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Audio Switched Mode Power Supply

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ABSTRACT

A linear power supply is preferred most purists because it avoids any components that might introduce electromagnetic noise into the amplifier circuit. In fact, the linear style supply is by far the most prevalent, so this treatise will focus on that. SMPS designs are designed as IR2153 amplifier power sources based on IR2153 Integration. The 300W version gives 2X44V DC. Circuits have Short circuit protection.

Keywords:- SMPS, Power Supply

INTRODUCTION

SMPS- Switched Mode Power Supply is a device used as a external power source for circuits. To efficiently convert electrical power, it has a switching regulator. Based on circuit topology SMPS are classified into two namely: Non- isolated converters and Isolated converters. The non-isolated SMPS are the ones whose input and output circuitry are not isolated from each other and are further classified into three namely Buck, Boost, Buck-Boost. In this type of SMPS, no such device is used that can separate the switching circuit from that of output and inductors are used as energy storing element. In isolated SMPS, there is a isolation maintained between input and output circuitry. The isolated SMPS are further classified into two they are Flyback Converter and Forward Converter. In these SMPS, the switching and output are seperated using a transformer. The secondary winding of the transformer act as the energy storing element. Other than isolated and non- isolated the SMPS has some more classifications, they are Full bridge SMPS and Half bridge SMPS. The half bridge converter is a type of DC-DC converter, like flyback and forward converters, can supply an output voltage either higher or lower than the input voltage and provide electrical isolation through a transformer. Phase-Shifted full bridge converters are used in medium to high power applications to step down high DC voltages and to provide isolation. PSFB converters are similar to conventional full bridge DC-DC converters but with a phase shifting control. SMPS are usually used in computers to change the voltage to appropriate range for the computers.

WORKING

Describing about the circuit topology of SMPS, the main components of the circuit are: a fuse, MOV (metal oxide varisor, a device that protects the circuit from high voltages.), capacitors, resistors, bridge rectifiers, transistors, IR2153 chip etc. A fuse of 3A is placed at the circuit firstly to enter only the required current to the circuit.A MOV is used for circuit protection from high voltages. Capacitor C1 is used smoothening the current and a inductor chock for EMI filtering. Capacitor C2 acts as a voltage limiting capacitor it limits the 230V to 12V. The capacitor C2 connected to a bridge rectifier (VDS1 1N4007) which convert the AC to pulsating DC and capacitor C4 smoothens the current. A zener diode (VD1 1N4743) is provided for voltage verification. The C7 and R5combined act as RC delay circuit. When a voltage is applied for the first time the transistor will be in OFF condition, then the delay will get activated and automatically a time will get set. When the activated time get over a pulse from delay circuit switch ON the transistor VT3 and it will turn ON the relay K1 and the turning ON of the relay K1 does not allow the flow of current across the resistor R6 and instead it act as a short circuit and it is also RC oscillator so we can increase or decrease the frequency according to the application.

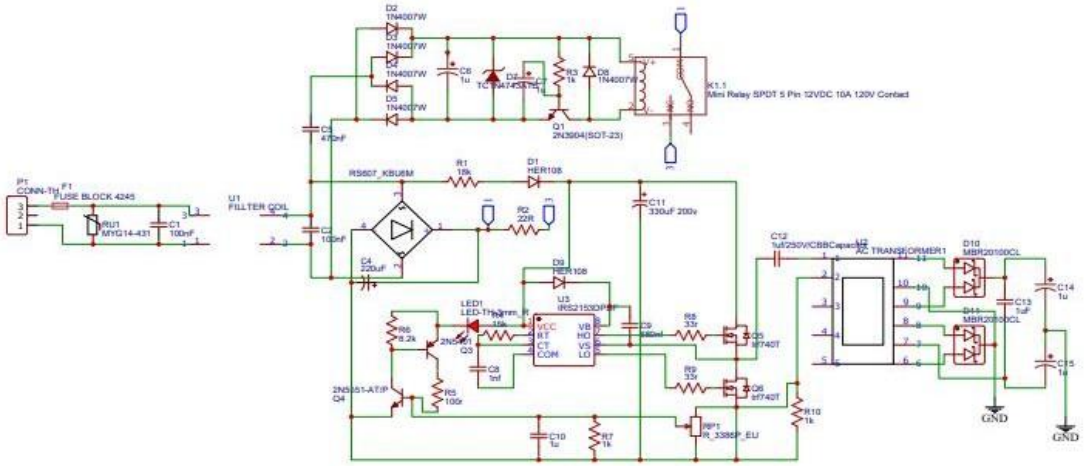
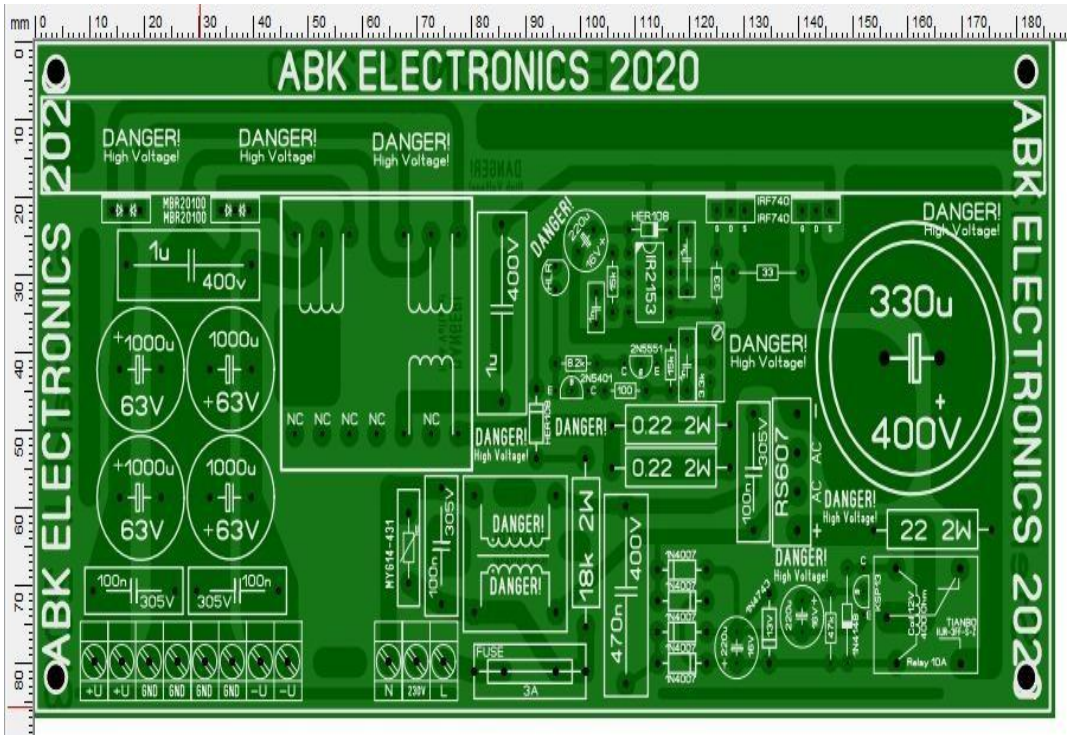


