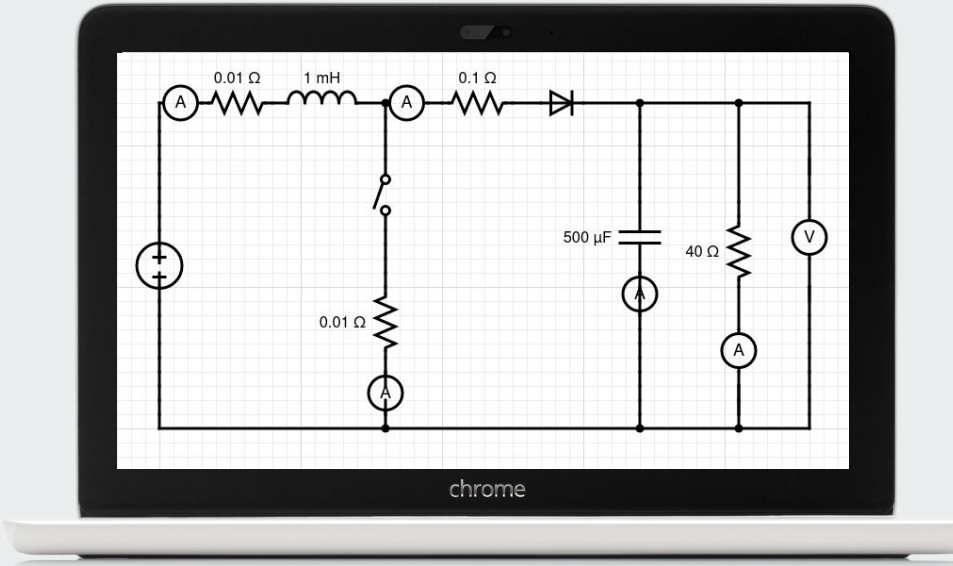
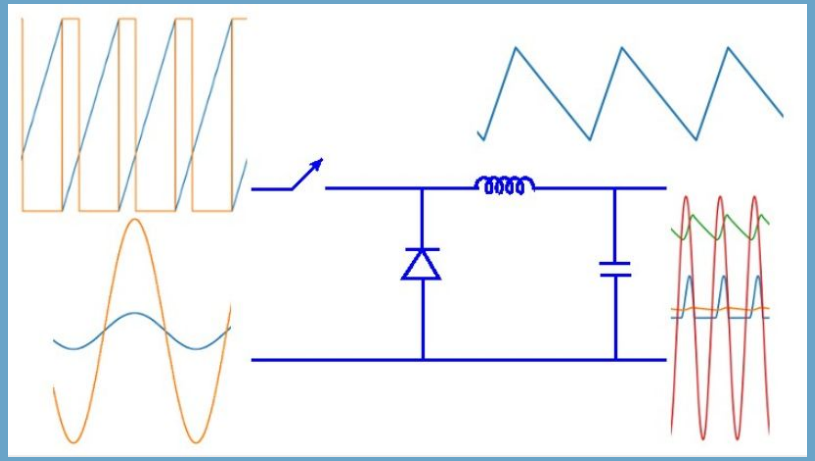
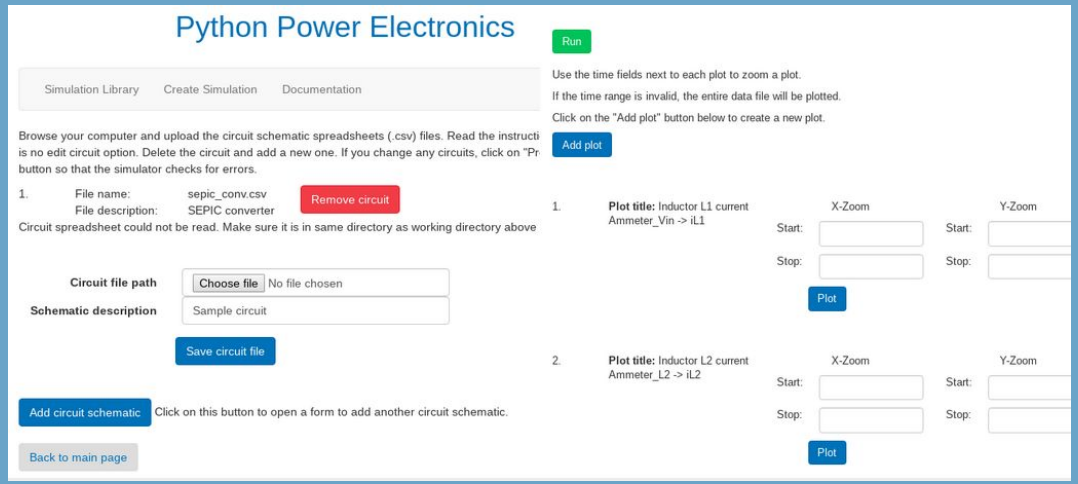
Boost Converter Analysis

