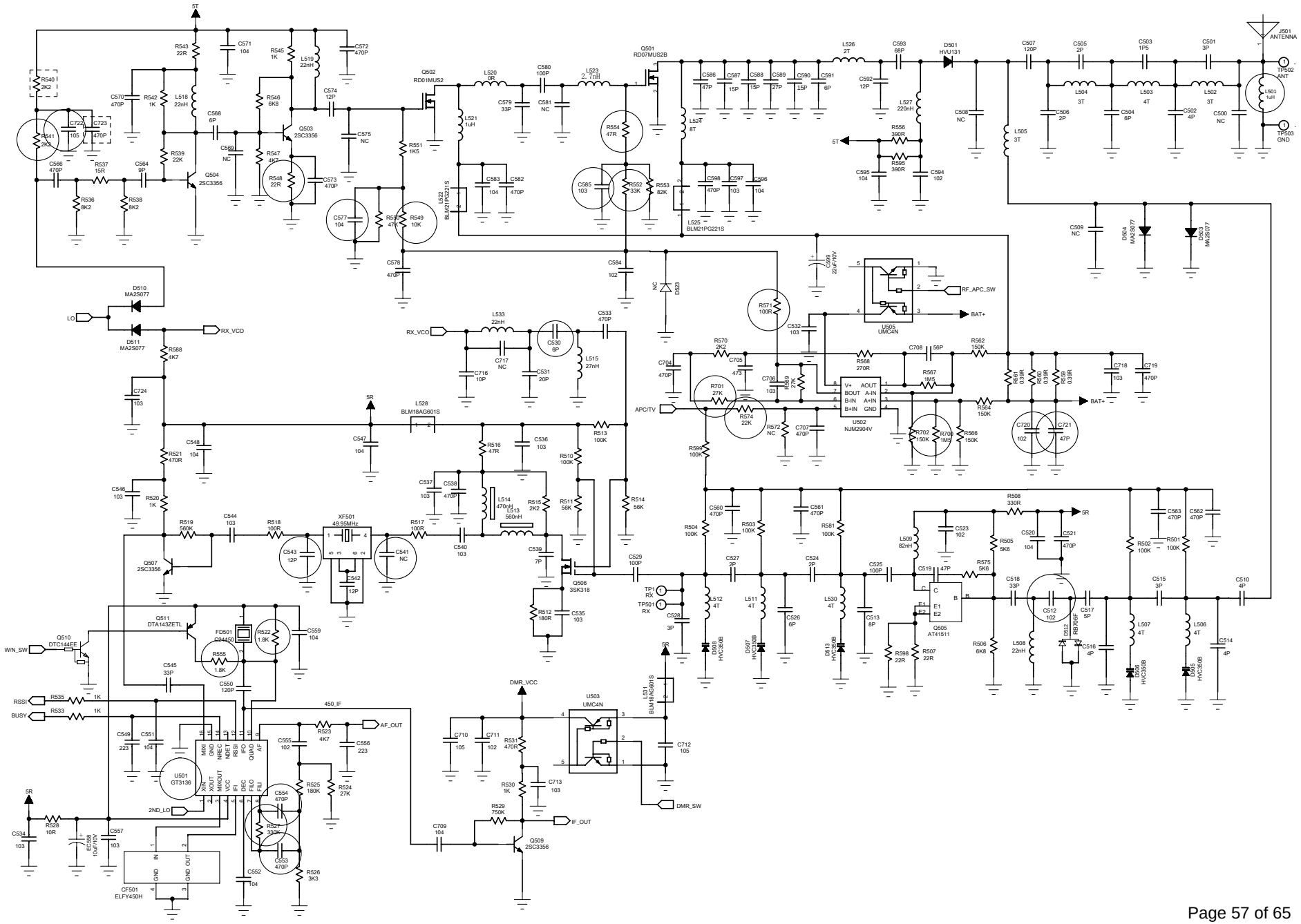



A3V3
3V3
L208
BLM18AG601S
C291
10U/10V
C290
C276
C278
C279
C281
C282
C283
C284
C239
C240
C237
C310
C311
C238
105
27/57/DTMF_OUT
MIC_OUT
DMR_SLEEP
U201
HR_C5000
HPVCC
CDC_AVCC
PLL_VDD33
ADC_AVDD33_Q
ADC_AVDD33_I
DAC_AVDD33
DCDC_VDD33
VDD12
VDD12
ADC_AVDD12_I
ADC_AVDD12_Q
DCDC_VDD12
DCDC_SW
BCLK
LRCK
MCLK
ADCDAT
RESETN
DBIST_IN
TEST_MODE
DAC_IVOUT
DAC_QVOUT
LINEOUT
ADC_VBG_I
HPOUT
U_CS
U_SCLK
U_SDI
U_SDO
RF_RX_INTER
RF_TX_INTER
SYS_INTER
TIME_SLOT_INTER
C_CS
C_SCLK
C_SDO
C_SDI
ADC_IVINP
ADC_IVINN
CDC_VREF
DMR_CS
DMR_SCLK
DMR_SDI
DMR_SDO
I2S_FS
I2S_CK
I2S_TX
I2S_RX
IF_OUT
R238
1K
MOD_Q
C244
220P
R236
1K
MOD_I
C241
220P
DMR_VCC
C253
470P
C252
104
R243
220K
C224
105
R225
1K
C225
104
C248
102
R244
100K
U203
TC75S51F
C250
105
R253
1K
VOL_IN
R241
15K
R240
10K
C249
105
C273
104
C274
104
L202
BLM18AG601S
C269
105
C270
103
C271
105
C272
103
L203
47uH
C236
10U/10V
C235
104
R235
NC
C234
NC
R234
10K
R233
10K
C5000_RST
C226
104
R226
NC
ADC_IN_N
R227
NC
C227
103
C228
10U/10V
C230
104
R232
10K
R229
10R
X201
29.4912MHz
VCC
NC
OUT
GND
102
C233
C232
104
R231
10K
C231
10P
SW6+
BAT+
R258
2K2
VOL_IN
VOL_OUT
C257
103
VOL-SWITCH
SW401
R263
100R
Q206
DTC144EE
VOL_MAX
R249
NC
C256
102


