DP480
SERVICE MANUAL

Contents

1. Overview

1.1. Range of Application

This manual is intended for the maintenance of DP480 frequency-modulated handheld two-way radio, and can be used only by the engineers and professional technicians trained by Kirisun. The parameters in this manual are subject to change because of technology improvement. For the latest information, please contact Kirisun or your local dealer.

Please carefully read this manual before repairing the radio.

1.2. Safety Precaution

Electromagnetic Radiation

A two-way radio generates and radiates electromagnetic energy. Kirisun two-way radios strictly conform to Chinese and international standards of electromagnetic radiation. To ensure ideal communication and human safety, please keep the device vertical to the ground and keep the microphone 2 ~ 5cm away from the mouth while using the radio.

Electromagnetic Interference

To avoid electromagnetic interference, turn off the radio in a place where you are so instructed, for example, a hospital, a health center and an airport.

Explosive Gases

You'd better shut down the radio when you are in an area with explosive gas (for example, the lower deck of a hull, a container or transport facility of fuel oil or chemicals) or with chemical or particles, dust or metallic dusts in the air, or near a blast area or an electric blasting detonator. Replacing or recharging the battery in potentially explosive atmospheres is prohibited.

Damaged Antenna

You are suggested not to use the radio if the antenna is damaged. A damaged antenna may cause mild burns when contacted with human skin.

Battery Life

To prolong the service life of the battery, avoid fully discharging the battery frequently. Please charge and discharge the battery repeatedly if it will be not used for a long time. For satisfactory performance and safety, you are suggested to replace the battery every two years.

Part Replacement

Pay attention to the model while replacing a part. Do not use a component not meeting the requirements of Kirisun.

1.3. Maintenance Service

Warranty service is provided to the radio and the accessories, except in any of the following situations.

- No provision of a valid warranty card or an original invoice

- Malfunction due to unpermitted disassembly, repair or modification

- Damage of the product due to wear, mechanical damage, burn or inlet of water

- Damaged product SN. or unidentifiable brand

Paid maintenance service will be provided after the warranty period. Meanwhile, we offer parts to authorized maintenance stations and dealers at preferential prices, except those of discontinued products).

2. External View and Keys

2.1. External View
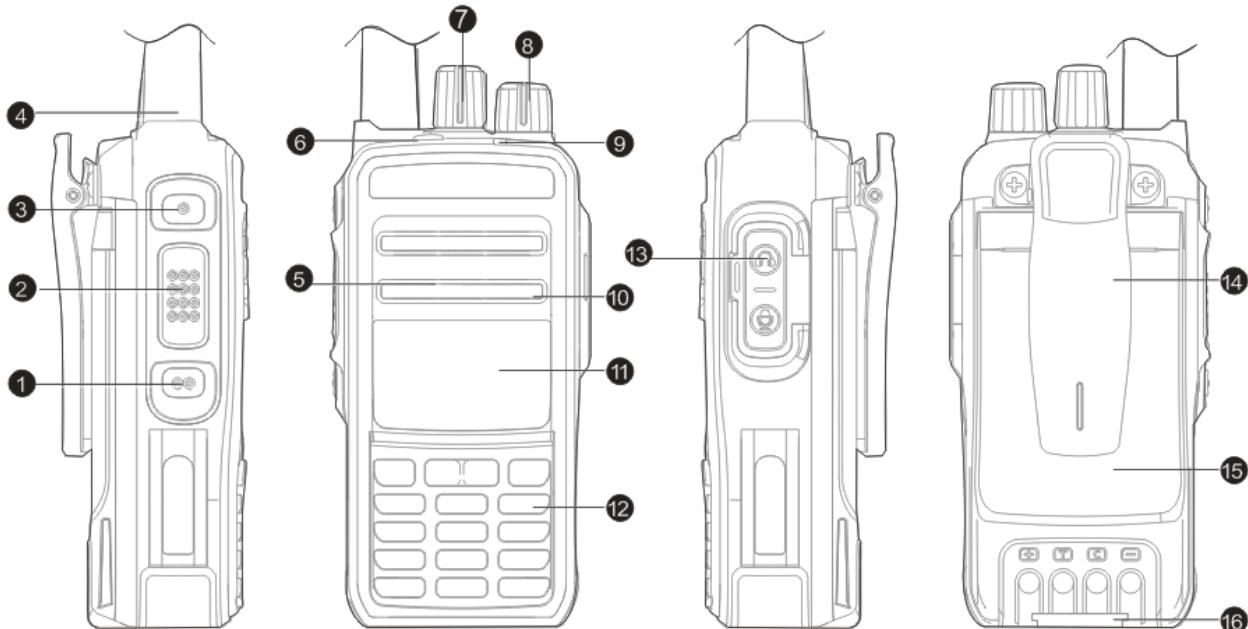
NO.	Description	NO.	Description
1	Lower Side Key (Programmable) Programmable by a dealer to achieve various functions. See 2.2 Programmable Keys.	9	LED Indicator Red light on: The radio is transmitting signals. Green light on: The radio is receiving signals. Flashing red light: The battery is low.
2	PTT Key Press it to make a call and talk.	10	Microphone Input voice.
3	Upper Side Key (Programmable) Programmable by a dealer to achieve various functions. See 2.2	11	LCD screen

	Programmable Keys.		
4	Antenna	12	Digital Keys
5	Speaker Output voice.	13	External Interface Connect to an external earphone or programming cable
6	Programmable Key (Usually Alarm Key)	14	Belt Clip
7	Channel Knob Rotate it to select one from the channels 1 to 16.	15	Battery
8	Power/Volume Knob Turn it clockwise until a click is heard to power on the radio. Turn it counterclockwise until a click is heard to power off the radio. When the radio is on, turn it to regulate the volume.	16	Battery Latch

2.2.Programmable Keys

To cater to users' habits of operating the radio, programmable keys (i.e. side keys) are provided, which can be configured as shortcut keys through programming by the dealer.

Note:

- *Press: Press down and release quickly.*

- *Press and hold: Press down and hold still for a period, which is set through the CPS (customer programming software).*

NO.	Programming Function	Function Description
1	None	The radio does not respond when this key is pressed.
2	Battery Level Announcement	Announce the current battery level.
3	High/Low Power	Switch to high/low power.
4	Broadcast Call	Initiate a broadcast call.
5	Monitor	Switch to carrier squelch mode (i.e. cancel CTCSS) when the selected analogue channel is CTCSS enabled. If carrier is matched, voice will be output.

NO.	Programming Function	Function Description
		To go back to the previous state, press the key again.
6	Emergency On	Send an emergency alarm. It is used to seek help under emergency.
7	Emergency Off	Exit emergency alarm.
8	Squelch On/Off	Under analogue channel, open voice reception path to receive weak signals. Under digital channel, no response when this key is pressed.
9	Zone Selection	Switch to next zone.
10	Scan	Start/stop scanning other channels and receive traffic from them.
11	Alert Tone On/Off	Enable/disable all alert tones.
12	Nuisance Delete	Delete an unnecessary channel (e.g. interference channel) dwelled on during scan, and then continue scan.
13	Repeater/Talk Around	On a repeater channel, press it to enter/exit repeater mode.

2.3.LED Indicator

LED Indication	Radio State
Red light on	Transmitting signals.
Green light on	Receiving signals.
Red Light Flashing	Low battery. Please charge it.
Green Light Flashing	Scanning channels
Orange Light Flashing	In call hold state under digital mode. Exit when hold time is up.
Orange Light on	The channel unusable. Switch to another channel to quit.
Red Light Flashing Fast	CPS is reading configurable parameters of the radio.
Green Light Flashing Fast	CPS is programming configurable parameters of the radio.

3. Basic Operation

3.1. Powering On/Off

To power on the radio, rotate the Power/Volume knob clockwise until a click is heard.

To power off the radio, rotate the Power/Volume knob counterclockwise until a click is heard.

3.2. Selecting a Channel

When the radio is on, rotate the Channel knob to select a channel.

3.3. Adjusting Volume

When the radio is on, rotate the Power/Volume knob clockwise to increase the volume or counterclockwise to decrease it.

3.4. Initiating a Call

If the selected channel is digital, you can call the default contact for the selected channel by pressing the PTT key. This contact can be set by the dealer through programming.

3.5. Receiving a Call

When the radio receives RF signals on the selected channel and the squelch level is reached, the green LED glows to indicate that carrier is received.

When the selected channel is digital channel and when it received individual call, group call or all call, the radio will output the voice from the channel.

When the channel is analogue channel and when it received analogue signals with CTCSS matching the one on this channel (or there is no CTCSS set on the channel), the radio will output voice form the channel.

3.6. Calling Back

When the selected channel is digital channel and after a call is received, press the PTT button within the calling duration to call back. If the calling duration is up, you need to initiate a call. The calling duration can be set by the dealer.

When the selected channel is analogue channel and after a call is received, press the PTT button and speak to the microphone to call back.

4. Circuit Description

4.1. Circuit Diagram of Main Board
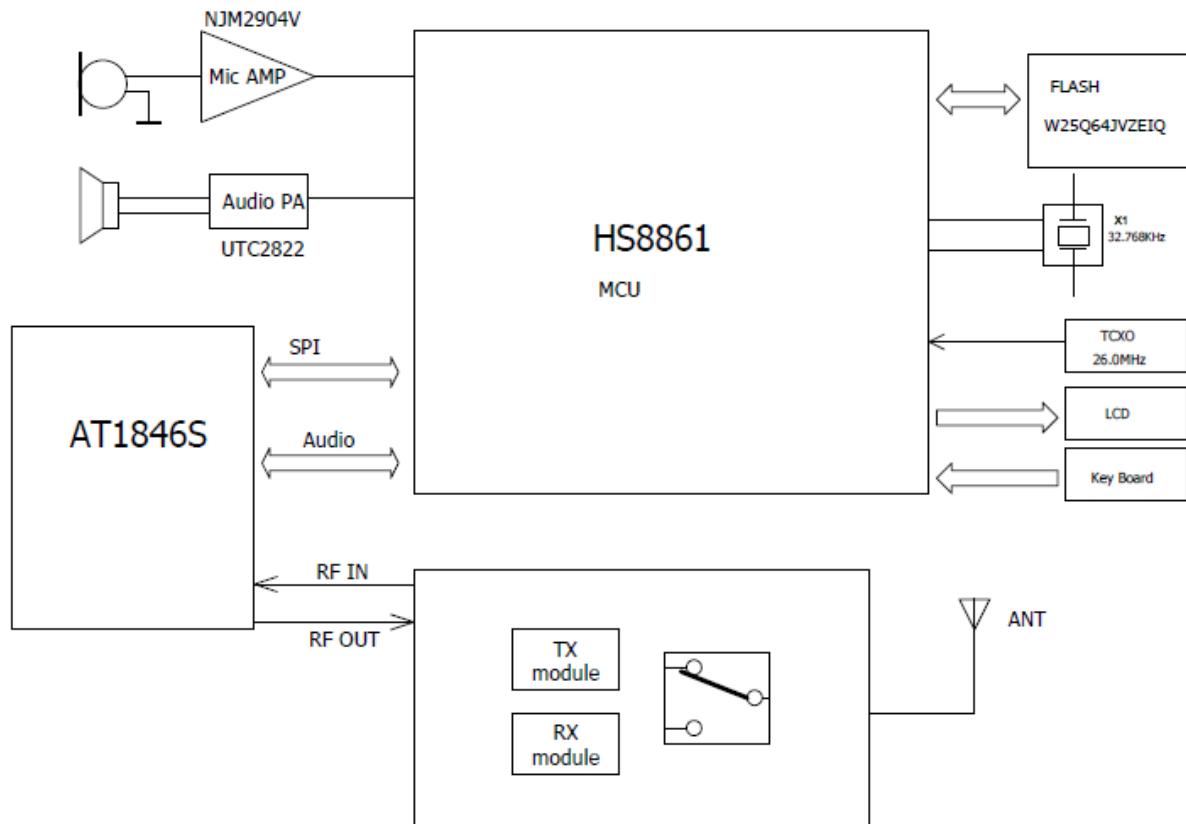
4.2.RF Circuit Diagram
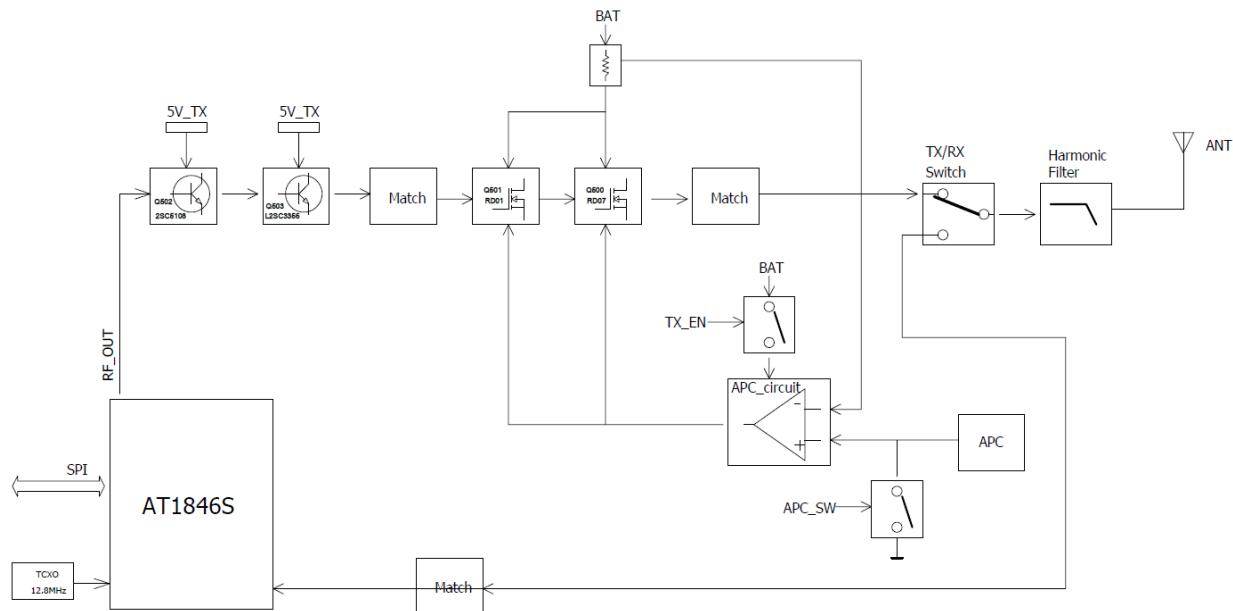
4.3.Baseband Circuit Diagram
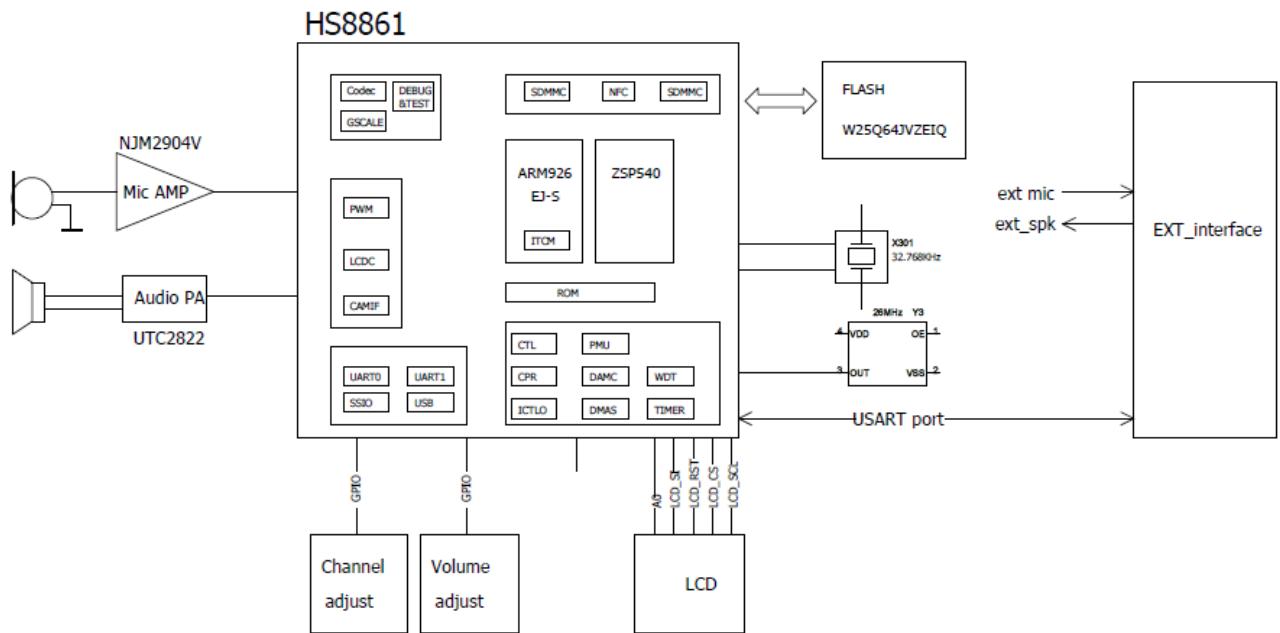
4.4.TX Circuit

The TX circuit includes an RF power amplification circuit, a low pass filter circuit and an automatic power control circuit.

● RF Power Amplification Circuit

RDA1846S outputs RF signal from pin 18 and enters first-level pre-drive amplifier (Q502) for initial amplification; then it enters second-level pre-drive amplifier (Q503) and drive amplifier (Q501) for further power amplification, ensuring sufficient drive power signal can be offered to final amplifier for ultimate power amplification; after amplification by multiple amplifiers, the transmitted signal will complete the output impedance match at the output terminal of final power amplifier through a section of microstripe, so as to minimize output power loss from impedance match failure; afterwards, the transmitted signal will enter the low pass filter through TX/RX switch.

● Low Pass Filter Circuit

The low pass filter which suppresses harmonic wave is an advanced Chebyshev filter composed of lumped parameter inductor and capacitor. On a certain basis of in-band fluctuation, the filter can improve suppression to out-of-band harmonic wave and spurious signal.

● Automatic Power Control Circuit (APC)

In the automatic power control circuit, the drain current from drive power amplifier and final power amplifier completes switch from current to voltage through the sampling resistor and subtraction circuit which is made of the first operational amplifier; the voltage will be compared with the APC control voltage output from DAC at the second operational amplifier, and the error voltage that is output will change the transmitting power through the grid bias voltage of the control power amplifier tube (including the drive level and final level).

4.5.RX Circuit

The RX circuit is mainly composed of RF low pass filter, RX/TX switch, low noise amplifier, AT1846S, HS8861 and audio power amplifier.

● RX Circuit Front-end

The signal from antenna is sent though RX/TX switches (D500, D501, D502 and D503) to the U500 (AT1846S) for demodulation and output.

● RX Circuit Back-end

The analogue/digital signal which is demodulated and output by AT1846S, after completing demodulation and processing of digital signal through DSP in HS8861, will be input to digital audio processor module for further processing, and then be switched to analogue voice signal through DAC of codec; the analogue voice signal will finally be amplified by external audio amplifier to drive the speaker.

4.6.Power Section

RF PA

Audio PA

RDA1846S

PMU

3M

3C

USB 3V3

DC-DC 3.6V

Battery

Fuse Switch

LDO- 5V

Q102 5T

Q100 5R
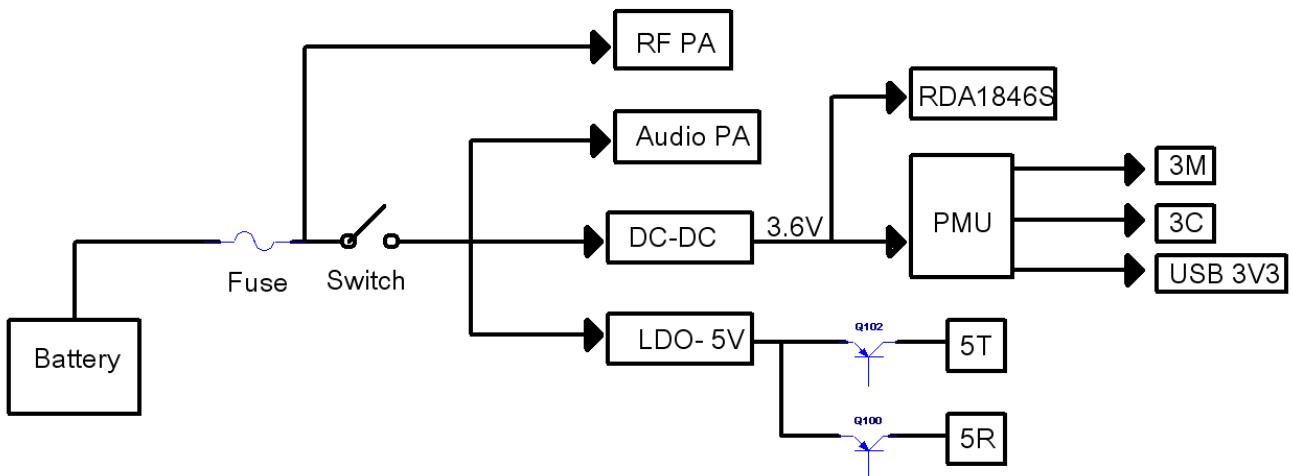
The radio applies 7.4V lithium-ion battery for power supply. RF power amplification and audio power amplification are directly powered by battery; the battery outputs 3.6V to supply power to PMU in AT1846S and HS8861 through DC-DC switch; 3M, 3C and USB3.3V output from PMU separately supplies power to other baseband circuits; the battery outputs 5V voltage through LDO and then outputs separate 5T and 5R after control by Q100 and Q102.

