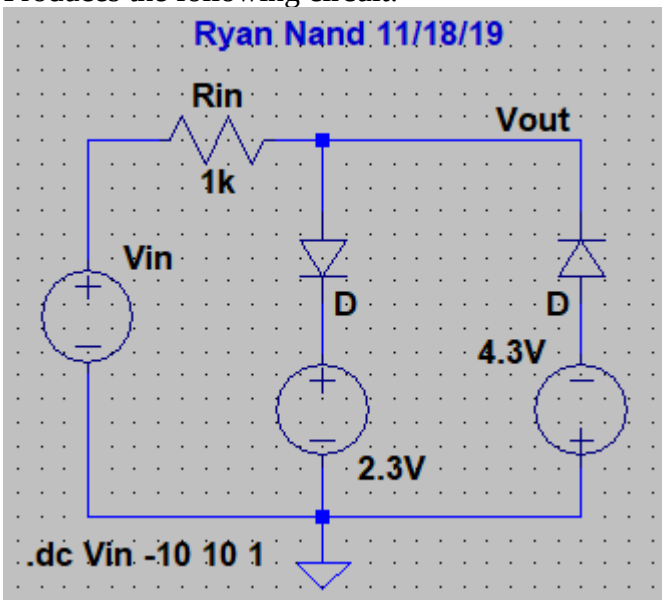
Ryan Nand Lab 2 Diode Circuits

Part 1 Limiting Circuit:

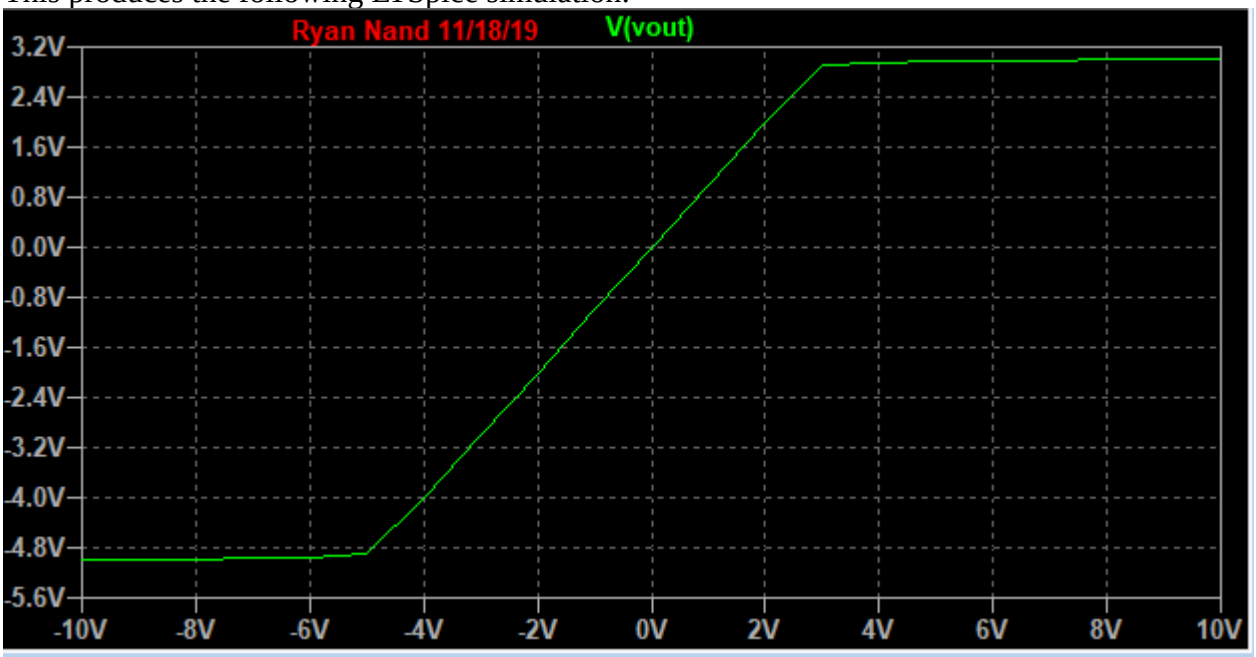
A limiting circuit with the following characteristics:

–5 ≤ Vin ≤ 3 V, Vout = Vin
Vin ≤ -5V, Vout = -5 V
Vin ≥ 3 V, Vout = 3 V

Produces the following circuit:



This produces the following LTSpice simulation:



The simulation follows expected results according to theory.

