

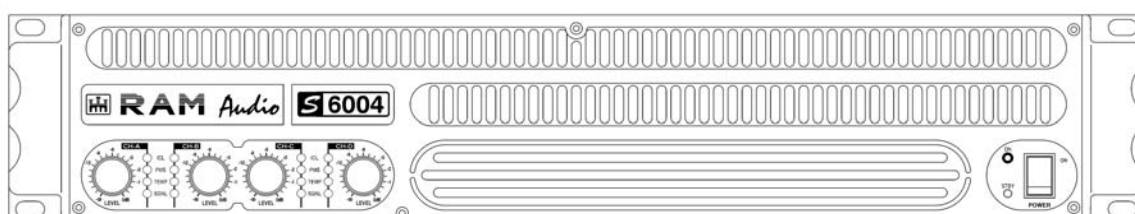


Professional Power Amplifiers

1500-2000-3000-4000-6000

3004-4004-4044-6004-6044

S Series



SERVICE MANUAL



SAFETY PRECAUTIONS

WARNING:



The exclamation point inside an equilateral triangle indicates the existence of internal components whose substitution may affect safety.



The lightning and arrowhead symbol warns about the presence of uninsulated dangerous voltage.

CAUTION

**RISK OF ELECTRIC SHOCK
DO NOT OPEN**

To avoid fire or electrocution risk do not expose the unit to rain or moisture.

To avoid electric shock, do not open the unit. No user serviceable parts inside. In the case of disfunction, have the unit checked by qualified agents.

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GENERAL DESCRIPTION

The S series is a hi power amplifier composed by 2 or 4 channel class H technology fed by a switching power supply. It has twin male-female XLR back panel input connectors per channel with the possibility to work in stereo, parallel or bridge modes. Has too a gain selection switch which permits work at 26, 32 or 38 dB, and a selectable subsonic filter. It has four front panel indicators per channel to inform the amplifier operative status and a potentiometer attenuator per channel to adjust the output level.

At the back panel there are the output Speakon audio connectors. It has too a three wire power mains cord to connect the amplifier to a properly voltage and current rated mains network with earth connection.

Audio circuit description

The circuit input has a balanced (differential) amplifier to reject the common mode noise added to the audio signal. Then the signal passes through the gain amplifier, subsonic filter and the clip limiter gain control that is inactive unless the amplifier will be in clipping situation due to excessive input signal.

Following this, the signal arrives to the properly named power amplifier. This circuit is comprised by an opamp that provides the error signal to a class A voltage amplifier that feeds the common emitter power amplifier. The feedback signal from the output is returned to the opamp that performs the corrections necessary to replicate at the output the amplified input signal.

Inside the class A voltage amplifier is inserted a bias control circuit that provides a operating point to the following power stage and compensates the thermal derating of silicon PN junctions avoiding the thermal runaway problem.

Inside the power stage is implemented a current limiting circuit that avoid to excessive power transistors dissipation in case of shortcircuit or very low impedance loads. The actuation of this circuit limits the output to secure levels.

Following the power amplifier circuit there are a Zobel network and a coil in series that provides correct amplifier performing and unconditional stability in case of excessive inductive or capacitive loads.

The power supply symmetrical rails come from the class H conmutation matrix. This matrix is composed by mosfet transistors and diodes and selects the most suitable voltage level to feed the amplifier depending of the output signal level. This operating method leads to a very low power dissipation in the power transistors. The mosfets in the conmutation matrix are commanded by a voltage comparator which output depends of the output signal and the supply rails voltage.

There is an on board fan control to regulate the fan speed depending of temperature that is sensed via a ntc thermistor attached to the heatsink.

Regarding to the protection systems there are several blocks which comprise:

- DC protection, via a low pass filter that detects DC or very low frequency signal at the output.
- Shortcircuit protection.
- High temperature protection, via the ntc thermistor and a comparator with a fixed absolute reference.
- Power on delay, via a timer that sets the time between power on and full operative status.
- Clip limiter

Regarding the front panel indicators, all of them are commanded from the audio power section, providing visual information for fault, ok status, high temperature, clipping and input signal existence.

GENERAL DESCRIPTION

Power supply description

The amplifier has a switching power supply fully independent and self commanded and protected, to feed the DC voltage to the audio power section.

The mains voltage passes through an interference filter to filter out both the switching noise to go out and the mains interference to come in. Then is located the main fuse and power on switch that when closed permits the charging of primary capacitors via the soft start circuit and the diode bridge. After a few seconds the soft start circuit is bypassed and full mains voltage is applied to the primary side. From the capacitors DC voltage an inverter implemented by two power transistors creates a high frequency square wave that feeds the high frequency transformer primary winding. From the multiple secondary windings several dc voltages are built via the corresponding rectifiers, inductances and capacitors too feed the audio power section.

The control of the entire power supply is done from a separate board with contains all the necessary circuitry. This circuitry is fed via its own power supply, fully independent, located in the same board. Inside the board are located the power transistor drivers and clock generator for the high frequency signal. Beside, are located too the soft start control and the power supply protections, that are:

- Power off or mains voltage absence detector
- Low/high mains voltage detector
- Excessive peak or average primary current detector via a current sensor.
- DC output shutdown

All these protections act stopping the high frequency oscillation and restarting the system configuring a very fast acting way to protect the power supply. The current detector circuit try first to lower the amplifier gain to reduce the current consumption, stopping the oscillation as a seconday action. Also, the audio section can send information to the power supply to stop the oscillation, if you have DC output.

TECHNICAL SPECIFICATIONS

Technical Specifications										
	S-1500	S-2000	S-3000	S-4000	S-6000	S-3004	S-4004	S-4044	S-6004	S-6044
Output Power										
1kHz, 1.0% THD+N										
@ 2Ω	2x 880 W	2x 1190 W	2x 1570 W	2x 1950 W	2x 2950 W	4x 700 W	4x 980 W	-	4x 1440 W	-
@ 4Ω	2x 575 W	2x 790 W	2x 1100 W	2x 1380 W	2x 2025 W	4x 500 W	4x 670 W	4x 975 W	4x 1000 W	4x 1480 W
@ 8Ω	2x 325 W	2x 460 W	2x630 W	2x 810 W	2x 1250 W	4x 300 W	4x 430 W	4x 690 W	4x 620 W	4x 1015 W
Bridge @ 4Ω	1760 W	2380 W	3140 W	3900 W	5900 W	2x 1400 W	2x 1960 W	-	2x 2880 W	-
Bridge @ 8Ω	1150 W	1580 W	2200 W	2760 W	4050 W	2x 1000 W	2x 1340 W	2x 1950 W	2x 2000 W	2x 2960 W
Pink Noise 12dB C.F.										
@ 2Ω	2x 975 W	2x 1360 W	2x 2060 W	2x 2460 W	2x 4225 W	4x 890 W	4x 1170 W	-	4x 2080 W	-
@ 4Ω	2x 610 W	2x 880 W	2x 1240 W	2x 1600 W	2x 2600 W	4x 580 W	4x 820 W	4x 1230 W	4x 1280 W	4x 2110 W
Frequency Response										
Power Bandwidth ±0.25dB	20Hz-20kHz									
Phase Response										
@ 1 watt 20Hz-20kHz	±15 deg									
Total Harmonic Distortion										
20Hz-20kHz	<0.05%									
Intermodulation Distortion										
SMPTE	<0.05%									
Damping Factor										
20-500Hz @8Ω	>500									
Crosstalk										
20Hz-20kHz	>75 dB									
Voltage Gain										
	26/32/38 dB									
Sensitivity										
Rated Power @ 8Ω (V)	2.6/1.3/0.6	3.0/1.5/0.8	3.6/1.8/0.9	4.0/2.0/1.0	5.0/2.5/1.3	2.6/1.3/0.6	3.0/1.5/0.8	3.7/1.9/0.9	3.5/1.8/0.9	5.0/2.5/1.3
Signal-to-Noise Ratio										
20Hz-20kHz	112 dB	113 dB	115 dB	116 dB	118dB	112dB	113dB	116dB	116dB	118dB
Required AC Mains										
230 V - 50 Hz (idle)	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A
@ 4Ω (1/8 rated power)	4 A	4.8 A	6.2 A	7.5 A	10.5A	6 A	7.5 A	11A	10.5A	15A
Dimensions										
W x H x D (mm)	483x89x310									
W x H x D (inches)	19x3.5x12.2									
Weight										
Net (Kg- Lbs)	8-17.6	8-17.6	8.5-18.7	8.5-18.7	8.6-18.9	8.5-18.7	8.5-18.7	8.5-18.7	8.6-18.9	8.6-18.9
Protections										
Soft-start, Turn-on Turn-off transients, Muting at turn-on, Over-heating, DC, RF, Short-circuit, Open or mismatched loads, Overloaded power supply, ICL™, PMS™, SSP™										

QUICK REPAIR PROCEDURE

MAINS CURRENT LIMITER:

To test the power amplifier it is advisable to implement a mains current limiter to avoid any shortcircuit, in case the unit has damaged parts that have not been fixed. The most effective and easy solution is to use a pair of 100W light bulbs arranged in parallel, and placed in series with the mains supply. If everything is OK, when you switch on the power supply the bulbs will light until the primary capacitors are fully charged and then they will bright softly enabling enough current to pass through to reach a normal start up of the supply.

POWER SUPPLY:

When the switching power supply breaks, the usual consequences are that both IGBT transistors (Q2 & Q3) explode and that the IR2110S ic (U12) from the control board (the IGBT driver) gets damaged. It may be possible that more ic's from the control board get damaged too (U15 SG3525 or U9 NE555), but this is not usual. Once an IGBT breaks, it is absolutely necessary to change the IR2110S ic too, even if it seems to be OK. If the IR2110S ic is not replaced, the IGBTs will damage again. If you have not the requiered SMT tools to change any SMD component, the best option is to change the complete control board.

To change the IGBTs follow the next steps: take out the power supply unit from the amplifier by removing the screws at the PCB. Put the power supply PCB upside down and unscrew the 4 screws that are on the IGBT heatsink, remove both switching transistors by cutting their legs and clean the pad holes of solder. Screw another pair of transistors to the heatsink with their corresponding mica insulators, and place the heatsink again into its location by fastening the other two screws and soldering the transistors legs to the PCB. Above manipulations must be done with utmost care in order to have a successful repair. Check that the transistor collector is insulated from the heatsink and that this heatsink is located parallel to the other one. Change the control PCB and do a visual test of the rest of the components.

Test too the integrity of secondary rectifiers using a multimeter in "diode mode". Test also they are insulated from the heatsink. (D9, D10, D11, D12, D13, D14, D15 and D16).

To test the power supply it is advisable to implement a little bench to avoid any risk because of lack of insulation from direct ac mains voltage in most of the circuit. We recommend to use a transformer with turns ratio 1:1 to isolate the mains from the power supply (remember that the 230 V ac is still present) but now you are isolated from earth. Connect the power supply through the current limiter (bulbs in series with the mains) and you must look at the control board green led to check that the 15Vdc control board supply is operating and that there is not any shorted ic. You can measure then the voltages at the output connector, they will be lower than expected because the voltage drops at the bulbs. The voltages are the following:

S 1500: $\pm 49V$ / $\pm 81V$
S 2000: $\pm 49V$ / $\pm 98V$
S 3000: $\pm 65V$ / $\pm 114V$
S 4000: $\pm 65V$ / $\pm 130V$
S 6000: $\pm 54V$ / $\pm 108V$ / $\pm 162V$
S 3004: $\pm 49V$ / $\pm 81V$
S 4004: $\pm 49V$ / $\pm 98V$
S 4044: $\pm 65V$ / $\pm 130V$
S 6004: $\pm 38V$ / $\pm 76V$ / $\pm 115V$
S 6044: $\pm 54V$ / $\pm 108V$ / $\pm 162V$

When you are sure that the unit is OK, you can short the light bulbs with the aid of a switch and measure the correct voltages.

Bear in mind that it is possible that one of the audio power section may be damaged. Test there is no short at the power transistors. Verify also there is not any ground track opened. When switching the amplifier on, measure that the voltage at the power audio section emitter resistors correspond to the first class H level. Check with an oscilloscope, with the probe attached to the emitter resistors, that when applying signal the power supply will change in steps as expected. Test both polarities.

It is highly recommended to test the entire amplifier with the light bulbs in series with the mains supply to avoid further power supply breakings. If the amplifier start up correctly then you may short the light bulbs and apply signal to obtain power from the amp.

QUICK REPAIR PROCEDURE

POWER AUDIO SECTION:

When the audio section breaks, the usual consequences are that some final transistor or/and driver transistor gets shortcircuited. It is possible to get also some class h conmutation mosfet transistor or diode shortcircuited. To check it you have to use a multimeter in diode mode or resistance measure. If the final transistors are OK you can measure around 10ohms between the base and the emitter and very high resistance between collector and emitter. In the driver transistor you have to measure around 230ohms between base and emitter.

If you have a final transistor shortcircuited, you can measure a very low resistance between collector and emitter of all final transistors, but the lower resistance indicates what is exactly the transistor shortcircuited, because this has a direct shortcircuit and the other paralleled transistors have arround 0.66ohms (two serie emittter resistor). Cut the leads of this shortcircuited transistors and continue testing if you have some more transistor broken.

Also, you may have only the driver transistor shorcircuited, then you can measure this direct shorcircuit between collector and emitter of this transistor, and arround 10ohms between the collector and emitter of the all final transistors. Also it is possible to have the driver and some final transistor broken. Cut the leads of any device broken and continue testing until you are sure you have not any more device shorcircuited.

You have to check also the mosfet transistor and diode from the class H switch. They are placed on the same heatsink nearest to the fan. Check you have not a shortcircuit between the drain and the source of the mosfet and check the diode works correctly.

To change any device broken you have remove the heat sinks needed to reach it. Now remove his screw and place the new one with thermal silicone. Clean the surface if needed. Tight the screw using a screwdriver with a torque arround 1.3N/m.

Its is possible you have to change some burn resistor. Check visually specially the 0.33ohms emitter resistor and the 10ohms/1W driver emitter resistor, and if you have some dark resistor measure it and change if needed.

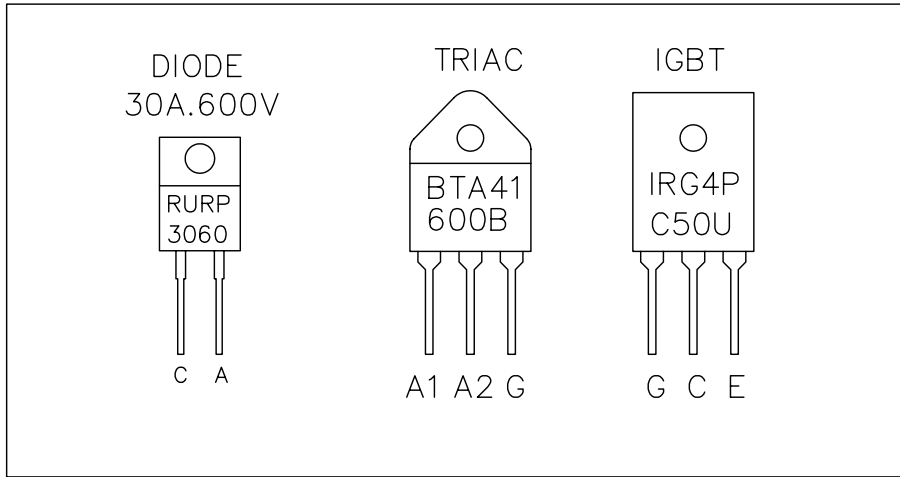
After change all broken devices, check you have not any shorcircuit between the outputs (heat sink), rails and ground. It is highly recommended to test the entire amplifier with the light bulbs in series with the mains supply to avoid further power module breakings. If the amplifier start up correctly then you may short the light bulbs and apply signal to obtain power from the amp. Use 1kHz sinusoidal signal and 4 ohms dummy load to test all works perfectly. Check specially the switch rail works correctly, and you have not any instability when you clip the output.

If the signal input clips before as expected, perhaps you can have some problem with the SOA limit circuit. Some small SMD transistor can be broken. Check if you have problems with the positive or negative semicycle and test the SOA limit components, placed in front of the heat sink. This circuit controls the maximun transistor current and you can test it working with a very low impedance load (1ohm for example) and a small input signal. you can see this system limits the output to a secure value.

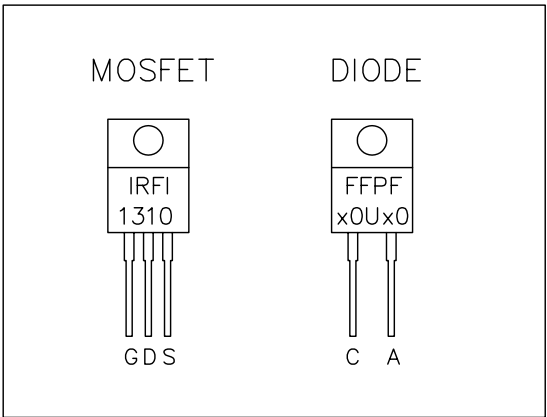
Bias adjusting: you may adjust the Bias point only if requiered. To do it, connect the output to a 4ohms dummy load. Place a 10kHz sinusoidal signal in the input, and setting the oscilloscope at 1V/div scale, adjust the level to have 4Vp output. You have to adjust the PT1 trimer to remove the cross distortion. Take in account you have to adjust to have the minimun current needed to remove the crossover distortion, because if you adjust it with excesive bias current the power amplifier will work very hot or also can become hot without signal.

