



PORTABLE TRANSCEIVER



PT4208

**FM PORTABLE RADIO
SERVICE MANUAL**

Dangerous!

Do not connect the AC power or DC power over 8.6V with any connector or terminal of the radio. Otherwise it will cause fire, electric shock or damage to the radio.

Warning!

Do not reverse power connection.

It may cause harm to the radio if signal input on the antenna connector is higher than 20 dBm (100mW).

Do not turn on the power before the antenna or load connection is completed.

If the antenna has been damaged, do not use the radio. Damaged antenna may cause light burning on skin.

Though the radio is waterproof, it's better to avoid putting it in rain or snow, or any other liquid to ensure its life and performance.

Statement!


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Chapter 1 Overview

1.1 Introduction

This manual applies to the service and maintenance of PT4208 series portable radios, and is intended for use by engineers and professional technicians that have been trained by Kirisun. It contains all required service information for the equipment. Kirisun reserves the right to modify the product structure and specifications without notice in order to enhance product performance and quality. You can also log on our website www.kirisun.com to download the latest service manual or contact your local dealer or us.

Please read this manual before repairing the product.

1.2 Service Attentions

* Safety

Do not contact the antenna connector or PCB with your skin directly.

Do not reverse the battery polarity.

It may cause harm to the radio if signal input on the antenna connector is larger than 20 dBm (100mW).

Do not turn on the radio before the antenna and load connection is completed.

If the antenna has been damaged, do not use the radio. Damaged antenna may cause light burning on skin.

* Explosive Atmosphere

It's prohibited to use or repair the radio in the following places:

Hospital, health center, and airport.

Any area with a potentially explosive atmosphere (e.g. orlop deck of the ship, storage and transportation equipment for fuel and chemical etc.)

Any place near blasting sites or area with electrical blasting cap.

* Replacement Parts

All components used for repair should be supplied by Kirisun.

Components of the same type available on the market are not surely able to be used in this product and we do not guarantee the quality of the product using such components.

If you want to apply for any component from Kirisun, please fill in an application form as below.

e.g.

Component Application Form

Radio Model	Component	Position Mark	Model/ Specifications	Parts No.	Qty
PT4208-02	FET	Q3	RD01MUS1	105-RD01MU-R01	1
PT4208-02	Triode	Q49	2SC5108 (Y)	104-SC5108-001	1

1.3 Service

All the Kirisun products are subject to the service warranty.

After-sales service will be provided, and the length of warranty is stated by Kirisun. The radio and its accessories are all in the warranty. However, in one of the following cases, charge free service will not be available.

* No valid warranty card or original invoice.

* Malfunction caused by disassembling, repairing or restructuring the radio by users without permission.

* Wear and tear or any man-made damage such as mechanical damage, burning or water leaking.

* Product's serial number has been damaged or the product trademark is difficult to identify.

After the warranty expires, lifetime service is still available. We also provide service components to service stations and staffs.

Chapter 2 External View and Functional Keys

2.1 External View

See Figure 1.

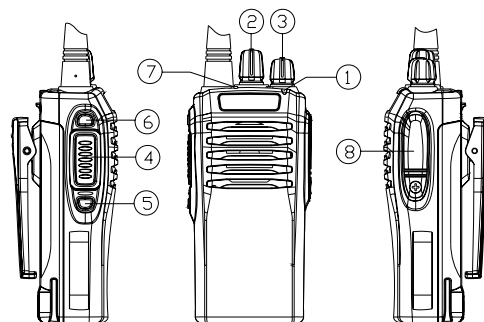


Figure 1

2.2 Functional Keys

1. LED Indicator

Lights red while transmitting; lights green while

receiving; flashes red while in low battery power.

2. Channel Selector Knob

Rotate the knob to select channel 1-16.

3. On/Off/Volume Control Knob

Rotate clockwise to turn on the radio, and keep turning to adjust the volume. To turn off the radio, rotate the knob anticlockwise till a sound of click is produced.

4. PTT (Push-To-Talk) Key

Press the PTT key and talk to the microphone to send the voice to the recipient.

5. Side Key 2 (Programmable key)

6. Side Key 1 (Programmable key)

7. Top Key (Programmable key)

8. Speaker/Microphone Jack

Jack for connecting external speaker or external microphone to the radio.

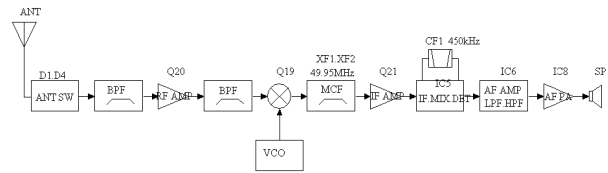


Figure 3.2 Principle of Receiver

Front end

The signal coming from the antenna passes through the RX/TX switch circuit (D1, D2, D4 and D5), and passes through a BPF (C37, C227, L8, L15, C70, C126, D30, C218, L9, C230, C128, D26, C217, L10, C229, C127 and D24) to remove unwanted out-of-band signal, and is routed to the low noise amplifier (LNA) consists of Q20 and its peripheral components where it is amplified.

Output signal from the LNA passes through a BPF (L7, C228, C47, D23, C219, L6, C182, C124, D22, C216, L5, C132, C32 and D21) and goes to the first mixer (Q19).

PWM wave is output from pin 12 of the MCU. The wave is filtered and rectified into adjustable voltage, which can control the center frequency of the band pass filter through changing capacity of the varactor diode (D21, D22, D23, D24, D26 and D30).

First mixer

The receiving signal from LNA is mixed with the first local oscillator signal from the frequency synthesizer to produce the first IF signal (49.95MHz). Then the first IF signal passes through crystal filter (XF1 and XF2) to remove the adjacent channel signal and signal outside the adjacent channel.

IF circuit

The first IF signal from the crystal filter is amplified by the first IF amplifier (Q21), and is routed to the IF processing IC (IC5, TA31136).

IF IC consists of the second mixer, second local oscillator, IF amplifier, limiter, discriminator, and noise amplifier.

The 16.8MHz frequency produced by TCXO (X4) is multiple-amplified and then adopts the third harmonic (50.4MHz) as the second local oscillator signal source. The second local oscillator signal (50.4MHz) is mixed with the first IF signal (49.95MHz) in IC5 to generate the second IF (450kHz). And then the second IF signal is amplified and limited in IC5, filtered in the ceramic filter (CF1, 450kHz), and demodulated in IC5. After that, the demodulated signal is routed to the audio circuit to output audio signal.

Chapter 3 Circuit Description

3.1 Frequency Configuration

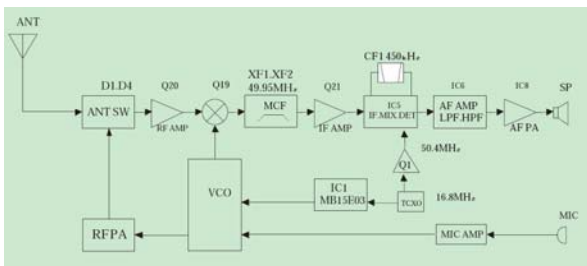


Figure 3.1 Frequency Configuration

The reference frequency of the frequency synthesizer is provided by crystal oscillator X4 (TCXO, 16.8MHz). The receiver adopts double mixing. The first IF is 49.95MHz and the second IF is 450kHz. The first local oscillator signal of the receiver is generated by the frequency synthesizer. The second local oscillator signal adopts the third harmonic (50.4MHz) of the crystal oscillator X4 (TCXO, 16.8MHz). Transmitter signal is directly produced by the frequency synthesizer.

3.2 Principle of Receiver (RX)

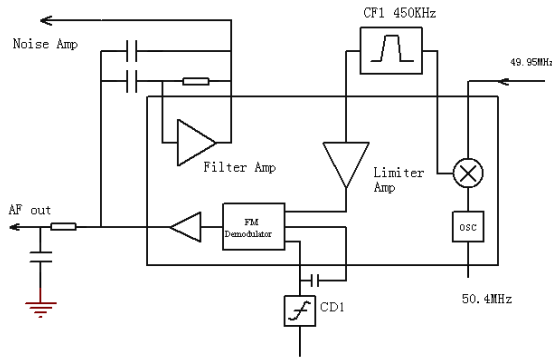


Figure 3.3 IF System

Audio signal processing

The voice signal processing circuit of the receiver consists of IC6 and its peripheral circuits. After being amplified in IC6-C, voice signal from IC5 is sent to IC4 (CTCSS signaling filtering circuit) and IC6-D respectively. The signal is then amplified, deemphasized and filtered by other units of IC6 to remove HF and LF components contained in the audio frequency, with only voice components within 300~3000Hz left. The resulting signal is then routed to Q9 for amplifying. The amplified signal is adjusted in volume potentiometer and then is routed to the audio power amplifier (IC8).

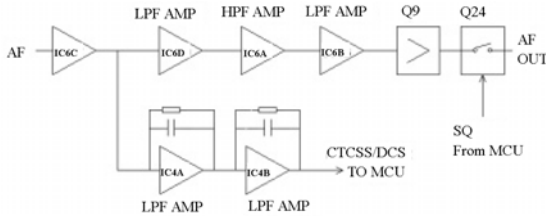


Figure 3.4 Audio Processing of Receiver

Squelch circuit

The demodulated signal from IC5 goes to the selective noise amplifier consists of noise amplifier within IC5, C211, R99, R100, C107 and R94 to remove the noise component. The resulting signal is then amplified in Q7 and demodulated in D17 and is routed to the MCU. MCU identifies level of the noise and controls the squelch.

Audio power amplifier

The audio power amplifier circuit consists of IC8 and its peripheral components.

The received audio signal, voice alert signal, alert tone signal and warning tone signal are collected and pass through the audio amplifier where it is amplified and output to drive the speaker. The warning tone has no volume limitation.

When AFCO is in high level, Q35 turns on, IC8 starts to

operate, and the speaker sounds. Speaker impedance: 16Ω.

Q38: RX audio signal switch

Q51: Warning tone switch

Q25: Alert tone switch

CTCSS signal filtering

Demodulated audio signal from IC5 may contain CTCSS (Continuous Tone Control Squelch System) or DCS (Digital Code Squelch) signal. The spectrum components of CTCSS/DCS are within 67-250Hz. The filtering circuit consists of IC4 can remove signals outside the CTCSS/DCS spectrum, which enables the MCU to decode CTCSS/DCS more accurately.

3.3 Principle of Transceiver (TX)

TX power amplification

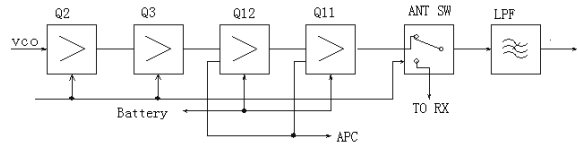


Figure 3.5 Principle of Power Amplification and Antenna Switch

The modulated RF signal from VCO is amplified in Q2, Q3 and Q12, and is routed to Q11 for power amplification.

Grid bias of Q11 and Q12 is controlled by the APC circuit. Through changing the grid bias voltage, the Tx output power can be controlled conveniently.

APC (Automatic Power Control)

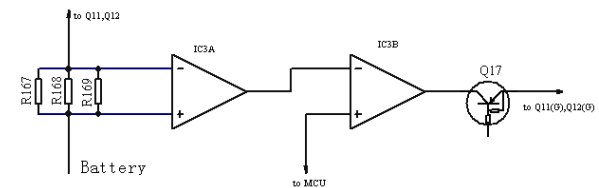


Figure 3.6 APC Circuit

R167, R168 and R169 are used to test the power amplification current. IC3A is the sampling amplifier for the power amplification current. IC3B is the power comparator amplifier.

If the Tx output power is too high, the power amplification current and IC3A output will increase; IC3B output voltage will decrease, so the bias voltage of Q11 and Q12 will also decrease, which causes the Tx output power to be lowered, and vice versa. Thus the output power of Tx can keep stable under different working conditions.

MCU can set the power through changing the voltage

input to IC3B.

Tx voice signal processing

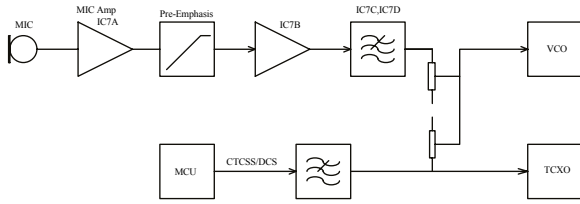


Figure 3.7 Audio Circuit of Tx

The Tx voice signal processing circuit consists of IC7 and its peripheral components. After being amplified, limited and filtered, the voice signal from MIC is routed to VCO for modulation together with CTCSS/DCS signal.

The AGC circuit is consisting of D13, D308 and Q24. When signal from MIC is too large, the AGC circuit will lower the signal strength to make sure that no distortion happens to the signal.

Q34 is the power switch of the voice processing circuit. It is controlled by MCU. Power supply of IC7 will be turned on when the radio is transmitting.

J2 is the jack for external MIC. When using external MIC, the internal MIC will be turned off automatically. But the internal PTT is still effective.

3.4 Principle of Frequency Synthesizer

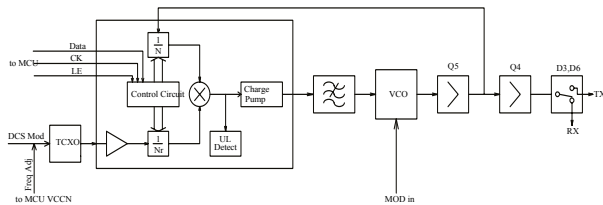


Figure 3.8 Frequency Synthesizer

The radio adopts PLL type frequency synthesizer.

The frequency synthesizer consists of reference oscillator, voltage control oscillator (VCO), programmable divider, phase comparator, and low pass filter.

Rx VCO unit consists of Q14, L30, C120, C88, C142, C180, D8 and D9. Tx VCO unit consists of Q15, L51, C121, C137, C206, C194, D10 and D11. D12 is the modulation circuit of VCO.

IC1 (MB15E03) is PLL integrated circuit, which consists of programmable reference divider, programmable swallowing divider, phase comparator, and charge pump.

The low pass filter consists of R244, C193, R202, R40, C207, R141, C205, R2 and C204. The reference frequency is

provided by X4 (TCXO, 16.8MHz).

The reference frequency from TCXO (Temperature Controlled Crystal Oscillator) is divided by the programmable reference divider in IC1 to produce reference frequency of 5kHz or 6.25kHz (determined by the preset channel frequency and is controlled by MCU).

The oscillation frequency from VCO goes to IC1 where it is divided by the programmable swallowing divider and is then compared with the reference frequency to obtain the error signal. The signal is then filtered by a low pass filter and is routed to VCO to change the oscillation frequency of the VCO, enabling the frequency to reach the set value. Then the VCO is locked.

$$N = F_{VCO} / F_R$$

N: Times of frequency division

F_{VCO} : Oscillation frequency of VCO

F_R : Reference frequency

Unlock detection: When PLL is unlocked, Pin 14 of IC will output the low level signal to MCU. Then MCU prohibits the Tx from transmitting and makes an alert tone.

Q6: Power filter, which provides more purified power for PLL to reduce noise of the frequency synthesizer.

3.5 Voice Alert Circuit

The radio is provided with voice alert function, which is especially useful at night or in dark environment.

IC15 is a voice memory chip, which is stored with voices of channel indication etc. Once the channel selector knob is switched, the speaker will announce the current channel number. User can press the preprogrammed “Voice Alert” key to repeat the current channel number.

If voice alert function is enabled, the speaker will announce the current channel number once the “Voice Alert” key is pressed under standby mode. You can switch the voice type by pressing and holding the “Voice Alert” key while rebooting the radio. Do it repeatedly to switch the voice type in the order of “Chinese Male-English Male-Chinese Female-English Female-No Alert”.

3.6 Power Supply

The radio uses 7.4V, 1700mAh Li polymer battery. The Tx power amplification circuit (Q11 and Q12) and the Rx audio power amplifier (IC8) directly adopt the battery for power supply. Power of other circuits is supplied by 5V regulated voltage.

IC12: 5V, low dropout, micro-power regulator, which supplies 5V power with large current for the radio together with Q10 and Q30.

Q29: 5T switch, which is controlled by MCU.

5T: Supplies power for front end of Tx.

Q31: 5R switch, which is controlled by MCU.

5R: Supplies power for RF amplifier, mixer, IF processing unit, and audio signal processing unit etc. of Rx.

Q32: 5C switch, which is controlled by MCU.

5C: 5V power supply under SAVE control. Supplies power for frequency synthesizer.

3.7 MCU Unit

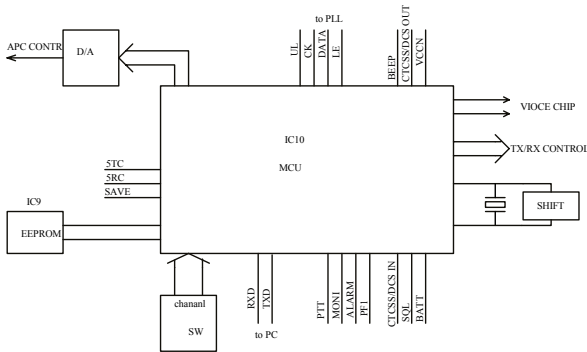


Figure 3.9 Principle of MCU Unit

MCU unit controls the operation of each unit of the radio so that all functions can be realized.

Communicate with external PC.

Access the status data of the radio.

Control the PLL to generate Rx and Tx local oscillator frequencies.

Obtain status parameters of current channel.

Control status of LED indicator.

Control power supply for each unit.

Check the actions of each functional key.

Generate CTCSS signal.

Generate DCS signal.

Generate power control signal.

Perform CTCSS decoding.

Perform DCS decoding.

Test and control the squelch.

Control content of voice alert.

Memory (E²PROM, AT24C08):

The memory is stored with channel data, CTCSS/DCS data, other data for function setting, and parameter adjusting data.

CTCSS/DCS signal encoding and decoding:

The CTCSS/DCS signal (output from pin 12) generated by MCU is filtered by R155, R156, C242 and C243. Then the resulting signal is divided into two parts and sent to VCO and TCXO respectively for modulation.

The CTCSS/DCS signal from the receiver is decoded by MCU (pin 49). MCU checks if the CTCSS/DCS signal in the receiving signal matches the preset value of the radio, and determines whether to open the speaker or not.

Power adjustment:

Output from pin 42 of the MCU passes through integrating filter (R161, C317, R206, and C318), and is routed to the APC unit to control the output power of the transmitter.

CTCSS signal

CTCSS (Continuous Tone Control Squelch System) is a squelch control system which is modulated on carrier and is guided by a continuous sub-audio signal. If CTCSS is set, the communication between the transmitting and receiving radios can be realized only when the two radios has set the same CTCSS frequency. In doing this, disturbance from other signals can be avoided.

PT4208 has 39 groups of standard CTCSS frequencies for your selection. See table 3.1.

The CTCSS signal is generated by MCU, and is passed through low pass filter consists of RC to remove high frequency components (above 300Hz). Then the resulting signal is routed to VCO for modulation.

Table 3.1 CTCSS Frequencies

No.	Frequency [Hz]	No.	Frequency [Hz]	No.	Frequency [Hz]	No.	Frequency [Hz]
1	67.0	11	94.8	21	131.8	31	186.2
2	69.3	12	97.4	22	136.5	32	192.8
3	71.9	13	100.0	23	141.3	33	203.5
4	74.4	14	103.5	24	146.2	34	210.7
5	77.0	15	107.2	25	151.4	35	218.1
6	79.7	16	110.9	26	156.7	36	225.7
7	82.5	17	114.8	27	162.2	37	233.6
8	85.4	18	118.8	28	167.9	38	241.8
9	88.5	19	123.0	29	173.8	39	250.3
10	91.5	20	127.3	30	179.9		

DCS signal

DCS (Digital Code Squelch), which is used to control squelch, is a series of continuous digital codes modulated on carrier together with voice signal. If DCS is set, the speaker can be opened only when the radio receives signal with the same DCS to avoid disturbance of unwanted signals.

PT4208 has 83 standard codes (inverted and non-inverted) for your selection. See table 3.2.

DCS signal is produced by MCU (in waveform of PWM). It passes through the low pass filter consists of RC to remove the high frequency components (above 300Hz). Then the resulting signal is sent to VCO and TCXO for modulation, with HF components of the DCS signal being modulated by VCO, and the LF components of the DCS signal being modulated by TCXO.

The DCS signal coming from the receiver is routed to MCU for decoding. MCU checks if the DCS code in the received signal matches the preset DCS of the radio, and determines whether to open the speaker or not.

Table 3.2 DCS Codes

023	114	174	315	445	631
025	115	205	331	464	632
026	116	223	343	465	654
031	125	226	346	466	662
032	131	243	351	503	664
043	132	244	364	506	703
047	134	245	365	516	712
051	143	251	371	532	723
054	152	261	411	546	731
065	155	263	412	565	732
071	156	265	413	606	734
072	162	271	423	612	743
073	165	306	431	624	754
074	172	311	432	627	

3.8 Semiconductor Data

Refer to table 3.3 for descriptions of each pin.

