POWER ELECTRONICS LAB REPORT

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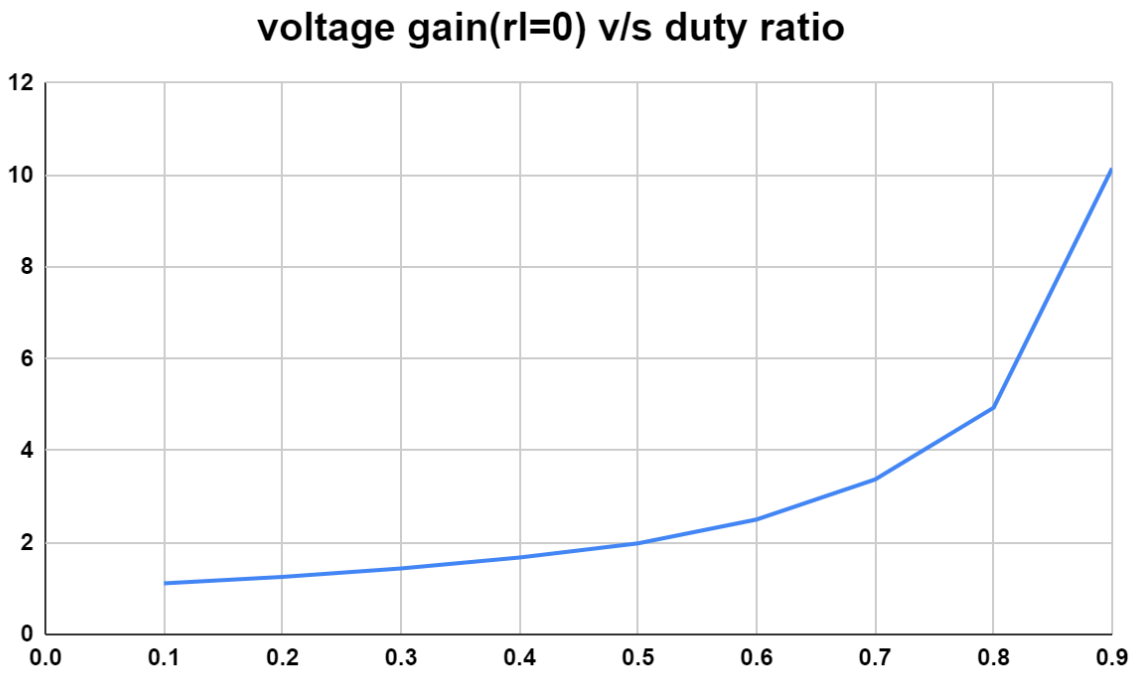
Exp no: 1

Part A: Boost Converter

Specifications: Input Voltage (Vin) =24V, Inductor L = 115μH, Capacitance C = 54μF, Load resistance RL = 11.52Ω, Switching Frequency = 50 kHz, Duty Cycle = 0.5.

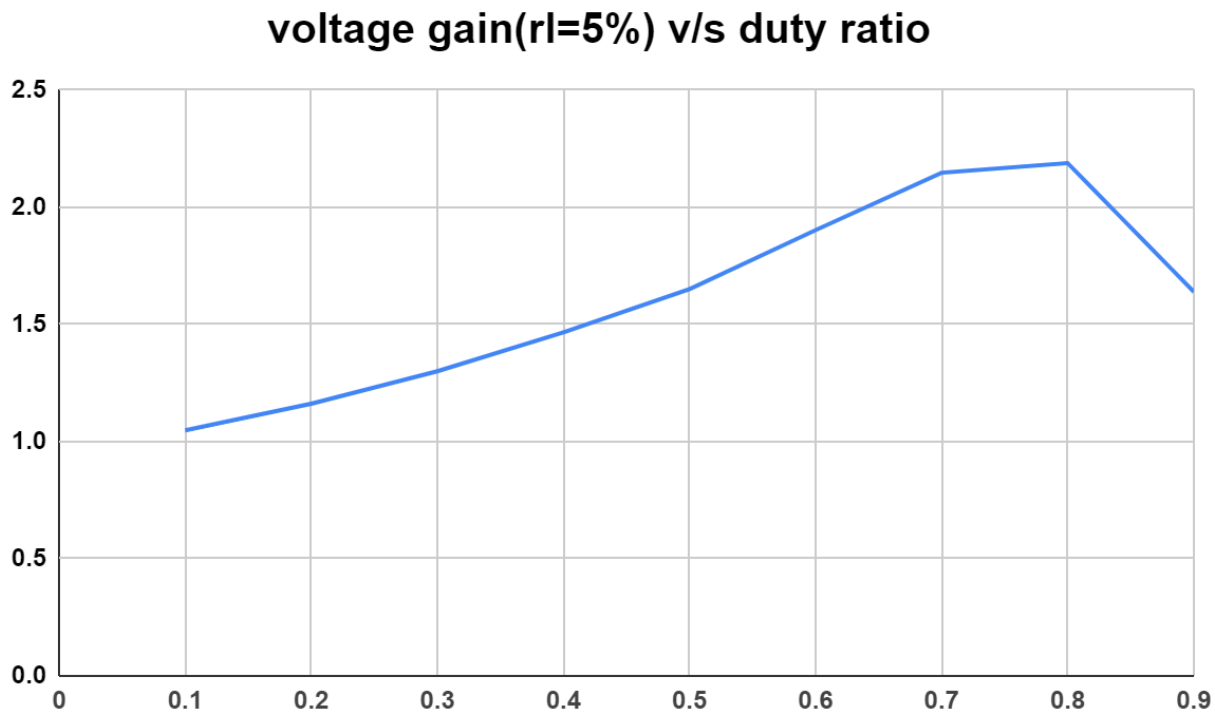
I. Case (i)

