

Diodes and AC/DC Conversion

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April 22, 2018

Purpose

The purpose of this lab is to gain experience with diodes, AC/DC conversion, and power supply filtering.

Procedure

Measure the I-V characteristics of diode with a 2-wire analyzer on ELVIS board, discuss results. Build a half-wave rectifier. Show the circuit used and sketch the inputs and outputs. With a $1\mu F$ capacitor as a filter test the output of across a $10k\Omega$ resistor and a $1k\Omega$ resistor. Describe what happens in each, explain why.

Build a full-wave rectifier and perform the same assessment. Build a regulated power supply using an LM317L variable voltage regulator.

Diode

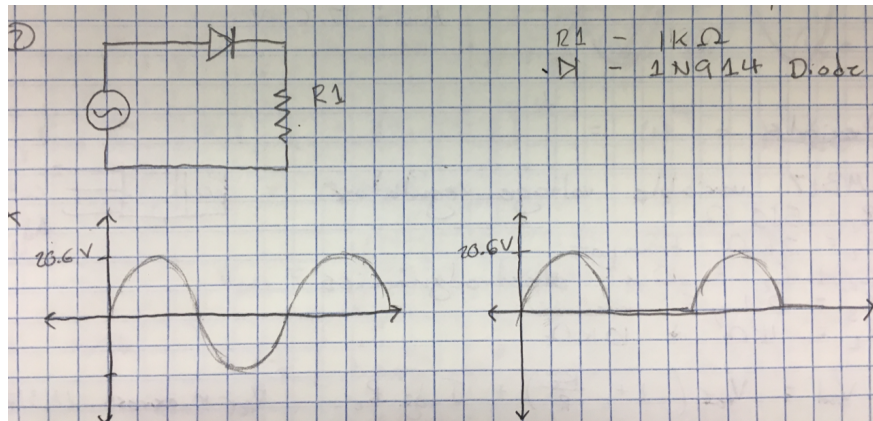


Figure 1: 1N914 Diode characteristics

The 1N914 diode does not exhibit ohmic characteristics.

Half-wave Rectifier

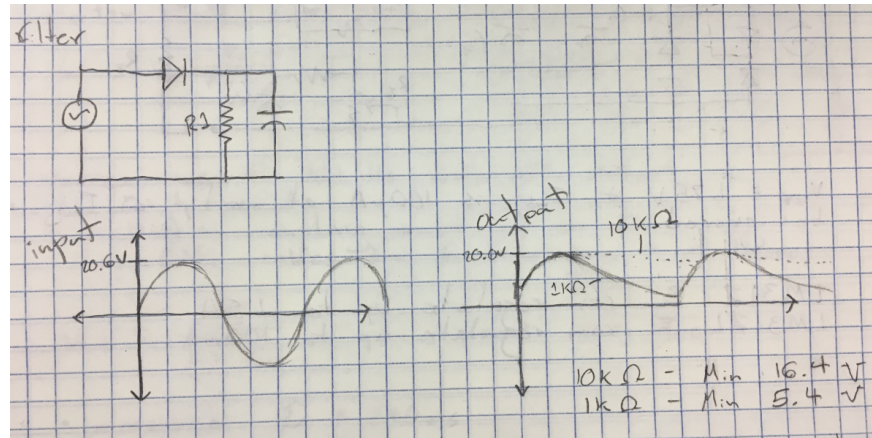


Figure 2: Half-wave rectifier with different loads

When a larger resistance is used for the load the the capacitor takes longer to discharge across it.

Full-wave Rectifier

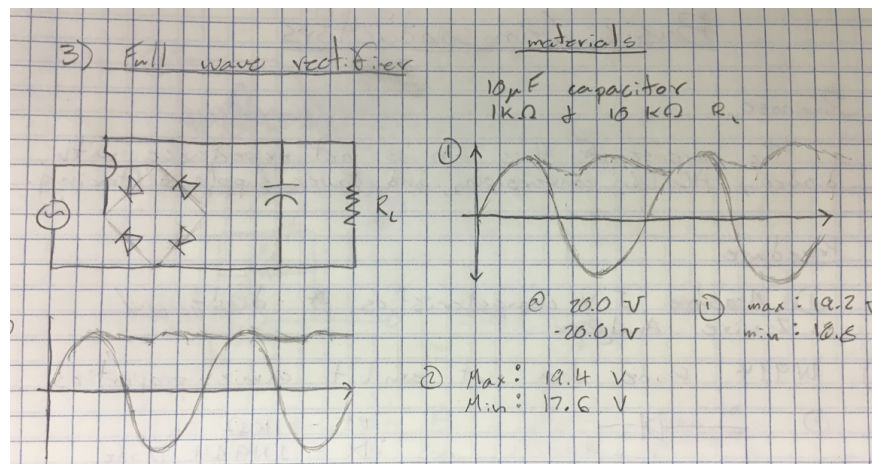


Figure 3: Full-wave rectifier with different loads

Similar characteristic result in the case of a full-wave rectifier but now peaks occur twice as frequently.

LM317 Voltage Regulator

A constant voltage was provided by the regulator dependent upon the reference voltage and the equation $V_{ref} \left(\frac{R_2}{R_1} + 1 \right) + I_{adj} R_2$ where I_{adj} is small so is neglected. Resistance of the load will affect the current output by the regulator. The LM317 will regulate up to 1.5A and the LM317L will regulate up to 100mA.

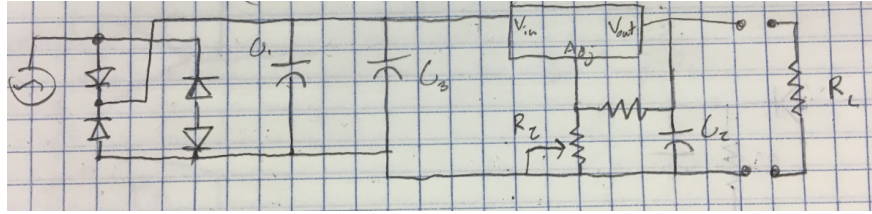


Figure 4: Circuit layout for voltage regulator

Conclusion

Bigger is not always better, pay attention to the needs of a circuit.