

HF TRANSCEIVER **X108G** SERVICE MANUAL



【Important Notes】

- Before disassembling, make sure that the problem comes from inside the transceiver.
 - Be sure to completely cut off the external power before opening case.
 - Do not forcibly remove any parts to avoid any damage.
 - Please use insulated screwdriver to adjust the circuit to avoid short circuit.
 - Do not turn on the radio for a long time if there is any fault.
 - Do not connect the transmit port directly to the test ports of signal generator or network analyzer.
 - Do not keep transmitting in open circuit status for repairing.
 - Read the manual carefully before doing any test.
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VERSION: 1.00.0

Part 1 Technical Specs

Basic specs:

Frequency range: RX: 0.5~30MHz
TX: All ham band

Operate mode: SSB (J3E)
CW (A1A)
AM (A3E)

Min freq. Step: 1Hz

Antenna impedance: 50 Ω

Operating temperature range: -10°C ~ +60°C

Frequency stability: $\pm 0.5\text{ppm}$ @ Power on 5mins, -10°C~+60°C

Operating voltage: 12~14.5V DC

Current parameter: RX 700mA @Max
TX 7.5A @Max

Size: 120*45*180 (mm) [Not including knob, holder etc.]

TX

TX Power: $\geq 15\text{W}$ (@13.8V)

Modulation: SSB Balanced modulation
AM Low level modulation

Spurious suppression: $\geq 40\text{dBc}$

Carrier suppression: $\geq 45\text{dBc}$

Selectivity: SSB 2.2kHz(-6dB)
CW 500Hz(-6dB)

RX

Middle frequency: 10.7MHz

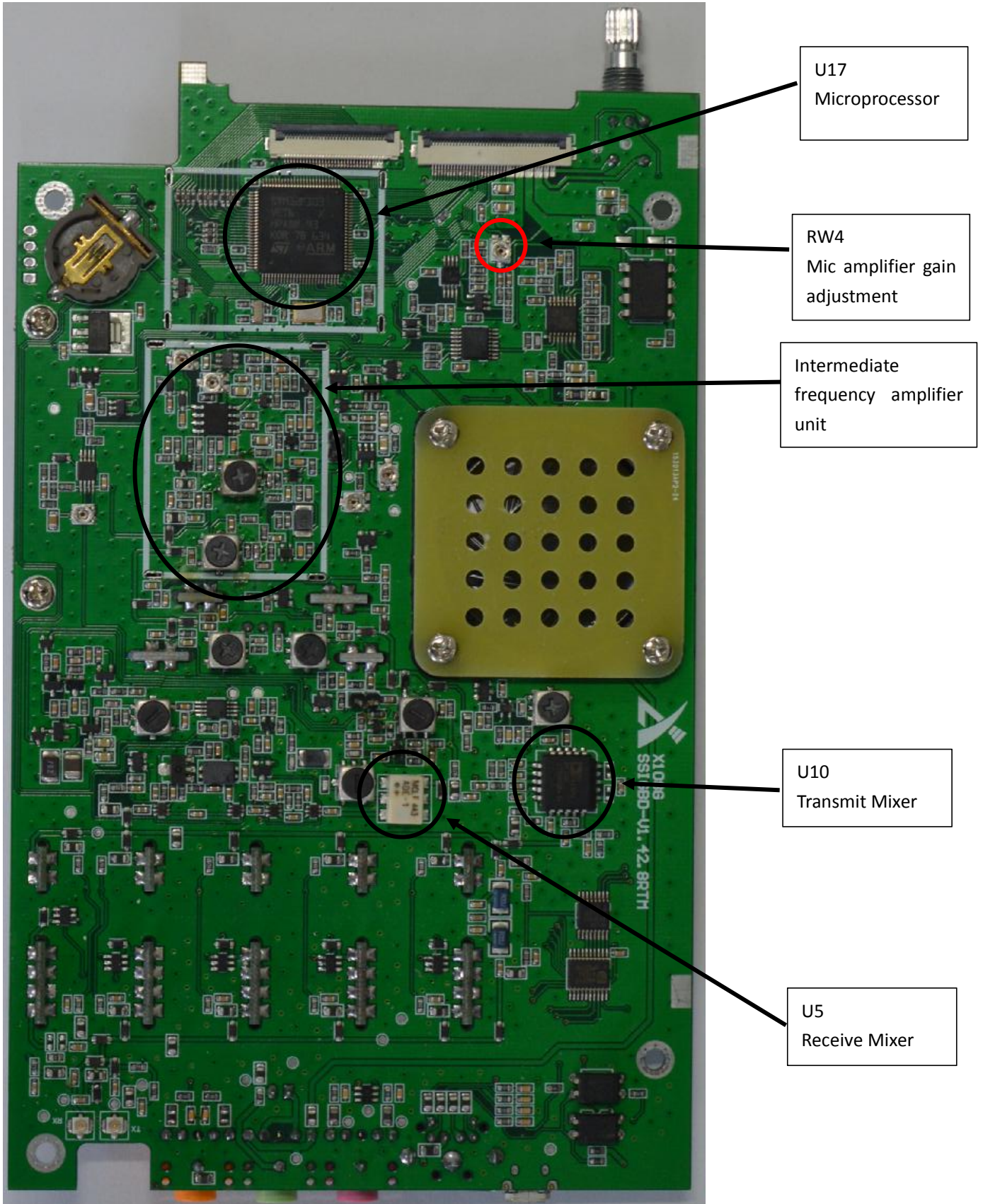
RX sensitivity: 0.5uV @ 12dB SINAD (PRE ON, $\leq 2.0\text{MHz}$)
0.35uV @ 12dB SINAD (PRE ON, $> 2.0\text{MHz}$)

RX Band: 1.8~2.0MHz
3.5~4.0MHz
5.0~5.5MHz
7.0~7.3MHz
10.0~10.2MHz
14.0~14.5MHz
18.0~18.2MHz
21.0~21.6MHz
24.8~25.0MHz
28.0~28.8MHz

Dynamic range: $\geq 90\text{dB}$

Part 2 Inside Circuit

Small signal front panel

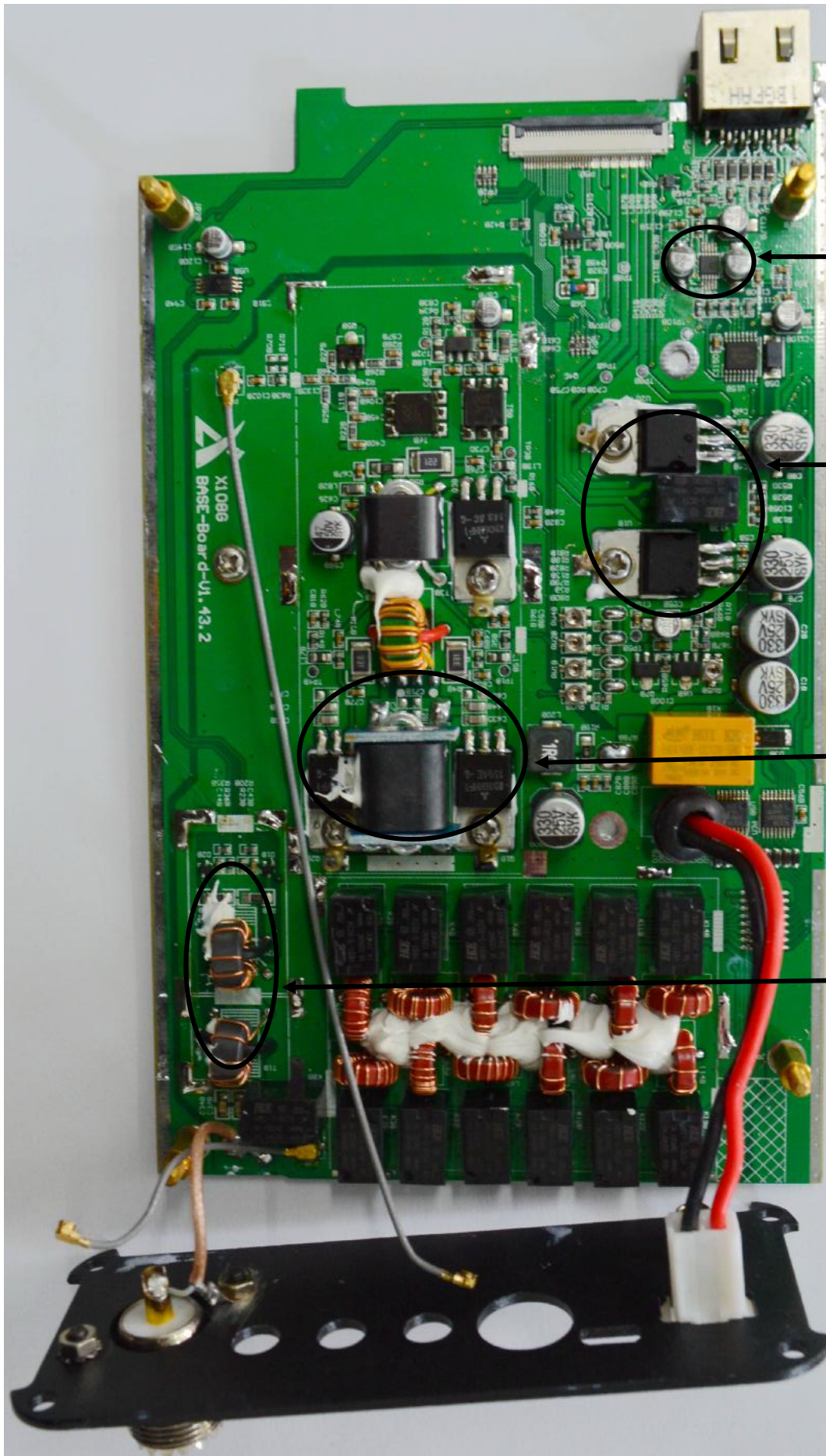


Small signal back panel



Local oscillator module

BPF module



U17B
VC Voice Compressor

Steady voltage
power

Final RF power
amplifier

Power standing
wave detector

Part 3 Circuit principle

3.1 Receiving Circuit

3.1.1 RF front-end circuit

The RF front-end circuit of 0.5--30MH is composed of a Receiving band-pass filter, receiving preamplifier, pre attenuator.

Band-pass filter consists of 5 modules (XGM1--XGM5), it can make 10 amateur bands. U20, U21 are band switching controller, connect the input band switching signal to LPF unit switching relay of power amplifier board.

Preamplifier is composed of Q7 and its periphery circuit. Preattenuator is π Type attenuator, which is composed of R57、R64、R65. U4、U12、U15、U18 are RF switching trigger, to control the RX Signal trend. PRE_EN and ATT_EN are control signals, by these 2 control signals to control the signal to be passthrough mode, amplifier mode, attenuator mode, amplifier+attenuator mode. Q8、Q9 are switching control digital triode.

3.1.2 Receiving mixer

U5 (ADE-1) is receiving mixer, inside is diode balanced mixing structure. The RX receiving signal is mixing 1st LO here, to bring 10.7MHz IF signal.

D15 is LO input switch, it's in forward conduction status when receiving, the LO enters the mixer. D15 is closed when transmitting.

3.1.3 IF PREAMP

After mixing, it brings a receiving 1st IF signal. This signal enters IF preamplifier Q21 via transformer T7 to finish the first IF amplify. This amplified IF signal

outputs to intermediate frequency crystal filter(IFCF) by T5. Q6 is NB control switch which controls the conducting of the Q21.

3.1.4 IFCF sets

The radio is built-in with 3 sets of IFCF, they are SSB - 2.2k (XMD1), CW - 500Hz (XMD2), and AM - 7.5K (XF1). Q1, Q11 and Q12 control the access of this three IFCF respectively.

3.1.5 IF Two stage amplifier circuit

The IF two stage amplifier circuit is composed of Q13 and Q15, the IF signal which be input by T4 makes the final IF amplification here then sent to the automatic gain control unit and the demodulation unit.

The automatic gain control unit is composed of Q4, D1, U1 and its peripheral devices. The automatic gain control voltage is sent to the G2 pole of the two stage IF amplifier respectively to receive automatic gain control. The starting speed is switched by U1 and Q23, and the switching signal is AGC-S.

The automatic gain control voltage outputs S table signal after buffering and amplifying by U2.

3.1.6 Demodulator circuit

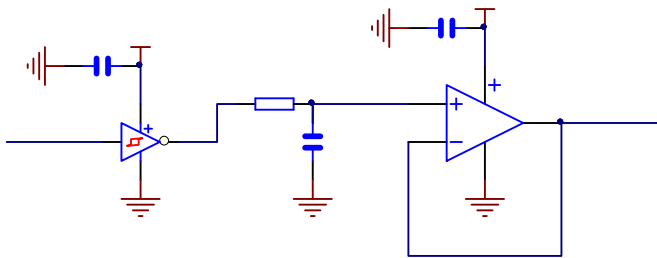
The demodulation of single sideband signal SSB and continuous wave signal CW is accomplished by a product detector which is composed of U6 (SA602). The BFO signal is input through by the 6 pins to the demodulator, and the demodulated audio signal is output by 5 pins. By controlling the frequency of the injected BFO signal, the demodulation of SSB and CW modes can be completed.

SPK port is the external speaker interface, it connects to the audio power amplifier U9.

ACC port is MIDI-DIN type 6 core data interface, which extends the external PTT signal, band voltage, external ALC input, external audio, +9V and GND ports.

AUX interface function is not open yet, the internal connects to the RX/TX port of processor, can be reserved as a backup serial port.

The band voltage generator consists of microprocessor and U25 and U26.



3.4 Power unit

There are 2 groups main power supply for X108G, 9V and 5V, which are generated by U1B (LM2940T-9.0) and U2B (LM7805) on the power amplifier board.