U301
STM32F405VGT6
U302
W25Q80BVSIG
U303
PST9124
U304
NC
U305
NC
U306
NC
U307
HR_V3000S
SW302
CODE-SWITCH
Q301
DTC144EE
Q302
DTC144EE
JTAG_SWCLK
JTAG_SWDIO
JTAG_RESET
MICPOW_SW
BOOT_CRL
FPC301
PTT_KEY
ALARM_KEY
FM_SW
W/N_SW
EXT_PTT
MSW
2T/5T/DTMF_OUT
VOL_IN
CTC/DCS_OUT
FAST_LOCK
BAT+
3V3
5C

POWER CIRCUT




5T
R543 22R
C571 104
R545 1K
L519 22nH
C572 470P
R540 2K2
C570 470P
R542 1K
L518 22nH
C574 12P
C722 105
C723 470P
R541 2K2
C568 6P
R546 6K8
Q503 2SC3356
C575 NC
C569 NC
R547 4K7
R548 22R
C573 470P
C566 470P
R537 15R
C564 9P
R536 8K2
R538 8K2
Q504 2SC3356
C577 104
R550 47R
R549 10K
R551 1K5
Q502 RD01MUS2
L520 0R
C580 100P
L523 2.7nH
Q501 RD07MUS2B
L526 2T
C593 68P
D501 HVU131
C507 120P
C505 2P
C503 1P5
C501 3P
J501 ANTENNA
TP502 ANT
TP503 GND
L501 1uH
L504 3T
L503 4T
L502 3T
L505 3T
C506 2P
C504 6P
C502 4P
C500 NC
C506 NC
C579 33P
C581 NC
C586 47P
C587 15P
C588 15P
C589 27P
C590 15P
C591 6P
C592 12P
L527 220nH
R556 390R
R595 390R
C595 104
C594 102
L521 1uH
L522 BLM21PG221S
C583 104
C582 470P
C585 103
R554 47R
R552 33K
R553 82K
L524 8T
C598 470P
C597 103
C596 104
L525 BLM21PG221S
C509 NC
D504 MA2S077
D503 MA2S077
C578 470P
C584 102
C599 22uF/10V
D510 MA2S077
LO
D511 MA2S077
RX_VCO
R588 4K7
C724 103
D523 NC
R571 100R
U505 UMC4N
RF_APC_SW
BAT+
L533 22nH
C533 470P
C530 6P
C717 NC
C716 10P
C531 20P
L515 27nH
R570 2K2
C705 473
C708 56P
R562 150K
C704 470P
R588 270R
R567 1M5
R559 27K
C706 103
R701 27K
R574 22K
R572 NC
C707 470P
U502 NJM2904V
R564 150K
R702 150K
R709 1M5
R566 150K
C720 102
C721 47P
C718 103
C719 470P
R539 0.39R
R560 0.39R
R561 0.39R
APC/TV
5R
L528 BLM18AG601S
C547 104
C548 104
R516 47R
C536 103
R513 100K
R510 100K
R595 100K
R521 470R
C546 103
R520 1K
C537 103
C538 470P
L514 470nH
L513 560nH
R515 2K2
R511 56K
R514 56K
R519 560K
C544 103
R518 100R
XF501 49.95MHz
R517 100R
C540 103
C539 7P
C539 100P
C543 12P
C541 NC
C542 12P
Q506 3SK318
R512 180R
C535 103
TP1 RX
TP501 RX
C528 3P
L512 4T
L511 4T
L530 4T
C513 8P
C526 6P
C527 2P
C524 2P
C525 100P
C560 470P
C561 470P
R504 100K
R503 100K
R581 100K
L509 82nH
C523 102
R508 330R
C519 47P
R575 5K6
C518 33P
C520 104
C521 470P
R505 5K6
C512 102
C517 5P
R512 RB706F
C516 4P
R508 6K8
L508 22nH
C563 470P
C562 470P
R502 100K
R501 100K
C515 3P
C510 4P
L507 4T
L506 4T
C514 4P
D507 HVC350B
D513 HVC350B
D508 HVC350B
D506 HVC350B
D505 HVC350B
Q505 AT41511
R598 22R
R507 22R
Q507 2SC3356
Q511 DTA143ZETL
Q510 DTC144EE
W/N_SW
FD501 C24450
R555 1.8K
R522 1.8K
C559 104
C545 33P
C550 120P
RSSI
BUSY
R535 1K
R533 1K
C549 223
C551 104
U501 GT3136
XIN
XOUT
MIXOUT
VCC
IFI
DEC
FILO
FILI
MOD
CKO
NREC
NDET
RSSI
IFO
QUAD
AFC
450_IF
R523 4K7
AF_OUT
C555 102
C556 223
R525 180K
R524 27K
C554 470P
R527 330K
C553 470P
R526 3K3
C552 104
2ND_LO
R528 10R
C534 103
EC558 10uF/10V
C557 103
CF501 ELFY450H
IN
GND
GND
OUT
C709 104
DMR_VCC
U503 UMC4N
C710 105
C711 102
R531 470R
R530 1K
C713 103
R529 750K
IF_OUT
Q509 2SC3356
C712 105
DMR_SW
L531 BLM18AG601S