ED18B027
Sai Rohitth Chiluka

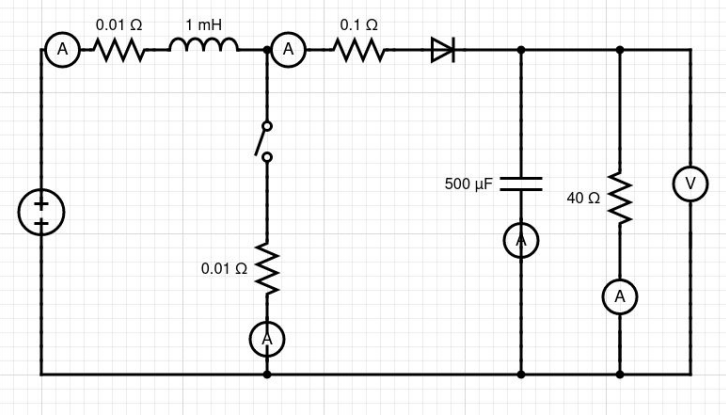


Simulation Software





Circuit

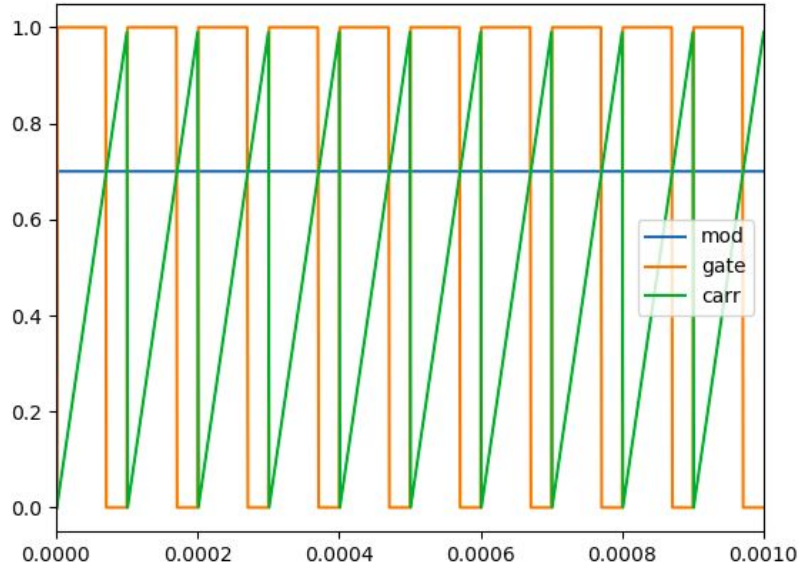


	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Ammeter_L1	wire	Inductor_L1	wire	Resistor_L1	wire	Ammeter_D1	wire	Diode_D1	wire	Resistor_D1	wire	wire	wire	wire	wire	wire
2	wire					wire							wire		wire		wire
3	wire					wire							wire		wire		wire
4	wire					Ammeter_S1							Resistor_C1		wire		wire
5	wire					wire							wire		Resistor_load		wire
6	VoltageSource_Vin					Switch_S1							Capacitor_C1		wire		Voltmeter_Vo
7	wire					wire							wire		Ammeter_load		wire
8	wire					Resistor_S1							Ammeter_C1		wire		wire
9	wire					wire							wire		wire		wire
10	wire					wire							wire		wire		wire
11	wire					wire							wire		wire		wire
12	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire	wire