The microprocessor requires 3.3V voltage which is generated by the U19.

The local oscillator requires 3.3V and 1.8V voltages which are generated by their BMP power supply.

Q9B and Q10B generates transmit-receive voltage +9R and +9T.

The power switch is an electronic power switch which is composed of Q6B and Q8B. PWR_SW is the control signal of the power on/off.

Part 4 Debugging

Following the below debugging methods to adjust the parameters of the small signal board and the power amplifier board to resume to default setting.

4.1 Machines

Machine	SPECS	Machine	SPECS
DC power supply	Output voltage: 13.8V	RF spectrum analyzer	Frequency range: 0.1-1000MHz
	Output current: maximum 10A		BW resolution ratio: 10Hz
	It has perfect protection function	Audio analyzer	SINAD analysis function
Audio frequency generator	Output frequency: 100Hz-10kHz	Oscilloscope	Measuring range: 10mV-10V
	Output amplitude: 1mV-1V RMS		Frequency range: DC-100MHz
RF signal generator	Output frequency: 0.1-500MHz	Digital multimeter	Measuring range: 0.01-20V
	Output amplitude: -127dBm-0dBm		3 and a half
Digital ammeter	Measuring range: 0.001-10A	External speaker	8 Ω & 2W

All equipment has been measured and tested within the period of validity.

4.2 Small signal board debugging

4.2.1 The small signal board has used the network analyzer to adjust the channel to the predetermined status.

Please do not make any adjustments to the IF transformer on the channel, otherwise it will cause the deterioration of the transmit-receive capability.

4.2.2 Receiving channel gain debugging

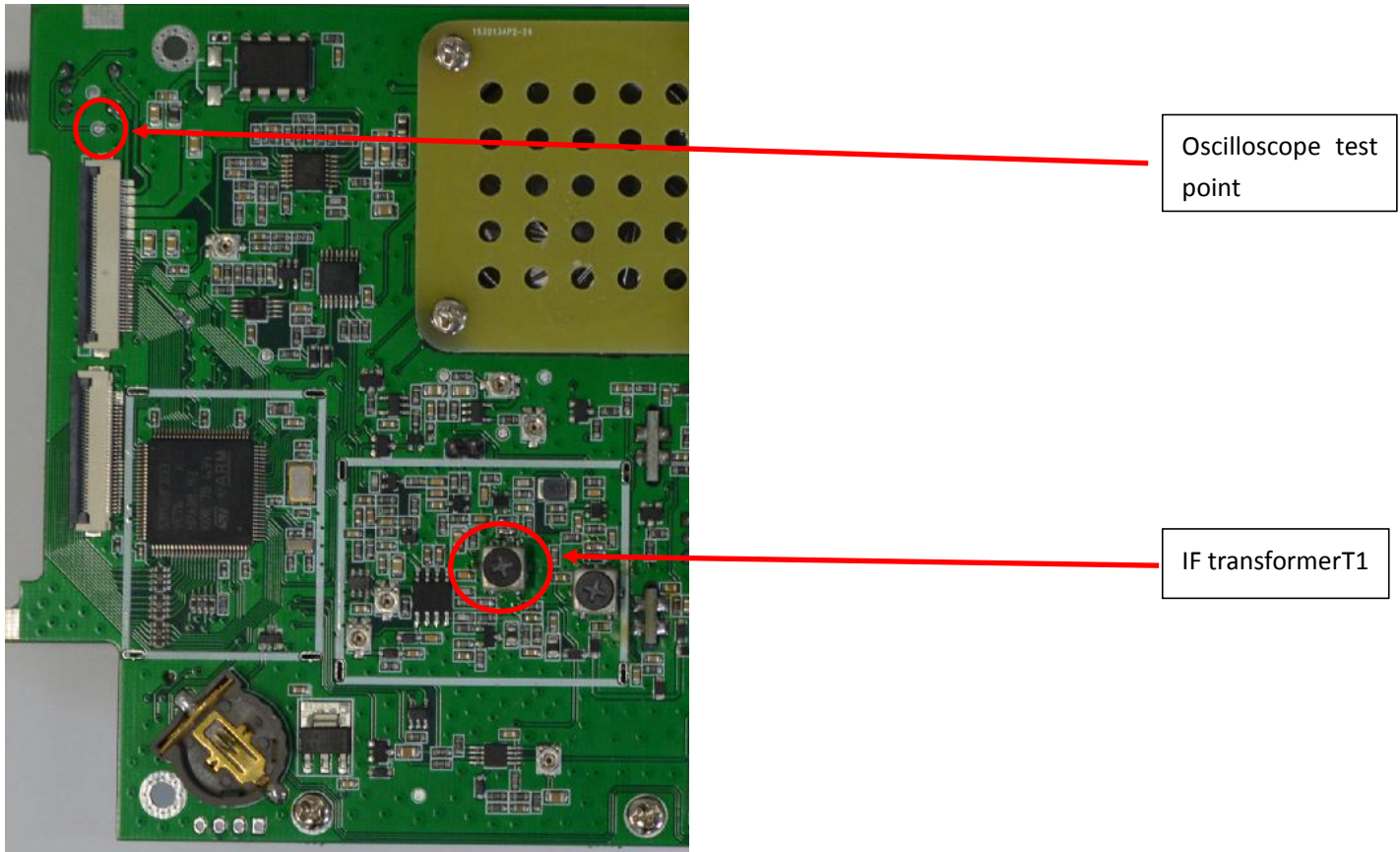
Required machines and its settings

Machine	Setting specs
RF signal source	Frequency: 14.251MHz, output amplitude: -97dBm
Oscilloscope	the units on the X-axis: 1ms, the units on the Y-axis: 100mV

Note: During the test, do not turn-on the X108G to transmit, otherwise the RF signal source will be damaged!

- 1) Set the receiving frequency of X108G to be **14.25000MHz**, [USB] mode.
- 2) Open [PRE],close [ATT] and [AGC] and [SQL].
- 3) Adjust the volume to be 1/3.

- 4) Signal source output a signal, connect it to the antenna interface of X108G.
- 5) Use oscilloscope to observe the signal amplitude of test point(signal frequency:1kHz).
- 6) Adjust the 2nd IF transformerT1 to make the range of magnitude observed on the oscilloscope is the largest (normally it is more than 550mV-Vpp).



4.2.3 Receiving sensitivity test

Required machines and its settings

Machine	Setting specs
RF signal source	Frequency: 14.251MHz, initial output amplitude: 10uV
Audio analyzer	SINAD test

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Open [PRE],close [ATT] and [AGC] and [SQL].
- 3) Connect the SPK interface to input port of audio analyzer.
- 4) adjust the volume of the X108G to make the amplitude of the signal measured by the audio analyzer is 2000mV.
- 5) Set the RF signal source output amplitude to be 0.35uV, and the SINAD test value of the audio analyzer should be greater than 12dB, which is regarded as qualified.

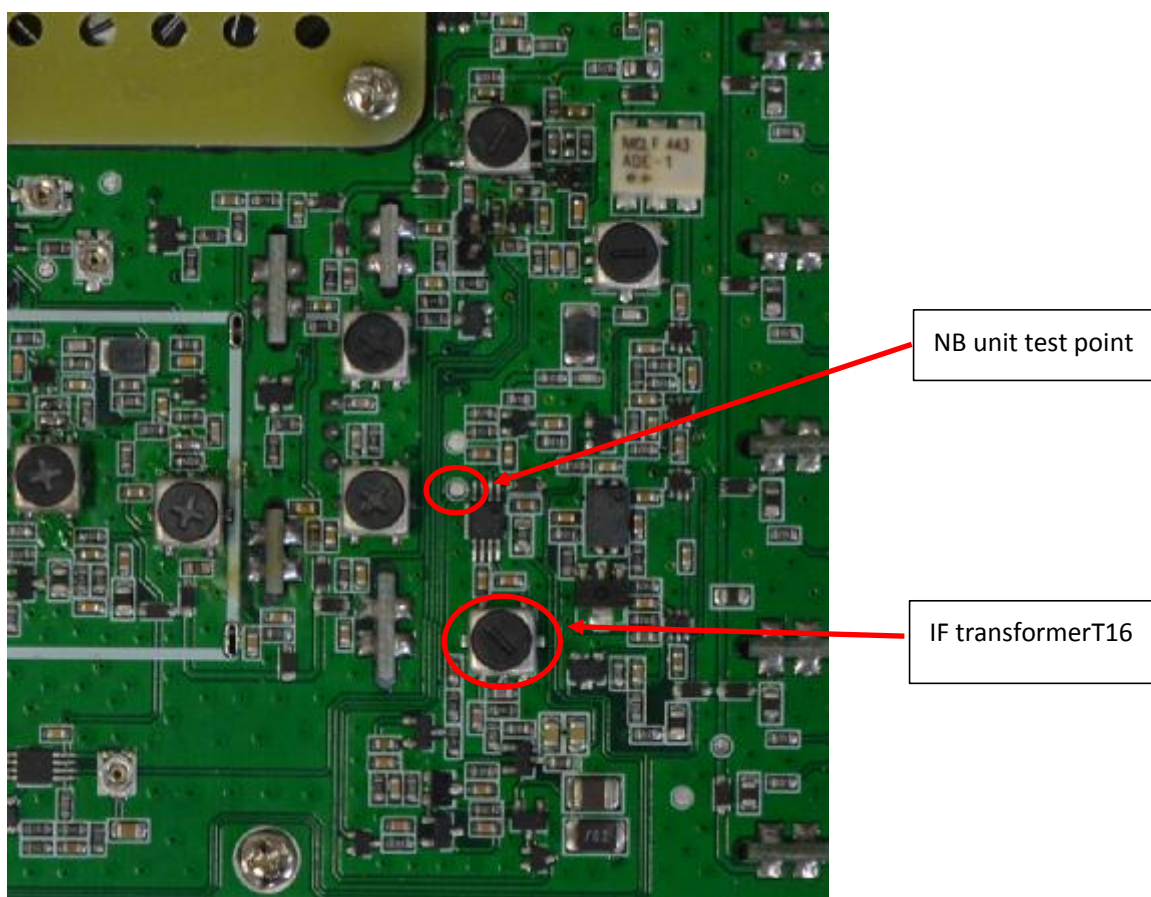
4.2.4 NB unit test

Required machines and its settings

Machine	Setting specs
RF signal source	Frequency: 14.251MHz, output amplitude: -80dBm
Digital multimeter	DC voltage test

Note: During the test, do not turn-on the X108G to transmit, otherwise the RF signal source will be damaged!

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Open [PRE],close [ATT] and [AGC] and [SQL].
- 3) Measure the voltage of NB unit test point with digital multimeter.
- 4) Adjust NB amplify IF transformerT16 to make the test point voltage to be minimum (around 1.55V).
- 5) Turn off the signal source output, and the voltage value of the test point is about 4.15V.



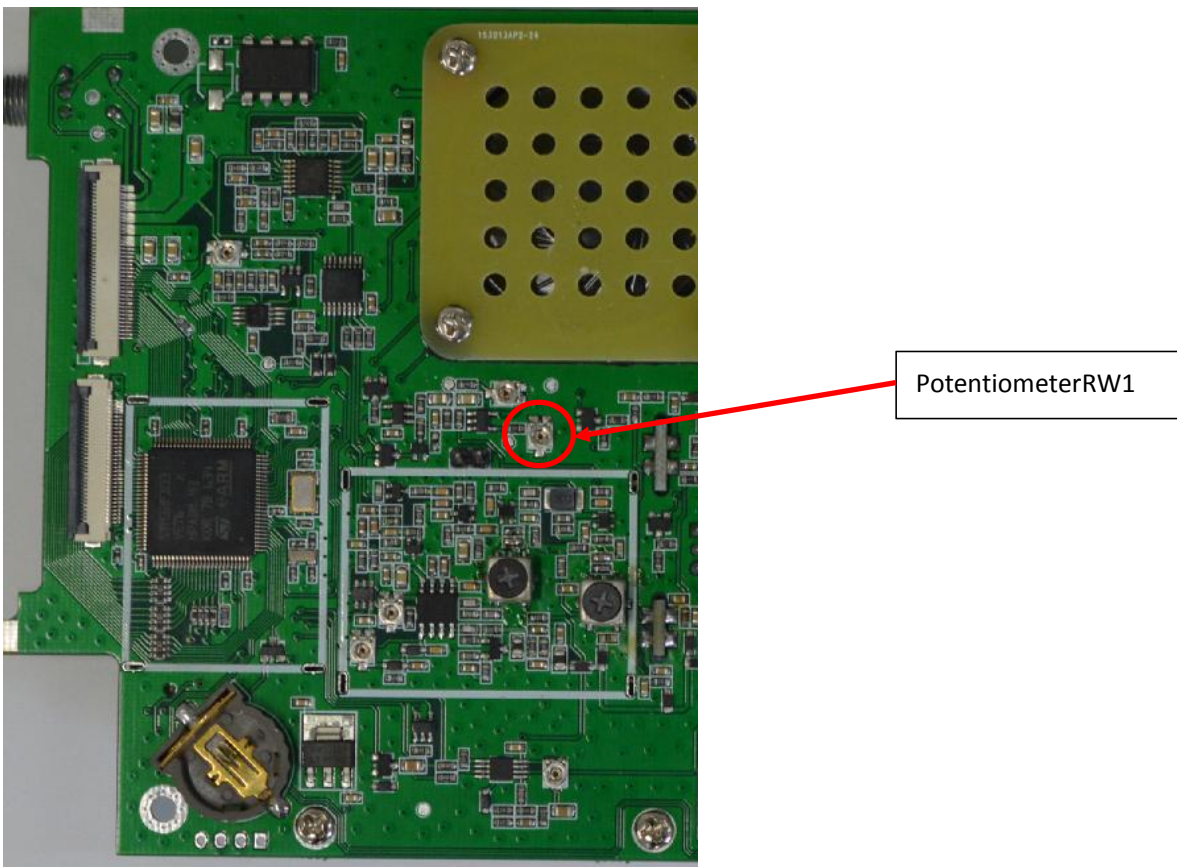
4.2.5 S table Parameter calibration

Required machines and its settings

Machine	Setting specs
RF signal source	Frequency: 14.251MHz

Note: During the test, do not turn-on the X108G to transmit, otherwise the RF signal source will be damaged!