voltage gain(rl=0)	duty ratio
1.1125	0.1
1.252083333	0.2
1.433333333	0.3
1.670833333	0.4
1.9825	0.5
2.500833333	0.6
3.370416667	0.7
4.933333333	0.8
10.14583333	0.9



I. Case (ii)

voltage gain(rl=5%)	duty ratio
1.0475	0.1
1.16125	0.2
1.3	0.3
1.465833333	0.4
1.650416667	0.5
1.9025	0.6
2.1475	0.7
2.188333333	0.8
1.639583333	0.9



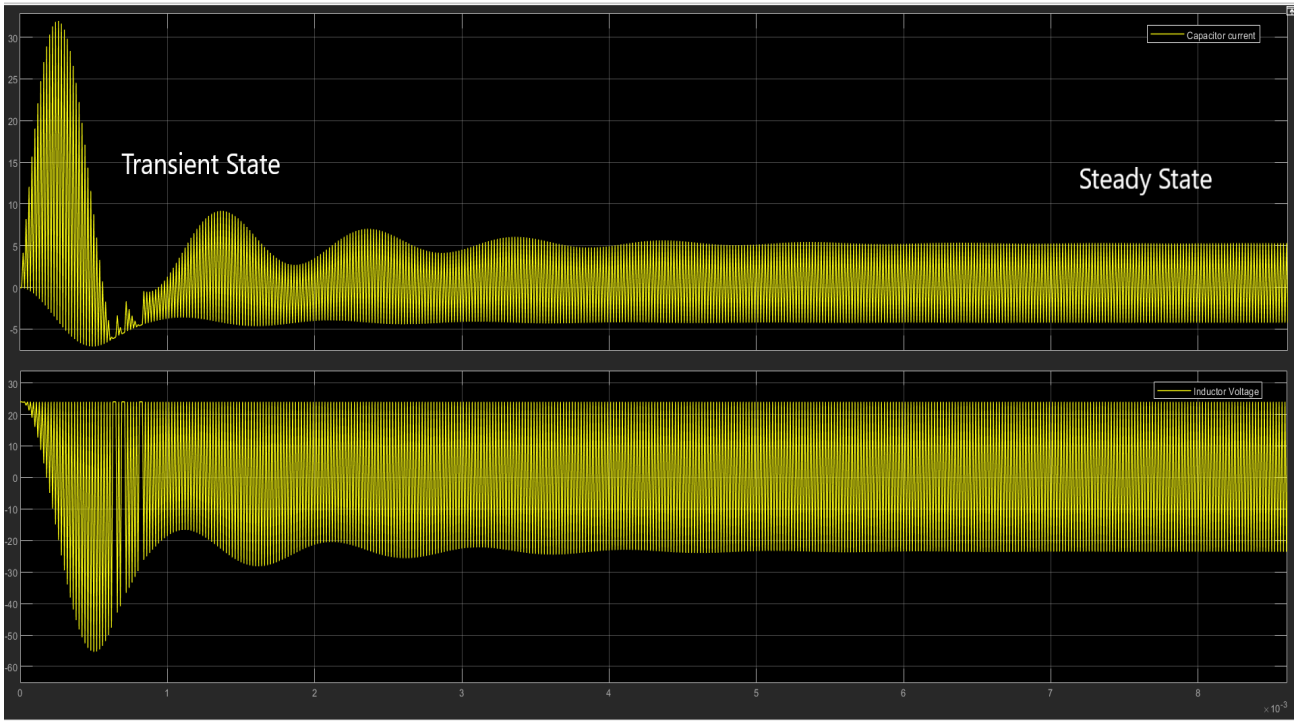
II. R.M.S. value of capacitor current observed = 4.34A

