

Audio smps 550 watts 700watts peak

Here is an audio half bridge smps that can be altered in quite a lot of ways. This smps was designed in such a way that different drivers can be adopted, also that different protection circuits can be adopted. The one presented here is with a current limiter which works very well.

The driver choice at the moment is with the IR2153 which is rather cheap. However other options can be made to be driven with an SG3525 and can be regulated. Options for feed back can be included on a small pcb having an opto coupler and Zener to stabilize the output voltage. Provisions have been made for output inductors. However these are made very small (5uH) at the moment as this smps is intended for audio purposes and not stabilized, the IR2153 works at full duty cycle and not much noise is generated.

The transformer construction is very important and tight coupling was kept in mind during winding. However the input and output snubbers were not needed as the wave forms came out very clean and free of distortion and spikes. A video is available on youtube regarding the construction of the transformer which can be found on this link. https://www.youtube.com/watch?v=_K3ixhcTYFg Here the whole construction of the trafo is seen with some very good tips for good transformer construction for this smps.

Circuit description

As the smps is switched on the rectified DC voltage starts charging the main bulk capacitor limiting the current through the 15 ohm NTC thermistor. As the voltage at the bulk cap reaches around 170 vdc TR1 and 2 are coupled in a constant current source which the voltage at TR1 is clamped at 160v via ZD1. TR 2 is clamped at 10 volts via ZD2. together they start charging C8 when the threshold voltage of around 9.2 volts. The chip starts oscillation The auxiliary supply takes over and stabilize the voltage at the pin 1 of the IR2153 at 13 volts via ZD3 hence the constant current source is switched off. At the same time it starts charging the main secondary caps the current however is limited by the current limiter to around 6 amp on the input of the drain of TR4 and TR5. A 2 turn loop at the transformer supplies the gate of the triac at the input shorting out the NTC thermistor and full power is now available. All this happens in the blink of an eye.

Short circuit and current limiting.

The choice of current limiter was chosen however I admit its not my design and after a few trimmings in the coupling capacitor and also in the some resistor values from the original circuit works very nicely. It limits the output power to 700 watts of which this can also be adjusted for higher and lower power. This will protect both amplifier and the smps itself during over load by reducing the output voltage and the output current drops to around 2.5 amps until the overload is removed.

The current sensing can be done either with a current transformer or with a more simple method which I chose. In my case the current sense is done by sensing the ripple voltage at the centre point of the fets. When the threshold is reached TR3 pulls down the supply at pin 1 via Led 1 of the IR2153 and thus switching it off. A point is reached where the load reduces and also the ripple hence and oscillation starts again. This action is repeated until reasonable load is reached and normal operation starts again. If a dead short is present the output current is limited to 2.5 amps.

Choice of oscillators and protection

The PCB can be adopted to work with a different oscillator as mentioned before due to the oscillator board and protection circuit is mounted on a separate pin header. This is plugged in the socket provided on the pcb. I also made plans to use different protection circuitry using either a Schmitt trigger or driving an SCR gate both options pulling down pin 3 of the IR2153 to ground. However these type of protection brings out the need to re-set by switching off the supply and waiting for the bulk cap to discharge until it can be switched on again. I prepared the prototype pcbs for these but have not been tried yet

Heat sink and cooling

A good heat sink is needed for the fets and output diodes as these are driven quite hard during the peak output. With the heat sink used can handle the power easily if a small fan is included. I made a fan socket available for this reason. In my setup peak power could be held for quite a long time without things getting hot with the fan on. This was placed at the side to cool also the transformer

Auxiliary output.

An auxiliary output of 12v-0-12v is provided capable of around 800mA. This is intended to drive a preamp stage or some protection circuit on an amplifier. I often see the need of a separate output for this reason.

The design voltage of the smps is 46-0-46 peak at 230 volts input. During my tests the output voltage went down to 78volts at 9.4 amps. The input voltage was 227vac with a power output of 730watts. The efficiency of the smps reached 90%.