PLL&VCO Circuit

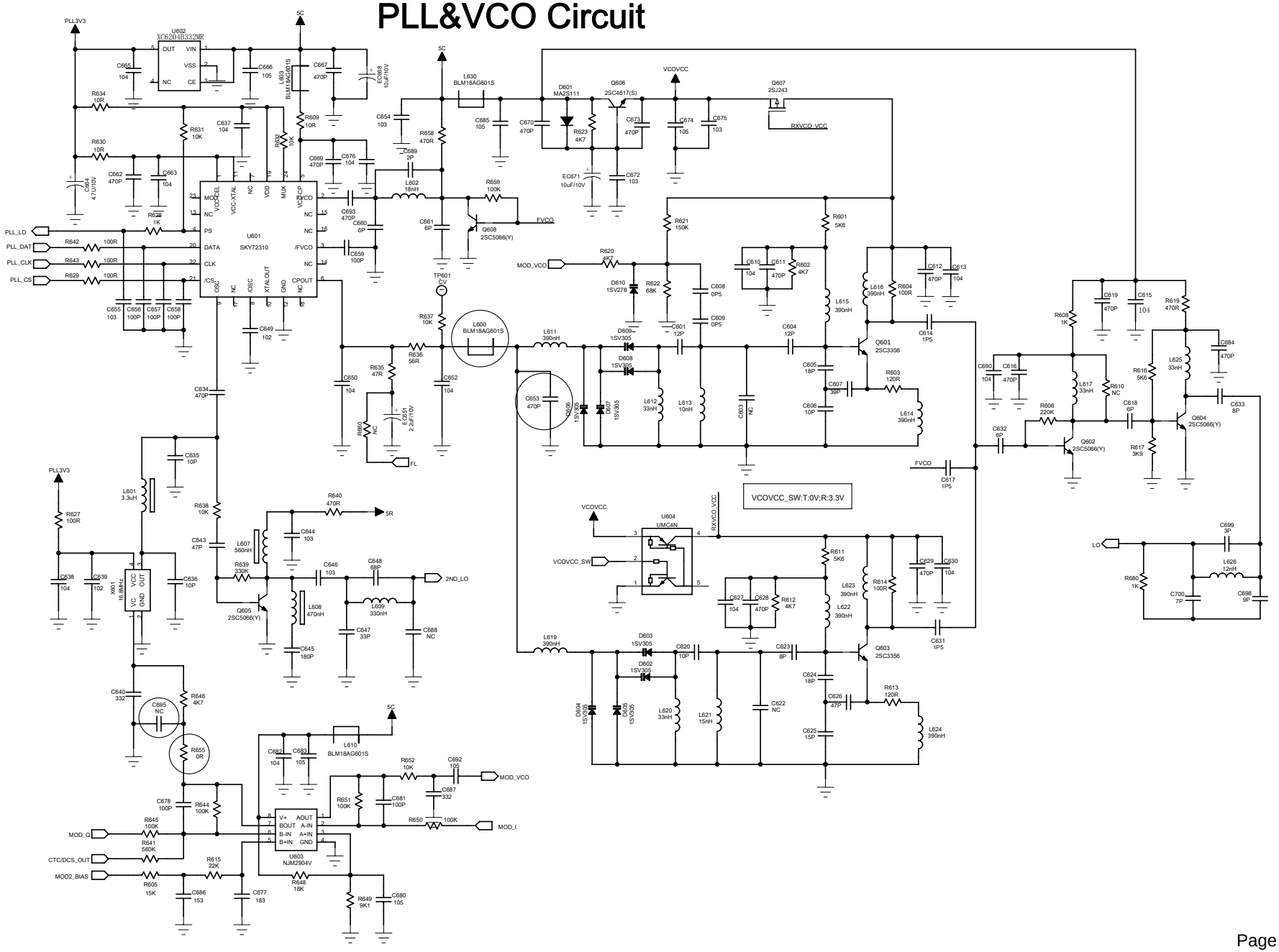
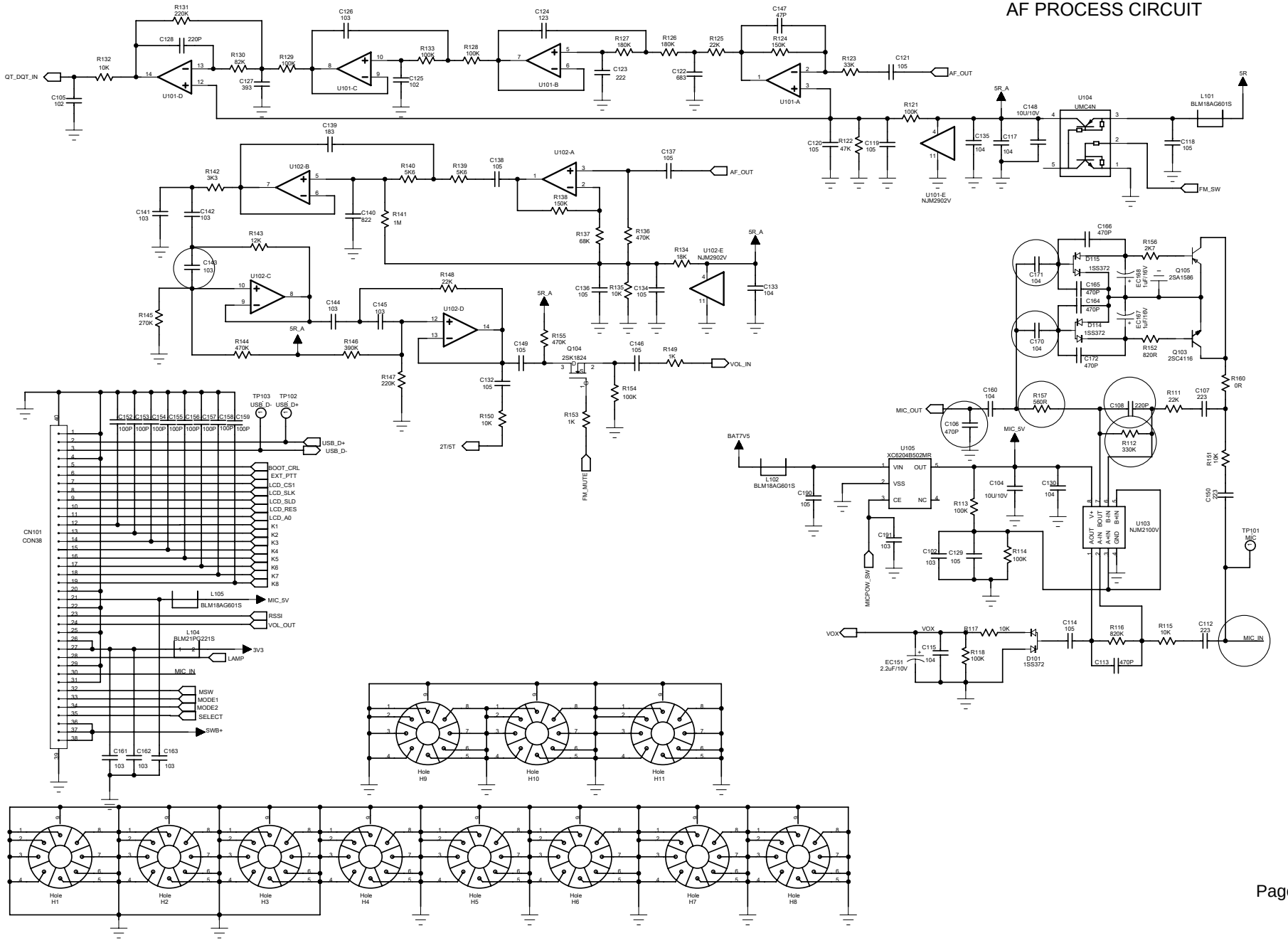