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Open [PRE], close [ATT] and [AGC] and [SQL].
- 3) Connect the output port of the RF signal source to the antenna interface of the X108G;
- 4) Turn off the RF signal source output, adjust the S table reference voltage PotentiometerRW1, make the -121dBm value of ADC on the screen is 2500, press the [SET] button to enter the next level signal setting.
- 5) Open the RF signal source, in turn, set up the signal source output signal amplitude by the each signal intensity as displayed on a screen, and then press the [SET] button to enter the next level of signal settings.
- 6) After setting all the signal levels, press the [SAVE] button to save and exit.



4.2.6 Overall gain adjustment of transmit channel

Required machines and its settings

Machine	Setting specs
Digital multimeter	DC voltage test

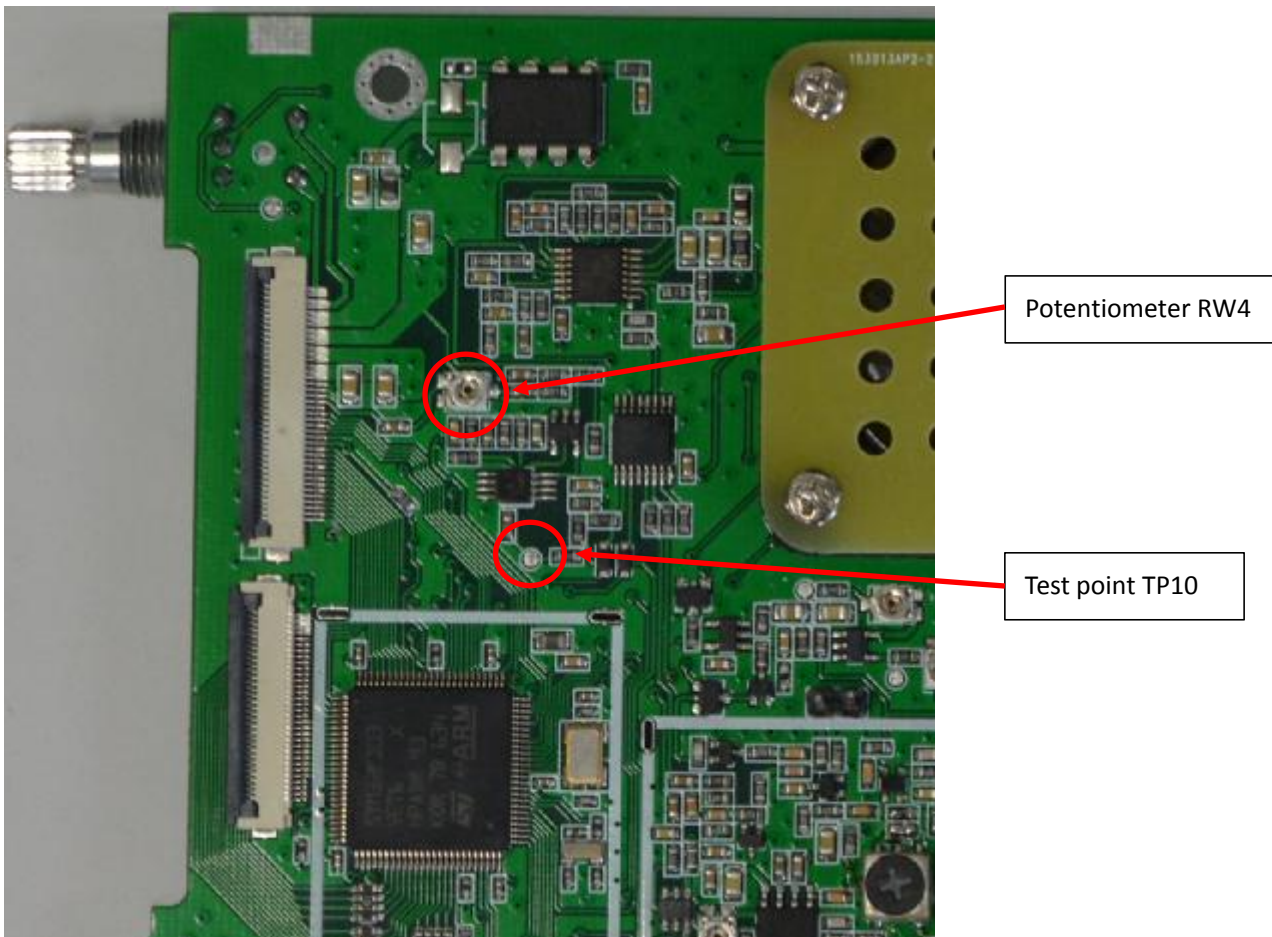
- 1) Set the receiving frequency of X108G to be 14.25000MHz, [CW] mode.
- 2) Pull out the TX signal plug of the small signal board.
- 3) Press the key to start the CW mode transmit.
- 4) Measure the voltage of the transmit gain test point TP11, and adjust the PotentiometerRW8 to make the voltage of the test point be $2V + 0.1V$.

4.2.7 Modulation audio signal amplitude adjustment

Required machines and its settings

Machine	Setting specs
Audio frequency generator	Frequency:1kHz Amplitude:100mV-Vpp
50W RF load	

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Connect the RF load to the antenna port of the X108G.
- 3) Unplug the TX signal line from small signal board to the power amplifier board.
- 4) Measure the amplitude of the test point TP10 with oscilloscope.
- 5) Press PTT of hand microphone, adjust PotentiometerRW4 to make the amplitude of test point be 50mV-Vpp.

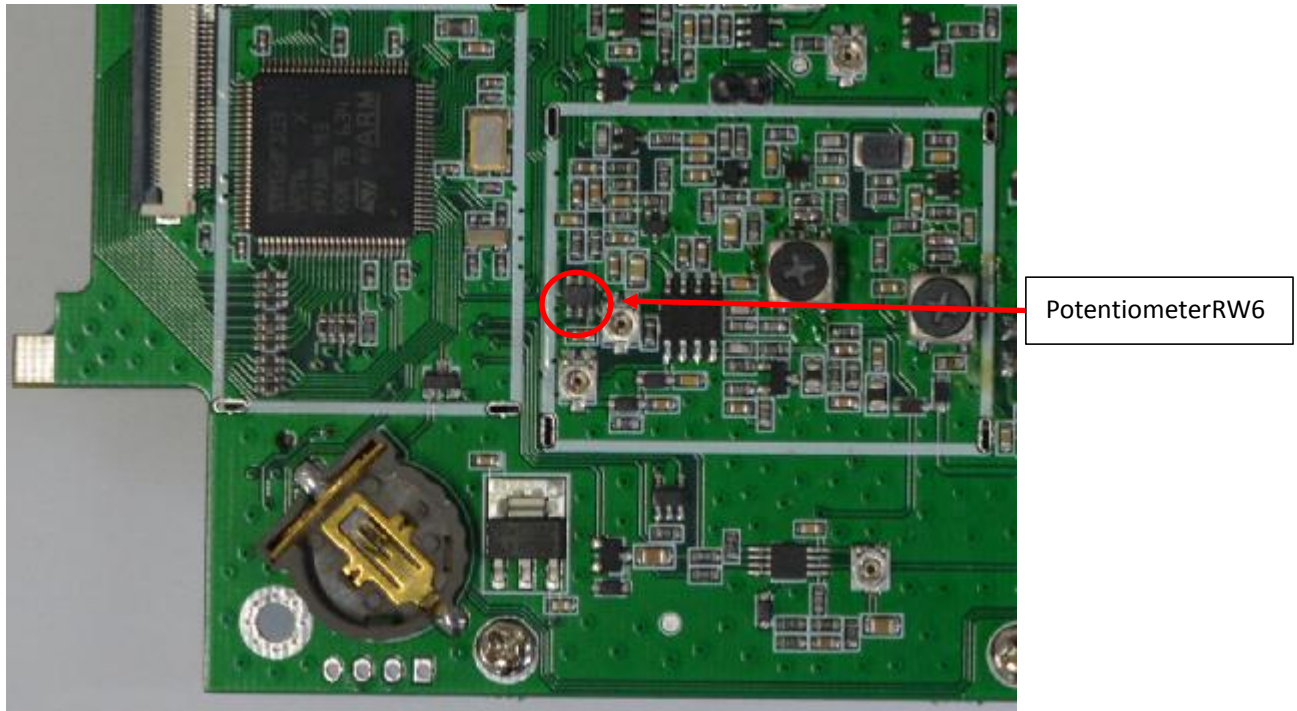


4.2.8 SSB mode carrier suppression debugging

Required machines and its settings

Machine	Setting specs
Audio signal generator	Frequency:1kHz Amplitude:100mV-Vpp
Spectrum analyzer	Central frequency:14.25MHz BW:10MHz
50W RF load	

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Connect the RF load to the antenna interface of the X108G.
- 3) Connect the TX output signal of the small signal board RF spectrum analyzer.
- 4) The output signal of the audio signal source is connected to a special test microphone, and open the output of the audio signal source.
- 5) Press the PTT of speaker microphone to start the X108G transmitting, and observe the carrier output power measured by the spectrum analyzer.
- 6) Adjust PotentiometerRW6 to make the carrier power measured on the spectrum analyzer is minimum.

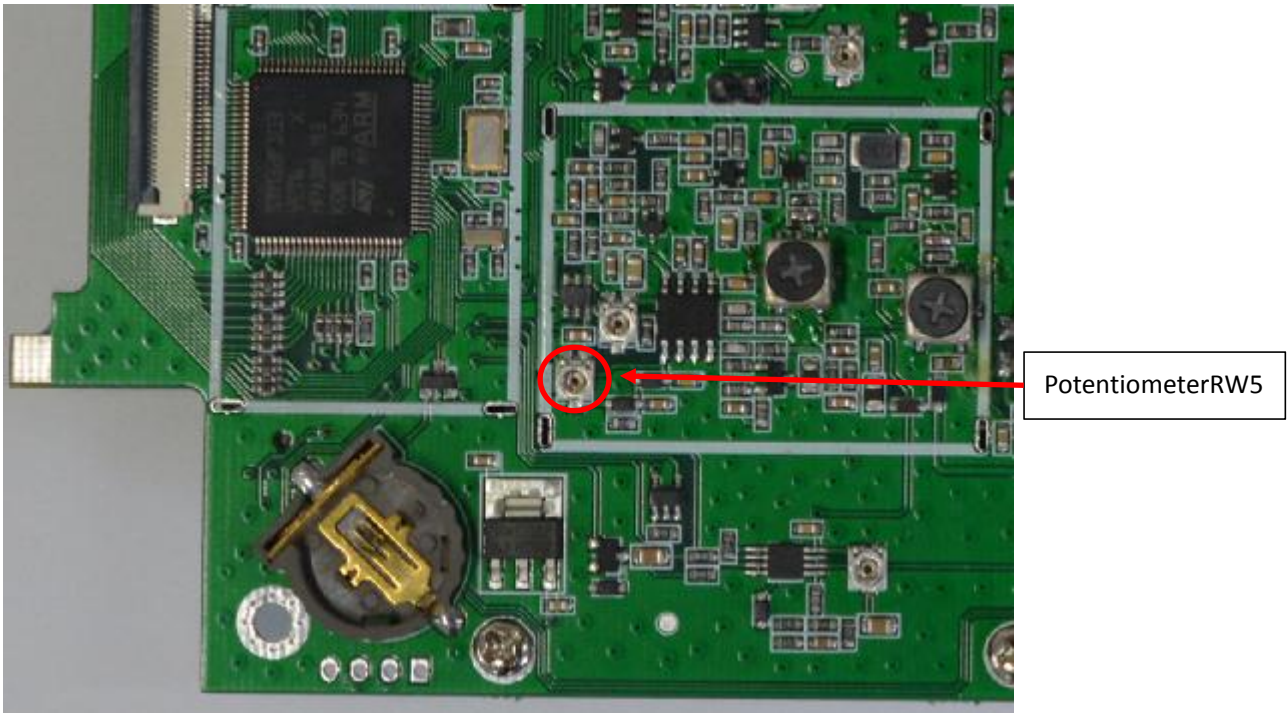


4.2.9 AM modulation debugging

Required machines and its settings

Machine	Setting specs
Audio frequency generator	Frequency:1kHz Amplitude:100mV-Vpp
Spectrum analyzer	Central frequency:14.25MHz BW:10MHz
50W RF load	

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [AM] mode;
- 2) Connect the RF load to the antenna interface of the X108G.
- 3) Connect the TX output signal of the small signal board RF spectrum analyzer.
- 4) The output signal of the audio signal source is connected to a special test microphone, and open the output of the audio signal source.
- 5) Press the PTT of speaker microphone to start the X108G transmitting, and observe the power difference between carrier and envelope which are measured by spectrum analyzer
- 6) Adjust PotentiometerRW5, to make the carrier power is higher than the envelope power 14dB + 1dB.