RF PA: RF Power Amplifier Circuit Q500 (RD07MUS2B), Q501 (RD01MUS2)

Audio PA: Audio Power Amplifier Circuit U3 (TDA8547TS)

3M: EEPROM IC200 (AT24C512C)

3C: Transistor X500 (12.8M TCXO)

5T: RF Pre-drive Amplifier Circuit Q502 (2SC5108), Q503 (2SC3356)

DC-DC: PMU IC1 (HS8861), U500 (RDA1846S)

4.7.IC Description

4.7.1.Features of AT1846S

a. Integrated CMOS RF front-end

b. High linearity low-noise amplifier and mixer

c. Low IF receiver path

● Automatic DC offset calibration circuit

● High performance analogue/digital converter and digital/analogue converter

● Fully-integrated receiver filter

● Digital AGC

● Modulation and demodulation technique based on digital signal processing technology

d. TX path of direct frequency synthesis

● Modulation method of direct frequency synthesis

● TX filter based on digital signal processing technology

● TX modulation gain number is adjustable

● Digital voice activates TX control

e. High-performance fractional PLL frequency synthesizer

● Fully-integrated in-chip RF VCO

● Fully-integrated internal loop filter

● Low phase noise

● Fast lock of phase

● High-frequency resolution with random frequency adjustable

● Built-in transistor frequency error calibration circuit

f. Sleep mode of ultra-low loss

g. Three wire serial digital interface control

4.7.2.Port Description of AT1846S

AVDD	1	Power supply
SCLK	2	Clock input for serial control bus
SDIO	3	Data input/output for serial control bus
AVDD	4	Power supply
XTAL1	5	Oscillator pin 1
XTAL2	6	Oscillator pin 2,control interface select
MODE	7	When MODE = VL, I2C Interface is select; When MODE = VH, SPI Interface is select
SENB	8	Latch enable (active low) input for serial control bus
AFOUT	9	Audio signal output to speaker
NC*	10	No connection

MIC_IN	11	MIC input
Cc	12	Compensation capacitor connection
AVDD	13	Power supply
NC*	14	No connection
RFIN	15	RF signal input
AVDD	16	Power supply
NC*	17	No connection
RFOUT	18	RF signal output
NC*	19	No connection
NC*	20	No connection
AVDD	21	Power supply
PABIAS	22	PA bias supply for PA
AVDD	23	Power supply
PDN	24	Chip enable, high active; Chip sleep, low active
GPIO7	25	Gpio7/vox (When Gpio7=VH, vox is active; else VL)
GPIO6	26	Gpio6 / sq (When Gpio6=VH, sq is active; else VL)
GPIO5	27	Gpio5 / txon (When Gpio5=VH, txon is active; else VL)
GPIO4	28	Gpio4 / rxon (When Gpio4=VH, rxon is active; else VL)
GPIO3	29	Gpio3 / sdo (Gpio3=VH or VL, it is the output register data in 4 wire control Interface mode)
GPIO2	30	Gpio2 / int (When Gpio2=VH, int is active; else VL)
GPIO1	31	Gpio1 / code_in / code_out

		(Gpio1=VH or VL, it is the input/output code data)
GPIO0	32	Gpio0 / css_in / css_out (Gpio0=VH or VL, it is the input/output CTCSS/CDCSS signal)

4.7.3.Port Description of Master Chip HS8861

PIN NO.	Port NO.	Port Name	Function
E11	GPIO_D44	NC	NC
J19	BSENS	MAND_IN	IC level input under Man Down state
L22	ADC_IN	BAT_DET	Battery capacity detection
W13	GPIO_D7	PF	Input from side key
R14	GPIO_D6	BEEP_C	Switch of voice receiving / alert tone
W14	GPIO_D101	EERROM_WP	EEPROM
AA17	GPIO_D24	ECN_3	Channel switch
AB17	GPIO_D23	ECN_2	Channel switch
V15	GPIO_D11	KEYPAD5	4*4 keys
V16	GPIO_D99	KEYPAD3	4*4 keys
V17	GPIO_D100	MAND_C	IC power supply control under Man Down state
AA18	GPIO_D22	EXT_PTT	External PTT
U18	GPIO_D98	KEYPAD2	4*4 keys
V19	GPIO_D96	KEYPAD0	4*4 keys
U19	GPIO_D13	KEYPAD7	4*4 keys
T19	GPIO_D14	NC_GPIO	NC
U21	GPIO_D12	KEYPAD6	4*4 keys
T21	GPIO_D97	KEYPAD1	4*4 keys
V22	GPIO_D10	KEYPAD4	4*4 keys
F5	GPIO_D112	LCD_RS	LCD

PIN NO.	Port NO.	Port Name	Function
AB19	LCD_CS1	LCD_RST	LCD
L21	SSI0_RX	SSI0_RX	FLASH
P21	SSI0_TX	SSI0_TX	LCD/FLASH
N21	SSN0	LCD_CS	LCD
M21	SSN1	FLASH_CS	FLASH
F6	GPIO_D111	NC	NC_GPIO
R21	SSI0_CLK	SSI0_CLK	LCD/FLASH
A12	VOUT_D9	VIO_3V_C	PMU_3V output
J14	GPIO_D76	UART_RXD0	Serial port 0
J15	GPIO_D75	UART_TXD0	Serial port 0
F22	BAT_DET	BAT_DET	Battery detection
J18	GPIO_D25	UART_TXD1	Serial port 1
H18	GPIO_D26	UART_RXD1	Serial port 1
E17	GPIO_D74	TONE_OUT	Output alert tone in PWM mode
E18	VSB	BATTERY	Access of clock to button cell battery
E21	SINK1	NC	NC
D23	SINK2	NC	NC
C18	GPIO_D88	I2C_SDA	EEPROM
A17	VOUT_D2	3M	PMU_3M output
C17	GPIO_D87	I2C_SCL	EEPROM
E14	GPIO_D49	NC	NC
C14	GPIO_D51	AFCO1	Audio power amplifier MUTE
E13	GPIO_D48	5TC	5TC
A13	VOUT_D3	3C	PMU_3M output
C13	GPIO_D52	DACS_SW1	DA_MCP4802

PIN NO.	Port NO.	Port Name	Function
B13	GPIO_D47	5RC	5RC
E12	GPIO_D50	LDAC_PC/TV	DA_MCP4802
C12	GPIO_D53	AFCO2	Speaker output MUTE
A11	GPIO_D46	RDA_PDN	RDA1846S
A10	GPIO_D58	SPI/CS	RDA1846S
F11	GPIO_D2		NC_GPIO
B11	GPIO_D57	SPI/CLK	RDA1846S
B10	GPIO_D56	SPI/DA_OUT	RDA1846S
F10	GPIO_D0	RDA_SQL	SQL
E10	GPIO_D3	KEYPAD_BL	Backlight control
K18	GPIO_D107	NC	NC
B9	GPIO_D21	ECN1	Channel switch
A8	GPIO_D18	GREEN_LED	Green LED control
B8	GPIO_D16	PTT	PTT
A7	GPIO_D19		NC_GPIO
B7	GPIO_D20	ECO_0	Channel switch
C7	GPIO_D17	RED_LED	Red LED control
C3	AUX_OUTP	SPK+	Audio output after demodulation by HS8861
D3	AUX_OUTN	SPK-	NC
D1	M_MICP	AFDET	Transmit to HS8861 after reception and demodulation by AT1846S
D2	M_MICN	NC	NC
E2	HP_MICN	MIC1	Transmit MIC signals to HS8861
H5	DM	USB_DM	USB
J5	DP	USB_DP	USB

PIN NO.	Port NO.	Port Name	Function
L1	HPL_OUT	MOD1	Output digital MIC signals
M1	HPR_OUT	MOD2	NC
D21	SINK3	NC_SINK3	NC
B12	GPIO_D45	NC	NC
C11	GPIO_D55	NC_GPIO	NC
A9	GPIO_D59	APC_SW2	APC_SW2
C9	GPIO_D105	NC_GPIO	NC
C8	GPIO_D43	APC_SW1	APC_SW1
F15	GPIO_D8	NC_GPIO	NC
F14	GPIO_D9	QT/DQT IN	QT/DQT IN
F13	GPIO_D1	LCD_BL	LCD backlight control

4.7.4.Feature Description of Semiconductor Devices

Component NO.	Model	Description
IC500	NJM2904	APC, voltage comparison, drive
U21	HS8861	MCU
IC200	24LC512	E2PROM, saves channel frequency data, feature parameters and modulation parameters
U3	TDA8547TS	Receiver audio power amplification
Q500	RD07S2B	TX final power amplification
Q4	DTA144EE	APC output switch
Q200	DTC144EE	Red LED driver
Q201	DTC144EE	Green LED driver
Q501	RD01MUS1	Transmitter power amplifier drive
Q601	DTC144EE	Audio power amplifier control switch

IC100	XC6204B502 MR	5R, 5T voltage output
IC102	MP2359	3.5V voltage DC-DC output
U20	MCP4802	DA chip, used for modulation of power and frequency stability
IC302	NJM2904	Operational amplifier for MIC signals

5. Feature Description and Parameter Setting

5.1. Stun, Revive and Remote Monitor

Stun

You can enable this function, so that the radio can be stunned after receiving a Stun command. A stunned radio can only receive a Revive command but cannot send or receive other signals.

Revive

You can enable this function, so that a stunned radio can be revived after receiving a Revive command. After the radio is revived, it can operate normally again.

Remote Monitor

When the radio receives Remote Monitor command, it will automatically turn on the transmitting and the monitoring party can listen to the surroundings around the monitored radio.

5.2. Scan

Enabling Scan

Press the Scan programmable key to enable Scan and listen to activities on other channels. Press Scan key again to exit Scan.

Scan List

Each channel can be related to one "Scan List" though dealer programming. The radio can only start Scan on channels related with "Scan List". Each "Scan List" contains a maximum of 16 channels (including the current channel), and both analogue channels and digital channels can be contained. By selecting "Scan List" menu, you can check the scan channels included in the "Scan List" used by the current channel.

Note:

If the scan channels in the list are changed, other channels which are related with the same list will be affected during channel scan.

Nuisance (Temporary) Delete

During scan, when the radio stops on an unnecessary channel, e.g. interference channel, it can select

Nuisance Delete to delete this channel before it goes on scanning. You can also add a temporary channel during scan. After exiting scan mode, the channel which is temporarily deleted or added will turn invalid.

Scanning Revert Channel

During radio scan, press the PTT key to enable the radio to transmit or talk on the preset channel. This channel can be set by local dealer using programming software.

Prior Scan

If a priority channel is set in a scan list, the channel will be scanned in cycle, i.e. being scanned once before each common channel is scanned. For example, if a scan list has channels 1, 2, 3 and 4 with channel 2 set as a prior channel, the scan order will be 1 → 2 → 3 → 2 → 4 → 1.

5.3.Zones

A group of available traffic channels constitute a zone. Please select a zone by pressing a side key.

5.4.Setting

The radio can be set to cater to your habits or meet your needs. Settings include power, squelch level, alert tones, sleep mode, CPS password and speech encryption, and they may vary for different dealers.

Power

Under high power, communication distance is longer but battery life is shorter; under low power, communication distance is shorter and battery life is longer. You can set a power level for each channel.

Squelch Level

You can set the squelch level of the radio to any of 0 to 9. The higher the squelch level is, the more noise interference there will be and the harder to receive weak signals.

Alert Tone

You can enable or disable various alert tones via the PC Tool.

Microphone Gain

Microphone gain is the value based on which an audio level is amplified. You can adjust volume by setting a microphone gain. The higher the gain is, the higher the volume will be.

Note:

To avoid speech distortion, do not set a too high gain.

Power-saving Mode

You can enable this mode to enable the radio to automatically enter power-saving mode if it has not transmitted or received carriers for a set period. In this mode, fewer programs are run and less battery is consumed, so that battery life is prolonged.

CPS Password

You can set a password for the CPS (customer programming software).

Speech Encryption

You can enable/disable speech encryption for the current channel, so that speech is sent after encryption.

5.5.TOT (Time-Out-Timer)

This function is to prevent overlong channel occupation. If the radio keeps transmitting signals for a duration longer than the one set by a dealer through programming, the radio will stop transmitting and warning tone will ring. To stop the tone, release the PTT key. You can transmit again after a period (set by a dealer) by holding down the PTT key.

If early warning is enabled, you will receive an early warning of transmission halt when time is nearly out.

5.6.Emergency Alarm

Under emergency, you can send an emergency alarm by pressing the side key programmed as the Emergency Alarm key. Please specify acousto-optic effect by setting an alarm type and the content to send to other radios in the group by setting an alarm mode.

You can have these settings done by a local dealer through programming. To quit emergency alarm, press the side key programmed as the Quit Emergency Alarm key.

Alarm Types

1) Siren Only —— After the radio enters the emergency state, the siren only sounds locally and the control center will not receive any alarm signal.

2) Regular —— The radio sends emergency alarm and audio-video alert.

3) Silent —— The radio sends emergency alarm but no audio-video alert. When the radio receives speech signals, the speaker will not be turned on until the PTT button is pressed.

4) Silent with voice —— The radio sends emergency alarm without audio-video alert. When the radio receives speech signals, there will be no audio-video alert until the PTT button is pressed.

Alarm Modes

1) Alarm: The radio sends an emergency alarm and then quits alarm mode.

2) Alarm with call: The radio sends an emergency alarm can initiates an emergency call by holding down the PTT key.

3) Alarm with voice to follow: The radio sends an emergency alarm and then sends background tone periodically.

Note:

An emergency alarm is non-speech signals sent from a radio in a group to other radios in the group, so that alarm prompt will be given off on these radios.

To guarantee communication under emergency, an alarm call has a higher call priority than a common call does.

5.7.Settings

The radio has been set before delivery. However, to meet customers' requirements, it may be necessary to set such digital functions as operating frequencies, channels, DT/DQT and automatic scan. This can be achieved by the programming software CPSM Vx.xx developed by Kirisun. It is user-friendly and easy to operate, and supports Chinese and English.

To set the parameters of the radio using the software, take the following steps.

Step 1. Install the CPS software on your PC.

Step 2. Connect the radio to the PC using the programming cable.

Note:

   Make sure the radio is powered on.

Step 3. While connecting the programming cable for the first time, please install its driver.

PC	⟺	Programming Cable	⟺	Radio
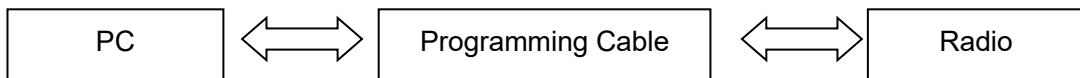
Step 4. Run the CPS software Kirisun CPSm_VX.XX.

Step 5. Click Setting → Communication Port, and select the serial port to which the programming cable is connected.

Step 6. In the software, select Program → Read Data. In the prompted dialog box, click Read. The radio parameters will be read.

Step 7. In the software interface, modify parameters, select Program → Write Data. In the prompted dialog box, click Write. The radio parameters will be written.

5.8.Upgrade

To upgrade the radio program using the software, take the following steps.

Step 1. Power off the radio. Connect the radio to the PC using the programming cable.

Note:

   While connecting the programming cable for the first time, please install its driver.

Step 2. Double click the upgrade tool as shown below.

   DMR Software Upgrade Tool.exe

Note:

   This tool upgrades firmware while retaining the previous programming and calibration data.

Step 3. The interface as shown below will be displayed.

Step 4. Click "Load file", select the load upgrade file.

The name of the selected firmware is displayed on the upgrade tool interface.

Step 5. Click "Setting", select the communication port number and the data rate "921600".
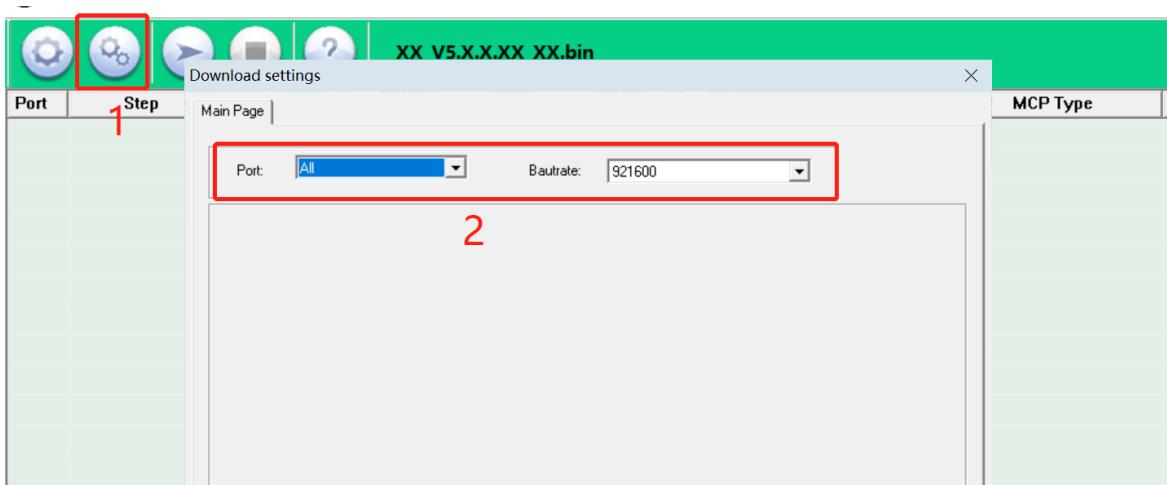
Step 6. Click "Start downloading", start upgrade and the message "Waiting" will be displayed.

Step 7. Make sure the programming cable is connected to the radio, and rotate the "Power/Volume" Knob to power on the radio. Upgrading will be started automatically.
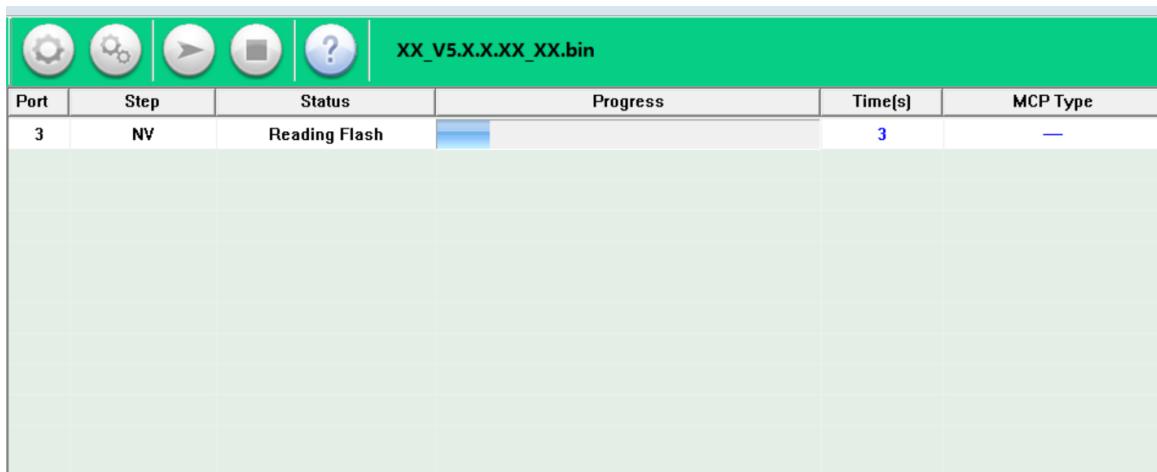
Step 8. After upgrading is finished, "Passed" will be displayed. Click "Stop downloading".
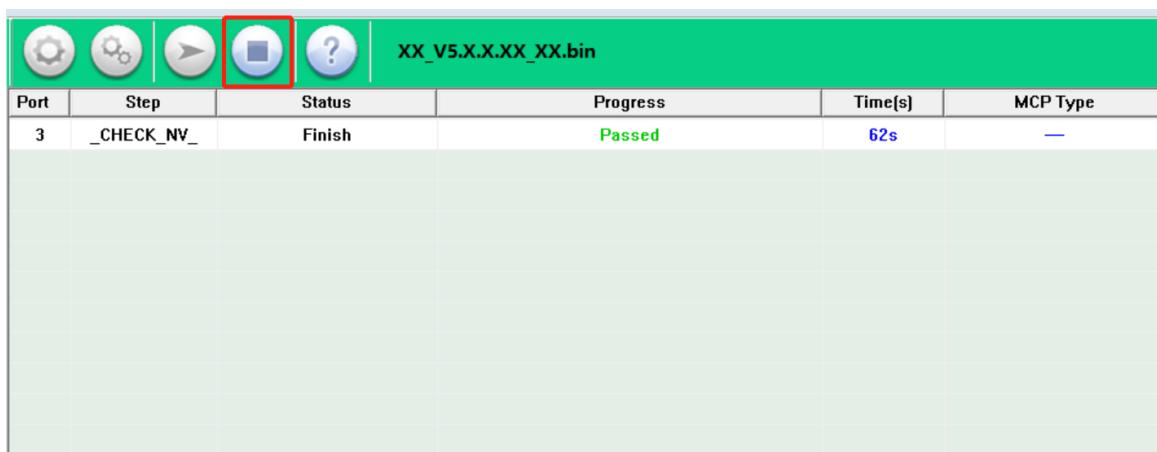
6. Assembly and Disassembly

This radio is a sophisticated communication device with precise and compact structure. Please be careful with the repair.

6.1. Installing and Uninstalling the Battery

Installing the Battery

Step 1. Press the upper part of the belt clip gently so that it goes up. (Figure ①)

Step 2. Align the battery with the battery holder at the back of the radio, and then insert the battery. (Figure ②)

Step 3. Push the battery in the direction indicated until the latch is in position. (Figure ③)

Step 4. Press the upper part of the battery until it is latched. (Figure ④)
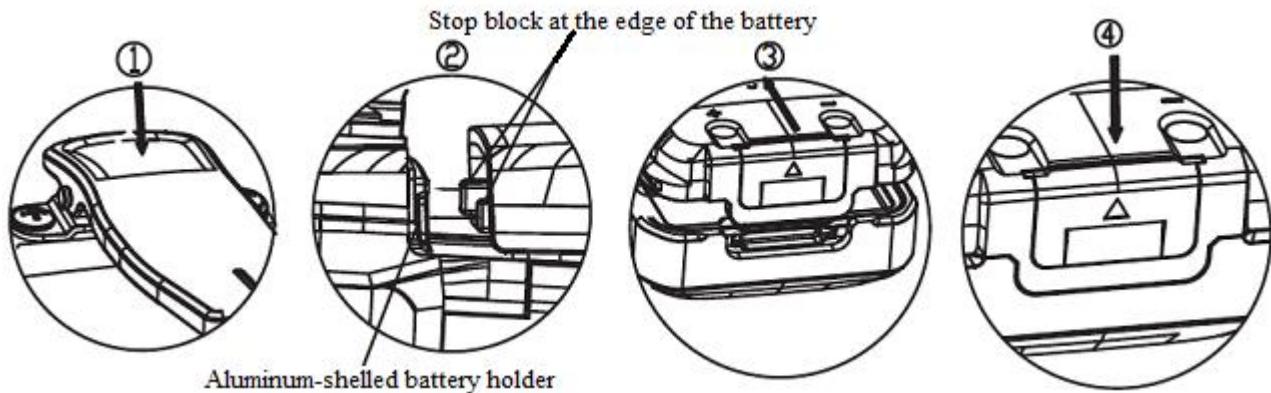
Uninstalling the Battery

Step 1. Power off the radio.