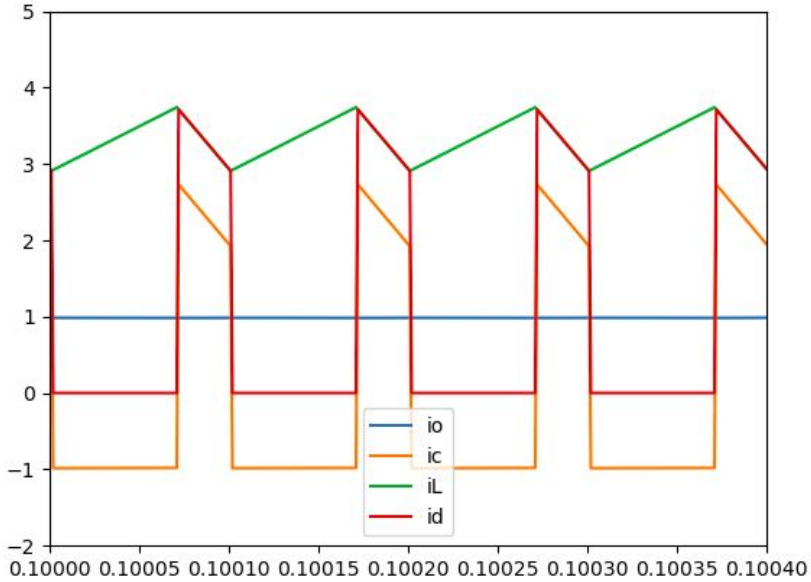
Gate Signal

Switching Frequency 10000 Hz

Duty Ratio 0.7

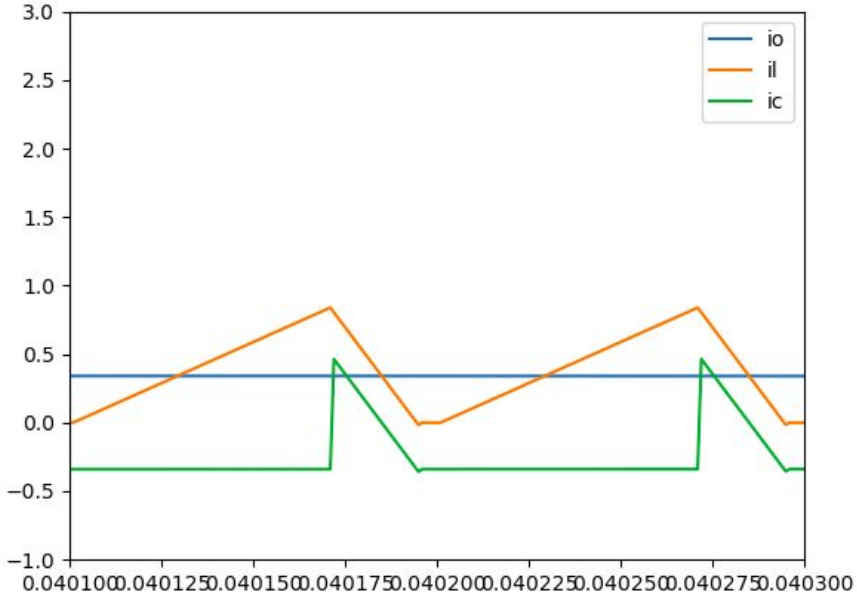


Current Plots: CCM Mode

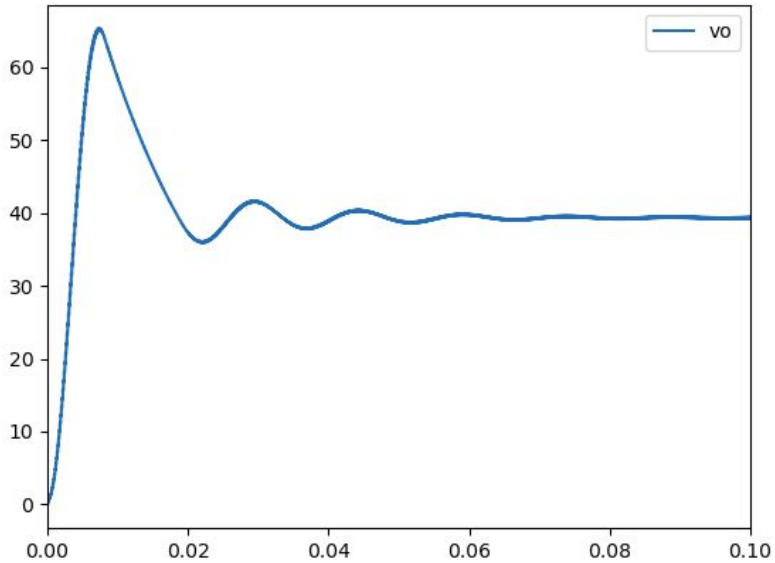


DCM Mode

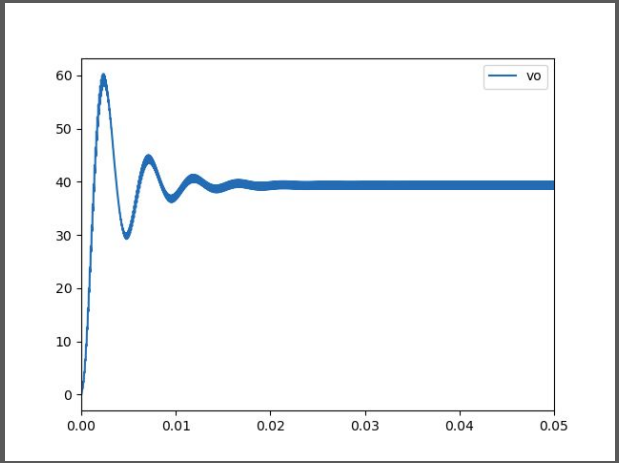