III. L value calculated theoretically for CCM condition = 28.8µH,but value obtained from simulation is 14.276µH for ideal condition and 13.7µH for converter with parasitic condition.

IV.

First plot:Capacitor Current

Second Plot:Inductor Voltage

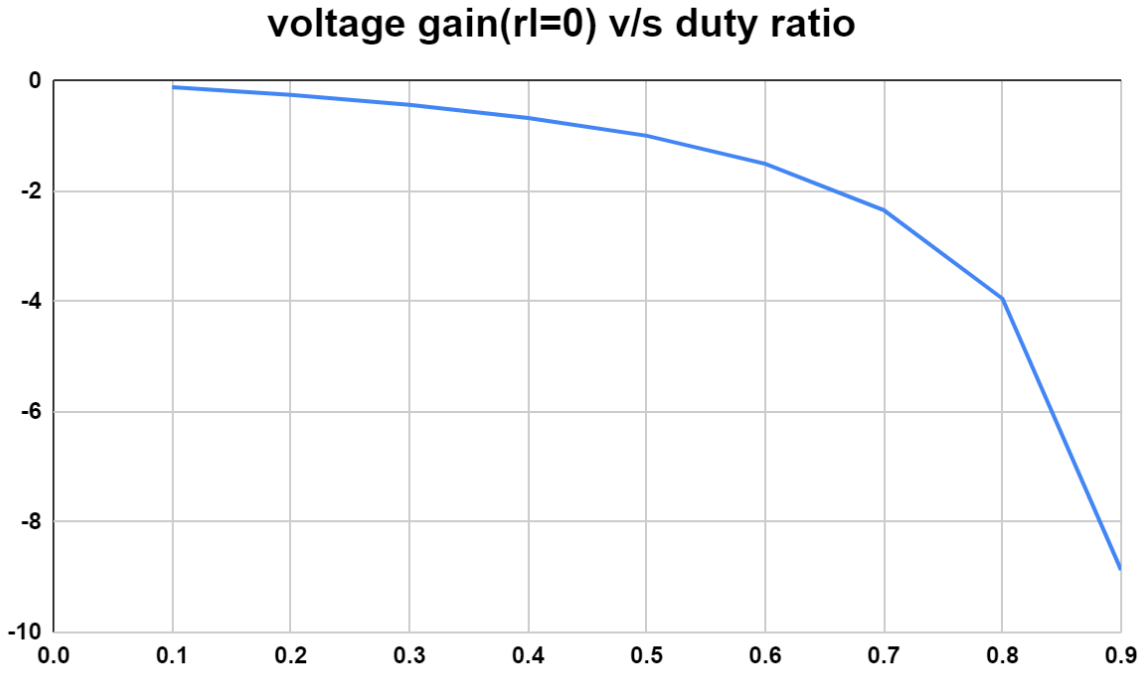


Part B: Buck-Boost Converter

Specifications: Input Voltage (Vin)=57V, Inductor L = 226μH, Capacitance C = 54μF, Load resistance RL = 11.52Ω, Switching Frequency = 50 kHz, Duty Cycle =0.457.