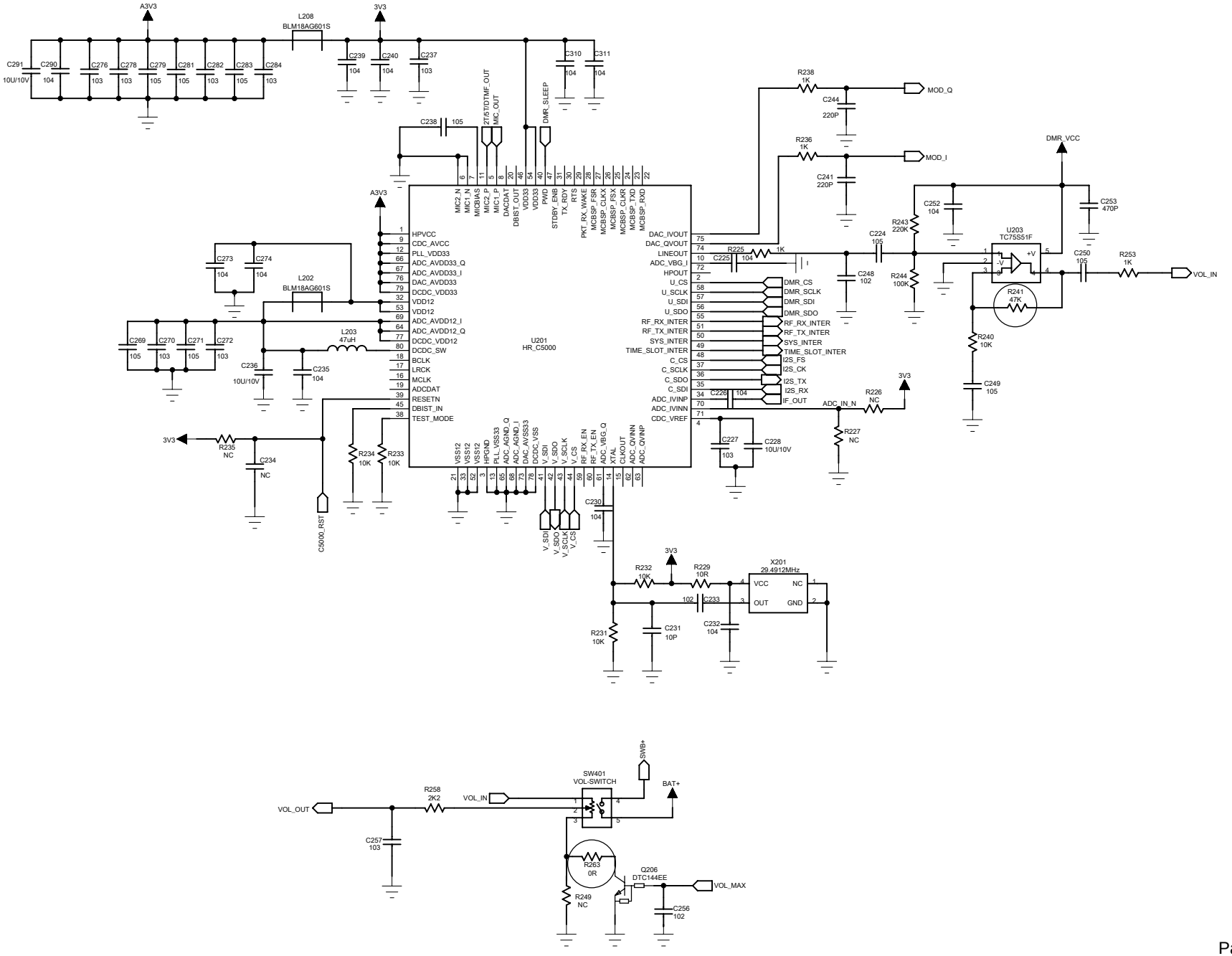
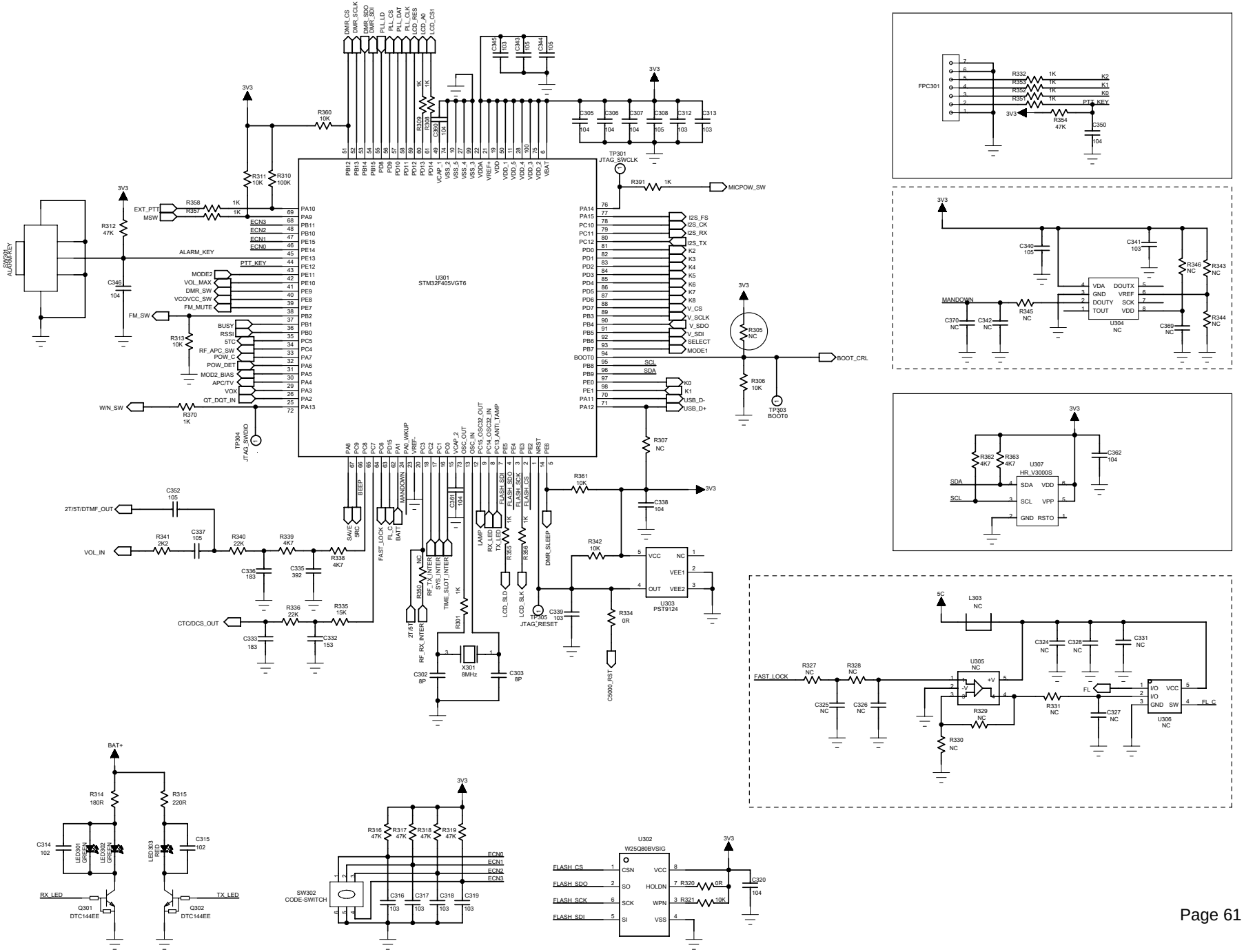