Resistance Increased

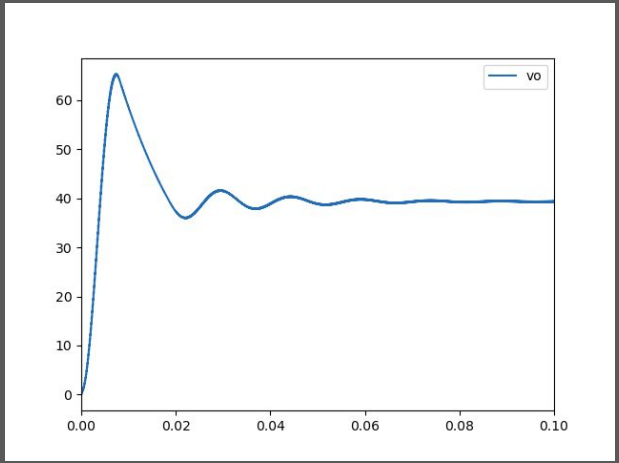


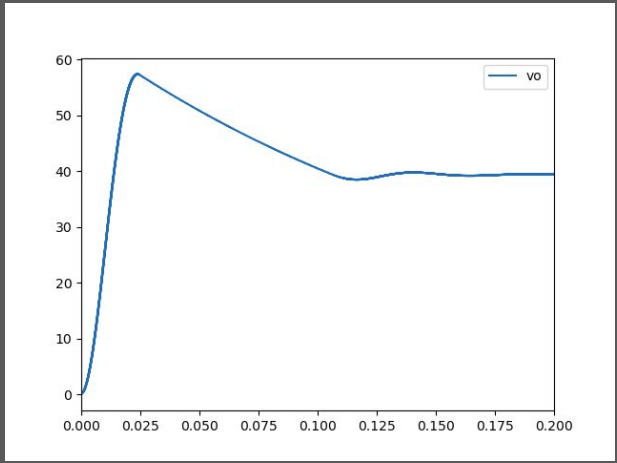
Boosting from 12V to 40V



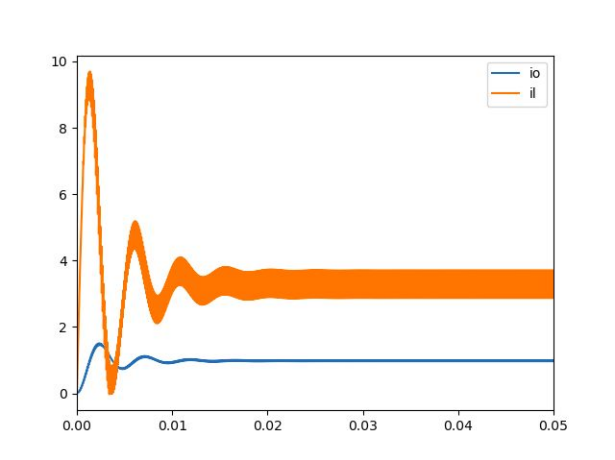
Effect of Capacitance on Voltage