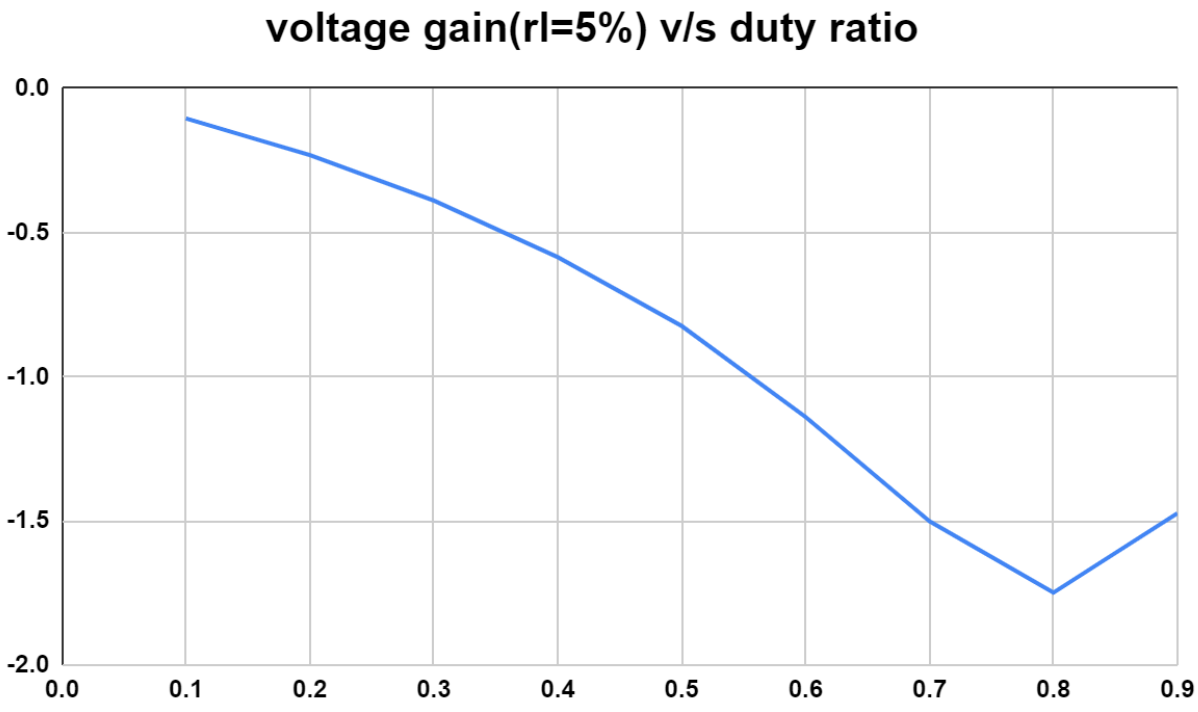
I. Case (i)

voltage gain(rl=0)	duty ratio
-0.1111754386	0.1
-0.2505263158	0.2
-0.43	0.3
-0.6684210526	0.4
-0.9910526316	0.5
-1.500350877	0.6
-2.342105263	0.7
-3.947368421	0.8
-8.868421053	0.9



I. Case (ii)

voltage gain(rl=5%)	duty ratio
-0.1045614035	0.1
-0.2319298246	0.2
-0.3894736842	0.3
-0.5857894737	0.4
-0.8240350877	0.5
-1.140350877	0.6
-1.501578947	0.7
-1.748947368	0.8
-1.474035088	0.9



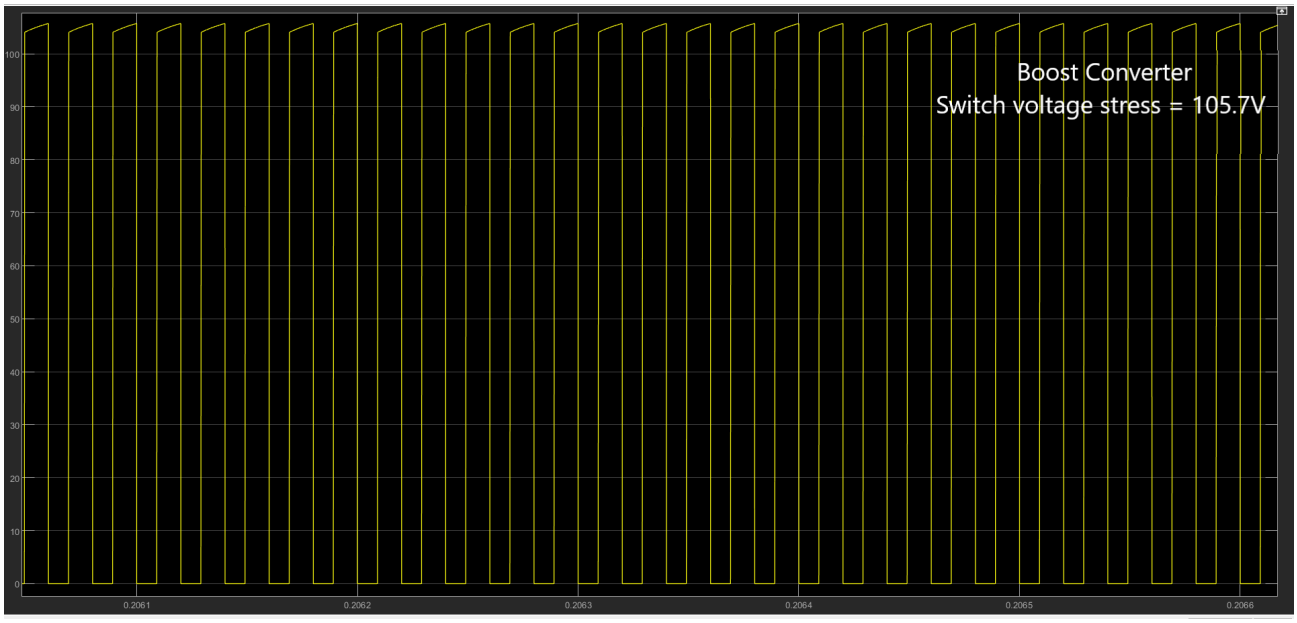
II. For ideal condition CCM condition occurs at **f = 7.514KHz** and with parasitic resistance it occurs at **f = 8.05KHz.**