T0220–T0247 Package devices

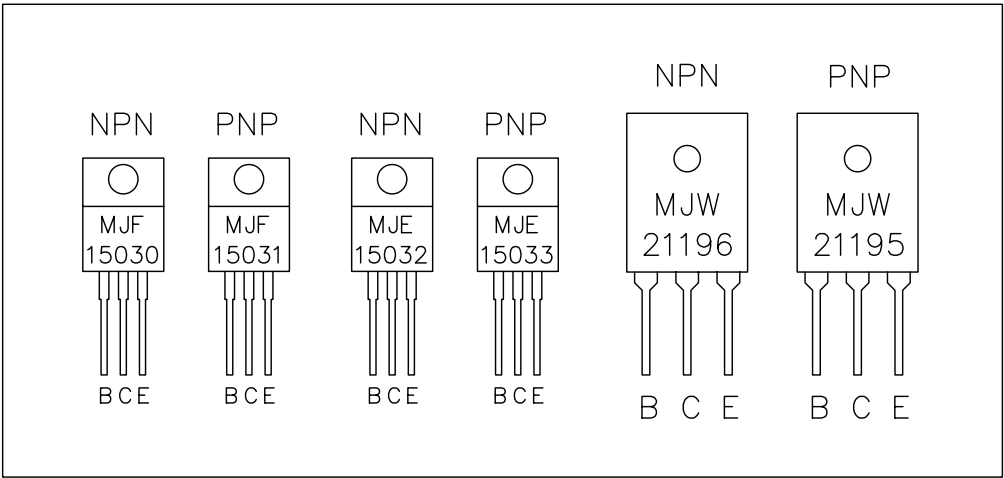
Lead assignments



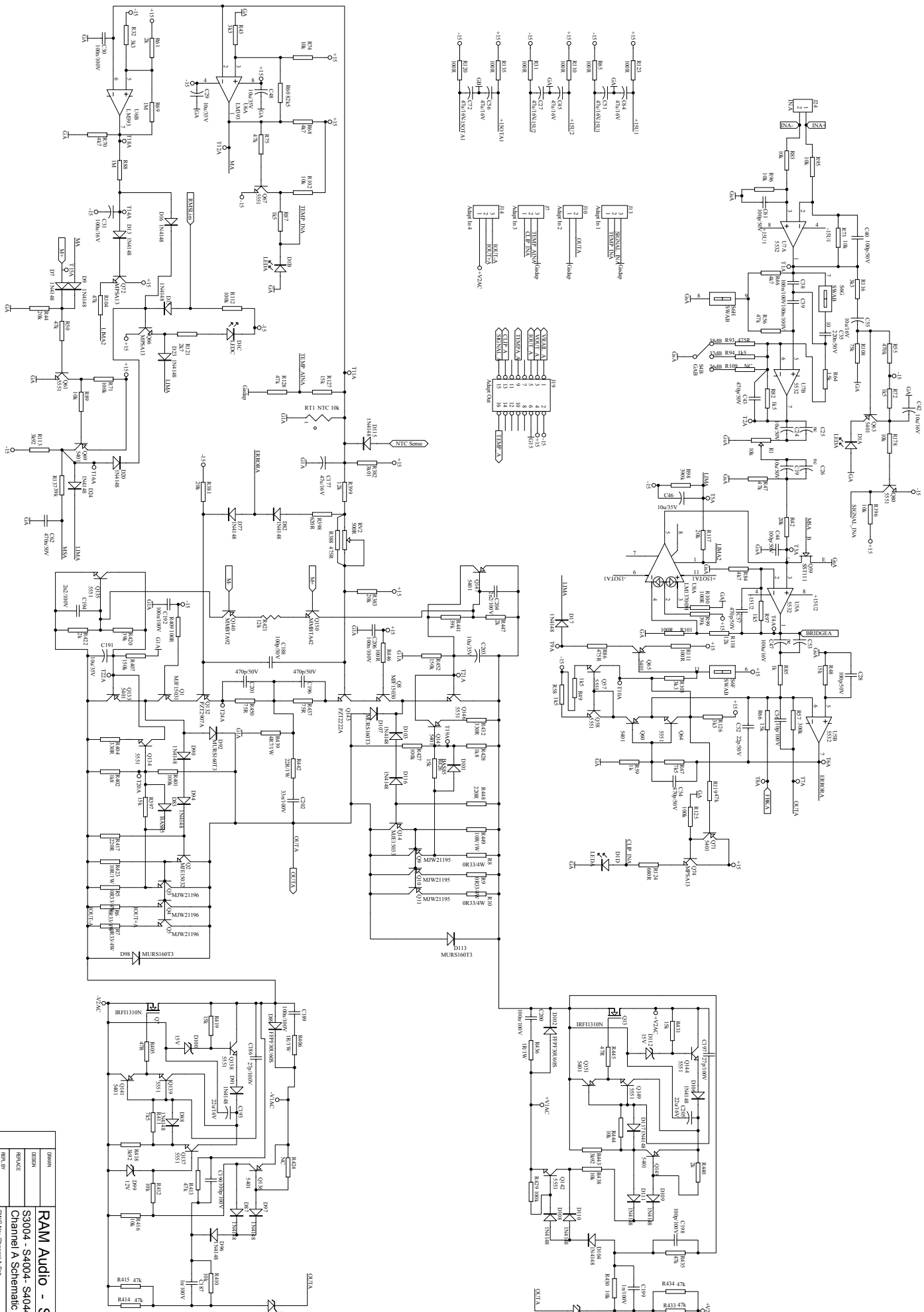
Power
Supply

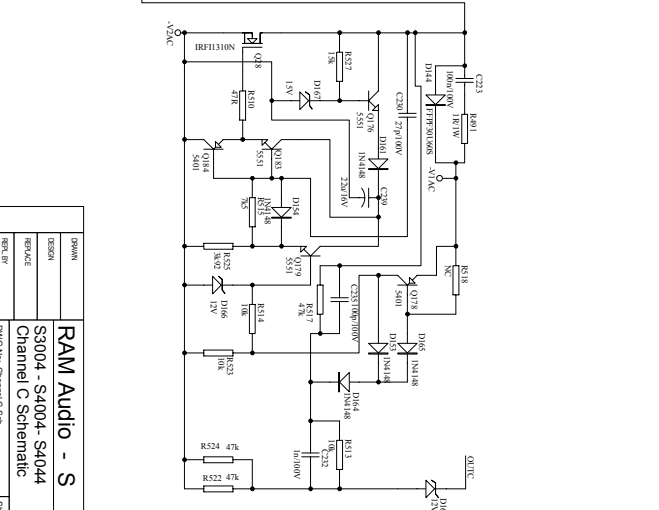
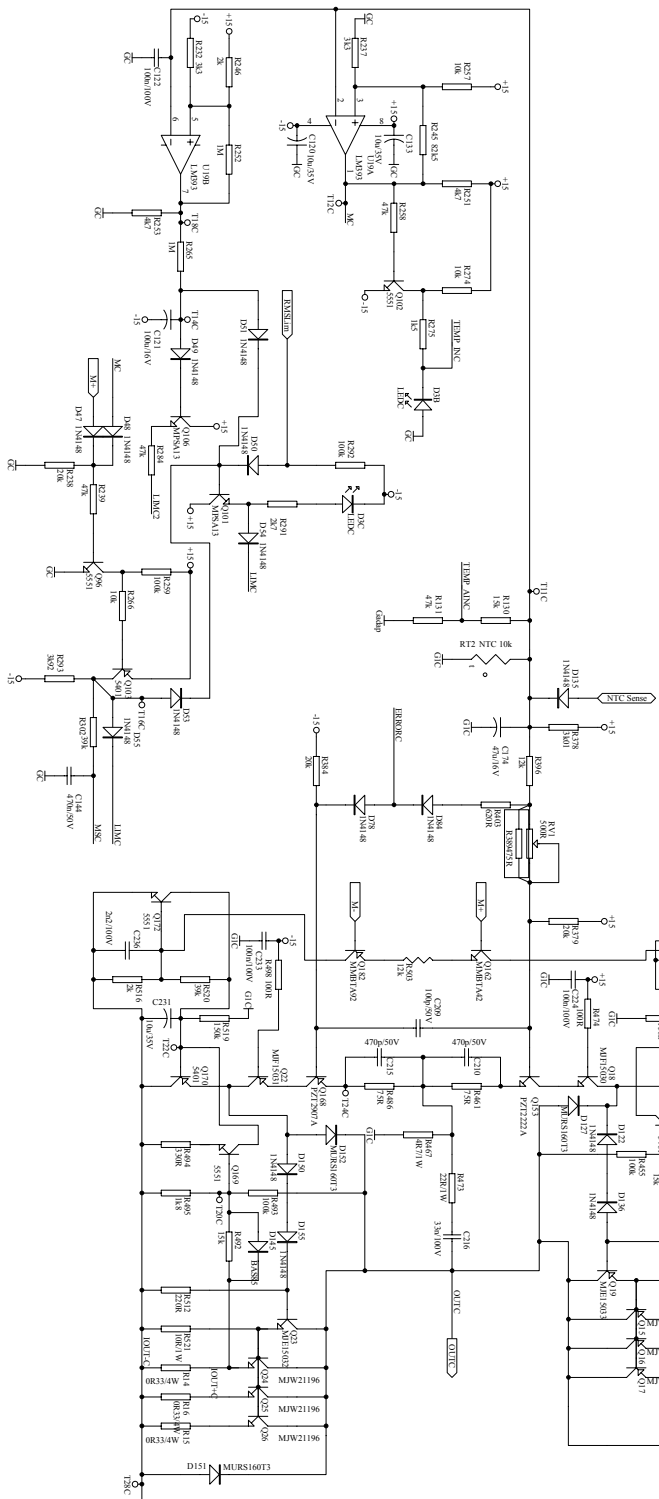
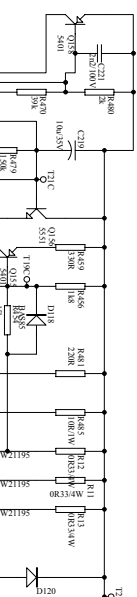
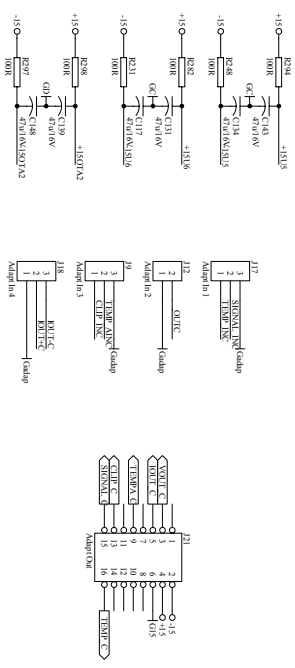
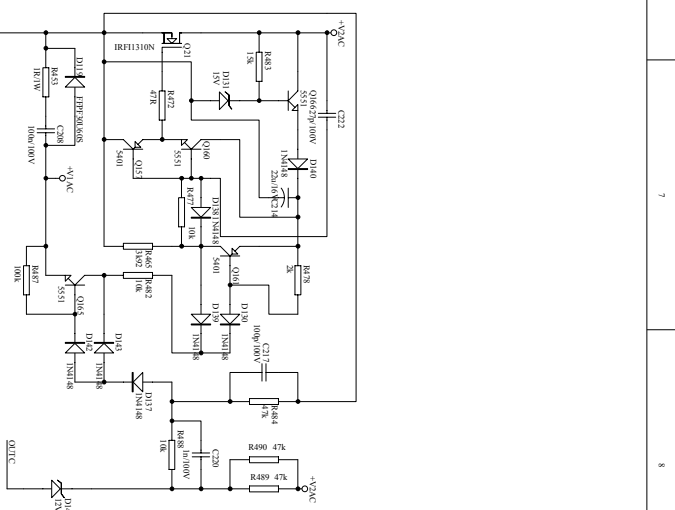
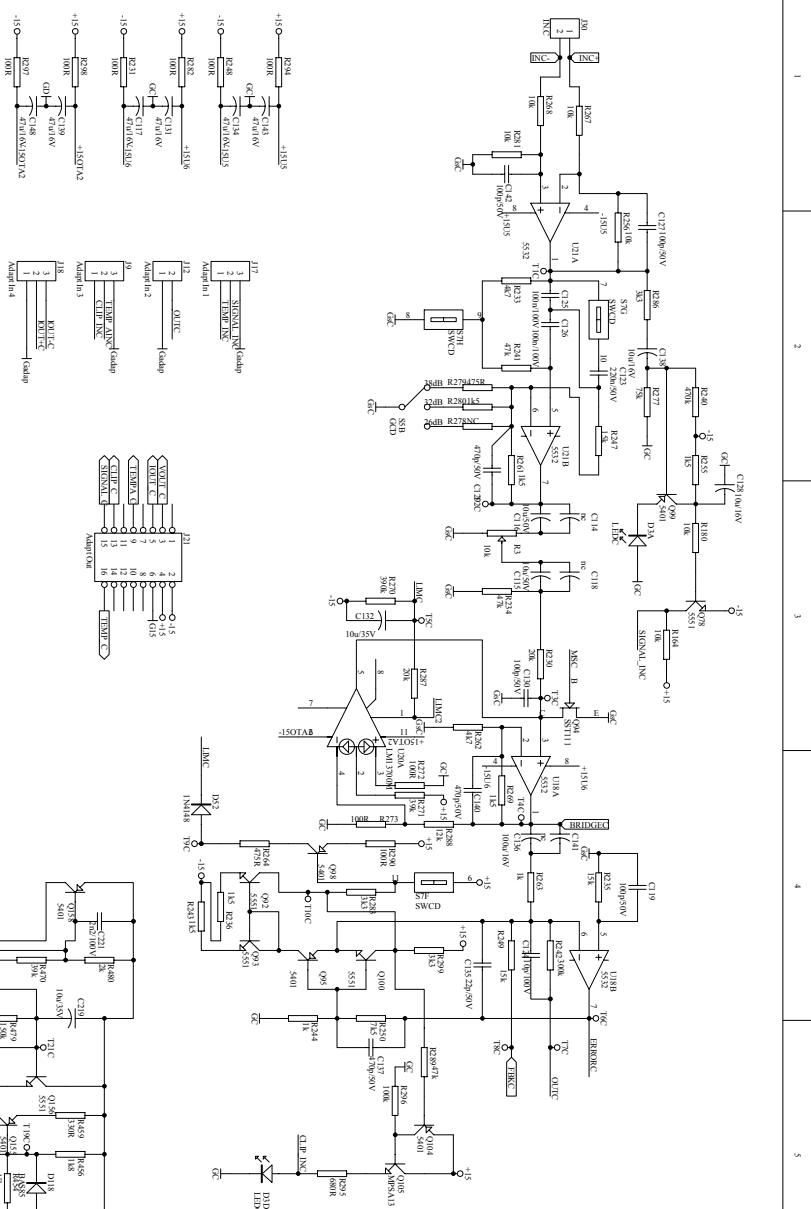


Class H
Switch

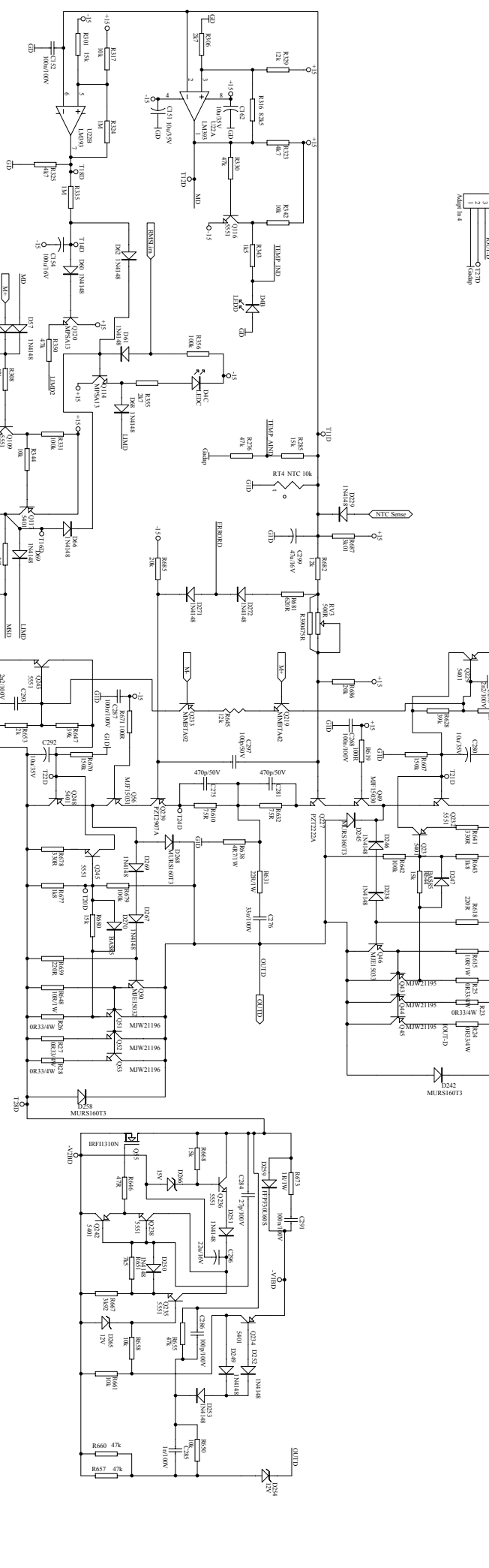
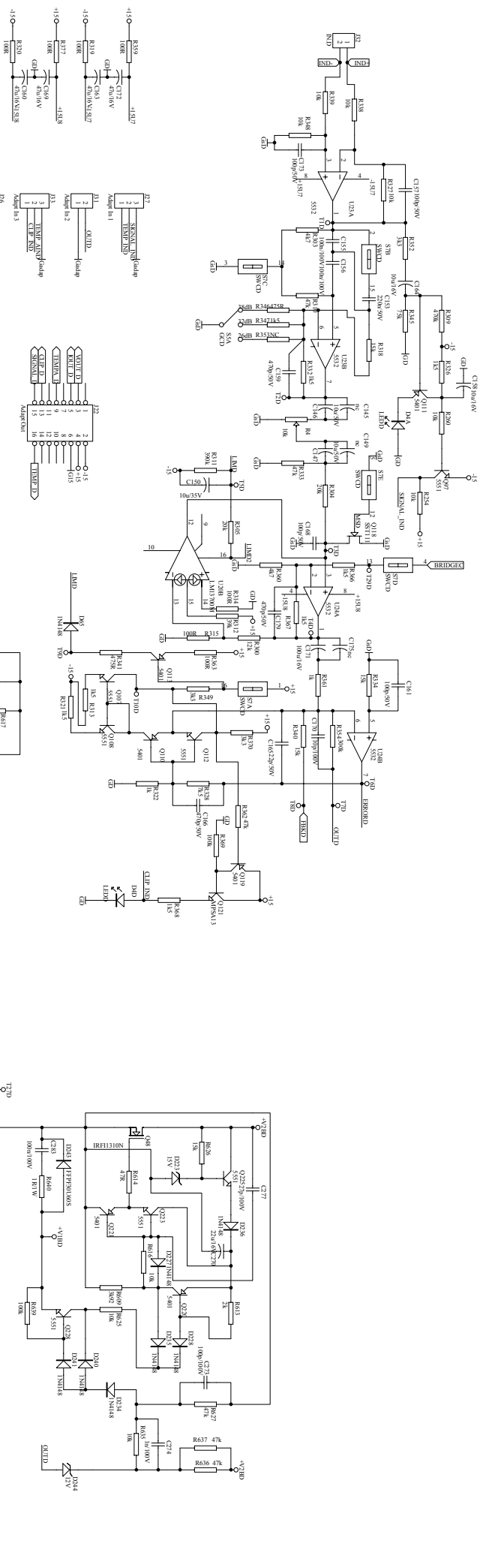