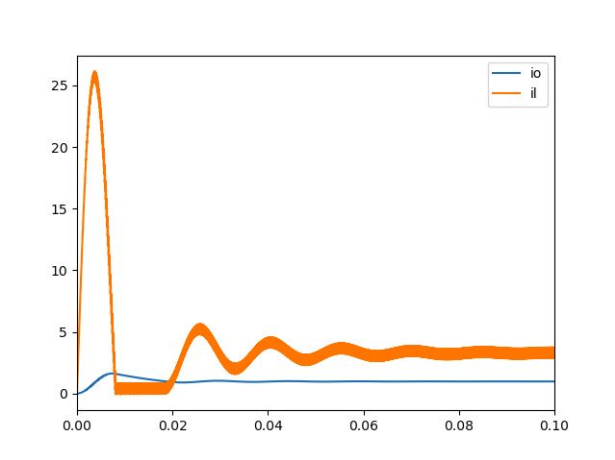


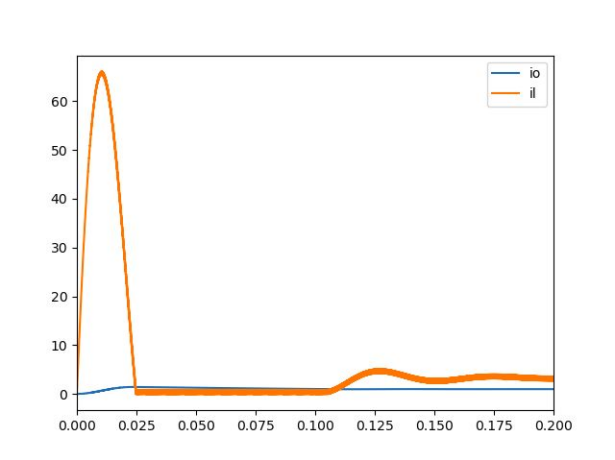




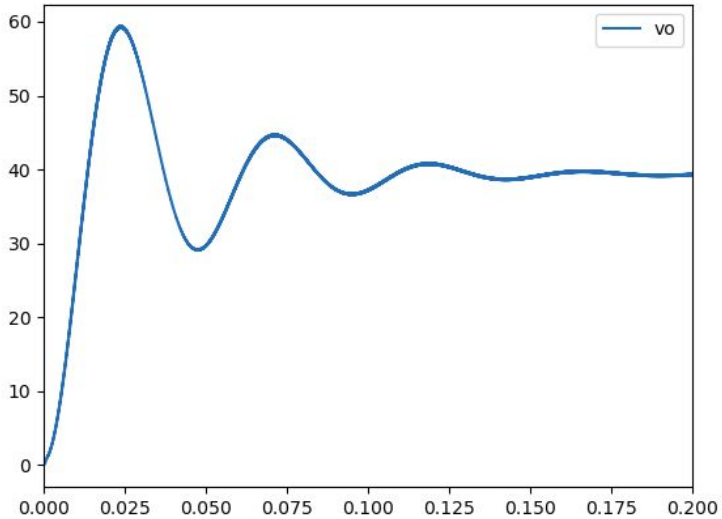
Effect of Capacitance on Current

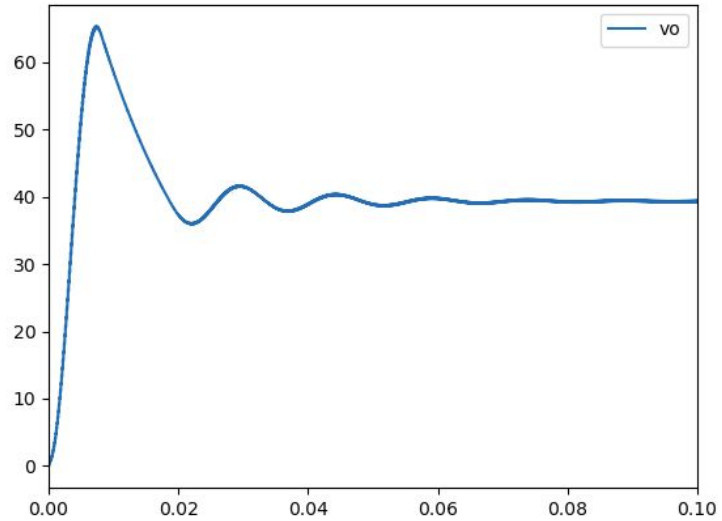




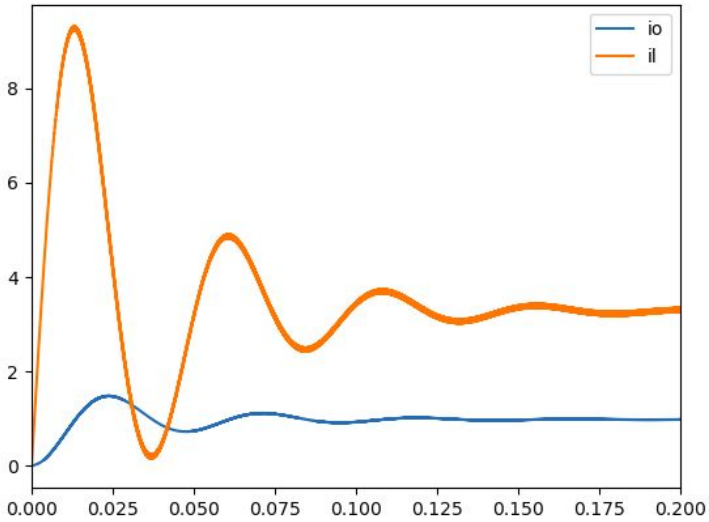


