

Electronic Circuit Design - EN2111

Lab 3 Report - Group 10



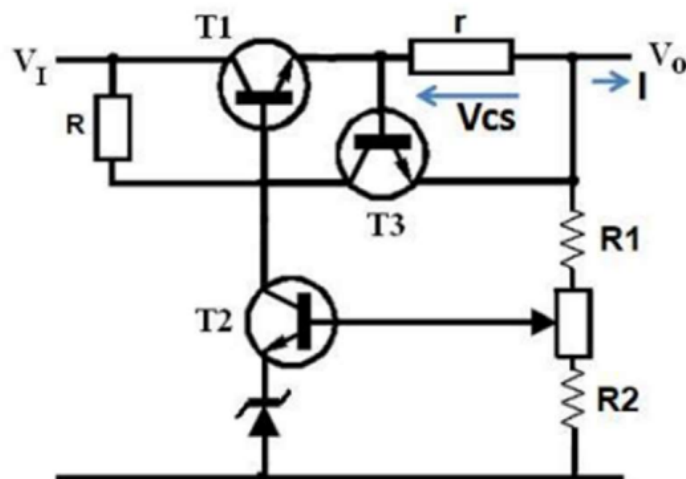
GAMIDU.A.G.D 200179H

GUNAWARDENA.M.N 200201V

HAPUTHANTHRI H.H.A.M 200207U

Abstract

This report presents the design and implementation of a simple linear power supply with line and load regulation, as well as current limiting functionality. The power supply is designed to operate within an input voltage range of 12-16V and provide an adjustable output voltage range of 4-10V. The design incorporates three transistors, one zener diode, and four resistors to regulate and limit the voltage and current. The line regulation ensures that the output voltage remains relatively constant even with variations in the input voltage, while the load regulation ensures stable output voltage despite changes in the load conditions. The current limiting feature protects the circuit and connected devices by preventing excessive current flow. This report describes the design methodology, circuit schematic, component selection, and testing results to demonstrate the functionality and performance of the designed linear power supply. The obtained results showcase satisfactory line and load regulation, as well as effective current limiting, making the power supply suitable for a range of electronic applications.