Power
Audio

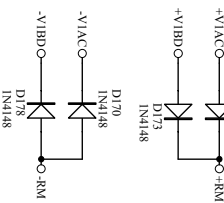
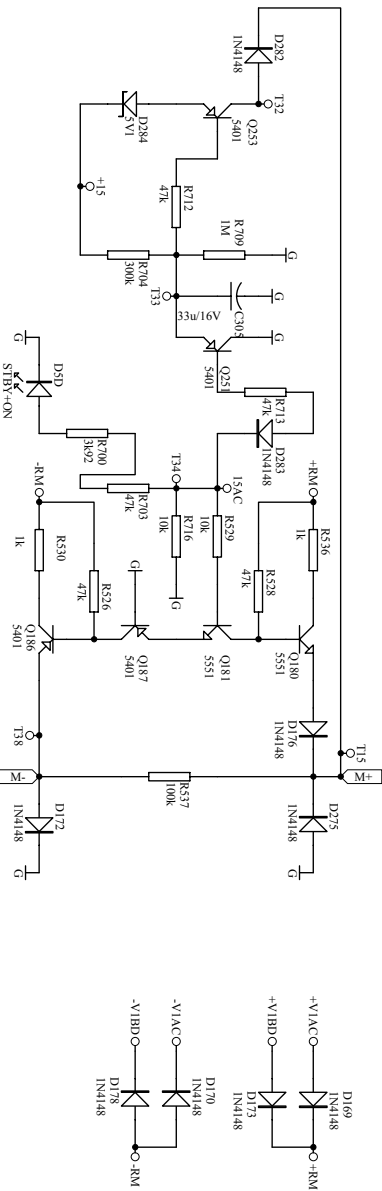
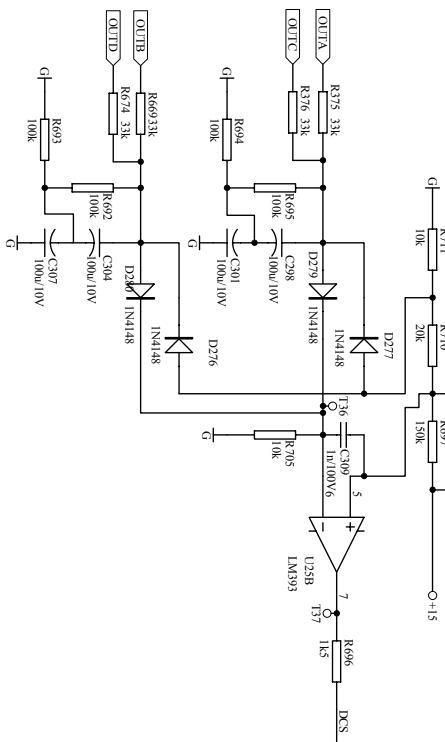
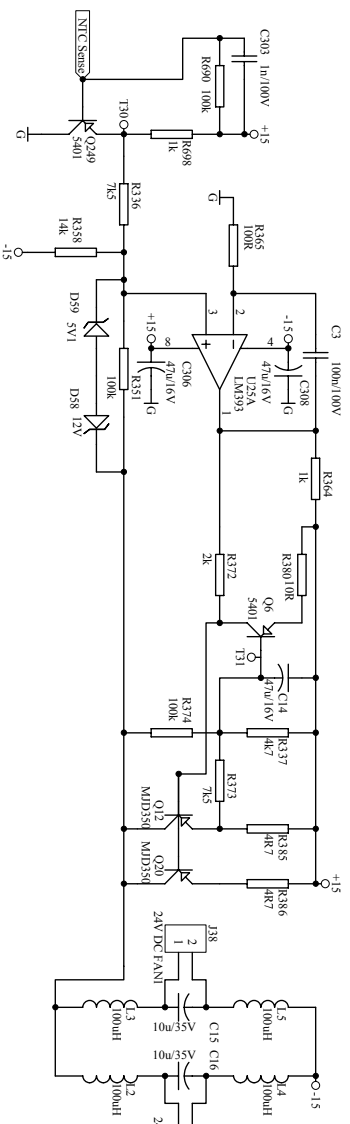
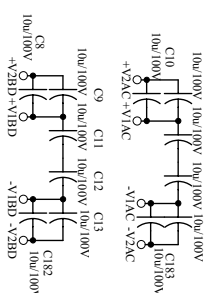
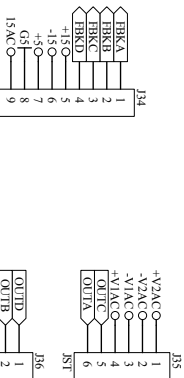
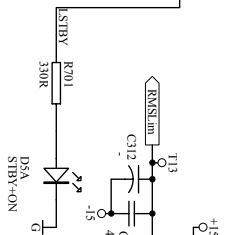
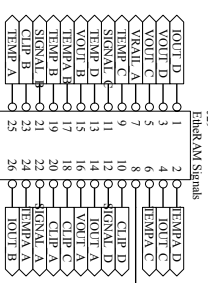
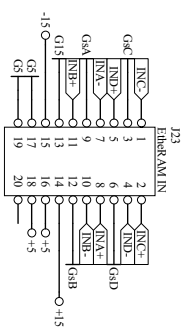
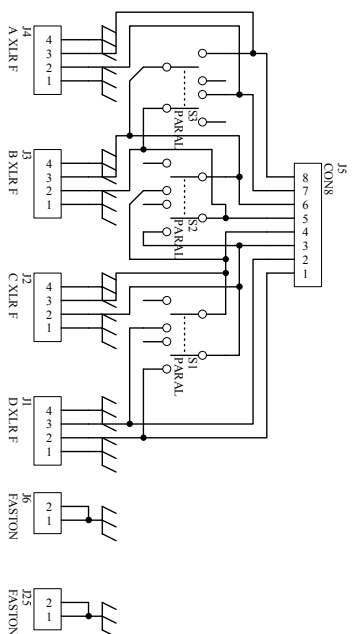




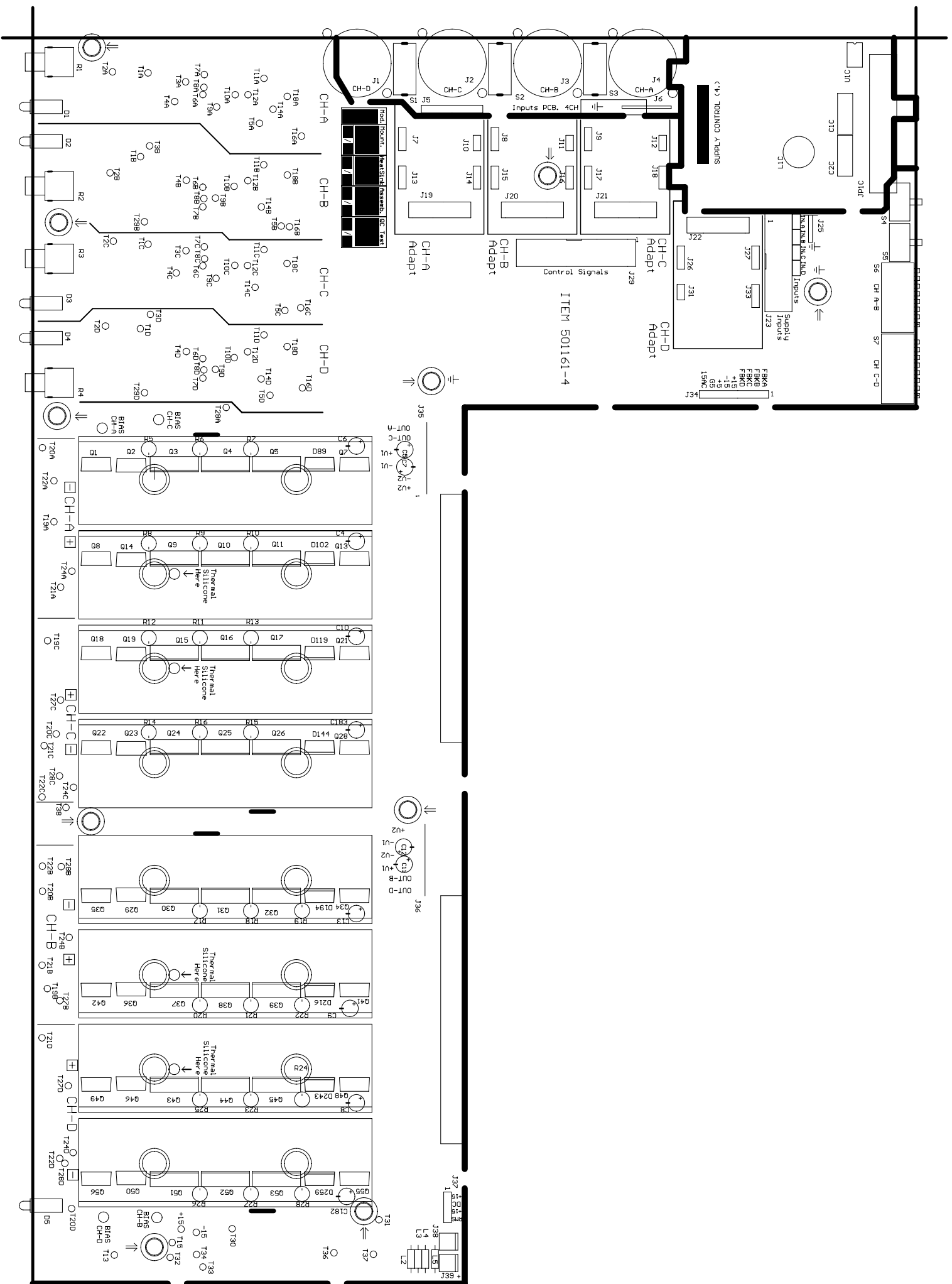
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REPLACE		
REPAIR		
DWG No: Channel C Sch		Sheet 4 of 8

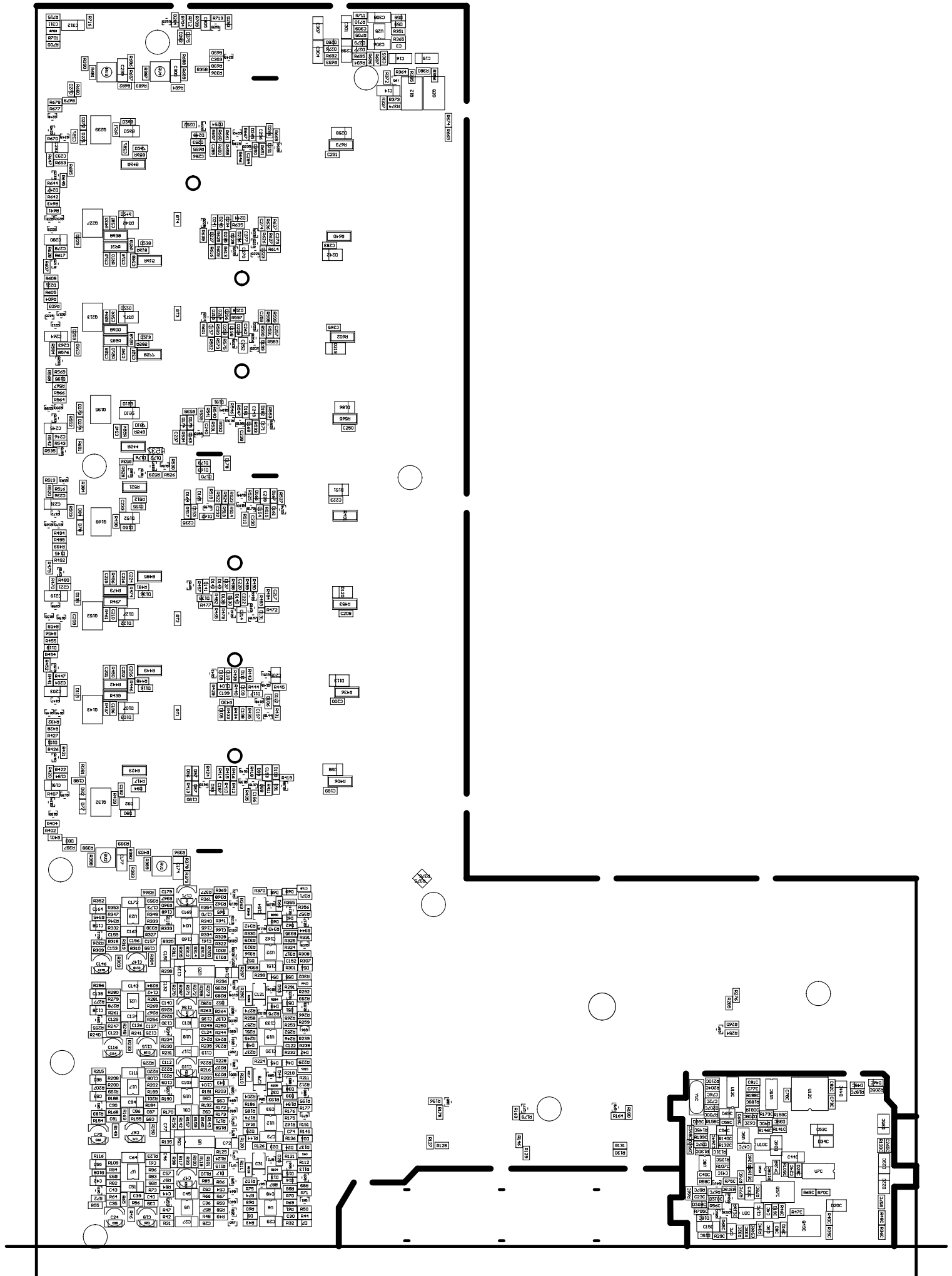


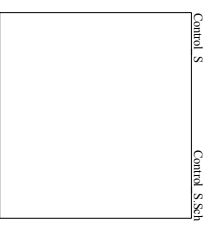
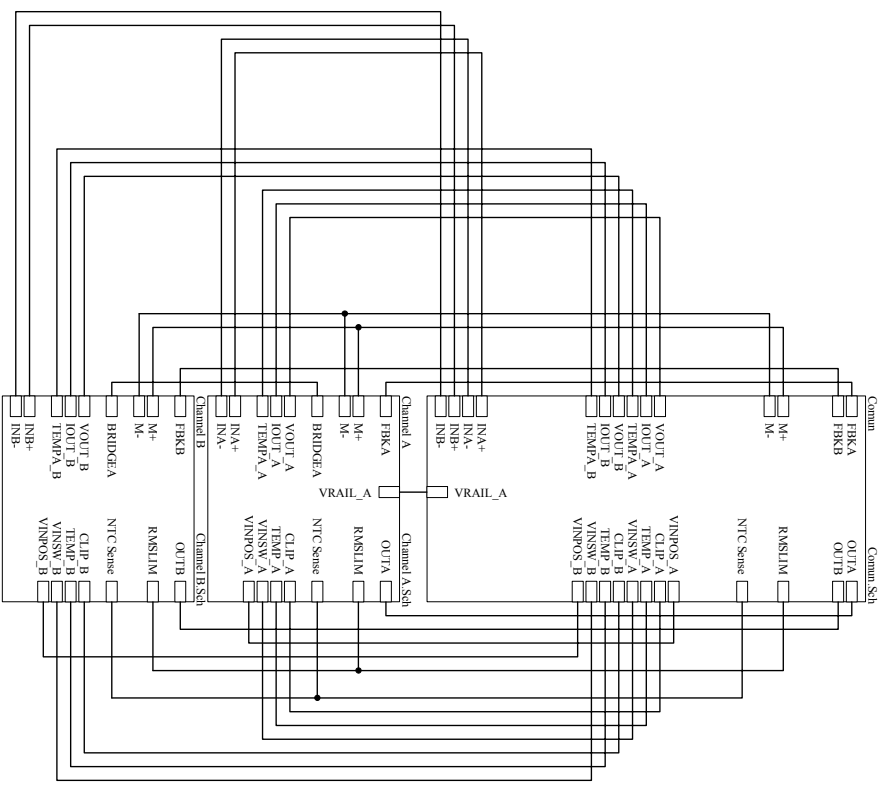
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REVISION	Channel D Schematic
DATE	2010/01/01
BY	Channel D Schematic



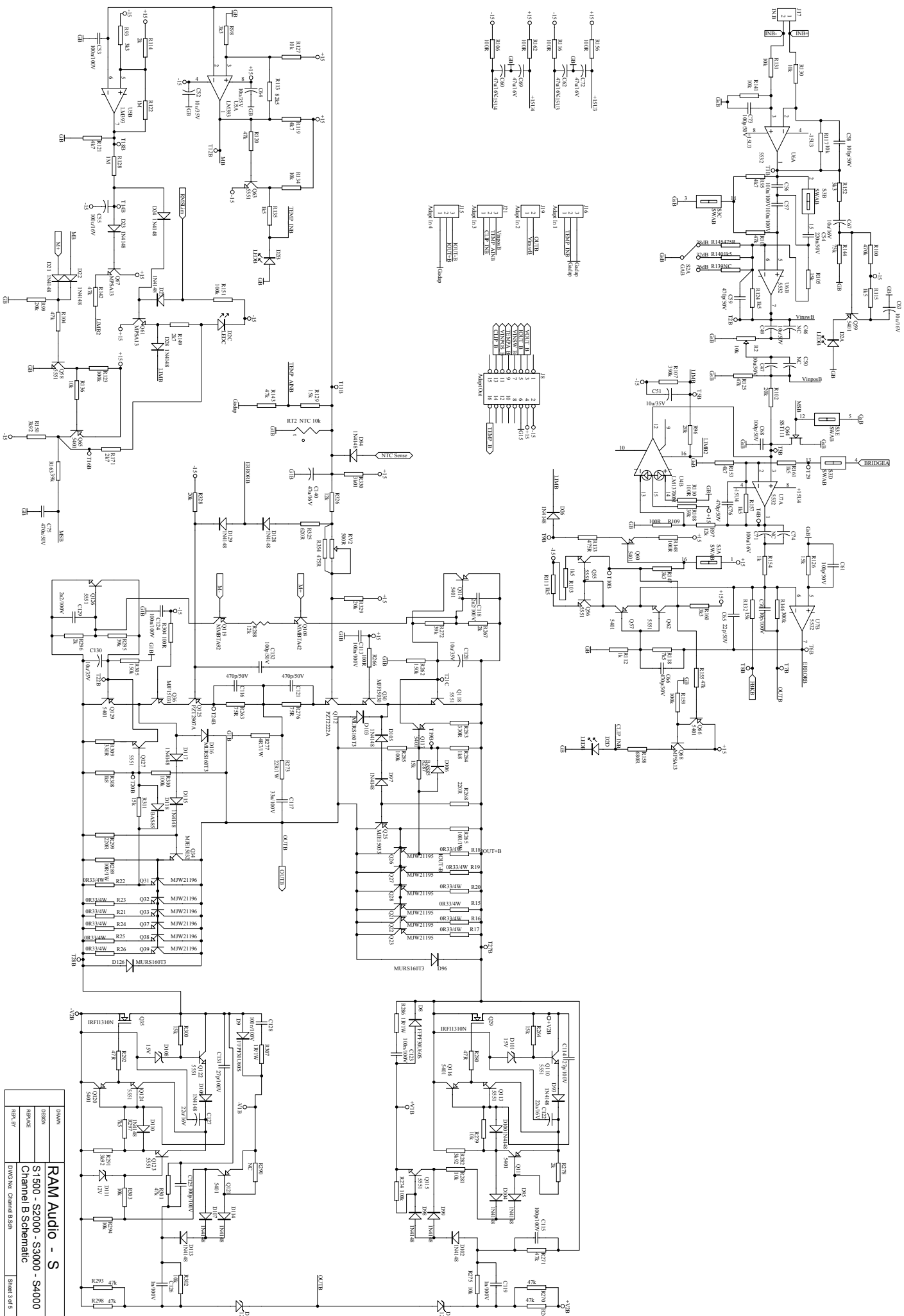
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REPLACE		
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S3004 - S4004-S4044 Input, protections & fans		
DWG No. Comm Sch		Sheet 6 of 8