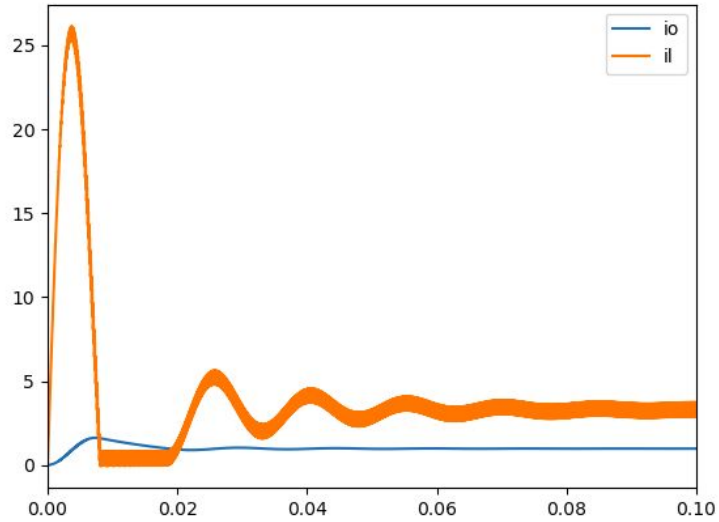
Effect of Inductance on Voltage





Effect of Inductance on Current

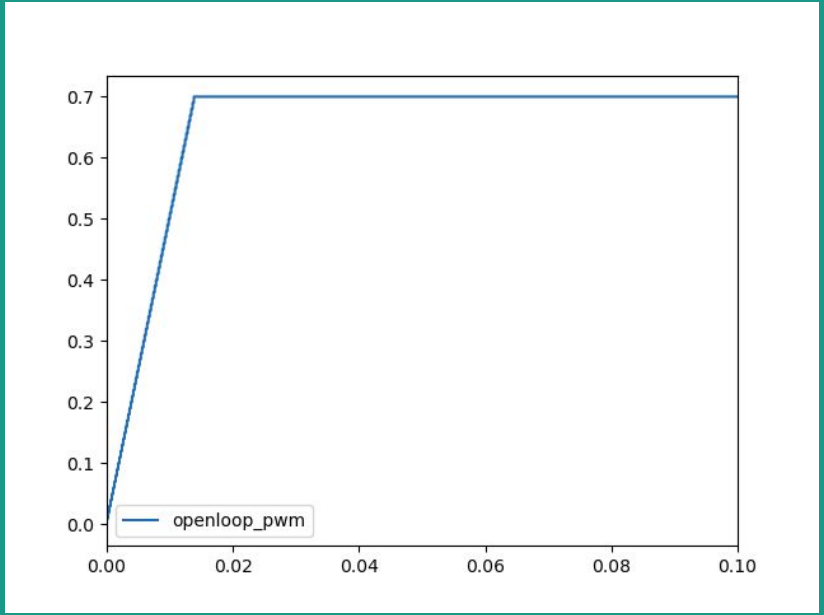




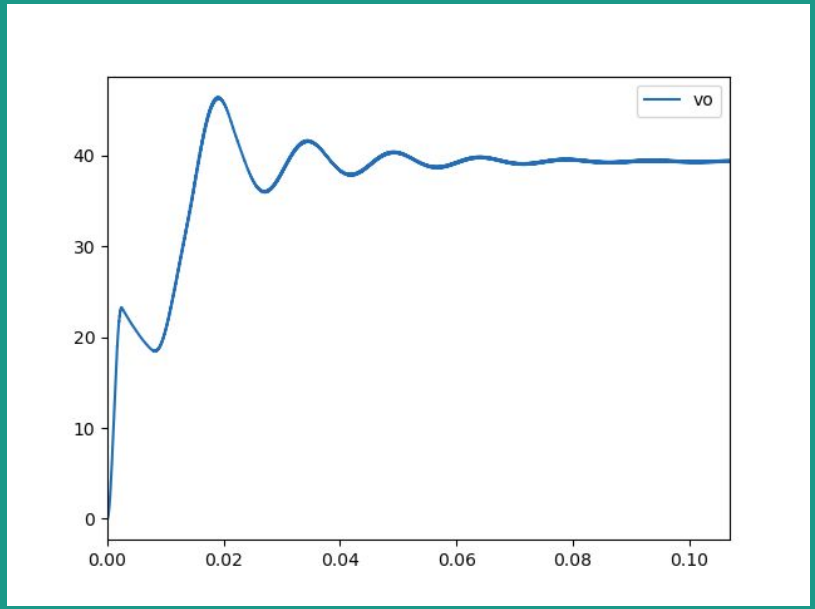
The Transient response in DCM mode is also similar.