Table 3.3 Definition of CPU Pins

No.	Port name	Pin Name	I/O	Function
1	TOPKEY	P33	I	Top key detect
2	UPKEY	P34	I	Up key detect
3	MODE		I	Connect the 4.7K resistor with VCC, programming test point
4	PTT	P43	I	[PTT] input
5	DNKEY	P44	I	Down key detect
6	RST		I	Reset input, programming test point
7	XOUT		O	Oscillator
8	VSS		I	GND
9	XIN		I	Oscillator (7.3MHz)

10	VCC		I	5V CPU power input
11	SHIFT	P54	O	Clock beat shift. H: On
12	TO0	P53	O (PWM)	BPF tuning output
13	TO1	P52	O (PWM)	QT/DQT output
14	VDEVC2	P51	I	Deviation switch 2 of VHF
15	VDEVC1	P50	I	Deviation switch 1 of VHF
16	NC			Connect the pull-down resistor with VSS
17	PABC	P26	O	Final power supply H: On
18	OSCSI	P25	I	VCO crystal select and connect the pull-down resistor with VSS. H: 13, L: 16.8
19	WNTC	P24	O	Wideband/Narrowband control. H: Wideband L: Narrowband
20	ENC0	P23	I	Encoder input
21	ENC2	P22	I	Encoder input
22	ENC3	P21	I	Encoder input
23	ENC1	P20	I	Encoder input
24	PS	P17	O	PLL power-saving control. H: Normal L: Power Saving
25	NC			Connect the pull-down resistor with VSS
26	NC			Connect the pull-down resistor with VSS
27	NC	P86		Connect the pull-down resistor with VSS
28	SDA	P85	I/O	E ² PROM data line
29	SCL	P84	O	E ² PROM clock line
30	UL	P83	I I (TRFI)	PLL unlock detect pin H: Locked L: Unlocked
31	T2IN	P82		Reserved: 2TONE input
32	DT	P81	O	PLL data output
33	CK	P80	O	PLL clock output
34	LE	P60	O	PLL IC enable pin. H: Locked
35	5MC	P45	O	Power control except CPU and E ² PROM L: On
36	INT	P66	I	Power detect input
37	TXD	P67	O	RS-232C output, programming test point
38	RXD	P65	I	RS-232C input, programming test point
39	AFCO	P64	O	AF amplification power H: On
40	RX	P63	O	TX/RX VCO select H: Receiving
41	GLLED	P31	O	Green LED control H: On
42	APC	P30	O (PWM)	TX: Automatic power control output
43	RLED	P36	O	Red LED control H: On
44	SAVE	P32	O O	Battery saving control. H: Supply power, L: Power saving
45	MUTE	P13	O	Mute control. H: MIC mute; L: Audio mute
46	5RC	P12		Receiving power control. L: On
47	5TC		O	Transmitting power control. H: On
48	NC	P10		Speaker mute switch output
49	TI	P00	I (A/D8)	QT/DQT signal input
50	RSSI		I (A/D7)	Signal strength detect
51	BUSY	P01	I (A/D6)	Busy signal input
52	MANDO WN	P02	I (A/D5)	Man-down switch detect
53	BATT	P03	I (A/D4)	Battery voltage detect
54	NC			Connect the pull-down resistor with VSS
55	W588C	P62	O	Voice alert switch. H: Channel No. reporting
56	AC	P61	O	Alarm switch control. H: Controlled by Volume Switch The power level must be low in case of emergency alarm
57	BUSY_V	P05	I	Voice alert circuit busy detect
58	VCCN	P06	O (D/A0)	Frequency stability output
59	AVSS		I	Connect with VSS
60	DTMF	P07	O (D/A1)	DTMF Output
61	VREF		I	Connect with VCC
62	AVCC		I	Connect with VCC
63	DATA_V	P37	O	Voice alert data

64	SCLK_V	P35	O	Voice alert clock
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Table 3.4 Function Description of Semiconductor

Components

Position Mark	Model	Function Description
IC1	MB15E03	Frequency synthesizer
IC4	NJM2904	APC, voltage comparison, driving
IC5	TA31136	Rx second local oscillator, second IF amplification, limitation, demodulation, and noise amplification
IC6	NJM2902	Amplification and filtering of demodulation signal of receiver.
IC7	NJM2902	MIC amplification, limitation and filtering
IC8	TDA8541	Audio frequency power amplification of receiver
IC9	AT24C08	E ² PROM, memorizes channel frequency data, function setting parameters and adjusting status parameters
IC10	R5F212A8	MCU
IC11	PST9140NR	MCU reset circuit
IC12	HT7150-1	LDO, low-power voltage regulator
IC15	W588A080	Voice storage IC
Q2	2SC5108	First amplification of transmitter
Q3	2SC3356	Second amplification of transmitter
Q4	2SC5108	VCO buffer amplifier
Q5	2SC5108	VCO buffer amplifier
Q6	2SC4617	VCO power filter
Q7	2SC4738	Noise amplifier
Q9	2SC4617	Audio frequency signal amplification of receiver
Q10	2SC1623	5V voltage regulation output current stretching
Q11	RD07MVS1	Transmitter final power amplification
Q12	RD01MUS1	Transmitter power amplification driving
Q17	DTA144EE	APC output switch
Q19	3SK318	First mixer
Q20	3SK318	Receiver high power amplifier
Q21	KTC4082	1 st IF Amplifier
Q22	DTC144EE	Red LED Driving
Q23	DTC144EE	Green LED Driving
Q24	2SK1824	Voice alert switch
Q26	DTC144EE	5C switch
Q29	KTA1298	5T switch
Q30	KTA1298	5V voltage regulation output current stretching
Q31	KTA1298	5R switch
Q32	KTA1298	5C switch
Q34	DTA144EE	Power switch of MIC amplification unit
Q35	2SK1824	Receiver audio output switch. Disconnect on Emergency
Q36	2SK1824	Receiver audio output switch

Table 3.5 Function Description of Diodes

Position Mark	Model	Function Description
D1	MA77	Transmitter antenna switch diode
D2	MA77	Transmitter antenna switch diode
D3	HSC277	VCO output switch

D4	HSC277	Antenna toggle switch
D5	HSC277	Antenna toggle switch
D6	HSC277	VCO output switch
D7	HSC277	5V voltage regulation output current stretching
D8	HVC376B	VCO oscillation varactor diode
D9	HVC376B	VCO oscillation varactor diode
D12	MA360	VCO modulation diode
D14	HZU5ALL	APC output voltage-limiting diode
D15	MA2S111	Unlock detection diode
D16	MA2S111	VCO power filtering acceleration diode
D17	1N4148	Noise demodulation
D18	1N4148	Noise demodulation
D20	Green LED	Receiving indicator
D25	MA2S111	APC single diode
D28	Red LED	Transmitting indicator
D29	Green LED	Receiving indicator

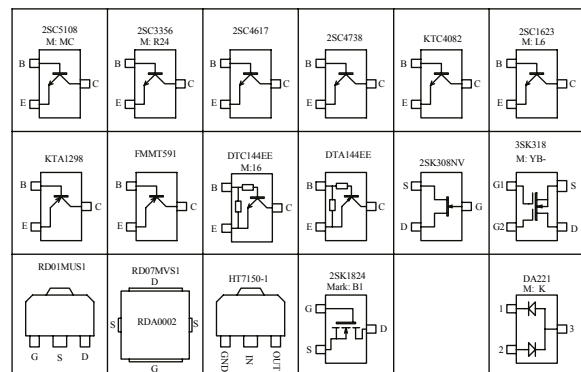
Table 3.6 Features of Crystal Filter XF1, XF2

Item	Rated Value
Nominal center frequency	49.95MHz
Passband width	±7.5kHz or higher
40dB stop bandwidth	±20.0kHz or lower
Pulse	1.0dB or lower
Insertion loss	3.0dB or lower
Guarantee attenuation	80dB or higher
Terminal impedance	---

Table 3.7 Features of CF1 LTVPC450EB

Item	Rated Value
Nominal center frequency	450kHz
6dB bandwidth	±6kHz or higher
50dB bandwidth	±12.5kHz or lower
Pulse	2.0dB or lower
Insertion loss	6.0dB or lower
Guarantee attenuation	35.0db or higher
Terminal impedance	2.0kΩ

Table 3.8 Schematic Diagram for Packaging of Semiconductor Devices



Chapter 4 Mode Introduction

Mode Introduction

Mode	Function	How to enter
User Mode	For normal use	Power ON
PC Mode	Data Programming Mode	Used to read and write frequency data and other features to and from the radio Received commands from PC. See below for further information.
	PC Test Mode	Tune the radio parameters by PC Received commands from PC. See below for further information.
	Firmware Programming Mode	Upgrade the radio when new features are released Press and hold the top key for over 2 seconds while turning the radio power ON, and received commands from PC
Wired Clone Mode	Used to transfer programming data from one radio to another	Press and hold side key 2 for over 2 seconds while turning the radio power ON

* User Mode

You can enter User Mode (conventional communication mode) by turning the radio power ON. Under this mode, users can use the defined functions of the radio.

* Data Programming Mode

The radio has been set before leaving the factory. However, due to different requirements of users, the radio's operating frequency, channels, CTCSS/DCS, scan, and other functional parameters should be reprogrammed. Therefore, Kirisun has specially designed a set of Chinese/English programming software KSP4208 with friendly interface, convenient operation and visualized display for setting functional parameters of the radio.

Steps for setting the functional parameters of the radio by PC are as follows:

- A. Install KSP4208 on the computer.
- B. Connect the radio to the serial port of the PC with the special programming cable. Refer to the figure below.

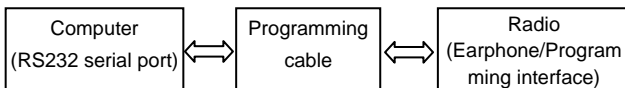


Figure 4.1

- C. Turn the computer power ON.
- D. Turn the radio power ON.
- E. Run the KSP4208 programming software by double clicking on its executive program.
- F. Click "Program" in the main menu of KSP4208,

and click "Read from radio" in the pull-down menu to read parameters of the radio to the computer; click "Write to radio" in the pull-down menu to write parameters in the computer to the radio.

- G. The following parameters can be set by using KSP4208 according to requirements of the user:

Radio Information:

Radio Model (model/frequency range), Serial Number, Embedded Information, MCU Version, Hardware Version, etc.

Radio Configuration:

- (1) Key Assignment: Side Key 1 (Up Key), Side Key 2 (Down Key), and Top Key can be set as long/short key and the hold time can be defined.

- (2) Miscellaneous

1. Wired Clone Mode
2. TOT (Time Out Timer)
3. TOT Reset
4. TOT Pre-alert
5. TOT Re-key time
6. Squelch Level selection
7. Alert Tone
8. Read Data Password
9. Write Data Password

- (3) Scan

Scan Function option, Priority Channel, Revert Channel, Tx Dwell Time, Dropout Delay Time, Lookback Time.

- (4) Emergency settings

Channel Parameters

- (1) Rx Frequency and Tx Frequency (Step: 2.5KHz/5KHz/6.25KHz)
- (2) Rx Signaling and Tx Signaling
 - a) None
 - b) CTCSS (60~260Hz @ 0.1Hz step)
 - c) DCS (-777~777@octal number)
- (3) Busy Channel Lockout (BCL)
- (4) Beat Shift
- (5) Channel Spacing: 25KHz/12.5KHz (Wide/Narrow)
- (6) Scan Add/Delete
- (7) Tx Power (High/Low)
- (8) Clear Tail Tone
- (9) CALL1 and CALL2 encode
- (10) PTT ID Keyup Telegram, PTT ID Dekey Telegram

DTMF Setting

DTMF Encoder Template

DTMF Encoder Sequences (1~12)

Please refer to the “Help” document of KSP4208 for details.

Note:

1. Please firstly read data of the radio and back up the data before editing the parameters on KSP4208.
2. If the radio cannot function normally after being written in with the edited data, please rewrite the backup data into the radio.
3. “Model Information” is important for the radio; users should not modify it.

*** PC Test Mode**

Connect the radio to the serial port of the computer with the special programming cable. Refer to figure 4.1.

Warning: Before entering the PC Test Mode, please firstly connect a 50Ω HF load to the antenna connector of the radio or connect the radio to a general test set.

With the KSP4208 programming software, you can enter the Tuning Mode under PC Test Mode to tune the following parameters of the radio:

- (1) Frequency stability
- (2) Five frequency points of Tx High Power
- (3) Five frequency points of Tx Low Power
- (4) Five frequency points for SQL9 On (Wideband)
- (5) Five frequency points for SQL9 Off (Wideband)
- (6) Five frequency points for SQL9 On (Narrowband)
- (7) Five frequency points for SQL9 Off (Narrowband)
- (8) Five frequency points for SQL1 On (Wideband)
- (9) Five frequency points for SQL1 Off (Wideband)
- (10) Five frequency points for SQL1 On (Narrowband)
- (11) Five frequency points for SQL1 Off (Narrowband)
- (12) Five frequency points for QT (67.0Hz) Deviation (Wideband)
- (13) Center frequency point for QT (67.0Hz) Deviation (Narrowband)
- (14) Five frequency points for QT (151.4Hz) Deviation (Wideband)
- (15) Center frequency point for QT (151.4Hz) Deviation (Narrowband)
- (16) Five frequency points for QT (254.1Hz) Deviation (Wideband)
- (17) Center frequency point for QT (254.1Hz) Deviation (Narrowband)
- (18) Five frequency points for DQT Deviation (Wideband)
- (19) Center frequency point for DQT Deviation (Narrowband)
- (20) Five frequency points for Rx Sensitivity
- (21) Center frequency of DTMF Deviation (Wideband and Narrowband)
- (22) Tx Low Voltage
- (23) Rx Low Voltage

*** Firmware Programming Mode**

The radio is in possession with an internal Flash ROM which can be upgraded when new features are released.

Procedure:

1. Press and hold the Top Key for over 2 seconds while turning the radio power ON. The LED will light orange and the radio enters the Firmware Programming Mode.
2. Run the firmware programming software KMU on PC.
3. Connect the radio to the computer by the programming cable.
4. Select a COM port and load the firmware upgrading file. Then click on “E.P” to start downloading.
5. If the communication ends successfully, turn the radio power OFF to exit.
6. If you want to continue programming other radios, repeat steps 1 to 5.

*** Wired Clone Mode**

If the wired clone function is enabled, the radio can enter the Wired Clone Mode. After entering this mode, the radio will not exit automatically. The user needs to reboot the radio if he wants the radio to return to the User Mode.

The operation is as follows:

1. Press and hold Side Key 2 for over 2 seconds while turning the radio power ON to enter the Wired Clone Mode. The radio will enter User Mode if wired clone function is disabled.
2. Connect the slave radio to the master radio by the cloning cable (KCL-01) and turn on the power of the slave radio.
3. Press Side Key 1 on the master radio to start cloning. Then the red LED on the master will light. The data of the master is sent to the slave. While the slave is receiving the data, the LED lights green. When cloning of data is completed, the red LED on the master will go out, and the slave radio will reboot automatically.

4. The other slaves can be continuously cloned. Carry out the operation in step 3.

Note: The user can enable or disable the wired clone function through PC programming software. Once the wired clone function is disabled, the radio cannot enter the Wired Clone Mode.

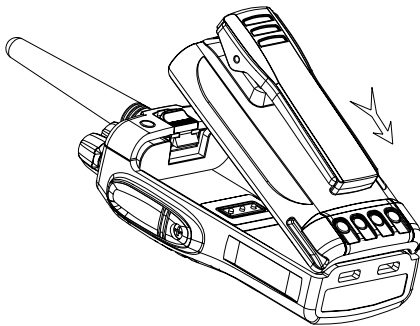
Chapter 5 Assembly and Disassembly for Maintenance

The radio is a kind of sophisticated communication equipment with precise structure and small size. You should assemble and disassemble it carefully during the maintenance. The instructions for the assembly and disassembly are as follows.

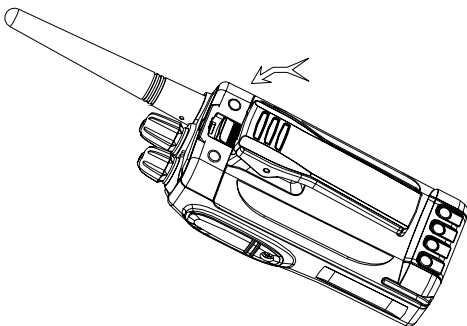
5.1 Install/Remove the battery

1) Install the battery

Insert the two protrusions at the lower end of the battery into the holes at the lower end of the shell of the radio.

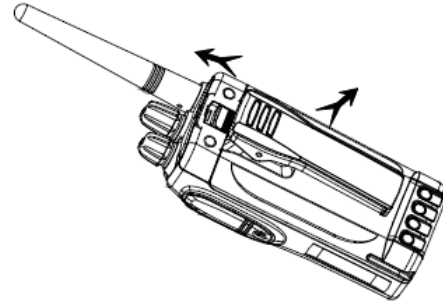


Press down the upper part of the battery until the latch on the radio completely bounces out and locked.



2) Remove the battery

Press the back of the battery slightly, and push the latch upward. Then remove the battery from the radio.

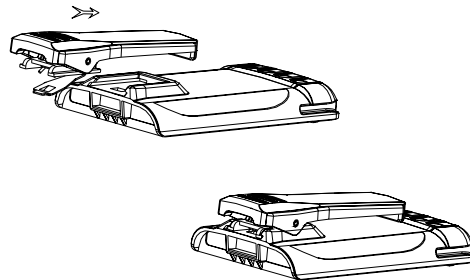


Note:

- * Never short the terminals of the battery.
- * Do not throw the battery into fire.
- * Do not remove the housing of the battery by yourself.

5.2 Install/Remove the belt clip

Slide the guide rails on the belt clip along the guide slots on the rear of the battery with proper strength until the belt clip is hooked. When removing the belt clip, lift the sheet metal on the top of the belt clip with your finger nail or a tool while pushing the belt clip upward.



5.3 Remove the front cabinet from the chassis

- 1) Pull out the knobs and screw off the antenna;
- 2) Remove the two nuts of the knobs and one nut of the antenna with a special tool;
- 3) Screw off the screw on the earphone jack cover with a cross screwdriver, and then remove the rubber cover;
- 4) Remove the two rubber plugs on the screws of the coping; screw off the screws by a hexagonal screwdriver, and then take off the coping;
- 5) Remove the two fixing screws at the lower part of the AI chassis by a hexagonal screwdriver;
- 6) Insert a flat-blade screwdriver into the slot at the bottom of the AI chassis, and prize up it. Then pull the AI chassis backward to remove it from the front cabinet. Please be careful not to break the cable of the speaker.

Refer to Figure 5.5.

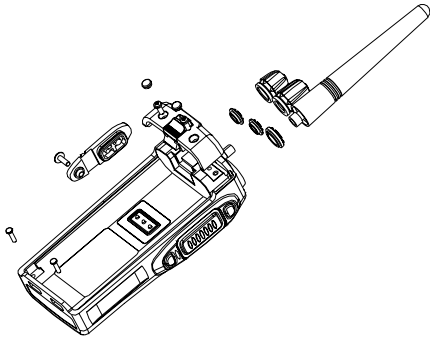


Figure 5.5

5.4 Remove the main board from the AI chassis

- 1) Remove the screws from the PCB board by a cross screwdriver;
- 2) Remove the solder of the antenna terminal with a soldering iron. Then take off the main board.

Refer to Figure 5.6

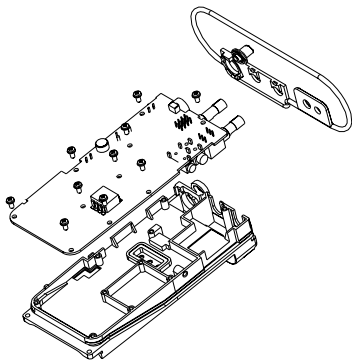


Figure 5.6

After the aforesaid disassembly, you can repair and adjust the radio according to its actual malfunction.

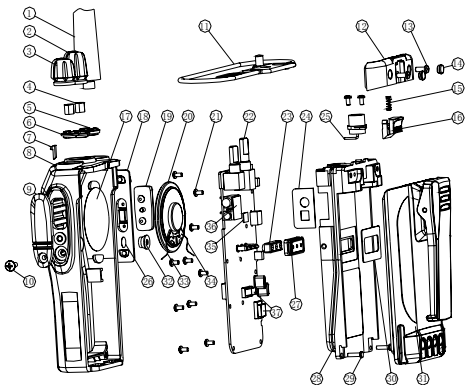


Figure 5.7 Exploded View

No.	Part No.	Description	PCS
1	710-420470-R06	Antenna	1
2	201-004208-R07	Channel Selector Knob	1
3	201-004208-R06	Volume Knob	1
4	203-003208-R09	Circlip	2

5	203-007200-R07	Nut for Antenna Socket	1
6	203-000558-R02	Nut for Knob	2
7	201-004208-R09	Light Guide	1
8	201-004208-R01	Front Cabinet	1
9	201-004208-R08	Earphone Jack Cover	1
10	301-25080J-R01	Screw M2.5*8.0	1
11	202-004208-R01	Main Waterproof	1
12	201-004208-R02	Coping	1
13	301-25050J-R01	Screw M2.5*5.0	2
14	202-007200-R07	Rubber Plug	2
15	203-000558-R05	Spring for Battery Latch	1
16	201-004208-R03	Battery Latch	1
17	204-003208-R02	Dust-proof Net for Speaker	1
18	202-004208-R02	Rubber PTT Key	1
19	201-004208-R04	PTT Key	1
20	121-100000-R20	Speaker	1
21	301-20040G-R01	Screw M2.0*4.0	12
22	602-04208X-HXX	Main Board	1
23	201-004208-R05	POGO Pin Socket	1
24	203-004208-R02	Earphone Plate	1
25	203-000558-R07	Antenna Socket	1
26	204-004208-R02	Dust-proof Net for MIC	1
27	202-007200-R06	POGO Pin Waterproof	1
28	203-004208-R01	AI Chassis	1
29	301-20080G-R02	Screw M2.0*8.0	2
30	204-007200-R03	Sponge for POGO Pin	1
31	706-0KB70B-R01	Battery	1
32	202-004208-R03	MIC Rubber Waterproof	1
33	120-100000-007	Plastic-packaged Wire	1
34	120-100000-008	Plastic-packaged Wire	1
35	202-003208-R07	Heat Exchange Silicone Rubber Washer	1
36	204-006500-R02	MIC Socket Guardian	1
37	204-0KB36L-R03	Sponge Cushion	1

Chapter 6 Adjustment

Before test/adjustment, make sure all equipment has been well connected to the ground!

Before test/adjustment, make sure the antenna output terminal has been correctly connected to corresponding equipment or load!

The transmitter output terminal must be terminated with

an RF power attenuator and connected to a standard signal generator (SSG)/frequency counter/deviation meter/spectrum analyzer!

Make sure no transmission operation is being conducted while measuring the receiver!

During the adjustment/test/maintenance, make sure reliable anti-static measures are taken for human body and equipment.

6.1 Equipment and Software Required for Test and Adjustment

Equipment and software listed in Table 6.1 are required for test and adjustment of PT4208.

Table 6.1 Equipment and Software Required for Test and Adjustment

No.	Name	Major Specifications
1	Computer	P2 or above, IBM compatible PC, WINDOWS 98/ME/2000/XP Operating System
2	Programming software	KSP4208
3	Programming cable	
4	Clone cable	KCL01
5	DC regulated power supply	Output voltage:7.5V Output current:≥ 5A
6	RF power meter	Measurement range: 0.5-10W Frequency range: 100MHz-500MHz Impedance: 50Ω SWR≤1.2
7	Frequency counter	Frequency range: 0-1600MHz Frequency accuracy: better than $\pm 1 \times 10^{-6}$ Sensitivity: better than 100mV
8	Deviation meter	Frequency range: DC600MHz Measurement range: 0-±5kHz
9	DMM	Input impedance: above 10MΩ/V DC, capable of measuring voltage, current and resistance.
10	Audio signal generator	Frequency range:2-3000Hz Output level: 1-500mV
11	RF power attenuator	Attenuation: 40dB or 50dB Supporting power : higher than10W
12	Standard signal generator	Frequency range:10MHz-1000MHz Output level: 0.1uV-32mV (-127dBm~-17dBm)
13	Oscilloscope	Frequency range: DC~20MHz Test range: 10mV-20V
14	Audio frequency voltmeter	Test range: 10mV-10V

Recommendation: Item 6, 7, 8, 10, 11, and 12 listed in the table can be replaced by HP8920 general test set.