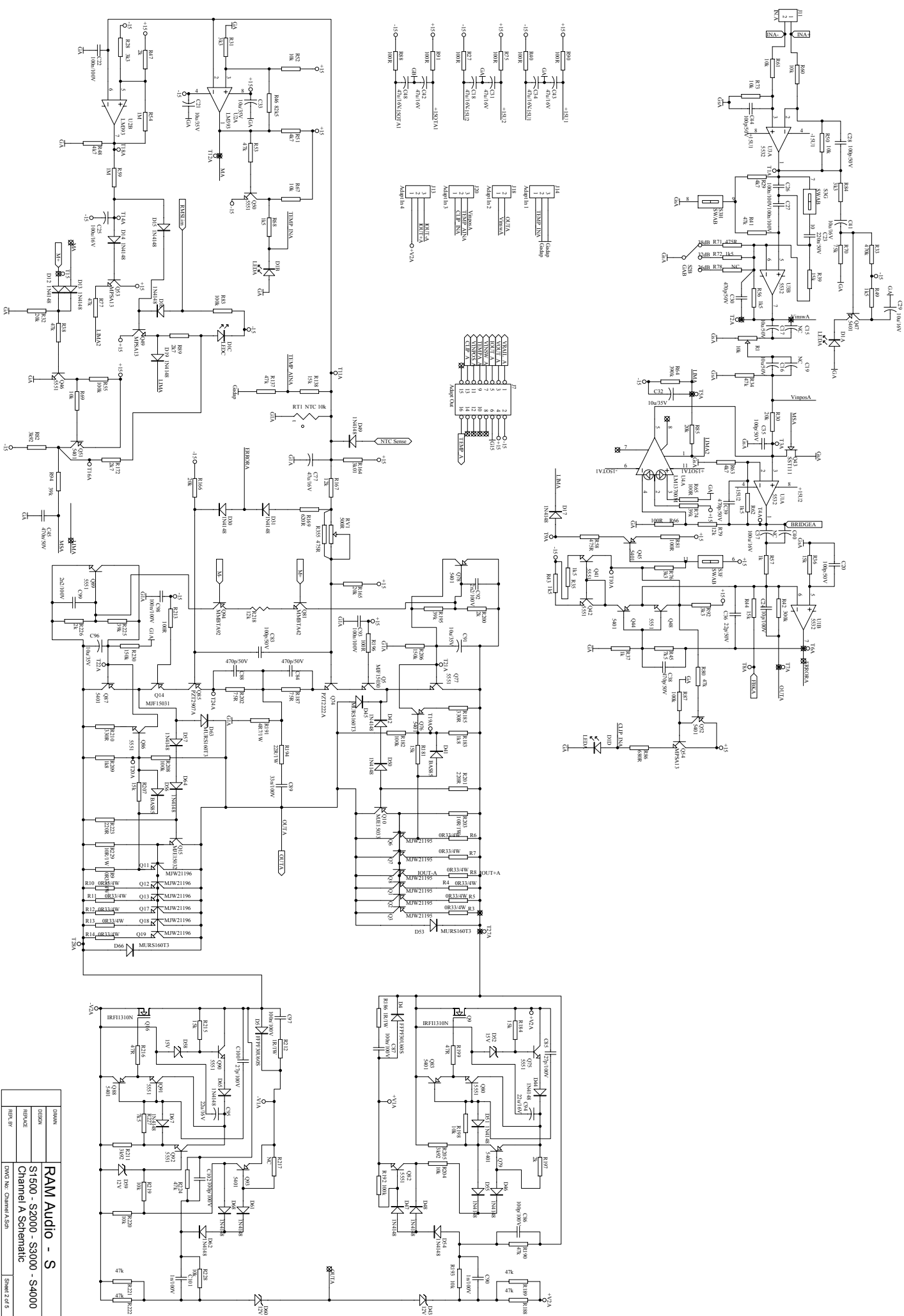


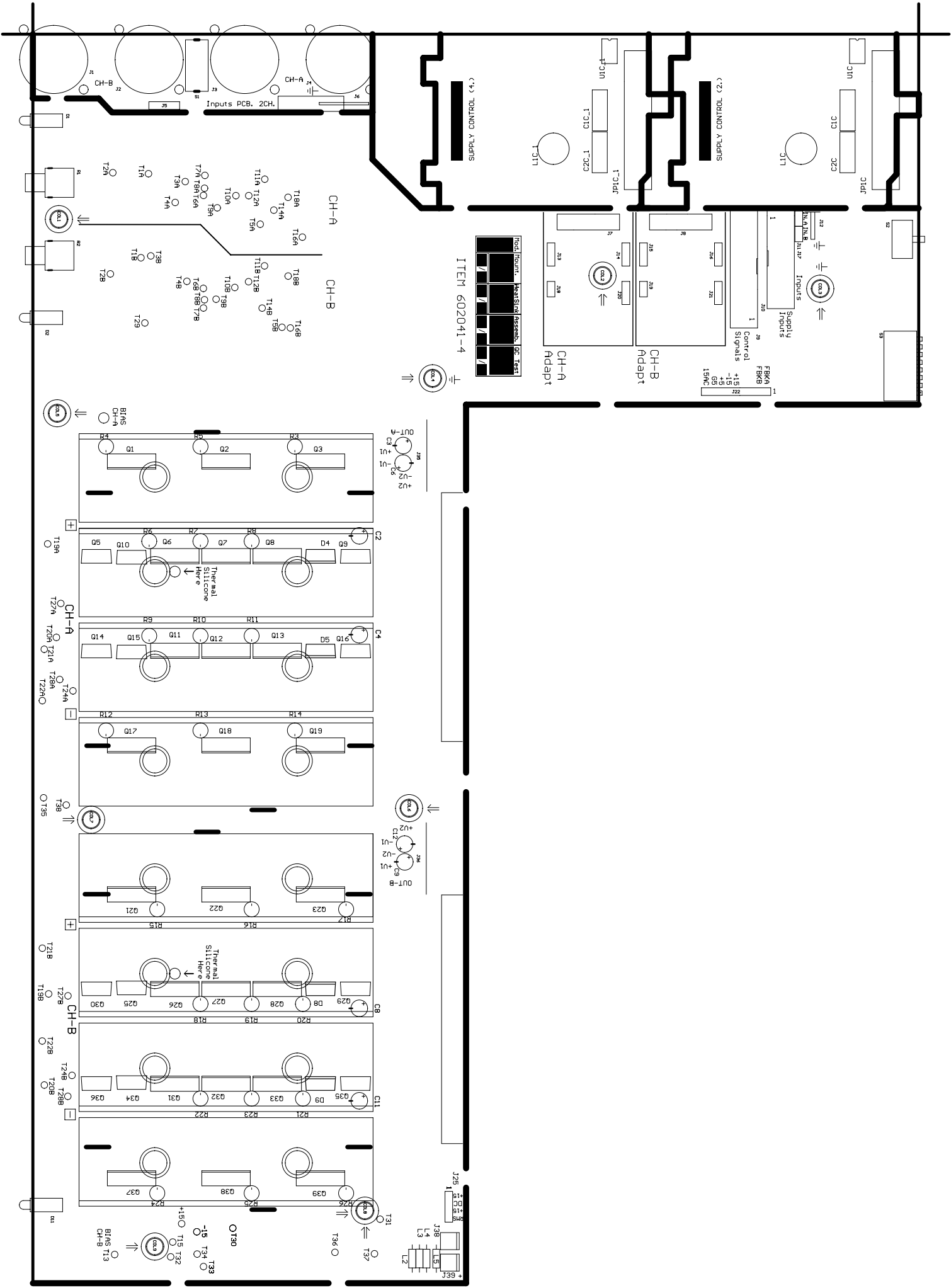


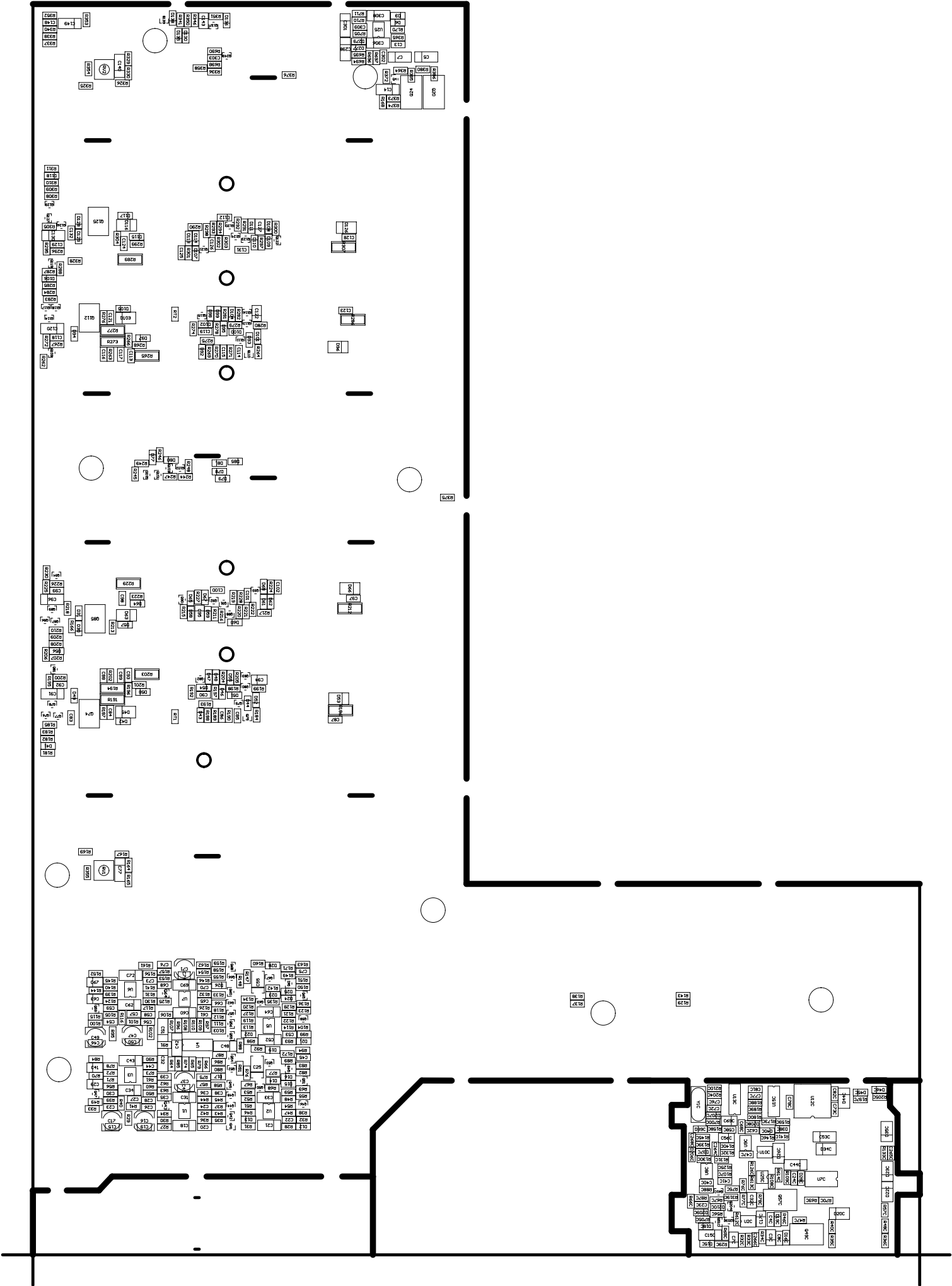


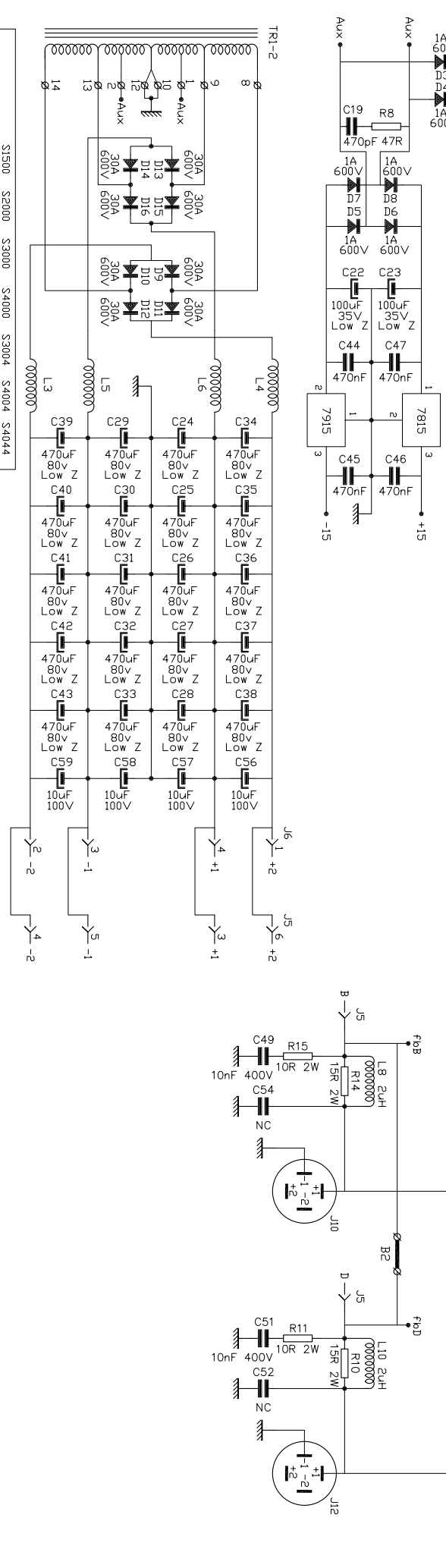
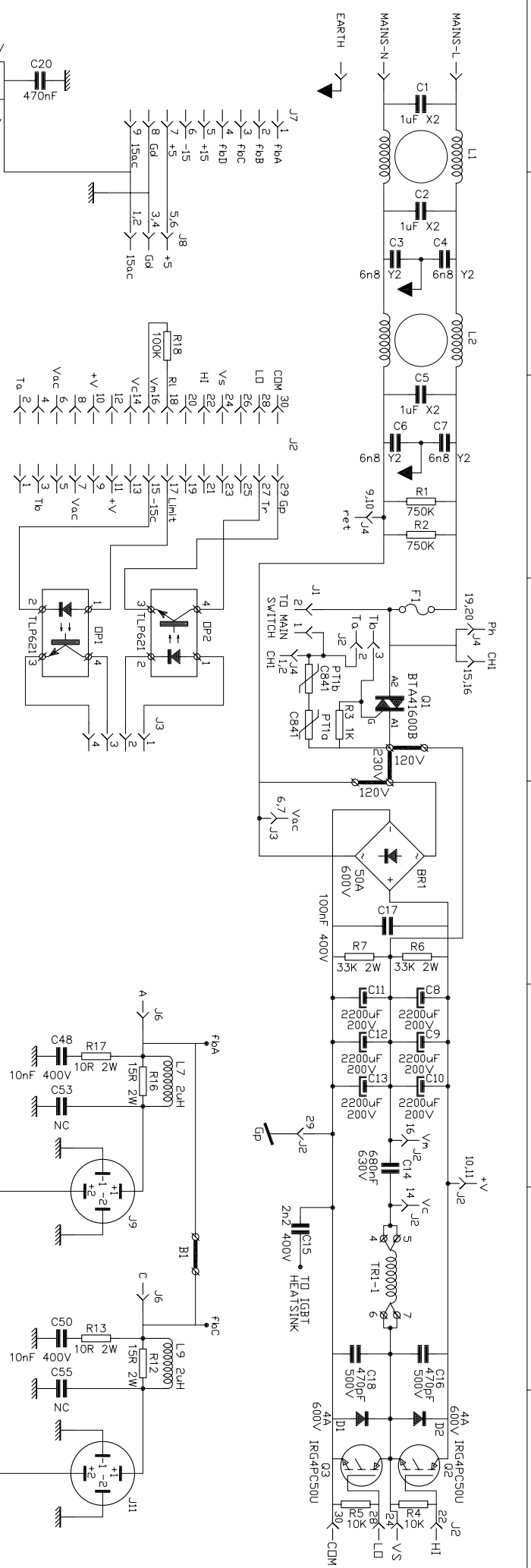
DRAWN	RAM Audio - S Series		
DESIGN			
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REFL BY			
S1500 - S2000 - S3000 - S4000		Signals Block Diagram	
DWG No.		Sheet 1 of 5	











	S1500	S2000	S3000	S4000	S3004	S4004	S4044
C8,C13	No	No	Yes	Yes	Yes	No	Yes
B1,B2	Yes	Yes	Yes	Yes	No	No	No
L9,L10	No	No	Yes	Yes	Yes	Yes	Yes
L10,R10	No	No	No	No	Yes	Yes	Yes
R10,R11,R12,R13	No	No	No	No	Yes	Yes	Yes
C30,C31	No	No	No	No	Yes	Yes	Yes
D1,D12	No	No	No	No	Yes	Yes	Yes
F1	10AT	10AT	15AT	15AT	15AT	15AT	15AT

- NOTES
- 1. All resistors 1/4W, 1% unless noted.
 - 2. All capacitors 50V unless noted.
 - 3. All diodes 1N4148 unless noted.

