Report for E-design 344

by

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Replace with your own name and number

E-Design final report (Assignment # 1)

September 2020

Declaration

By submitting this report electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualifcation.

**** Put your signature here and remove this line ****

Signature: .....

E. Stewdent

Date: .....

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Nomenclature

Replace with your own as needed

Constants

g = $9.81\,\mathrm{m/s^2}$

Variables

P	Power	[W]

Chapter 1

System design

1.1 System overview

Here you insert a block diagram of your voltage regulationa nd signal conditioning system. Try to explain **what** configiation you chose and **why**. There is no need to specify the capacitor and resistor values here, but you want to capture the higher-level functional arrangement you have opted for. The diagram ties together the other chapters in this report and helps the reader understand how you have connected the different funtional blocks together to produce the outputs. For example, a block could be "Differential amplifier" or "level shifting op-amp" or "Low-pass filter" or "Linear regulator" and the like. Please use a drawing application, such as draw.io, MS Visio, or Power Point and export it as a PDF, so it looks good. If you feel brave, draw them in LaTeXusing Inkscape/`TikZ`. Fig. 1.1 is a bad example that is completely irrelevant and just holds space for your beautiful system diagram.

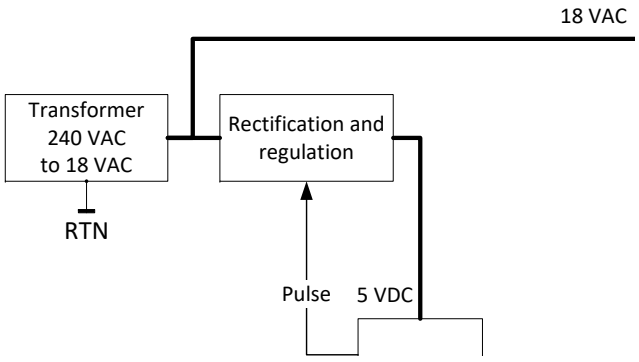


Figure 1.1: System diagram

Chapter 2

Voltage regulation

2.1 Background

Introduce the reader to what you want to present in this chapter. Include any references to literature you feel is needed. In this section, you put a very short summary of infrormation you gatherered from literature (papers, web sites, datasheets) that you used to do the design. Be sure to include the references, which you can add in the `References.tex` file.

Some examples of how to cite (all in `References.bib`): It was stated by [1] that ... . Subsequently, he changed his mind and said in [2] that ... . While [3] claims it to be ... .

2.2 Design

In this section, you need to capture your design, which should include the following:

- Design rationale, i.e. what your thinking was behind the design
- Design calculations, for example to determine resistor values and capacitor values, or to check for allowed voltage and current ranges and levels.
- Circuit diagram like the one in Figure 2.1. I used "print to PDF" from LTSpice, but feel free to use a cropped screengrab if you are PDF-challenged and do not have a PDF printer (there are some free PDF creators online).

For your benefit, here is how to write values with units: 150 mΩ or 199 myUnits, and this is how we write ranges: 2 to 5 kV.

Here is an inline equation $\frac{55}{45+3}$. Here is a numbered equation in Eq. 2.1.