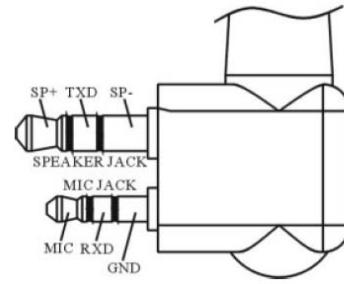


Figure 6.1 External Speaker/MIC Plug

6.2 Adjustment Items

After changing components during the maintenance, it is necessary to test the radio and adjust its technical parameters. The following part is going to introduce the adjustment items.

Some parameters can be adjusted by use of KSP4208 programming software (in the Tuning Mode). The adjustable parameters are as follows:

- 1) 6250Hz stability/2500Hz stability
- 2) Tx high power/low power
- 3) BATT Tx low voltage /Rx low voltage
- 4) SQL9/SQL1 On/Off
- 5) QT DEV
- 6) DCS DEV
- 7) DTMF DEV
- 8) Rx sensitivity

Steps for adjustment:

- a. Enter PC Test Mode. Refer to Chapter 4.
- b. Click “Edit” in the main menu of KSP4208 programming software, and then click “Entry Tuning” in the pull-down menu to enter the Tuning Mode.
- c. Then the “Tuning Item List” screen will pop up. Double click the item you want to adjust, and then you can adjust the parameters.
- d. Exit the PC Test Mode after adjustment.

6.3 Adjustment

6.3.1 VCO

Disable the “Battery Save” function, and set the Rx frequency to the low frequency point (see Table 6.2). Under the receiving status, measure the voltage of PD by DMM. Then adjust the PD voltage to be 0.7V±0.3V by tuning the trimming capacitor C180.

Set the Tx frequency to the high frequency point (see

Table 6.2), and press the PTT key. Then measure the voltage of PD by DMM. The resulting voltage should be lower than 4.5V.

Table 6.2 High/Center/Low Frequency Point for PT4208

	Low Freq Point	Center Freq Point	High Freq Point
PT4208(1)	136.125 MHz	145.125 MHz	173.975 MHz
PT4208(2)	400.125MHz	425.125MHz	449.975MHz
PT4208(3)	420.125MHz	445.125MHz	469.975MHz

6.3.2 PLL frequency

In the Tuning Mode, double click the “6250Hz stability/2500Hz stability” item to enter. Adjust the parameter within the adjusting range of 0-255 to make the Tx frequency be the rated value (with error within ± 200 Hz).

6.3.3 Tx power

In the Tuning Mode, double click the Tx “High power” item to enter. Adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High” and “Highest” within the adjusting range of 0-255 to make the Tx power be higher than 4W. Meanwhile, observe the operating current, and make sure that the current is no larger than 1.7A.

In the Tuning Mode, double click the Tx “Low power” item to enter. Adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High” and “Highest” within the adjusting range of 0-255 to make the Tx power be higher than 1W.

See Table 6.5 for detailed parameters.

6.3.4 Tx low voltage/Rx low voltage for BATT

Firstly, adjust the power voltage to be 6.8V. Double click the “Tx low voltage/Rx low voltage” in the Tuning Mode. Click “Begin” to let the software test automatically. When the value changes no more or only changes a little, click SAVE to exit.

6.3.5 Max. deviation

Input audio signal (100mV, 1000Hz) to the MIC jack of the radio. Adjust the potentiometer VR2 to make the Max. deviation be ± 4.5 kHz.

6.3.6 DCS Tx signal waveform and deviation

In the Tuning Mode, double click the “DCS DEV” item to enter. Adjust the potentiometer VR1 and observe the demodulation signal (the waveform should be smooth and similar to square wave). Click wideband, and adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High”, and

“Highest” to make the deviation be 0.8kHz. Then click narrowband, and adjust the five frequency points to make the deviation be 0.4kHz.

6.3.7 CTCSS deviation

In the Tuning Mode, double click the “QT(67.0) DEV” item to enter. Click wideband, and adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High”, and “Highest” to make the deviation be 0.75kHz. Then click narrowband, and adjust the value to make the deviation be 0.35kHz.

In the Tuning Mode, double click the “QT(151.4) DEV” item to enter. The tuning method is the same as that of “QT(67.0) DEV”.

In the Tuning Mode, double click the “QT(254.1) DEV” item to enter. The tuning method is the same as that of “QT(67.0) DEV”.

6.3.8 Rx sensitivity

In the Tuning Mode, double click the “Sensitivity” item to enter. Adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High”, and “Highest” within the adjusting range of 0-255 to make the sensitivity be the highest.

See Table 6.4 for detailed parameters.

6.3.9 Rx squelch

In the Tuning Mode, double click the “SQL9 On” item to enter. Click wideband and use the following method to adjust the five frequency points of “Lowest”, “Low”, “Mid”, “High”, and “Highest” respectively. Firstly, click one of the frequency points, and adjust the RF signal frequency of the test equipment to be the same with the receiving frequency of that frequency point, and adjust the signal level to be -116dBm. Then adjust the frequency of the modulation signal to be 1kHz and the deviation to be 3kHz. Click “Begin”, the programming software will adjust the value automatically. When the value keeps stable, click “OK”, the adjustment of that frequency point is completed. Then click the next frequency point to do the adjustment. After all of the five frequency points are adjusted, use the same method to adjust the five frequency points of the narrowband. The only difference is that the frequency of the modulation signal should be 1kHz, and the deviation should be 1.5kHz.

In the Tuning Mode, double click the “SQL9 Off” item to enter. Click wideband and use the following method to adjust the five frequency points of “Lowest”, “Low”, “Mid”,

“High”, and “Highest” respectively. Firstly, click one of the frequency points, and adjust the RF signal frequency of the test equipment to be the same with the receiving frequency of that frequency point, and adjust the signal level to be -118dBm. Then adjust the frequency of the modulation signal to be 1kHz and the deviation to be 3kHz. Click “Begin”, the programming software will adjust the value automatically. When the value keeps stable, click “OK”, the adjustment of that frequency point is completed. Then click the next frequency point to do the adjustment. After all of the five frequency points are adjusted, use the same method to

adjust the five frequency points of the narrowband. The only difference is that the frequency of the modulation signal should be 1kHz, and the deviation should be 1.5kHz.

In the Tuning Mode, double click the “SQL1 On” and “SQL1 Off” item to enter respectively. Use the same method stated above to do the adjustment. The only difference is that the RF signal level for “SQL1 On” should be 123dBm, and the RF signal level for “SQL1 Off” should be 125dBm.

6.4 Adjustment Description

See Table 6.3, 6.4, and 6.5.

Table 6.3 VCO

Item	Test Condition	Test Equipment	Measurement Terminal	Adjustment Parts	Requirement	Remark
Setting	BATT terminal voltage: 7.5V	DMM	PD			
VCO lock voltage	CH: Rx low freq point			C180	0.7V±0.3V	Adjustment
	CH: Tx high freq point				Lower than 4.5V	Observation

Table 6.4 Receiver Section

Item	Test Condition	Test Equipment	Measurement Terminal	Adjustment Parts	Requirement	Remark
Audio level	Test freq: Mid freq point Antenna input: RF OUT: -53dBm (501µV) MOD: 1kHz DEV: ±3.0kHz Audio load: 16Ω	RF signal generator	Speaker connector		(Turn the volume knob clockwise to the end) Audio power > 0.3W	Internal speaker power > 1.2W
Sensitivity	CH: Mid freq point CH: Low freq point CH: High freq point RF OUT: -119dBm (0.25µV) MOD: 1kHz DEV: ±3.0kHz	Oscilloscope Audio frequency voltmeter Distortion meter		PC Tuning Mode	SINAD: 12dB or higher	
SQL On sensitivity	CH: Rx center freq point	/General test set		PC Tuning Mode	Normal squelch on after adjustment	
	Level 9 RF OUT: -116dBm		Normal squelch on after adjustment			
	Level 1 RF OUT: -123dBm					

Table 6.5 Transmitter Section

Item	Test condition	Test equipment	Measuring terminal	Adjustment parts	Requirement	Remark
Tx frequency		Frequency counter / General test set	Antenna	PC Tuning Mode	Within ±200Hz	
DCS waveform (balance)		Oscilloscope / General test set		VR1	Smooth and similar to square wave	

Power	Power: 7.5V	Power meter/ General test set Ammeter	PC Tuning Mode	Adjust to 4W	Within ±0.2W
Max modulation deviation	CH: Tx center freq point AG: 1kHz/220mV	Deviation meter/ General test set	VR2	Adjust to ±4.5kHz	±200Hz
Modulation sensitivity	CH: Tx center freq point AG: 1kHz/22mV			Deviation checked should be 2.2kHz~3.6kHz	
CTCSS DEV	CTCSS: 67Hz	Deviation meter/ General test set	PC Tuning Mode	Adjust to ±0.75kHz	±50Hz
DCS DEV	DCS: 023N	Deviation meter/ General test set	PC Tuning Mode	Adjust to ±0.75kHz	±50Hz
Low battery	Battery terminal: 6.8V		PC Tuning Mode	Indicator flashes after adjustment	

Chapter 7 Specifications

Technical Parameters	PT4208	
7.1 General Specifications		
Frequency	(136 ~ 174) MHz	(400 ~ 450) MHz
	(350 ~ 390) MHz	(420 ~ 470) MHz
Number of Channels	16	
Channel Spacing	W:25 kHz / N:12.5kHz	
Operating Temperature	-25°C ~ +55°C	
Antenna Impedance	50Ω	
Frequency Stability	±2.5ppm	
Battery (Standard Configuration)	Lithium Polymer Battery: 1700mAh 7.4V	
Dimension (W×H×D)	54mm × 119mm × 34mm	
Weight	157g (Radio only); ≤ 255g: with antenna and 1700mAh Lithium Polymer Battery ≤ 330g: with antenna and 1350mAh Ni-MH Battery	
7.2 Receiver		
Sensitivity (12dB SINAD)	0.25μV(W) / 0.28μV(N)	
Adjacent Channel Selectivity	W: ≥ 70dB / N: ≥ 60dB	
Intermodulation Interference	≥ 65dB	
Audio Output Power	1W (16Ω)	
Audio Distortion	≤ 5%	
7.3 Transmitter		
Transmitting Power	4W(UHF) / 5W(VHF)	
Modulation Mode	W:16KφF3E / N:11KφF3E	
Clutter and Harmonic	≤ -36 dBm	
Residual FM (300~3000Hz)	W: ≤ -45 dB / N: ≤ -40dB	

Audio Distortion (300~3000Hz)	≤ 5%
Adjacent Channel Power	W: ≥ 70dB / N: ≥ 60dB
Max. Deviation	W: < ±5kHz / N: < ±2.5kHz

Chapter 8 Troubleshooting

No.	Problem	Causes and Solutions
1	Power on Failure	A. Unreliable connection between the battery and the radio, please reinstall the battery. B. The fuse of the power supply is burnt out. Please change it. C. Power switch in failure, please change it. D. The battery is out of power. Please charge it or change a new one. E. The CPU is broken, please change the IC.
2	PLL unlocked (Beeping)	A. Channel frequency goes beyond the limit, please reset the channel data. B. The PLL crystal oscillator X4 is broken. Please change it. C. The oscillator transistor is broken. Please change it. D. The PLL IC1 is broken. Please change it.
3	No talkback	A. The frequency of the radio's current channel is not the same with that of the other radio. Please reselect a channel. B. The CTCSS/DCS is not the same. Please reset it. C. The radio is out of the effective communication range.
4	No receiving signal	A. The antenna is in poor contact. Please fasten the antenna until secure. B. The high-frequency amplifying tube Q20 is broken. Please change it. C. The squelch level is too high and the squelch cannot be opened. Please reset the squelch level. D. The mixing tube Q19 is broken. Please change it.

		E. The FM processing chip IC5 is broken. Please change it.
5	The transmitting red light is on, but no voice is heard by the recipient.	A. Power module Q11 is broken, so there is no power output, please change the module. B. The microphone is broken, please change it.
6	The receiving green light is on, but no voice is heard.	A. The speaker is broken. Please change it. B. The audio power amplifier IC8 is broken. Please change it.

charging turns to rapid charging. Or pre-charge when the voltage is lower than $8.3V \pm 0.1V$. When the battery voltage reaches $9.6V \pm 0.2V$, the battery will be deemed as full and the charging will stop.

Li-ion battery: Pre-charge when the voltage is lower than $6.5 \pm 0.1V$. When the voltage reaches $6.5 \pm 0.1V$, the charging turns to rapid charging.

* During the charging process, battery voltage, battery temperature rise, $-\Delta V$, charging time, max. battery temperature will be checked.

* Min. battery voltage:

Ni-MH battery: $5.5V \pm 0.1V$

Li-ion battery: $6.5V \pm 0.1V$

* Pre-charge current for battery:

Ni-MH battery: $180mA \pm 10mA$

Li-ion battery: $90mA \pm 10mA$

* Pre-charge time: 15 ~ 20 minutes

* Check the battery voltage during the pre-charging process, when the voltage reaches the threshold of the battery, the charging will turn to rapid charging.

* Conditions for stopping charging:

Normal conditions: The battery is fully charged. Ni-MH battery: $-\Delta V = 30mV \sim 60mV$

Abnormal conditions:

(1) The battery temperature is higher than the limit.

(2) The battery voltage is higher than the limit.

(3) The charging time exceeds the limit.

(4) In the pre-charging process, the battery voltage fails to reach the min. voltage allowed for normal battery.

* Status of the charger after the charging is finished: Ni-MH battery enters trickle charging status (current: $30mA \pm 10mA$).

* Charging efficiency:

After being charged under normal temperature, the battery capacity should not be lower than 90% of its actual capacity.

After being charged under high temperature, the battery capacity should not be lower than 70% of its actual capacity.

After being charged under low temperature, the battery capacity should not be lower than 80% of its actual capacity.

* Other functions:

1. Charging indication

2. Abnormal charging indication

3. Pre-charging function for over-discharged battery

4. Trickle charging function for Ni-MH battery

Chapter 9 KBC-70C Charger

9.1 General

Function: Intelligent rapid charging

Applicable battery: KB-70B (1700mAH, 7.4V Li-ion battery)
/ KB-70A (1350mAH, 7.2V Ni-MH Battery)

Identification for battery type: External

Input power: DC12V, 500mA, ripple < 500mV

9.2 Operating Environment

Temperature: $-5^{\circ}C \pm 2^{\circ}C \sim +55^{\circ}C \pm 2^{\circ}C$

Humidity: 95%@40°C

9.3 Safety Requirement

Comply with CCC, CE, UL and other safety requirements.

9.4 Specifications

* Idling input current: $\leq 15mA$

* Charging terminal maximum idling voltage: 96% ~ 97% of the input voltage

* Rapid charging current: $410 \pm 25mA$

* Max. charging time of Ni-MH battery: 285 minutes ± 15 minutes

* Max. charging time of Li-ion battery: 510 minutes ± 30 minutes

* Max. charging voltage: $9.6V \pm 0.2V$

* Highest battery temperature: $+50^{\circ}C \pm 2^{\circ}C$

* Specified voltage for charged battery:

Ni-MH battery: Pre-charge when the voltage is lower than $5.5 \pm 0.1V$. When the battery voltage reaches $6.5 \pm 0.1V$, the

5. Output short circuit protection function (the current for short circuit is lower than 10mA)

Appendix 1 Abbreviations

9.5 LED Status Table

Charger Status	LED Status		
	Charging Indicator (red)	Power Indicator (green)	Indicator for abnormal battery temperature (yellow)
Standby/Unconnected with Battery	/	Light	/
Pre-charge	Flash	/	/
Rapid charge	Light	/	/
Charging completed	/	Light (Ni-MH)	/
Charger output short circuit	/	/	/
Abnormal charging status	/	/	Light

9.6 Descriptions

Face the charger, from left to right:

Red LED: Charging indication

Green LED: Power indication or charging completion indication

Yellow LED: Abnormal charging indication

BAT-: Charging output cathode

DECT: Battery type detection

Suspended: Ni-MH battery

Grounded: Li-ion battery

TEMP: Battery temperature detection. In the battery pack, there is a thermosensitive resistor (model: NTC103J) between the output terminal and the ground to detect the battery temperature.

BAT+: Charging output anode

AMP: Amplify, amplifier

ANT: Antenna

APC: Automatic Power Control

BPF: Band Pass Filter

CTCSS: Continuous Tone Control Squelch System

DCS: Digital Code Squelch

DEMODO: Demodulation

E²PROM: Electrical 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 Oscillators

TX: Transmitter

UL: Un-lock

VCO: Voltage Control Oscillator

Appendix 2 Electronic Parts List

Electronic Parts List (420-470MHz)

No.	Part No.	Description	Unit	Qty.	Position Mark
1	101-04208U-R04	PT4208PCB, FR-4, 1.2mm, PT4208U-081224, ROHS	pcs	1	
2	102-0R8C2A-R01	MCU / R8C/2A, R5F212A8SNFP, PLQP-64, ROHS	pcs	1	IC10
3	102-9140NR-R01	Reset IC / PST9140NR, ROHS	pcs	1	IC11
4	102-A31136-R01	IF(MF) modulation IC / TA31136FN, SSOP, ROHS	pcs	1	IC5
5	102-AT2408-R01	Memory IC / AT24C08BN-SH, ROHS	pcs	1	IC9
6	102-B15E03-R01	PLL IC / MB15E03SL, PLL,16-PIN, SSOP, ROHS	pcs	1	IC1
7	102-DA8541-R01	AUDIO, AMP / TDA8541, SO8, ROHS	pcs	1	IC8
8	102-HT7130-R01	Voltage regulator IC / HT7130-1, SOT-89, ROHS	pcs	1	IC14
9	102-HT7150-R01	Voltage regulator IC / HT7150-1, ROHS	pcs	1	IC12
10	102-M2902V-R01	Operational amplifier / NJM2902V, OP-AMP, ROHS	pcs	3	IC4, IC6, IC7

11	102-M2904V-R01	Operational amplifier/ NJM2904V, OP-AMP, ROHS	pcs	1	IC3
12	103-00MA77-R01	Chip switch diode / MA77, 0805, ROHS	pcs	1	D1
13	103-0MA360-R01	Chip variable capacitor diode/ 0805, MA360(PANASONIC), ROHS	pcs	1	D12
14	103-0MA742-R01	Chip switch diode / MA742(PANASONIC), ROHS	pcs	1	D17
15	103-1SR154-R01	Chip diode, / 1SR154-400(ROHM), ROHS	pcs	1	D33
16	103-1SS372-R01	Chip switch diode / 1SS372(TOSHIBA), ROHS	pcs	1	D13
17	103-1SV325-R01	Chip variable capacitor diode / 1SV325, ROHS	pcs	4	D8, D9, D10, D11
18	103-A2S111-R01	Chip switch diode / 0603, MA2S111(PANASONIC), ROHS	pcs	3	D15, D16, D25
19	103-DAN222-R01	Chip switch diode / DAN222, (ROHM), ROHS	pcs	1	D308
20	103-HSC277-R01	Chip diode / Waveband switch, HSC277(HITACHI), ROHS	pcs	5	D3, D4, D5, D6, D7
21	103-HVC350-R01	Chip variable capacitor diode / 0603, HVC350B(HITACHI), ROHS	pcs	6	D21, D22, D23, D24, D26, D30
22	103-HZU5AL-R01	Chip Voltage regulator diode / HZU5ALL(HITACHI), ROHS	pcs	1	D14
23	103-L190YG-R01	Chip LED / 0603, green, H19-213SYGC,ROHS	pcs	2	D20, D29
24	103-MHC190-R02	Chip LED / 0603,red,19-21SURC/S530-A2/TR8, ROHS	pcs	1	D28
25	104-A144EE-R01	Chip triode / DTA144EE(ROHM),ROHS	pcs	3	Q17, Q34, Q40
26	104-C144EE-R01	Chip triode / DTC144EE(ROHM),ROHS	pcs	11	Q8, Q22, Q23, Q26, Q27, Q35, Q39, Q42, Q44, Q52, Q101
27	104-C144EU-R01	Chip triode / DTC144EU(ROHM),ROHS	pcs	1	Q18
28	104-KRX102-R01	Chip triode / KRX102U,with,bias,resistor,ROHS	pcs	1	IC2
29	104-MT717T-R01	Chip triode / FMMT717TA,ROHS	pcs	1	Q30
30	104-SA1586-R01	Chip triode / 2SA1586,ROHS	pcs	1	Q43
31	104-SC1623-R01	Chip triode / 2SC1623,ROHS	pcs	1	Q10
32	104-SC3356-R01	Chip triode / 2SC3356,R24,ROHS	pcs	1	Q3
33	104-SC4617-R01	Chip triode / 2SC4617(S)(ROHM),ROHS	pcs	4	Q6, Q7, Q9, Q37
34	104-SC4919-R01	Chip triode / 2SC4919, MUTING, CIRCUIT(SANYO), ROHS	pcs	1	Q24
35	104-SC5108-R01	Chip triode / 2SC5108Y(TOSHIBA), ROHS	pcs	3	Q2, Q4, Q5
36	104-TA1298-R01	Chip triode / KTA1298(Y),ROHS	pcs	3	Q29, Q31, Q32
37	104-TC4082-R01	Chip triode / KTC4082,(KEC),ROHS	pcs	2	Q1, Q21
38	105-2SJ243-R01	Chip FET(field-effect transistor) / 2SJ243,ROHS	pcs	1	Q16
39	105-2SK508-R01	Chip FET(field-effect transistor) / 2SK508NV(K52), ROHS	pcs	2	Q14, Q15
40	105-3SK318-R01	Chip FET(field-effect transistor) / 3SK318,ROHS	pcs	2	Q19, Q20
41	105-RD01MU-R01	Chip FET(field-effect transistor) / RD01MUS2,ROHS	pcs	1	Q12
42	105-SK1588-R01	Chip FET(field-effect transistor) / 2SK1588(NEC), ROHS	pcs	1	Q102
43	105-SK1824-R01	Chip FET(field-effect transistor) / 2SK1824,ROHS	pcs	7	Q13, Q25, Q33, Q36, Q38, Q41, Q51
44	105-SK3476-R01	Chip FET(field-effect transistor) / 2SK3476,ROHS	pcs	1	Q11
45	106-0BA010-R01	Knob switch / SKHLLBA010,ROHS	pcs	1	K1
46	106-454548-R01	Touch switch / 4.5*4.5*4.8,ROHS	pcs	2	K2, K4
47	106-ED0873-R01	3208/558 Carbon encoder switch / ED0873-16-16HC-F18(9), BAND, ROHS	pcs	1	SW2
48	106-LBE010-R01	Chip touch switch / SKRTLBE010,ROHS	pcs	1	K3
49	108-450C24-R02	Chip phase frequency detector/ JTBM450CX24, ROHS	pcs	1	CD1
50	108-CF450G-R02	Chip porcelain filter/ LTWC450G, 450kHz±5kHz, ROHS	pcs	1	CF1
51	108-XF4995-R01	Chip IF filter / 49.95MHz±7.5KHz,U-5*2,ROHS	pair	2	XF1, XF2
52	109-040000-R01	Chip resistor / 0402,0R±5%,ROHS	pcs	13	C67, C166, C250, R7, R24, R141, R182, R183, R217, R241, R260, R261, R278
53	109-040100-R01	Chip resistor / 0402,10R±5%,ROHS	pcs	7	R95, R96, R98, R101, R127, R200, R283
54	109-040101-R01	Chip resistor / 0402,100R±5%,ROHS	pcs	8	R58, R4, R12, R89, R90, R128, R180, R240
55	109-040102-R01	Chip resistor / 0402,1K±5%,ROHS	pcs	24	R97, R37, R38, R41, R42, R47, R48, R49, R50, R69, R129, R130, R131, R150, R152, R157, R191, R199, R226, R234, R256, R262, R280, R281
56	109-040103-R01	Chip resistor / 0402,10K±5%,ROHS	pcs	25	R29, R92, R100, R109, R110, R117, R119, R120, R121, R122, R123, R133, R136, R137, R138, R139, R140, R194, R203, R228, R254, R264, R266, R268, R275
57	109-040104-R01	Chip resistor / 0402,100K±5%,ROHS	pcs	26	C170, R279, R6, R43, R79, R80, R84, R102, R103, R104, R107, R113, R115, R116, R154, R158, R174, R197, R235, R236, R243, R247, R249, R257, R272,