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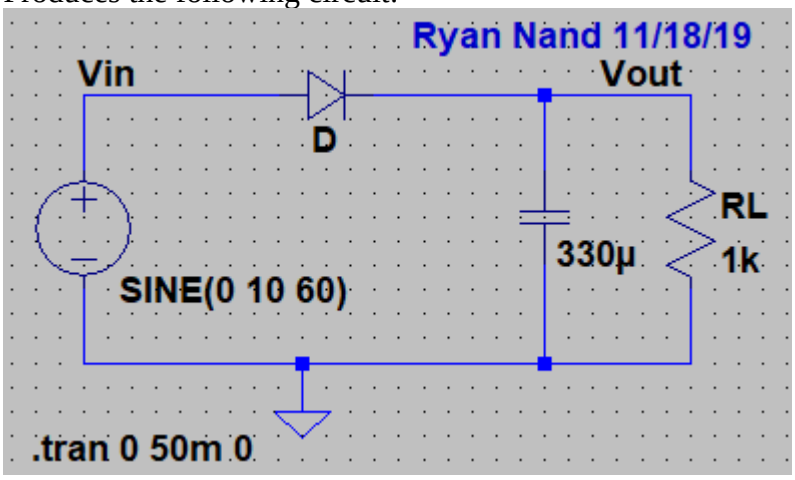
Part 2 Rectifier Circuits:

A rectifier circuit with the following characteristics:

Vin = 10 V (peak), 60 Hz, Rload = 1 kΩ, ripple voltage ≤ 5%

Produces the following circuit:

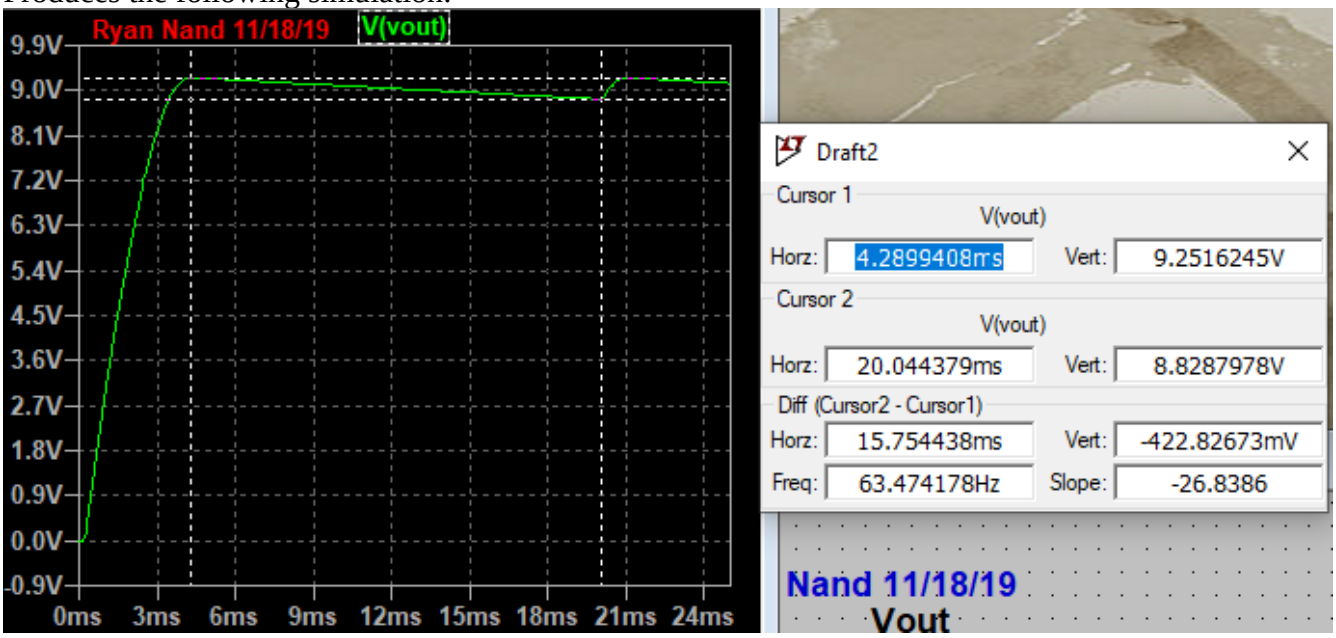


This circuit was designed using real values through calculation. Not ideal calculation results. The reason is that if real values are used then the practical testing results can be more accurately compared to simulation results.