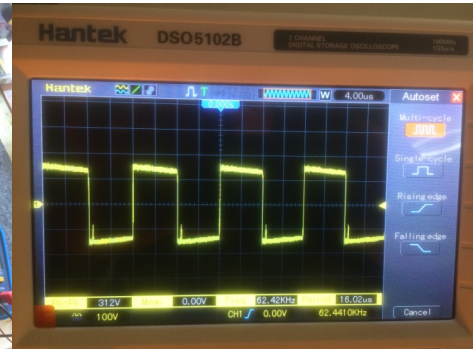
Top view of the smps



Side view of the smps

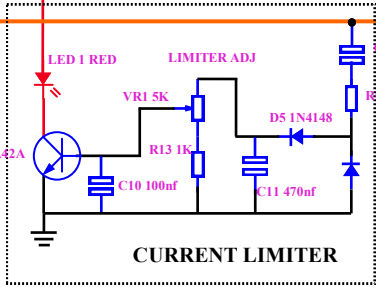
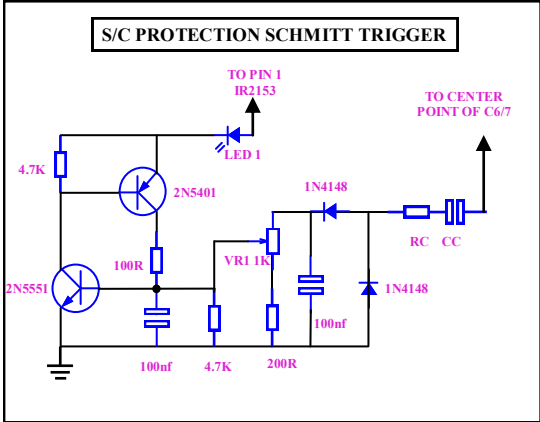
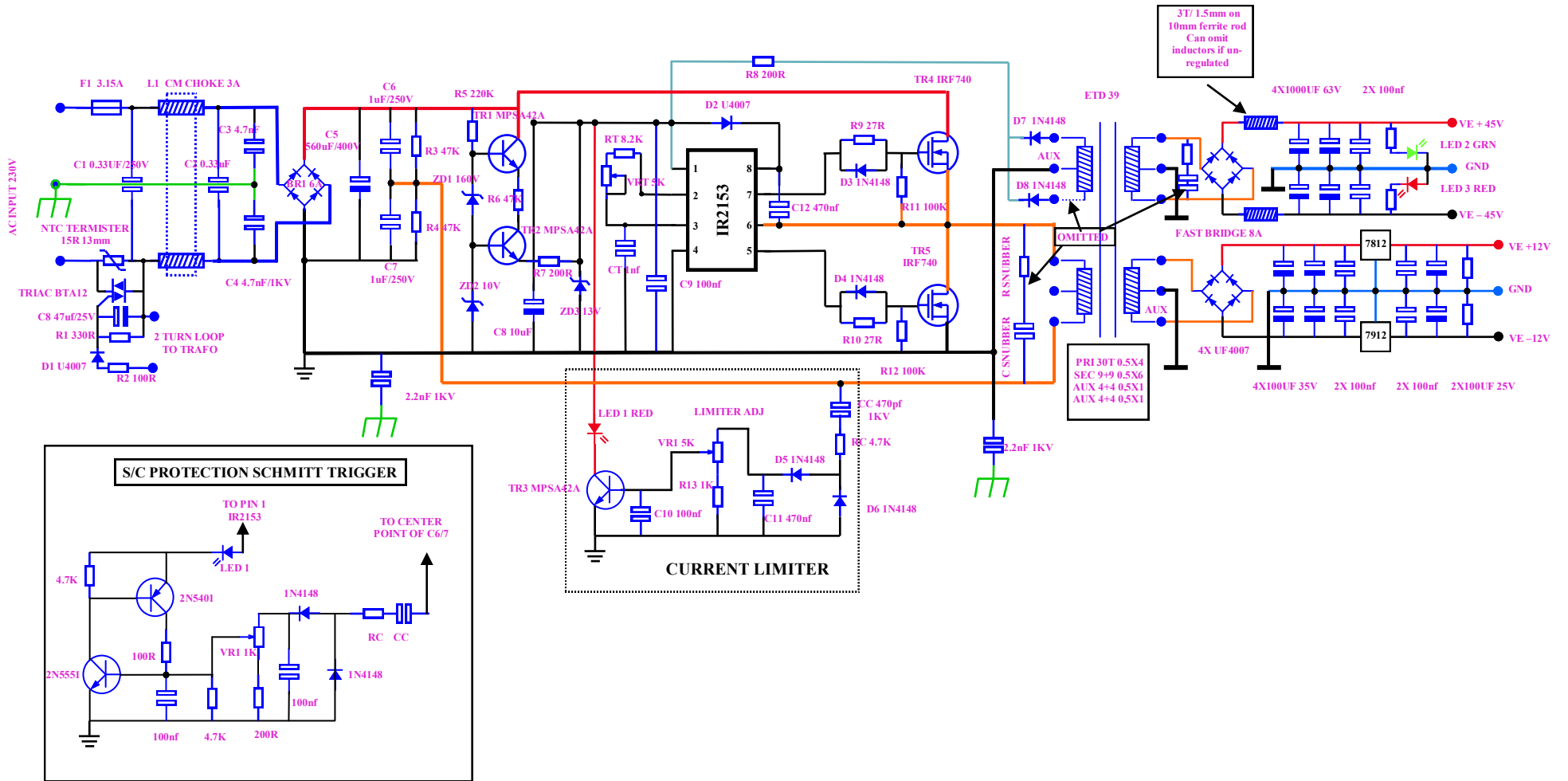