Step 2. Slide the latch in the indicated direction, and the battery will go up. (Figures ① and ②)

Step 3. the battery in the indicated direction to take it down. (Figure ③) If the belt clip is installed, please first press the upper part of it so that it goes up.
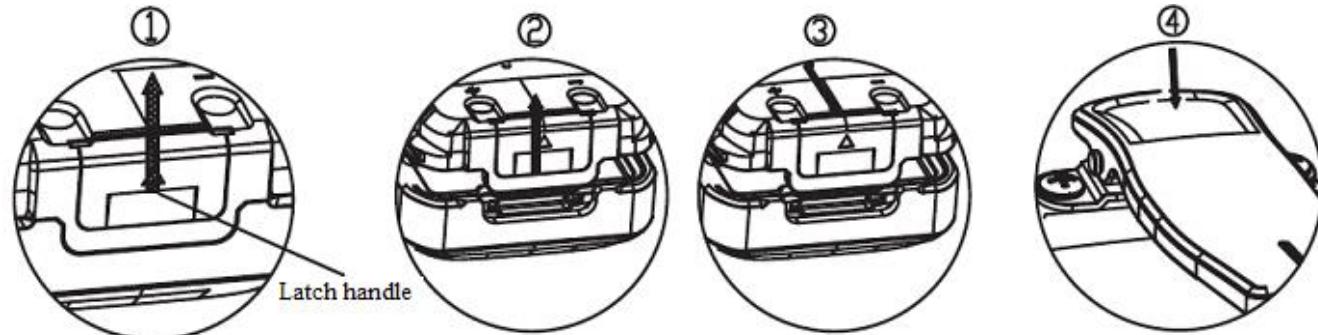
6.2.Installing and Uninstalling the Antenna

To install the antenna, insert the antenna on the top of the radio and turn it clockwise until it is fastened. To uninstall the antenna, turn it counter-clockwise to loosen it.
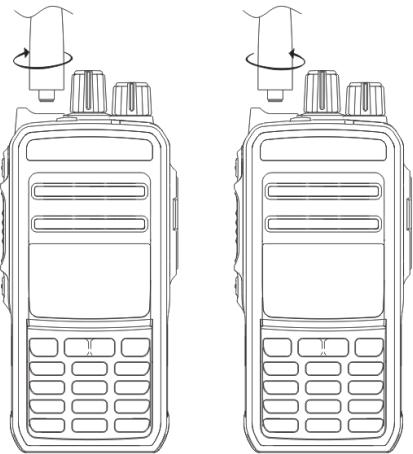
6.3.Installing and Uninstalling Belt Clip

To install the belt clip, align the two screw holes on the belt clip with the two at the back of the radio, and fasten the clip using two 2.5*8 machine screws.

To uninstall the belt clip, loosen the screws, and then take off the belt clip.

M2.5*8 screws for belt clip
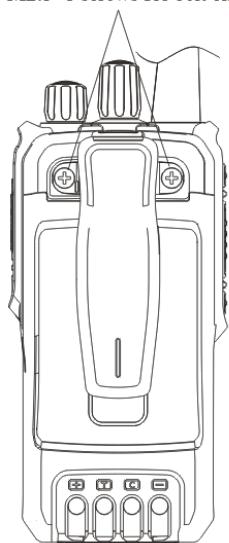
6.4.Using an Earphone

You can use an external earphone. Open the cover board on the right side of the radio, and insert the earphone plug into the interface.
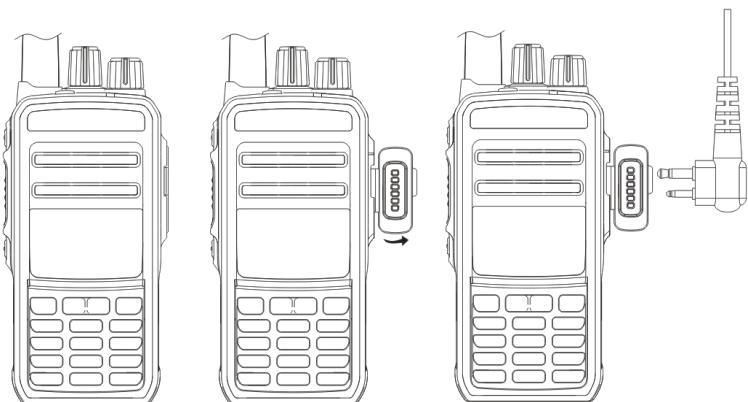
6.5.Detaching Shell from the Base

Step 1. Detach the antenna;

Step 2. Detach the two knobs and circlips;

Step 3. Detach the two knob nuts and antenna nut;

Step 4. Detach the two screws fastening the belt clip;

Step 5. Insert the blade of a straight screwdriver into the battery slot of the aluminum-alloy holder, and prise the holder upwards until it goes up;

Step 6. Hold the aluminum-alloy holder, draw the shell backwards, and then take out the flexible flat cable from the extension socket.
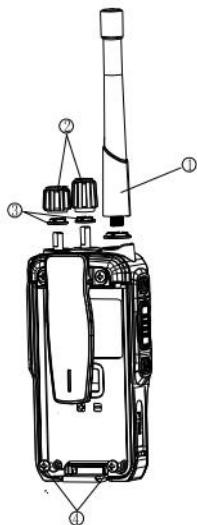
6.6.Detaching Main Board from the Base

Step 1. Detach the two screws on the PTT PCB.

Step 2. Unscrew the seven bolts on the main board.

Step 3. Unsolder the antenna using a soldering iron (or take down the antenna connector nut), and then separate the main board (including the PTT PCB) and the aluminum-alloy holder.

Note:

To protect the welding of the PTT PCB, please take down the board gently.
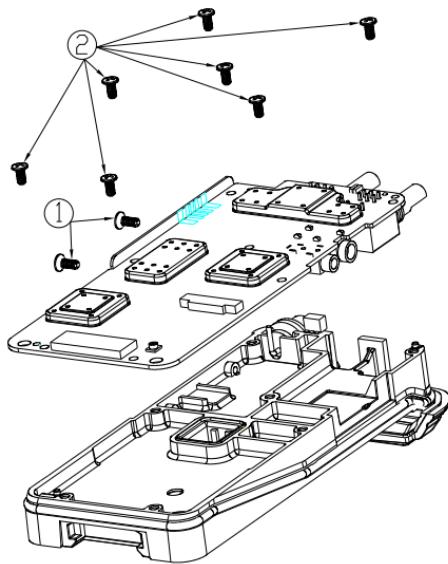
After disassembly, repair and modulation can then be performed.

6.7.Explosion Diagram
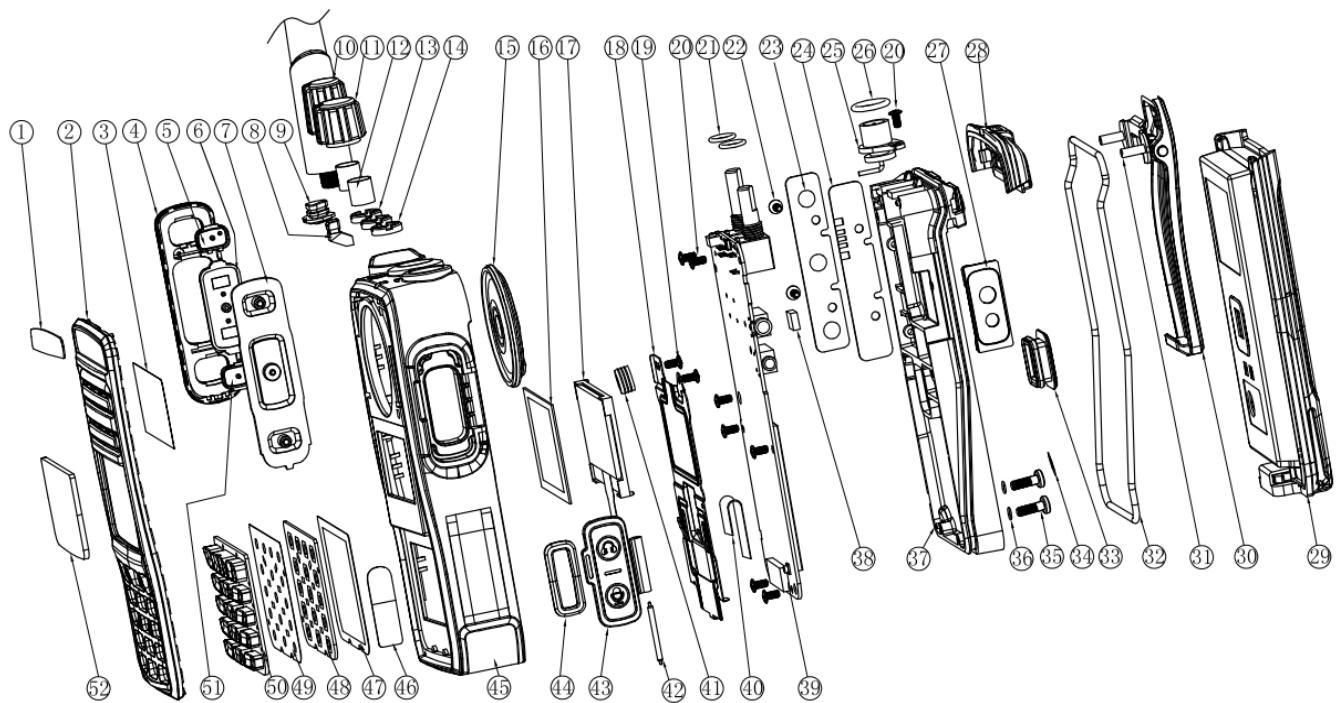
SN	Material Code	Material Name	Specification	QTY
1	7PLJ-4230-E01A	DP585 nameplate	Aluminum-alloy, wire drawing, silver text, lead free	1
2	147K01000060	DP480 front shell cover	PC1414, gray, etched	1
3	7GCB-448280-W0A	Speaker dust screen	Nylon net, 44.8*28.0mm*0.1mm	1
4	7MHP-4207-04A-W0	DP586 PTT cover	PC1414, black, etching	1
5	7MHP-4207-05A-W0	DP586 side key cap (up)	Material: PC1414, black, etched	1
6	7MHP-4207-01A-W0	DP586 plastic PTT key	Material: PC1414, co-molding dual-color, pantone 172c+, black, etched	1
7	7MHR-4207-03B-W0	DP586 silicon PTT key	Silicon rubber, black, hardness 60±5° (5°increased)	1
8	7MHR-4207-05A-WC	DP586 light pipe	Silicon rubber, hardness 60±5°, transparent	1
9	7MHR-4207-04A-W3	DP586 alarm key	Silicon rubber, pantone 172C, hardness 60±5°	1
10	7MHP-4182-02A-W0	DP990 encoding knob	Material: PC1414, black, etched, oiled gray	1
11	7MHP-4182-01A-W0	DP990 volume knob	PC1414, black, etched, oiled gray, lead free	1
12	7MHS-4072-08A-W	STP knob circlip	Stainless steel, T=0.3, original color	2
13	7NRC-4078-01A-N	TP660 antenna connector nut	Brass, black nickel plated, lead free	1
14	7MHC-4072-01A-W	STP knob nut	Brass, inner diameter 6mm, outer diameter 9mm, 2.4mm thick	2
15	157F04000004	Speaker	Φ36mm, H5mm, 16Ω, 1W, with hand microphone and 4-pin terminal, MM3653-1602	1
16	7GCM-411294-J	FP560 sponge mat for LCD screen	PRON, pad added, 41.1*29.4mm, single-sided adhesive	1
17	157F01000006	LCD module	Black-and-white screen, 128*64, ultra-wide temperature range	1

SN	Material Code	Material Name	Specification	QTY
18	7MHS-4245-02A-W	LCD hardware holder	SUS304, 48hr salt spray test passed	1
19	7STF-019047B-SZHT-X	M1.9*4.7 thick-head self-tapping Phillips screw	Material: harden iron, Φ1.9mm*4.7mm, flat-head, with guide, radiant plated	2
20	7SMF-020040M-SZYB-N	M2*4 cross recessed mushroom-head machine screw	Harden iron, Φ2mm*4mm cross recessed mushroom-head nickel plated machine screw, nylok	8
21	7MHR-4072-05A-W0	O-shaped ring of power key	Silicon rubber, outer diameter 8mm, wire diameter 1.5mm	2
22	7SMF-020037M-SZCT-N	Cross recessed countersunk-head machine screw	Harden iron 1018, Φ2.0mm*3.7mm, nickel plated	2
23	7MHS-4207-03A-W	DP586 PTT metal dome array	SUS301, Φ5mm, four-point metal dome	1
24	6PD7-4207-HPC	DP586 PTT plate	0.8mm thick, FR-4, 52X10mm	1
25	3CR7-SMA-50JF-4	RF coaxial cable	SMA-J, flange	1
26	7MHR-4207-06A-W0	DP586 O-shaped ring of antenna pedestal	Material: silicon rubber, outer diameter 11mm, wire diameter 1.5mm	1
27	7MHP-4253-04A-W0	DP485 waterproof pad for earphone jack	TPU, black, etched	1
28	7MHP-4207-03A-W0	DP586 top cover	PC1414, black	1
29	6SS3-DC7258-A	KB-75A battery	7.4V,2000mAh, Li-ion battery	1
30	63BJ000002	KBJ-17 belt clip (S series)	S760/DP405 belt clip	1
31	7SMF-025080M-SZYB-Z	M2.5*8 cross round-and-mushroom headed machine screw	Stainless steel, Φ2.5mm*8mm, black zinc plated, lead free	2
32	7MHR-4207-01A-W3	DP586 waterproof ring	Silicon rubber, pantone 172C, hardness 40±5°	1
33	7MHR-4182-01A-W0	DP990 discharge waterproof pad	Hardness 30, silicon rubber, orange PT172C	1
34	157F15000083	waterproof pad for aluminum shell	Material: white waterproof sound-transmitting membrane with	1

SN	Material Code	Material Name	Specification	QTY
			ventilated lining paper and dual-sided adhesive, diameterφ7.1*φ5.3*0.3mm	
35	7SMS-025075M-SZYB-N1	M2.5*7.5 torx machine screw	M2.5*7.5 torx round-head machine screw, stainless steel	2
36	7MHR-4072-06A-W0	O-shaped ring of power key	Silicon rubber, outer diameter 4mm, wire diameter 1.0mm	2
37	7MHL-4253-01B-W	DP485 aluminum shell	ADC12, surface grinding + sand blasting + paint spraying	1
38	7MHR-7042-06C-W0	Heat-conducting silicon pad	Silicon rubber, black, 3*6*9mm, hardness 20°	1
39	62DI000066	DP480-02 main board PCBA suite	With display module, DMR	1
40	3WF7-05030-500C4	FPC cable	Spacing 0.5mm, 30P, 50mm long, dual connectors, single-face, single-direction	1
41	7MHR-1727-09A-W3	R 558 hand microphone case	Material: silicon rubber, hardness 40°, orange	1
42	7MJS-4038-01A-W0	S760 spindle	SUS304, original color	1
43	7MHP-4253-05A-W0	DP485 earphone cover (with microphone sign)	TPU, black, etched	1
44	7MHR-4253-01A-W3	DP845 waterproof ring of earphone cover	Material: silicon rubber; hardness: 40°, orange	1
45	147K01000059	DP480 front shell	Material: PC1414, black, etched, screen print	1
46	7PLJ-4237-E01A	DP480 model sticker	Transparent PC, screen print DP610, gray-white text	1
47	7MHJ-4245-01A-W	DP580 dual-sided adhesive for key PCB	3M9448	1
48	6SS1-4245-HK1A	DP580 SMD nesting of key PCB	DP580 SMD nesting of key PCB	1
49	7MHS-4245-01A-W	DP580 metal dome array of numeric keyboard	SUS301, Φ5mm, four-point metal dome	1

SN	Material Code	Material Name	Specification	QTY
50	7MHR-4245-02A-W0	DP580 numeric keyboard	Silicon rubber, oil sprayed, laser etching; hardness 600±5°	1
51	7MHP-4207-06A-W0	DP586 side key cap (down)	PC1414, black, etched	1
52	7MBP-4207-02A-W0	DP586 glass	Material: PMMA/PC composite, T=1.5; screen print at PC side	1

7. Debugging

7.1. Debugging Method

During the repair, if the components are changed, you need to test and adjust the technical specification.

7.1.1. Components needed for adjustment

(1) Antenna interface converter

(2) Universal interface

7.1.2. PC Test Mode Modulation Method

Tx Section

● **Tx Frequency**

Under computer mode (frequency stability), adjust Tx frequency as reference frequency within ±100Hz.

● **Power**

a. Under computer mode (Tx high power) (five frequencies), adjust Tx high power as 3.5-5.0W.

b. Under computer mode (Tx low power) (five frequencies), adjust Tx low power as 0.5-1.5W.

c. Battery low power indication during transmission: set power voltage as 6.5V, and under computer mode (Tx low voltage), click Ok after digits are stable.

Rx Section

● **Maximum Volume**

Set the RF frequency of integrated tester as center frequency, signal strength as 1mV, modulated frequency deviation as 3.0 kHz /1.5kHz (wide/narrow band). Under computer mode(max volume, wide/narrow band), adjust audio power as 1.2-1.5W.

● **Squelch**

a. RF signal is set to -121dBm, modulated frequency deviation to 3.0kHz/1.5kHz (narrow/wide band). Under

computer mode (SQL on, narrow/wide band) (five frequencies), click Ok when the value is stable.

b. RF signal is set to -123dBm, modulated frequency deviation to 3.0kHz/1.5kHz (wide/narrow ban). Under computer mode (SQL off, narrow/wide band) (five frequencies), click Ok when the value is stable.

7.2.Radio Test

(1) Voltage used in test: 7.5V +/-0.1V room temperature

(2) Frequency range: 136~ 174MHz,400 ~470MHz

The specifications should be tested in the test mode:

Rx Section

1. Sensitivity: <=-119dBm (0.25uV) (wide band, narrow band) 12dB SINAD

2. Distortion: <=5%

3. Current: static current :<=100mA

Received working current: <=400mA

4. Squelch off Sensitivity: when RF input ≤-124dBm, squelch off.

5. Squelch on Sensitivity: when RF input ≥-119dBm, squelch on.

Tx Section

1. Output Power: high (3.8W---4.8W) low (0.7W---1.3W)

2. Tx Current: high power Tx<= 1.6A; low power Tx <=1.0A

3. Tx Distortion: <=5%

4. Tx Frequency Deviation: reference frequency +/-500Hz

5. Undervoltage Indication: when voltage is 6.2V, the red indicator should flash when pressing PTT, and no Tx power occurs.

8. General Specification

Model	DP480
Frequency	400 ~ 470 MHz,136 ~ 174 MHz
Channel Capacity	256 channels
Channel Spacing	25 kHz/12.5kHz
Operating Voltage	7.4V
Working Temperature	-25℃~ +55℃

Antenna Impedance	50Ω
Microphone Impedance	2.2kΩ
Battery	Lithium-ion battery DC 7.4V , 2000mAh
Average battery duration (5-5-90, high-power emission), 2000mAh lithium battery	Analogue channel: 18 hrs Digital channel: 20 hrs
Receiving Sensitivity (12dB SINAD)	-120dBm
Squelch Sensitivity (3-level)	≤-120dBm
Selectivity of Adjacent Channels	70dB@25KHz /60dB@12.5KHz
Intermodulation Immunity	65dB@25KHz/12.5 KHz
Rated Power	1W 16Ω
Blocking	84dB
Transmitting Power	4W/1W@7.4V DC
Frequency Stability	≤±2.5ppm
Maximum Modulation Offset	±5kHz@25KHz /±2.5kHz@12.5KHz
Modulation Distortion	≤3%
Spurious Emission	≤-36dBm
Current Consumption	≤1.5A@ 7.4V DC

9. Equipment for Maintenance and Test

1. Wireless general-purpose tester HP8920/8921

2. Digital multimeter

3. Regulated DC power supply

10. Troubleshooting

SN	Failure Description	Troubleshooting
1	Startup fails	A. Check the battery. If it is low, charge or replace it. B. The Power key does not work well. Replace the key. C. The CPU does not work well. Replace it with a new IC19.

2	Communication fails	A. Make sure the channels the both radios communicate on are of the same frequency. B. The radios use different CTCSS/DCS signaling codes. Set the same one via PC. C. Out of communication range.
3	Cannot receive signals	A. The antenna has bad contact. Screw up the antenna connector. B. Sensitivity is low. Fine tune the "debugging mode". C. The squelch level is too high, so that squelch cannot be enabled. Set a lower level via PC. D. The Q3 does not work well. Replace the 2SC3356.
4	Red light on during transmitting, but receiver hears no voice	A. The tube power amplifier outputs no power. Replace with a new amplifier. B. The microphone does not work well. Replace with a new microphone.
5	Green light on during receiving, but cannot hear voice	A. The speaker does not work well. Replace with a new speaker. B. The audio amplifier IC5 does not work well. Replace with a new TDA8547.
6	Programming fails	Check wiring.
7	Low voice	Check the settings of volume and MIC gain via the PC Tool.

