

Homework #5 (Power Supply)

Design a linear power supply that will provide **5V at up to 0.75A** from a 120VAC input (wall power). Use the LM7805 (**TO-220 package**) voltage regulator in your design (link to datasheet below).

<https://www.fairchildsemi.com/datasheets/LM/LM7805.pdf>

Label capacitor values and provide Digikey part #'s for the transformer and bridge rectifier. Calculate the ripple voltage on the filter cap and show there is sufficient headroom for the voltage regulator to operate. Don't forget about the full wave rectifier voltage drop (the current flows through two diodes so double the individual diode voltage drop).

Calculate the power dissipated in the voltage regulator when at full load (i.e. 0.75A). Calculate the temperature of the voltage regulator die if the ambient temp is 25C. Page one of the datasheet lists the thermal resistance of the TO-220 package (T) is typically **5°C/W junction to case and 65°C/W case to ambient**.

Do you need a heatsink to keep the voltage regulator die temperature below its maximum value? Note: Page one of the datasheet lists the **maximum Junction Temperature is 150°C**.

How large of a heatsink (in °C/W) would be needed to keep the die temperature below 60C (assume an ambient temperature of 25C)?