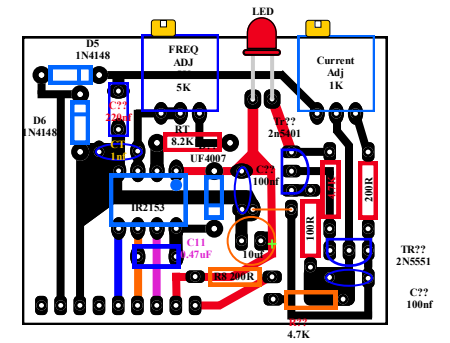
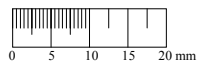
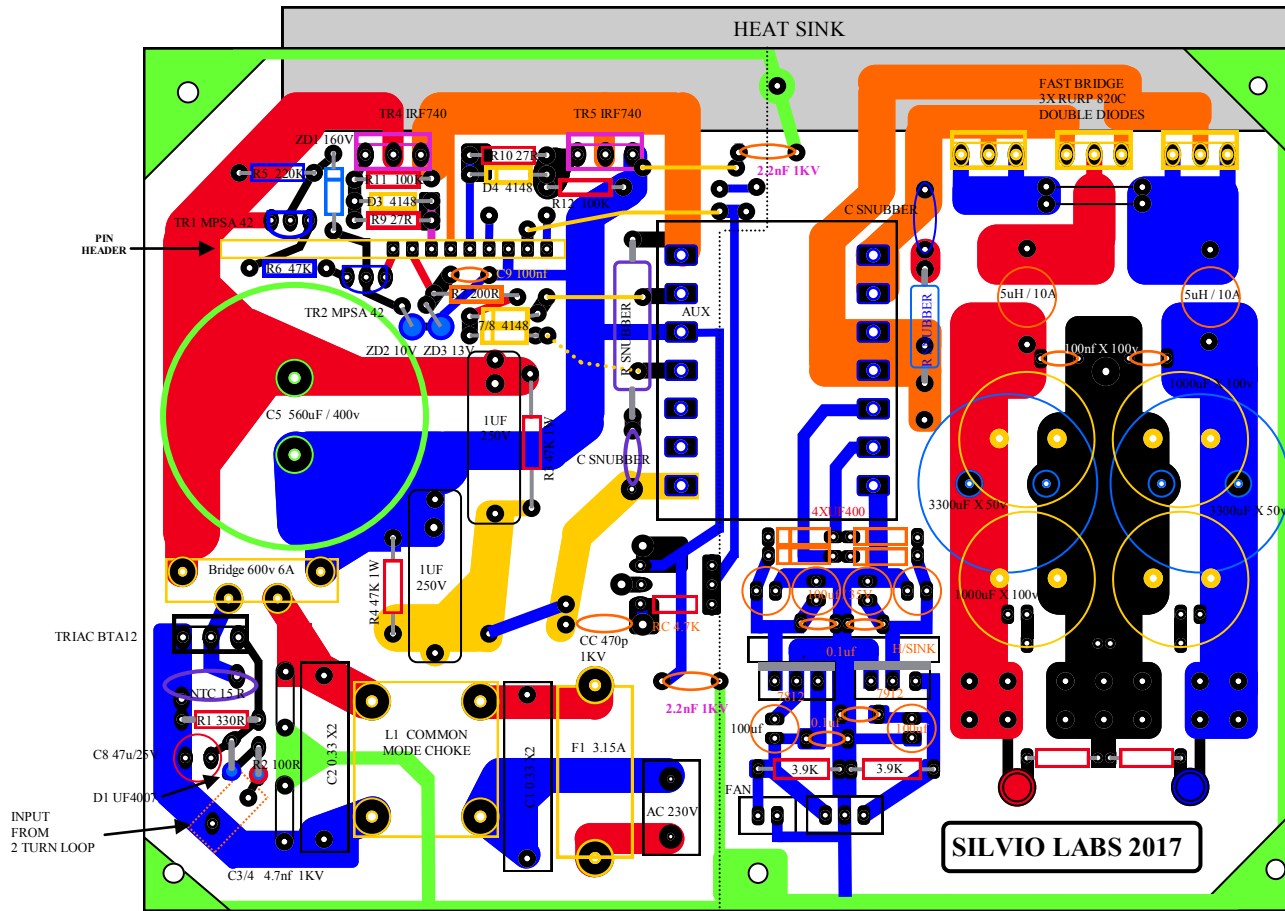
Smps at full peak load, 9.4A
Current limit about to cut in at around 10A