					R297
58	109-040105-R01	Chip resistor / 0402,1M±5%,ROHS	pcs	2	R160, R162
59	109-040111-R01	Chip resistor / 0402,110R±5%,ROHS	pcs	1	R91
60	109-040122-R01	Chip resistor / 0402,1.2K±5%,ROHS	pcs	2	C276, R188
61	109-040123-R01	Chip resistor / 0402,12K±5%,ROHS	pcs	2	R211, R301
62	109-040124-R01	Chip resistor / 0402,120K±5%,ROHS	pcs	4	R5, R8, R9, R17
63	109-040151-R01	Chip resistor / 0402,150R±5%,ROHS	pcs	1	R179
64	109-040152-R01	Chip resistor / 0402,1.5K±5%,ROHS	pcs	1	R54
65	109-040153-R01	Chip resistor / 0402,15K±5%,ROHS	pcs	10	C187, C188, C189, C265, R28, R76, R142, R155, R156, R192
66	109-040154-R01	Chip resistor / 0402,150K±5%,ROHS	pcs	2	R94, R201
67	109-040181-R01	Chip resistor / 0402,180R±5%,ROHS	pcs	3	R70, R71, R189
68	109-040182-R01	Chip resistor / 0402,1.8K±5%,ROHS	pcs	1	R224
69	109-040183-R01	Chip resistor / 0402,18K±5%,ROHS	pcs	5	R149, R210, R218, R219, R27
70	109-040184-R01	Chip resistor / 0402,180K±1%,ROHS	pcs	3	R66, R67, R86
71	109-040220-R01	Chip resistor / 0402,22R±5%,ROHS	pcs	3	R73, R93, R274
72	109-040221-R01	Chip resistor / 0402,220R±5%,ROHS	pcs	3	R214, R215, R216
73	109-040222-R01	Chip resistor / 0402,2.2K±5%,ROHS	pcs	4	R2, R185, R186, R187
74	109-040223-R01	Chip resistor / 0402,22K±5%,ROHS	pcs	3	R106, R198, R209
75	109-040224-R01	Chip resistor / 0402,220K±5%,ROHS	pcs	4	R87, R164, R233, R246
76	109-040271-R01	Chip resistor / 0402,270R±5%,ROHS	pcs	1	R35
77	109-040272-R01	Chip resistor / 0402,2.7K±5%,ROHS	pcs	5	R40, R124, R148, R223, R363
78	109-040273-R01	Chip resistor / 0402,27K±5%,ROHS	pcs	4	R99, R171, R172, R193
79	109-040274-R01	Chip resistor / 0402,270K±5%,ROHS	pcs	1	R231
80	109-040330-R01	Chip resistor / 0402,33R±5%,ROHS	pcs	1	R72
81	109-040332-R01	Chip resistor / 0402,3.3K±5%,ROHS	pcs	8	R26, R55, R56, R57, R59, R60, R111, R238
82	109-040333-R01	Chip resistor / 0402,33K±5%,ROHS	pcs	9	R114, R153, R161, R196, R206, R258, R263, R265, R375
83	109-040334-R01	Chip resistor / 0402,330K±5%,ROHS	pcs	3	R15, R82, R105
84	109-040392-R01	Chip resistor / 0402,3.9K±5%,ROHS	pcs	3	R39, R221, R222
85	109-040393-R01	Chip resistor / 0402,39K±5%,ROHS	pcs	2	R53, R68
86	109-040394-R01	Chip resistor / 0402,390K±5%,ROHS	pcs	1	R165
87	109-040470-R01	Chip resistor / 0402,47R±5%,ROHS	pcs	2	R31, R32
88	109-040471-R01	Chip resistor / 0402,470R±5%,ROHS	pcs	2	R3, R81
89	109-040472-R01	Chip resistor / 0402,4.7K±5%,ROHS	pcs	9	R52, R208, R118, R125, R151, R159, R204, R205, R282
90	109-040473-R01	Chip resistor / 0402,47K±5%,ROHS	pcs	14	R10, R11, R13, R14, R19, R20, R21, R22, R25, R46, R75, R273, R277, R292
91	109-040474-R01	Chip resistor / 0402,470K±5%,ROHS	pcs	3	R166, R232, R374
92	109-040511-R01	Chip resistor / 0402,510R±5%,ROHS	pcs	1	R18
93	109-040561-R01	Chip resistor / 0402,560R±5%,ROHS	pcs	2	R202, R244
94	109-040562-R01	Chip resistor / 0402,5.6K±5%,ROHS	pcs	11	R30, R44, R61, R62, R63, R64, R65, R132, R184, R195, R302
95	109-040563-R01	Chip resistor / 0402,56K±5%,ROHS	pcs	9	R16, R173, R175, R176, R177, R178, R239, R248, R376
96	109-040564-R01	Chip resistor / 0402,560K±5%,ROHS	pcs	1	R163
97	109-040682-R01	Chip resistor / 0402,6.8K±5%,ROHS	pcs	2	R212, R220
98	109-040683-R01	Chip resistor / 0402,68K±5%,ROHS	pcs	2	R190, R245
99	109-040684-R01	Chip resistor / 0402,680K±5%,ROHS	pcs	1	R77
100	109-040753-R01	Chip resistor / 0402,75K±5%,ROHS	pcs	1	R78
101	109-040821-R01	Chip resistor / 0402,820R±5%,ROHS	pcs	1	R33
102	109-040822-R01	Chip resistor / 0402,8.2K±5%,ROHS	pcs	3	R36, R229, R230
103	109-040823-R01	Chip resistor / 0402,82K±5%,ROHS	pcs	4	R51, R255, R271, R300
104	109-040913-R01	Chip resistor / 0402,91K±5%,ROHS	pcs	1	R213
105	109-060000-R01	Chip resistor / 0603,0R±5%,ROHS	pcs	5	L16, L23, L34, L62, R23
106	109-060100-R01	Chip resistor / 0603,10R±5%,ROHS	pcs	1	L21
107	109-060101-R01	Chip resistor / 0603,100R±5%,ROHS	pcs	2	R74, R88
108	109-060154-R02	Chip resistor / 0603,150K±1%,ROHS	pcs	6	R143, R144, R145, R146, R147, R170
109	109-060220-R01	Chip resistor / 0603,22R±5%,ROHS	pcs	1	L54
110	109-060271-R01	Chip resistor / 0603,270R±5%,ROHS	pcs	1	R34
111	109-100R47-R01	Chip resistor / 1206,0.47R±5%,ROHS	pcs	3	R167, R168, R169
112	110-110223-R01	Chip trimming resistor / MVR22HXBRN223, 22K±25%, B Linear, ROHS	pcs	1	VR2
113	110-110683-R01	Chip trimming resistor / MVR22HXBRN683, 68K±25%, B Linear, ROHS	pcs	1	VR1
114	110-220103-R03	Volume switch / RY-6932, ROHS	pcs	1	SW1
115	111-030000-R01	Chip self resume safety / 433003,3A/32V, 1206	pcs	1	F1

		(former 429003), ROHS			
116	112-043100-R01	Chip capacitor / 0402, 10P±0.5P,50V,C0G,ROHS	pcs	5	C142, C195, C257, C282, C288
117	112-043101-R01	Chip capacitor / 0402,100P±5%,50V,C0G,ROHS	pcs	1	C196
118	112-043102-R01	Chip capacitor / 0402,1000P±10%,50V,X7R,ROHS	pcs	33	C1, C38, C72, C73, C74, C75, C96, C97, C98, C99, C100, C103, C104, C105, C106, C107, C109, C111, C112, C114, C123, C150, C151, C169, C172, C184, C241, C263, C264, C272, C278, C279, C294
119	112-043103-R01	Chip capacitor / 0402,0.01uF±10%,50V,X7R,ROHS	pcs	15	C50, C79, C138, C149, C153, C155, C159, C160, C161, C162, C190, C226, C232, C253, C296
120	112-043104-R02	Chip capacitor / 0402,0.1uF±10%,10V,X5R,ROHS	pcs	20	C35, C82, C83, C85, C101, C167, C168, C173, C174, C175, C176, C177, C178, C221, C231, C233, C254, C271, C307, C310
121	112-043105-R01	Chip capacitor / 0402,1uF±10%,6.3V,X5R,ROHS	pcs	11	C170A, C25, C30, C225, C235, C248, C251, C261, C300, C303, C400
122	112-043122-R01	Chip capacitor / 0402,1200P±10%,50V,X7R,ROHS	pcs	1	C211
123	112-043123-R01	Chip capacitor / 0402,0.012uF±10%, 50V, X7R, ROHS	pcs	7	C156, C157, C158, C215, C239, C249, C275
124	112-043150-R01	Chip capacitor / 0402,15P±5%,50V,C0G,ROHS	pcs	2	C69, C86
125	112-043152-R01	Chip capacitor / 0402,1500P±10%,50V,X7R,ROHS	pcs	1	C289
126	112-043153-R01	Chip capacitor / 0402, 0.015uF±10%, 50V, X7R, ROHS	pcs	1	C244
127	112-043180-R01	Chip capacitor / 0402,18P±5%,50V,C0G,ROHS	pcs	1	C212
128	112-043182-R01	Chip capacitor / 0402,1800P±10%,50V,X7R,ROHS	pcs	2	C51, C113
129	112-0431R0-R01	Chip capacitor / 0402,1P±0.25P,50V,C0G,ROHS	pcs	2	C217, C218
130	112-043200-R01	Chip capacitor / 0402,20P±5%,50V,C0G,ROHS	pcs	2	C141, C200
131	112-043220-R01	Chip capacitor / 0402,22P±5%,50V,C0G,ROHS	pcs	3	C143, C255, C256
132	112-043221-R01	Chip capacitor / 0402,220P±5%,50V,C0G,ROHS	pcs	1	C295
133	112-043222-R01	Chip capacitor / 0402,2200P±10%,50V,X7R,ROHS	pcs	1	C262
134	112-043223-R01	Chip capacitor / 0402, 0.022uF±10%, 50V, X7R, ROHS	pcs	8	C179, C185, C245, C317, C318, C357, C358, C386
135	112-043224-R02	Chip capacitor / 0402,0.22uF±10%,10V,X7R,ROHS	pcs	1	C280
136	112-043270-R01	Chip capacitor / 0402,27P±5%,50V,C0G,ROHS	pcs	1	C224
137	112-0432R0-R01	Chip capacitor / 0402,2P±0.25P,50V,C0G,ROHS	pcs	3	C89, C110, C132
138	112-043330-R01	Chip capacitor / 0402,33P±5%,50V,C0G,ROHS	pcs	3	C119, C171, C227
139	112-043333-R01	Chip capacitor / 0402, 0.033uF±10%, 16V, X7R, ROHS	pcs	3	C213, C223, C283
140	112-043392-R01	Chip capacitor / 0402,3900P±10%,50V,X7R,ROHS	pcs	3	C222, C238, C284
141	112-043393-R01	Chip capacitor / 0402, 0.039uF±10%, 50V, X7R, ROHS	pcs	2	C252, C299
142	112-0433R0-R01	Chip capacitor / 0402,3P±0.25P,50V,C0G,ROHS	pcs	4	C70, C90, C131, C230
143	112-043470-R01	Chip capacitor / 0402,47P±5%,50V,C0G,ROHS	pcs	2	C4, C293
144	112-043471-R01	Chip capacitor / 0402,470P±10%,50V,X7R,ROHS	pcs	70	C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C24, C26, C28, C29, C31, C34, C36, C37, C39, C40, C41, C42, C43, C44, C45, C48, C49, C52, C53, C54, C55, C56, C58, C59, C60, C61, C71, C84, C102, C108, C125, C152, C154, C163, C183, C186, C220, C237, C267, C268, C269, C270, C274, C277, C286, C287, C290, C291, C297, C305, C315, C316, C502
145	112-043472-R01	Chip capacitor / 0402,4700P±10%,25V,X7R,ROHS	pcs	1	C285
146	112-043473-R01	Chip capacitor / 0402,0.047uF±10%,16V,X7R, ROHS	pcs	1	C301
147	112-043474-R01	Chip capacitor / 0402,0.47uF±10%,10V,X5R,ROHS	pcs	2	C80, C192
148	112-0434R0-R01	Chip capacitor / 0402,4P±0.25P,50V,C0G,ROHS	pcs	1	C182
149	112-0435R0-R01	Chip capacitor / 0402,5P±0.25P,50V,C0G,ROHS	pcs	5	C87, C118, C122, C145, C228
150	112-043681-R01	Chip capacitor / 0402,680P±10%,16V,X7R,ROHS	pcs	3	C57, C258, C260
151	112-043683-R01	Chip capacitor / 0402, 0.068uF±10%, 16V, X7R, ROHS	pcs	4	C242, C243, C247, C259
152	112-043820-R01	Chip capacitor / 0402,82P±5%,50V,C0G,ROHS	pcs	1	C214
153	112-0438R0-R01	Chip capacitor / 0402,8P±0.5P,50V,C0G,ROHS	pcs	4	C32, C47, C124, C128
154	112-0439R0-R01	Chip capacitor / 0402,9P±0.5P,50V,C0G,ROHS	pcs	2	C126, C127
155	112-043R50-R01	Chip capacitor / 0402,0.5P±0.1P,50V,C0G,ROHS	pcs	2	C147, C219
156	112-043R75-R01	Chip capacitor / 0402,0.75P±0.1P,50V,C0G,ROHS	pcs	1	C216
157	112-063101-R01	Chip capacitor / 0603,100P±5%,50V,C0G,ROHS	pcs	1	C93
158	112-063102-R01	Chip capacitor / 0603,1000P±10%,50V,X7R,ROHS	pcs	1	C95
159	112-063105-R01	Chip capacitor / 0603,1uF±10%,50V,X7R,ROHS	pcs	1	C209
160	112-063120-R01	Chip capacitor / 0603,12P±5%,50V,C0G,ROHS	pcs	1	C133
161	112-063180-R01	Chip capacitor / 0603,18P±5%,50V,C0G,ROHS	pcs	3	C94, C91, C78
162	112-0631R0-R01	Chip capacitor / 0603,1P±0.25P,50V,C0G,ROHS	pcs	2	C148, C236

163	112-0632R0-R01	Chip capacitor / 0603,2P±0.25P,50V,C0G,ROHS	pcs	1	C3
164	112-0632R5-R01	Chip capacitor / 0603, 2.4P/2.5P±0.1P, 50V, COG, ROHS	pcs	4	C2, C120, C121, C62
165	112-063334-R01	Chip capacitor / 0603,0.33uF±10%,50V,X7R, ROHS	pcs	1	C204
166	112-0633R0-R01	Chip capacitor / 0603,3P±0.25P,50V,C0G,ROHS	pcs	1	C137
167	112-0633R5-R01	Chip capacitor / 0603,3.5P±0.25P,50V,C0G,ROHS	pcs	2	C63, C88
168	112-063471-R01	Chip capacitor / 0603,470P±10%,50V,X7R,ROHS	pcs	2	C5, C27
169	112-0634R0-R01	Chip capacitor / 0603,4P±0.25P,50V,C0G,ROHS	pcs	2	C117, C129
170	112-063560-R01	Chip capacitor / 0603,56P±5%,50V,C0G,ROHS	pcs	2	C139, C194
171	112-0635R0-R01	Chip capacitor / 0603,5P±0.25P,50V,C0G,ROHS	pcs	1	C116
172	112-063680-R01	Chip capacitor / 0603,68P±5%,50V,C0G,ROHS	pcs	1	C144
173	112-063683-R01	Chip capacitor / 0603,0.068uF±10%,16V,X7R, ROHS	pcs	1	C193
174	112-0636R0-R01	Chip capacitor / 0603,6P±0.5P,50V,C0G,ROHS	pcs	2	C136, C206
175	112-0638R0-R01	Chip capacitor / 0603,8P±0.5P,50V,C0G,ROHS	pcs	2	C135, C77
176	112-063R50-R01	Chip capacitor / 0603,0.5P±0.1P,50V,C0G,ROHS	pcs	1	C115
177	112-072105-R01	Chip Ta capacitor/ TP Model, SIZE P, 1uF±20%, 10V, ROHS	pcs	1	C33
178	112-072106-R01	Chip Ta capacitor/ TP Model, SIZE P, 10uF±20%, 6.3V, ROHS	pcs	3	C191, C198, C199
179	112-072225-R01	Chip Ta capacitor / TP Model, SIZE P, 2.2uF±20%, 10V, ROHS	pcs	3	C140, C207, C246
180	112-072475-R01	Chip Ta capacitor / TP Model, SIZE P, 4.7uF±20%, 10V, ROHS	pcs	7	C165, C201, C202, C273, C292, C298, C308
181	112-073105-R01	Chip capacitor / 0805, 1uF+80%--20%, 16V, Y5V, ROHS	pcs	1	C306
182	112-073225-R01	Chip capacitor / 0805, 2.2uF+80%--20%, 10V, Y5V, ROHS	pcs	1	C234
183	112-102106-R02	Chip Ta capacitor / TS Model, SIZE A, 10uF±20%, 10V, ROHS	pcs	3	C197, C203, C210
184	112-102156-R01	Chip Ta capacitor / TS Model, SIZE A, 15uF±20%, 6.3V, ROHS	pcs	1	C208
185	112-102475-R02	Chip Ta capacitor / TS Model, SIZE A, 4.7uF±20%, 16V, ROHS	pcs	3	C46, C240, C266
186	112-172107-R02	Chip Ta capacitor / TS Model, SIZE C, 100uF±20%, 10V, ROHS	pcs	1	C401
187	113-010100-R01	Chip trimming capacitor / TZV2Z100A110, 3~10p+100, ROHS	pcs	2	C180, C181
188	114-06E221-R01	Chip Wire inductor / C1608CB-R22J, 220nH±5%, 0603, ROHS	pcs	2	L18, L36
189	114-06E331-R02	Chip inductor / MLF1608R33K, 330nH±10%, 0603, ROHS	pcs	2	L11, L59
190	114-06E560-R01	Chip Wire inductor / C1608CB-56NJ, 56nH±5%, 0603, ROHS	pcs	1	L13
191	114-06E680-R01	Chip Wire inductor / C1608CB-68NJ, 68nH±5%, 0603, ROHS	pcs	1	L53
192	114-06G120-R01	Chip inductor / MLG1608B12NJ, 12nH±5%, 0603, ROHS	pcs	1	L31
193	114-06G181-R01	Chip inductor / LGHK1608R18J-T, 180nH±5%, 0603, ROHS	pcs	2	L27, L50
194	114-06G221-R02	Chip inductor / LGHK1608R22J-T, 220nH±5%, 0603, ROHS	pcs	2	L49, L52
195	114-06G270-R01	Chip inductor / MLG1608B27NJ, 27nH±5%, 0603, ROHS	pcs	3	L12, L32, L33
196	114-06G332-R01	Chip inductor / MLF1608A3R3K, 3.3uH±5%, 0603, ROHS	pcs	2	L28, L29
197	114-06G470-R01	Chip inductor / MLG1608B47NJ, 47nH±5%, 0603, ROHS	pcs	1	L35
198	114-07E220-R01	Chip Wire inductor/ C2012C-22NJ, 22nH±5%, 0805, ROHS	pcs	1	L51
199	114-07E221-R01	Chip Wire inductor/ LQW2BHNR22NJ03L / LQN21AR22J, 220nH±5%, 0805, ROHS	pcs	1	L26
200	114-07E330-R01	Chip Wire inductor / C2012C-33NJ, 33nH±5%, 0805, ROHS	pcs	1	L30

		ROHS			
201	114-08E103-R01	Chip inductor / FSLM2520-100J, 10uH±5%, 1008, ROHS	pcs	1	L45
202	114-08E821-R01	Chip inductor / FSLM2520-R82K, 820nH±10%, 1008, ROHS	pcs	2	L55, L56
203	115-1R53R0-R04	Chip air-cored coil/ 0.3*1.5*3TR,negative,high pin, ROHS	pcs	10	L1, L2, L3, L4, L5, L6, L7, L8, L9, L10
204	115-1R54R0-R04	Chip air-cored coil/ 0.3*1.5*4TR,negative,high pin, ROHS	pcs	2	L14, L15
205	115-1R55R0-R01	Chip air-cored coil/ 0.3*1.5*5TR, negative, high pin, ROHS	pcs	1	L24
206	115-1R58R0-R02	Chip air-cored coil/ 0.4*1.5*8TR,negative,high pin, ROHS	pcs	1	L25
207	117-000000-R04	Chip bead / EMI, FILTER, SMT, BLM11A221S, 0603, ROHS	pcs	13	L19, L20, L40, L41, L42, L44, L46, L47, L48, L60, L61, L65, L66
208	117-000000-R05	Chip bead / EMI, FILTER, SMT, BLM21P300S, 0805, ROHS	pcs	7	L22, L37, L38, L39, L43, L58, L67
209	119-060104-R01	Hot quick resistor / NTH5G16P42B104K07TH, 100K, 0603, ROHS	pcs	1	R85
210	121-200000-R01	MIC socket / B6027AP402-88,ROHS	pcs	1	MIC1
211	122-116M80-R01	Chip transistor / TVCGDCSANE,16.8MHz ± 2.5PPm, ROHS	pcs	1	X4
212	122-17M300-R01	Chip crystal resonator / CSTCR7M30G53-R0, 7.3M, ROHS	pcs	1	X2
213	124-050000-R15	2.5mm Earphone socket / MOTOROLA, PJ-D2008B, DC30V0.5A, ROHS	pcs	1	J2
214	124-050000-R16	3.5mm MIC socket / MOTOROLA, PJ-D3027, DC30V0.5A, ROHS	pcs	1	J1
216	203-007200-R02	PT7200 pogo pin /brass/ Au plate/ ROHS	pcs	3	
218	603-0W558A-R01	Voice recorder IC / W588A080, binding, ROHS	pcs	1	IC15