DRAWN

DESIGN

REPLACE

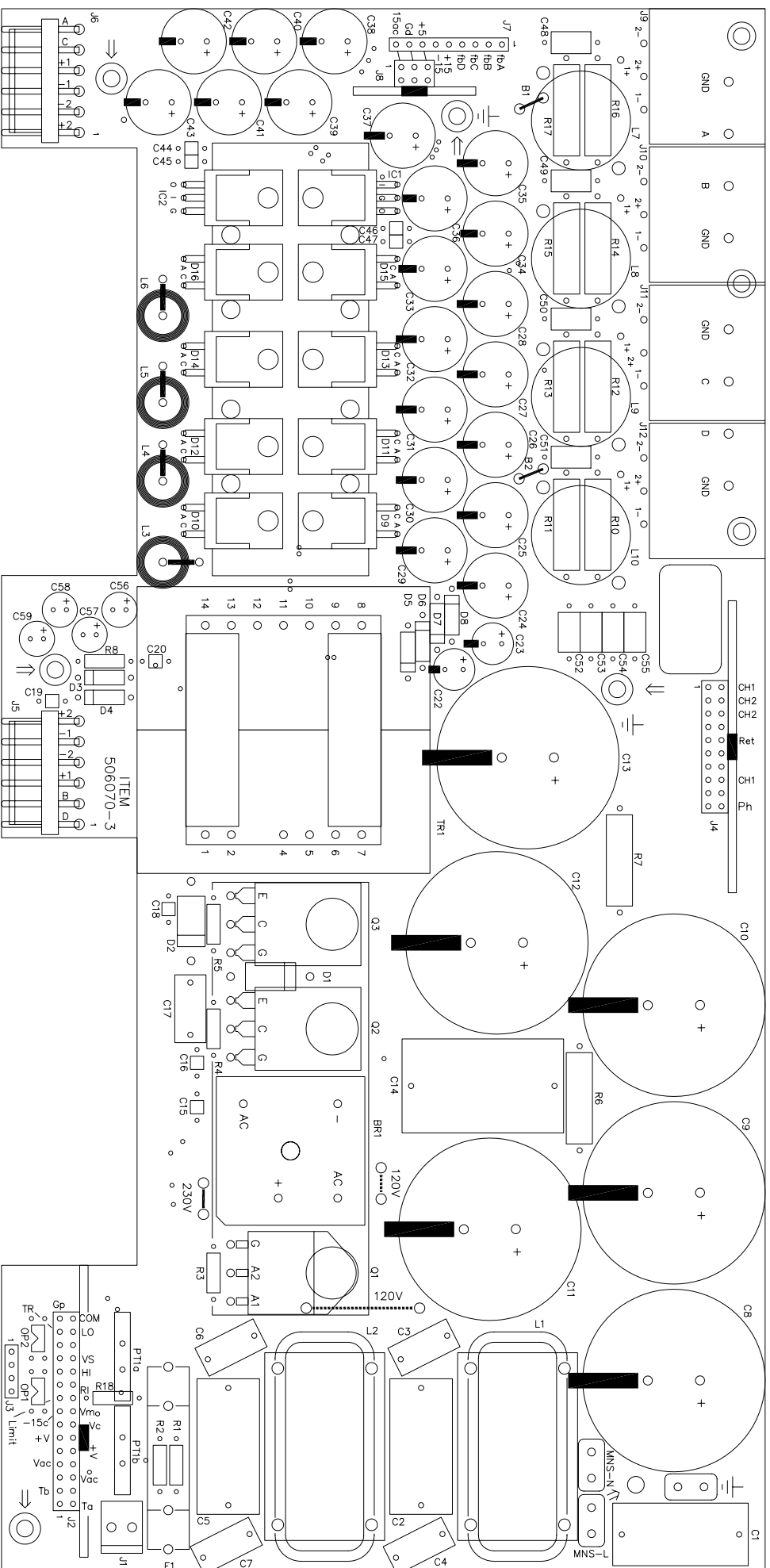
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RAM Audio - S Series

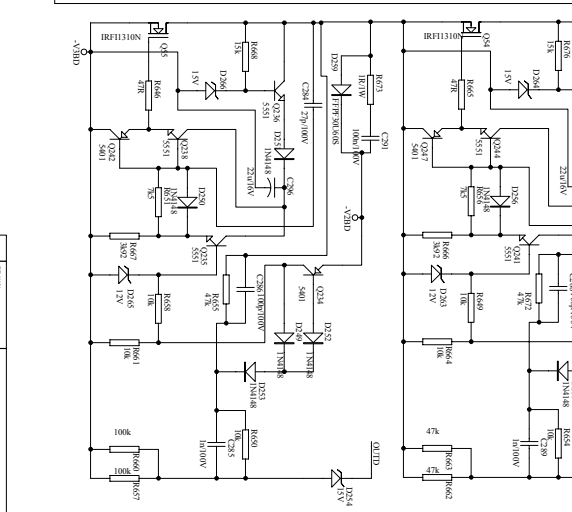
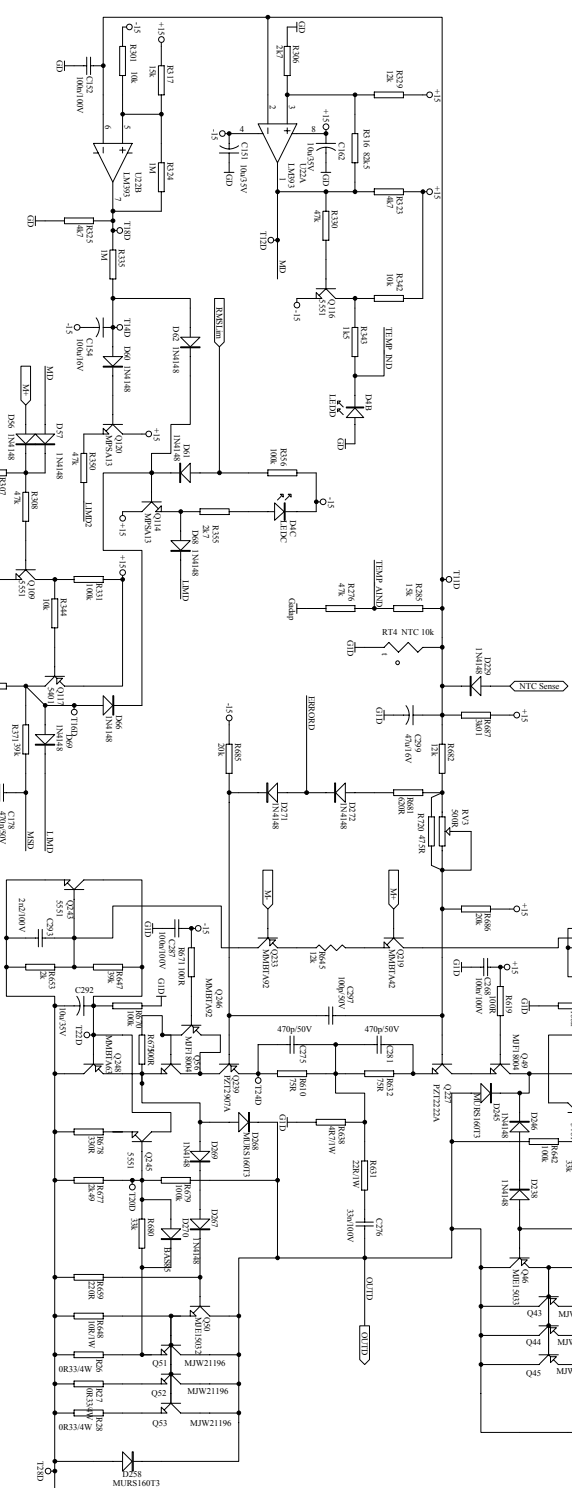
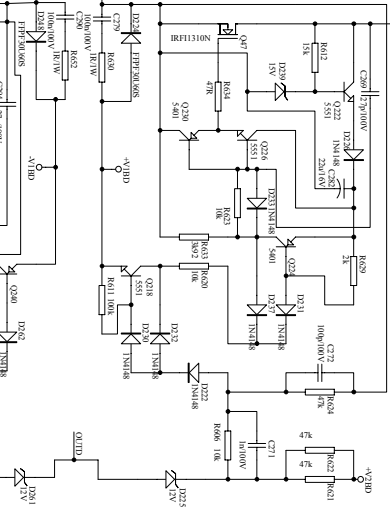
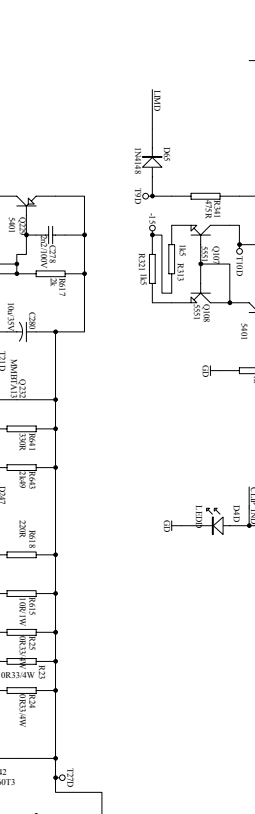
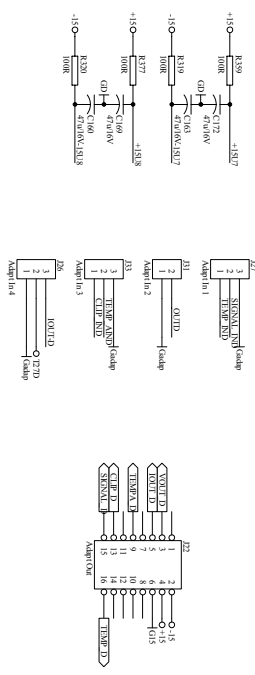
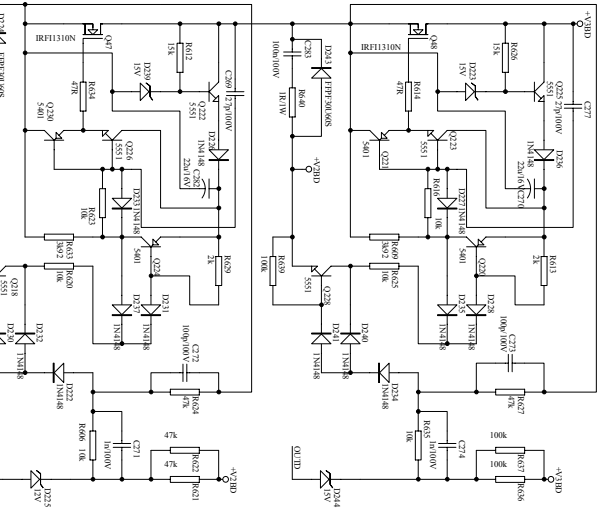
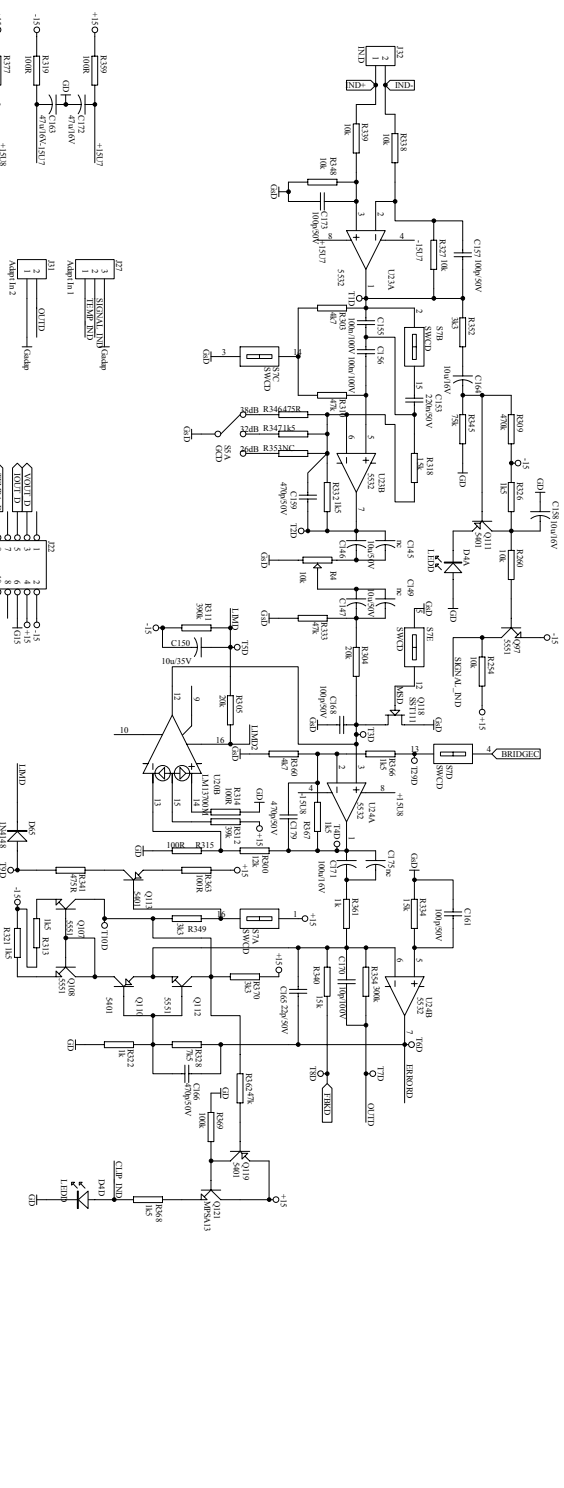
S3004 - S4004 - S4044

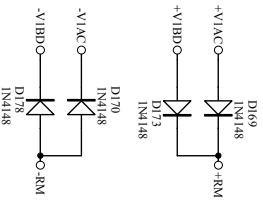
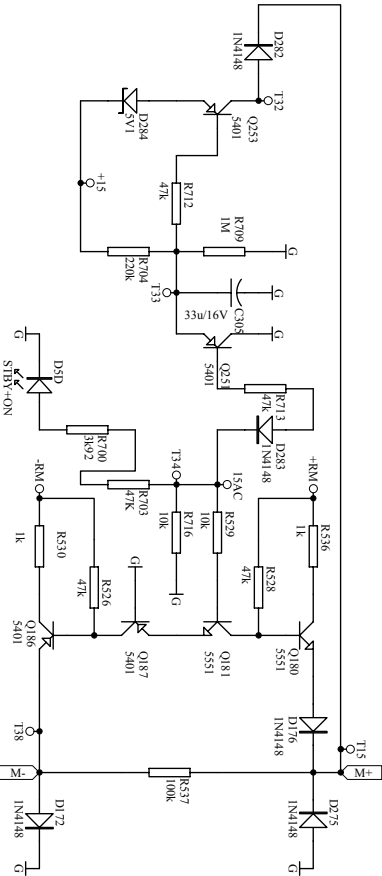
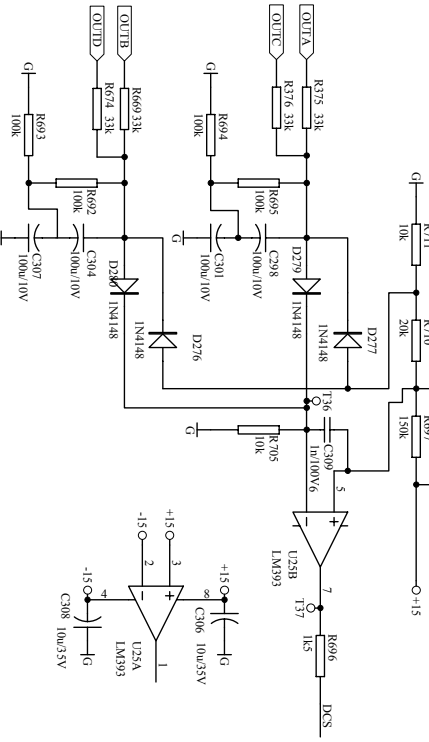
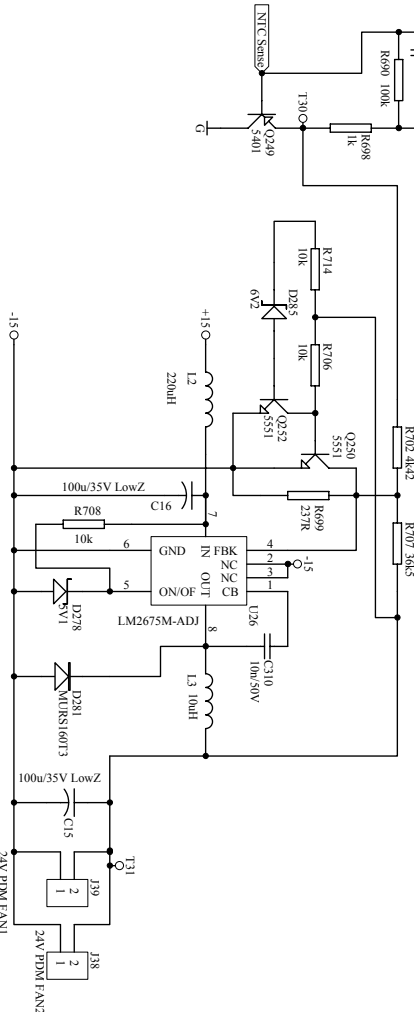
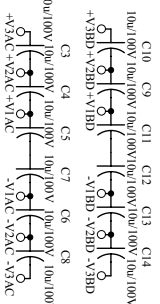
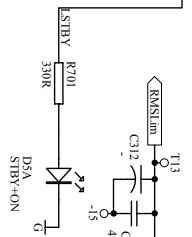
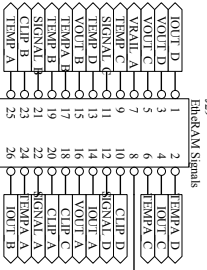
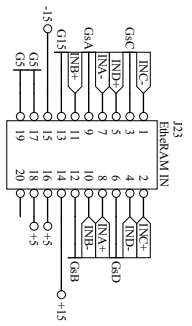
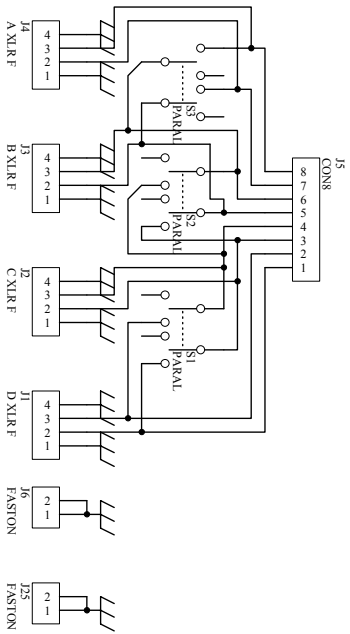
Power Supply Schematic