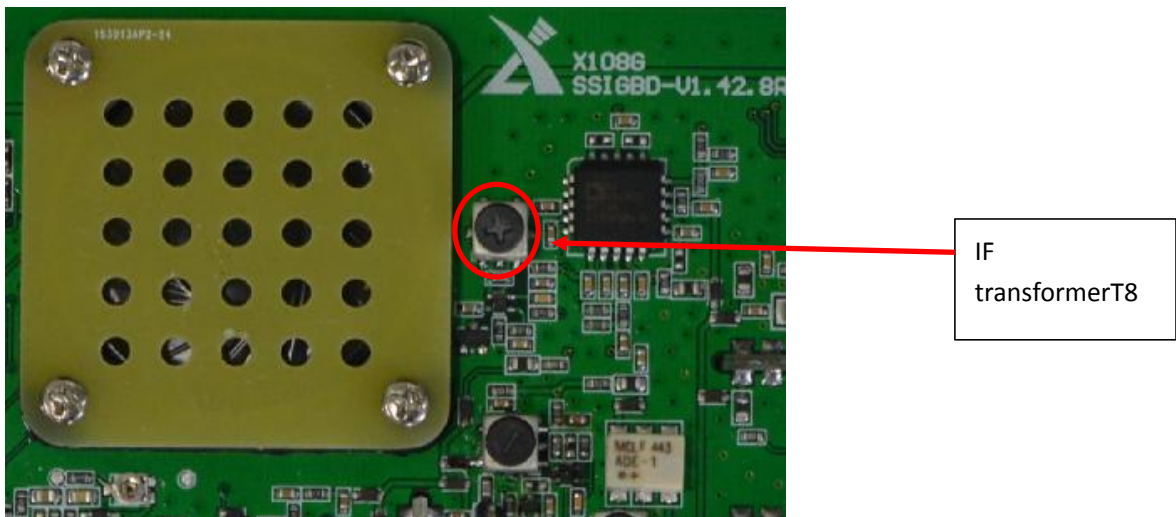


4.2.10 Transmit closed loop debugging

Required machines and its settings

Machine	Setting specs
Digital multimeter	DC voltage test gear
Spectrum analyzer	Central frequency:14.25MHz BW:5MHz
50W RF load	

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [CW] mode, power 20W
- 2) Connect the RF load to the antenna interface of the X108G.
- 3) Press the CW key to start the transmit, measure G2 voltage of the transmitting amplifier Q3 by digital multimeter.
- 4) Adjust the IF transformerT8 to make the test voltage value be minimum.



4.2.11 Power amplifier unit static debugging

Required machines and its settings

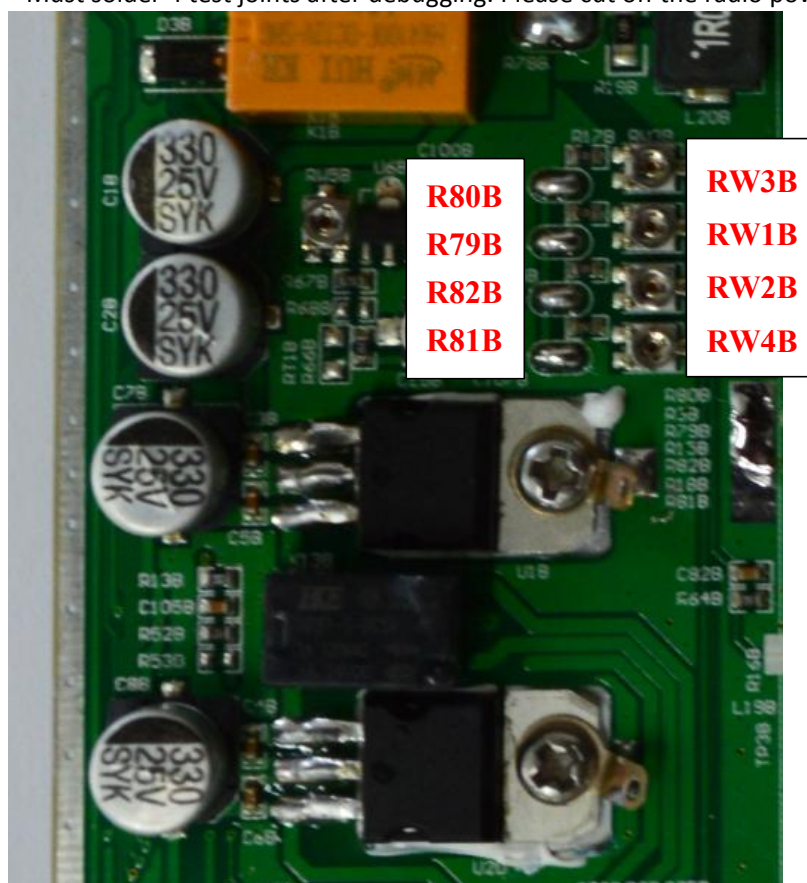
Machine	Setting specs
Digital ammeter	DC voltage test gear
50W RF load	

- 1) Set the receiving frequency of X108G to be 14.25000MHz, [USB] mode.
- 2) Unplug the TX signal line from small signal board to the power amplifier board.
- 3) Connect the RF load to the antenna interface of the X108G.
- 4) Disconnect R81B、R82B、R79B、R80B solder joints.
- 5) Connect a dedicated test microphone to X108(disconnect the microphone input), then press PTT to start the transmitting, and record the current ammeter value as a baseline reading.
- 6) Solder four debug solder joints, adjust the corresponding Potentiometer, start the transmitting to make the value of additional current are as follows:

Solder joints	Potentiometer	Additional current
R81B	RW4B	30mA
R82B	RW2B	250mA
R79B	RW1B	300mA
R80B	RW3B	300mA

Notes:

- When debug a joint, other 3 joints must be cut off.
- Must solder 4 test joints after debugging. Please cut off the radio power when soldering.



Part 5 Parts List

Power amplifier board

NO.	Item	SPECS	PACKAGE	BRAND	MPN	Designator
1	Aluminum solid cap	100uF		Würth	875105359010	C1B, C2B, C7B, C8B, C90B, C110B, C113B
2	capacitor	100nF	0603	Murata	GRM188R71H104KA93	C3B, C4B, C5B, C6B, C40B, C45B, C46B, C56B, C59B, C60B, C61B, C62B, C66B, C67B, C68B, C69B, C70B, C73B, C74B, C75B, C76B, C77B, C81B, C82B, C83B, C84B, C87B, C97B, C98B, C100B, C102B, C105B, C106B, C107B, C109B, C111B, C114B, C115B, C120B, C130B, C133B
3	capacitor	100pF	0805	Murata	GRM21A5C2D101JW01	C9B, C10B, C18B, C21B, C24B, C47B, C49B, C55B
4	capacitor	1nF	0805	Murata	GRM21AR72D102KW01	C11B, C19B, C63B, C64B, C79B, C80B
5	capacitor	330pF	0805	Murata	GRM21A5C2D331JW01	C12B, C28B, C31B, C36B
6	capacitor	680pF	0805	Murata	GRM21A7U2D681JW31	C13B, C15B, C27B
7	capacitor	470pF	0805	Murata	GRM21A7U2D471JW31	C16B, C17B
8	capacitor	1.5nF	0805	Murata	GRM21AR72D152KW01	C20B
9	capacitor	1.2nF	0805	Murata	GRM21A7U2D122JW31	C22B, C23B
10	capacitor	47pF	0805	Murata	GRM21A5C2D470JW01	C25B, C32B
11	capacitor	75pF	0805	Murata	GQM2195C2E750GB12	C26B, C52B
12	capacitor	30pF	0805	Murata	GQM2195C2E300GB12	C29B
13	capacitor	150pF	0805	Murata	GRM21A5C2D151JW01	C30B
14	capacitor	27pF	0805	Murata	GRM21A5C2D270JW01	C33B, C50B, C139B
15	capacitor	100nF	0805	Murata	GRM21BR72A104MAC4	C34B
16	capacitor	68pF	0805	Murata	GRM21A5C2D680JW01	C35B, C54B
17	capacitor	120pF	0805	Murata	GRM21A5C2D121JW01	C38B, C53B
18	capacitor	220pF	0805	Murata	GRM21A5C2D221JW01	C39B, C48B
19	capacitor	12pF	0805	Murata	GRM21A5C2D120JW01	C41B, C42B
20	capacitor	47nF	0603	Murata	GRM188R71H473KA61	C43B, C44B
21	capacitor	8.2pF	0805	Murata	GQM2195C2E8R2BB12	C51B, C136B
22	Aluminum solid cap	10uF		Würth	875105359001	C57B, C58B, C95B, C145B
23	capacitor	1nF	0603	Murata	GRM1885C2A102JA01	C85B, C88B, C91B, C92B, C94B
24	capacitor	100pF	0603	Murata	GRM1885C2A101JA01	C86B, C89B, C112B
25	capacitor	470nF	0603	Murata	GRM188R71C474KA88	C93B, C116B, C121B
26	capacitor	33pF	0805	Murata	GRM21A5C2D330JW01	C96B, C124B
27	capacitor	10uF	0805	Murata	GRM21BR61E106MA73	C117B, C118B
28	capacitor	20pF	0805	Murata	GQM2195C2E200GB12	C127B, C128B
29	capacitor	10nF	0603	Murata	GRM188R71H103KA01	C129B

30	capacitor	22pF	0805	Murata	GRM21A5C2D220JW01	C134B
31	capacitor	82pF	0805	Murata	GRM21A5C2D820JW01	C138B
32	Schottky diode	1SS372	SC-70	Toshiba	1SS372	D1B, D2B
33	Zener diode	10V	SOD-323	Changjiang Electronic	BZT52C10V0S	D3B, D4B, D16B
34	diode	1N4007	DO-214AC	domestic	M7	D5B
35	Zener diode	5.1V	SOD-323	Changjiang Electronic	BZT52C5V1S	D6B
36	diode	1N4148	SOD-323	domestic	T4	D7B, D8B, D9B, D10B, D11B, D12B, D13B, D14B, D15B, D17B
37	TVS diode array	NUP2201MR6T1G	TSOP-6	ON	NUP2201MR6T1G	D18B
38	relay	HRB1-S-DC5V	Through-Hole	HKE	HRB1-S-DC5V	K2B, K3B, K4B, K5B, K6B, K7B, K8B, K9B, K10B, K11B, K12B, K14B, K15B
39	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L1B, L2B
40	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L3B, L4B
41	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L5B, L6B
42	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L7B, L8B
43	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L9B, L10B
44	Magnetic inductance	100uH	0805	TDK	GLF2012T101K	L11B, L15B, L16B, L17B, L18B, L19B
45	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L13B
46	Magnetic inductance	T37-2	Through-Hole	HOMEMA DE	-	L14B
47	Power inductance	4.7uH	WE-PDF_1045	Würth	7447797470	L20B
48	Magnetic beads	600R	0805	Würth	74279204	LB1B, LB2B, LB4B, LB5B, LB6B, LB7B, LB8B
49	Magnetic beads	600R	1812	Würth	742792514	LB10B
50	RF connector	U.FL socket	SMT	MOLEX	73412-0114	P3B, P4B
51	FPC connector	40 pins 0.5mm spacing	SMT	HRS	FH33-40S-0.5SH	P5B
52	Connector	RJ45		ZXCNT	-	P7B
53	RF FET	RD16HHF1	T-30E	Mitsubishi	RD16HHF1	Q1B, Q2B
54	RF FET	RD06HHF1	T-30E	Mitsubishi	RD06HHF1	Q3B
55	RF FET	RD01MUS1	SOT-89	Mitsubishi	RD01MUS1	Q4B
56	Triode	2SC5551	SOT-89	Mitsubishi	2SC5551	Q5B

57	FET	FDS4435BZ	SO-8	FAIRCHILD	FDS4435BZ	Q6B, Q8B
58	RF FET	BC868	SOT-89	Philips	BC868	Q7B
59	FET	IRLML5203PBF	SOT-23	IR	IRLML5203PBF	Q9B, Q10B
60	Digital triode	DTC114EKA	SOT-23	ROHM	DTC114EKA	Q26
61	Resistance	51R	1206	Yageo	RC1206FR-0751R	R1B, R2B
62	Resistance	330R	0603	Yageo	RC0603FR-07330R	R3B, R15B, R17B
63	Resistance	330R	1812	Yageo	RC1812FR-07330R	R4B, R11B
64	Resistance	1k	0603	Yageo	RC0603FR-071K	R5B, R12B, R14B, R16B, R30B, R47B, R51B, R65B
65	Resistance	3.3R	0603	Yageo	RC0603FR-073R3	R6B, R10B
66	Resistance	220R	1206	Yageo	RC1206FR-07220R	R7B
67	Resistance	220R	0603	Yageo	RC0603FR-07220R	R8B
68	Resistance	220R	1812	Yageo	RC1812FR-07220R	R9B
69	Resistance		0603	Yageo	RC0603FR-07	R13B
70	Resistance	1.5k	0603	Yageo	RC0603FR-071K5	R18B
71	Resistance	4.7R	1206	Yageo	RC1206FR-074R7	R19B
72	Resistance	10k	0603	Yageo	RC0603FR-0710K	R20B, R23B, R32B, R33B, R35B, R36B, R49B
73	Resistance	5.1k	0603	Yageo	RC0603FR-075K1	R21B, R41B
74	Resistance	5.1R	0603	Yageo	RC0603FR-075R1	R22B, R26B
75	Resistance	1.8k	0603	Yageo	RC0603FR-071K8	R24B, R25B
76	Resistance	680R	0603	Yageo	RC0603FR-07680R	R27B, R34B
77	Resistance	150R	0603	Yageo	RC0603FR-07150R	R28B
78	Resistance	100k	0603	Yageo	RC0603FR-07100K	R29B, R31B, R42B, R45B
79	Resistance	15k	0603	Yageo	RC0603FR-0715K	R43B
80	Resistance	100R	0603	Yageo	RC0603FR-07100R	R44B, R46B, R48B
81	Resistance	30k	0603	Yageo	RC0603FR-0730K	R50B
82	Resistance		0603	Yageo	RC0603FR-07	R52B
83	Resistance	3.3k	0603	Yageo	RC0603FR-073K3	R54B
84	Resistance	51R	0603	Yageo	RC0603FR-0751R	R55B
85	Resistance	35k	0603	Yageo	RC0603FR-0735K	R56B
86	Resistance	175k	0603	Yageo	RC0603FR-07175K	R58B
87	Resistance	75k	0603	Yageo	RC0603FR-0775K	R59B
88	Resistance	3.9k	0603	Yageo	RC0603FR-073K9	R61B, R62B, R63B, R64B, R66B
89	Resistance	2k	0603	Yageo	RC0603FR-072K	R67B
90	Resistance		0603	Yageo	RC0603FR-07	R69B
91	Network Resistor	100k	8P4R	Yageo	YC164-JR07100K	RP1B, RP2B
92	Adjustable-resistance	5k	3X3 SMT	domestic	-	RW1B, RW2B, RW3B, RW4B
93	Magnetic inductance	74270176	Through-Hole	HOMEMA DE	-	T1B, T7B
94	Transformer	7427056	Through-Hole	HOMEMA DE	-	T2B
95	Magnetic	BN-43-302	Through-Hole	HOMEMA	-	T3B