Appendix 1 Abbreviations

AMP   Amplify, amplifier

ANT   Antenna

APC   Automatic power control

BPF   Band-pass filter

CTCSS   Continuous tone control squelch system

DCS   Digital code squelch

DEMOD   Demodulation

E2PROM   Electrically Erasable Programmable Read-Only Memory

HPF   High-pass filter

IDC   Instantaneous deviation control

IF   Intermediate frequency

LED   Light-emitting diode

LNA   Low-noise amplifier

LPF   Low-pass filter

MCU   Micro control unit

MIC   Microphone

MOD   Modulation

MONI   Monitor

PLL   Phase lock loop

PTT   Push-to-talk

RX   Receiver

SPK   Speaker

TCXO   Temperature controlled crystal oscillator

TX   Transmitter

Appendix 2 Material List (Electronic Part)

Table 1 Material List of Main Board 400~470MHz

SN	Material Code	Material Name	Specification	QTY	Position
1	133C07000002	3.5mm earphone socket	Material NO.: PJ-3511-0; 4-pin, with switch, lead free	1	J600
2	3SE3-ED08E42S-FE15C7	Power encoder switch	ED08E42S-FE15C7.0-A16-1020, with location column, 4.75mm axis, 15mm long	1	S3
3	3SE3-ED08C03O-FE18C9	PT118D #encoder switch	ED08C03O-FE18C9.0-A16-1002, axis 4.75mm thick, M6 thread	1	S200
4	3CE3-ST-2004	2.5mm earphone socket	SI-2004, 4mm high, lead free	1	
5	7MHP-4253-05A-JC	DP485 Potentiometer gasket	DP485, Potentiometer gasket, PVC, transparent	1	
6	2CC1-20-X5R160-106KD	Multi-layer chip capacitor	EMK212ABJ106KD-T,2012,10uF±10%,16V,TAIYO,0.85±0.1mm high	16	C28,C47,C103,C108,C119,C123,C20,C39,C91,C106,C582,C86,C615,C312,C315,C606
7	2CC1-10-X7R500-471K	Multi-layer chip capacitor	murata,GRM155R71H471KA01D,470,pF,±10%,50V,1005,X7R	51	C55,C102,C104,C113,C118,C122,C14,C7,C8,C9,C10,C11,C64,C65,C66,C67,C230,C231,C232,C233,C237,C238,C239,C240,C241,C242,C243,C332,C107,C519,C522,C523,C528,C530,C531,C532,C533,C535,C537,C538,C5

					41,C549,C550,C551,C553,C554,C559,C564,C565,C21,C333
8	2CC1-10-X7R500-103K	2CC1-10-X7R500-471K	MURATA,GRM155R71H103KA88D,10,nF,±10%,50V,0402,X7R	18	C61,C110,C112,C115,C12,C17,C57,C58,C326,C327,C328,C329,C529,C539,C540,C42,C49,C612
9	2CC1-10-X7R160-104K	2CC1-10-X7R500-471K	MURATA,GRM155R71C104KA88D,100,nF,±10%,16V,0402,X7R	17	C609,C604,C101,C111,C114,C117,C5,C13,C18,C346,C56,C15,C22,C33,C43,C46,C616
10	2RS1-10-155J	Chip resistor	yageo,RC0402JR-071M5L,1.5,MΩ,±5%,0402	1	C109
11	2CC1-10-X7R500-102K	Multi-layer chip capacitor	MURATA,GRM155R71H102KA01D,1,nF,±10%,50V,0402,X7R	14	C120,C124,C526,C536,C573,C581,C31,C93,C94,C95,C96,C98,C613,C614
12	1DR1-1SR154-400	SMD rectifier diode	rohm,1SR154-400,4.5mm*2.6mm*2.0mm,-55℃ to 150℃	1	D100
13	121D03000007	SMD Schottky barrier diode	SD103AW,SOD-323，2.7mm*1.35mm*1.0mm,-55℃ to 150℃,	1	D101
14	3FW1-42932-302320	SMD fuse	littelfuse,429003/433003/466003,3216,3A/32V	1	F100
15	1IS1-XC6204B502MR	SMD voltage regulator IC	XC6204B502MR,SOT-25,-40~85°	1	IC100
16	1IS1-MP2359	SMD switch power supply IC	MPS,MP2359,TSOT23-6,-40 to +85℃	1	IC102
17	135F04000011	Magnetic beads	GZ1608U601CTF,1608,	12	L30,L100,L104,L105,L1,L2,L300,L515,L521,L31,L600,L38

18	2LG1-VLS3012ET-100M	SMD power inductor	TDK,VLS3012ET-100M,10,uH,±20%,3*3*1.2	1	L107
19	1TT1-KTA1298-Y	R SMD transistor	KEC,KTA1298-Y,SOT-23,-~150℃	1	Q102
20	1TT1-DTC144EE	R SMD transistor	ROHM,DTC144EE,EMT3,-~150℃	9	Q103,Q1,Q3,Q200,Q201,Q4,Q7,Q10,Q606
21	2RS1-10-222J	R Chip resistor	yageo,RC0402JR-072K2L,2.2,KΩ,±5%,0402	3	R102,R246,R247
22	2RS1-10-103J	R Chip resistor	yageo,RC0402JR-0710KL,10,KΩ,±5%,0402	19	R103,R110,R1,R48,R52,R53,R55,R57,R58,R59,R68,R70,R245,R601,R614,R172,R173,C611,R86
23	2RE1-10-1602	SMD precision resistor	YAGEO,RC0402FR-0716K2L,16.2,KΩ,±1%,0402	1	R106
24	2RS1-10-104J	R Chip resistor	yageo,RC0402JR-07100KL,100,KΩ,±5%,0402	1	R63
25	2RS1-10-102J	R Chip resistor	yageo,RC0402JR-071KL,1KΩ,±5%,0402	19	R108,R3,R50,R60,R236,R237,R238,R239,R6,R10,R502,R539,R544,R545,R547,R551,R560,R623,R340
26	2CC1-10-X7R160-333K	2CC1-10-X7R500-471K	MURATA,GRM155R71C333KA01D,33,nF,±10%,16V,0402,X7R	4	C99,C100,C125,C583
27	2CC1-10-X5R100-474K	2CC1-10-X7R500-471K	MURATA,GRM155R61A474KE15D,470,nF,±10%,10V,0402,X5R	15	C105,C126,C127,R61,R62,C313,C314,C316,C317,C318,C319,C320,C321,C322,C323
28	61SL000016	Module HS8861	Module HS8861	1	IC1
29	2RS1-16-000O	R Chip resistor	yageo,RC0603JR-070RL,0,Ω,±5%,1608	10	R96,R97,L8,L6,L33,L510,R9,R519,R49,R90

30	2RS1-10-471J	R Chip resistor	yageo,RC0402JR-07470RL,470,Ω,±5%,0402	4	R14,R612,R615,R622
31	2RS1-10-000O	R Chip resistor	yageo,RC0402JR-070RL,0,Ω,±5%,0402	36	C75,R43,R45,R46,R47,R71,R72,R167,R11,R26,R92,R251,R252,C73,C569,C570,C577,R504,R516,R555,C48,C53,R7,R20,R32,R82,R83,R88,R624,C80,R76,R101,R112,R171,R21,IC301 (pin 2 and pin 3)
32	2RS1-10-332J	R Chip resistor	yageo,RC0402JR-073K3L,3.3,KΩ,±5%,0402	2	R56,R81
33	1IS1-MCP4802-A	D/A converter IC	MICROCHIP,MCP4802	1	U20
34	2CC1-10-C0G500-101J	2CC1-10-X7R500-471K	MURATA,GRM1555C1H101JA01D,100,pF,±5%,50V,0402,C0G	5	C1,C2,C24,C324,C325
35	2CC1-10-Y5V160-105Z	2CC1-10-X7R500-471K	murata,GRM155R61C105KA12D,1,uF,+80%/-20%,16V,1005,Y5V	10	C38,C134,C136,C137,C138,C139,C140,C141,C142,C59
36	2RS1-20-000O	R Chip resistor	yageo,RC0805JR-070RL,0,Ω,±5%,2012	1	C337
37	124P01000006	SMD light emitting diode	,HJ-19URC-T6,red,2V@20mA,1.6mm*0.8mm*0.6mm,-40~85°C,	1	D203
38	124P01000007	SMD light emitting diode	HJ-19YGC-T6,chartreuse,2V@20mA,1.6mm*0.8mm*0.6mm,-40~85°C,	1	D205
39	121I04000031	SMD linear IC	LM2904XTS8G/TR,TSSOP-8,-40℃to125℃,	2	IC500,IC302

40	3CF1-BL112-30RU	SMD FFC/FPC connector	0.5-3-30P,lower flip connector,H=2.0	1	J201
41	5FE1-CB100505-102	SMD EMI filter	CB100505-102,1005.0	25	L7,L9,L10,L11,L12,L13,L14,L15,L16,L17,L18,L19,L20,L21,L22,L23,L24,L25,L26,L27,L28,FB1,FB17,FB20,FB41
42	1TF1-ST2301	R SMD field effect transistor	Stanson,ST2301,SOT-23-3L,-~150℃	2	Q20,Q600
43	2RS1-16-220J	R Chip resistor	yageo,RC0603JR-0722RL,22,Ω,$\pm$5%,1608	2	R2,R5
44	2RE1-10-6802	SMD precision resistor	yageo,RC0402FR-0768KL,68,KΩ,$\pm$1%,0402	1	R104
45	2RS1-10-302J	R Chip resistor	yageo,RC0402JR-073KL,3,KΩ,$\pm$5%,0402	1	R22
46	2RS1-10-153J	R Chip resistor	yageo,RC0402JR-0715KL,15,KΩ,$\pm$5%,0402	2	R512,R542
47	2RS1-10-333J	R Chip resistor	yageo,RC0402JR-0733KL,33,KΩ,$\pm$5%,0402	6	R65,R67,R18,R31,R616,R617
48	2RS1-10-100J	R Chip resistor	yageo,RC0402JR-0710RL,10,Ω,$\pm$5%,0402	3	R66,R244,R559
49	2RS1-10-473J	R Chip resistor	yageo,RC0402JR-0747KL,47,KΩ,$\pm$5%,0402	20	R77,R78,R79,R80,R240,R241,R242,R243,R265,R266,R267,R268,R501,R508,R513,R540,R541,R557,R558,R526
50	2RS1-10-221J	R Chip resistor	yageo,RC0402JR-07220RL,220,Ω,$\pm$5%,0402	2	R249,R250

51	3ST1-SKRTLBE010	SMD tact switch	ALPS,SKRTLBE010,4.5*3.55*3.3mm,-40 to +90℃	1	S1
52	1ID1-MXD2020ML	Accelerometer	memsic,MXD2020ML,LCC-8 ,5.0mm*5.0mm*1.99mm,-40℃ to 105℃	1	U4
53	2CC1-10-X7R500-271K	R Multi-layer chip capacitor	MURATA,GRM155R71H271KA01D,270,pF,±10%,50V,0402,X7R	1	C36
54	2CC1-10-X7R160-473K	R Multi-layer chip capacitor	MURATA,GRM155R71C473KA01D,47,nF,±10%,16V,0402,X7R	2	C40,C16
55	2CC1-16-C0G500-330J	Multi-layer chip capacitor	murata,GRM1885C1H330JA01D,33,pF,±5%,50V,1608,C0G	1	C501
56	2CC1-16-C0G500-3R0B	Multi-layer chip capacitor	murata,GRM1885C1H3R0BA01D,3,pF,±0.1pF,50V,1608,C0G	1	C503
57	2CC1-16-C0G500-2R0B	Multi-layer chip capacitor	murata,GRM1885C1H2R0BA01D,2,pF,±0.1pF,50V,1608,C0G	2	C504,C505
58	2CC1-16-C0G500-120J	R Multi-layer chip capacitor	murata,GRM1885C1H120JA01D,12,pF,±5%,50V,1608,C0G	1	C507
59	2CC1-16-C0G500-8R0D	R Multi-layer chip capacitor	murata,GRM1885C1H8R0DA01D,8,pF,±0.5pF,50V,1608,C0G	2	C509,C502
60	112C03000273	Ceramic capacitor	YAGEO,CC0603JRNPO9BN680,68pF,±5%,50V,0603,NPO	1	C510
61	2CC1-16-C0G500-121J	R Multi-layer chip capacitor	murata,GRM1885C1H121JA01D,120,pF,±5%,50V,1608,C0G	1	C511
62	2CC1-10-C0G500-330J	R Multi-layer chip capacitor	MURATA,GRM1555C1H330JA01D,33,pF,±5%,50V,0402,C0G	2	C512,C521

63	2CC1-16-C0G500-2R0C	R Multi-layer chip capacitor	murata,GRM1885C1H2R0CA01D,2,pF,±0.25pF,50V,1608,C0G	1	C514
64	2CC1-16-C0G500-5R0B	Multi-layer chip capacitor	murata,GRM1885C1H5R0BA01D,5,pF,±0.1pF,50V,1608,C0G	2	C515,C516
65	2CC1-16-C0G500-7R0C	Multi-layer chip capacitor	murata,GRM1885C1H7R0CA01D,7,pF,±0.25pF,50V,1608,C0G	1	C517
66	2CC1-10-C0G500-200J	R Multi-layer chip capacitor	MURATA,GRM1555C1H200JA01D,20,pF,±5%,50V,0402,C0G	1	C518
67	2CC1-10-C0G500-6R0C	R Multi-layer chip capacitor	MURATA,GRM1555C1H6R0CA01D,6,pF,±0.25pF,50V,0402,C0G	2	C520,C561
68	2CC1-10-X7R500-472K	Multi-layer chip capacitor	MURATA,GRM155R71H472KA01D,4.7,nF,±10%,50V,0402,X7R	1	C527
69	2CC1-16-C0G500-2R5B	R Multi-layer chip capacitor	murata,GRM1885C1H2R4BA01D,2.4,pF,±0.1pF,50V,1608,C0G	2	C534,C513
70	2CC1-10-X7R500-153K	R Multi-layer chip capacitor	MURATA,GRM155R71H153KA12D,15,nF,±10%,50V,0402,X7R	2	C547,C545
71	2CC1-10-C0G500-470J	R Multi-layer chip capacitor	MURATA,GRM1555C1H470JA01D,47,pF,±5%,50V,0402,C0G	3	C558,C560,C54
72	2RS1-10-561J	R Chip resistor	yageo,RC0402JR-07560RL,560,Ω,±5%,0402	1	C578
73	2CC1-10-X7R250-223K	R Multi-layer chip capacitor	MURATA,GRM155R71E223KA61D,22,nF,±10%,25V,0402,X7R	1	C584
74	1DS1-RN142S	SMD switch diode	ROHM,RN142S,1.6mm*0.8mm*0.6mm,-55℃ to 150℃	2	D500,D501

75	1DS1-1SS390	SMD switch diode	ROHM,1SS390,1.6mm*0.8mm*0.6mm,-55℃ to 125℃	2	D502,D503
76	2LW1-16UC-150J	R SMD wire wound inductor	sagami,C1608CB-15NJ,15,nH,±5%,1608	1	L3
77	2LW1-16UC-180J	R SMD wire wound inductor	sagami,C1608CB-18NJ,18,nH,±5%,1608	1	L5
78	2LW1-20UC-8R2J	SMD wire wound inductor	2012,8.2nH±5%, (C2012C-8N2J)	1	L29
79	2LH1-R401R5-R03-05	R SMD air core inductor	E20.40*1.5*3TL	3	L500,L501,L503
80	2LH1-R401R5-R04-05	R SMD air core inductor	E20.40*1.5*4TL	2	L502,L505
81	2LL1-16-3N9SA	Multi-layer chip inductor	SunLord,SDCL1608C3N9STDF,3.9,nH,±0.3nH,1608	2	L34,L35
82	2LH1-R501R5-L05-05	R SMD air core inductor	E20.50*1.5*5TR	1	L506
83	2LH1-R401R5-R08-05	R SMD air core inductor	E20.40*1.5*8TL	1	L507
84	2LW1-20UC-221J	R SMD wire wound inductor	murata,LQW2BHNR22J03L,220,nH,±5%,2012	1	L508
85	2LL1-16-22NJB	Multi-layer chip inductor	SunLord,SDCL1608C22NJTDF,22,nH,±5%,1608	2	L509,L511

86	5FE1-BLM21P300S	SMD EMI filter	murata,BLM21PG300SN1D,2012.0	2	L512,L514
87	2RS1-16-560J	R Chip resistor	yageo,RC0603JR-0756RL,56,Ω,±5%,1608	1	L513
88	2CC1-20-X7R500-471K	Multi-layer chip capacitor	yageo,CC0805KRX7R9BB471,470,pF,±10%,50V,2012,X7R	1	L520
89	1TF1-RD07MUS2B-501	SMD field effect transistor	MITSUBISHI,RD07MUS2B-501,SLP,-~150℃	1	Q500
90	1TF1-RD01MUS2-501	SMD field effect transistor (for portable digital and analog radios)	MITSUBISHI,RD01MUS2-501,S0T-89,-~150℃	1	Q501
91	1TT1-2SC5108-Y	R SMD transistor	TOSHIBA,2SC5108-Y,2-2H1A,-~125℃	1	Q502
92	1TT1-L2SC3356LT1	SMD transistor	LRC,L2SC3356LT1,SOT-23,-~150℃	1	Q503
93	2RS1-16-333J	R Chip resistor	yageo,RC0603JR-0733KL,33,KΩ,±5%,1608	1	R8
94	2RS1-16-103J	R Chip resistor	yageo,RC0603JR-0710KL,10,KΩ,±5%,1608	1	R12
95	2RS1-10-472J	R Chip resistor	yageo,RC0402JR-074K7L,4.7,KΩ,±5%,0402	3	R39,R561,R562
96	2RE1-16-2203	SMD precision resistor	yageo,RC0603FR-07220KL,220,KΩ,±1%,0603	1	R42
97	2RS1-10-470J	R Chip resistor	yageo,RC0402JR-0747RL,47,Ω,±5%,0402	1	R500
98	2RS1-10-682J	R Chip resistor	yageo,RC0402JR-076K8L,6.8,KΩ,±5%,1005	1	R503
99	2RS1-10-152J	R Chip resistor	yageo,RC0402JR-071K5L,1.5,KΩ,±	2	R507,R51

			5%,0402		
100	2RS1-10-563J	R Chip resistor	yageo,RC0402JR-0756KL,56,KΩ,±5%,0402	2	R509,R38
101	2RS1-10-330J	R Chip resistor	yageo,RC0402JR-0733RL,33,Ω,±5%,0402	1	R510
102	2RS1-10-220J	R Chip resistor	yageo,RC0402JR-0722RL,22,Ω,±5%,0402	1	R511
103	2RS1-16-271J	R Chip resistor	yageo,RC0603JR-07270RL,270,Ω,±5%,1608	2	R515,R505
104	2RS1-16-225J	Chip resistor	yageo,RC0603JR-072M2L,2.2,MΩ,±5%,1608	1	R517
105	2RE1-16-1503	R SMD precision resistor	yageo,RC0603FR-07150KL,150,KΩ,±1%,0603	2	R518,R525
106	2RS1-32-R39J	R Chip resistor	yageo,RC1206JR-070R39L,0.39,Ω,±5%,3216	4	R520,R521,R522,R523
107	2RE1-16-1003	SMD precision resistor	yageo,RC0603FR-07100KL,100,KΩ,±1%,0603	2	R527,R528
108	2RS1-10-203J	R Chip resistor	yageo,RC0402JR-0720KL,20,KΩ,±5%,0402	1	R529
109	1TC1-UMC4	R SMD Darlington tube	Rohm,UMC4N,UMT5,-~150℃	1	U301
110	121I05000076	SMT IC	AT1846S,2021	1	U500
111	5OT1-12R8-HHL-0303	Voltage controlled temperature compensated crystal oscillator	DSA321SCL,3.0V,12.8MHz±2.5ppm,-30℃～+75℃,3225	1	X500

112	112C03000163	Ceramic capacitor	YAGEO,CC0402KRX7R7BB683,68nF,±10%,16V,0402,X7R	1	C23
113	2CC1-10-C0G500-100D	R Multi-layer chip capacitor	MURATA,GRM1555C1H100JA01D,10,pF,±5%,50V,0402,C0G	1	C35
114	2CC1-20-X7R6R3-475K	R Multi-layer chip capacitor	murata,GRM219R6J475KE19D,4.7,uF,±10%,6.3V,2012,X7R,高度 0.85±0.1MM	3	C50,C51,C617
115	112C03000141	Ceramic capacitor	YAGEO,CC0603JRNPO9BN102,1nF,±5%,50V,0603,NPO	2	C52,C97
116	3FW1-0805L035	SMD fuse	Littelfuse,0805L035,0603,-40 to +85℃	2	C85,C605
117	3CF1-SMT-4P	SMT connector	1.25mm 4PIN,1.25mm 4PIN,-25°C to 85°C	1	J6
118	1TT1-2SC4116-GR	R SMD transistor	TOSHIBA,2SC4116-GR,SOT-323/SC-70,-~125℃	1	Q2
119	1TT1-2SA1586	R SMD transistor	TOSHIBA,2SA1586,SC-70,-~125℃	1	Q605
120	2RS1-10-392J	R Chip resistor	yageo,RC0402JR-073K9L,3.9,KΩ,±5%,0402	2	R24,R632
121	2RS1-10-223J	R Chip resistor	yageo,RC0402JR-0722KL,22,KΩ,±5%,0402	2	R27,C34
122	2RS1-10-564J	R Chip resistor	yageo,RC0402JR-07560KL,560,KΩ,±5%,1005	1	R29
123	2RS1-10-101J	R Chip resistor	yageo,RC0402JR-07100RL,100,Ω,±5%,0402	1	R36
124	2RS1-10-821J	R Chip resistor	yageo,RC0402JR-07820RL,820,Ω,±5%,1005	1	R37

125	2RS1-10-474J	R Chip resistor	yageo,RC0402JR-07470KL,470,KΩ,±5%,0402	1	R44
126	2RS1-10-562J	R Chip resistor	yageo,RC0402JR-075K6L,5.6,KΩ,±5%,0402	1	R613
127	2RS1-10-182J	R Chip resistor	yageo,RC0402JR-071K8L,1.8,KΩ,±5%,0402	1	R618
128	2RS1-10-393J	R Chip resistor	yageo,RC0402JR-0739KL,39,KΩ,±5%,0402	1	R631
129	1IS1-TDA2822	SMD IC	UTC,TDA2822,SOP8,-20 to +85℃	1	U600
130	2CC1-10-C0G500-6R8C	Multi-layer chip capacitor	MURATA,GRM1555C1H6R8CA01D,6.8,pF,±0.25pF,50V,0402,C0G	1	C32
131	2CC1-10-C0G500-2R5B	R Multi-layer chip capacitor	SU,MURATA,GRM1555C1H2R5BA01D,2.5pF,±0.1pF,50V,0402,C0G	4	C60,C69,C70,C71
132	2CC1-10-C0G500-2R0B	Multi-layer chip capacitor	MURATA,GRM1555C1H2R0BA01D,2,pF,±0.1pF,50V,0402,C0G	1	C72
133	1IS1-XC6209F332M	SMD voltage regulator IC	XC6209F332MR,SOT-25,-40~85°	1	IC15
134	2LL1-16-10NJA	Multi-layer chip inductor	SunLord,SDCL1608C10NJTDF,10,nH,±5%,1608	1	L36
135	2LL1-16-8N2DA	Multi-layer chip inductor	SunLord,SDCL1608C8N2JTDF,8.2,nH,±0.5nH,1608	1	L37
136	121I05000092	SMD IC	AT6558F-5N32,	1	U3