DWG No:Sheet 8 of 8

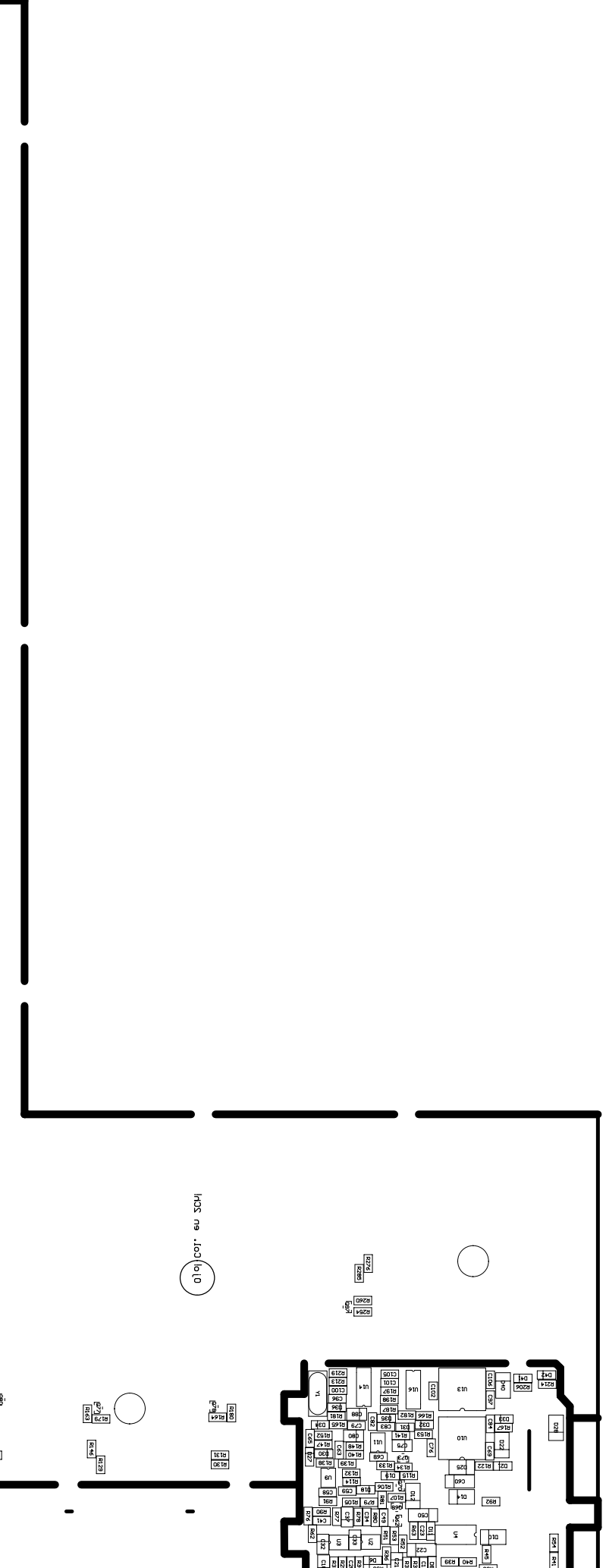
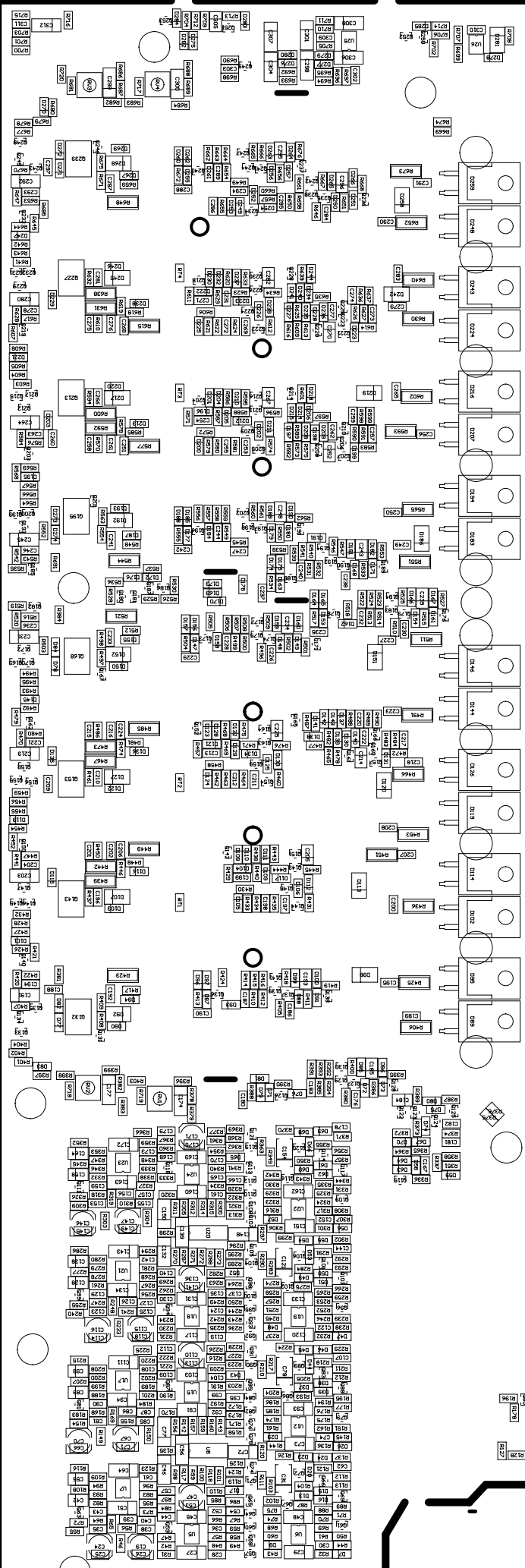


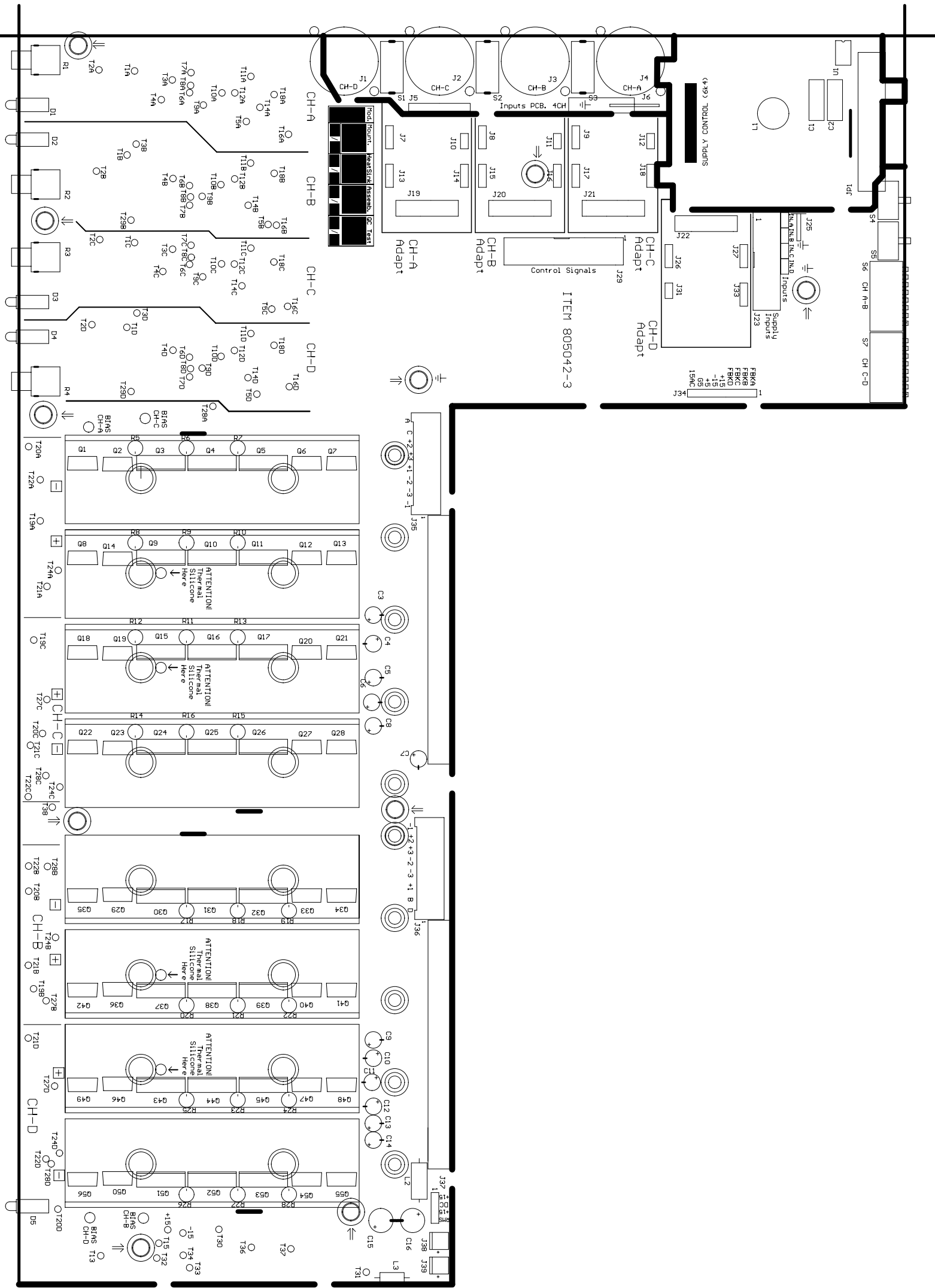
DRAWN	DATE	S Series	
A. Royo	13/02/06		
DESIGN		REF.	
J.Sonseca	15/01/06	506070-3 PSU Silkscreen	
REPLACE			
REPLACED BY		SIZE A4	DWG NO. mods2ch-3.dwg
			SHEET 1 of 1

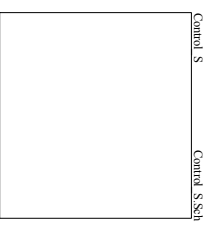
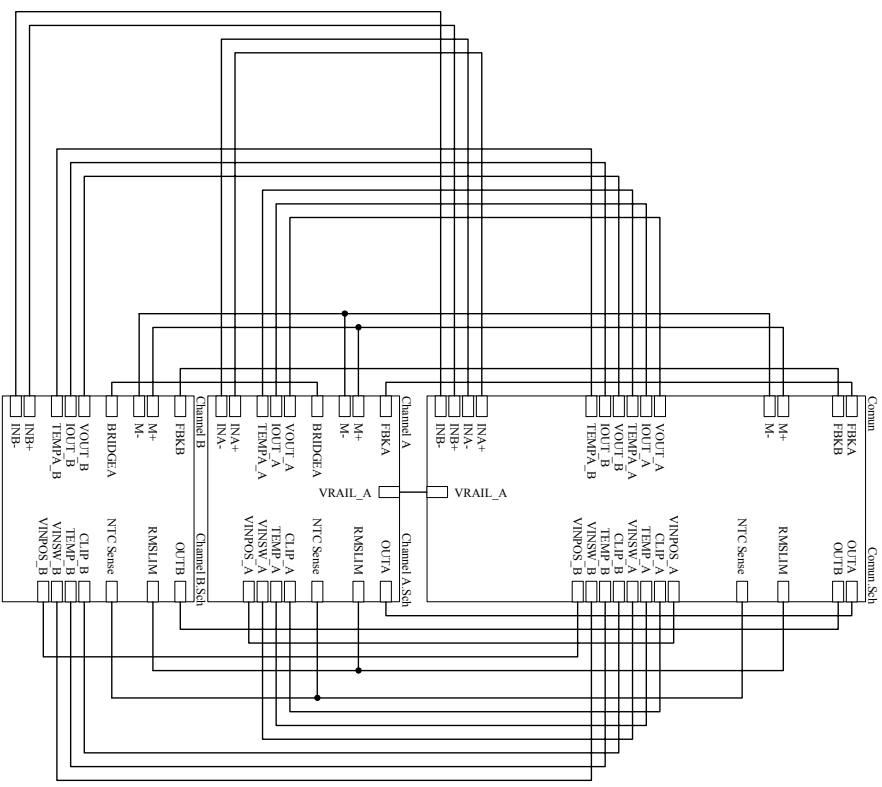




DRAWN	DESIGN	REPLACE	REFL BY
RAM Audio - S Series	S6004 - S6044	Inputs, protections & fans	DWG No. ConnUnSch
			Sheet 6 of 7