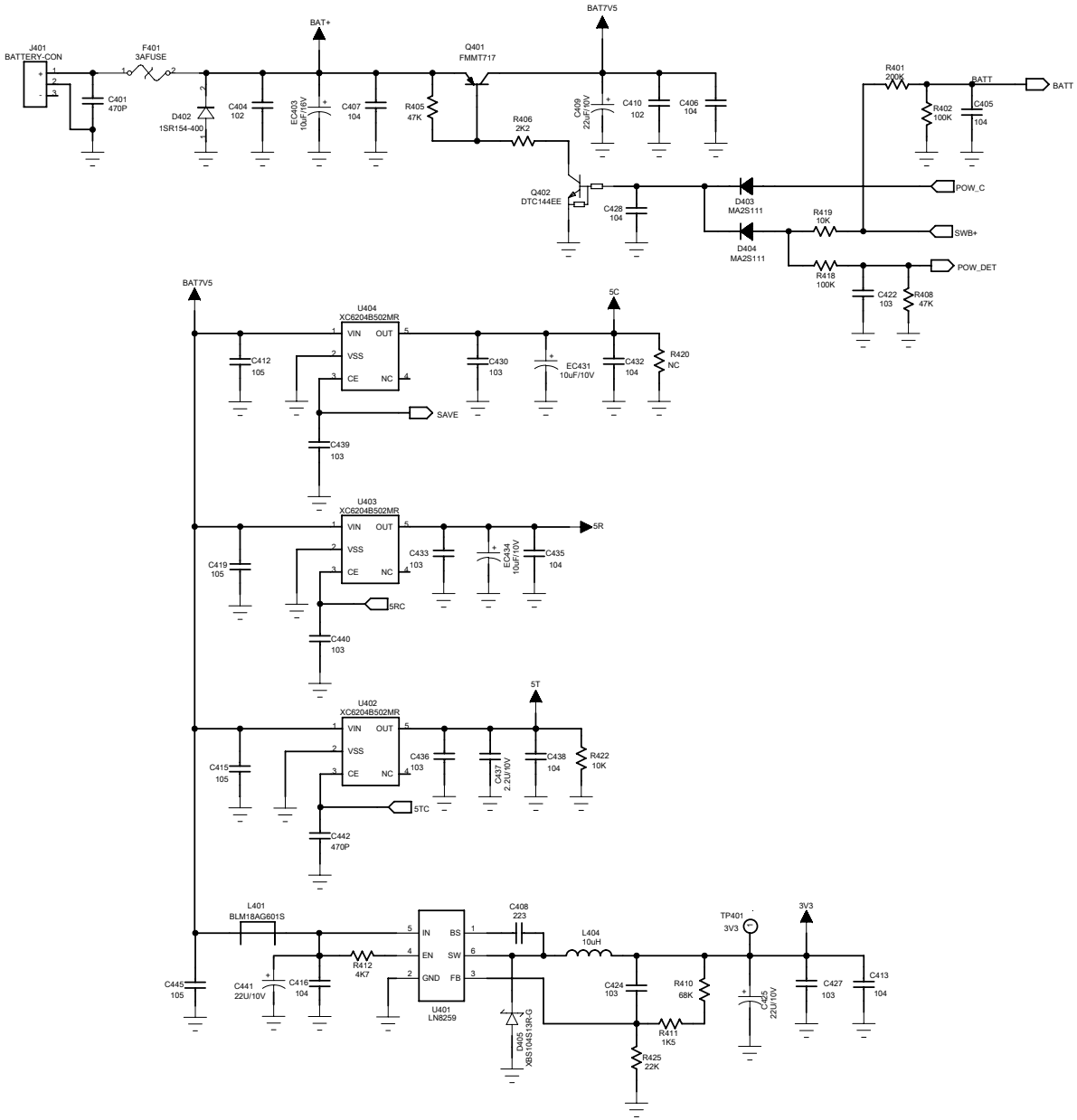
Figure 6 TP660 Mainboard Schematic Diagram(136-174MHz)