137	1IS1-AT2659	Low noise amplifier	AT2659,1550MHz～1615MHz,6pinDFN	1	U8
138	125O03000001	Temperature compensated crystal oscillator	2TG2600001,	1	X101
139	135X02000005	Crystal resonator	32.768KHz,+20.0-20.0,FC-135,Q13FC13500002,7P,3.2mm*1.5mm,EPSON	1	Y1
140	6PM7-4237-HMC	PCB	106*47MM, mainboard,1.0mm,4.0,FR4	1	
141	7MDC-4207-02A-W	GPS shield cover	Copper-Nickel-Zinc alloy,original color,0.2mm thick,33*13.05*3	1	
142	7MDC-4207-03A-W	Automatic power control (APC) shield cover	Copper-Nickel-Zinc alloy, 21.3*11.45*2.2mm	1	
143	7MDC-4207-04A-W	Power shield cover	Copper-Nickel-Zinc alloy, original color, 0.2mm thick, 16.2*15.1*2.3	1	
144	2RS1-10-4R7J	R Chip resistor	yageo,RC0402JR-074R7L,4.7,Ω,±5%,0402	2	R84,R85
145	7MHP-4002-01C-W	Battery connector	BC-2P-4.1PH-6.8H	1	
146	7PLJ-025006-T01A	High temperature sticker	25*6mm	1	
147	2LL1-16-2N7SA	Multi-layer chip inductor	SunLord,SDCL1608C2N7STDF,2.7,nH,±2%,1608	1	L504
148	2RE1-10-1003	SMD precision resistor	1005,100K±1%	2	R105,R107
149	9FSC0100001	Hardware version number	F	1	
150	2RS1-16-122J	R Chip resistor	yageo,RC0603JR-071K2L,1.2,KΩ,±5%,1608	1	L32

Table 2 Material List of Main Board 137~174MHz

SN	Material Code	Material Name	Specification	QTY	Position
1	133C07000002	3.5mm earphone socket	Material NO.: PJ-3511-0; 4-pin, with switch, lead free	1	J600
2	3SE3-ED08E42S-FE15C7	Power encoder switch	ED08E42S-FE15C7.0-A16-1020, with location column, 4.75mm axis, 15mm long	1	S3
3	3SE3-ED08C03O-FE18C9	PT118D #encoder switch	ED08C03O-FE18C9.0-A16-1002, axis 4.75mm thick, M6 thread	1	S200
4	3CE3-ST-2004	2.5mm earphone socket	SI-2004, 4mm high, lead free	1	
5	7MHP-4253-05A-JC	DP485 Potentiometer gasket	DP485, Potentiometer gasket, PVC, transparent	1	
6	6PM7-4237-HMC	PCB	106*47MM, mainboard,1.0mm,4.0,FR4	1	PCB
7	7MDC-4207-02A-W	GPS shield cover	Copper-Nickel-Zinc alloy,original color,0.2mm thick,33*13.05*3	1	P1
8	7MDC-4207-03A-W	Automatic power control (APC) shield cover	Copper-Nickel-Zinc alloy, 21.3*11.45*2.2mm	1	P2

9	7MDC-4207-04A-W	Power shield cover	Copper-Nickel-Zinc alloy, original color, 0.2mm thick, 16.2*15.1*2.3	1	P3
10	7PLJ-025006-T01A	High temperature sticker	25*6mm	1	
11	2CC1-20-X5R160-106KD	Multi-layer chip capacitor	EMK212ABJ106KD-T,2012,10uF±10%,16V,TAIYO,0.85±0.1mm high	16	C28,C47,C103,C108,C119,C123,C20,C39,C91,C106,C582,C86,C606,C615,C312,C315
12	2CC1-10-X7R500-471K	R Multi-layer chip capacitor	murata,GRM155R71H471KA01D,470,pF,±10%,50V,1005,X7R	51	C55,C102,C104,C113,C118,C122,C14,C64,C65,C66,C67,C230,C231,C232,C233,C332,C107,C522,C523,C528,C530,C531,C532,C533,C537,C538,C541,C549,C550,C551,C553,C554,C559,C564,C565,C21,C333,C624,R25,C7,C8,C9,C10,C11,C237,C238,C239,C240,C241,C242,C243
13	2CC1-10-X7R500-103K	R Multi-layer chip capacitor	MURATA,GRM155R71H103KA88D,10,nF,±10%,50V,0402,X7R	19	C61,C110,C112,C115,C12,C17,C326,C327,C328,C329,C527,C529,C539,C540,C42,C49,C612,C58,C57
14	2CC1-10-X7R160-104K	R Multi-layer chip capacitor	MURATA,GRM155R71C104KA88D,100,nF,±10%,16V,0402,X7R	17	C101,C111,C114,C117,C5,C13,C18,C346,C15,C22,C33,C43,C46,C604,C609,C616,C56
15	2RS1-10-155J	Chip resistor	yageo,RC0402JR-071M5L,1.5,MΩ,±5%,0402	1	C109
16	2CC1-10-X7R500-102K	R Multi-layer chip capacitor	MURATA,GRM155R71H102KA01D,1,nF,±10%,50V,0402,X7R	12	C120,C124,C536,C581,C31,C93,C94,C95,C96,C98,C613,C614
17	1DR1-1SR154-400	R SMD rectifier diode	rohm,1SR154-400,4.5mm*2.6mm*2.0mm,-55℃	1	D100

			to 150℃		
18	121D03000007	SMD Schottky barrier diode	SD103AW,SOD-323，2.7mm*1.35mm*1.0mm,-55℃ to 150℃,	1	D101
19	3FW1-42932-302320	SMD fuse	littelfuse,429003/433003/466003,3216,3A/32V	1	F100
20	1IS1-XC6204B502MR	R SMD voltage regulator IC	XC6204B502MR,SOT-25,-40~85°	1	IC100
21	1IS1-MP2359	SMD switch power supply IC	MPS,MP2359,TSOT23-6,-40 to +85℃	1	IC102
22	7MHP-4002-01C-W	Battery connector	BC-2P-4.1PH-6.8H	1	J1
23	135F04000011	Magnetic beads	GZ1608U601CTF,1608,	12	L30,L100,L104,L105,L300,L515,L521,L31,L600,L38,L1,L2
24	2LG1-VLS3012ET-100M	SMD power inductor	TDK,VLS3012ET-100M,10,uH,±20%,3*3*1.2	1	L107
25	1TT1-KTA1298-Y	R SMD transistor	KEC,KTA1298-Y,SOT-23,-~150℃	1	Q102
26	1TT1-DTC144EE	R SMD transistor	ROHM,DTC144EE,EMT3,-~150℃	9	Q103,Q200,Q201,Q4,Q7,Q10,Q606,Q1,Q3
27	2RS1-10-222J	R Chip resistor	yageo,RC0402JR-072K2L,2.2,KΩ,±5%,0402	3	R102,R246,R247
28	2RS1-10-103J	R Chip resistor	yageo,RC0402JR-0710KL,10,KΩ,±5%,0402	19	R103,R110,R1,R48,R52,R53,R55,R57,R58,R59,R68,R70,R245,C611,R86,R601,R614,R172,R173
29	2RE1-10-6802	SMD precision resistor	yageo,RC0402FR-0768KL,68,KΩ,±1%,0402	1	R104

30	2RE1-10-1602	SMD precision resistor	YAGEO,RC0402FR-0716K2L,16.2,KΩ,±1%,0402	1	R106
31	2RS1-10-104J	R Chip resistor	yageo,RC0402JR-07100KL,100,KΩ,±5%,0402	4	R107,R526,R105,R63
32	2RS1-10-102J	R Chip resistor	yageo,RC0402JR-071KL,1KΩ,±5%,0402	18	R108,R3,R50,R236,R237,R238,R239,R6,R10,R502,R539,R544,R545,R547,R551,R560,R623,R60
33	2CC1-10-X7R160-333K	R Multi-layer chip capacitor	MURATA,GRM155R71C333KA01D,33,nF,±10%,16V,0402,X7R	4	C99,C100,C125,C583
34	2CC1-10-X5R100-474K	R Multi-layer chip capacitor	MURATA,GRM155R61A474KE15D,470,nF,±10%,10V,0402,X5R	15	C105,C126,C127,R61,R62,C313,C314,C316,C317,C318,C319,C320,C321,C322,C323
35	61SL000016	Module HS8861	Module HS8861	1	IC1
36	2RS1-16-000O	R Chip resistor	yageo,RC0603JR-070RL,0,Ω,±5%,1608	8	L8,L33,R9,R519,R49,R90,R96,R97
37	2RS1-10-471J	R Chip resistor	yageo,RC0402JR-07470RL,470,Ω,±5%,0402	4	R14,R612,R615,R622
38	2RS1-10-000O	R Chip resistor	yageo,RC0402JR-070RL,0,Ω,±5%,0402	37	R43,R45,R46,R47,R71,R72,R167,R11,R26,R251,R252,C558,C560,C569,C570,C577,R516,R555,C48,C53,R7,R20,R32,R82,R83,R88,R624,C75,C80,R76,R101,R112,R171,R92,R340,R21,(IC301 pin 2 and pin 3)
39	2RS1-10-332J	R Chip resistor	yageo,RC0402JR-073K3L,3.3,KΩ,	2	R56,R81

			±5%,0402		
40	1IS1-MCP4802-A	D/A converter IC	MICROCHIP,MCP4802	1	U20
41	2CC1-10-C0G500-101J	R Multi-layer chip capacitor	MURATA,GRM1555C1H101JA01D,100,pF,±5%,50V,0402,C0G	5	C24,C324,C325,C1,C2
42	2RS1-20-000O	R Chip resistor	yageo,RC0805JR-070RL,0,Ω,±5%,2012	1	C337
43	124P01000006	SMD light emitting diode	,HJ-19URC-T6,red,2V@20mA,1.6mm*0.8mm*0.6mm,-40~85°C,	1	D203
44	124P01000007	SMD light emitting diode	HJ-19YGC-T6,chartreuse,2V@20mA,1.6mm*0.8mm*0.6mm,-40~85°C,	1	D205
45	121I04000031	SMD linear IC	LM2904XTS8G/TR,TSSOP-8,-40℃to125℃,	2	IC500,IC302
46	2RS1-10-153J	R Chip resistor	yageo,RC0402JR-0715KL,15,KΩ,±5%,0402	2	R512,R542
47	2RS1-10-473J	R Chip resistor	yageo,RC0402JR-0747KL,47,KΩ,±5%,0402	19	R77,R78,R79,R80,R240,R241,R242,R243,R265,R266,R267,R268,R501,R508,R513,R540,R541,R557,R558
48	2RS1-10-100J	R Chip resistor	yageo,RC0402JR-0710RL,10,Ω,±5%,0402	3	R244,R559,R66
49	2RS1-10-221J	R Chip resistor	yageo,RC0402JR-07220RL,220,Ω,±5%,0402	2	R249,R250

50	3ST1-SKRTLBE010	R SMD tact switch	ALPS,SKRTLBE010,4.5*3.55*3.3mm,-40 to +90℃	1	S1
51	2CC1-10-X7R500-271K	R Multi-layer chip capacitor	MURATA,GRM155R71H271KA01D,270,pF,±10%,50V,0402,X7R	1	C36
52	2CC1-10-X7R160-473K	R Multi-layer chip capacitor	MURATA,GRM155R71C473KA01D,47,nF,±10%,16V,0402,X7R	2	C40,C16
53	2CC1-10-C0G500-470J	R Multi-layer chip capacitor	MURATA,GRM1555C1H470JA01D,47,pF,±5%,50V,0402,C0G	2	C73,C54
54	2CC1-10-C0G500-1R0C	R Multi-layer chip capacitor	MURATA,GRM1555C1H1R0CA01D,1,pF,±0.25pF,50V,0402,C0G	1	C74
55	2CC1-16-C0G500-7R0D	R Multi-layer chip capacitor	murata,GRM1885C1H7R0DA01D,7,pF,±0.5pF,50V,1608,C0G	2	C83,C503
56	2CC1-16-C0G500-300J	R Multi-layer chip capacitor	murata,GRM1885C1H300JA01D,30,pF,±5%,50V,1608,C0G	2	C87,C88
57	112C03000273	Ceramic capacitor	YAGEO,CC0603JRNPO9BN680,68pF,±5%,50V,0603,NPO	1	C89
58	2CC1-16-C0G500-180J	R Multi-layer chip capacitor	murata,GRM1885C1H180JA01D,18,pF,±5%,50V,1608,C0G	1	C90
59	2CC1-16-C0G500-130J	R Multi-layer chip capacitor	murata,GRM1885C1H130JA01D,13,pF,±5%,50V,1608,C0G	1	C504
60	2CC1-16-C0G500-9R0D	R Multi-layer chip capacitor	murata,GRM1885C1H9R0DA01D,9,pF,±0.5pF,50V,1608,C0G	1	C505
61	2CC1-16-C0G500-820J	R Multi-layer chip capacitor	murata,GRM1885C1H820JA01D,82,pF,±5%,50V,1608,C0G	1	C511

62	2CC1-10-C0G500-820J	R Multi-layer chip capacitor	MURATA,GRM1555C1H820JA01D,82,pF,±5%,50V,0402,C0G	1	C512
63	2CC1-16-C0G500-8R0D	R Multi-layer chip capacitor	murata,GRM1885C1H8R0DA01D,8,pF,±0.5pF,50V,1608,C0G	2	C513,C517
64	2CC1-16-C0G500-200J	R Multi-layer chip capacitor	murata,GRM1885C1H200JA01D,20,pF,±5%,50V,1608,C0G	1	C515
65	2CC1-16-C0G500-220J	R Multi-layer chip capacitor	murata,GRM1885C1H220JA01D,22,pF,±5%,50V,1608,C0G	1	C516
66	2CC1-10-C0G500-R75B	R Multi-layer chip capacitor	MURATA,GRM1555C1HR75BA01D,0.75,pF,±0.1pF,50V,0402,C0G	1	C519
67	2CC1-10-C0G500-120J	R Multi-layer chip capacitor	MURATA,GRM1555C1H120JA01D,12,pF,±5%,50V,0402,C0G	1	C520
68	2CC1-10-C0G500-390J	R Multi-layer chip capacitor	MURATA,GRM1555C1H390JA01D,39,pF,±5%,50V,0402,C0G	1	C521
69	2CC1-10-X7R500-472K	Multi-layer chip capacitor	MURATA,GRM155R71H472KA01D,4.7,nF,±10%,50V,0402,X7R	1	C526
70	2CC1-16-C0G500-120J	R Multi-layer chip capacitor	murata,GRM1885C1H120JA01D,12,pF,±5%,50V,1608,C0G	2	C534,C514
71	2CC1-10-Y5V160-105Z	Multi-layer chip capacitor	murata,GRM155R61C105KA12D,1,uF,+80%/-20%,16V,1005,Y5V	11	C535,C38,C134,C136,C137,C138,C139,C140,C141,C142,C59
72	2CC1-10-X7R160-822K	R Multi-layer chip capacitor	MURATA,GRM155R71C822KA01D,8.2,nF,±10%,16V,0402,X7R	1	C545

73	2CC1-10-X7R500-153K	R Multi-layer chip capacitor	MURATA,GRM155R71H153KA12D,15,nF,±10%,50V,0402,X7R	1	C547
74	2CC1-10-C0G500-6R0C	R Multi-layer chip capacitor	MURATA,GRM1555C1H6R0CA01D,6,pF,±0.25pF,50V,0402,C0G	1	C561
75	2CC1-10-C0G500-151J	R Multi-layer chip capacitor	MURATA,GRM1555C1H151JA01D,150,pF,±5%,50V,0402,C0G	1	C573
76	2RS1-10-561J	R Chip resistor	yageo,RC0402JR-07560RL,560,Ω,±5%,0402	1	C578
77	2CC1-10-X7R250-223K	R Multi-layer chip capacitor	MURATA,GRM155R71E223KA61D,22,nF,±10%,25V,0402,X7R	1	C584
78	2CC1-16-C0G500-151J	R Multi-layer chip capacitor	murata,GRM1885C1H151JA01D,150,pF,±5%,50V,1608,C0G	1	C610
79	1DS1-RN142S	SMD switch diode	ROHM,RN142S,1.6mm*0.8mm*0.6mm,-55℃ to 150℃	2	D500,D501
80	1DS1-1SS390	SMD switch diode	ROHM,1SS390,1.6mm*0.8mm*0.6mm,-55℃ to 125℃	2	D502,D503
81	2LW1-16UC-680J	R SMD wire wound inductor	sagami,C1608CB-68NJ,68,nH,±5%,1608	1	L3
82	2LW1-16UC-470J	R SMD wire wound inductor	sagami,C1608CB-47NJ,47,nH,±5%,1608	2	L6,L40
83	2LW1-20UC-8R2J	SMD wire wound inductor	2012,8.2nH±5%, (C2012C-8N2J)	1	L29
84	2LH1-R401R5-R03-05	R SMD air core inductor	E20.40*1.5*3TL	2	L44,L45
85	2LH1-R301R5-L05-05	R SMD air core inductor	E20.3*1.5*5TR	1	L46

86	2LH1-R301R5-R07-05	SMD air core inductor	E20.3*1.5*7TL	2	L501,L505
87	2LH1-R301R5-L06-05	R SMD air core inductor	E20.3*1.5*6TR	2	L502,L503
88	2LL1-16-2N2SB	Multi-layer chip inductor	SunLord,SDCL1608C2N2STDF,2.2,nH,±0.3nH,1608	1	L504
89	2LW1-25UC-102JA	R SMD wire wound inductor	2520,1μH±5%,(FHW1008UC1R0J)	2	L506,L508
90	2LH1-R401R5-R08-05	R SMD air core inductor	E20.40*1.5*8TL	1	L507
91	2LL1-16-R10JB	Multi-layer chip inductor	LQG18HNR10J00D,100nH,±5%,1608,	2	L509,L511
92	2LL1-16-27NJB	Multi-layer chip inductor	SunLord,SDCL1608C27NJTDF,27,nH,±5%,1608	1	L510
93	5FE1-BLM21P300S	R SMD EMI filter	murata,BLM21PG300SN1D,2012.0	2	L512,L514
94	2RS1-16-560J	R Chip resistor	yageo,RC0603JR-0756RL,56,Ω,±5%,1608	1	L513
95	2CC1-20-X7R500-471K	Multi-layer chip capacitor	yageo,CC0805KRX7R9BB471,470,pF,±10%,50V,2012,X7R	1	L520
96	1TF1-RD07MUS2B-501	SMD field effect transistor	MITSUBISHI,RD07MUS2B-501,SLP,-~150℃	1	Q500
97	1TF1-RD01MUS2-501	ＥＲ 贴片场效应管手持数字机及模拟机通用料	MITSUBISHI,RD01MUS2-501,S0T-89,-~150℃	1	Q501

98	1TT1-2SC5108-Y	R SMD transistor	TOSHIBA,2SC5108-Y,2-2H1A,-~125℃	1	Q502
99	1TT1-L2SC3356LT1	SMD transistor	LRC,L2SC3356LT1,SOT-23,-~150℃	1	Q503
100	2RS1-16-333J	R Chip resistor	yageo,RC0603JR-0733KL,33,KΩ,±5%,1608	1	R8
101	2RS1-16-103J	R Chip resistor	yageo,RC0603JR-0710KL,10,KΩ,±5%,1608	1	R12
102	2RS1-10-472J	R Chip resistor	yageo,RC0402JR-074K7L,4.7,KΩ,±5%,0402	3	R39,R561,R562
103	2RE1-16-2203	SMD precision resistor	yageo,RC0603FR-07220KL,220,KΩ,±1%,0603	1	R42
104	2RS1-10-470J	R Chip resistor	yageo,RC0402JR-0747RL,47,Ω,±5%,0402	1	R500
105	2RS1-10-682J	R Chip resistor	yageo,RC0402JR-076K8L,6.8,KΩ,±5%,1005	1	R503
106	2CC1-10-C0G500-150J	R Multi-layer chip capacitor	MURATA,GRM1555C1H150JA01D,15,pF,±5%,50V,0402,C0G	1	R504
107	2RS1-16-271J	R Chip resistor	yageo,RC0603JR-07270RL,270,Ω,±5%,1608	2	R505,R515
108	2RS1-10-152J	R Chip resistor	yageo,RC0402JR-071K5L,1.5,KΩ,±5%,0402	2	R507,R51
109	2RS1-10-563J	R Chip resistor	yageo,RC0402JR-0756KL,56,KΩ,±5%,0402	2	R509,R38
110	2RS1-10-330J	R Chip resistor	yageo,RC0402JR-0733RL,33,Ω,±5%,0402	1	R510

111	2RS1-10-220J	R Chip resistor	yageo,RC0402JR-0722RL,22,Ω,±5%,0402	1	R511
112	2RS1-16-225J	Chip resistor	yageo,RC0603JR-072M2L,2.2,MΩ,±5%,1608	1	R517
113	2RE1-16-1503	R SMD precision resistor	yageo,RC0603FR-07150KL,150,KΩ,±1%,0603	2	R518,R525
114	2RS1-32-R39J	R Chip resistor	yageo,RC1206JR-070R39L,0.39,Ω,±5%,3216	4	R520,R521,R522,R523
115	2RE1-16-1003	SMD precision resistor	yageo,RC0603FR-07100KL,100,KΩ,±1%,0603	2	R527,R528
116	2RS1-10-203J	R Chip resistor	yageo,RC0402JR-0720KL,20,KΩ,±5%,0402	1	R529
117	1TC1-UMC4	R SMD Darlington tube	Rohm,UMC4N,UMT5,-~150℃	1	U301
118	121I05000076	SMD IC	AT1846S,2021	1	U500
119	5OT1-12R8-HHL-0303	Voltage controlled temperature compensated crystal oscillator	DSA321SCL,3.0V,12.8MHz±2.5ppm,-30℃～+75℃,3225	1	X500
120	112C03000163	Ceramic capacitor	YAGEO,CC0402KRX7R7BB683,68nF,±10%,16V,0402,X7R	1	C23
121	2CC1-10-C0G500-100D	R Multi-layer chip capacitor	MURATA,GRM1555C1H100JA01D,10,pF,±5%,50V,0402,C0G	1	C35
122	2CC1-20-X7R6R3-475K	R Multi-layer chip capacitor	murata,GRM219R6J475KE19D,4.7,uF,±10%,6.3V,2012,X7R,高度0.85±0.1MM	3	C50,C51,C617