	transformer			DE		
96	common mode inductance		Through-Hole	domestic	custom made	T4B
97	common mode inductance	744253200	SMT	Würth	744253200	T5B, T6B
98	Integrated circuit	LM2940T-9.0	TO-220	TI	LM2940T-9.0	U1B
99	Integrated circuit	L7805CV	TO-220	ST	L7805CV	U2B
100	Integrated circuit	74HC238PW	TSSOP-16	NXP	74HC238PW	U3B, U9B
101	Integrated circuit	ULN2004D	SO-16	TI	ULN2004D	U4B
102	Integrated circuit	LM358PW	TSSOP-8	TI	LM358PW	U5B
103	Integrated circuit	TL431CPK	SOT-89	TI	TL431CPK	U6B
104	Integrated circuit	TL331DBV	SOT-23-5	TI	TL331DBV	U8B
105	Integrated circuit	CD4051BPWR	TSSOP-16	TI	CD4051BPWR	U15B
106	Integrated circuit	SSM2167-1RM	MSOP-10	ADI	SSM2167-1RM	U17B

Display button board parts

NO.	Item	SPECS	PACKAGE	BRAND	MPN	Designator
1	Capacitance	47uF	3225	Murata	GRM32ER7YA476KE15L	C1
2	Capacitance	100nF	0603	Murata	GRM188R71H104KA93	C2, C3, C4, C5, C7, C8, C9
3	Capacitance	1nF	0603	Murata	GRM1885C2A102JA01	C6
4	Aluminum solid capacitor	56uF		Würth	875105444007	C10, C12
5	Schottky diode	RB480K	SOT-343	DIODES	RB480K	D1
6	Schottky diode	BAT54C	SOT-23	FAIRCHILD	BAT54C	D2
7	Power Inductor	150uH		Würth	744787151	L1
8	Magnetic bead	600R	0805	Würth	74279204	LB1
9	OLED panel	1.77"160128 colors OLED	TAB	RiTdisplay	RTD9916812000	OLED1
10	FPC Connector	FH26-45S-0.3SHW(05)	SMT	HRS	FH26-45S-0.3SHW(05)	P1
11	FPC Connector	32pins 0.5mm spacing	SMT	HRS	FH33-32S-0.5SH	P2
12	Resistance	51R	0805	Yageo	RC0805FR-0751R	R1
13	Resistance	2.2R	0805	Yageo	RC0805FR-072R2	R2
14	Resistance	180R	0603	Yageo	RC0603FR-07180R	R3
15	Resistance	100R	0603	Yageo	RC0603FR-07100R	R4, R6, R7

16	Resistance	10k	0603	Yageo	RC0603FR-0710K	R5
17	Resistance	1.2M	0603	Yageo	RC0603FR-071M2	R11
18	Resistance	15k	0603	Yageo	RC0603FR-0715K	R12
19	Resistance	1.2k	0603	Yageo	RC0603FR-071K2	R13
20	Exclusion	10k	8P4R	Yageo	YC164-JR0710K	RP1, RP2
21	IC	MC34063EBD	SO-8	ST	MC34063EBD	U1

Local vibration board

NO.	Item	SPECS	PACKAGE	BRAND	MPN	Designator
1	Capacitance	100nF	0402	Murata	GRM155R71E104ME14	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C15, C16, C18, C19, C22, C26, C27, C28, C29, C30, C31, C32, C35, C36, C37, C41, C47
2	Capacitance	1nF	0402	Murata	GRM15XB11H102MA86	C13, C17
3	Capacitance	100pF	0402	Murata	GRM1555C1H101GA01	C14, C24
4	Capacitance	6.8pF	0402	Murata	GRM1552C2A6R8WA01	C20, C21
5	Capacitance	39pF	0402	Murata	GRM1552C2A390GA01	C23, C25
6	Capacitance	10uF	0805	Murata	GRM21BR61E106MA73	C34, C40, C42, C43
7	Capacitance	10pF	0402	Murata	GRM1552C2A100GA01	C39, C44
8	Winding inductance	100uH	0805	TDK	GLF2012T101K	L1, L2
9	High Q Winding inductance	270nH	1210	TDK	NLV32T-271J-PF	L3, L4
10	BTB Connector	Spacing 0.8mm	SMT	domestic	-	P1
11	RF Connector	U.FL socket	SMT	MOLEX	73412-0114	P2, P3
12	Resistance	220R	0402	Yageo	RC0402FR-07220R	R1, R113
13	Resistance	68R	0402	Yageo	RC0402FR-0768R	R2, R3
14	Resistance	330R	0402	Yageo	RC0402FR-07330R	R4, R5, R6, R7, R9
15	Resistance	10R	0402	Yageo	RC0402FR-0710R	R8, R11, R12
16	Resistance	4.7k	0402	Yageo	RC0402FR-074K7	R10
17	Resistance	1M	0402	Yageo	RC0402FR-071M	R15
18	Resistance	51R	0402	Yageo	RC0402FR-0751R	R17
19	Resistance	1k	0402	Yageo	RC0402FR-071K	R116, R117
20	RF transformer	458PT-1565	SMT	TOKO	458PT-1565	T1
21	IC	SN74LVC1G07DBV	SOT-23	TI	SN74LVC1G07DBV	U1, U4, U5, U6, U9
22	IC	AD9913BCPZ	QFN32	ADI	AD9913BCPZ	U2
23	IC	UPC2710TB	SC-70	NEC	UPC2710TB	U3
24	IC	74V1G04C	SC-70	ST	74V1G04C	U7, U10, U13
25	IC	AD9833BRM	TSSOP-10	ADI	AD9833BRM	U8
26	IC	AS1360-33-T	SOT-23	AMS	AS1360-33-T	U11
27	IC	AS1360-18-T	SOT-23	AMS	AS1360-18-T	U12

28	TCXO	26MHz DSB321SDN	3225	KDS	26MHz DSB321SDN	X1
29	Ceramic filter	TDK107MS180K	Through-Hole	TDK	TDK107MS180K	XF3

Small signal board

NO.	Item	SPECS	PACKAGE	BRAND	MPN	Designator
1	Button type lithium battery	MS920SE FL27E	SMT	Seiko	MS920SE FL27E	BT1
2	Capacitance	100nF	0603	Murata	GRM188R71H104KA93	C1, C2, C4, C6, C7, C11, C12, C13, C14, C15, C16, C19, C24, C25, C29, C30, C33, C34, C35, C37, C38, C39, C40, C44, C45, C47, C50, C55, C56, C57, C58, C62, C63, C64, C65, C67, C68, C70, C71, C72, C73, C75, C76, C79, C81, C82, C83, C87, C93, C94, C95, C96, C97, C99, C100, C101, C102, C105, C106, C107, C108, C109, C111, C112, C113, C114, C115, C117, C118, C119, C122, C123, C124, C130, C135, C136, C140, C142, C144, C148, C154, C155, C157, C159, C162, C163, C166, C167, C170, C172, C182, C188, C192, C201, C212, C215
3	Capacitance	2.2pF	0603	Murata	GRM1885C2A2R2BA01	C3, C110
4	Capacitance	68pF	0603	Murata	GRM1885C2A680JA01	C5, C10, C23, C36, C42, C69, C121, C164
5	Capacitance	1nF	0603	Murata	GRM1885C2A102JA01	C8, C18, C52, C80, C85, C90, C98, C103, C131, C137, C138, C141, C145, C156, C158, C161, C168, C175, C177, C210, C214
6	Capacitance	5.1pF	0603	Murata	GRM1885C2A5R1BA01	C9
7	Capacitance	470nF	0603	Murata	GRM188R71C474KA88	C17, C48, C59, C60, C66, C77, C84, C92, C127, C128, C133, C173, C181, C189
8	Capacitance	10uF	0805	Murata	GRM21BR61E106MA73	C20, C41, C176, C202, C203
9	Capacitance	39pF	0603	Murata	GRM1885C2A390JA01	C21, C208
10	Capacitance	10nF	0603	Murata	GRM188R71H103KA01	C22, C49, C51, C61, C78, C129, C143, C205, C206, C207, C209, C211
11	Capacitance	100pF	0603	Murata	GRM1885C2A101JA01	C26, C91, C174
12	Capacitance	1uF	0805	Murata	GRM21BB31H105MA12	C27
13	Capacitance	4.7nF	0603	Murata	GRM1885C1H472JA01	C28

14	Capacitance	33pF	0603	Murata	GRM1885C2A330JA01	C31, C32
15	Aluminum solid Capacitance	330uF		Würth	875115350004	C43, C160
16	Capacitance	47nF	0603	Murata	GRM188R71H473KA61	C53
17	Aluminum solid Capacitance	47uF		Würth	875105359006	C54, C169, C190
18	Capacitance	22pF	0402	Murata	GRM1552C2A220GA01	C86, C89
19	Capacitance	12pF	0603	Murata	GRM1885C2A120JA01	C116
20	Capacitance	470pF	0603	Murata	GRM1885C2A471JA01	C120
21	Capacitance	150pF	0603	Murata	GRM1885C2A151JA01	C132, C134
22	Capacitance	100nF	0402	Murata	GRM155R71E104ME14	C139, C149, C150, C151, C152, C153
23	Capacitance	6pF	0402	Murata	GRM1552C2A6R0WA01	C146, C147
24	Capacitance	2.2nF	0603	Murata	GRM1885C1H222JA01	C165
25	Capacitance	47uF	3225	Murata	GRM32ER7YA476KE15L	C171, C197, C198, C199, C200
26	Capacitance	1uF	0603	Murata	GRM188R71C105ME15	C178
27	Capacitance	2.2uF	0805	Murata	GRM21BR71E225ME11	C179, C180
28	Capacitance	330pF	0603	Murata	GRM1885C2A331JA01	C196
29	Capacitance	10pF	0603	Murata	GRM1885C2A100JA01	C204
30	Capacitance	220pF	0603	Murata	GRM1885C2A221JA01	C213
31	Schottky diode	1SS372	SC-70	Toshiba	1SS372	D1, D2
32	Diode	1N4148WS-7-F	SOD-323	DIODES	1N4148WS-7-F	D3, D8, D11, D14, D31, D39, D40, D41, D42, D43, D46, D48
33	Diode	MA2Z077	SOD-323	Panasonic	MA2Z077	D4, D5, D6, D7, D9, D10, D12, D13, D15, D16, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D32, D33, D35, D36
34	TVS Diode array	NUP2201MR6T1G	TSOP-6	ON	NUP2201MR6T1G	D34, D44, D45
35	Schottky diode	BAT54C	SOT-23	FAIRCHILD	BAT54C	D37
36	Zener Diode	5.1V	SOD-323	Changjiang Electronic	BZT52C5V1S	D38
37	Schottky diode	HSM88AS	SOT-23	HITACHI	HSM88AS	D47
38	Connector	3.5mm	Through-Hole	domestic	-	J2
39	Connector	3.5mm	Through-Hole	domestic	-	J4
40	Connector	3.5mm	Through-Hole	domestic	-	J5
41	Winding inductance	2.7uH	1210	TDK	NLV32T-2R7J-PF	L1
42	Winding inductance	2.2uH	1210	TDK	GLF2012T2R2M	L2