Electronic Parts List (136-174MHz)

No.	Part No.	Description	Unit	Qty.	Position Mark
1	101-04208V-R02	PT4208PCB / VHF, FR-4, 1.2mm, PT4208V-090401, ROHS	pcs	1	
2	102-0R8C2A-R01	MCU / R8C/2A, R5F212A8SNFP, PLQP-64, ROHS	pcs	1	IC10
3	102-9140NR-R01	Reset IC / PST9140NR, ROHS	pcs	1	IC11
4	102-A31136-R01	IF(MF) modulation IC / TA31136FN, SSOP, ROHS	pcs	1	IC5
5	102-AT2408-R02	Memory IC / AT24C08BN-SH, ROHS	pcs	1	IC9
6	102-B15E03-R01	PLL IC / MB15E03SL, PLL, 16-PIN, SSOP, ROHS	pcs	1	IC1
7	102-DA8541-R01	AUDIO, AMP / TDA8541, SO8, ROHS	pcs	1	IC8
8	102-HT7130-R01	Voltage regulator IC / HT7130-1, SOT-89, ROHS	pcs	1	IC14
9	102-HT7150-R01	Voltage regulator IC / HT7150-1, ROHS	pcs	1	IC12
10	102-M2902V-R01	Operational amplifier / NJM2902V, OP-AMP, ROHS	pcs	3	IC4, IC6, IC7
11	102-M2904V-R01	Operational amplifier/ NJM2904V, OP-AMP, ROHS	pcs	1	IC3
12	103-0MA742-R01	Chip switch diode / MA742(PANASONIC), ROHS	pcs	1	D17
13	103-1SR154-R01	Chip diode, / 1SR154-400(ROHM), ROHS	pcs	1	D33
14	103-1SS372-R01	Chip switch diode / 1SS372(TOSHIBA),ROHS	pcs	1	D13
15	103-1SV278-R01	Chip variable capacitor diode / 1SV278, ROHS	pcs	1	D12
16	103-1SV305-R01	Chip variable capacitor diode / 1SV305,ROHS	pcs	1	D30
17	103-1SV325-R01	Chip variable capacitor diode / 1SV325, ROHS	pcs	8	D8, D9, D10, D11, D18, D31, D32, D34
18	103-A2S111-R01	Chip switch diode / 0603, MA2S111(PANASONIC), ROHS	pcs	3	D15, D16, D25
19	103-DAN222-R01	Chip switch diode / DAN222, (ROHM), ROHS	pcs	1	D308
20	103-HSC277-R01	Chip diode / Waveband switch, HSC277(HITACHI), ROHS	pcs	3	D3, D6, D7
21	103-HVC131-R01	Chip HF switch diode / 0603, HVC131(HITACHI), ROHS	pcs	4	D1, D2, D4, D5
22	103-HVC376-R01	Chip variable capacitor diode / HVC376B, ROHS	pcs	3	D21, D23, D24
23	103-HZU5AL-R01	Chip Voltage regulator diode / HZU5ALL(HITACHI), ROHS	pcs	1	D14

24	103-L190YG-R01	Chip LED / 0603, green, H19-213SYGC, ROHS	pcs	2	D20, D29
25	103-MHC190-R02	Chip LED / 0603, red, 19-21SURC/S530-A2/TR8, ROHS	pcs	1	D28
26	104-A144EE-R01	Chip triode / DTA144EE(ROHM), ROHS	pcs	3	Q17, Q34, Q40
27	104-C144EE-R01	Chip triode / DTC144EE(ROHM), ROHS	pcs	11	Q8, Q22, Q23, Q26, Q27, Q35, Q39, Q42, Q44, Q52, Q101
28	104-C144EU-R01	Chip triode / DTC144EUA(ROHM), ROHS	pcs	1	Q18
29	104-KRX102-R01	Chip triode / KRX102U, with, bias, resistor, ROHS	pcs	1	IC2
30	104-MT717T-R01	Chip triode / FMMT717TA,ROHS	pcs	1	Q30
31	104-SA1586-R01	Chip triode / 2SA1586, ROHS	pcs	1	Q43
32	104-SC1623-R01	Chip triode / 2SC1623,ROHS	pcs	1	Q10
33	104-SC4617-R02	Chip triode / 2SC4617(R)(ROHM), ROHS	pcs	4	Q6, Q7, Q9, Q37
34	104-SC4919-R01	Chip triode / 2SC4919, MUTING, CIRCUIT(SANYO), ROHS	pcs	1	Q24
35	104-SC5108-R01	Chip triode / 2SC5108Y(TOSHIBA), ROHS	pcs	3	Q2, Q4, Q5
36	104-TA1298-R01	Chip triode / KTA1298(Y), ROHS	pcs	3	Q29, Q31, Q32
37	104-TC4082-R01	Chip triode / KTC4082, (KEC), ROHS	pcs	2	Q1, Q21
38	105-2SJ243-R01	Chip FET (field-effect transistor) / 2SJ243, ROHS	pcs	1	Q16
39	105-2SK508-R01	Chip FET(field-effect transistor) / 2SK508NV(K52), ROHS	pcs	2	Q14, Q15
40	105-2SK880-R01	Chip FET (field-effect transistor) / 2SK880, ROHS	pcs	1	Q90
41	105-3SK318-R01	Chip FET (field-effect transistor) / 3SK318, ROHS	pcs	2	Q19, Q20
42	105-SK1588-R01	Chip FET (field-effect transistor) / 2SK1588(NEC), ROHS	pcs	1	Q102
43	105-SK1824-R01	Chip FET (field-effect transistor) / 2SK1824, ROHS	pcs	7	Q13, Q25, Q33, Q36, Q38, Q41, Q51
44	105-SK3475-R01	Chip FET (field-effect transistor) / 2SK3475(6200 add WB"), ROHS"	pcs	1	Q12
45	105-SK3476-R01	Chip FET (field-effect transistor) / 2SK3476, ROHS	pcs	1	Q11
46	106-0BA010-R01	Knob switch / SKHLLBA010, import, ROHS	pcs	1	K1
47	106-454548-R01	Touch switch / 4.5*4.5*4.8, ROHS	pcs	2	K2, K4
48	106-ED0873-R01	3208/558 Carbon encoder switch / ED0873-16-16HC-F18(9), BAND, ROHS	pcs	1	SW2
49	106-LBE010-R01	Chip touch switch / SKRTLBE010, ROHS	pcs	1	K3
50	108-450C24-R02	Chip phase frequency detector/ JTBM450CX24, ROHS	pcs	1	CD1
51	108-CF450G-R02	Chip porcelain filter/ LTWC450G, 450kHz±5kHz, ROHS	pcs	1	CF1
52	108-XF4995-R01	Chip IF filter / 49.95MHz±7.5KHz, U-5*2, ROHS	pair	2	XF1, XF2
53	109-040000-R01	Chip resistor/ 0402,0R±5%, ROHS	pcs	16	C34, C67, C166, C250, R7, R24, R27, R30, R36, R43, R103, R202, R241, R260, R261, R278
54	109-040100-R01	Chip resistor/ 0402,10R±5%, ROHS	pcs	7	R37, R96, R98, R101, R200, R217,R283
55	109-040101-R01	Chip resistor/ 0402,100R±5%, ROHS	pcs	6	R4, R12, R89, R128, R180, R240
56	109-040102-R01	Chip resistor/ 0402,1K±5%, ROHS	pcs	22	R41, R42, R45, R47, R48, R49, R50, R69, R129, R130, R131, R150, R152, R157, R191, R199, R234, R256, R280, R281, R826, R902
57	109-040103-R01	Chip resistor/ 0402,10K±5%, ROHS	pcs	26	R29, R46, R100, R109, R110, R119, R120, R121, R122, R123, R133, R136, R137, R138, R139, R140, R183, R194, R228, R254, R264, R266, R268, R275, R900, R953
58	109-040104-R01	Chip resistor/ 0402,100K±5%, ROHS	pcs	23	R6, R79, R80, R84,R257, R104, R107, R113, R115, R116, R154, R158, R174, R197, R235, R236, R243, R247, R249, R272, R297, R300, R864
59	109-040105-R01	Chip resistor/ 0402,1M±5%, ROHS	pcs	3	R108, R160, R162
60	109-040121-R01	Chip resistor/ 0402,120R±5%, ROHS	pcs	1	R244
61	109-040122-R01	Chip resistor/ 0402,1.2K±5%, ROHS	pcs	3	R44, R141, R188
62	109-040123-R01	Chip resistor/ 0402,12K±5%, ROHS	pcs	2	R211, R301
63	109-040124-R01	Chip resistor/ 0402,120K±5%, ROHS	pcs	3	R5, R8, R9
64	109-040151-R01	Chip resistor/ 0402,150R±5%, ROHS	pcs	1	R179
65	109-040152-R01	Chip resistor/ 0402,1.5K±5%, ROHS	pcs	2	R10, R54
66	109-040153-R01	Chip resistor/ 0402,15K±5%, ROHS	pcs	8	C187, C188, C189, C265, R142, R192, R203, R209
67	109-040154-R01	Chip resistor/ 0402,150K±5%, ROHS	pcs	4	R66, R94, R201,R279
68	109-040180-R01	Chip resistor/ 0402,18R±5%, ROHS	pcs	1	R38
69	109-040182-R01	Chip resistor/ 0402,1.8K±5%, ROHS	pcs	1	R224
70	109-040183-R01	Chip resistor/ 0402,18K±5%, ROHS	pcs	4	R149, R210, R218, R219
71	109-040184-R01	Chip resistor/ 0402,180K±1%, ROHS	pcs	2	R67, R86
72	109-040220-R01	Chip resistor/ 0402,22R±5%, ROHS	pcs	3	R274, R799, R945

73	109-040221-R01	Chip resistor/ 0402,220R±5%, ROHS	pcs	5	R71, R189, R214, R215, R216
74	109-040222-R01	Chip resistor/ 0402,2.2K±5%, ROHS	pcs	7	R18, R39, R57, R181, R185, R186, R187
75	109-040223-R01	Chip resistor/ 0402,22K±5%, ROHS	pcs	3	R106, R153, R198
76	109-040224-R01	Chip resistor/ 0402,220K±5%,ROHS	pcs	5	R17, R87, R164, R233, R246,
77	109-040271-R01	Chip resistor/ 0402,270R±5%,ROHS	pcs	2	R70, R91
78	109-040272-R01	Chip resistor/ 0402,2.7K±5%,ROHS	pcs	3	R124, R148, R223
79	109-040273-R01	Chip resistor/ 0402,27K±5%,ROHS	pcs	4	R171, R172, R193, R271
80	109-040274-R01	Chip resistor/ 0402,270K±5%,ROHS	pcs	1	R231
81	109-040303-R01	Chip resistor/ 0402,30K±5%,ROHS	pcs	3	R28, R76, R212
82	109-040331-R01	Chip resistor/ 0402,330R±5%,ROHS	pcs	5	R23, R35, R73, R920, R921
83	109-040332-R01	Chip resistor/ 0402,3.3K±5%,ROHS	pcs	6	R26, R55, R59, R60, R97, R111
84	109-040333-R01	Chip resistor/ 0402,33K±5%,ROHS	pcs	6	R114, R161, R196, R206, R258, R375
85	109-040334-R01	Chip resistor/ 0402,330K±5%,ROHS	pcs	3	R15, R82, R105
86	109-040362-R01	Chip resistor/ 0402,3.6K±5%,ROHS	pcs	1	R62
87	109-040363-R01	Chip resistor/ 0402,36K±5%,ROHS	pcs	1	R248
88	109-040392-R01	Chip resistor/ 0402,3.9K±5%,ROHS	pcs	4	R52, R205, R221, R222
89	109-040393-R01	Chip resistor/ 0402,39K±5%,ROHS	pcs	2	R53, R68
90	109-040394-R01	Chip resistor/ 0402,390K±5%,ROHS	pcs	1	R165
91	109-040470-R01	Chip resistor/ 0402,47R±5%,ROHS	pcs	2	R95, R182
92	109-040471-R01	Chip resistor/ 0402,470R±5%,ROHS	pcs	3	R2, R3, R81
93	109-040472-R01	Chip resistor/ 0402,4.7K±5%,ROHS	pcs	13	R56, R61, R155,R156,R92, R99, R118, R125, R151, R159, R204, R282, R808
94	109-040473-R01	Chip resistor/ 0402,47K±5%,ROHS	pcs	11	R11, R13, R19, R20, R21, R22, R25, R273, R277, R292, R901
95	109-040474-R01	Chip resistor/ 0402,470K±5%,ROHS	pcs	4	R166, R232, R374, R903
96	109-040560-R01	Chip resistor/ 0402,56R±5%,ROHS	pcs	1	R58
97	109-040561-R01	Chip resistor/ 0402,560R±5%,ROHS	pcs	3	R40, R72,R238,
98	109-040562-R01	Chip resistor/ 0402,5.6K±5%,ROHS	pcs	8	R63, R64, R65, R132,C276, R184, R195, R302
99	109-040563-R01	Chip resistor/ 0402,56K±5%,ROHS	pcs	8	R16, R173, R175, R176, R177, R178, R239, R376
100	109-040681-R01	Chip resistor/ 0402,680R±5%,ROHS	pcs	1	R127
101	109-040682-R01	Chip resistor/ 0402,6.8K±5%,ROHS	pcs	1	R220,
102	109-040683-R01	Chip resistor/ 0402,68K±5%,ROHS	pcs	3	R75, R190, R245
103	109-040684-R01	Chip resistor/ 0402,680K±5%,ROHS	pcs	1	R77
104	109-040750-R01	Chip resistor/ 0402,75R±5%,ROHS	pcs	1	R31
105	109-040753-R01	Chip resistor/ 0402,75K±5%,ROHS	pcs	1	R78
106	109-040754-R01	Chip resistor/ 0402,750K±5%,ROHS	pcs	1	R163
107	109-040821-R01	Chip resistor/ 0402,820R±5%,ROHS	pcs	1	R33
108	109-040822-R01	Chip resistor/ 0402,8.2K±5%,ROHS	pcs	2	R229, R230
109	109-040823-R01	Chip resistor/ 0402,82K±5%,ROHS	pcs	2	R51, R255,
110	109-040913-R01	Chip resistor/ 0402,91K±5%,ROHS	pcs	1	R213
111	109-060000-R01	Chip resistor/ 0603,0R±5%,ROHS	pcs	6	C95, L9, L18, L49, L54, L62
112	109-060100-R01	Chip resistor/ 0603,10R±5%,ROHS	pcs	1	L21
113	109-060101-R01	Chip resistor/ 0603,100R±5%,ROHS	pcs	2	R74, R88
114	109-060154-R02	Chip resistor/ 0603,150K±1%,ROHS	pcs	6	R143, R144, R145, R146, R147, R170
115	109-060271-R01	Chip resistor/ 0603,270R±5%,ROHS	pcs	2	R34, R934
116	109-060470-R01	Chip resistor/ 0603,47R±5%,ROHS	pcs	1	L34
117	109-100R47-R01	Chip resistor/ 1206,0.47R±5%,ROHS	pcs	3	R167, R168, R169
118	110-110223-R01	Chip trimming resistor / MVR22HXBRN223, 22K±25%, B Linear, ROHS	pcs	1	VR2
119	110-110683-R01	Chip trimming resistor / MVR22HXBRN683, 68K±25%, B Linear, ROHS	pcs	1	VR1
120	110-220103-R03	Volume switch / RY-6932, ROHS	pcs	1	SW1
121	111-030000-R01	Chip self resume safety / 433003, 3A/32V, 1206(old 429003), ROHS	pcs	1	F1
122	112-043100-R01	Chip capacitor / 0402, 10P±0.5P, 50V, C0G, ROHS	pcs	5	C87, C92, C257, C282, C288
123	112-043101-R01	Chip capacitor / 0402,100P±5%, 50V, C0G, ROHS	pcs	1	C196
124	112-043102-R01	Chip capacitor / 0402, 1000P±10%, 50V, X7R, ROHS	pcs	60	C1, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C18, C19, C20, C21, C29, C38, C39, C40, C41, C42, C44, C72, C73, C74, C75, C96, C97, C100, C103, C105, C106, C107, C109, C111, C112, C114, C123, C124, C128, C147, C150, C151, C169, C172, C182, C184, C186, C241, C263, C264, C268, C272, C278, C279, C294, C652, C658, C943
125	112-043103-R01	Chip capacitor / 0402, 0.01uF±10%, 50V, X7R, ROHS	pcs	20	C50, C79, C104, C149, C153, C155, C159, C160, C161, C162, C190, C226, C232, C253, C296, C509, C853, C900, C901, C902
126	112-043104-R02	Chip capacitor / 0402, 0.1uF±10%, 16V, X7R, ROHS	pcs	19	C35, C80, C82, C83, C85, C101, C167, C168, C173, C174, C175, C178, C221,

					C231, C233, C254, C271, C307, C310
127	112-043105-R01	Chip capacitor / 0402, 1uF±10%, 6.3V, X5R, ROHS	pcs	13	C25, C30, C138, C170, C183, C192, C225, C235, C248, C251, C300, C303, C400
128	112-043110-R01	Chip capacitor / 0402, 11P±5%, 50V, C0G, ROHS	pcs	1	C651
129	112-043120-R01	Chip capacitor / 0402, 12P±5%, 50V, C0G, ROHS	pcs	1	C145
130	112-043122-R01	Chip capacitor / 0402, 1200P±10%, 50V, X7R, ROHS	pcs	1	C211
131	112-043123-R01	Chip capacitor / 0402, 0.012uF±10%, 25V, X7R, ROHS	pcs	7	C156, C157, C158, C215, C239, C249, C275
132	112-043150-R01	Chip capacitor / 0402, 15P±5%, 50V, C0G, ROHS	pcs	1	C143
133	112-043152-R01	Chip capacitor / 0402, 1500P±10%, 50V, X7R, ROHS	pcs	1	C289
134	112-043153-R01	Chip capacitor / 0402, 0.015uF±10%, 50V, X7R, ROHS	pcs	1	C244
135	112-043180-R01	Chip capacitor / 0402, 18P±5%, 50V, C0G, ROHS	pcs	4	C69, C127, C212, C230
136	112-043182-R01	Chip capacitor / 0402, 1800P±10%, 50V, X7R, ROHS	pcs	2	C51, C113
137	112-043220-R01	Chip capacitor / 0402, 22P±5%, 50V, C0G, ROHS	pcs	3	C110, C255, C256
138	112-043221-R01	Chip capacitor / 0402, 220P±5%, 50V, C0G, ROHS	pcs	1	C295
139	112-043222-R01	Chip capacitor / 0402, 2200P±10%, 50V, X7R, ROHS	pcs	1	C262
140	112-043223-R01	Chip capacitor / 0402, 0.022uF±10%, 25V, X7R, ROHS	pcs	7	C179, C185, C243, C245, C317, C318, C386
141	112-043224-R02	Chip capacitor / 0402, 0.22uF±10%, 10V, X7R, ROHS	pcs	1	C280
142	112-043240-R01	Chip capacitor / 0402, 24P±5%, 50V, C0G, ROHS	pcs	1	C227
143	112-0432R0-R01	Chip capacitor / 0402, 2P±0.25P, 50V, C0G, ROHS	pcs	1	C122
144	112-043300-R01	Chip capacitor / 0402, 30P±5%, 50V, C0G, ROHS	pcs	1	C32
145	112-043330-R01	Chip capacitor / 0402, 33P±5%, 50V, C0G, ROHS	pcs	4	C37, C47, C141, C171
146	112-043333-R01	Chip capacitor / 0402, 0.033uF±10%, 16V, X7R, ROHS	pcs	4	C213, C223, C242, C283
147	112-043390-R01	Chip capacitor / 0402, 39P±5%, 50V, C0G, ROHS	pcs	1	C119
148	112-043392-R01	Chip capacitor / 0402, 3900P±10%, 50V, X7R, ROHS	pcs	3	C222, C238, C284
149	112-043393-R01	Chip capacitor / 0402, 0.039uF±10%, 10V, X7R, ROHS	pcs	2	C252, C299
150	112-0433R0-R01	Chip capacitor / 0402, 3P±0.25P, 50V, C0G, ROHS	pcs	2	C90, C131
151	112-043470-R01	Chip capacitor / 0402, 47P±5%, 50V, C0G, ROHS	pcs	4	C4, C118, C293, C904
152	112-043471-R01	Chip capacitor / 0402, 470P±10%, 50V, X7R, ROHS	pcs	45	C22, C24, C26, C28, C31, C36, C43, C45, C48, C49, C52, C53, C54, C55, C56, C58, C59, C60, C61, C71, C84, C86, C102, C108, C125, C152, C154, C163, C220, C237, C267, C269, C270, C274, C277, C286, C287, C290, C291, C297, C305, C315, C316, C502, C969
153	112-043472-R01	Chip capacitor / 0402, 4700P±10%, 25V, X7R, ROHS	pcs	1	C285
154	112-043473-R01	Chip capacitor / 0402, 0.047uF±10%, 16V, X7R, ROHS	pcs	1	C301
155	112-0434R0-R01	Chip capacitor / 0402, 4P±0.25P, 50V, C0G, ROHS	pcs	4	C132, C218, C228, C654
156	112-0434R7-R01	Chip capacitor / 0402, 4.5P/4.7P±0.25P, 50V, C0G, ROHS	pcs	4	C126, C216, C217, C219
157	112-043560-R01	Chip capacitor / 0402, 56P±5%, 50V, C0G, ROHS	pcs	2	C200, C224
158	112-043680-R01	Chip capacitor / 0402, 68P±5%, 50V, C0G, ROHS	pcs	1	C945
159	112-043681-R01	Chip capacitor / 0402, 680P±10%, 16V, X7R, ROHS	pcs	3	C57, C258, C260
160	112-043683-R01	Chip capacitor / 0402, 0.068uF±10%, 16V, X7R, ROHS	pcs	4	C247, C259, C176, 177
161	112-0436R0-R01	Chip capacitor / 0402, 6P±0.5P, 50V, C0G, ROHS	pcs	2	C653, C657
162	112-043820-R01	Chip capacitor / 0402, 82P±5%, 50V, C0G, ROHS	pcs	1	C214
163	112-0438R0-R01	Chip capacitor / 0402, 8P±0.5P, 50V, C0G, ROHS	pcs	2	C229, C655
164	112-0439R0-R01	Chip capacitor / 0402, 9P±0.5P, 50V, C0G, ROHS	pcs	1	C656
165	112-043R50-R01	Chip capacitor / 0402, 0.5P±0.1P, 50V, C0G, ROHS	pcs	1	C120
166	112-063101-R01	Chip capacitor / 0603, 100P±5%, 50V, C0G, ROHS	pcs	2	C5, C93
167	112-063102-R01	Chip capacitor / 0603, 1000P±10%, 50V, X7R, ROHS	pcs	2	C27, C139
168	112-063104-R01	Chip capacitor / 0603, 0.1uF±10%, 50V, X7R, ROHS	pcs	1	C193,