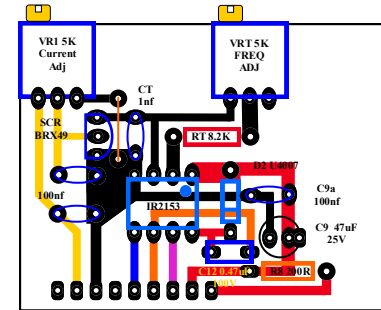
7.4A load wave form taken across the primary winding. No snubber in primary

AUDIO SMPS 700WATT
46-0-46 Peak 62KHz

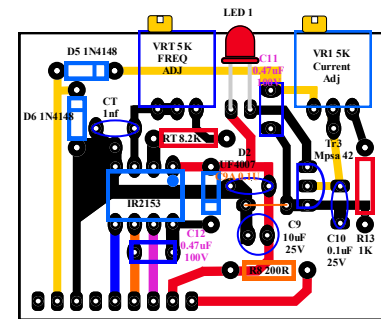




S/C protection with



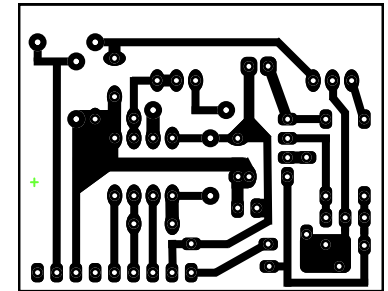
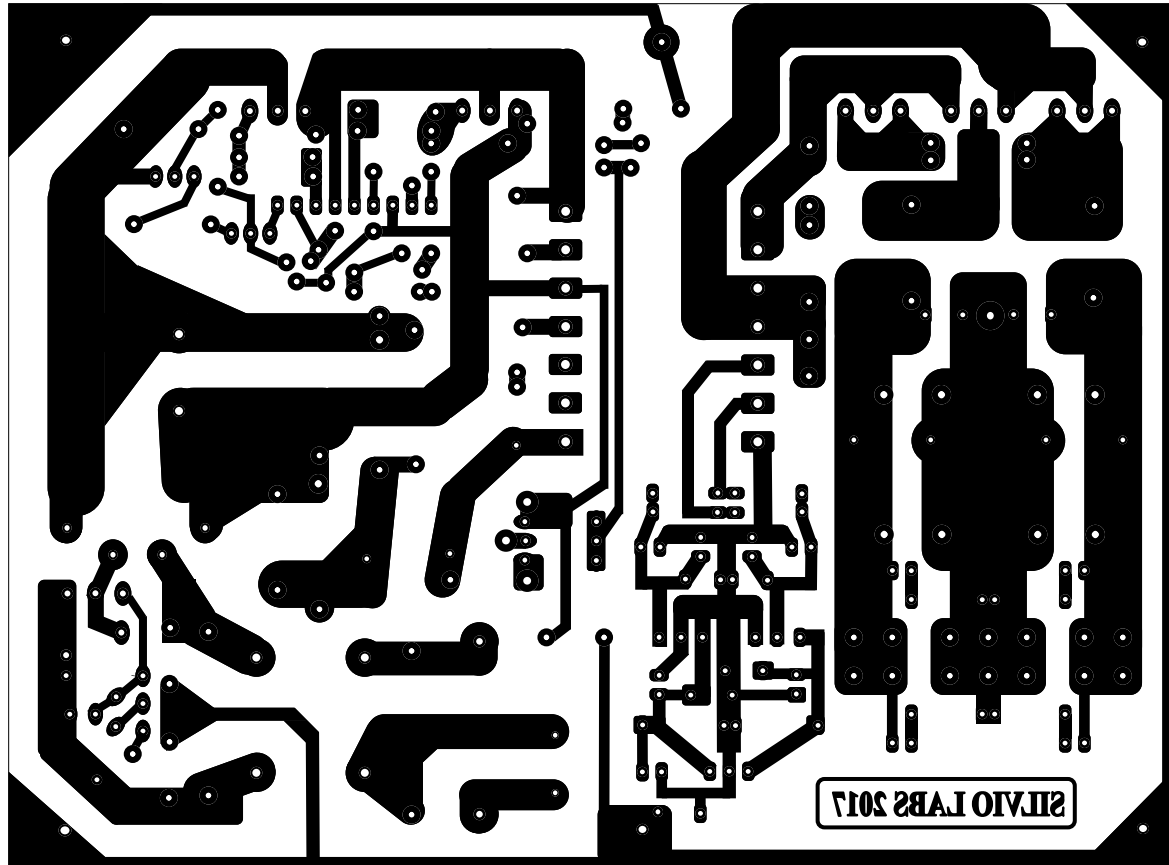
S/C PROTECTION WITH SCR