123	112C03000141	Ceramic capacitor	YAGEO,CC0603JRNPO9BN102,1nF,±5%,50V,0603,NPO	2	C52,C97
124	3FW1-0805L035	SMD fuse	Littelfuse,0805L035,0603,-40 to +85℃	2	C85,C605
125	3CF1-SMT-4P	SMT connector	1.25mm 4PIN,1.25mm 4PIN,-25°C to 85°C	1	J6
126	1TT1-2SC4116-GR	R SMD transistor	TOSHIBA,2SC4116-GR,SOT-323/SC-70,-~125℃	1	Q2
127	1TF1-ST2301	R SMD field effect transistor	Stanson,ST2301,SOT-23-3L,-~150℃	2	Q600,Q20
128	1TT1-2SA1586	R SMD transistor	TOSHIBA,2SA1586,SC-70,-~125℃	1	Q605
129	2RS1-10-333J	R Chip resistor	yageo,RC0402JR-0733KL,33,KΩ,±5%,0402	6	R18,R31,R616,R617,R65,R67
130	2RS1-10-392J	R Chip resistor	yageo,RC0402JR-073K9L,3.9,KΩ,±5%,0402	2	R24,R632
131	2RS1-10-223J	R Chip resistor	yageo,RC0402JR-0722KL,22,KΩ,±5%,0402	2	R27,C34
132	2RS1-10-564J	R Chip resistor	yageo,RC0402JR-07560KL,560,KΩ,±5%,1005	1	R29
133	2RS1-10-101J	R Chip resistor	yageo,RC0402JR-07100RL,100,Ω,±5%,0402	1	R36
134	2RS1-10-821J	R Chip resistor	yageo,RC0402JR-07820RL,820,Ω,±5%,1005	1	R37
135	2RS1-10-474J	R Chip resistor	yageo,RC0402JR-07470KL,470,KΩ,±5%,0402	1	R44

136	2RS1-10-4R7J	R Chip resistor	yageo,RC0402JR-074R7L,4.7,Ω,±5%,0402	2	R84,R85
137	2RS1-10-562J	R Chip resistor	yageo,RC0402JR-075K6L,5.6,KΩ,±5%,0402	1	R613
138	2RS1-10-182J	R Chip resistor	yageo,RC0402JR-071K8L,1.8,KΩ,±5%,0402	1	R618
139	2RS1-10-393J	R Chip resistor	yageo,RC0402JR-0739KL,39,KΩ,±5%,0402	1	R631
140	1IS1-TDA2822	SMD IC	UTC,TDA2822,SOP8,-20 to +85℃	1	U600
141	2CC1-10-C0G500-6R8C	Multi-layer chip capacitor	MURATA,GRM1555C1H6R8CA01D,6.8,pF,±0.25pF,50V,0402,C0G	1	C32
142	2CC1-10-C0G500-2R5B	R Multi-layer chip capacitor	SU,MURATA,GRM1555C1H2R5BA01D,2.5pF,±0.1pF,50V,0402,C0G	4	C60,C69,C70,C71
143	2CC1-10-C0G500-2R0B	Multi-layer chip capacitor	MURATA,GRM1555C1H2R0BA01D,2,pF,±0.1pF,50V,0402,C0G	1	C72
144	5FE1-CB100505-102	SMD EMI filter	CB100505-102,1005.0	25	FB1,FB17,FB20,FB41,L7,L9,L10,L11,L12,L13,L14,L15,L16,L17,L18,L19,L20,L21,L22,L23,L24,L25,L26,L27,L28
145	1IS1-XC6209F332M	SMD voltage regulator IC	XC6209F332MR,SOT-25,-40~85°	1	IC15
146	2LL1-16-3N9SA	Multi-layer chip inductor	SunLord,SDCL1608C3N9STDF,3.9,nH,±0.3nH,1608	2	L34,L35
147	2LL1-16-10NJA	Multi-layer chip inductor	SunLord,SDCL1608C10NJTDF,10,nH,±5%,1608	1	L36

148	2LL1-16-8N2DA	Multi-layer chip inductor	SunLord,SDCL1608C8N2JTDF,8.2,nH,±0.5nH,1608	1	L37
149	121I05000092	SMD IC	AT6558F-5N32,	1	U3
150	1IS1-AT2659	Low noise amplifier	AT2659,1550MHz～1615MHz,6pinDFN	1	U8
151	125O03000001	Temperature compensated crystal oscillator	2TG2600001,	1	X101
152	135X02000005	Crystal resonator	32.768KHz,+20.0-20.0,FC-135,Q13FC13500002,7P,3.2mm*1.5mm,EPSON	1	Y1
153	2RE1-10-2202	SMD precision resistor	YAGEO,RC0402FR-0722KL,22,KΩ,±1%,0402	1	R23
154	3CF1-BL112-30RU	SMD FFC/FPC connector	0.5-3-30P,lower flip connector,H=2.0	1	J201
155	2RS1-16-220J	R Chip resistor	yageo,RC0603JR-0722RL,22,Ω,±5%,1608	2	R2,R5
156	9FSC0100001	9FSC0100001	9FSC0100001	1	
157	1ID1-MXD2020ML	Accelerometer	memsic,MXD2020ML,LCC-8，5.0mm*5.0mm*1.99mm,-40℃ to 105℃	1	U4
158	2RS1-16-122J	R Chip resistor	yageo,RC0603JR-071K2L,1.2,KΩ,±5%,1608	1	L32

Table 3 Material List of Module Board HS8861

SN	Material NO.	Material Name	Specification	QTY	Position
1	2CC1-20-X5R160-106KD	multi-layer chip capacitor	EMK212ABJ106KD-T,2012,10uF±10%,16V,TAIYO,0.85±0.1mm high	5	C1,C17,C18,C37,C38
2	2RS1-06-330J	chip resistor	yageo,RC0201JR-0733RL,33,Ω,±5%,0201	4	R29,R30,R31,R32
3	2CC1-10-X7R500-102K	R multi-layer chip capacitor	MURATA,GRM155R71H102KA01D,1,nF,±10%,50V,0402,X7R	6	C3,C10,C9,C15,C34,C36
4	2CC1-10-Y5V160-105Z	multi-layer chip capacitor	murata,GRM155R61C105KA12D,1,uF,+80%/-20%,16V,1005,Y5V	19	C7,C20,C21,C23,C24,C25,C26,C27,C29,C30,C31,C32,C33,C35,C42,C43,C0044,C153,C154
5	2CC1-10-X7R160-104K	R multi-layer chip capacitor	MURATA,GRM155R71C104KA88D,100,nF,±10%,16V,0402,X7R	6	C6,C8,C47,C11,C12,R23
6	2CC1-10-C0G500-101J	R multi-layer chip capacitor	MURATA,GRM1555C1H101JA01D,100,pF,±5%,50V,0402,C0G	1	C13
7	2CC1-16-X5R160-105K	multi-layer chip capacitor	murata,GRM188R61C105KA12D,1,uF,±10%,16V,1608,X5R	3	C28,C39,C40
8	2CC1-06-X7R500-103K	chip capacitor	MURATA,GRM033R61C103KA12D,10nF,±10%,16V,0201,X7R	3	C144,C512,C325
9	2CC1-06-X5R100-104	multi-layer chip capacitor	MURATA,GRM033R61A104KE15D,100,nF,±10%,10V,0201,X5R	2	C262,C443
10	2CC1-06-X5R100-105M	chip capacitor	MURATA,GRM033R61A105M,1,uF,±20%,10V,0201,X5R	2	C439,C4
11	1DR1-RB521S30	Schottky barrier diode	ROHM,RB521S30,SOD-523,1.6mm*0.8mm*0.6mm,-40℃	5	D1,D2,D3,D4,D5

			to 125℃		
12	121D03000006	rectifier diode	ROHM,RB706UM-40,	1	D30
13	2RS1-16-000O	R chip resistor	yageo,RC0603JR-070RL,0,Ω,±5%,1608	1	FB105
14	121I04000023	linear IC	韦尔,WS72321B-5/TR,SOT353,-40 to +125℃,	1	IC6
15	2RS1-10-103J	R chip resistor	yageo,RC0402JR-0710KL,10,KΩ,±5%,0402	6	R1,R12,R15,R16,R17,R18
16	2RS1-10-102J	R chip resistor	yageo,RC0402JR-071KL,1KΩ,±5%,0402	3	R3,R7,R8
17	2RS1-10-000O	R chip resistor	yageo,RC0402JR-070RL,0,Ω,±5%,0402	2	R4,R68
18	2RS1-10-101J	R chip resistor	yageo,RC0402JR-07100RL,100,Ω,±5%,0402	3	R5,R6,R19
19	2RS1-10-511J	R chip resistor	yageo,RC0402JR-07510RL,510,Ω,±5%,0402	2	R13,R14
20	2RS1-06-103J	chip resistor	yageo,RC0201JR-0710KL,10,KΩ,±5%,0201	5	R20,R21,R27,R2,R11
21	2RS1-06-473J	chip resistor	yageo,RC0201JR-0747KL,47,KΩ,±5%,0201	3	R326,R332,R333
22	2RS1-06-102J	chip resistor	yageo,RC0201JR-071KL,1,KΩ,±5%,0201	3	R328,R329,R133
23	2RS1-06-104J	chip resistor	yageo,RC0201JR-07100KL,100KΩ,±5%,0201,	2	R330,R331

24	1IS1-LN1121P332MR	SMD voltage regulator IC	Natlinear,LN1121P332MR,SOT23-3,-40 to +85℃	3	U1,U3,U4
25	121I02000005	Storage IC	W25Q64JVZEIQ,2.7-3.6V,	1	U0005
26	121I01000003	MCU+baseband IC	HS8861;175;TFBGA;7.8X7.8;040;BB,	1	U2100
27	5OT1-26R0-DSB221SDN	Temperature compensated crystal oscillator	KDS,1XXB26000MAA,26MHz±0.5ppm,2520	1	X2
28	136P04000077	PCB	DP405W_MODULE,36.4X24.7mm,4-layer,1.0mm	1	
29	1DS1-1SS390	SMD switch diode	ROHM,1SS390,1.6mm*0.8mm*0.6mm,-55℃ to 125℃	1	D105
30	2CC1-10-C0G500-7R0C	multi-layer chip capacitor	MURATA,GRM1555C1H7R0CA01D,7,pF,±0.25pF,50V,0402,C0G	2	C14,C19
31	2CC1-10-X7R500-103K	R multi-layer chip capacitor	MURATA,GRM155R71H103KA88D,10,nF,±10%,50V,0402,X7R	3	C2,C5,C16

Table 4 Material List of Key PCB

SN	Material NO.	Material Name	Specification	QTY	Position
1	2CC1-10-C0G500-101J	R multi-layer chip capacitor	1005,100P±5%,50V,C0G	8	C5,C6,C7,C8,C9,C10,C11,C12
2	2CC1-10-X7R160-104K	R multi-layer chip capacitor	1005,100nF±10%,16V,X7R	8	C1,C2,C3,C4,C13,C14,C15,C16
3	3CF1-BL112-30RU	SMD FFC/FPC connector	Spacing 0.5 mm, 30-pin, horizontal type	1	J1

4	3CF1-BL112-16RL	SMD FFC/FPC connector	Spacing 0.5 mm, 16-pin, BL112-16RL, horizontal type, bottom contact, with lock	1	J2
5	124P01000008	SMD light emitting diode	19-217/W1D-APQHY/3T,0603	8	D1,D2,D3,D4,D5,D6,D7,D8
6	2RS1-10-101J	R chip resistor	1005,100Ω±5%	4	R1,R2,R3,R4
7	6PM7-4245-HKB	DP580 key PCB	DP580-KEY, size: 45.45x36.2mm, thickness: 0.8MM, 4-layer, FR-4, lead free	1	PCB
8	2RS1-16-101J	R chip resistor	1608,100Ω±5%	2	R5 R6

Appendix 3 Material List (Structural Section)

SN	Material NO.	Material Name	Specification	QTY
1	7MHP-4182-01A-W0	DP990 volume knob (cover die 1)	PC1414, black, etched, oiled gray, lead free	1
2	7MHP-4182-02A-W0	DP990 encoding knob (cover die 2)	Material: PC1414, black, etched, oiled gray, lead free	1
3	7MHP-4207-03A-W0	DP586 top cover (cover die 1)	PC1414, black, lead free	1
4	7MHR-4207-01A-W3	DP586 waterproof ring	Silicon rubber, pantone 172C, hardness 40±5°, lead free	1
5	7MHR-4182-01A-W0	DP990 discharge waterproof pad	Hardness 30°, silicon rubber, orange PT172C, lead free	1
6	7MHR-4207-06A-W0	DP586 O-shaped ring of antenna pedestal	Material: silicon rubber, outer diameter 11mm, wire diameter 1.5mm, lead free	1
7	7MHR-4072-05A-W0	O-shaped ring of power key	Silicon rubber, outer diameter 8mm, wire diameter 1.5mm, lead free	2
8	7MHR-4072-06A-W0	Silicon O-shape ring	Silicon rubber, outer diameter 4mm, wire diameter 1.0mm, lead free	2
9	7MHR-7042-06C-W0	R heat-conducting silicon pad	Silicon rubber, black, 3*6*9mm, hardness 20°, lead free	1
10	7MHL-4253-01B-W	Aluminum shell	ADC12, surface grinding + sand blasting + paint spraying, lead free	1

SN	Material NO.	Material Name	Specification	QTY
11	3CR7-SMA-50JF-4	RF coaxial cable	SMA-J, flange, 7200 times of use	1
12	7NRC-4078-01A-N	Antenna connector nut	Brass, black nickel plated, lead free	1
13	7SMF-020040M-SZYB-N	R M2*4 cross recessed mushroom-head machine screw	Harden iron, Φ2mm*4mm cross recessed mushroom-head nickel plated machine screw, metric coarse thread, nylok	8
14	7SMF-020037M-SZCT-N	Cross recessed countersunk-head machine screw	Harden iron 1018, Φ2.0mm*3.7mm, nickel plated	2
15	7SMS-025075M-SZYB-N1	M2.5*7.5 torx round-head machine screw	Stainless steel, Φ2.5mm*7.5mm, lead free	2
16	7MHC-4072-01A-W	STP knob nut	Brass, inner diameter 6mm, outer diameter 9mm, 2.4mm thick, lead free	2
17	7MHS-4072-08A-W	STP knob circlip	Stainless steel, T=0.3, original color, lead free	2
18	7STF-019047B-SZHT-X	M1.9*4.7 thick-head self-tapping Phillips screw	Material: harden iron, Φ1.9mm*4.7mm, flat-head, with guide, radiant plated	2
19	7MHS-4245-02B-W	DP580 LCD hardware holder	SUS304, 48hr salt spray test passed	1
20	6PD7-4207-HPC	DP586 PTT plate	DP586_PTT_1600707, 0.8mm thick, FR-4, 52X10mm, 2-layer, lead free	1
21	7MHS-4207-03A-W	DP586 PTT metal dome array	SUS301, Φ5mm, four-point metal dome	1
22	157F01000006	LCD module	Black-and-white screen, 128*64mm, ultra-wide temperature range, lead free	1
23	7SMF-025080M-SZYB-Z	M2.5*8 cross round-and-mushroom headed machine screw	Stainless steel, Φ2.5mm*8mm, black zinc plated, lead free	2
24	3WF7-05030-500C4	FPC cable	Spacing 0.5mm, 40P, length 120mm, 3mm, stiffener 5mm, dual connectors, single-face, single-direction	1
25	6SS3-MK4237-HMA	DP480 front shell assembly	Cover ultrasonic, black	1
26	63BJ000002	KBJ-17 belt clip (S series)	S760/DP405 belt clip	1

SN	Material NO.	Material Name	Specification	QTY
27	7MHP-4253-04A-W0	DP485 waterproof pad for earphone jack	TPU, black, etched, lead free	1
28	7MHR-1727-08A-W0	R 558 rubber pad for shrapnel at battery anode/cathode	Material: silicon rubber, hardness 40°, black, no surface treatment	2
29	7GCM-150120025-J	Sponge mat for battery	5*12*2.5mm, single-sided adhesive, black	1
30	7MHZ-1731-01A-J5	Horn insulating paper	Horn insulating paper	1
31	7MBM-S4002-A	Conductive foam	Gum,12*7*7	1
32	147K02000149	Knob circlip	Black	1

Appendix 4 Accessory List

Accessory	QTY
Radio	1
Charger	1
Power adapter	1
Battery	1
Belt clip	1
Antenna	1
Strap	1
Certificate of Quality	1
User Manual	1

Charger   Battery   Belt clip + screws
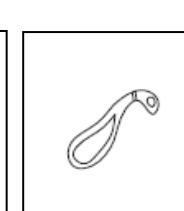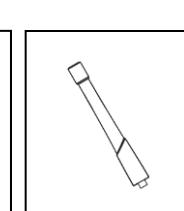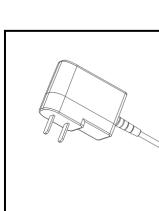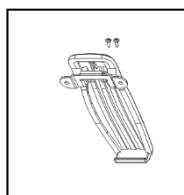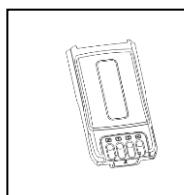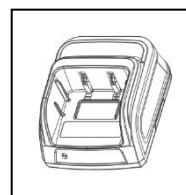
Power Adapter   Antenna   Strap

