1 Introduction

1.1 Tikz

1.1.1 Vector Graphics Vs Raster Graphics

A Cockroft-Walton voltage multiplier (CWVM) is a useful device. The second time though, the CWVM is just more of the same.

A good thing to understand is the difference between a raster graphic or a vector graphic. Ever notice how when you zoom in on a pdf the letters don't start to pixelize? or in an image as you zoom in all you're doing is making the pixels bigger? well this is the difference beteen vectos and raster. That means that if you want nice plots that let you resize as needed, getting them as a vector graphics is a must. Handily enough latex has a very powerful and popular packages called Tikz that lets you create vector images withing latex. Doing this requires you to have a mental image of the end product, but getting used to this will be extremely helpful.

Of the many great aspects to tikz, one of my favourites is the consistency of font, and the ability to even include those symbols as discussed previously.

Maybe you'd like to plot some data in a csv file?

1.2 standalone

For simplification, you can have your tikz pictures in separate files for easy compilation and verification of the tikz picture.

2 input Command

- Reusing your preambles (without copying and pasting)
- Reusing glossaries

3 Import Package

4 Standalone Package

- Breaking your document into mular parts
- TikZ Images

5 catchfilebetweentags Package

5.1 catchfilebetweentags

This handy package allows you to store a bunch of different things (say for example, equations) and pull them in to your document. This is really nice because it makes your document's code more easily read. It also makes it that you can reuse the equations in another place, say for example an associated presentations

$$\Delta E_B \equiv \sum E_D(Reactants) - \sum E_D(Products) \tag{1}$$
$$\Delta E_B = (E_D(^2\mathrm{H}) + E_D(^2\mathrm{H})) - (E_D(^3\mathrm{He}) + E_D(\mathrm{n}^0))$$
$$\Delta E_B = (13.135\mathrm{MeV} + 13.135\mathrm{MeV}) - (14.931\mathrm{MeV} + 8.071\mathrm{MeV})$$
$$\Delta E_B = 3.27\mathrm{MeV}$$

$$\Delta = \begin{cases} \delta, & \text{for } A \text{ and } N \text{ both even} \\ 0, & \text{for } A + N \text{ odd} \\ -\delta, & \text{for } A \text{ and } N \text{ both odd} \end{cases} \tag{2}$$

$$E_B(Z,N) = \alpha_1 A - \alpha_2 A^{2/3} - \alpha_3 \frac{Z(Z-1)}{A^{1/3}} - \alpha_4 \frac{(N-Z)^2}{A} + \Delta \tag{3}$$

Table 1: Table of specified parameters and achieved values

Parameter	**Target**	**Calculated**	**Simulated**
NF_{dsb}	≤ 4	11.17	5.95
$IIP3$	≥ -22	≥ -2.73	-4.98
1 dB Compression	≥ -32	≥ -12.73	-14.2
Gain	≥ 16	≥ -3.26	-4.58
I_{bias}			
I_{buf}			
I_{ref}		1	1
R_D	≤ 10	570	600
V_{lo}	≤ 1		
V_{rf}	≤ 1		