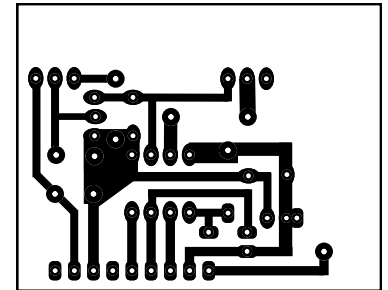
Current Limiter

MIRROR IMAGE CENTER TAP FROM TRAF0 TO PCB GROUND

AUDIO SMPS 700WATTS WITH AUX 12-0-12

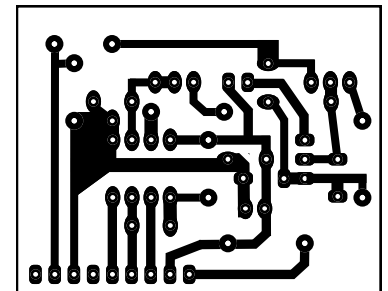


S/C Protection with Schmitt trigger



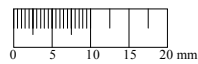
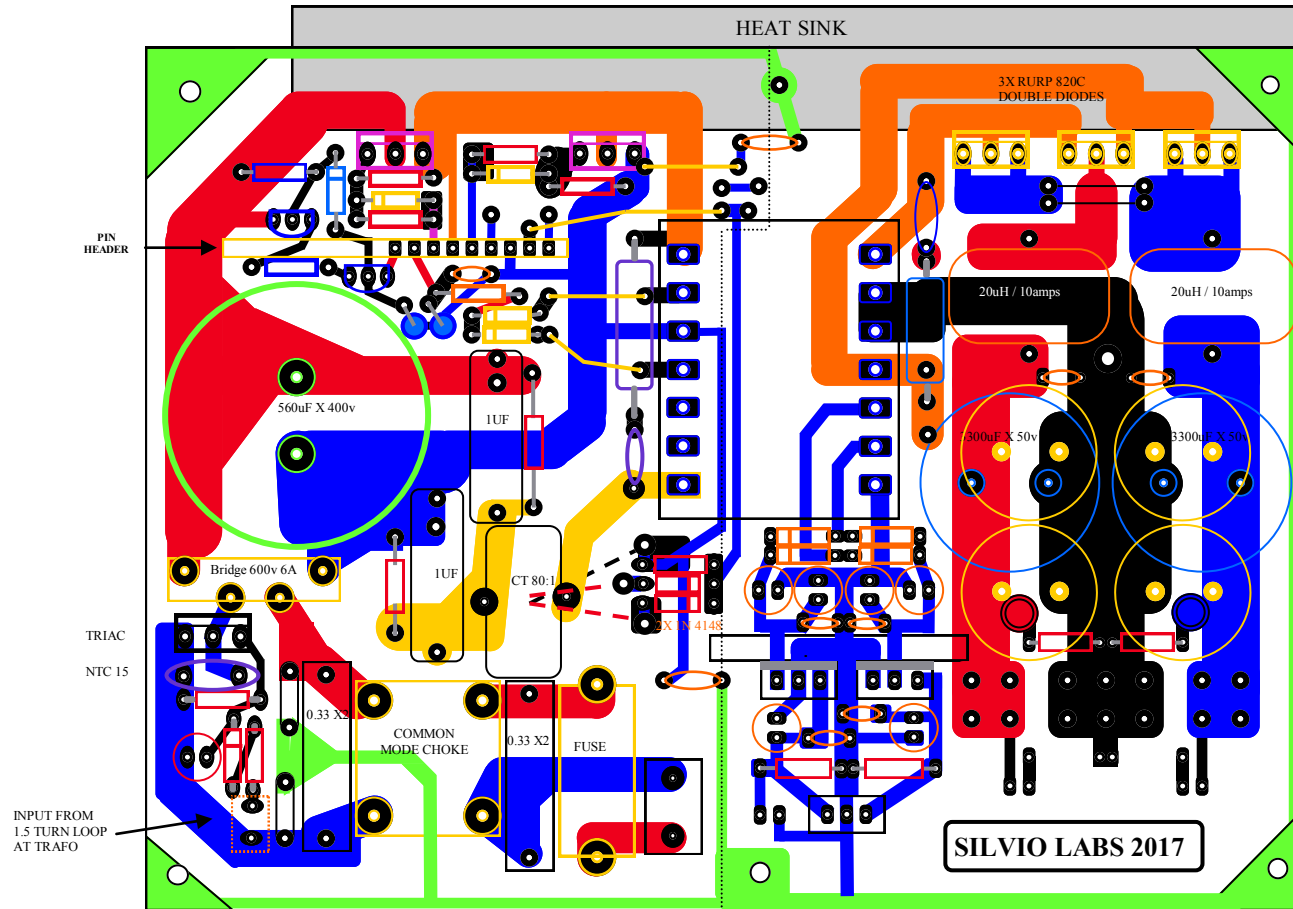
0 OC - 0 LOC HO AX+