169	112-063110-R01	Chip capacitor / 0603, 11P±5%, 50V, C0G, ROHS	pcs	4	C2, C62, C63, L35
170	112-063130-R01	Chip capacitor / 0603, 13P±5%, 50V, C0G, ROHS	pcs	1	C133
171	112-063150-R01	Chip capacitor / 0603, 15P±5%, 50V, C0G, ROHS	pcs	1	C129
172	112-063160-R01	Chip capacitor / 0603, 16P±5%, 50V, C0G, ROHS	pcs	1	C3
173	112-063220-R01	Chip capacitor / 0603, 22P±5%, 50V, C0G, ROHS	pcs	3	C117, C135, C195
174	112-063240-R01	Chip capacitor / 0603, 24P±5%, 50V, C0G, ROHS	pcs	1	C78
175	112-063270-R01	Chip capacitor / 0603, 27P±5%, 50V, C0G, ROHS	pcs	4	C65, C81, C142, C650
176	112-063300-R01	Chip capacitor / 0603, 30P±5%, 50V, C0G, ROHS	pcs	1	C144
177	112-0634R7-R01	Chip capacitor / 0603, 4.5P/4.7P±0.25P, 50V, C0G, ROHS	pcs	1	C88
178	112-063560-R01	Chip capacitor / 0603, 56P±5%, 50V, C0G, ROHS	pcs	1	C194
179	112-0635R0-R01	Chip capacitor / 0603, 5P±0.25P, 50V, C0G, ROHS	pcs	2	C94, C98
180	112-0637R0-R01	Chip capacitor / 0603, 7P±0.5P, 50V, C0G, ROHS	pcs	2	C121, C137
181	112-063820-R01	Chip capacitor / 0603, 82P±5%, 50V, C0G, ROHS	pcs	1	C91
182	112-063R50-R01	Chip capacitor / 0603, 0.5P±0.1P, 50V, C0G, ROHS	pcs	1	C236
183	112-063R75-R01	Chip capacitor / 0603, 0.75P±0.25P, 50V, C0G, ROHS	pcs	1	C115
184	112-072105-R01	Chip Ta capacitor / TP Model, SIZE P, 1uF±20%, 10V, ROHS	pcs	1	C33
185	112-072106-R01	Chip Ta capacitor / TP Model, SIZE P, 10uF±20%, 6.3V, ROHS	pcs	3	C165, C191, C198,
186	112-072106-R02	Chip Ta capacitor / TP Model, SIZE P, 10uF±20%, 10V, ROHS	pcs	1	C199
187	112-072225-R01	Chip Ta capacitor / TP Model, SIZE P, 2.2uF±20%, 10V, ROHS	pcs	2	C140, C246
188	112-072475-R01	Chip Ta capacitor / TP Model, SIZE P, 4.7uF±20%, 10V, ROHS	pcs	7	C201, C202, C207, C273, C292, C298, C308
189	112-073104-R01	Chip capacitor / 0805, 0.1uF±10%, 50V, X7R, ROHS	pcs	2	C205, C204
190	112-073105-R01	Chip capacitor / 0805, 1uF+80%~-20%, 16V, Y5V, ROHS	pcs	1	C306
191	112-073225-R01	Chip capacitor / 0805, 2.2uF+80%~-20%, 10V, Y5V, ROHS	pcs	1	C234
192	112-073475-R01	Chip capacitor / 0805, 4.7uF±10%, 6.3V, X7R, ROHS	pcs	1	C209
193	112-102106-R02	Chip Ta capacitor / TS Model, SIZE A, 10uF±20%, 10V, ROHS	pcs	3	C197, C203, C210
194	112-102156-R01	Chip Ta capacitor / TS Model, SIZE A, 15uF±20%, 6.3V, ROHS	pcs	1	C208
195	112-102475-R02	Chip Ta capacitor / TS Model, SIZE A, 4.7uF±20%, 16V, ROHS	pcs	3	C46, C240, C266
196	112-172107-R02	Chip Ta capacitor / TS Model, SIZE C, 100uF±20%, 10V, ROHS	pcs	1	C401
197	113-010100-R01	Chip trimming capacitor / TZV2Z100A110, 3~10p±100, ROHS	pcs	2	C180, C181
198	114-06E330-R01	Chip Wire inductor/ C1608CB-33NJ, green, ceramic core33NH±5%, 0603, ROHS	pcs	1	L120
199	114-06E331-R02	Chip inductor / MLF1608R33K, 330nH±10%, 0603, ROHS	pcs	1	L59
200	114-06E470-R01	Chip Wire inductor/ C1608CB-47NJ, green, ceramic core47NH±5%, 0603, ROHS	pcs	1	L121
201	114-06E560-R01	Chip Wire inductor/ C1608CB-56NJ, ceramic core56nH±5%, 0603, ROHS	pcs	1	L13
202	114-06G101-R01	Chip inductor / MLF1608DR10K, 100nH±10%, 0603, ROHS	pcs	1	L12
203	114-06G101-R03	Chip inductor / MLG1608BR10J, 100nH±5%, 0603, ROHS	pcs	2	L32, L33
204	114-06G151-R01	Chip inductor / MLF1608DR15K, 150nH±10%, 0603, ROHS	pcs	1	L11
205	114-06G270-R01	Chip inductor / MLG1608B27NJ, 27nH±5%, 0603, ROHS	pcs	2	L16, L23
206	114-06G561-R01	Chip inductor / MLF1608DR56K, 560nH±10%, 0603, ROHS	pcs	1	L124

207	114-06G682-R01	Chip inductor / MLF1608E6R8K, 6.8uH±10%, 0603, ROHS	pcs	6	L27, L28, L29, L36, L50, L52
208	114-06GR15-R01	Chip inductor / MLG1608BR15J, 150nH±5%, 0603, ROHS	pcs	1	L53
209	114-07E220-R01	Chip Wire inductor/ C2012C-22NJ,22nH±5%,0805,ROHS	pcs	1	L30
210	114-07E330-R01	Chip Wire inductor/ C2012C-33NJ, 33nH±5%, 0805, ROHS	pcs	1	L51
211	114-07E470-R01	Chip Wire inductor/ C2012C-47NJ, 47nH±5%, 0805, ROHS	pcs	1	L15
212	114-07E560-R01	Chip Wire inductor/ LQN21A56NJ04, 56nH±5%, 0805, ROHS	pcs	3	L5, L8, L10
213	114-08E102-R02	Chip Wire inductor/ 2520, 1uH±5%, ceramic core(FHW1008UC1R0J), ROHS	pcs	1	L24
214	114-08E103-R01	Chip inductor / FSLM2520-100J, 10uH±5%, 1008, ROHS	pcs	1	L45
215	114-08E222-R02	Chip inductor / FSLM2520-2R2K, 2.2uH±10%, 1008, ROHS	pcs	1	L26
216	114-08E331-R01	Chip inductor / FSLM2520-R33K, 330nH±10%, 1008, ROHS	pcs	1	L55
217	114-08E561-R01	Chip inductor / FSLM2520-R56K, 560nH±10%, 1008, ROHS	pcs	1	L56
218	115-1R07R0-R01	Chip air-cored coil/ 0.3*1.0*7TR, negative, high pin, ROHS	pcs	1	L4
219	115-1R53R0-R04	Chip air-cored coil/ 0.4*1.5*3TL, negative, high pin, ROHS	pcs	2	L80, L83
220	115-1R55R0-R02	Chip air-cored coil/ 0.3*1.5*5TR, negative, high pin, ROHS	pcs	2	L3, L81
221	115-1R56R0-R04	Chip air-cored coil/ 0.3*1.5*6TR, negative, high pin, ROHS	pcs	2	L2, L14
222	115-1R58R0-R03	Chip air-cored coil/ 0.4*1.5*8TR, negative, high pin, ROHS	pcs	1	L25
223	117-000000-R04	Chip bead / EMI,FILTER, SMT, BLM11A221S, 0603, ROHS	pcs	14	L19, L20, L39, L40, L41, L42, L44, L46, L47, L48, L60, L61, L65, L66
224	117-000000-R05	Chip bead / EMI, FILTER, SMT, BLM21P300S, 0805, ROHS	pcs	6	L22, L37, L38, L43, L58, L67
225	117-000000-R08	Chip bead / EMI,FILTER, SMT, BLM11A601S, 0603, ROHS	pcs	2	L409, L419
226	119-060104-R01	Hot quick resistor / NTH5G16P42B104K07TH, 100K, 0603, ROHS	pcs	1	R85
227	121-200000-R01	MIC socket / B6027AP402-88,ROHS	pcs	1	MIC1
228	122-116M80-R02	Chip transistor / TVCGDCSANF, 16.8MHz±2.5PPm, ROHS	pcs	1	X4
229	122-17M300-R01	Chip crystal resonator / CSTCR7M30G53-R0, 7.3M, ROHS	pcs	1	X2
230	124-050000-R15	2.5mm Earphone socket / MOTOROLA, PJ-D2008B, DC30V0.5A, ROHS	pcs	1	J2
231	124-050000-R16	3.5mm MIC socket / MOTOROLA, PJ-D3027, DC30V0.5A, ROHS	pcs	1	J1
232	603-0W558A-R01	Voice recorder IC / W588A080, binding, ROHS	pcs	1	IC15

Appendix 3 Structural Parts List
Front Cabinet ASM.

No.	Part No.	Description	PCS	No.	Part No.	Description	PCS
1	201-004208-R01	Front Cabinet	1	6	204-003208-R02	Dust-proof Net for Speaker	1
2	201-004208-R09	Light Guide	1	7	121-100000-R20	Speaker	1
3	201-004208-R08	Earphone Jack Cover	1	8	202-004208-R02	Rubber PTT Key	1
4	301-25080J-R01	Screw M2.5*8.0	1	9	201-004208-R04	PTT Key	1
5	204-004208-R02	Dust-proof Net for MIC	1	10	202-004208-R03	MIC Rubber Waterproof	1

AI Chassis ASM.

No.	Part No.	Description	PCS	No.	Part No.	Description	PCS
1	203-004208-R01	AI Chassis	1	5	301-20040G-R01	Screw M2.0*4.0	2
2	203-000558-007	Antenna Socket	1	6	202-003208-R07	Heat Exchange Silicone Rubber Washer	1
3	202-007200-R06	POGO Pin Waterproof	1	7	204-007200-R03	Sponge for POGO	1
4	202-004208-R01	Main Waterproof	1				

Channel Selector Knob ASM.

No.	Part No.	Description	PCS	No.	Part No.	Description	PCS
1	201-004208-R07	Channel Selector Knob	1	2	203-003208-R09	Circlip	1

Volume Knob ASM.

No.	Part No.	Description	PCS	No.	Part No.	Description	PCS
1	201-004208-R06	Volume Knob	1	2	203-003208-R09	Circlip	1

Coping ASM.

No.	Part No.	Description	PCS	No.	Part No.	Description	PCS
1	201-004208-R02	Coping	1	3	201-004208-R03	Battery Latch	1
2	301-25050J-R01	Screw M2.5*5.0	2	4	203-000558-R05	Spring for Battery Latch	1

NO.	PART NUMBER	DESCRIPTION	PCS
1	121-100000-R20	SPEAKER	1
2	201-004208-R01A	FRONT CABINET	1
3	201-004208-R02A	COPING	1
4	201-004208-R03A	BATTERY LATCH	1
5	201-004208-R04A	PTT KEY	1
6	201-004208-R05A	POGO PIN SOCKET	1
7	201-004208-R06A	VOLUME KNOB	1
8	201-004208-R07A	CHANNEL SELECTOR KNOB	1
9	201-004208-R08A	EARPHONE JACK COVER	1
10	201-004208-R09A	LIGHT GUIDE	1
11	202-003208-R07	HEAT EXCHANGE SILICONE RUBBER WASHER	1
12	202-004208-R01A	MAIN WATERPROOF	1
13	202-004208-R02A	RUBBER PTT KEY	1
14	202-004208-R03A	MIC RUBBER WATERPROOF	1
15	202-007200-R06	POGO PIN WATERPROOF	1
16	203-000558-R02	NUT FOR KNOB	2
17	203-000558-R05B	SPRING FOR BATTERY LATCH	1
18	203-000558-R07	ANTENNA SOCKET	1
19	203-003208-R09	CIRCLIP	2
20	203-004208-R01A	AL CHASSIS	1
21	203-004208-R02A	EARPHONE PLATE	1
22	203-007200-R07B	NUT FOR ANTENNA SOCKET	1
23	204-003208-R02	DUST-PROOF NET FOR SPEAKER	1
24	204-004208-R02A	DUST-PROOF NET FOR MIC	1
25	204-005583-R01	SPONGE 4MM	2
26	204-006500-R02	MIC SOCKET GUARDIAN	1
27	204-007200-R03	SPONGE FOR POGO PIN	1
28	301-20040G-R01	SCREW M2.0*4.0	12
29	301-20080G-R02	SCREW M2.0*8.0	2
30	301-25050J-R01	SCREW M2.5*5.0	2
31	301-25080J-R01	SCREW M2.5*8.0	1

Appendix 4 Accessories








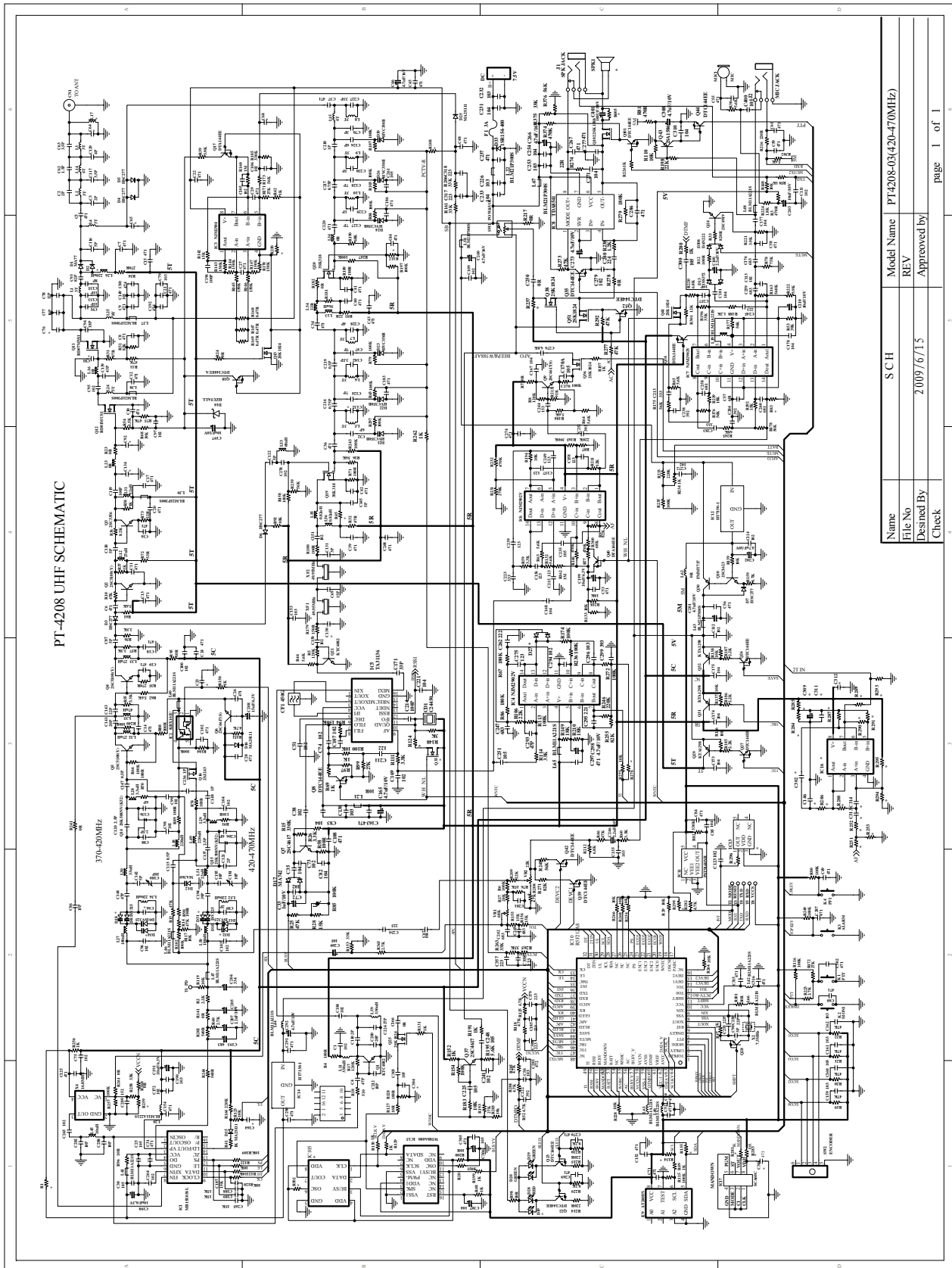
Name	Model	Specifications	External View
Battery	KB-70B	7.4V 1700mAh Li Polymer Battery	
Hand strap	KGS-03		
Earphone	KME-014		
	KME-015		
Charger	KBC-70Q	Fast Charger DC OUT 12V 800mA	
Power adaptor	KTC-50A1/50C1/50E1/50F1		
Antenna	KA stubby antenna		

Figure 2 PT4208 Schematic Circuit Diagram (420-470MHz)



Name	SCH
File No	PT4208-03(420-470MHz)
Desined By	REV
Check	Approved by
	2009/6/15
	page 1 of 1

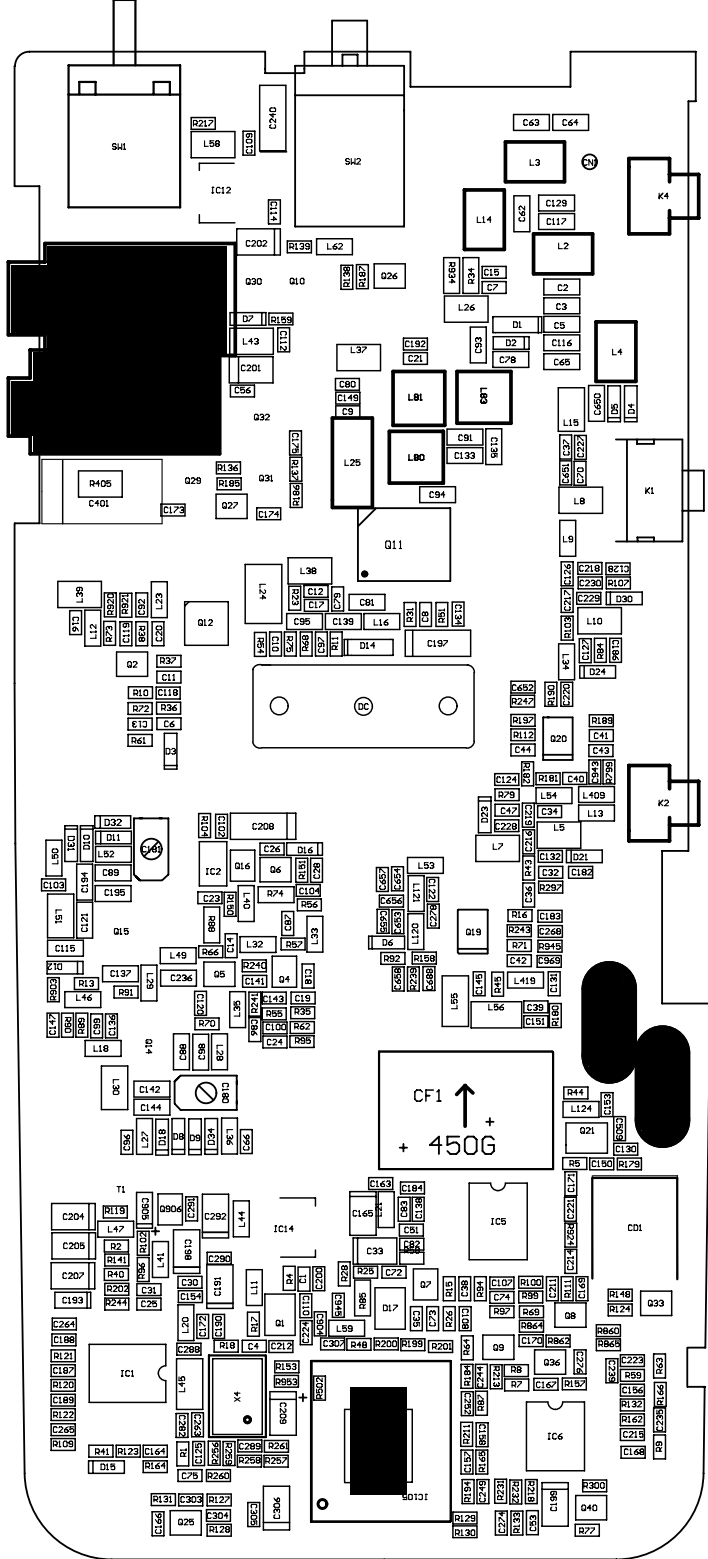


Figure 5 PT4208 Main Board Top Layer Position Value Diagram (420-470MHz)

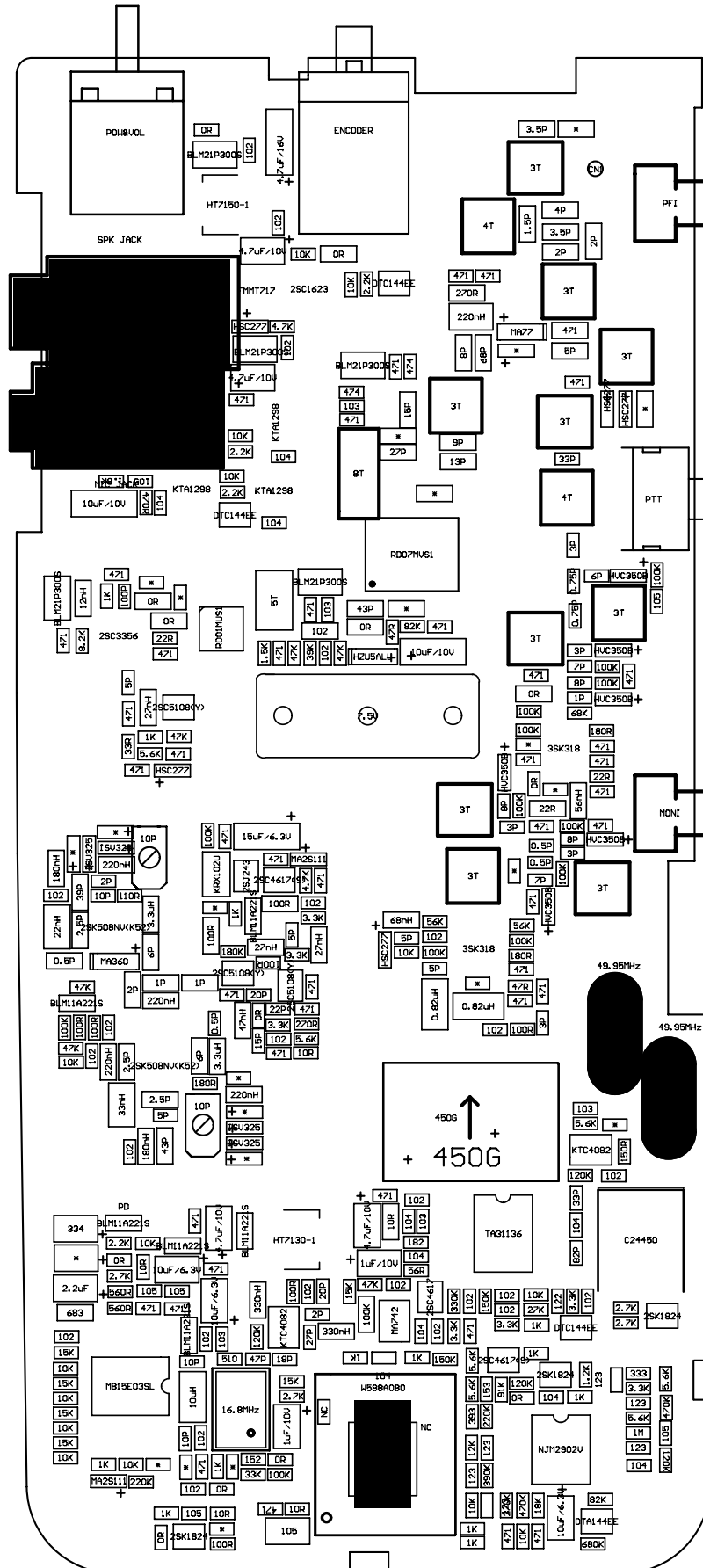


Figure 7 PT4208 Main Board Top Layer Layout (420-470MHz)