Fig 1 Circuit Diagram

The bridge rectifier VDS2 is used to convert AC to pulsating DC. The capacitor C5 and resistor R2 acts as a combined circuit which performs as a voltage divider circuit and diode VD2 is used for removing the AC repulses and limiting the current. IR2153 IC ,an oscillator IC which works in 45 KHz (the frequency which is produced by a RC network, C6&R4).This IC provides protection from overload and short circuit and for indication of it a red LED is placed. There are two Mosfets (VT4 and VT5)for driving the transformer which is placed in the output side. Further resistors R8 and R9 is connected to the gate pin of VT4 and VT5 for limiting the current going to the gate. The current sensor R11 which is a low value resistor used to measure the current. A transformer of primary winding turns 46 and secondary winding 24-24 which is paired is placed at the output side and the paired secondary winding has four diodes, ie, two pairs of diode VD5&VD6 respectively. These are used of rectification. C12 is a high frequency bi-pass capacitor used for removing high frequency voltages or noises. C13, C14, C15 and C16 are charge storing capacitors. C17 and C18 has same functions of C12, if there is an error occur in the functions of C12 (removing high frequency voltages and noises).

PROTOTYPE



2. Fig 2 PCB Top View

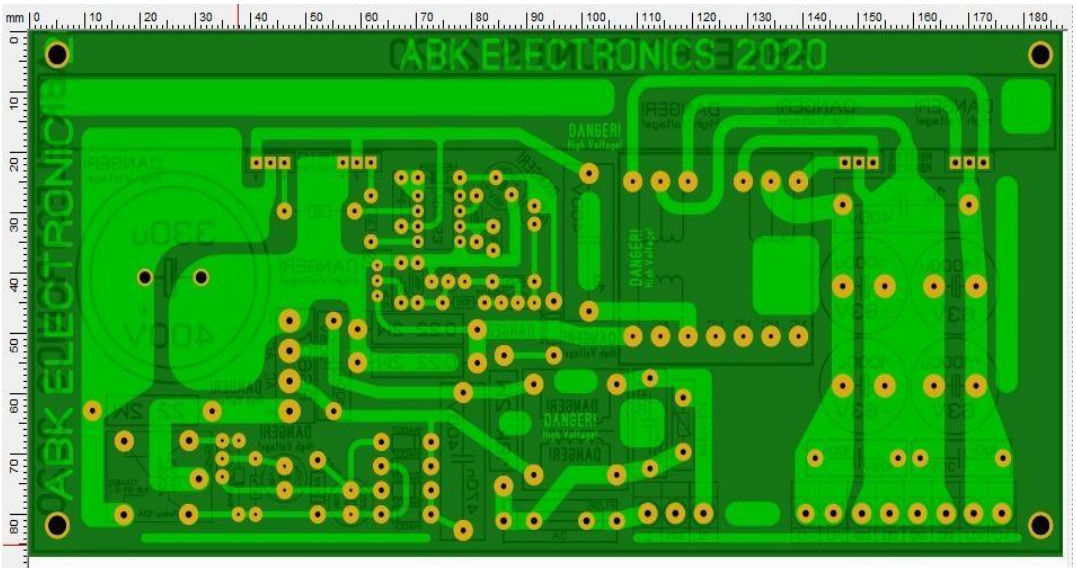


Fig 3. PCB Bottom View

CONCLUSION

The output voltage of this SMPS is 0 to 35V. This device is mostly used in audio amplifiers and related applications. Comparing with transformers the size and weight of this device is less. It is compact. It produces 15A current in the output. This SMPS has more clear output than normal SMPS like low noise etc. Totally it is very suitable for audio applications.

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