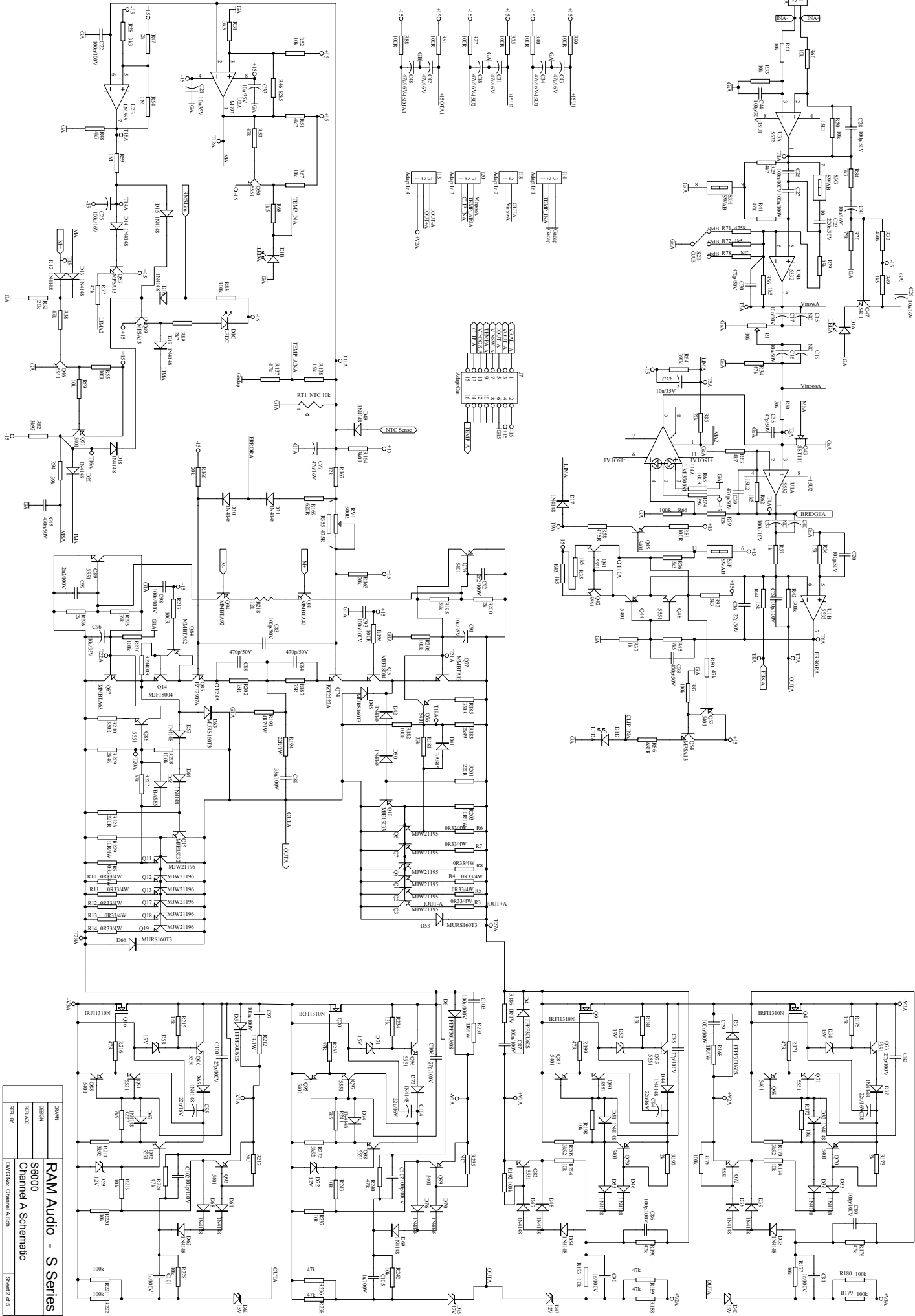


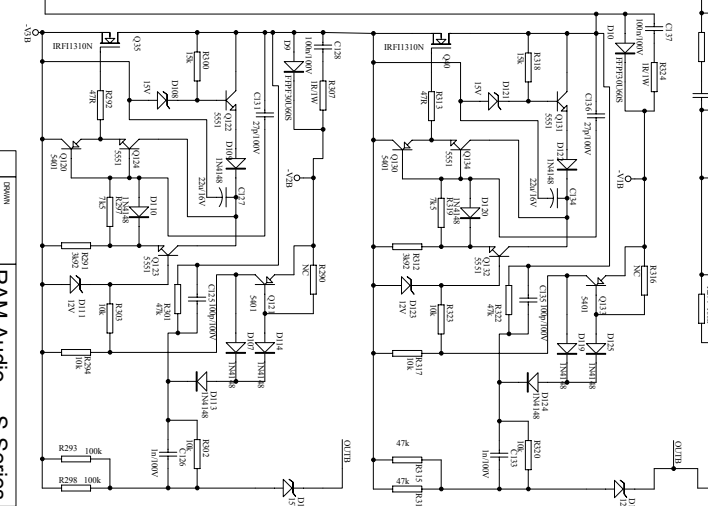
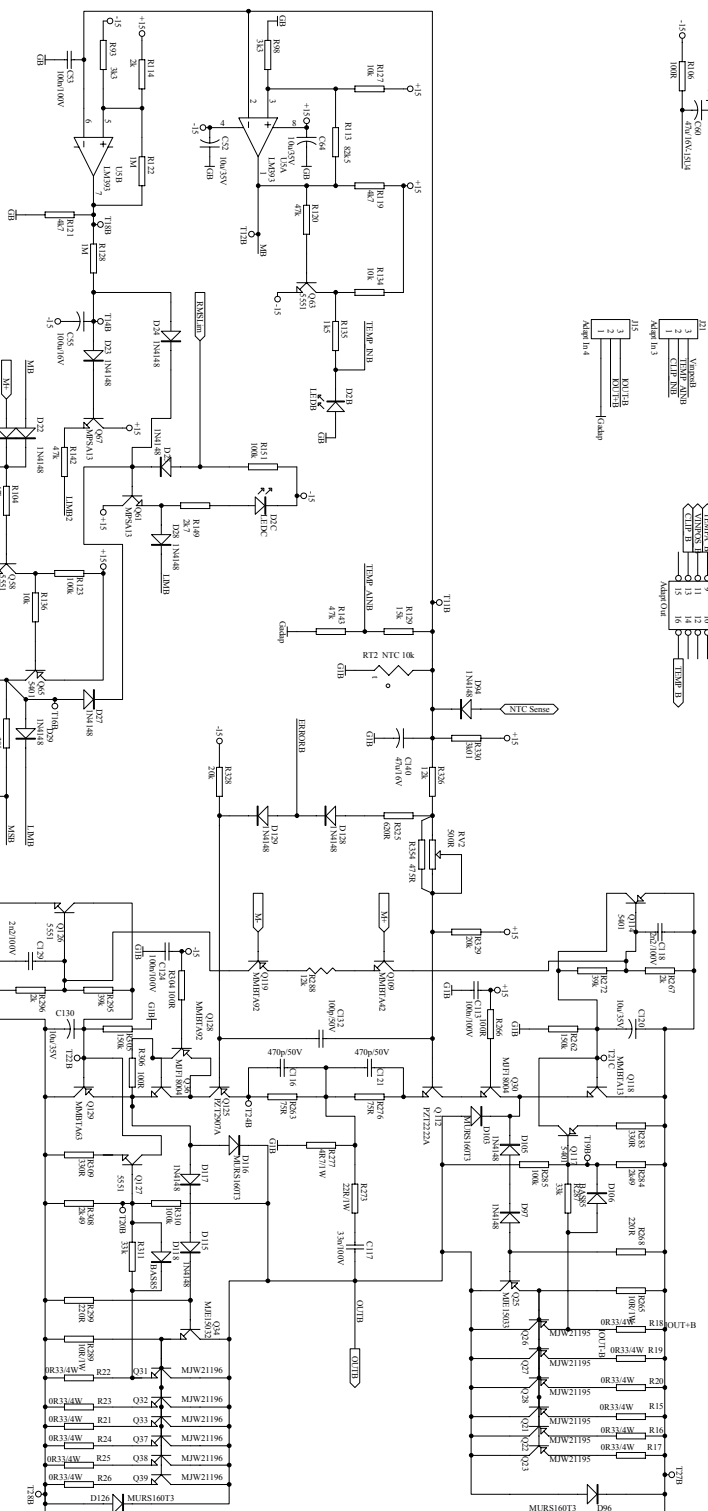
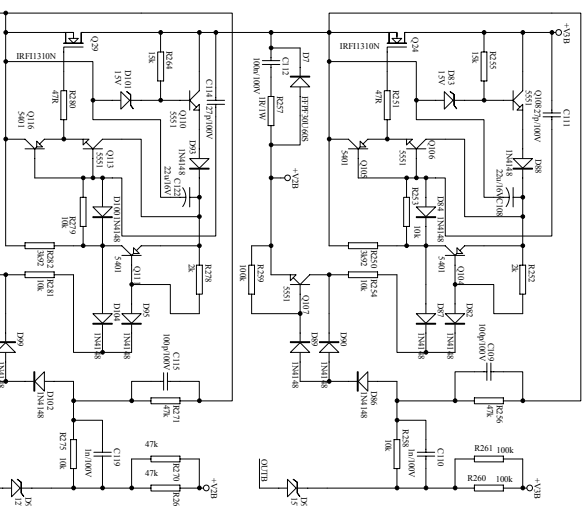
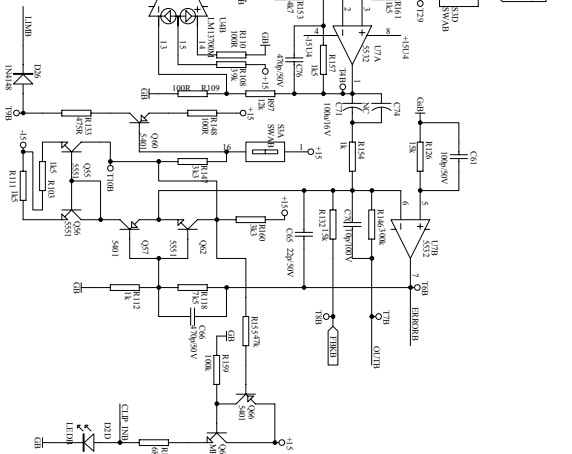
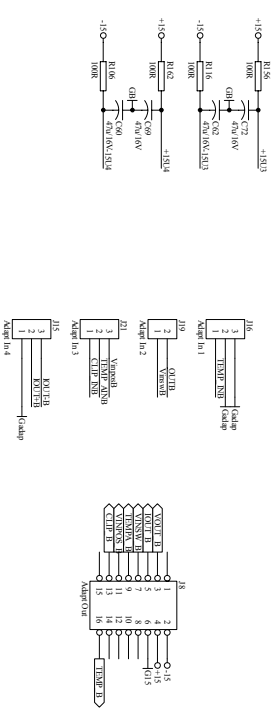
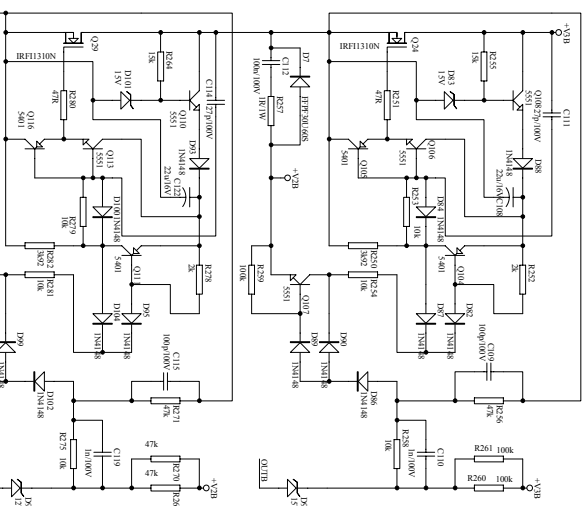
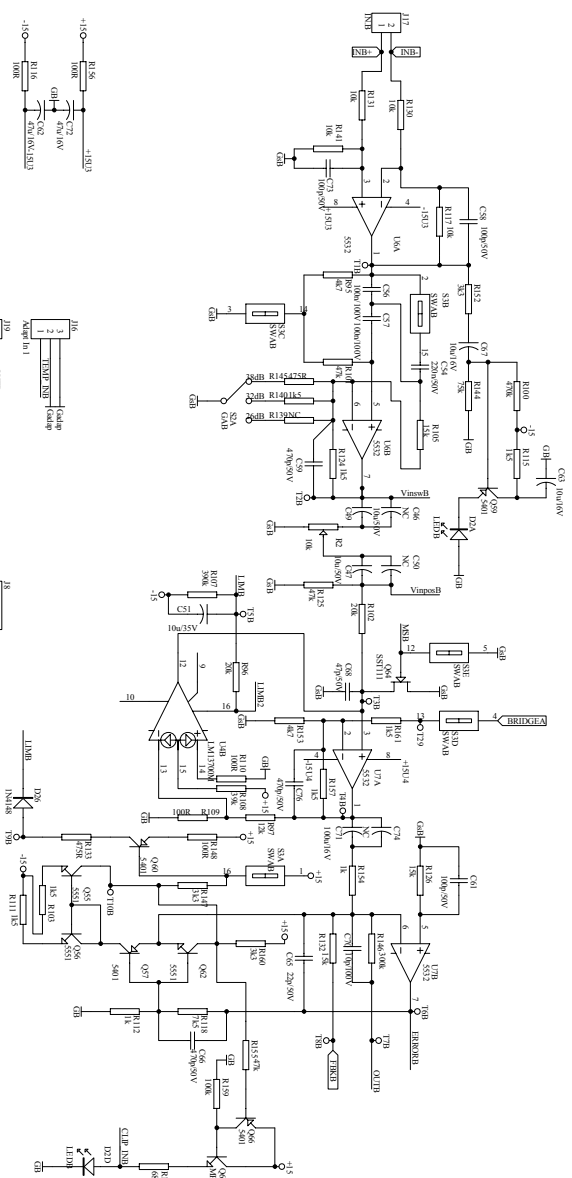




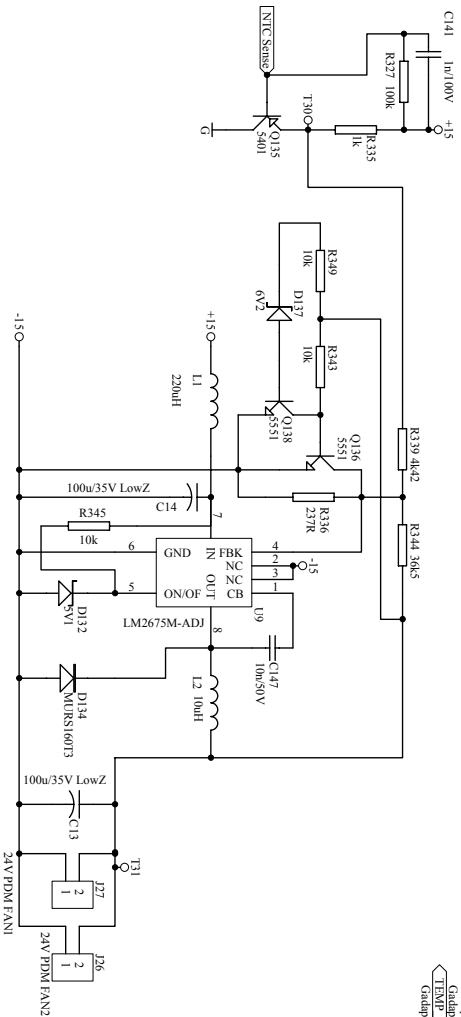
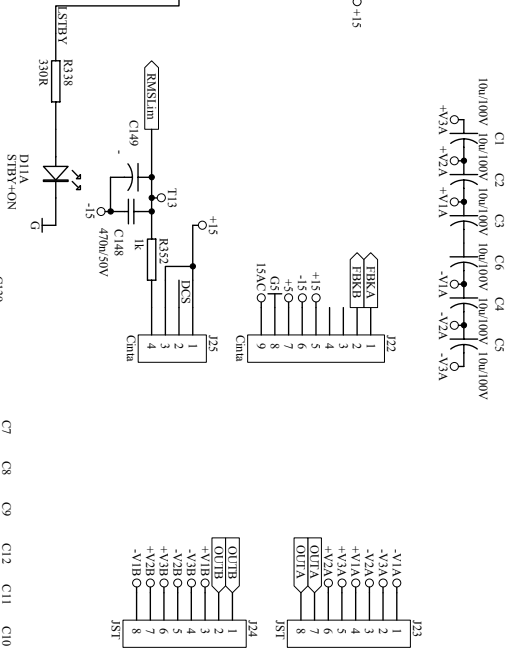
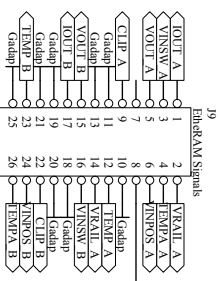
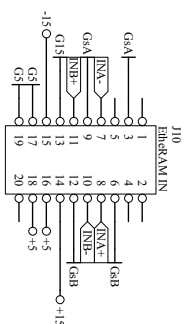
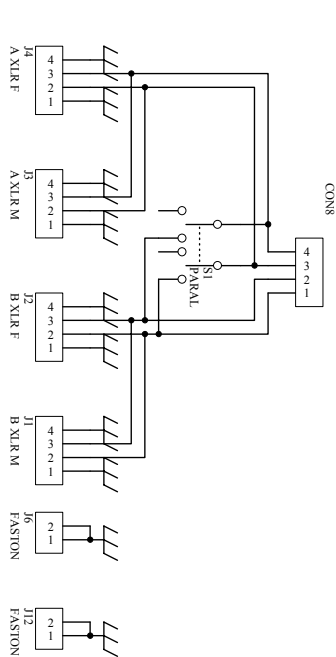
DRAWN		RAM Audio - S Series	
DESIGN			
REPLACE			
REFL BY			
S6000		Signals Block Diagram	
DWG No.			
		Sheet 1 of 5	

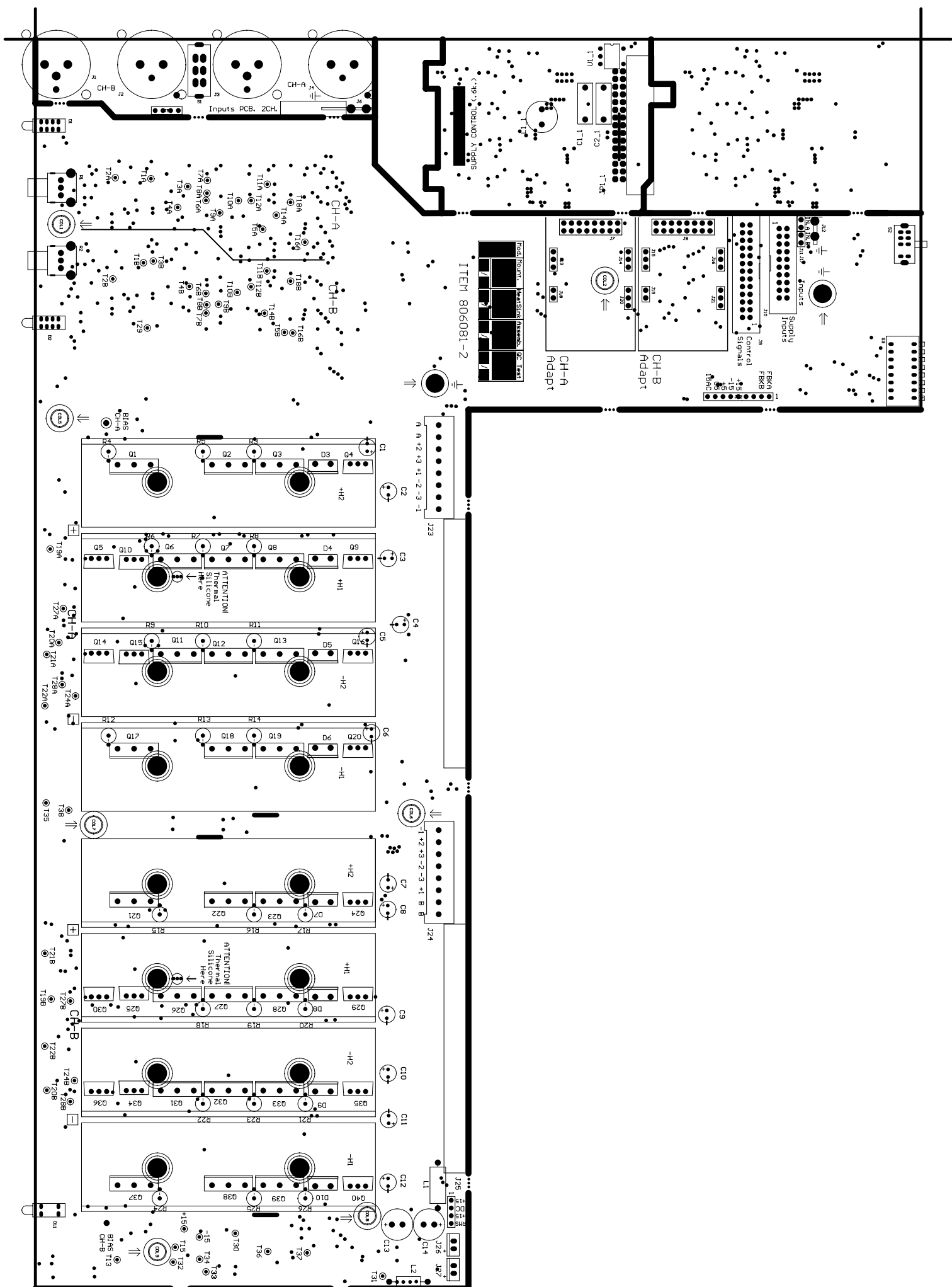
RAM Audio - S Series
S6000
Channel A Schematic
Sheet 2 of 5

