ECE 214 - Lab #9 — DC–DC Power Supply

4 April 2022

Introduction

In this lab, you will design, simulate, build, and test a DC–DC power supply. The power supply must meet the circuit specifications listed below. A block diagram of the DC–DC power supply is shown in Figure 1. The circuit incorporates the boost converter from Lab #7, the oscillator from Lab #8, and a low-pass filter.

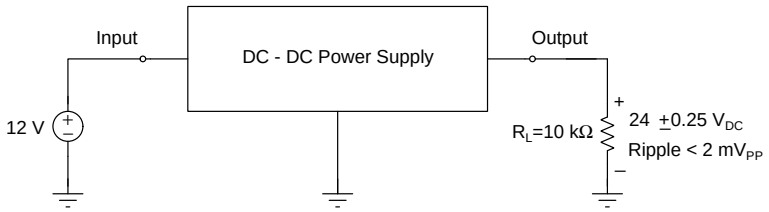

Figure 1: Block diagram of a DC–DC power supply.

Circuit Specifications

1. Input Voltage: +12 V_{DC}.
2. Output Load: 10 kΩ resistor.
3. Output Voltage: 24 ± 0.25 V_{DC} with a ripple < 2 mV_{PP}.

Pre-Lab

Design a DC–DC power supply to meet the circuit specifications. Simulate the design and verify the specifications are met.

Lab Procedure

Build the DC–DC power supply designed during the Pre-Lab. Apply power to the circuit for at least five minutes to allow the temperature to stabilize before making measurements. Test the circuit to verify the specifications are met. Redesign, resimulate, rebuild, and retest the circuit as necessary until the specifications are met. Photograph the circuit with a DVM attached across the 10 kΩ resistor to illustrate the DC output voltage.

Post-Lab

Submit a technical report describing the design, simulations, and measured performance of the DC–DC power supply. Include a cost estimate to produce 1,000 units of the DC–DC power supply and an estimate of the Thèvenin equivalent output impedance. The format of the report will be described in class. The report must be submitted electronically, in PDF format, to kotecki@maine.edu no later than midnight EDT on Friday, 29 April 2022.