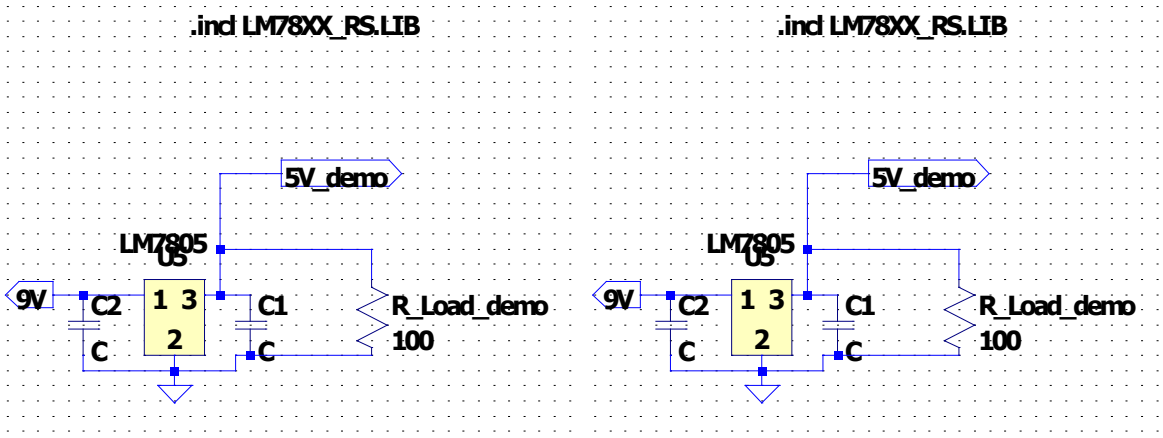
$$a = \frac{55}{45+3}. \tag{2.1}$$

.

2.3 Design

In this section, you need to capture your design, which should include the following:

- Design rationale, i.e. what your thinking was behind the design.
- References to literature/sources as appropriate [3]. You can assume the reader has an E&E degree, and will not need trivial explanations or references (e.g. what a resistor is, or what Ohm's law is).



(a) Linear voltage regulator. (b) Switchmode voltage regulator.

Figure 2.1: Circuit diagrams of the two voltage regulators

.

Table 2.1: Example of a table.

	2017	2018	Δ_{Abs}	Δ_{DiD}
A	9,868	10,399	+5	-11
B	10,191	10,590	+4	-12

- Analysis of given or expected input conditions.
- Design calculations, for example to determine resistor values and capacitor values, or to check for allowed voltage and current ranges and levels.
- Expected values and ranges based on your design.
- Schematic circuit diagram, like in Figure 2.1b (which is, again, just an irrelevant example).
- Explain your choice of supply buy referring to the advantages and disadvantages of each.

2.4 Simulation

In this section, you want to demonstrate, by means of referring to simulation results, using the designed circuit, how your circuit is expected to behave. Present and report on your simulated results in Figure 2.2 Be absolutely sure that the text and information in your report are readable.

You can use screengrabs or photos of the oscilloscope, or download the CSVs and plot them as PDFs using Matlab, Excel or similar. You can also use tables, example of which are presented in Tables 2.1 and 2.2.

2.5 Summary and implementation

State whether your design performs as expected and what the limitations are or things to keep in mind are.