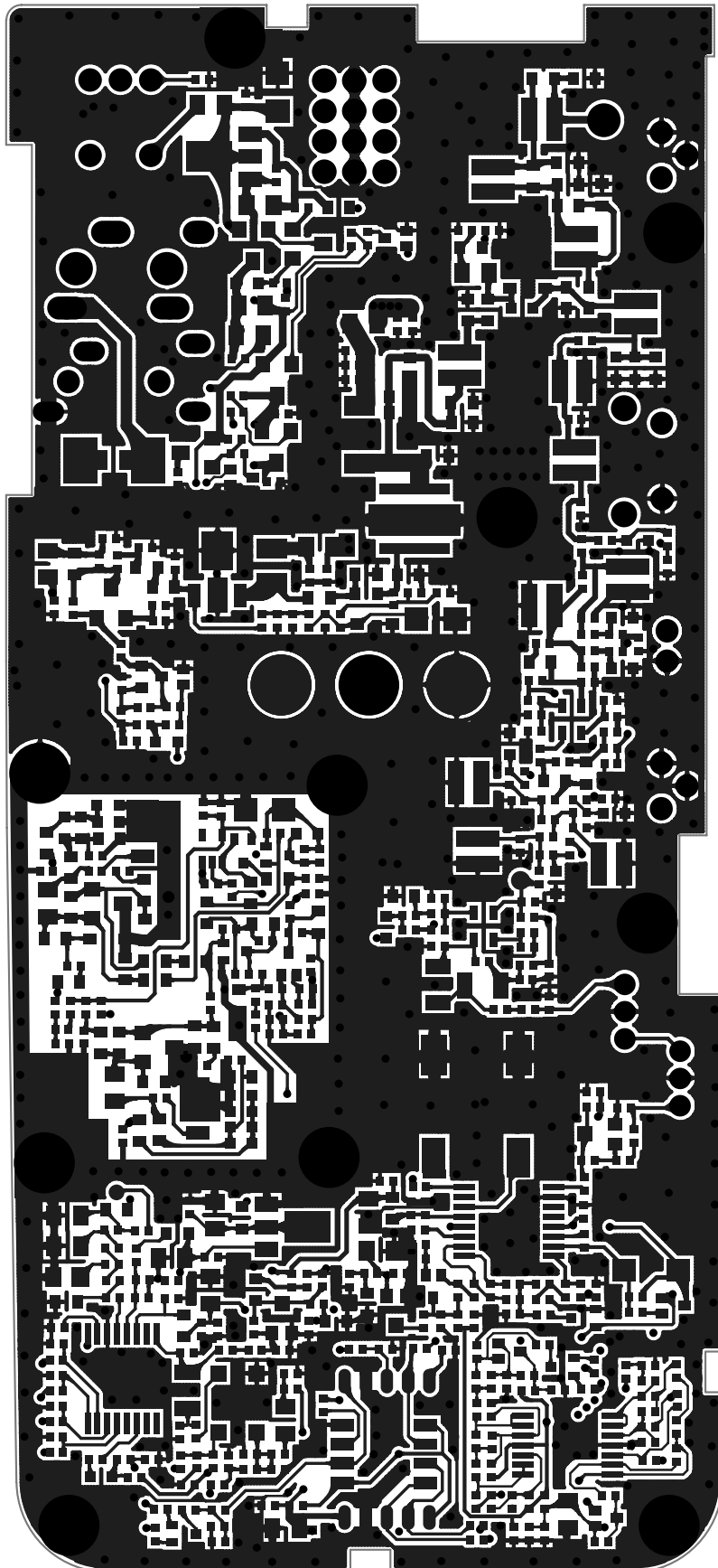


Figure 8 PT4208 Main Board Bottom Layer Layout (420-470MHz)

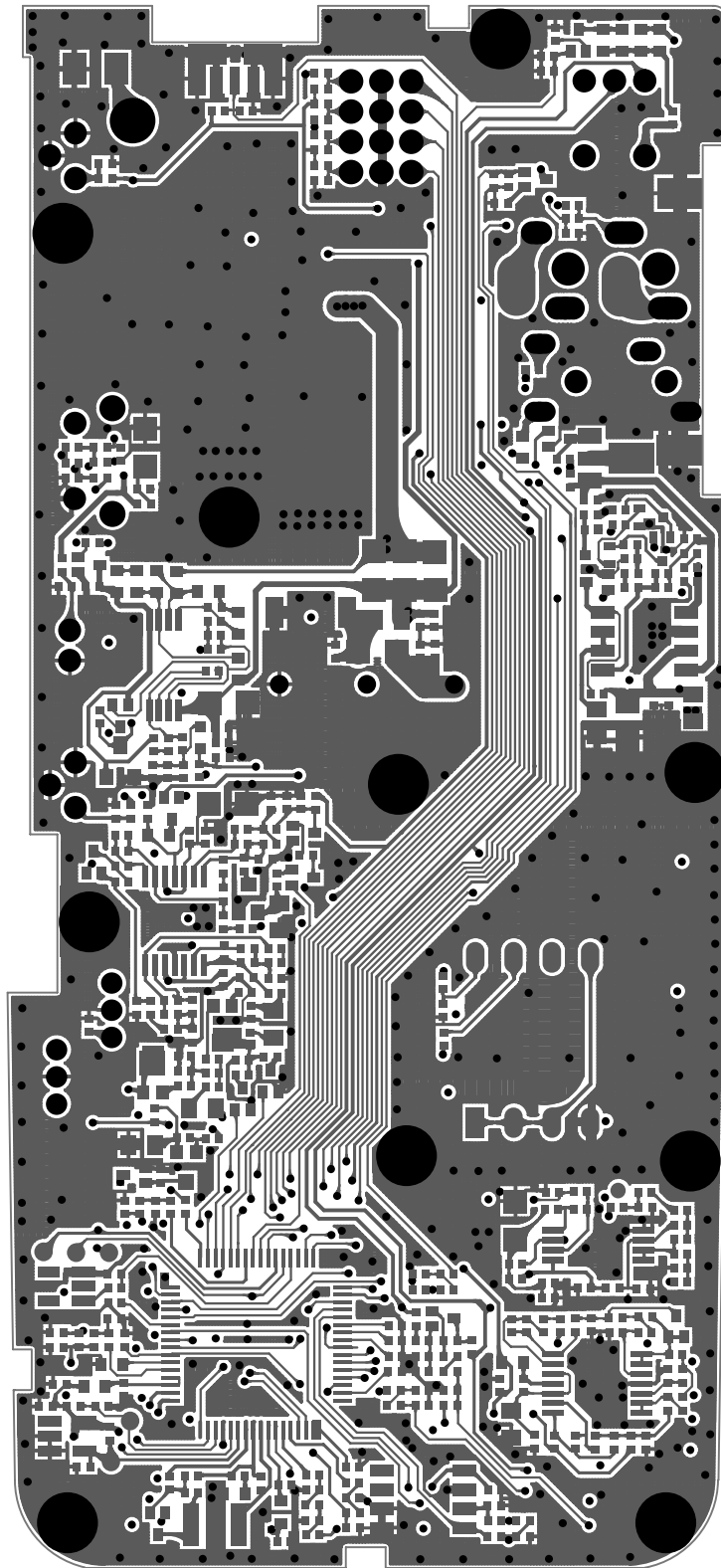
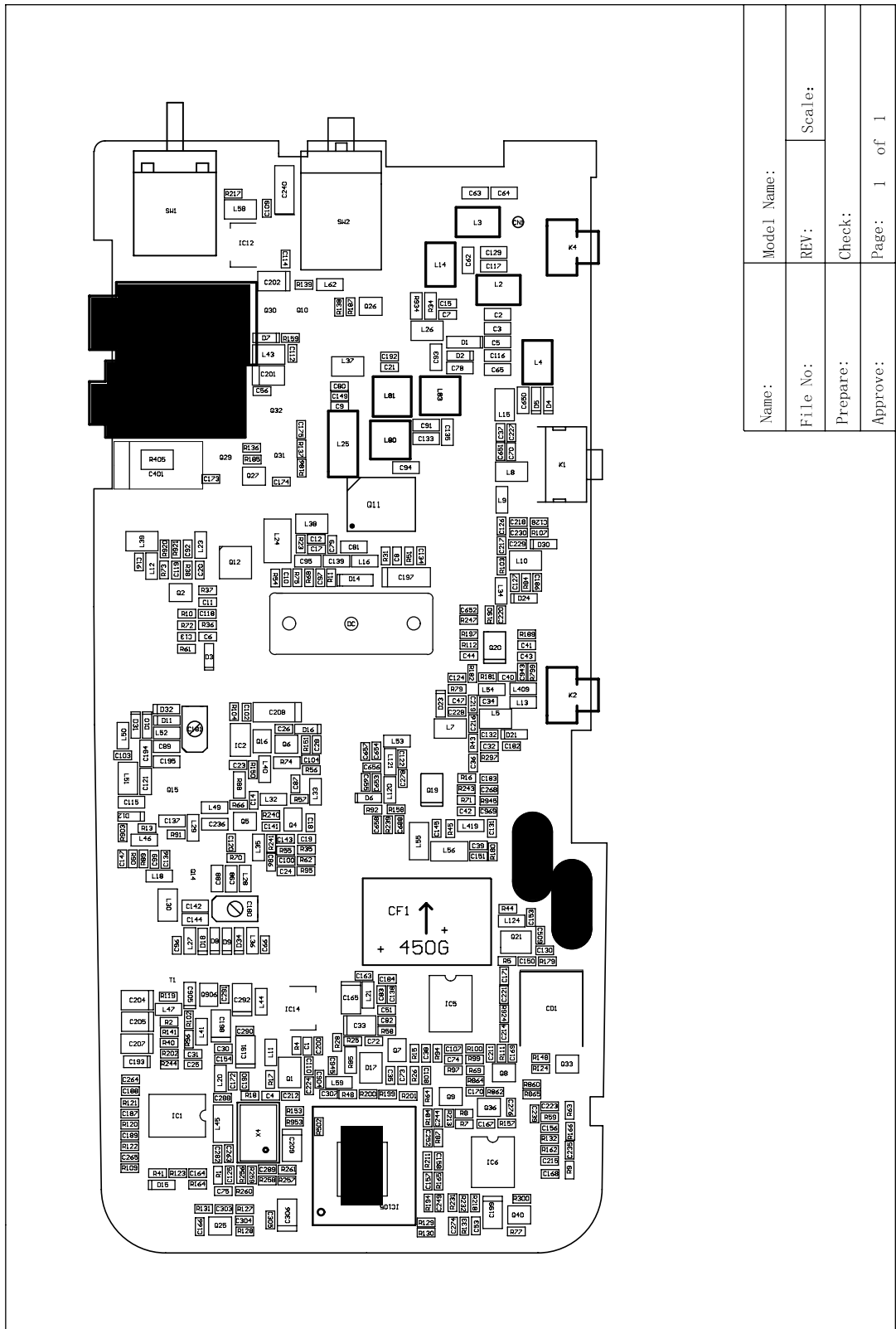


Figure 10 PT4208 Main Board Top Layer Position Mark Diagram (136-174MHz)



Name:	Model Name:
File No:	REV:
Prepare:	Check:
Approve:	Scale:
	Page: 1 of 1

Figure 11 PT4208 Main Board Bottom Layer Position Mark Diagram (136-174MHz)

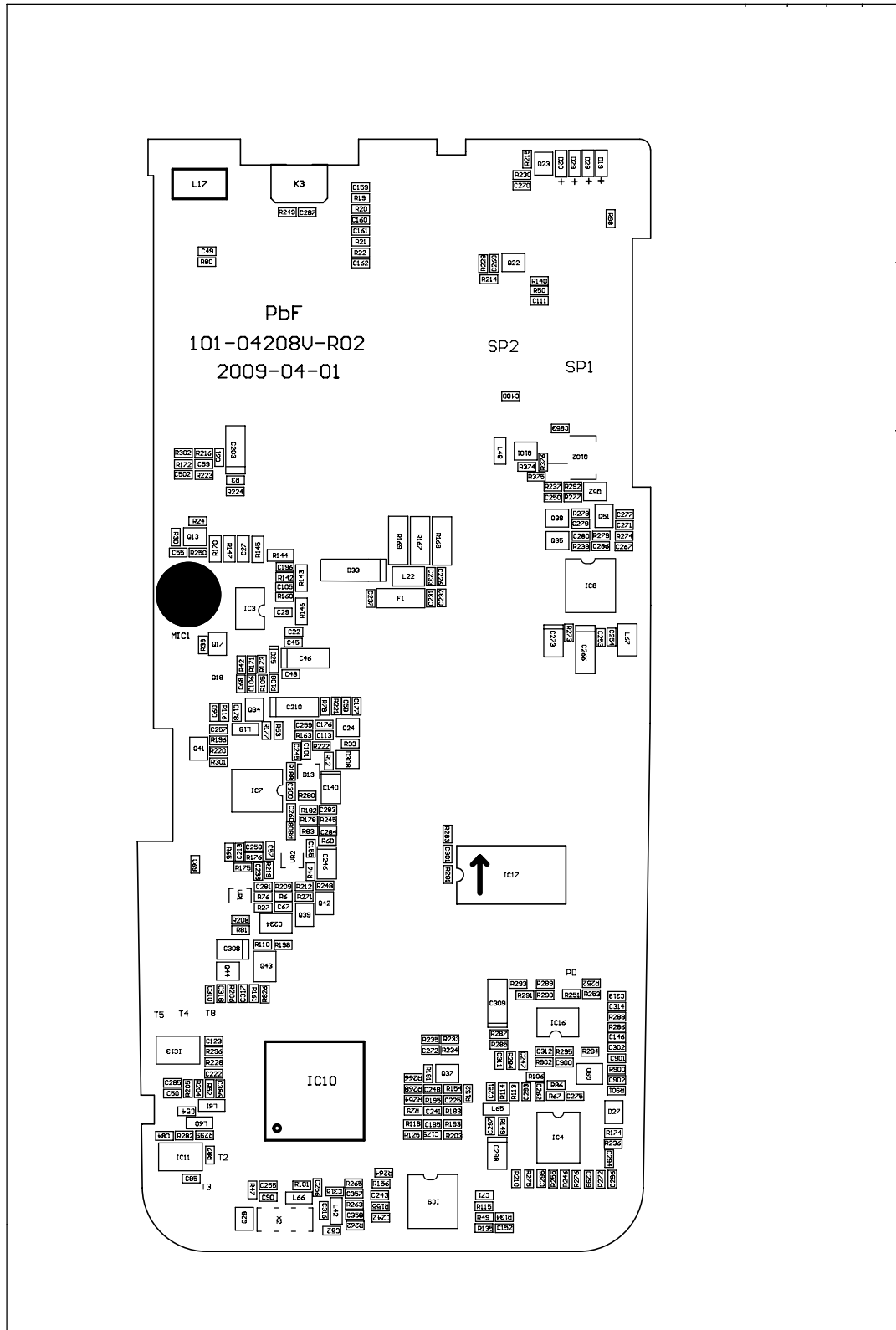


Figure 12 PT4208 Main Board Top Layer Position Value Diagram (136-174MHz)

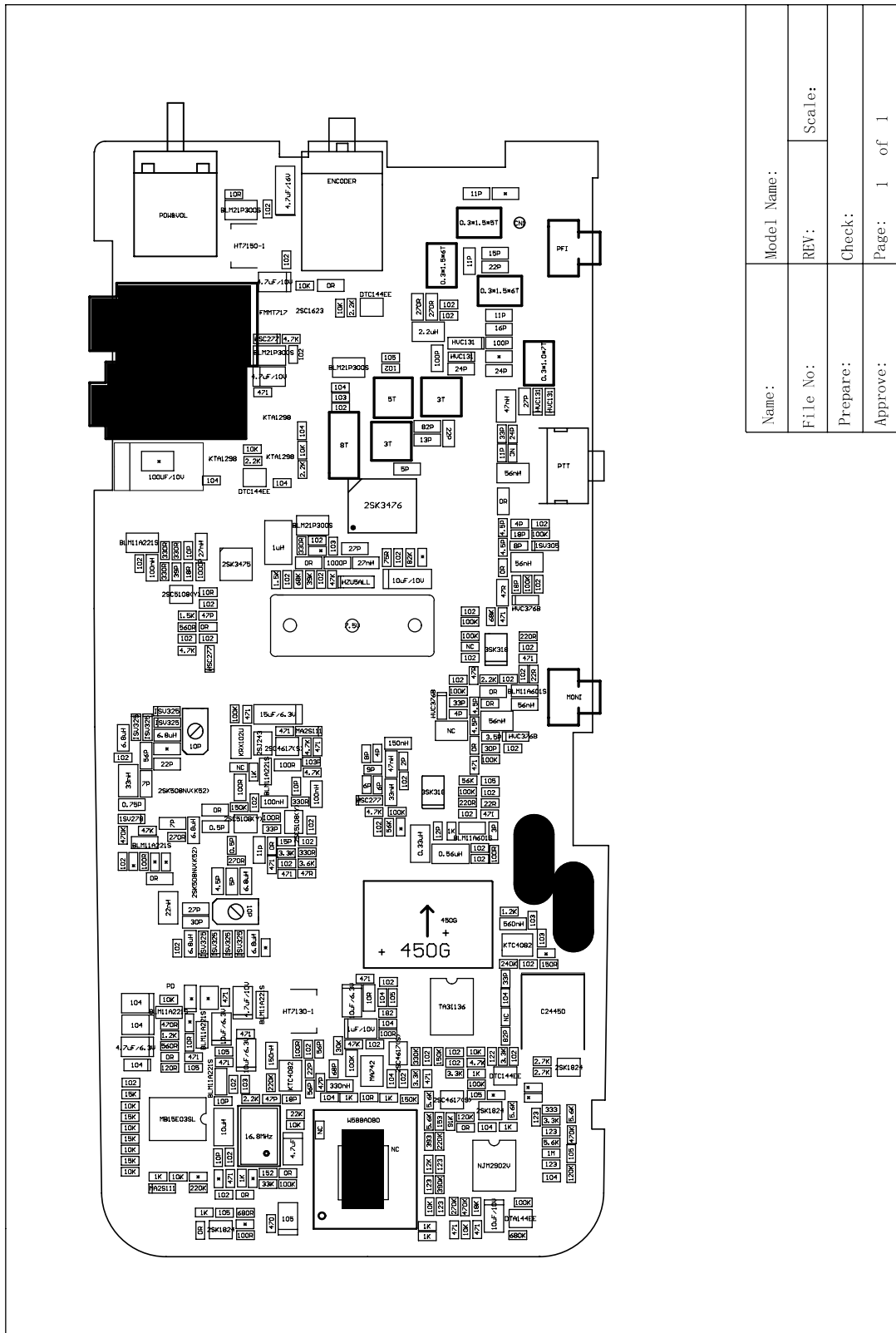


Figure 14 PT4208 Main Board Top Layer Layout (136-174MHz)

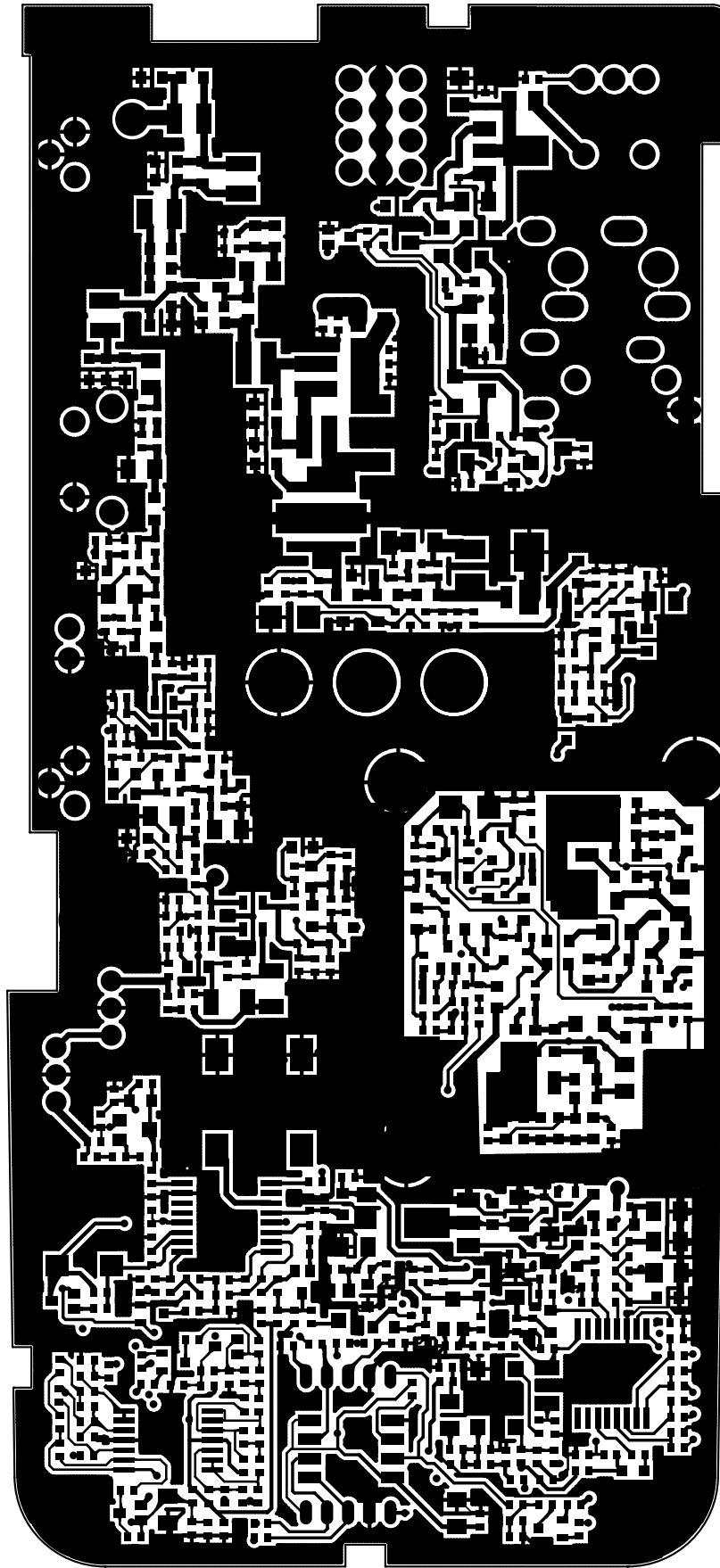


Figure 15 PT4208 Main Board Bottom Layer Layout (136-174MHz)