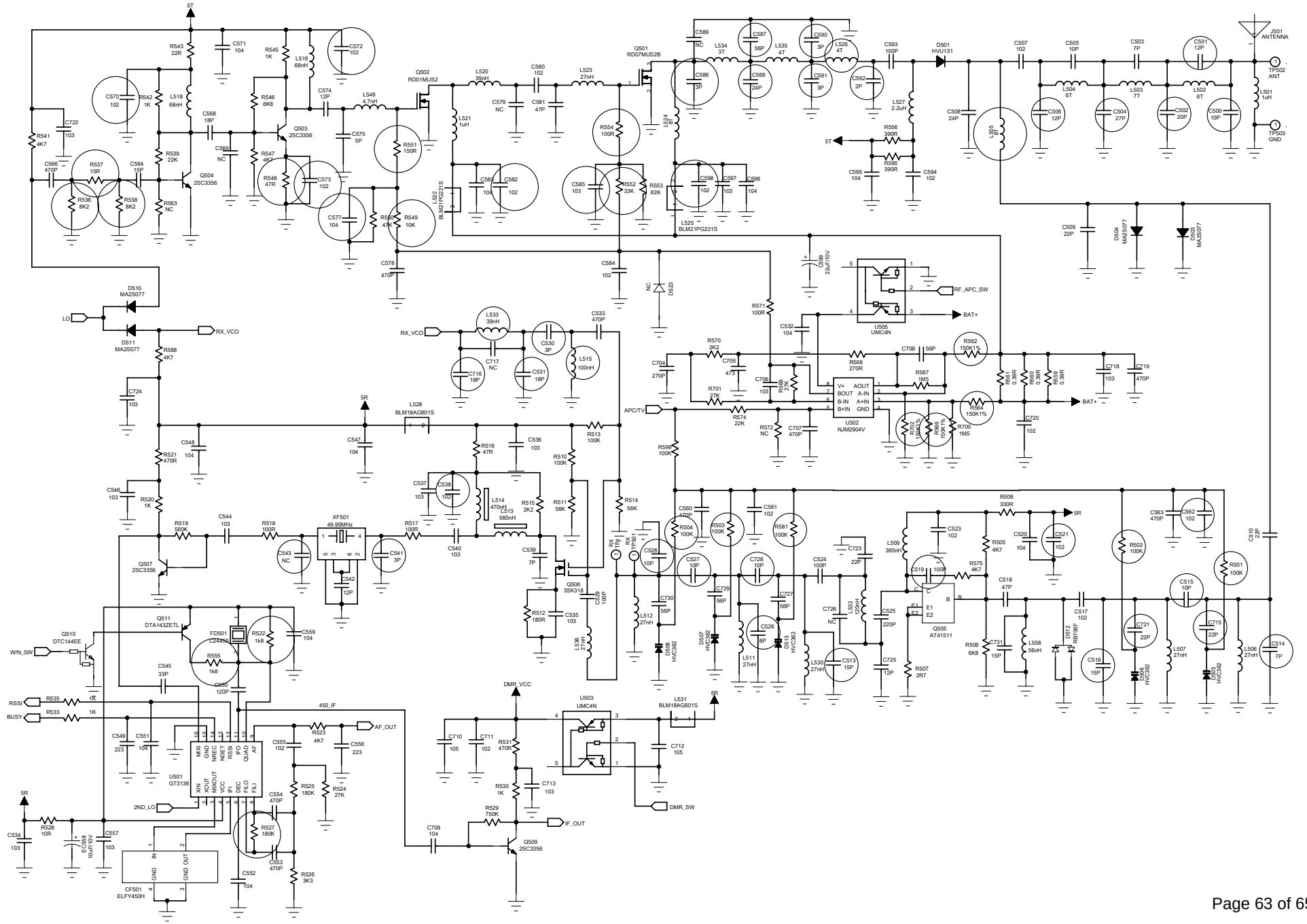



A3V3
3V3
L208
BLM18AG601S
C291
C290
C276
C278
C279
C281
C282
C283
C284
C239
C240
C237
C310
C311
C238
2T/5T/DTMF_OUT
MIC_OUT
DMR_SLEEP
U201
HR_C5000
MIC2_N
MIC1_N
MICBIAS
MIC2_P
MIC1_P
DAC_OUT
DBIST_OUT
VDD33
VDD33
PWD
STDBY_ENB
TX_RDY
RTS
PKT_RX_WAKE
MCBSP_FSR
MCBSP_CLKX
MCBSP_FSX
MCBSP_CLKR
MCBSP_TXD
MCBSP_RXD
HPVCC
CDC_AVCC
PLL_VDD33
ADC_AVDD33_Q
ADC_AVDD33_I
DAC_AVDD33
DCDC_VDD33
VDD12
VDD12
ADC_AVDD12_I
ADC_AVDD12_Q
DCDC_VDD12
DCDC_SW
BCLK
LRCK
MCLK
ADCDAT
RESETN
DBIST_IN
TEST_MODE
DAC_IVOUT
DAC_QVOUT
LINEOUT
ADC_VBG_I
HPOUT
U_CS
U_SCLK
U_SDI
U_SDO
RF_RX_INTER
RF_TX_INTER
SYS_INTER
TIME_SLOT_INTER
C_CS
C_SCLK
C_SDO
C_SDI
ADC_IVINP
ADC_IVINN
CDC_VREF
DMR_CS
DMR_SCLK
DMR_SDI
DMR_SDO
RF_RX_INTER
RF_TX_INTER
SYS_INTER
TIME_SLOT_INTER
I2S_FS
I2S_CK
I2S_TX
I2S_RX
IF_OUT
VSS12
VSS12
VSS12
HPGND
PLL_VSS33
ADC_AGND_Q
ADC_AGND_I
DAC_AVSS33
DCDC_VSS
V_SDI
V_SDO
V_SCLK
V_CS
RF_RX_EN
RF_TX_EN
ADC_VBG_Q
XTAL
CLKOUT
ADC_QVINN
ADC_QVINP
C273
C274
L202
BLM18AG601S
C269
C270
C271
C272
L203
47uH
C236
10U/10V
C235
C234
NC
R235
NC
R234
10K
R233
10K
C5000_RST
C230
R238
1K
MOD_Q
C244
220P
R236
1K
MOD_I
C241
220P
DMR_VCC
C252
C253
470P
R243
220K
C224
C225
R225
1K
C248
102
R244
100K
U203
TC7SS51F
+V
-V
C250
R253
1K
VOL_IN
R241
47K
R240
10K
C249
C226
R226
NC
ADC_IN_N
R227
NC
C227
C228
10U/10V
R232
10K
R229
10R
X201
29.4912MHz
VCC
NC
OUT
GND
C233
C231
10P
C232
R231
10K
SWB+
SW401
VOL-SWITCH
BAT+
R258
2K2
VOL_IN
VOL_OUT
C257
R263
0R
Q206
DTC144EE
VOL_MAX
R249
NC
C256


U301
STM32F405VGT6
U302
W25Q80BVSIG
U303
PST9124
U304
U305
U306
U307
HR_V3000S
TP301
JTAG_SWCLK
TP303
BOOT0
TP305
JTAG_RESET
TP304
JTAG_SWDIO
SW302
CODE-SWITCH
X301
8MHz
FPC301
L303
MICPOW_SW
BOOT_CRL
ALARM_KEY
PTT_KEY
EXT_PTT
MSW
FM_SW
W/N_SW
MANDOWN
FAST_LOCK
VOL_IN
CTC/DCS_OUT
2T/5T/DTMF_OUT
RF_TX_INTER
RF_RX_INTER
TIME_SLOT_INTER
FLASH_CS
FLASH_SDO
FLASH_SCK
FLASH_SDI
LCD_SLK
LCD_SLD
DMR_SLEEP
RX_LED
TX_LED
SCL
SDA
BAT+
3V3

POWER CIRCUT




5T
R543 22R
C571 104
R545 1K
L519 68nH
C572 102
C570 102
R542 1K
L518 68nH
C574 12P
L548 4.7nH
Q502 RD01MUS2
L520 39nH
C580 102
L523 27nH
Q501 RD07MUS2B
C589 NC
L534 3T
C587 56P
L535 4T
C590 3P
L526 4T
C593 100P
D501 HVU131
C507 102
C505 10P
C503 7P
C501 12P
J501 ANTENNA