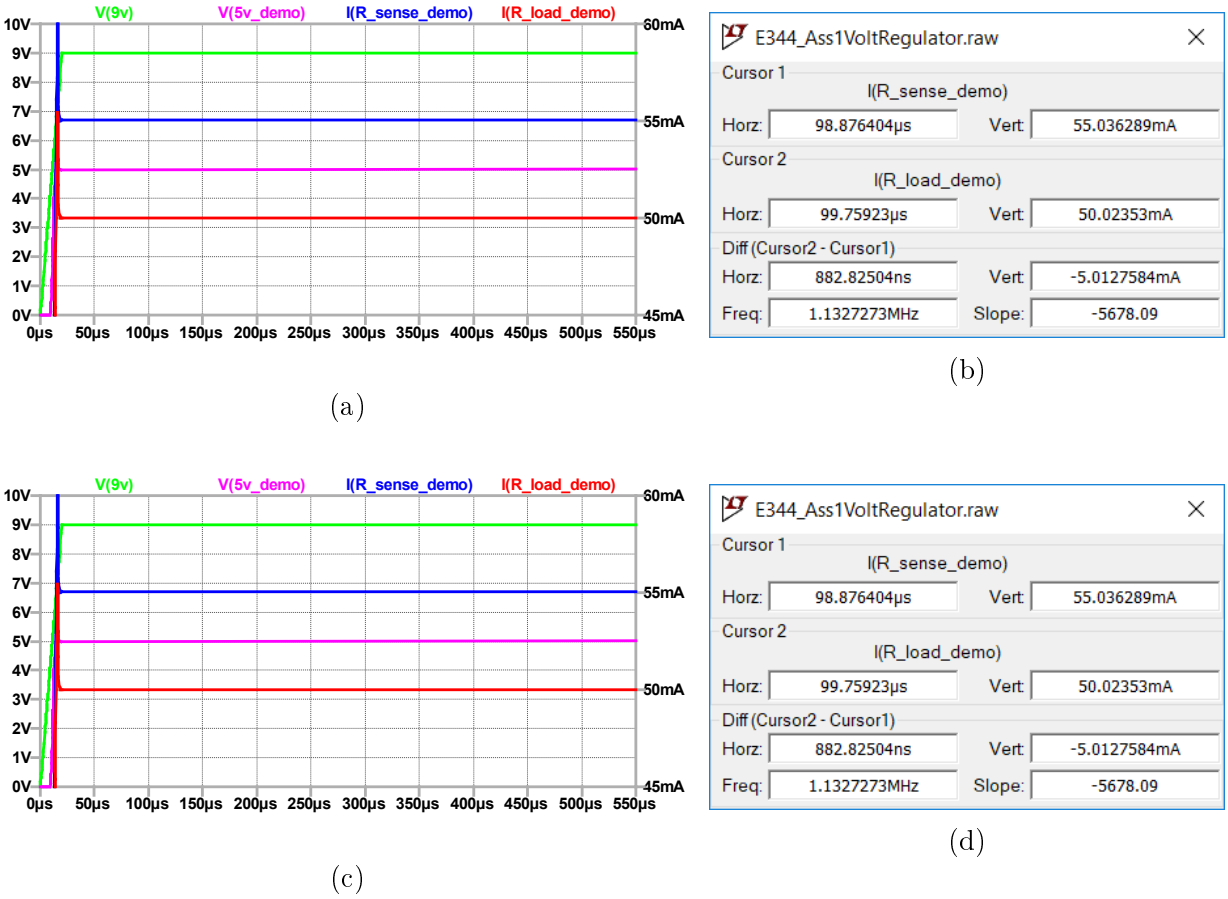


Figure 2.2: Voltage regulation, comparing the linear and switchmode regulators... (a) Blah blah. (b) Blah blah. (c) Blah blah. (d) Blah blah. Based on the datasheet of XXXX in [3]

Table 2.2: Example of another table.

Schools	Total energy used		Change	
	2017 [kWh]	2018 [kWh]	Δ_{Abs} [%]	Δ_{DiD} [%]
A	9,868	10,399	+5	-11
B	10,191	10,590	+4	-12

Chapter 3

Temperature sensor

3.1 Background

3.2 Design

3.2.1 Simualtion

Demonstrate that you meet the requirements.

3.3 Summary and implementation

Summary of performance, and how it will fit into the system (E.g. where the calibration will look like).

Chapter 4

System and conclusion

4.1 System

4.2 Lessons learnt

Write down at least three of the most important things you have learned or lessons you acquired from Assignment 1.

References

[1] Booysen, M.J., Andersen, S.J. and Zeeman, A.S.: Informal public transport in Sub-Saharan Africa as a vessel for novel Intelligent Transport Systems. In: *16th International IEEE Conference on Intelligent Transportation Systems (ITSC 2013)*, pp. 767–772. Oct 2013. ISSN 2153-0009.

[2] Gerber, S., Rix, A.J. and Booysen, M.J.: Combining grid-tied PV and intelligent water heater control to reduce the energy costs at schools in South Africa. *Energy for Sustainable Development*, vol. 50, pp. 117 – 125, 2019. ISSN 0973-0826.

[3] BBC: How to make opamps amp op. 2018.
Available at: `www.electronics-tutorials.ws`

Appendix A: Social contract

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jou kennisvennoot • your knowledge partner

E-design 344 Social Contract

2020

The purpose of this document is to establish commitment between the student and the organisers of E344. Beyond the commitment made here, it is not binding.

