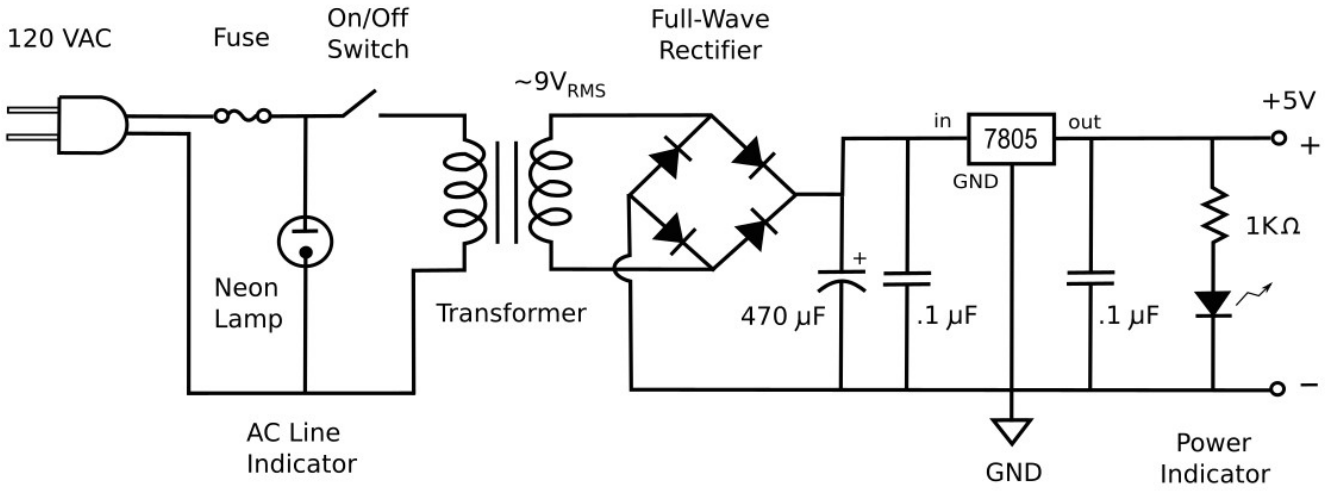
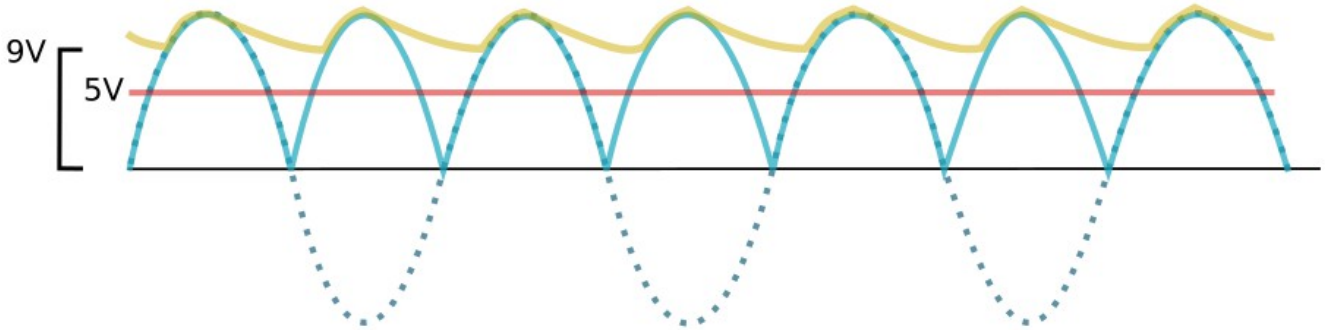
Power Supply Circuitry

Ying Sun's Lecture Notes

An Example of a 5V DC Power Supply

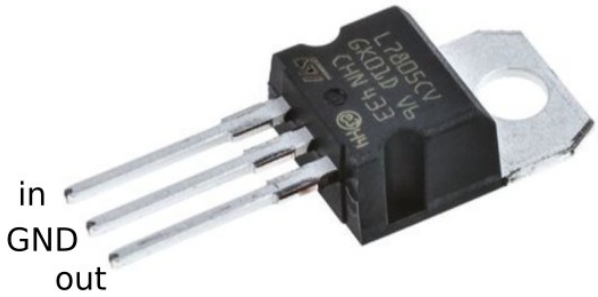




The diode bridge provides full-wave rectification as shown above. The 470 μF electrolytic capacitor reduces the ripples. The two .1 μF ceramic capacitors decouple the high-frequency signals of the load, if present, from the power source. Note that the electrolytic capacitor has equivalent series resistor and inductor (ESR and ESL), making it to behave more like an inductor at high frequencies.

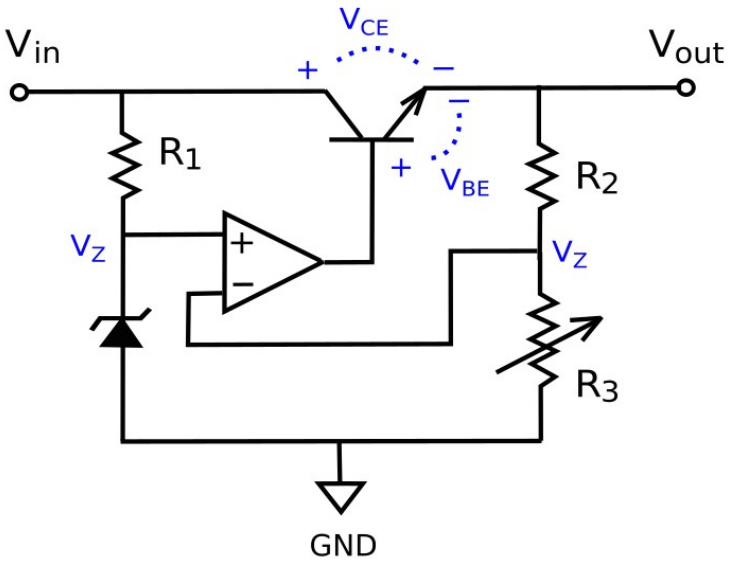
LM7805 – 5V Voltage Regulator

TO-220 package 1A rating



TO-92 package 100 mA rating

Voltage Regulator Circuit



V_{in} needs to be sufficiently higher than V_{out}, typically by 1.5 V in order to maintain a constant V_{out}. R_1 provides the bias current to keep the zener diode at the constant breakdown voltage V_Z. Because of the "virtual ground" of the OP amp, the voltage across is R_3 also at the constant voltage V_Z. The output voltage is maintained at a constant value via the negative feedback of the OP amp. V_{out} can be adjusted via the potentiometer R_3.

$V_{out} = V_Z \times (R_2 + R_3) / R_3$

Schematic Diagram of LM7805