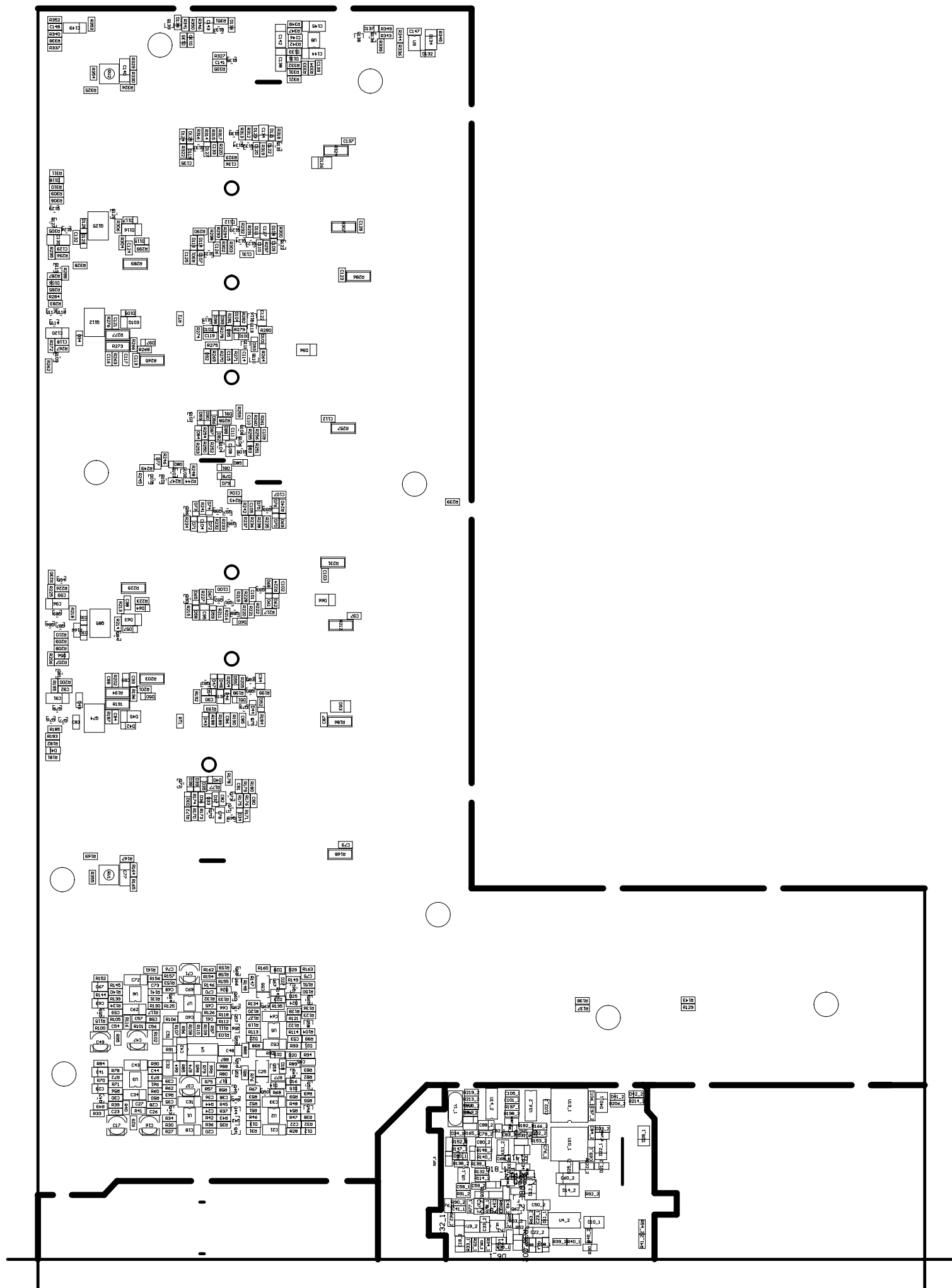


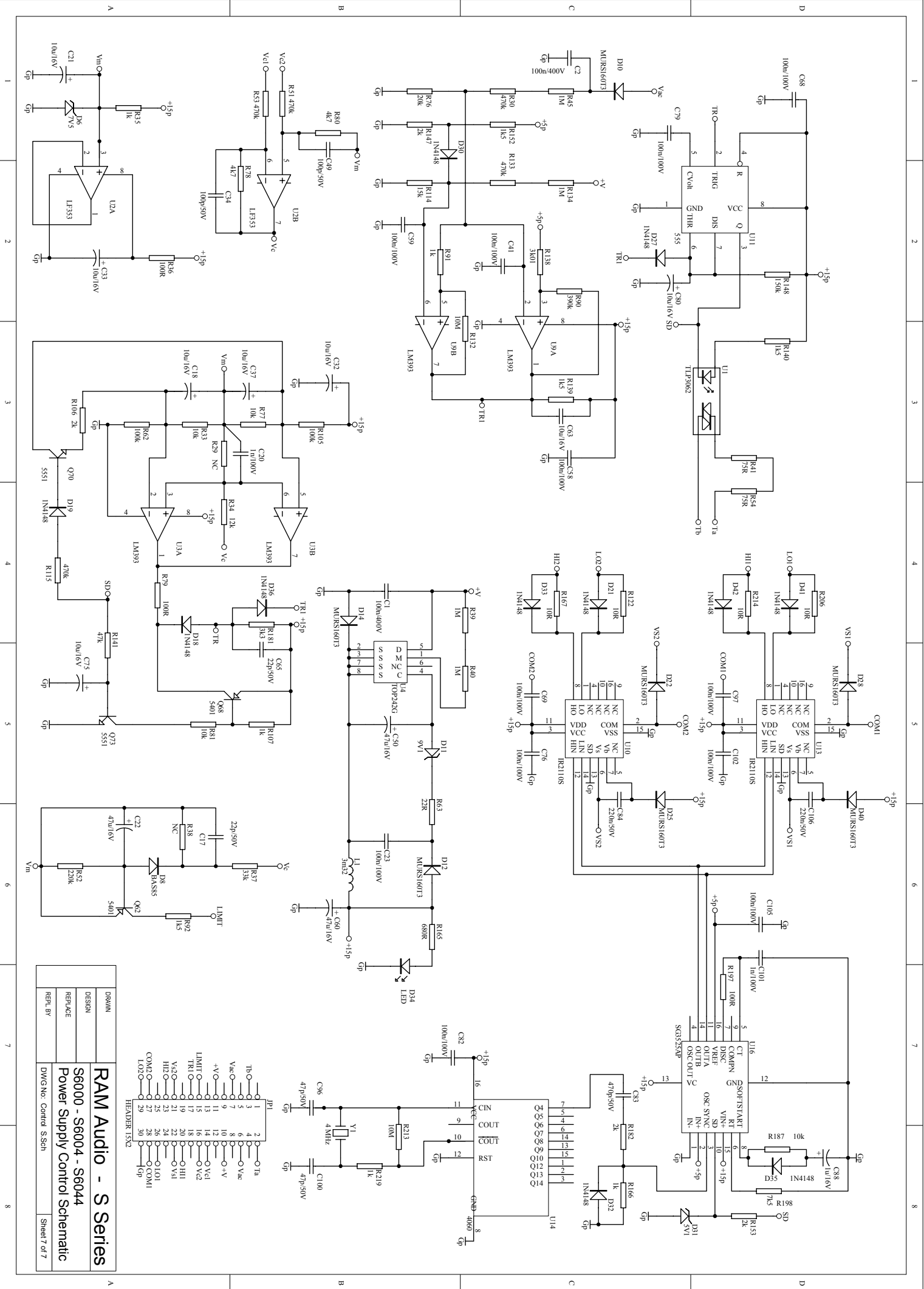


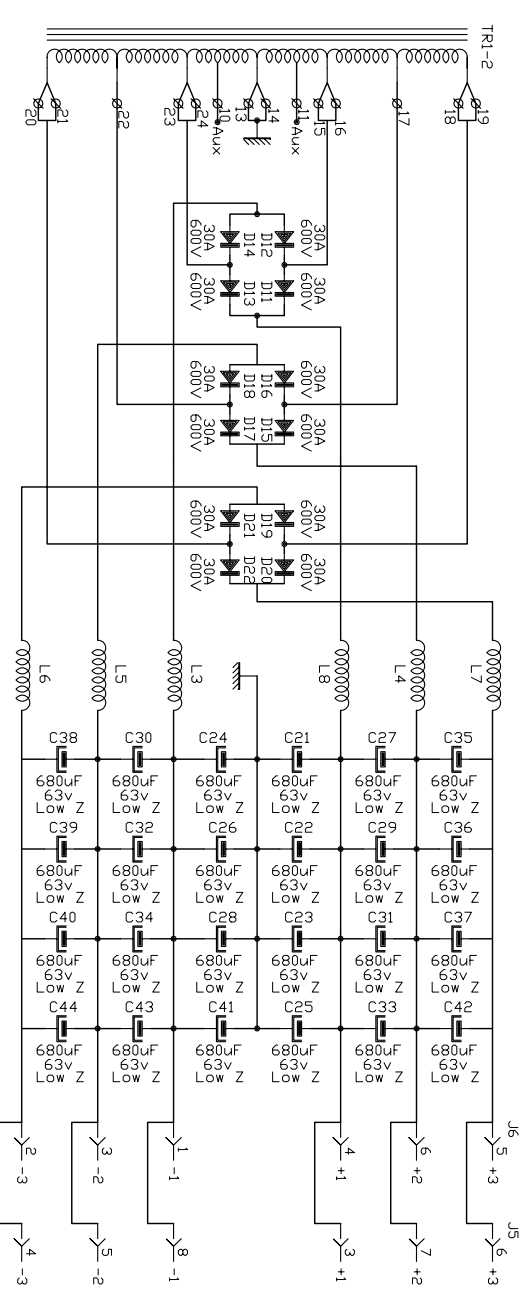
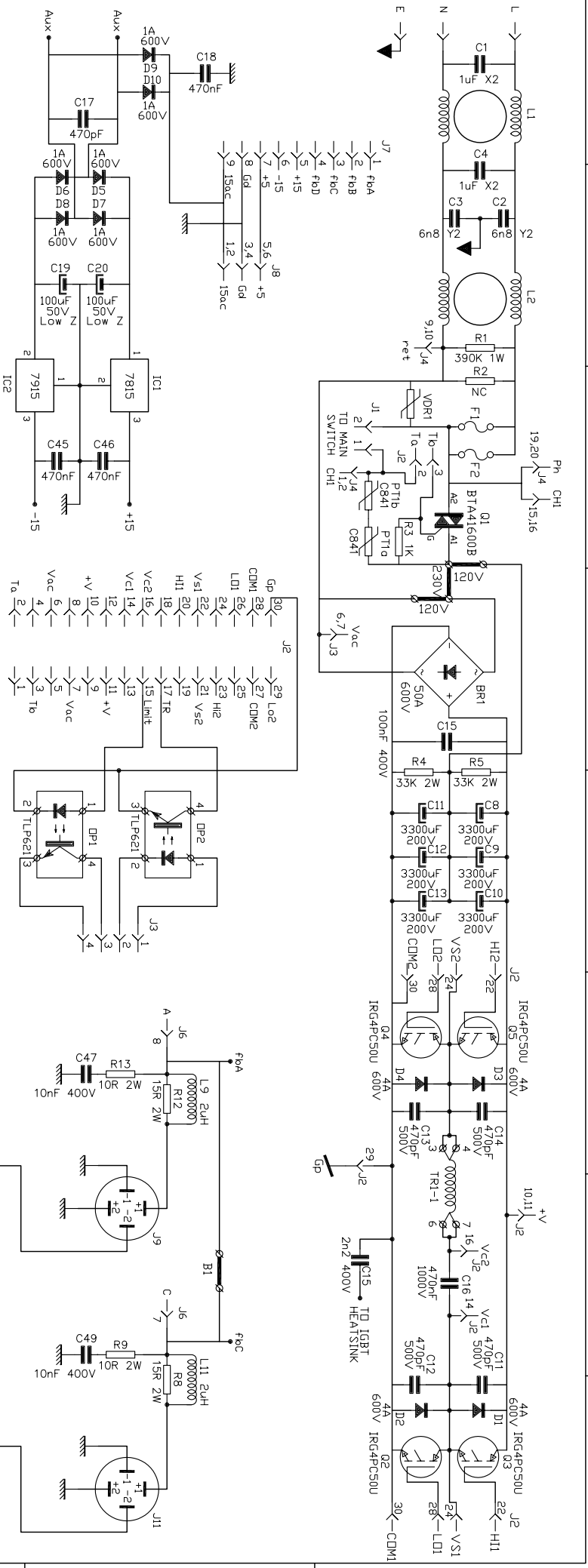
PSW#N	<h1>RAM Audio - S Series</h1>
DESIGN	
REPLACE	
REFL. BY	
DWG. No. Channel B, Sch	<h2>S6000</h2> <h3>Channel B Schematic</h3>
Sheet 3 of 5	











Part	Value	Notes
B1,B2	S6000	No
L1,L12	S6004	No
R6,R7,R8,R9	S6044	No
C49,C50		Yes
J11,J12		Yes
F1,F2		Yes
	2x10AT 2x10AT	Yes

NOTES
 1. All resistors 1/4W, 1% unless noted.
 2. All capacitors 50V unless noted.

Drawn	Design	Replace	Rev. By
Power Supply Control Schematic			
DWG No. Supply-Sketch			
Sheet 6 of 6			

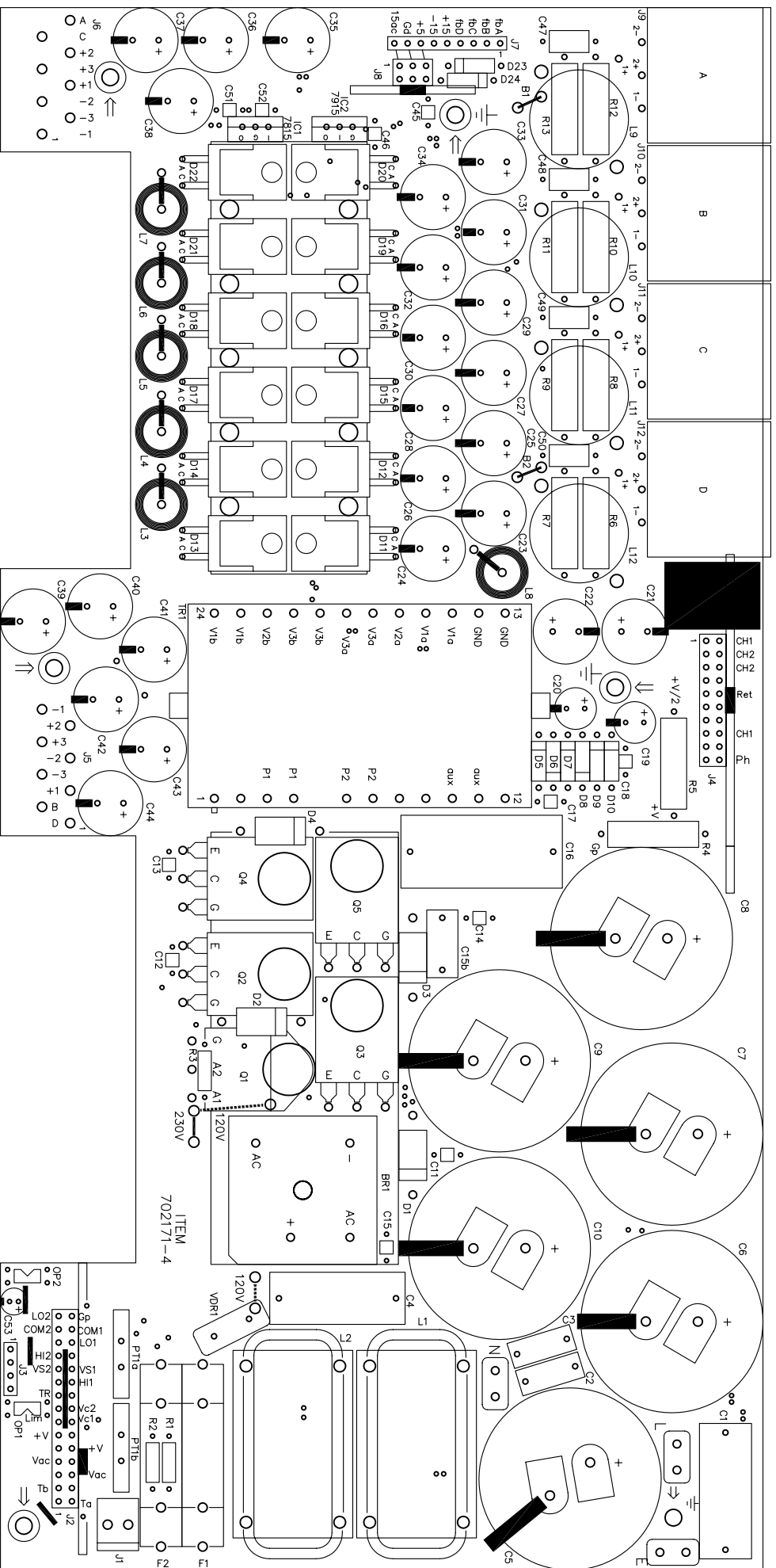
RAM Audio - S Series

S6000 - S6004 - S6044

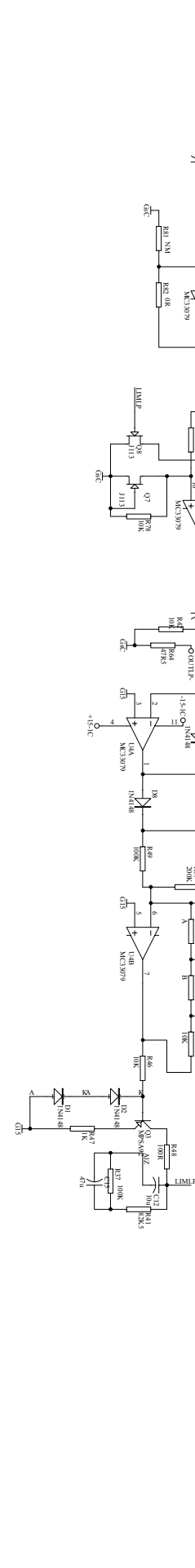
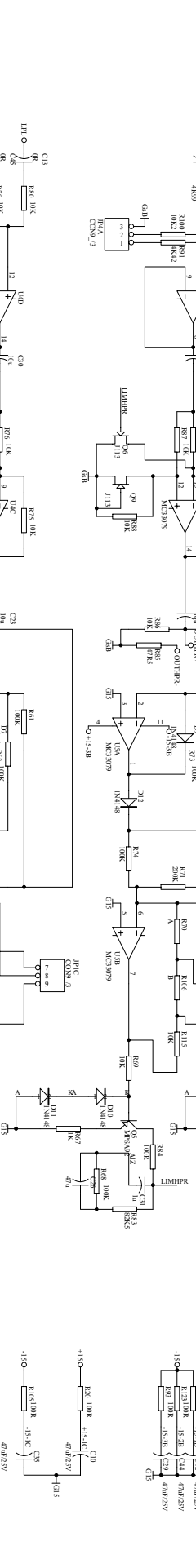
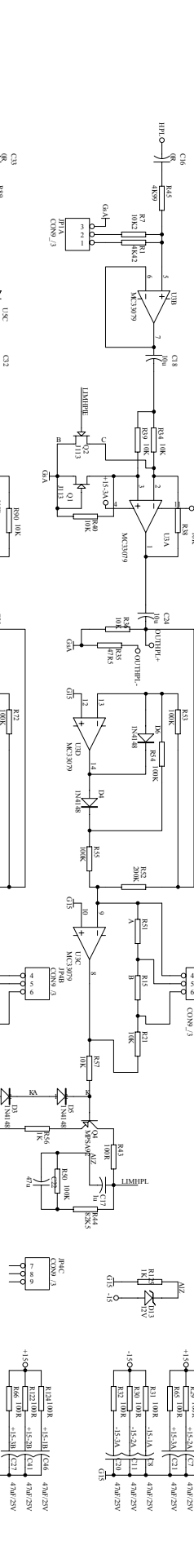
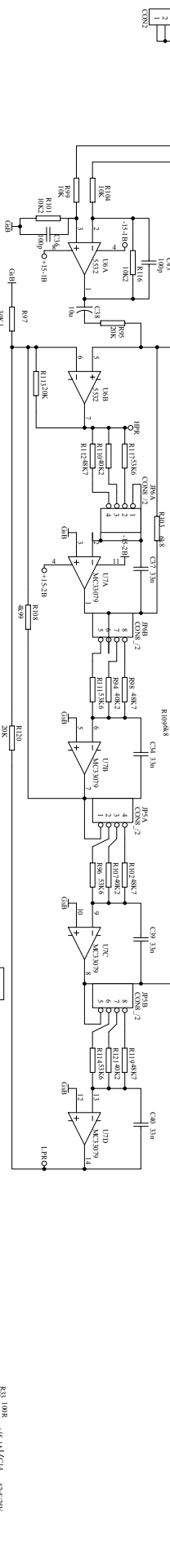
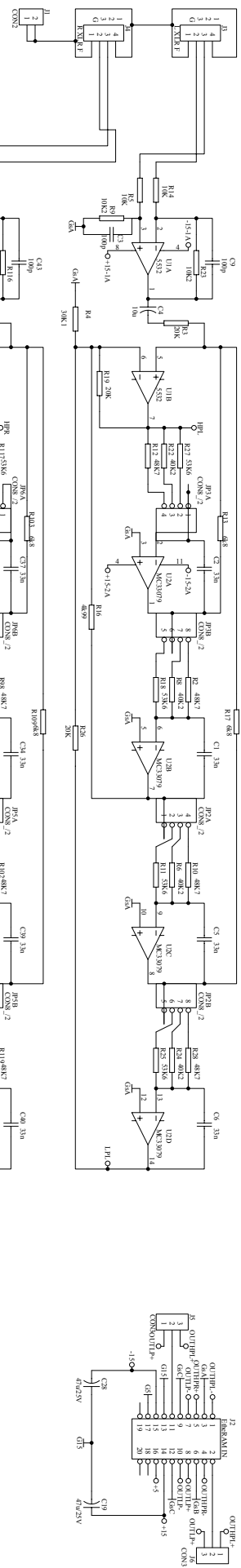
Power Supply Control Schematic

DWG No. Supply-Sketch

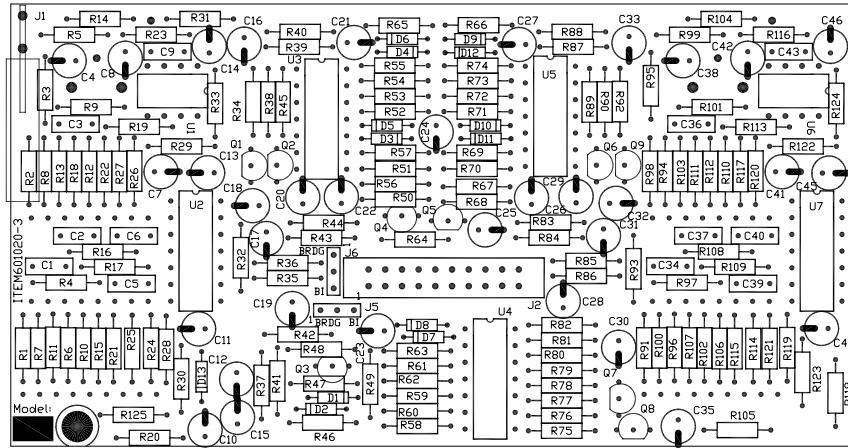
Sheet 6 of 6




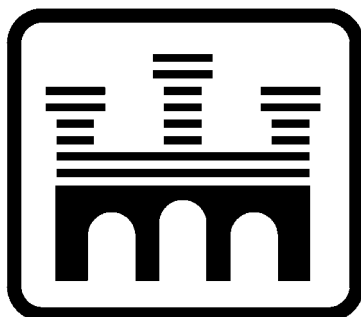
DRAWN	A. Royo	DATE	23/03/08	REF.	702171-4 PSU Silkscreen
DESIGN	J.Sonseca	10/02/08			
REPLACE					
REPLACED BY					
SIZE	A4	DWG NO.	mods2ch-3.dwg	SHEET	1 of 1



DESIGN	RAM Audio - S Series
REVISION	1.0
DATE	10/1/2010
DESIGNED BY	David M. Smith



DRAWN A. Royo	DATE 13/10/06	 RAM S Series	
DESIGN A. Royo	15/09/06		
REPLACE		REF. 601020-3 Processor Silkscreen	
REPLACED BY		SIZE A4	DWG. NO. prcss4ch-3.dwg <div>SHEET 1 OF 1</div>



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