Component selection

T1 - BD139

T2,T3 - BC109

Zener Diode - 1N4728A

R - 330 ohm

r - 5.6 ohm

R1 - 470 ohm

R2 - 1 kOhm

R3- 2 kOhm variable

Requirements

Input voltage range - 12V - 16V

Output voltage range - 4V - 10V

Maximum current - 100mA

Calculations

Important parameters

V_z - 2.7V

I_{zk} - 1mA

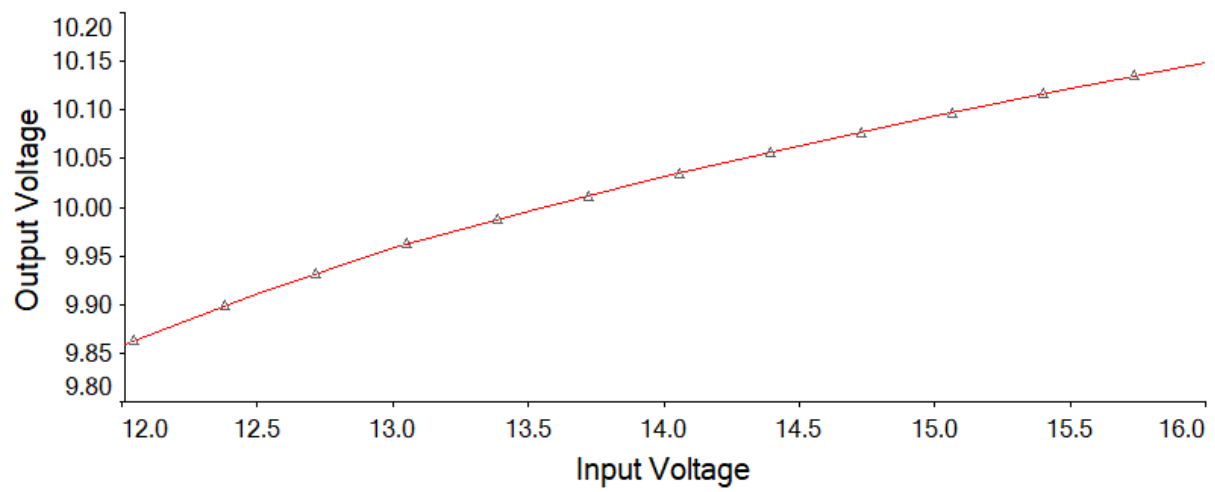
DC current gain (T1) - 50

BE voltage (T2,T3) - 0.62V

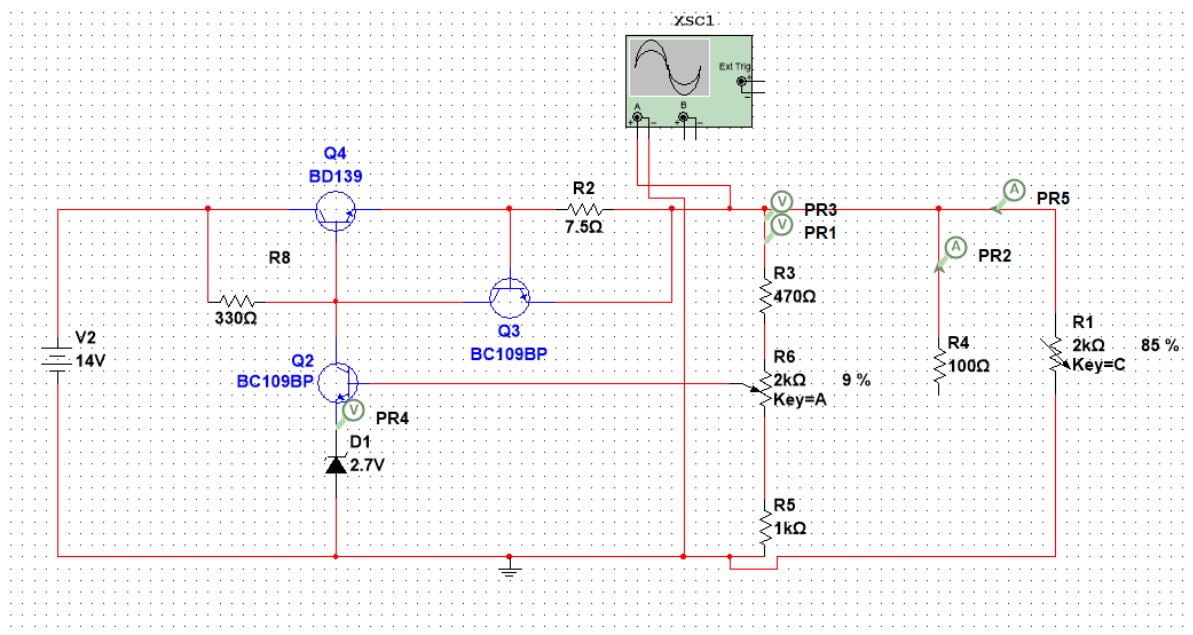
Simulation results

At output voltage 10V

DC Transfer Characteristic



☒ V(10) ☒ V(PR1)
☒ V(10) ☒ V(PR3)



Observations

Any desired output voltage within its range was able to be obtained for all input voltage values.

To verify whether the supply was able to provide a fixed output voltage despite line variations, the input voltage was set to its maximum (16V) and the output was adjusted to supply its minimum (4V), then the input was varied from 16V to 12V. It was observed the output voltage varied by about 0.2V.

To verify the supply's performance when connected to a load, a resistor of 210 ohms was connected. No significant output voltage variation was observed.

To verify the functioning of the current limiting circuit, a load of 47 ohms was connected. As a result, the current limiting circuit was activated and a voltage drop was seen across the output.