

EE241 Laboratory Exercise: Zener Regulators

Name: _____ Section: _____ Date: _____

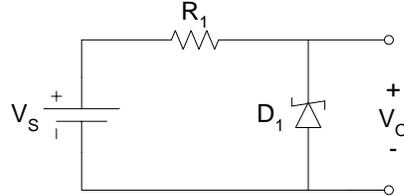
I. GOAL: To build and test diode regulator circuits.

II. EQUIPMENT:

- a. Diodes: 1N754 zener (1 each)
- b. Resistors: 100 Ω (1 each), 1 k Ω (2 each), 10 k Ω (1 each)

III. PROCEDURE:

- a. Look up this zener diode on the web to verify its normal reverse breakdown voltage. Build the regulator circuit shown below, for which $R_1 = 1 \text{ k}\Omega$, $V_S = 15 \text{ V}$, and the diode is a 1N754. Record the voltage at the output.



- b. Change the source voltage to 20 V, and record the output. Then change the input voltage to 10 V and repeat. Record the results. Return the source voltage to 15 V.
- c. Now connect a 10 k Ω resistor (the “load”) in parallel with the output and record the new output voltage. Repeat with a 1 k Ω load, and again with a 100 Ω load.
- d. Remove the load and flip the diode around. Measure and record the output voltage.

IV. RESULTS:

- a. Initial output voltage: _____
- b. Output voltage with supply increased to 20 V: _____
- c. Output voltage with supply decreased to 10 V: _____
- d. Output voltage with 10 k Ω load: _____
- e. Output voltage with 1 k Ω load: _____
- f. Output voltage with 100 Ω load: _____
- g. Output voltage with the diode flipped: _____

V. QUESTIONS:

- a. In your own words, what is the purpose of a regulator? What is the maximum power rating?

- b. Use your data as the supply was changed (part b of the procedure) to calculate the “source regulation” for this regulator, given by: $S.R. = \Delta V_o / \Delta V_S$. Should this quantity be large or small for a good regulator?

- c. Did the regulator ever seem to fail (with the zener in the right orientation)? Consider the loading of the circuit and explain why this might happen. Theoretically, at what “load” resistance will the regulator fail in the above circuit?

- d. To provide greater power to a load, what must be changed in the circuit (without changing the 1N754)?

- e. What happened when you flipped the zener diode around? Did this make sense? Explain why or why not.