TP502 ANT
L501 1uH
TP503 GND
C586 3P
C588 24P
C591 3P
C592 2P
C722 103
R541 4K7
C568 18P
Q503 2SC3356
C575 5P
R551 150R
L521 1uH
L524 6T
R554 100R
R556 390R
R595 390R
C595 104
C594 102
C596 104
C597 103
C598 102
R553 82K
R552 33K
C585 103
C582 102
C581 47P
C579 NC
C566 470P
R537 15R
C564 15P
R539 22K
Q504 2SC3356
C569 NC
R547 4K7
R548 47R
C573 102
R563 NC
R536 8K2
R538 8K2
C577 104
R550 47K
R549 10K
L522 BLM21PG221S
L525 BLM21PG221S
C578 470P
C584 102
D523 NC
C599 22uF/10V
U505 UMC4N
RF_APC_SW
BAT+
C509 22P
D504 MA2S077
D505 MA2S077
D510 MA2S077
LO
D511 MA2S077
RX_VCO
R588 4K7
C724 103
R571 100R
C532 104
R570 2K2
C705 473
C704 270P
C706 103
R569 2K7
R568 270R
C708 56P
R562 150K1%
R567 1M5
R561 0.39R
R560 0.39R
R559 0.39R
C718 103
C719 470P
R701 27K
APC/TV
R574 22K
R572 NC
C707 470P
U502 NJM2904V
R702 150K1%
R563 150K1%
R700 1M5
C720 102
C533 470P
L533 39nH
C530 3P
C717 NC
C716 18P
C531 18P
L515 100nH
5R
L528 BLM18AG601S
C547 104
R516 47R
C536 103
R513 100K
R510 100K
C548 104
R521 470R
C546 103
R520 1K
C537 103
C538 102
L514 470nH
L513 560nH
R515 2K2
R511 56K
R514 56K
R519 560K
C544 103
R518 100R
XF501 49.95MHz
R517 100R
C540 103
C543 NC
C541 3P
C542 12P
C539 7P
Q506 3SK318
C529 100P
R512 180R
C535 103
L536 27nH
RX TP701
C528 10P
C560 470P
R504 100K
R503 100K
C561 102
R581 100K
C527 10P
C728 10P
C729 56P
C730 56P
L512 27nH
D507 HVC382
D508 HVC382
L511 27nH
D513 HVC382
C526 8P
C727 56P
C524 100P
C723 22P
C726 NC
L532 120nH
C525 220P
C725 12P
R507 2R7
L530 27nH
C513 15P
L509 390nH
C523 102
C519 100P
Q505 AT41511
R508 330R
R505 4K7
C520 104
C521 102
R575 4K7
C518 47P
R506 6K8
C731 15P
L508 56nH
D512 RB706F
C517 102
C516 15P
D506 HVC382
C721 22P
L507 27nH
C515 10P
C715 22P
D509 HVC382
L506 27nH
C514 7P
R502 100K
R501 100K
C563 470P
C562 102
C510 22P
Q511 DTA143ZETL
Q510 DTC144EE
W/N_SW
FD501 C2445D
R522 1k6
C559 104
R555 1k8
C545 33P
C550 120P
RSSI
BUSY
R535 1K
R533 1K
450_IF
AF_OUT
C549 223
C551 104
U501 GT3136
C555 102
R523 4K7
C556 223
C554 470P
R525 180K
R524 27K
2ND_LO
R527 180K
C553 470P
R526 3K3
C552 104
R528 10R
C534 103
E-C558 10uF/10V
C557 103
CF501 ELFY450H
DMR_VCC
U503 UMC4N
C710 105
C711 102
R531 470R
R530 1K
C713 103
R529 750K
C709 104
Q509 2SC3356
IF_OUT
L531 BLM18AG601S
C712 105
DMR_SW