Appendix 5 Schematic Diagrams and Layout Drawings

Schematic Diagrams of Main Board
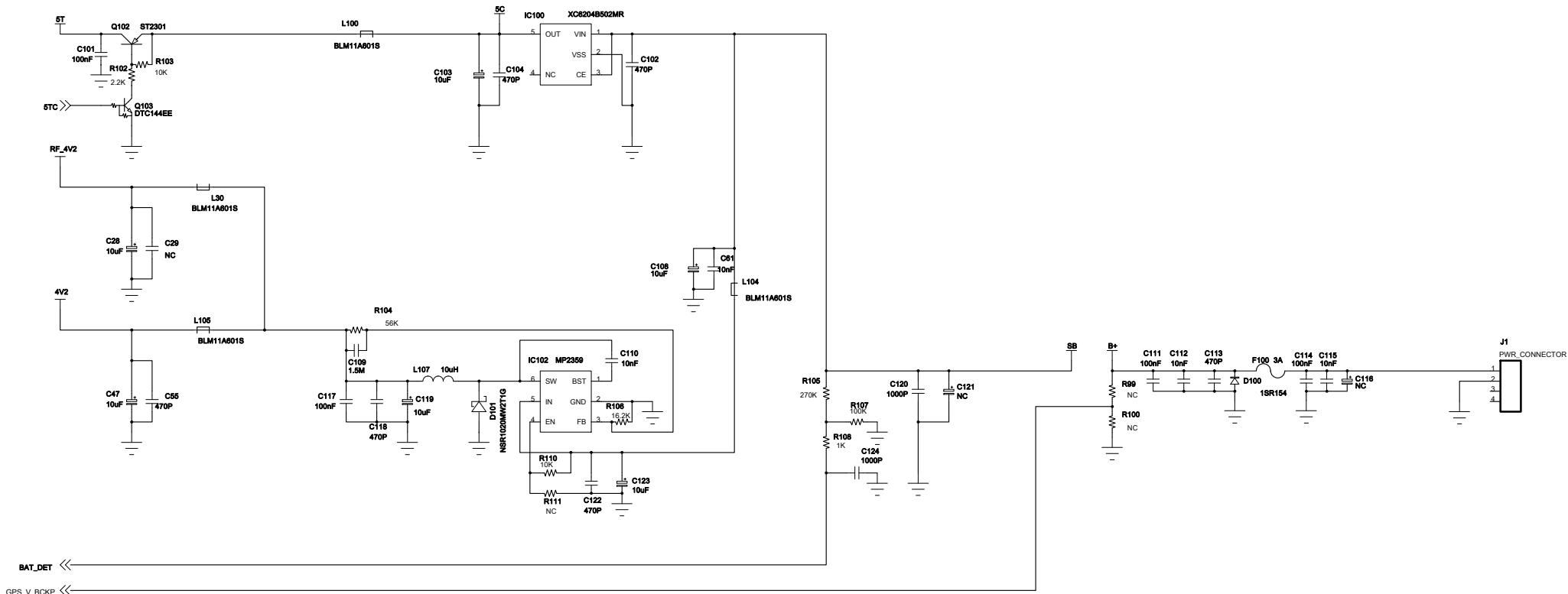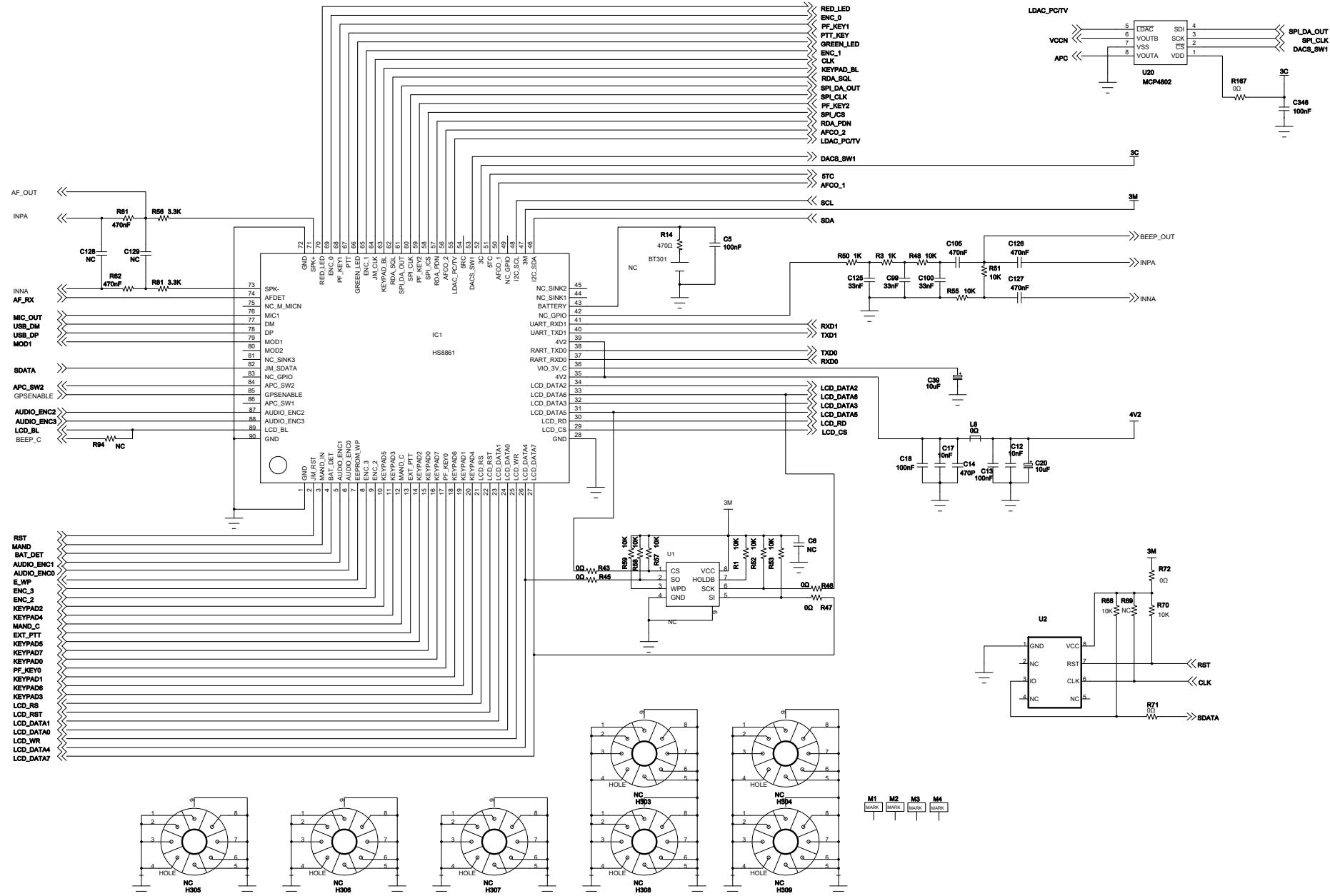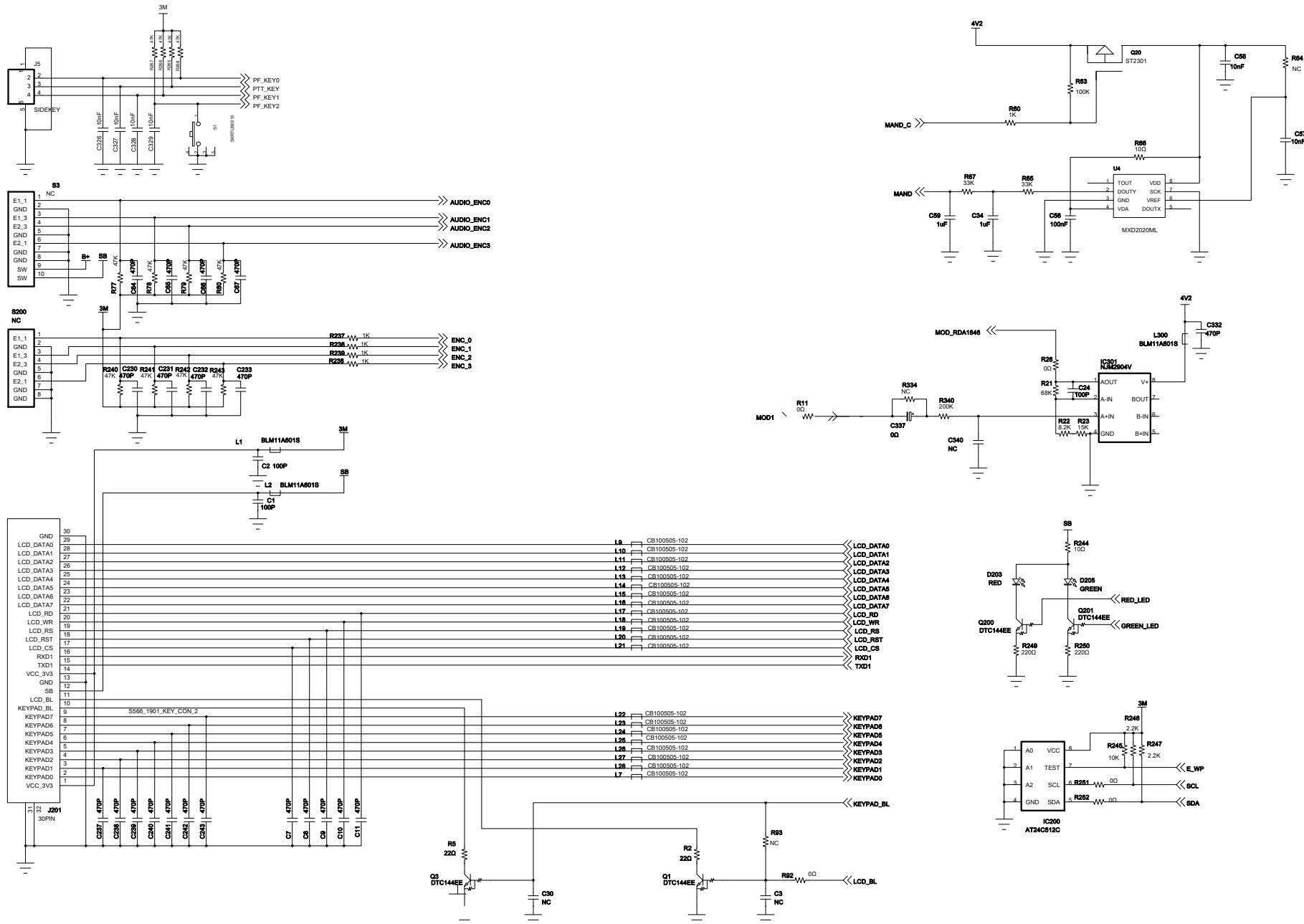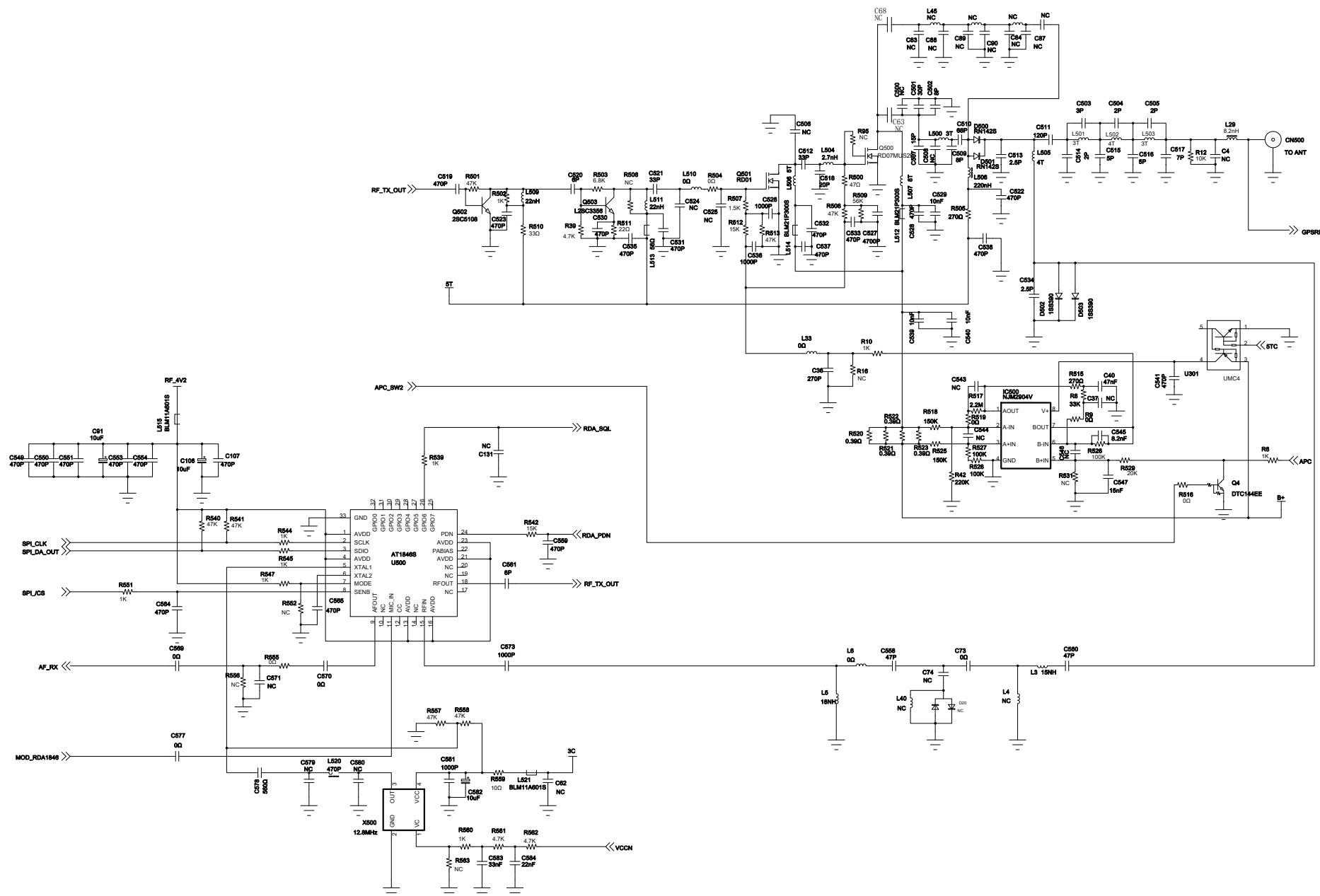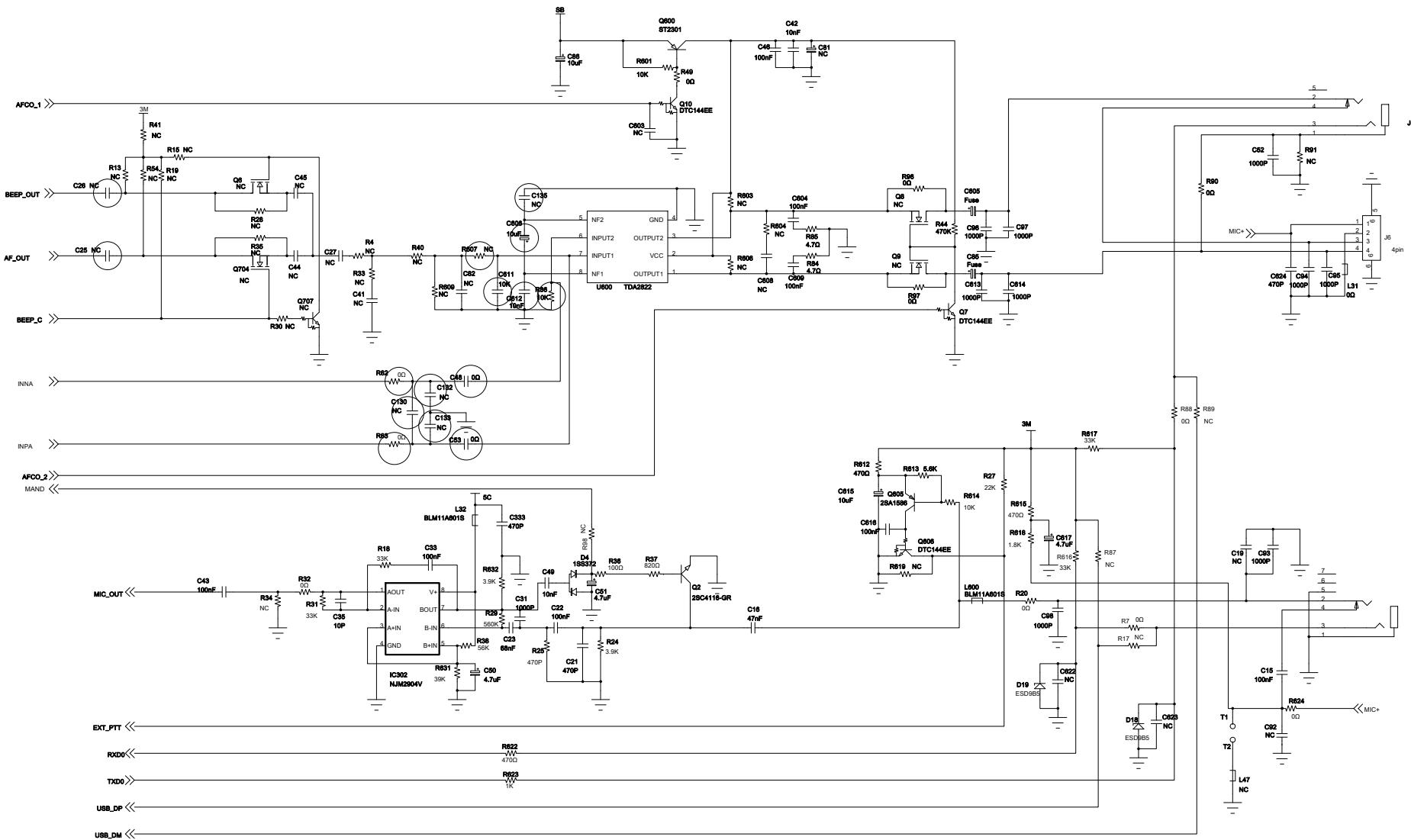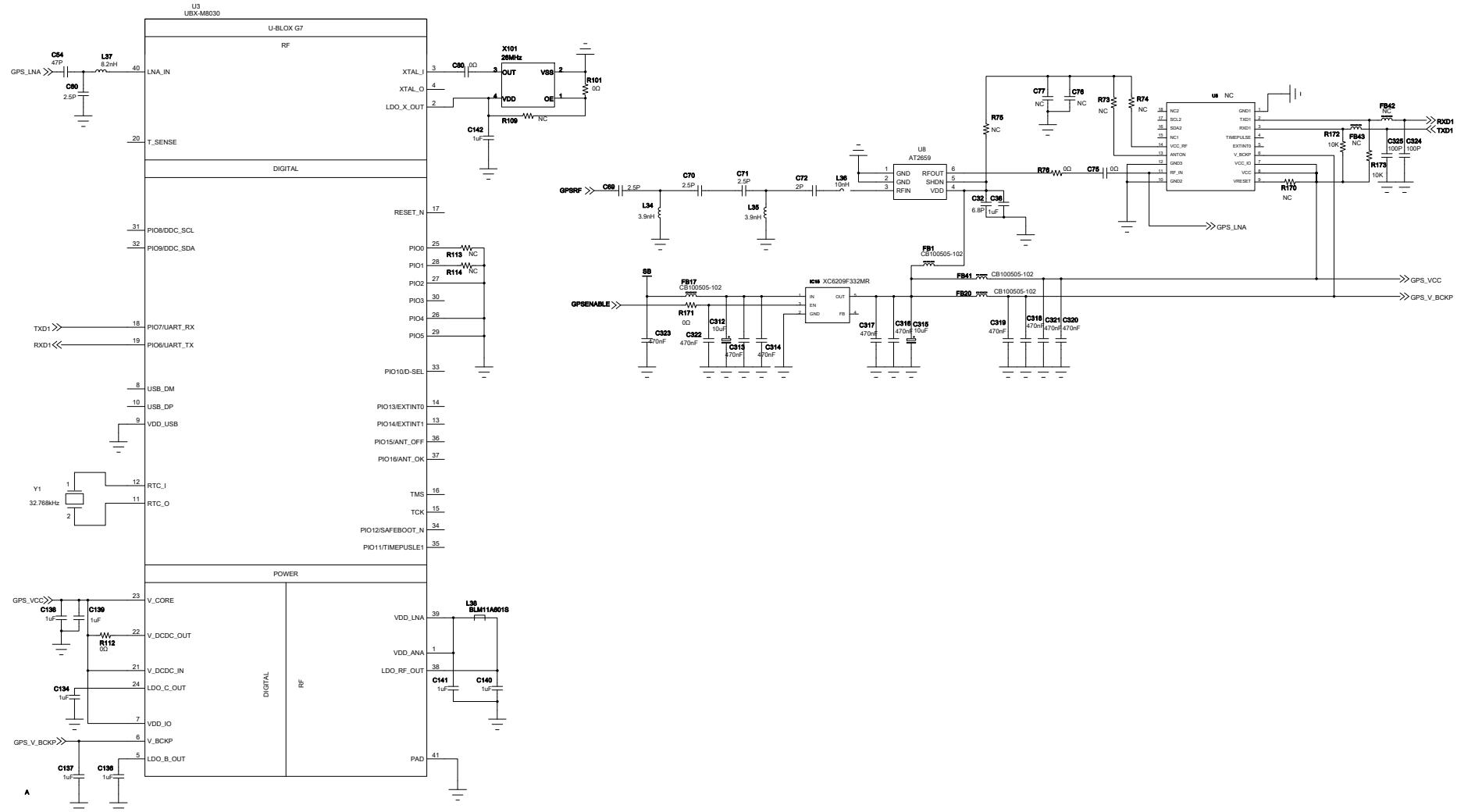
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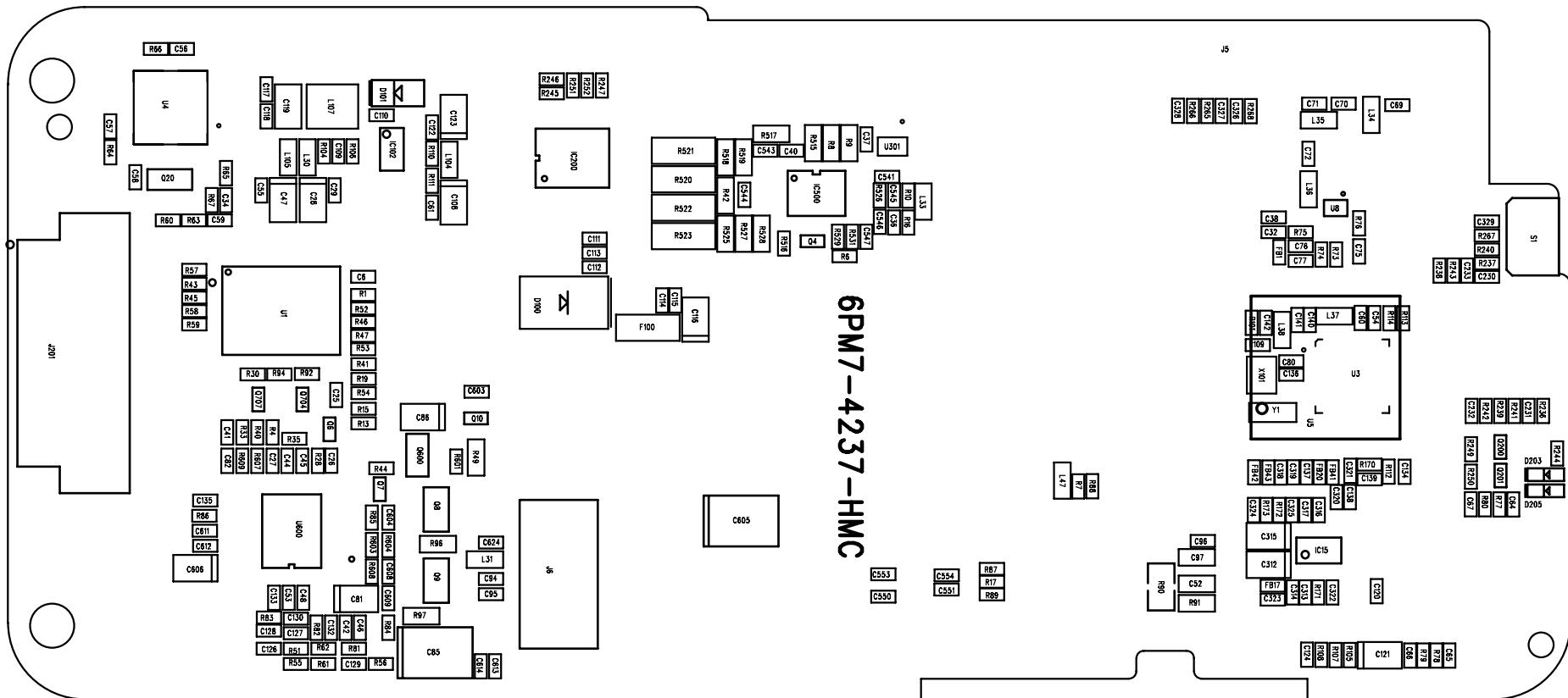
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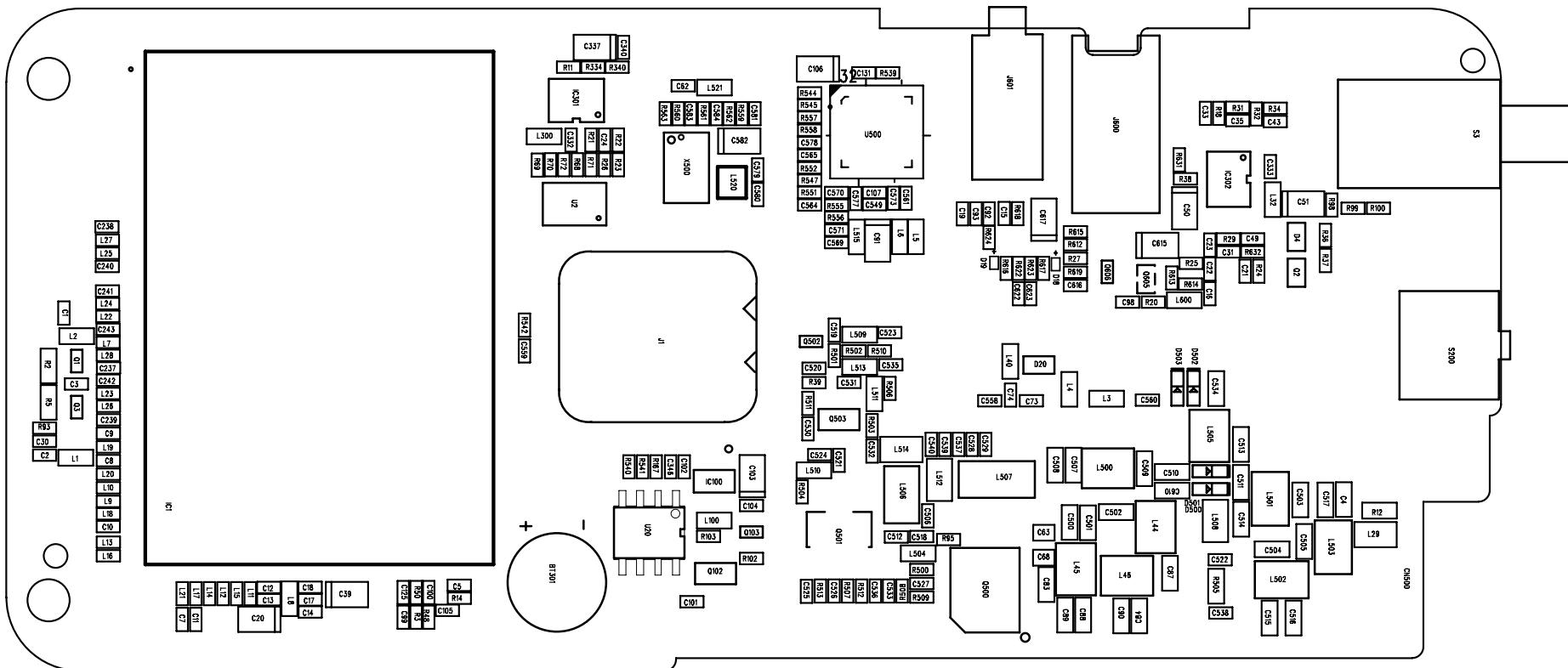
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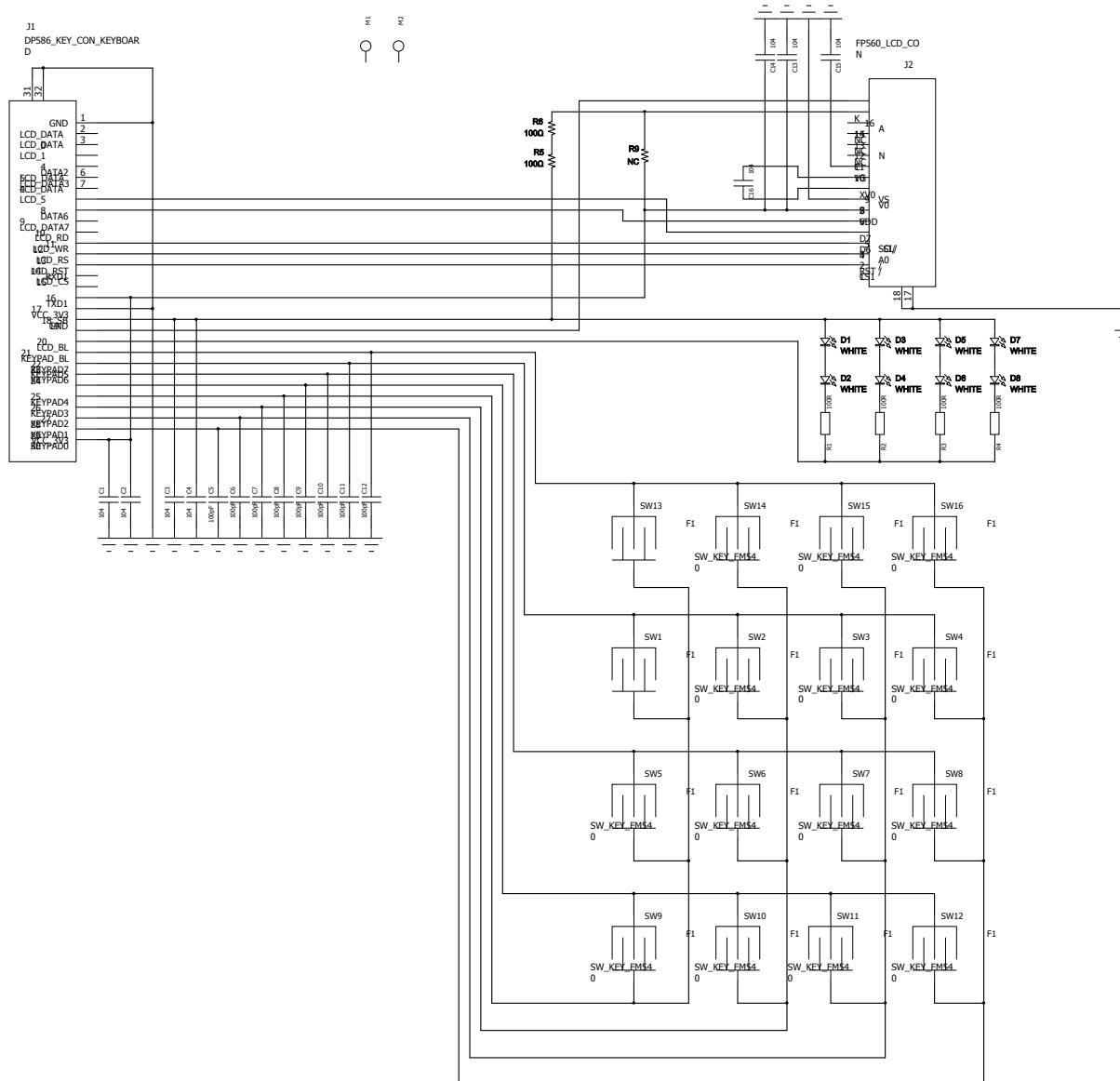
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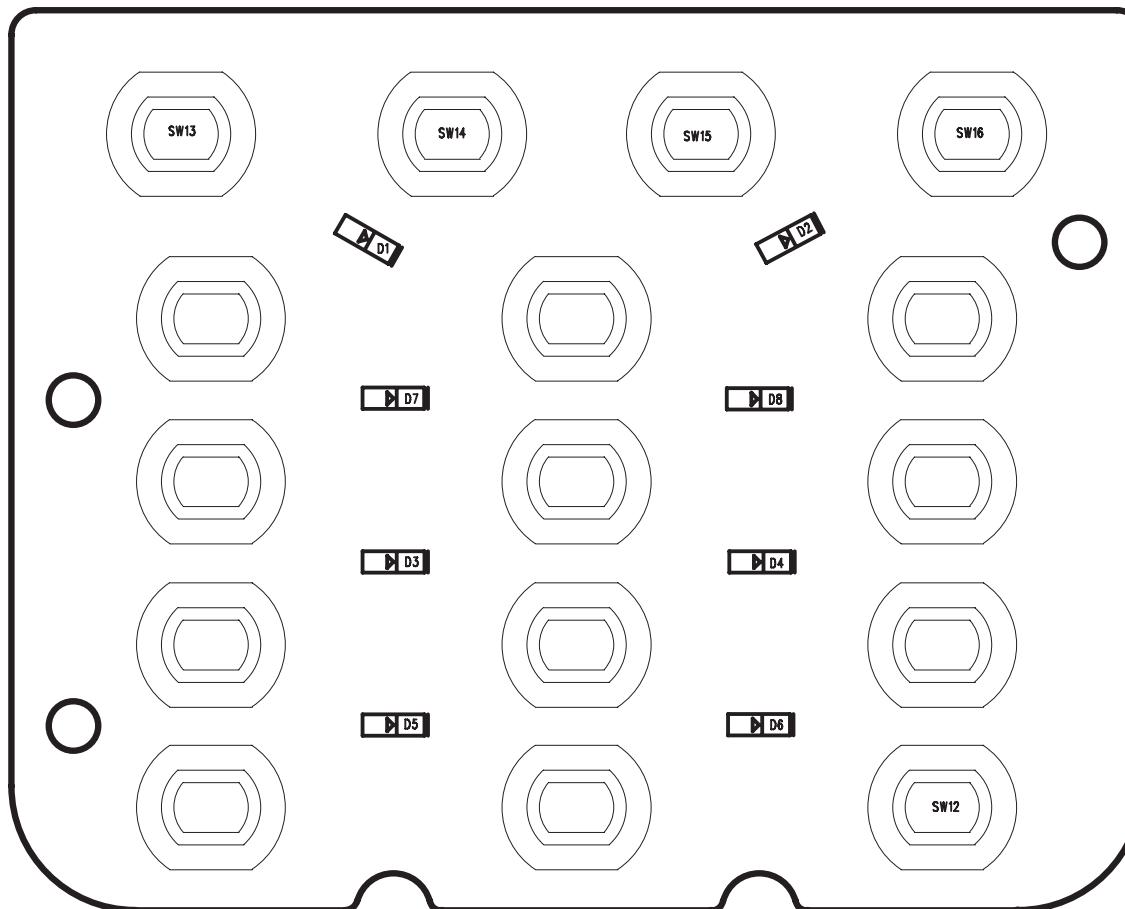
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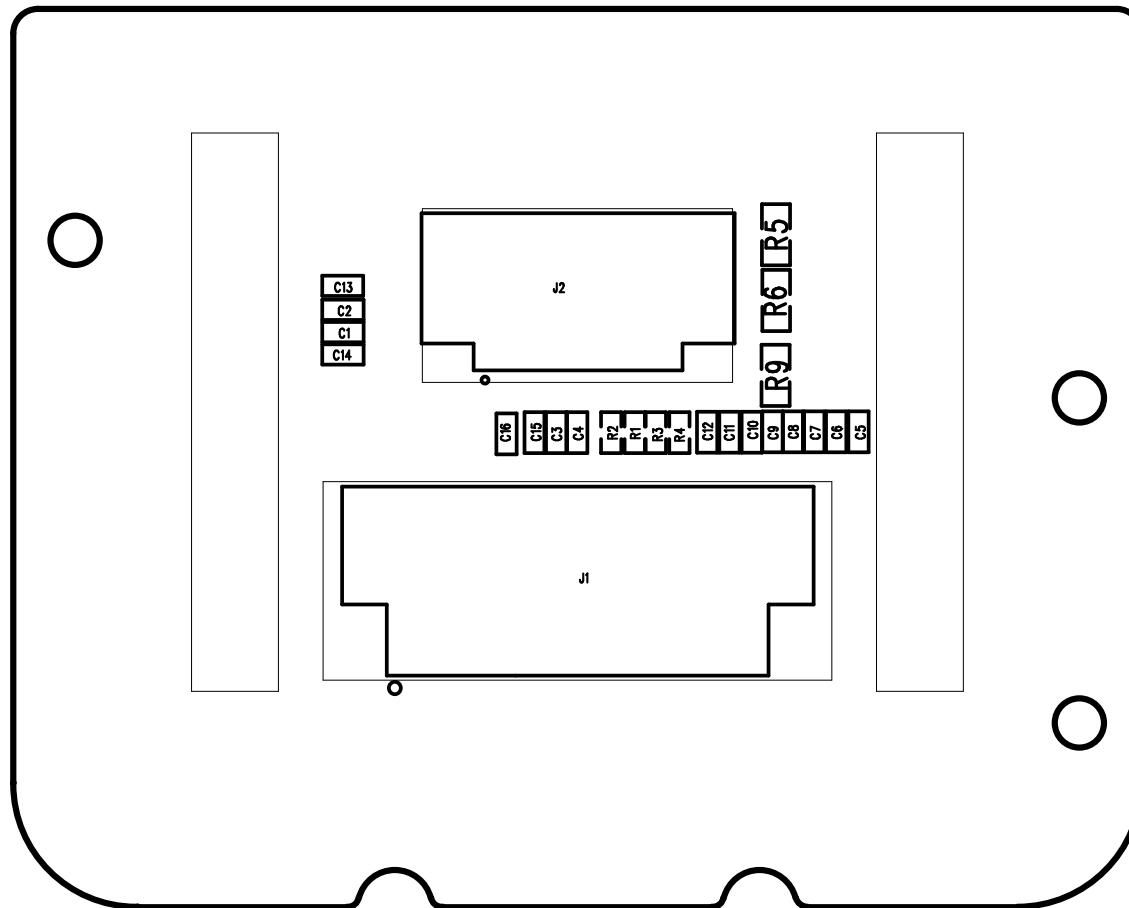
Schematic Diagrams of Module Board