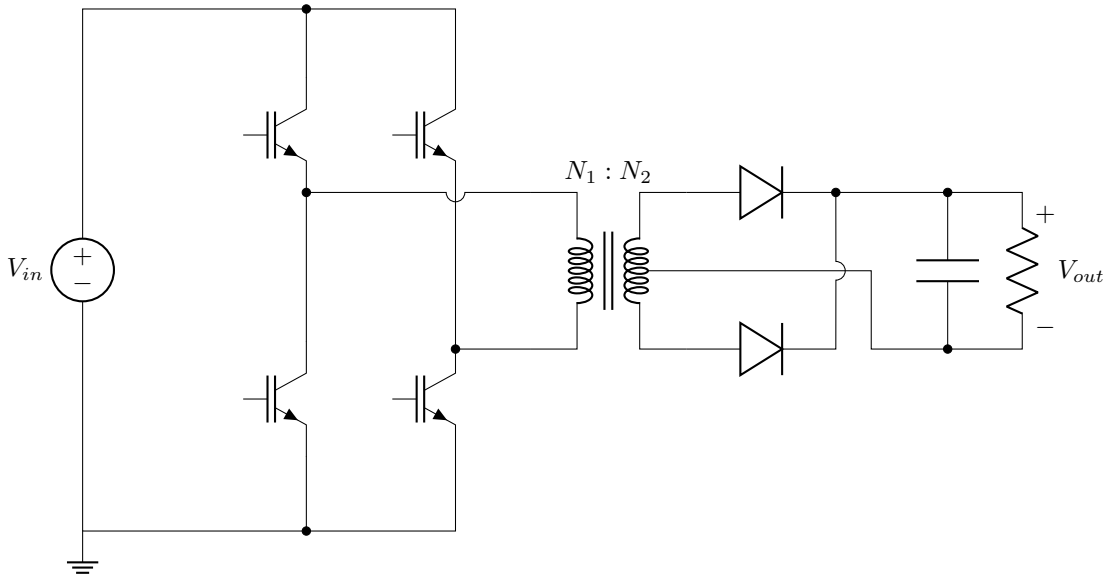

Figure 1: An Example of a circuit (an isolated boost converter) done in circuit TikZ