In the months preceeding the term, the lecturer (Thinus Booysen) and the Teaching Assistant (Michael Ritchie) spent countless hours to prepare for E344 to ensure that you get your money's worth and that you are enabled to learn from the module and demonstrate and be assessed on your skills. We commit to prepare for the module, to set the tests and assessments fairly, to be reasonably available, and to provide feedback and support as best and fast we can. We will work hard to give you the best opportunity to learn from and pass analogue electronic design E344.

Signature: ..... Date: 13 July 2020 .....

.....

I, ... have registered for E344 of my own volition with the intention to learn of and be assessed on the principals of analogue electronic design. Despite the potential publication of supplementary videos on specific topics, I acknowledge that I am expected to attend the lectures and lab sessions to make the most of these appointments and learning opportunities. Moreover, I realise I am expected to spend the additional requisite number of hours on E344 as specified in the yearbook.

I acknowledge that E344 is an important part of my journey to becoming a professional engineer, and that my conduct should be reflective thereof. This includes doing and submitting my own work, working hard, starting on time, and assimilating as much information as possible. It also includes showing respect towards the University's equipment, staff, and their time.

Signature: ..... Date: .....

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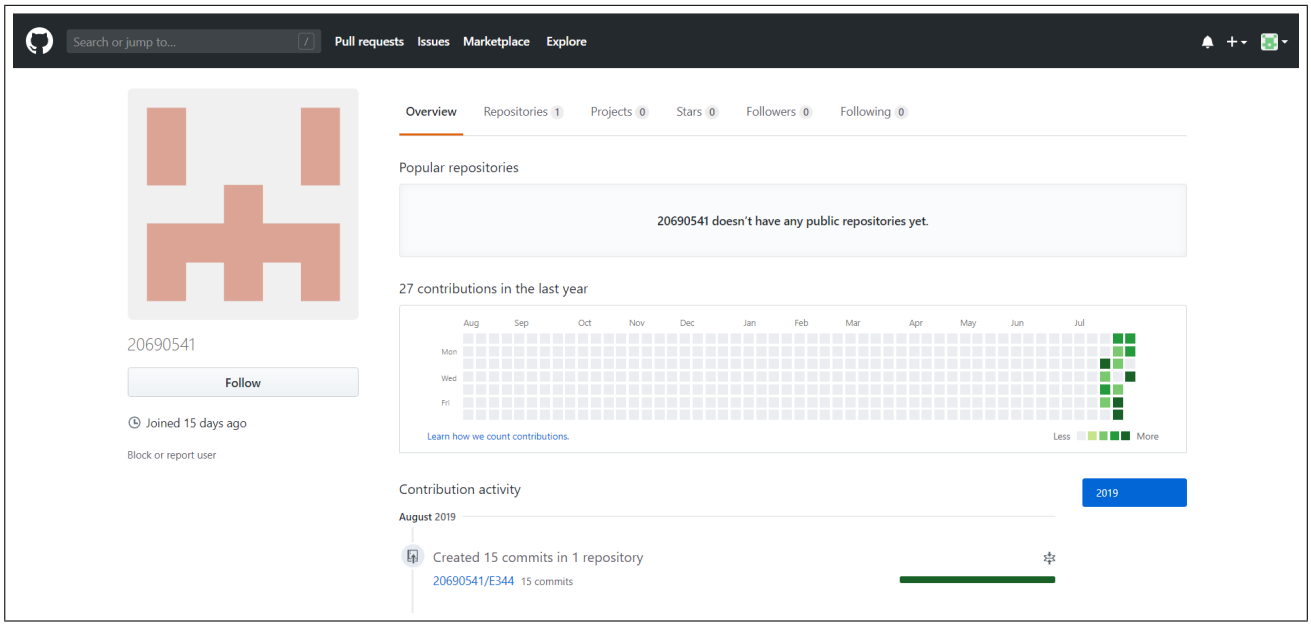
Appendix B: GitHub Activity Heatmap



Appendix B: Stuff you want to include

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