PLL&VCO Circuit

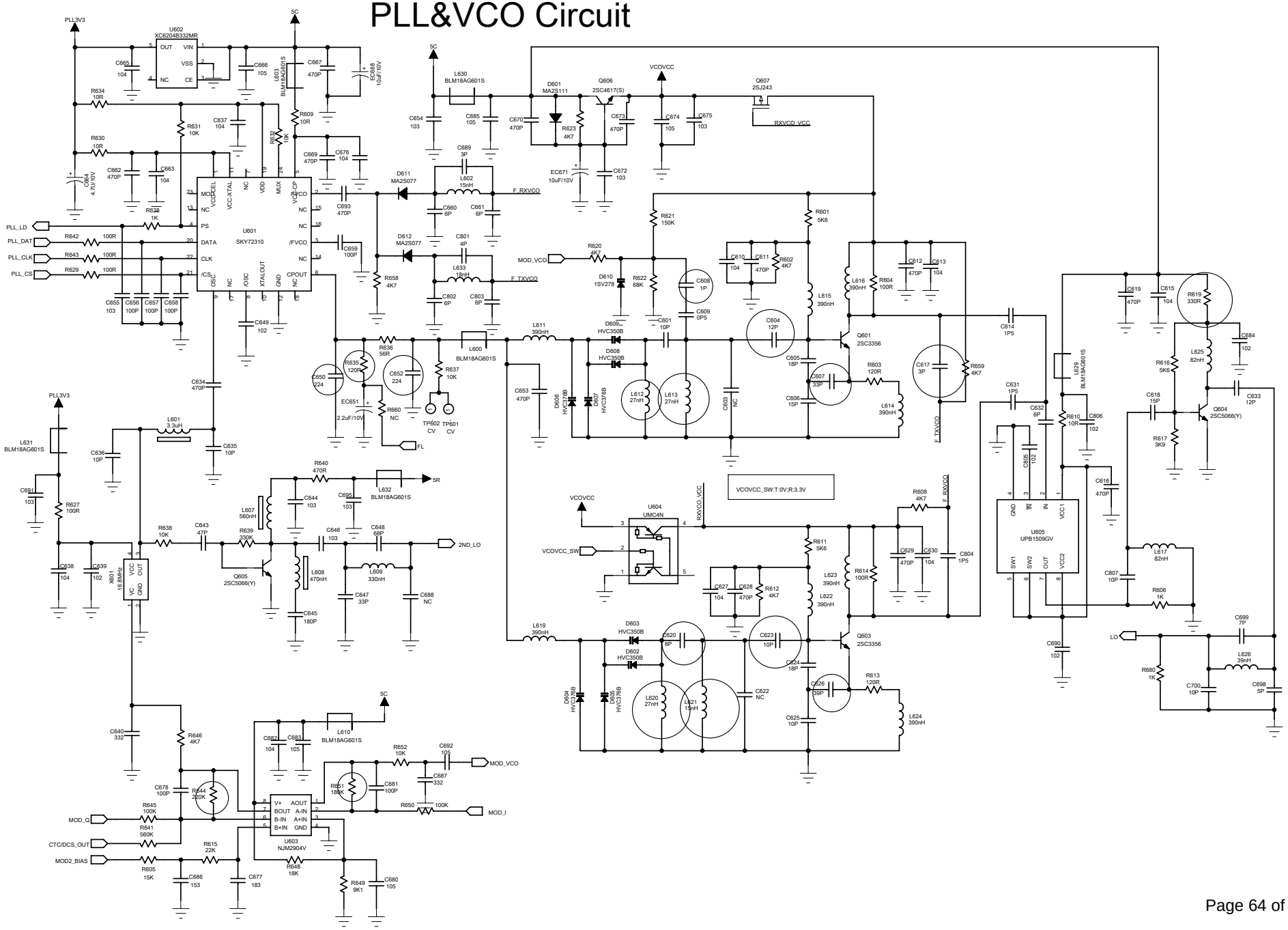


Figure 6 TP660 Keyboard Schematic Diagram