Also a half-wave rectifier was used to reduce the amount of components used. Makes for easier practical testing.

Vripple = $I_L/(c*f)$
where I_L = Vin/RL, C = cap value, and f = frequency
Vripple = .5V because 5% of 10 is .5

Produces the following simulation:



8.83V/9.25 = .95 or a 5 percent difference. So the simulation holds to theory.

Part 3 Voltage Regulator:

A voltage regulator with the following characteristics:

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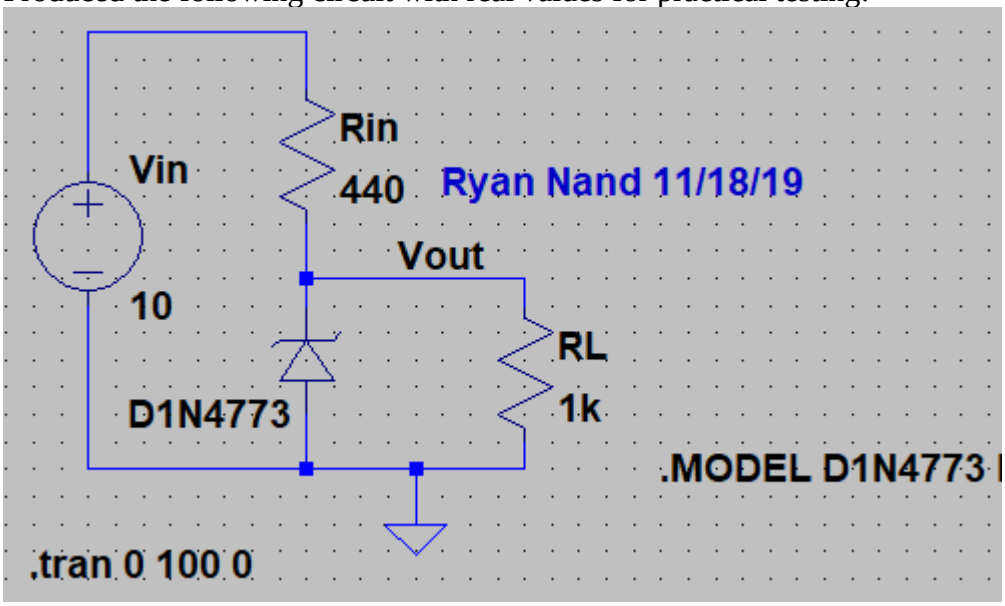
Diode power dissipation ≥ 1 W (I am assuming this is wrong! The diodes are rated at 1W)
Output voltage between 5 and 6 V (choose a value in this range)
Load resistance 1 kΩ ± 50%
Power supply voltage 10 V ± 10%