S/C PROTECTION WITH SCR



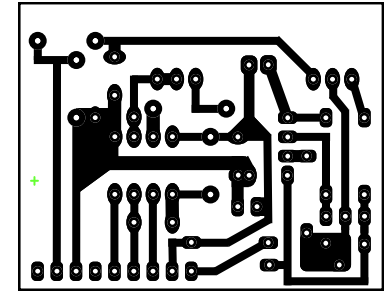
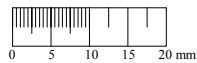
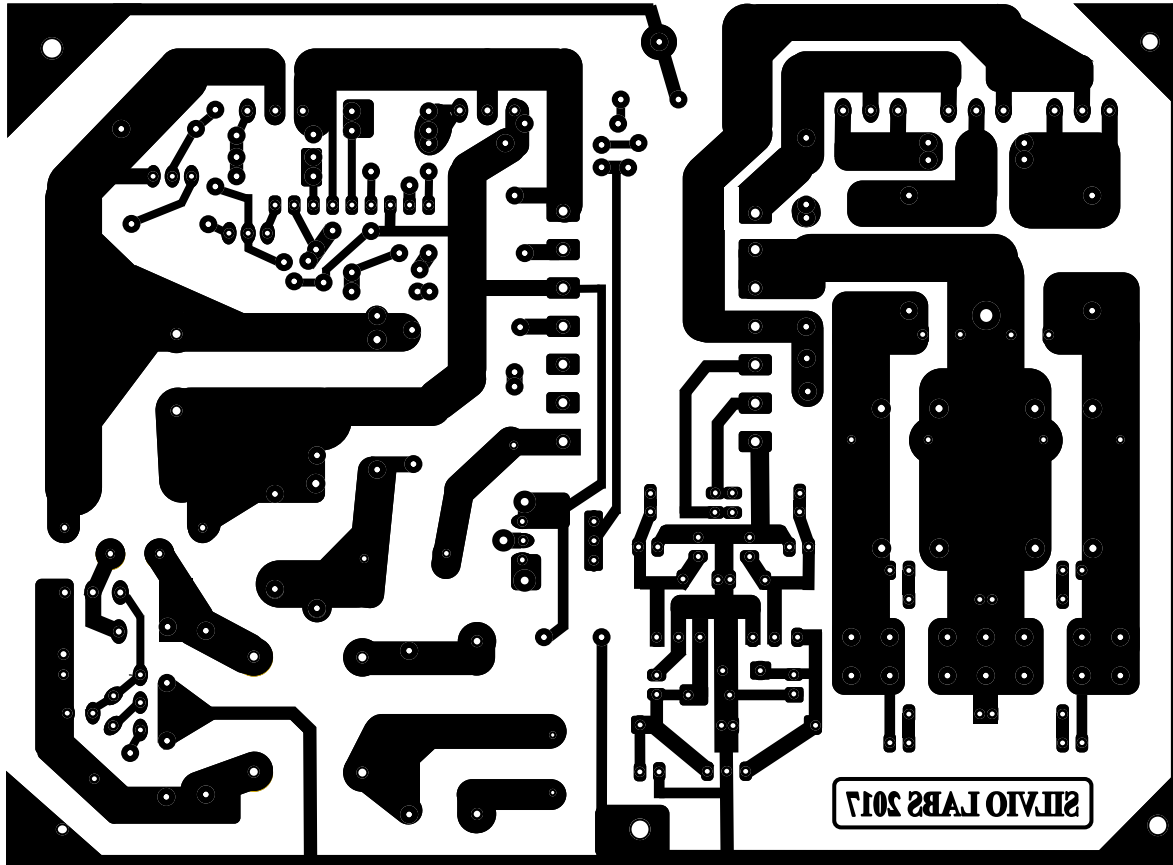
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Current Limiter

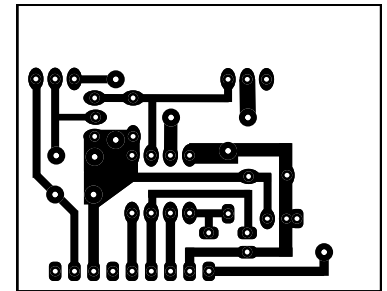


MIRROR IMAGE WITH CENTER TAP ON PINS

AUDIO SMPS 700WATTS WITH AUX 12-0-12

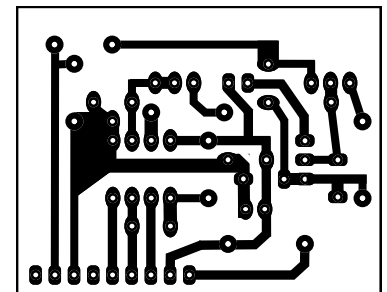


S/C Protection with Schmitt trigger



0 OC - 0 LOC HO AX+

S/C PROTECTION WITH SCR



0 OC - 0 LOC HO AX+

Current Limiter