43	Winding inductance	100uH	0805	TDK	GLF2012T101K	L3, L4, L5, L6, L7, L13, L19, L20, L22, L26, L27, L30, L32, L35, L37, L38, L39, L43, L44, L47, L48, L49, L50
44	Winding inductance	10uH	0805	TDK	GLF2012T100K	L8
45	Winding inductance	470uH	1210	Würth	744032471	L14
46	Winding inductance	1uH	0805	TDK	GLF2012T1R0M	L21, L23, L24, L25, L28, L29, L31, L51
47	Winding inductance	330nH	1210	TDK	NL322522T-R33J	L45, L46
48	Magnetic bead	600R	0805	Würth	74279204	LB1, LB2, LB3, LB4, LB5, LB6, LB7, LB8, LB9, LB10
49	RF Connector	U.FL socket	SMT	MOLEX	73412-0114	P1, P2, P8, P9
50	USB socket	Micro USB socket		domestic	-	P3
51	FPC Connector	40 pins 0.5mmspacing	SMT	HRS	FH33-40S-0.5SH	P4
52	FPC Connector	32 pins 0.5mmspacing	SMT	HRS	FH33-32S-0.5SH	P6
53	Connector	2.54spacing	2.54mm-2P	domestic	-	P7
54	BTB Connector	spacing0.8mm	SMT	domestic	-	P10
55	Connector	MINI-DIN6	Through-Hole	domestic	-	P11
56	Digital triode	DTC114EKA	SC-59	ROHM	DTC114EKA	Q1, Q2, Q8, Q9, Q11, Q12, Q23, Q24, Q26
57	FET	BB305CEW	SC-82A	RENESAS	BB305CEW-TL-E	Q3, Q13, Q15, Q21
58	Triode	2SC4154E	SC-70	domestic	2SC4154E	Q4, Q5, Q6, Q22
59	Triode	2SC5551	SOT-89	SANYO	2SC5551	Q7
60	Digital triode	IMD9A	SOT-23-6	ROHM	IMD9A	Q10, Q16, Q17, Q18, Q19, Q20
61	Digital triode	DTB113ZK	SC-59	ROHM	DTB113ZK	Q14, Q30
62	Triode	2SC2714(Y)	SC-59	Toshiba	2SC2714(Y)	Q25
63	Triode	2SC2712(Y)	SC-59	Toshiba	2SC2712(Y)	Q27, Q29, Q36
64	Digital triode	DTC114EUA	SC-70	ROHM	DTC114EUA	Q28, Q34
65	Resistance	1k	0603	Yageo	RC0603FR-071K	R1, R14, R15, R23, R24, R26, R27, R37, R51, R52, R55, R77, R78, R85, R86, R96, R97, R105, R106, R142, R162, R169, R191, R193, R194
66	Resistance	470R	0603	Yageo	RC0603FR-07470R	R2, R54, R60, R174, R178, R182
67	Resistance	51R	0603	Yageo	RC0603FR-0751R	R3, R36, R38, R43, R92, R185

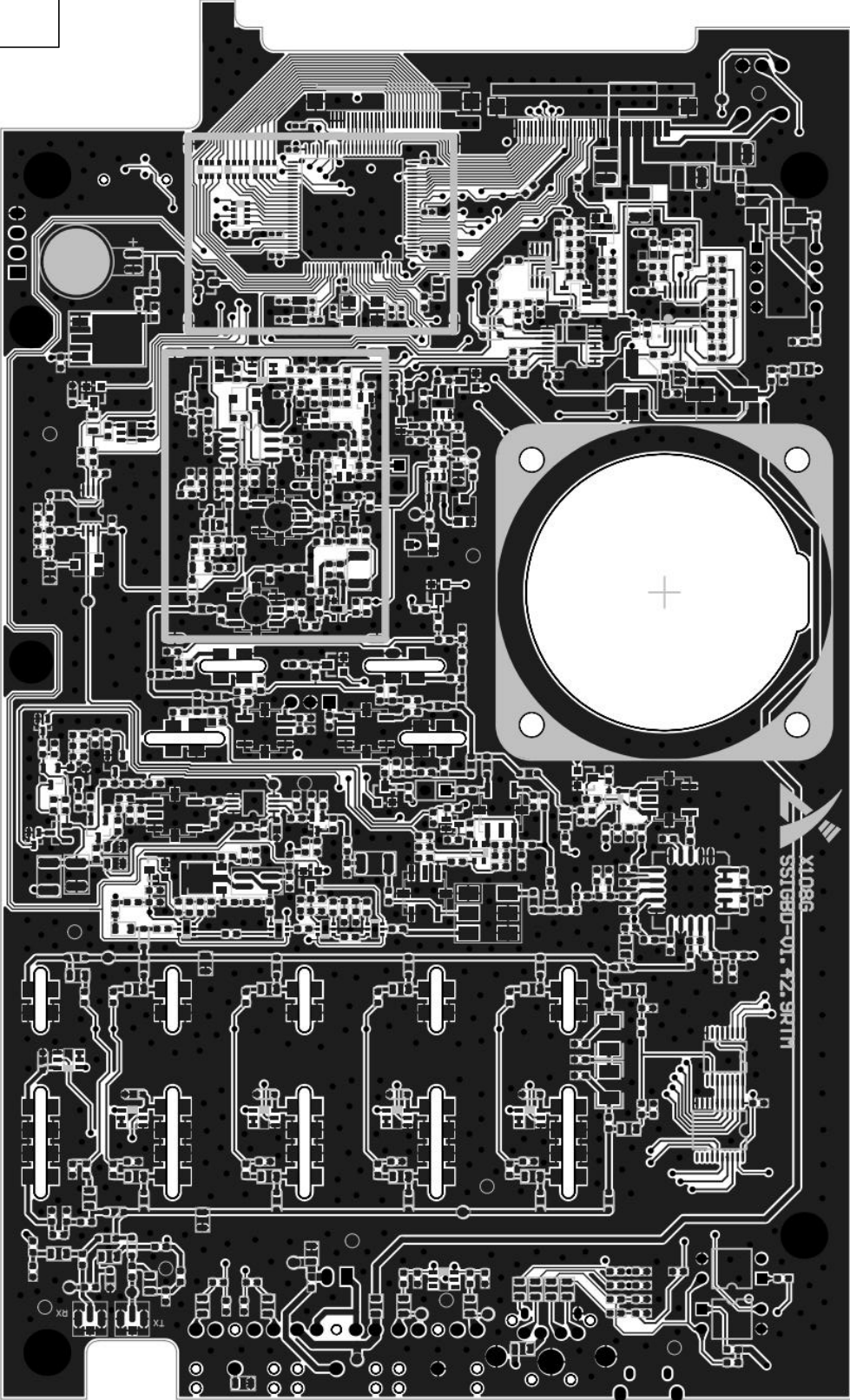
68	Resistance	100R	0603	Yageo	RC0603FR-07100R	R4, R20, R39, R40, R53, R64, R65, R71, R82, R108, R121, R122, R127, R132, R134, R137, R150, R154, R181, R184, R187, R190, R196, R197
69	Resistance	15k	0603	Yageo	RC0603FR-0715K	R5
70	Resistance	10k	0603	Yageo	RC0603FR-0710K	R6, R9, R10, R41, R63, R72, R88, R109, R118, R119, R120, R126, R135, R136, R140, R146, R147, R155, R159, R160, R170, R172, R173, R180, R200
71	Resistance	470k	0603	Yageo	RC0603FR-07470K	R7, R28
72	Resistance	10R	0603	Yageo	RC0603FR-0710R	R8, R66, R139, R171, R199, R201
73	Resistance	100k	0603	Yageo	RC0603FR-07100K	R11, R19, R25, R34, R49, R50, R59, R74, R75, R79, R91, R94, R100, R103, R104, R113, R144, R166
74	Resistance	220R	0805	Yageo	RC0805F 系列	R12
75	Resistance	2.2M	0603	Yageo	RC0603FR-072M2	R13, R16
76	Resistance	510R	0603	Yageo	RC0603FR-07510R	R17, R58, R95
77	Resistance	47k	0603	Yageo	RC0603FR-0747K	R18, R138, R151, R152
78	Resistance	2.7k	0603	Yageo	RC0603FR-072K7	R21, R29, R35, R46, R68, R81, R89, R90, R99, R131
79	Resistance	1M	0603	Yageo	RC0603FR-071M	R22
80	Resistance	220k	0603	Yageo	RC0603FR-07220K	R30, R112, R141
81	Resistance	4.7k	0603	Yageo	RC0603FR-074K7	R32, R84, R87, R114, R115, R116, R156, R161, R168, R177
82	Resistance	1.5k	0603	Yageo	RC0603FR-071K5	R33, R42, R117, R124, R153, R176, R195
83	Resistance	240k	0603	Yageo	RC0603FR-07240K	R44
84	Resistance	16k	0603	Yageo	RC0603FR-0716K	R47
85	Resistance	91k	0603	Yageo	RC0603FR-0791K	R48
86	Resistance	OR jumper	0603	Yageo		R56, R128, R148, R149, R167
87	Resistance	68R	0603	Yageo	RC0603FR-0768R	R57, R98, R101
88	Resistance	47R	0603	Yageo	RC0603FR-0747R	R61, R175, R179
89	Resistance	13k	0603	Yageo	RC0603FR-0713K	R62
90	Resistance	2.4k	0603	Yageo	RC0603FR-072K4	R67
91	Resistance	33R	0603	Yageo	RC0603FR-0733R	R69
92	Resistance	3.3k	0603	Yageo	RC0603FR-073K3	R70
93	Resistance	10k	0402	Yageo	RC0402FR-0710K	R76, R107, R125

94	Resistance	5.1k	0603	Yageo	RC0603FR-075K1	R83, R102, R186
95	Resistance	220R	0603	Yageo	RC0603FR-07220R	R93
96	Resistance	33k	0603	Yageo	RC0603FR-0733K	R110, R145, R163, R164
97	Resistance	680R	0603	Yageo		R111, R165
98	Resistance	20k	0603	Yageo	RC0603FR-0720K	R133, R183
99	Resistance	68k	0603	Yageo	RC0603FR-0768K	R143
100	Resistance	330R	0603	Yageo	RC0603FR-07330R	R157, R192
101	Resistance	510k	0603	Yageo	RC0603FR-07510K	R158
102	Resistance	6.8k	0603	Yageo	RC0603FR-076K8	R188
103	Resistance	56k	0603	Yageo	RC0603FR-0756K	R189
104	Resistance	OR jumper	0402	Yageo	-	R198
105	Exclusion	33R	0603X4/8P	Yageo	YC164FR-0733R	RP1
106	Exclusion	100R	0603X4/8P	Yageo	YC164FR-07100R	RP2, RP3, RP4
107	Adjustable Resistance	10k	3X3 SMT	domestic	-	RW1, RW3, RW4, RW5, RW6, RW8
108	Potentiometer	R09	Rachis centre-vent	domestic	-	RW2
109	IF transformer	1402	5x5 SMT		-	T1, T3, T4, T6, T8
110	Transformer	744242510	WE-SLM	Würth	744242510	T2, T11
111	IF transformer	1802	5x5 SMT		-	T5, T16
112	IF transformer	1404	5x5 SMT		-	T7
113	Single Pin Header	2.54mmspacing	SIP2	domestic	-	TP3, TP8
114	IC	BU4S66G2	SOT-23-5	ROHM	BU4S66G2	U1
115	IC	LM321MF	SOT-23-5	TI	LM321MF	U2, U11, U14
116	IC	UPC3218GV	TSSOP-8	CEL	UPC3218GV	U3
117	IC	AS179-92LF	SC-70-6	SKYWORKS	AS179-92LF	U4, U12, U15, U18
118	Ring mixer	ADE-1	SMT	MINI	ADE-1	U5
119	IC	NE602A	SO-8	Philips	NE602A	U6
120	IC	MC33204DTB	TSSOP-14	ON	MC33204DTB	U7
121	IC	AT24C32N-10SC-2.5	SO-8	ATMEL	AT24C32N-10SC-2.5	U8
122	IC	LM386N	DIP-8	NS	LM386N	U9
123	IC	AD831AP	PLCC-20	ADI	AD831AP	U10
124	IC	CD4051BPWR	TSSOP-16	TI	CD4051BPWR	U13
125	Optical coupler	PC817	DIP-4	domestic	-	U16, U28
126	IC	STM32F103VET6	QFP-100	ST	STM32F103VET6	U17
127	IC	LM1117MP-3.3/NOPB	SOT-223	TI	LM1117MP-3.3/NOPB	U19
128	IC	74HC245PW	TSSOP-20	NXP	74HC245PW	U20
129	IC	74HC238PW	TSSOP-16	NXP	74HC238PW	U21
130	IC	MC33202DM	TSSOP-8	ON	MC33202DM	U22
131	IC	LM4040AIM3-3.0	SOT-23	TI	LM4040AIM3-3.0	U24
132	IC	MCP6001U	SOT-23-5	MICROCHIP	MCP6001U	U25
133	IC	74V1G14C	SC-70-5	ST	74V1G14C	U26
134	IC	TC4W53FU	SSOP8-P-0.65	Toshiba	TC4W53FU	U27
135	Crystal	8MHz	5032-4PIN	domestic	-	X1