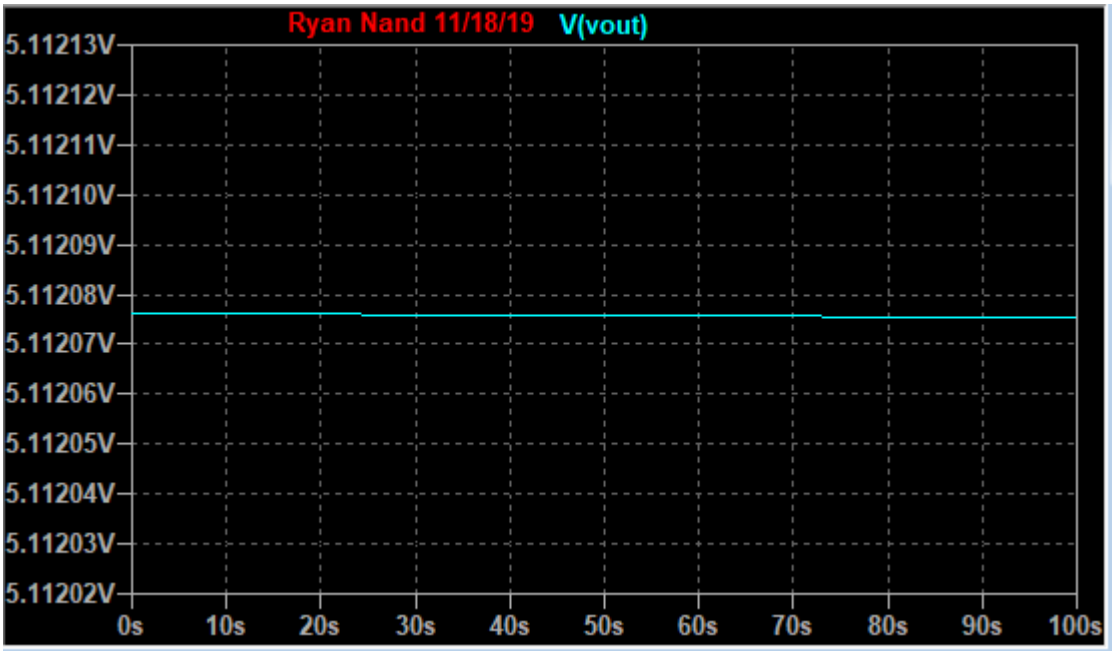
Produced the following circuit with real values for practical testing:



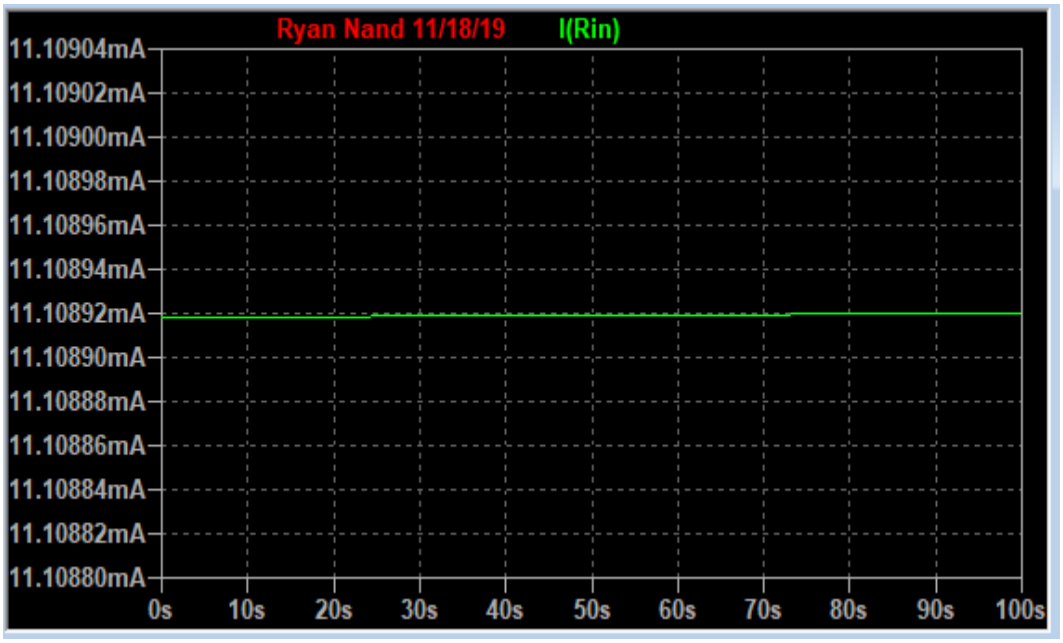
The value for Rin was arbitrary. I chose 440 ohms to limit the watt dissipation. Which is well below the power rating of ¼W of the resistors on hand.

Also, a zener diode (1N4773a) was chosen for a breakdown voltage of 5.1V.

The simulation results are as follows:



According to the simulation the results from theory hold true. A voltage of 5.1V was expected at output.



This was included to make sure the power dissipated in the resistor was below the maximum ratings.

11e-03*10 = .11W which is below the rating of .25W