

EE320 - project 2 - power supply

Objective

To design a power supply.

You are working for the Big Sound Company, on a new line of mixer products. These will be marketed toward bands, DJs, and radio stations.

Requirements

You need to design the power supply for your mixer. The mixer also has a monitor amplifier, that we haven't designed yet.

The input is the standard power line, with a voltage that varies from 110 to 125 RMS at 60 Hz.

The output is:

25-35 volts at 0-1 Amp, with less than 1 volt p-p ripple, unregulated.
Since this must also feed the 15 volt regulator, design it for 1.5 Amp.

14-16 volts at 0-.5 Amp, with less than .01 volts p-p ripple, regulated.
The voltage must hold within .1 volt over load and line variations.

You need to design the complete power supply, using standard components. It must meet specifications over the entire range of component and line tolerance.

You must specify the power transformer, by turns ratio and maximum internal resistance.

You also need to determine the power ratings of all devices.

Future projects

There will be two more projects. Project 3 is a headphone amplifier, using discrete transistors. It will be due Monday of 10th week.

Project 4 is to integrate the others into a complete system. If you did a good job at the first three, the fourth one should be easy. If not, you will need to fix what is wrong with them. To avoid pressure during the last week, if you got a less than perfect grade on project 1, you should fix it now because it will be graded again as part of project 4. It will be due Monday of 11th week.

The Report.

1. The cover:

On the cover, show a complete schematic, with all component values.

2. Calculations:

Provide a complete design for the system,

3. Simulation:

Use simulation to verify that it works as expected. For full credit, your simulation must demonstrate that the circuit works as expected.

Extra Credit:

There are two opportunities for extra credit.

1. Provide additional analysis as follows ..

a. Select an actual stock power transformer.

b. Based on thermal resistance specifications, verify that it is still within ratings when the temperature rises due to self heating.

2. Because of the special parts, it is impractical to build it. Instead, make an alternative design using a power transistor as an emitter-follower type voltage regulator to improve the efficiency.

Grade:

Your grade is based on a 5 point scale, with one point each for presentation, functionality, design basics, design completeness, and verification. You get the point if the part is there and of expected quality. You might get a half point if it is incomplete.

If you do extra credit, you get one extra point for the analysis, one point for the improved circuit, and one more for doing both, for a possible 3 extra points. The extra credit only applies if the basic requirements are met.

Due date:

It is due Monday of 8th week.

If it is late, extra credit does not apply and there will be a penalty as follows: 1 point if I get it before I hand them back, 2 points later. Late reports will be graded to the higher standards that are applied later in the course when I actually receive it.