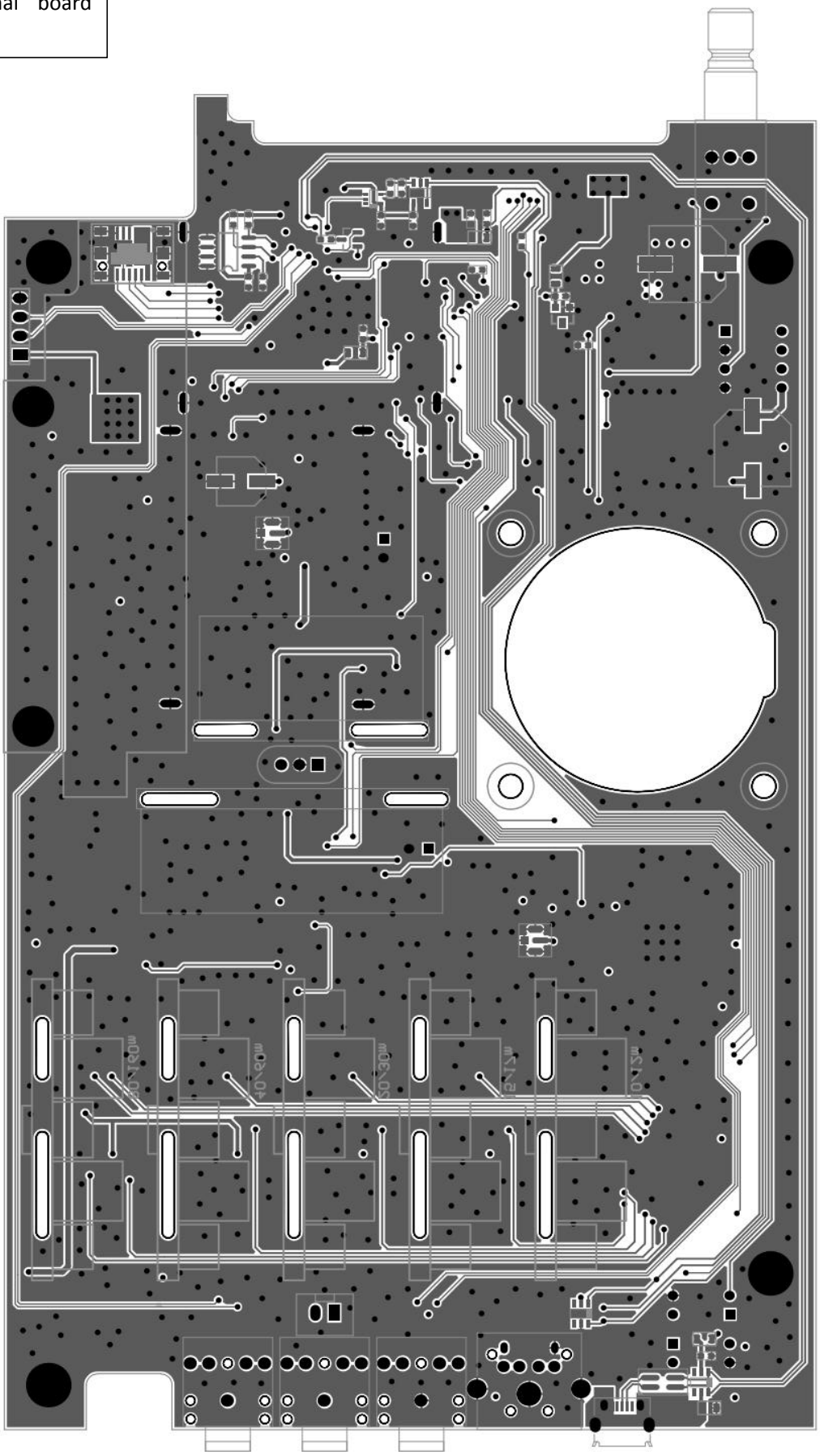
	oscillator					
136	Crystal oscillator	32.768kHz	3215-2PIN	EPSON		X2
137	Crystal filter		49U	SUNNY	-	XF1
138	Xiegu module	80m/160m	module	Xiegu	-	XGM1
139	Xiegu module	40m/60m	module	Xiegu	-	XGM2
140	Xiegu module	20m/30m	module	Xiegu	-	XGM3
141	Xiegu module	15m/17m	module	Xiegu	-	XGM4
142	Xiegu module	10m/12m	module	Xiegu	-	XGM5
143	Xiegu module	SSB Crystal filter	module	Xiegu	-	XMD1
144	Xiegu module	CW Crystal filter	module	Xiegu	-	XMD2