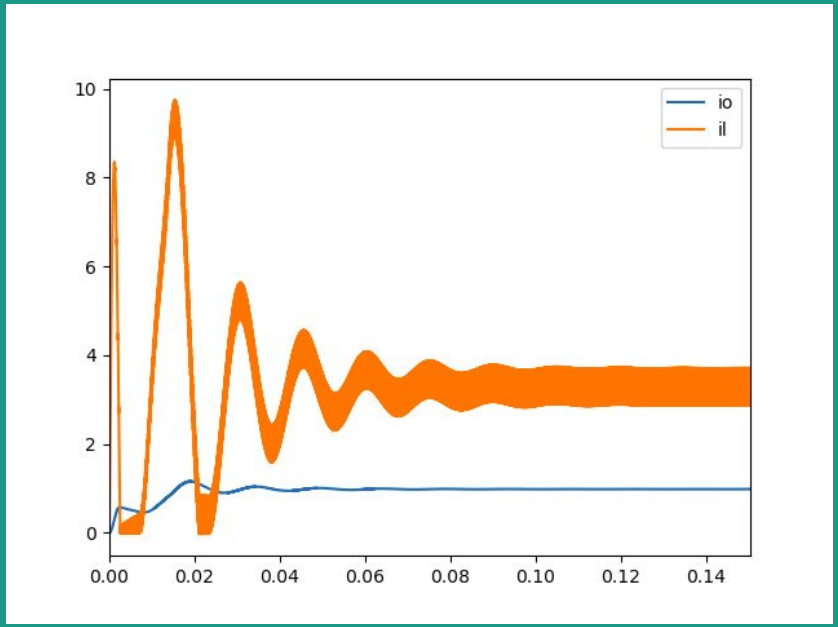
Open-loop Control

- To Reduce Initial Spike
- Gradual increment of Duty Cycle

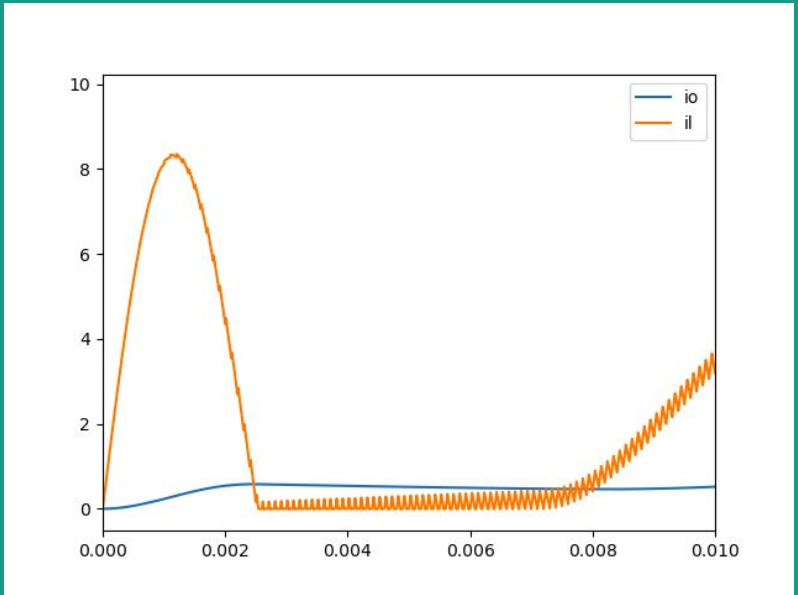


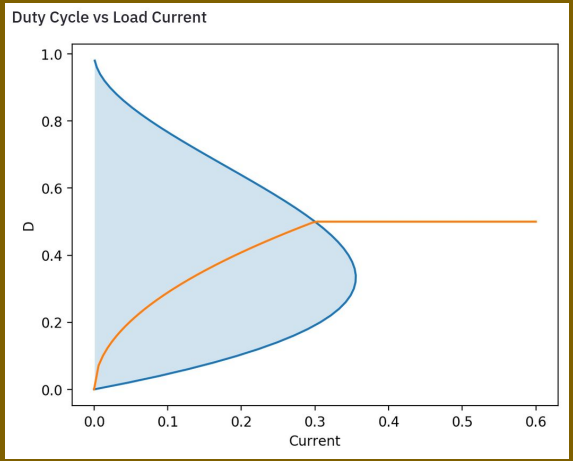
Results


vo
40
30
20
10
0
0.00
0.02
0.04
0.06
0.08
0.10

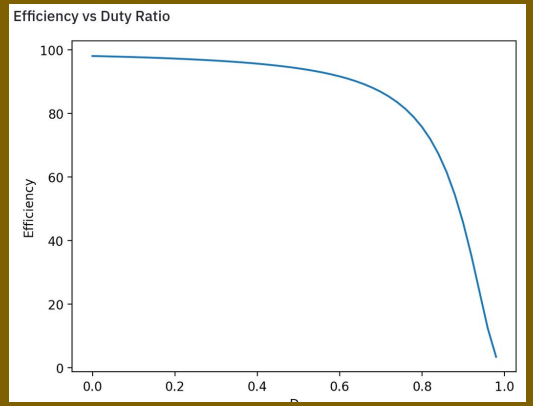

io
il
10
8
6
4
2
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14

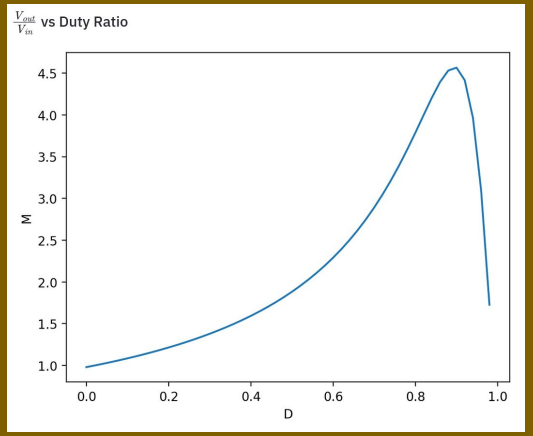
Initial jump is due to DCM-CCM transition





DCM - CCM Transition





Boost Converter Efficiency And Concatenated Boost Converters

References

http://pythonpowerelectronics.com/

Streamlit

http://eleceng.dit.ie/kgaughan/notes/FT220pe/The%20Boost%20Converter.pdf

http://ecee.colorado.edu/ecen4517/materials/Encyc.pdf

Fundamentals Of Power Electronics - Robert W. Erickson

Thank you