Linear Power Supply

1 Introduction

Power supplies are used to drive a load under constant voltage/current conditions. When designing power supplies several factors should be taken into consideration including efficiency, load and line regulation, short circuit protection etc. You are expected to design a voltage regulator from scratch to drive a high-power load (100 W) from 230 V input voltage.

2 Requirements

- 10 V Linear power supply with a maximum current rating of 10 A.
- Should include circuit protection mechanisms.
- Power supply efficiency should be considered when developing the circuit.
- A step-down transformer will be provided (230 V rms – 15 V rms). Your design should include every step (rectification, regulation) after transformer output.

3 Additional Notes

- All the circuits must be simulated using software (Ex- LT Spice, Multisim, PLECS,...,etc.) before the implementation.
- When necessary all relevant components should be evaluated and selected using their respective datasheets. i.e. The selection of a component requires a proper justification.
- A datasheet similar to LM7805 should be prepared for your power supply with all possible characteristics.
- Complete set of design and manufacturing documents such as Schematics, Layout, 3D Model, Gerber files, Assembly files, Bill of Materials (BOM), User guide etc, must be generated and properly documented.

- Operation of the power supply at maximum rating should be demonstrated by connecting a heating element (domestic water heater coil) to the output of the supply.
- Microcontrollers can be only used for user interface operation.
- Enclosure design must be done using a professional software (e.g., Solidworks,...,etc.)
- Enclosure and 3D model of the circuit must be assembled and inspected before manufacturing.
- 3D printing, Laser cutting and Sheet metal bending can be used to manufacture the enclosure.
- All circuits should be tested on the breadboard and reviewed by the assigned supervisor before moving further
- Schematics should be verified and evaluated by the assigned supervisor.
- Students are encouraged to consider the 3D model and PCB co-design (design in parallel by taking their integration into consideration) when designing
- Final implementation of the project need to done in a PCB.
- Follow provided "General guidelines".