Part 6 PCB

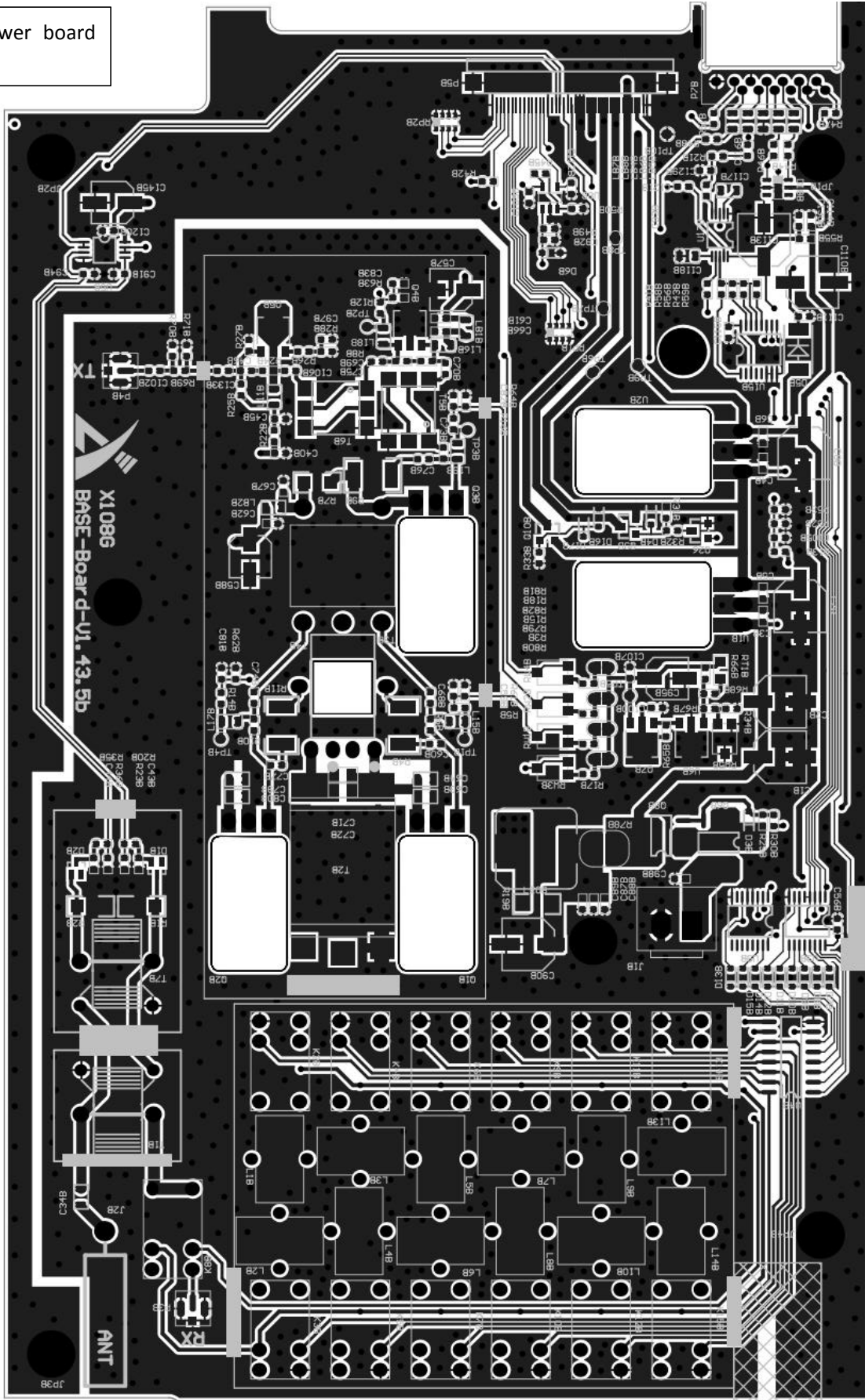
Small signal board
TOP



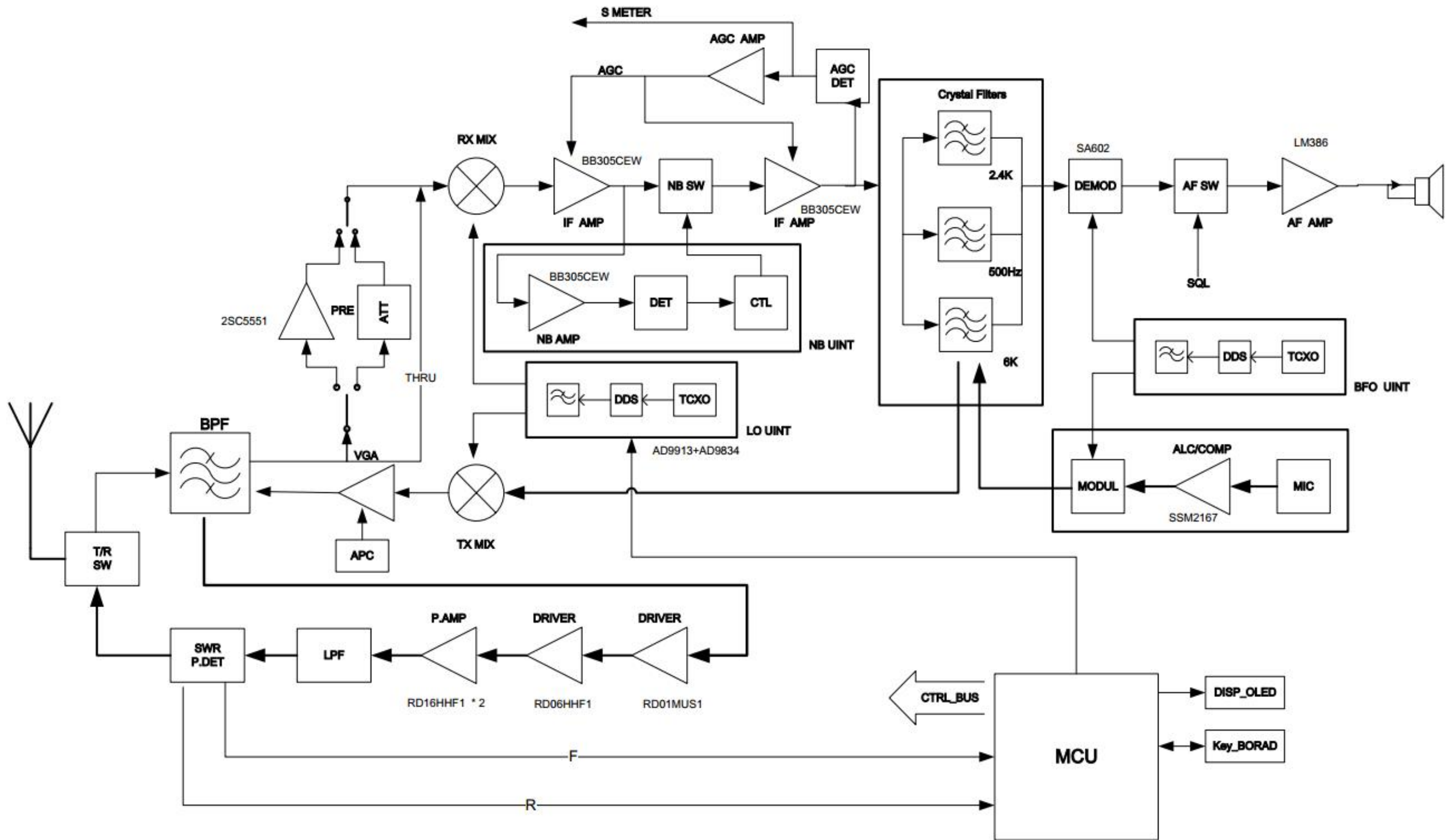
Small signal board
BOTT



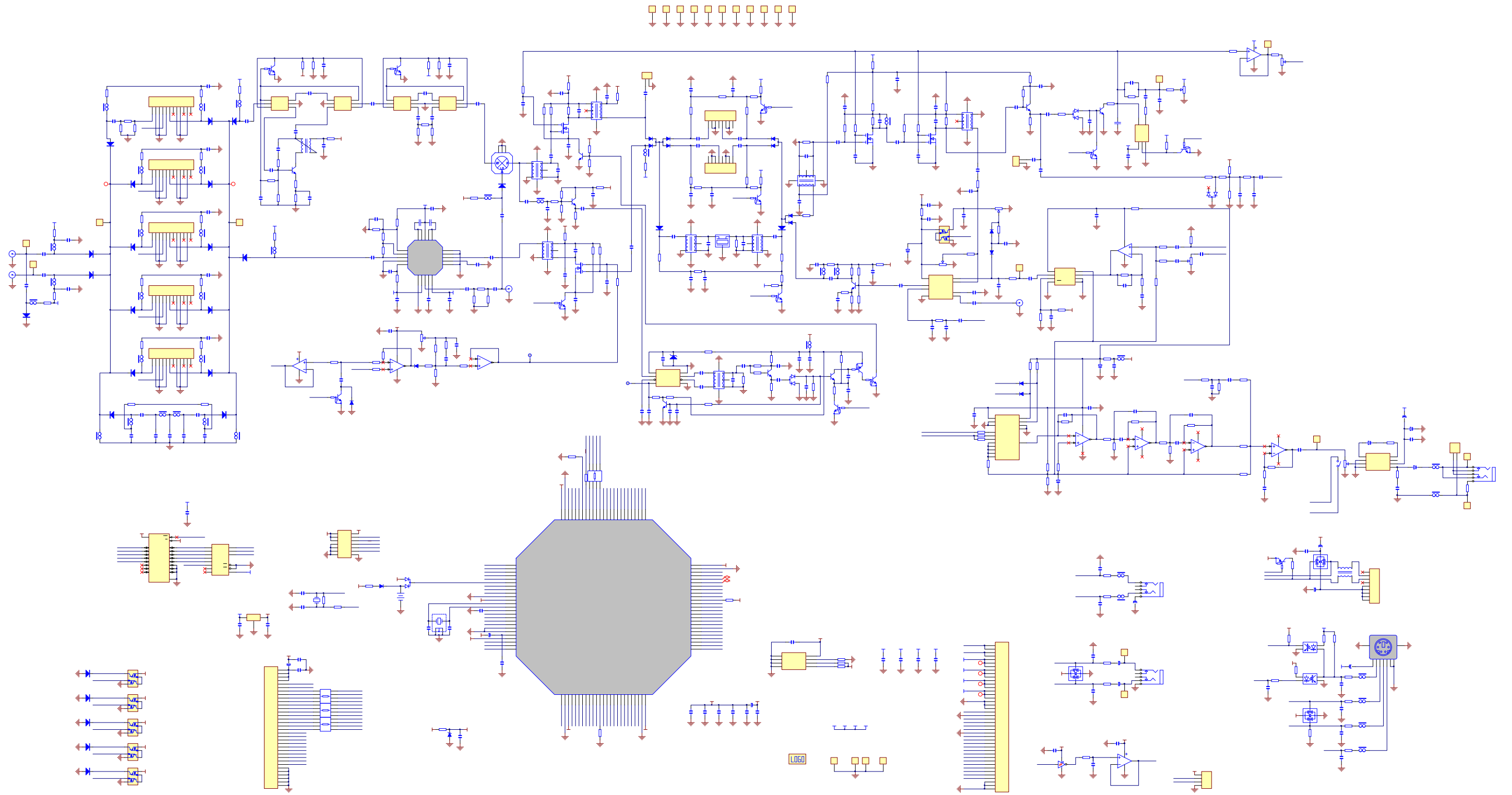
AMP Power board
TOP

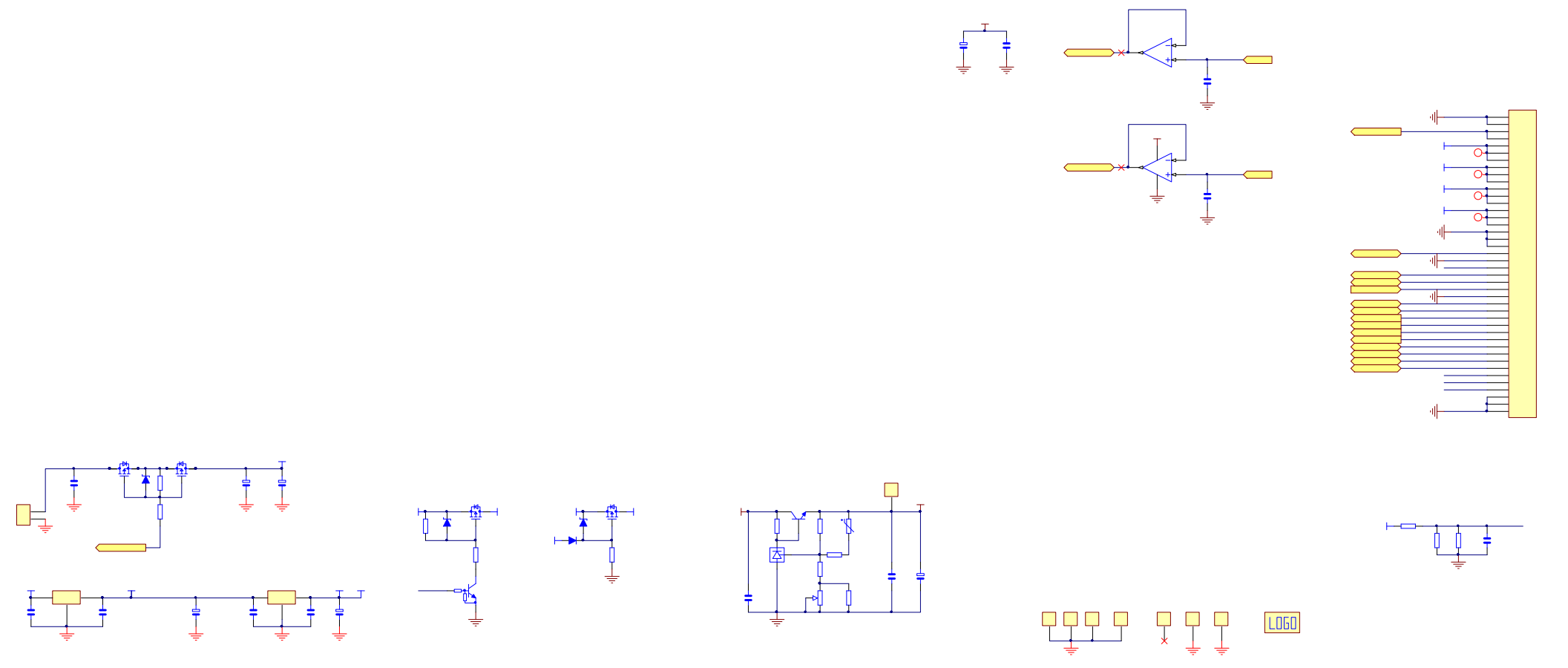
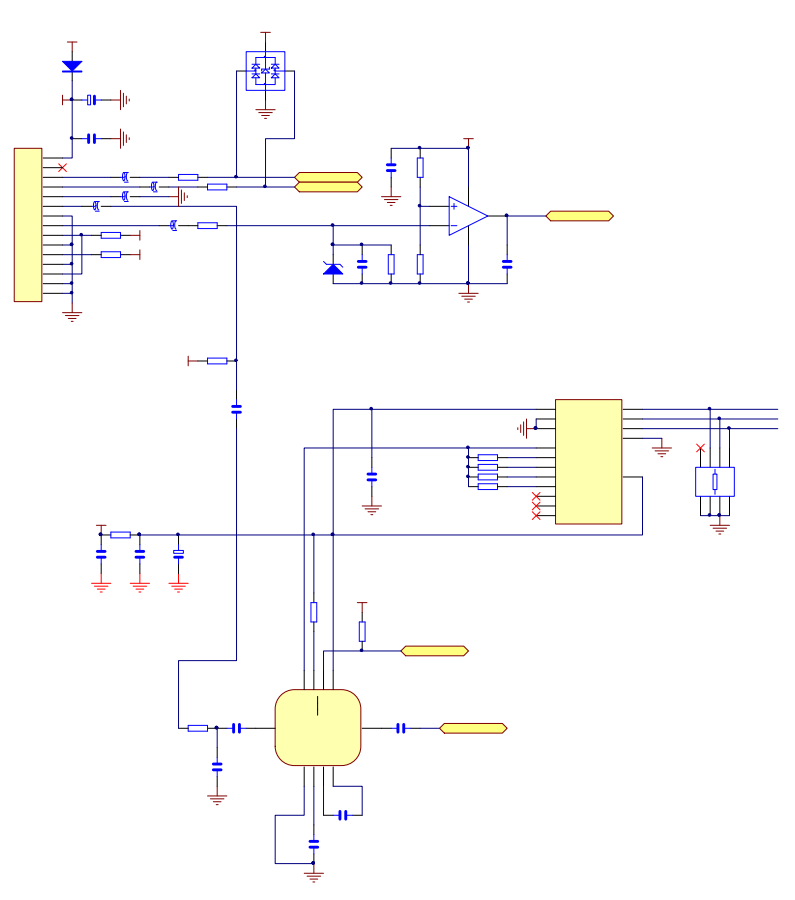
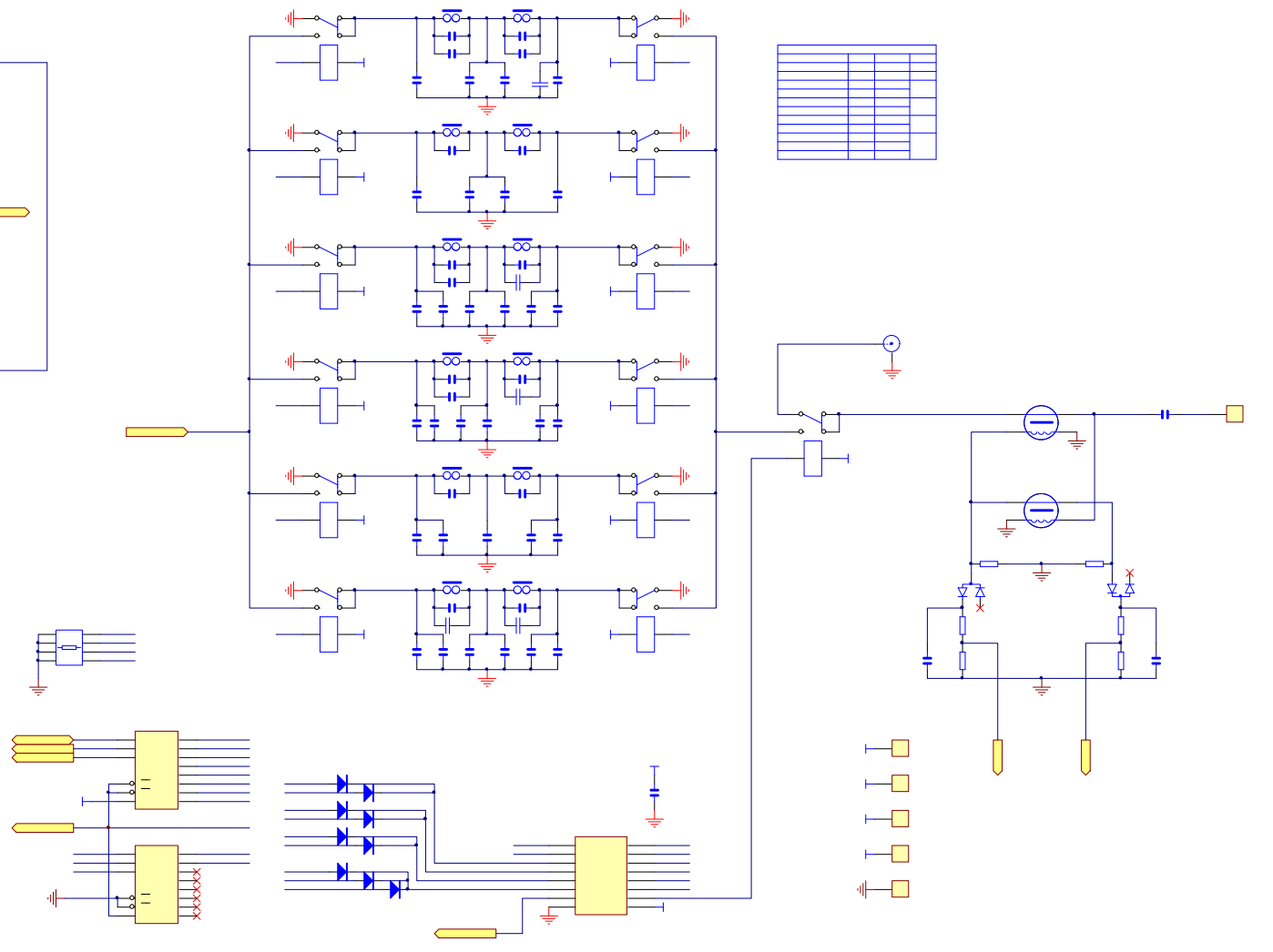
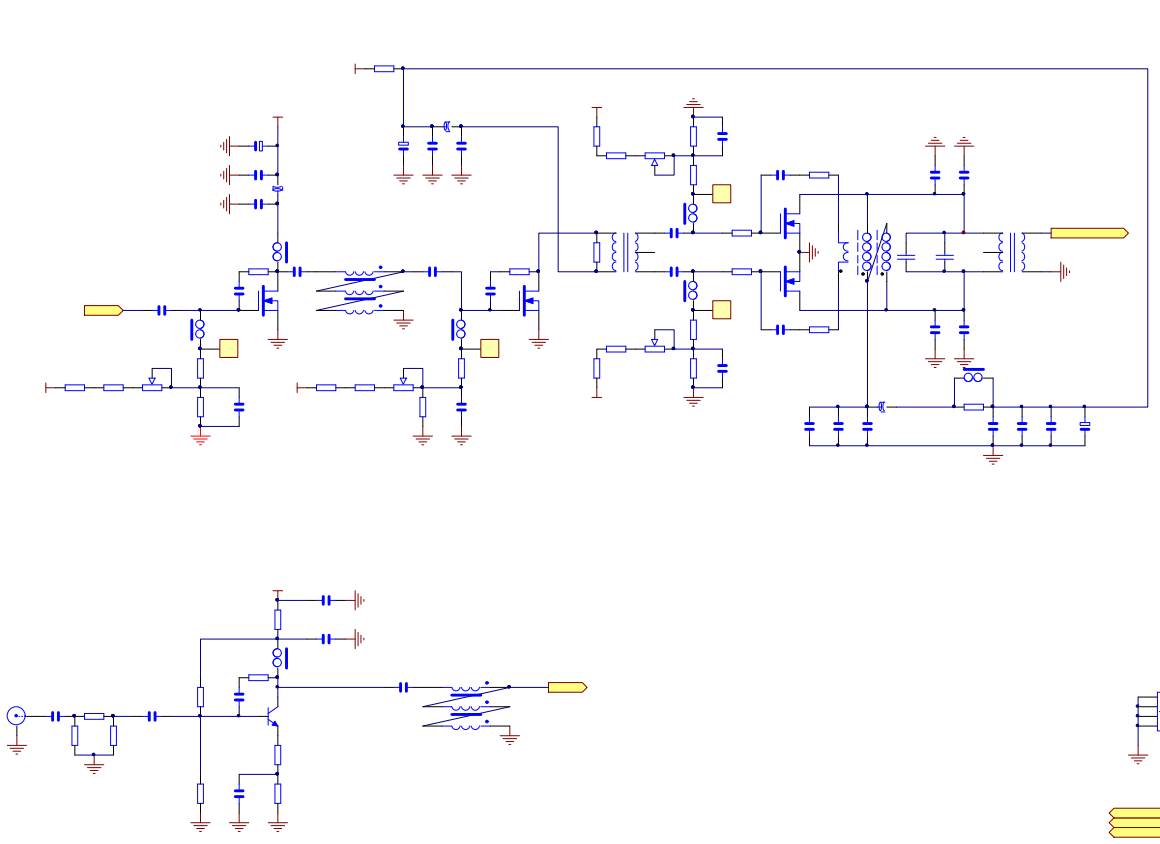


Part 7 Radio block diagram



Part 8 Circuit Schematic







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