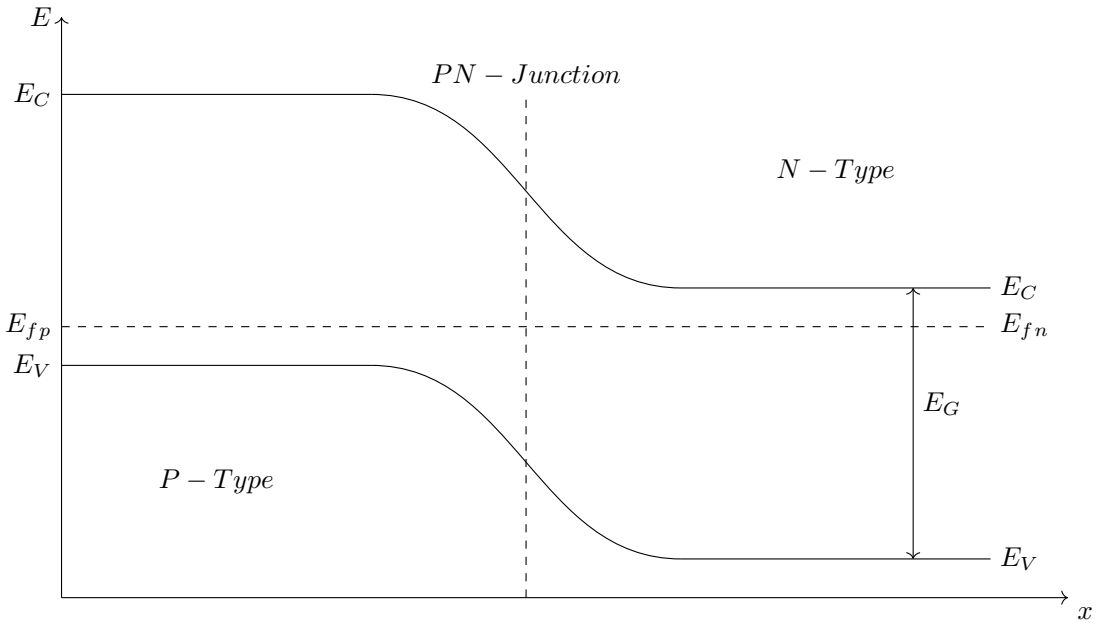

Figure 2: A simple Example TikZ showing the band diagram of a PN-junction

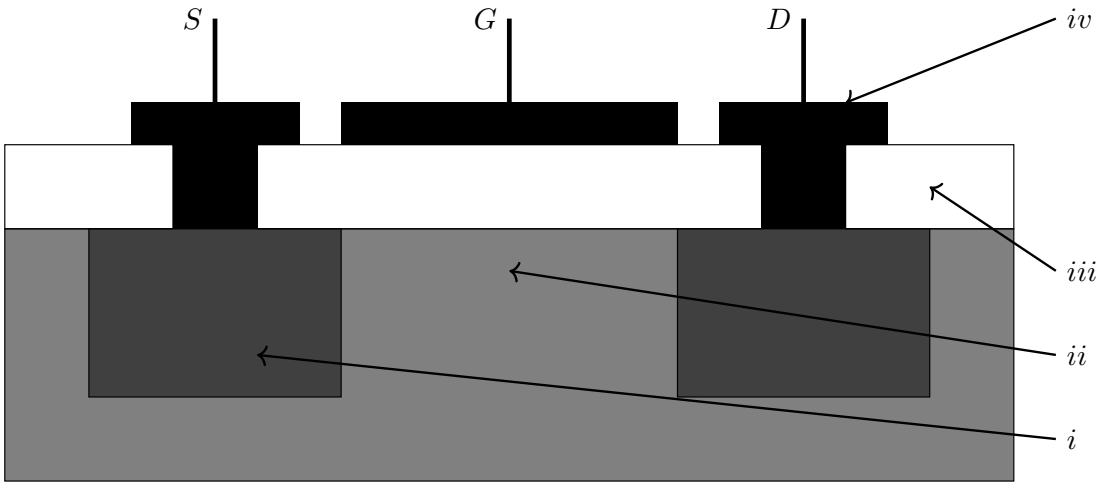

Figure 3: A simple TikZ diagram showing a MOSFET

So this is cool right, even the gls code is applied and you can have your axis labels be the symbols you defined earlier. Portability rules. But remember our little gif that was created from the video? Well thats not a function of beamer but instead a function of pdfs. So lets bring it all together and use our lua code, with tikz, to create an animation of the process of the attractors being formed.

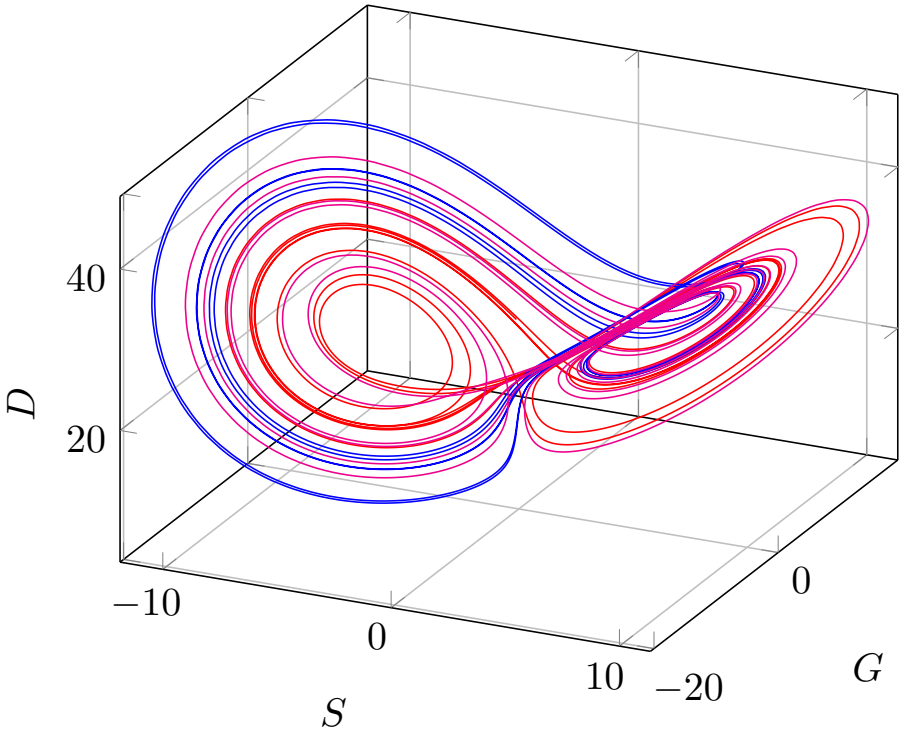

Figure 4: Lorenz Double Scroll Produced in LuaLatex

$$\frac{\mathrm{d}x}{\mathrm{d}t} = \sigma(y - x) \tag{4}$$

$$\frac{\mathrm{d}y}{\mathrm{d}t} = x(\rho - z) - y \tag{5}$$

$$\frac{\mathrm{d}z}{\mathrm{d}t} = xy - \beta z \tag{6}$$

$$\tag{7}$$

Symbols

A total number of nucleons in nucleus (unitless). 2

D Mosfet Drain. 3, 4

E_B nuclear binding energy (eV). 2

E_C Conduction band energy level. 3

E_D mass defect (eV). 2

E_G Bandgap. 3

E_V Valence band energy level. 3

E_f Fermi Energy of a Material. 3

E Energy. 3

G Mosfet Gate. 3, 4

N number of neutrons in nucleus (unitless). 2

S Mosfet Source. 3, 4

V_{in} Input voltage. 2

V_{out} Output voltage. 2

Z number of protons in nucleus (atomic mass number - unitless). 2

ΔE_B change in nuclear binding energy i.e. energy released in reaction (eV). 2

Δ pairing energy parameter (eV). 2

β Lorenz Parameter. 4

ρ Lorenz Parameter. 4

σ Lorenz Parameter. 4

Glossary

CWVM Cockroft-Walton voltage multiplier (CWVM) is a voltage multiplier that can be cascaded to give an output voltage of nV_{p-p} with n being the number of stages. 1