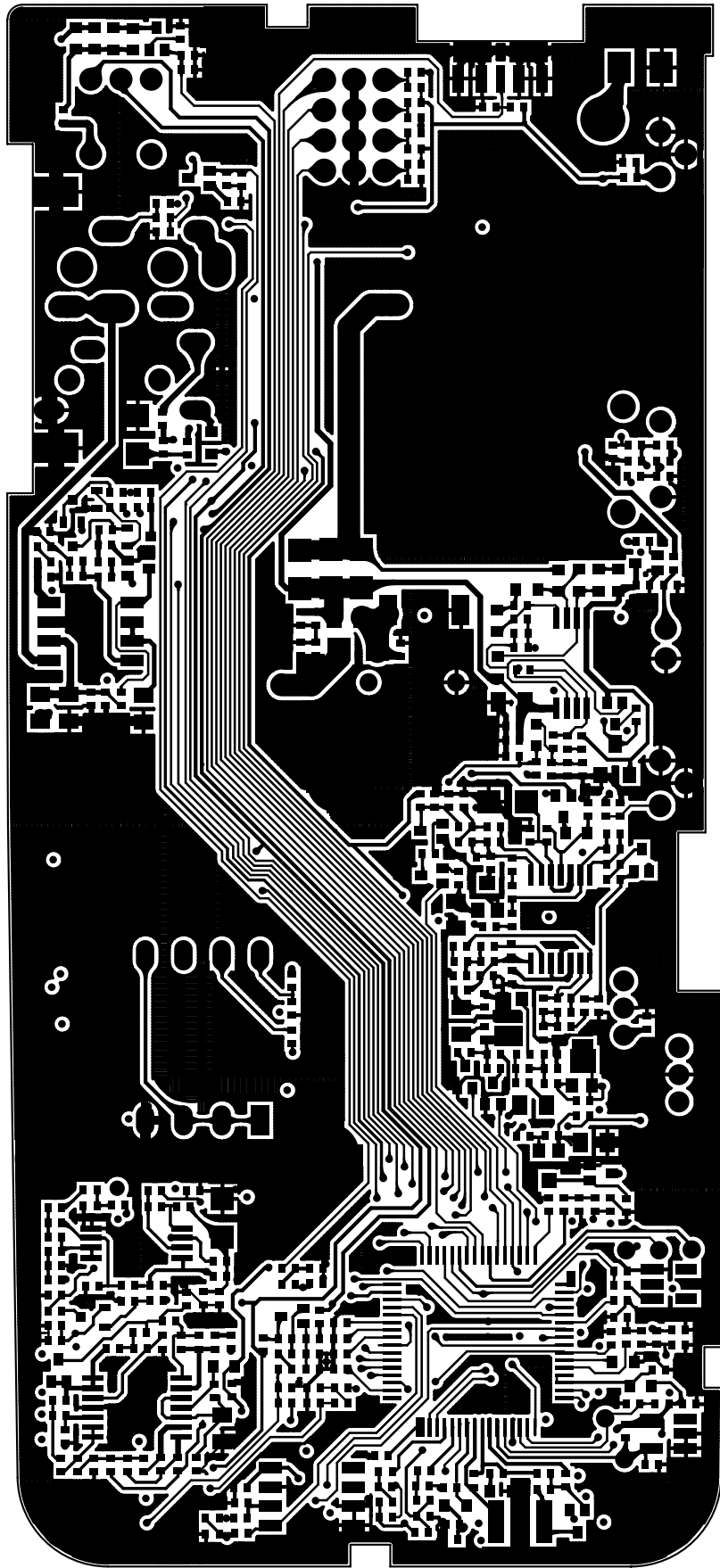


Figure 16 KBC-70C Schematic Circuit Diagram

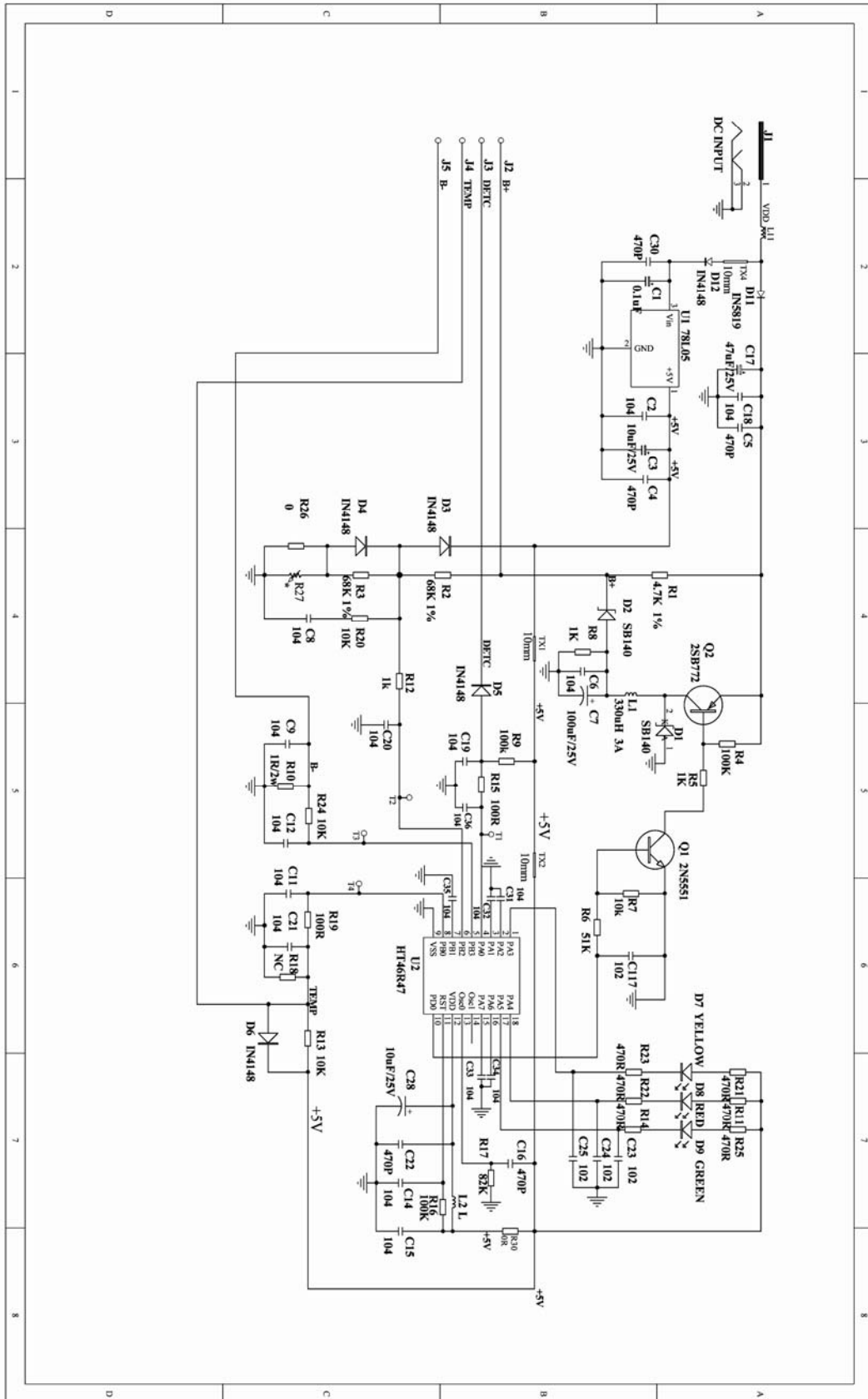


Figure 17 KBC-70C Top Layer Position Value Diagram

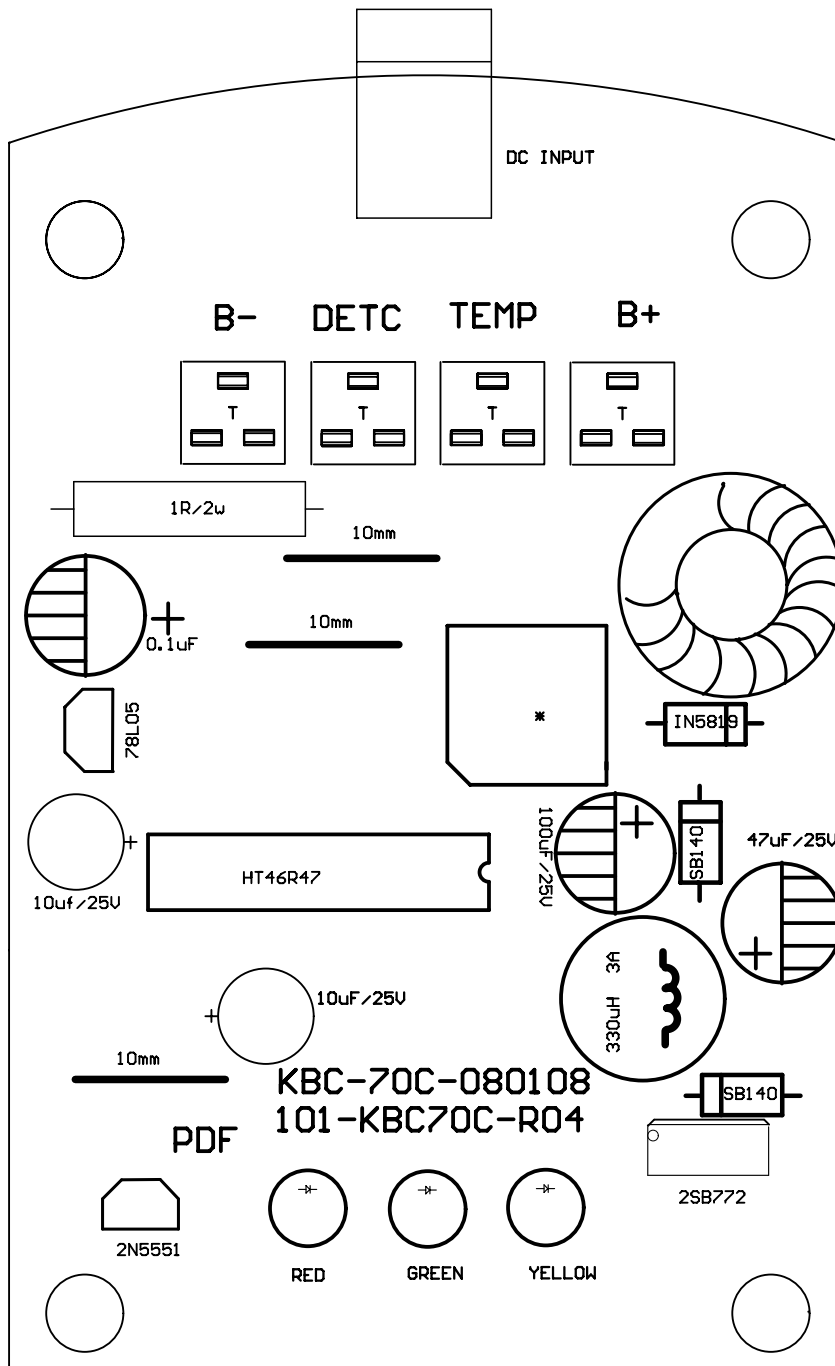


Figure 18 KBC-70C Top Layer Position Mark Diagram

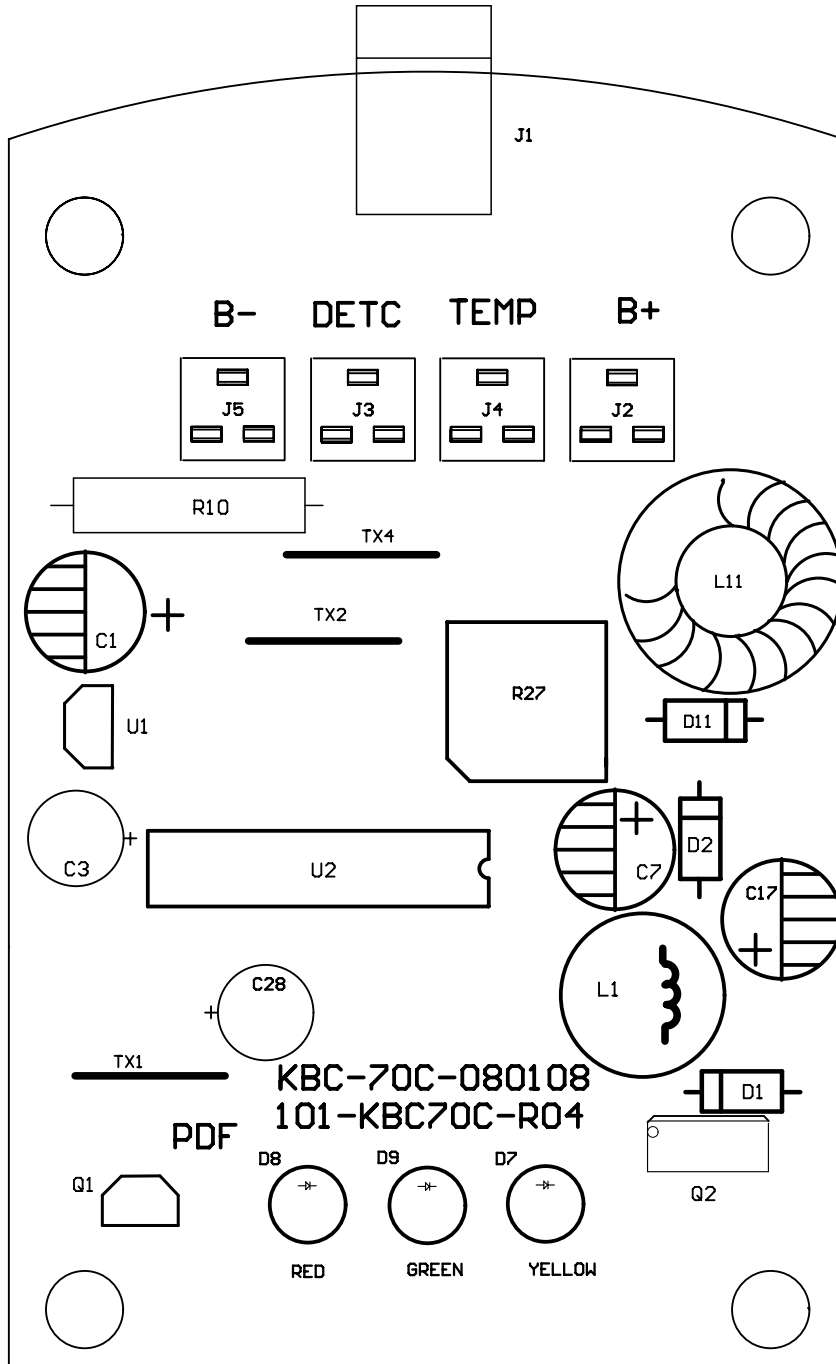


Figure 19 KBC-70C Bottom Layer Position Value Diagram

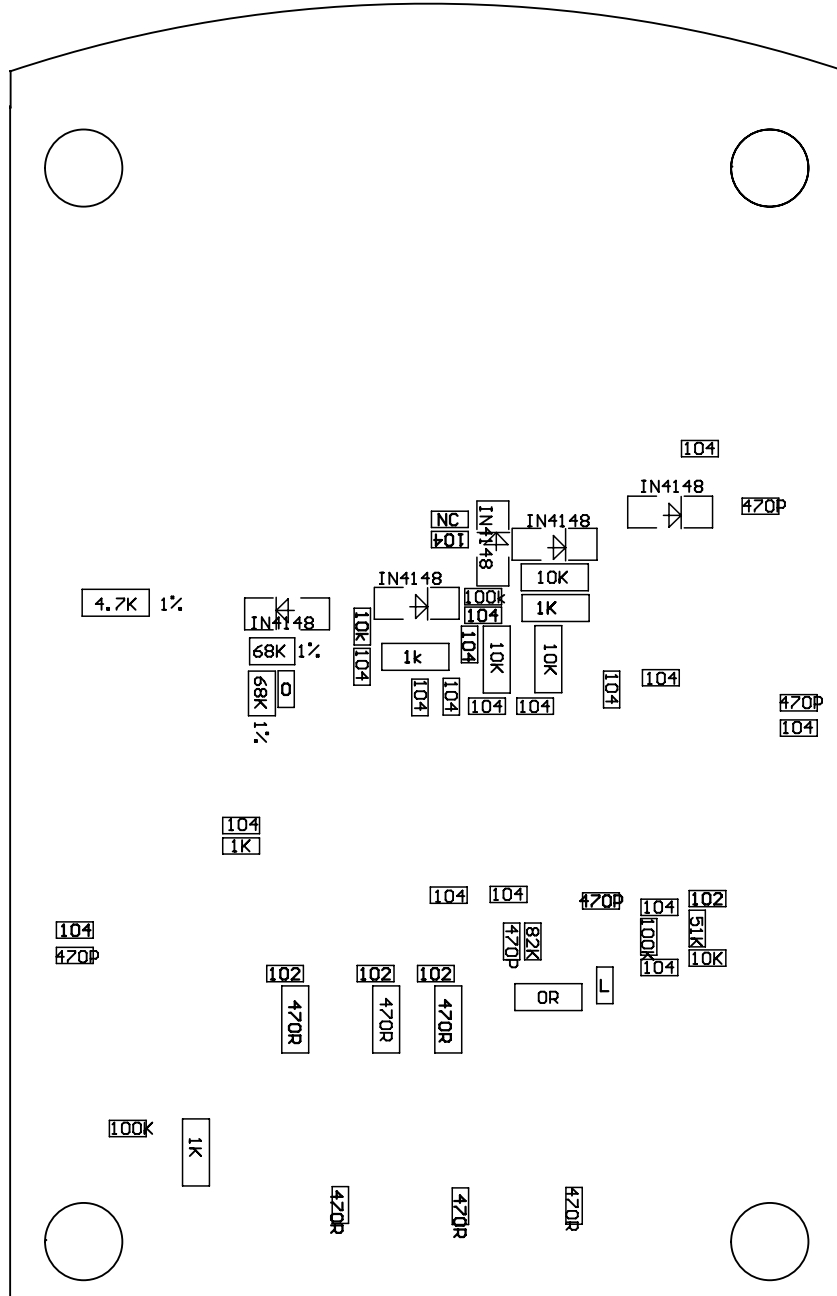


Figure 20 KBC-70C Bottom Layer Position Mark Diagram

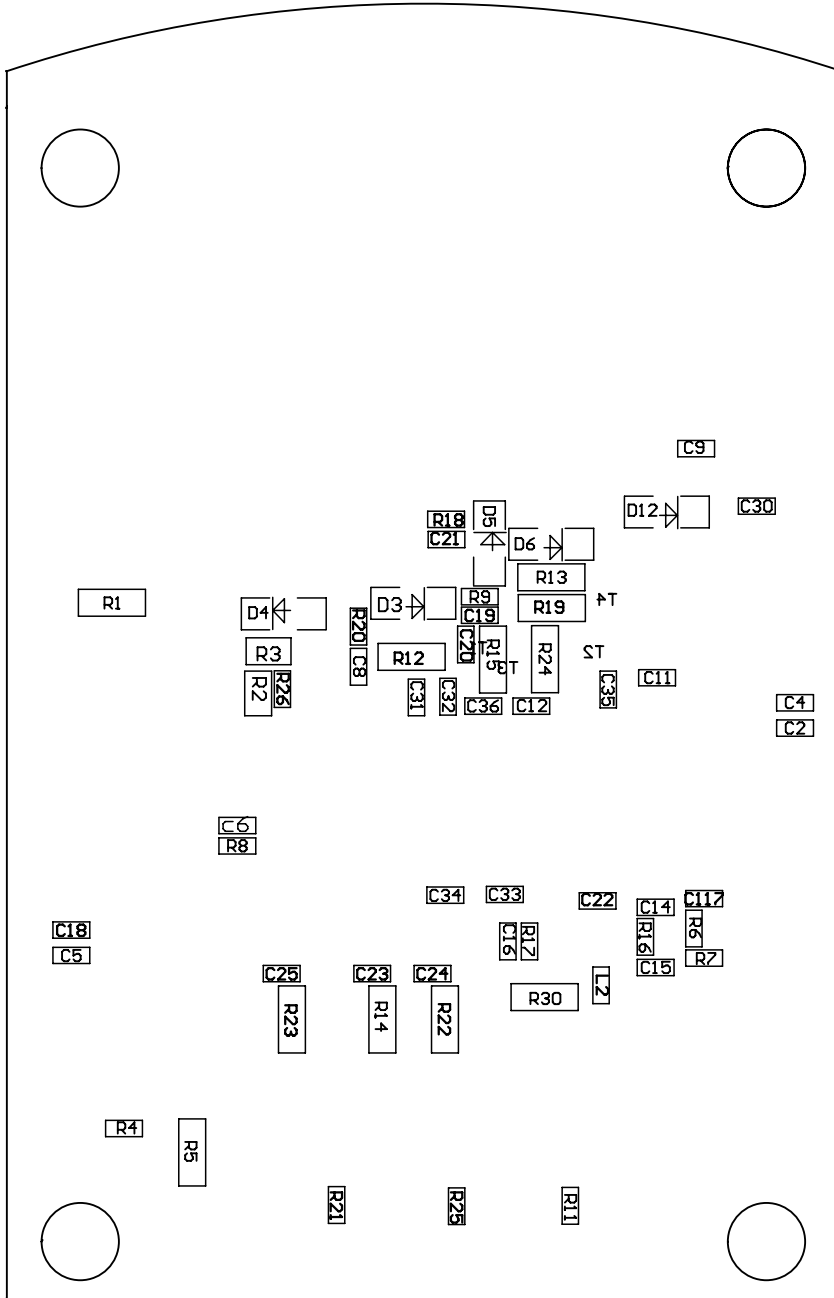


Figure 21 KBC-70C Layout