DBB

Close to BB

Close to BB

2520封装
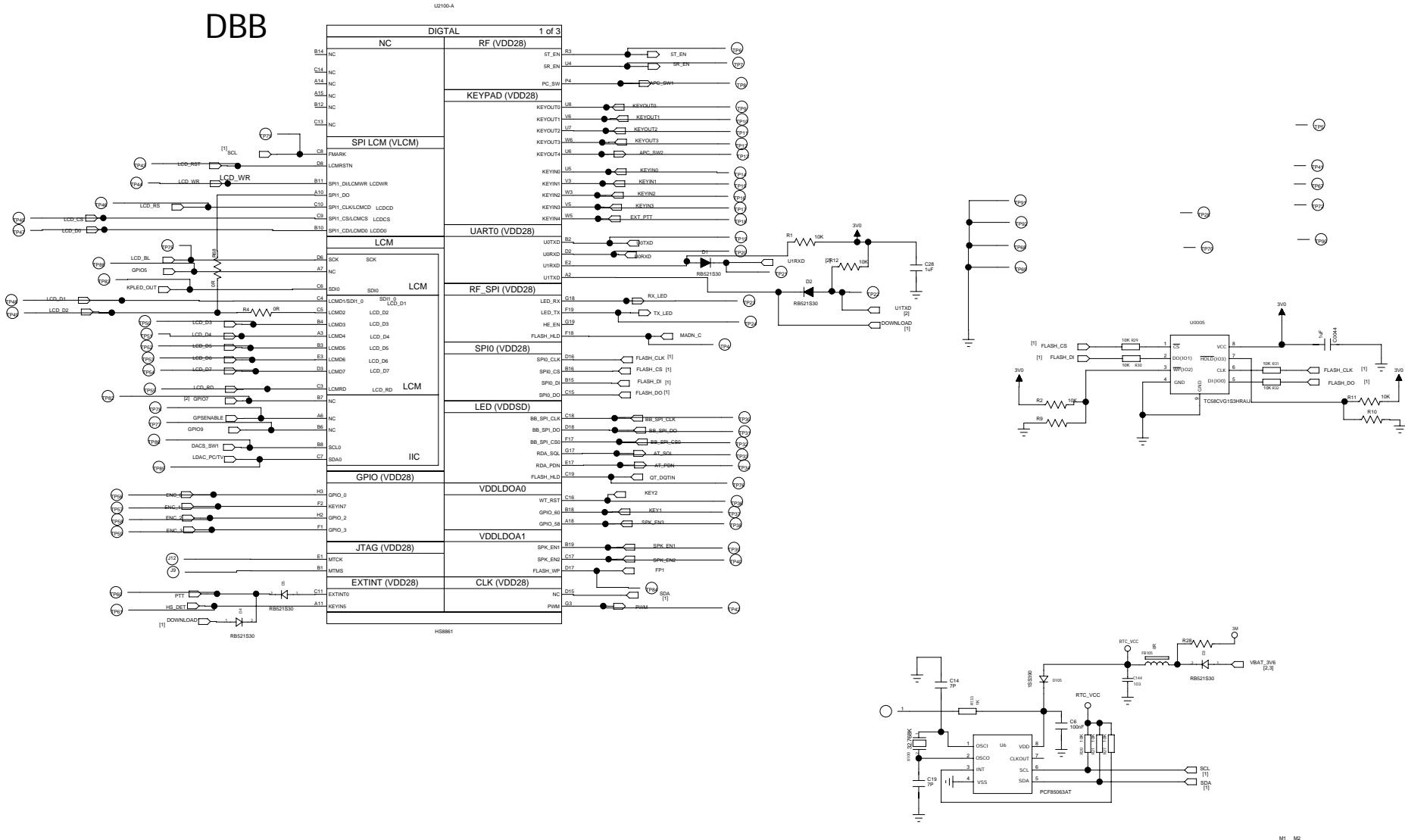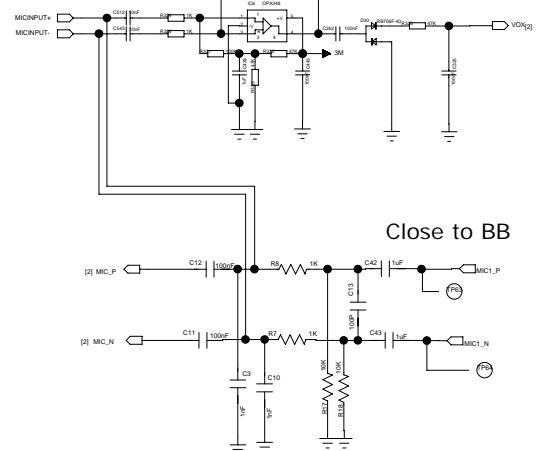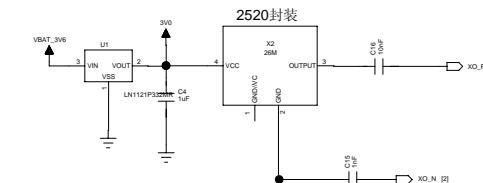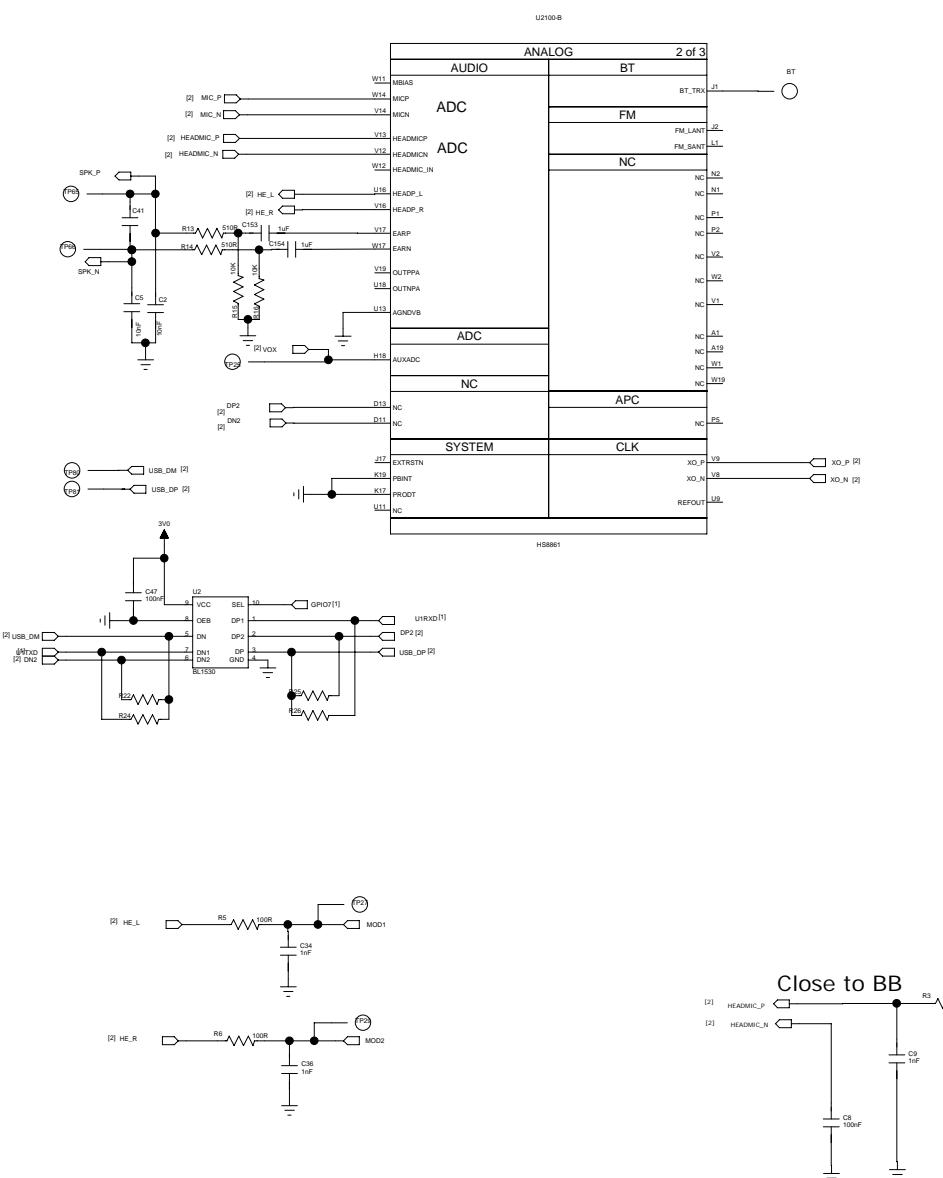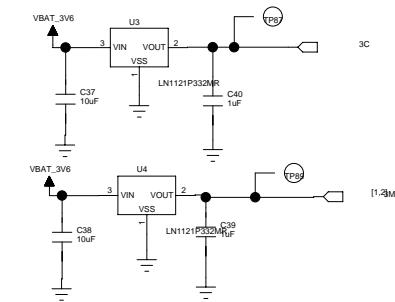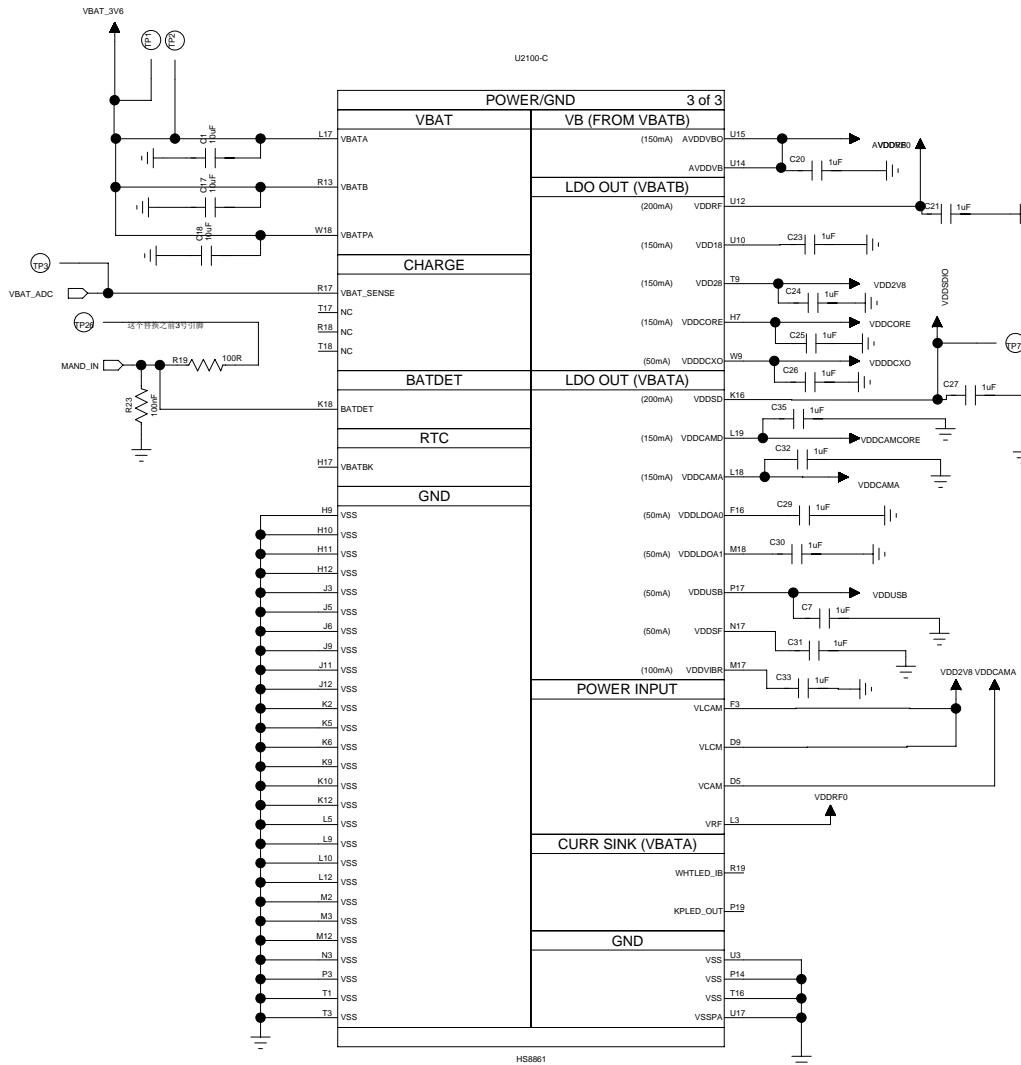
Top-Layer Layout Drawing of Module Board