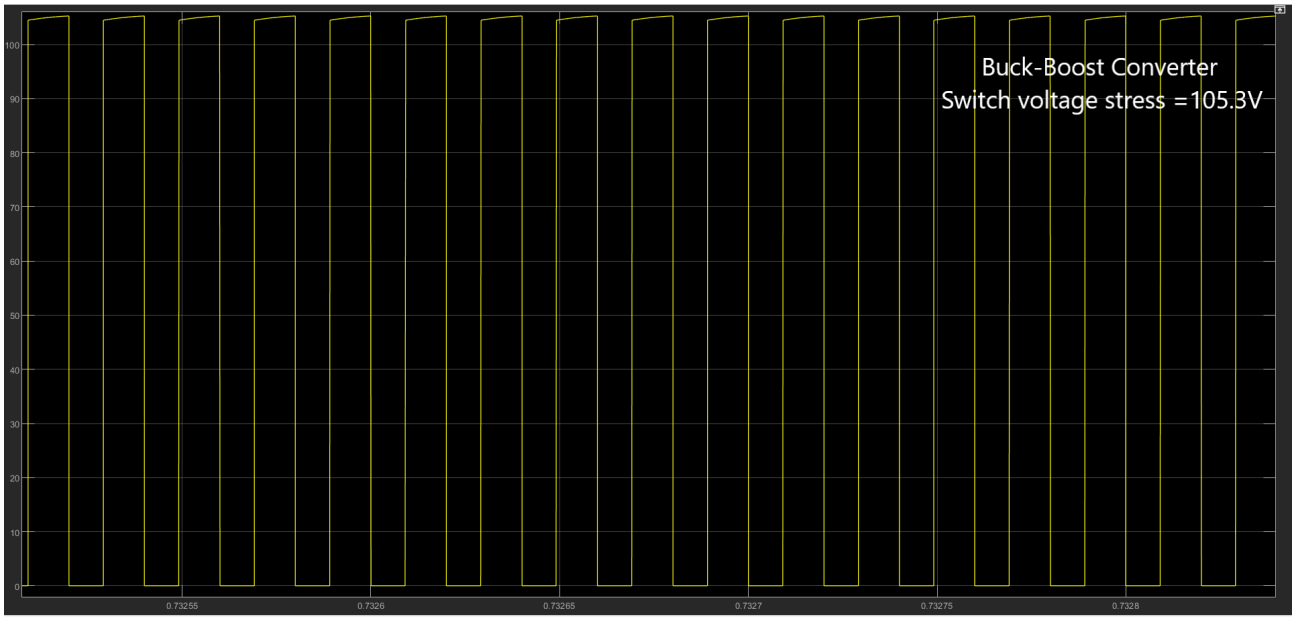
III.

input current	output current	duty ratio
0.0006334	-0.5501	0.1
0.0007128	-1.239	0.2
0.0008151	-2.127	0.3
0.000951	-3.307	0.4
0.001135	-4.904	0.5
0.001425	-7.424	0.6
0.001905	-11.59	0.7
0.00282	-19.53	0.8
0.005625	-43.88	0.9

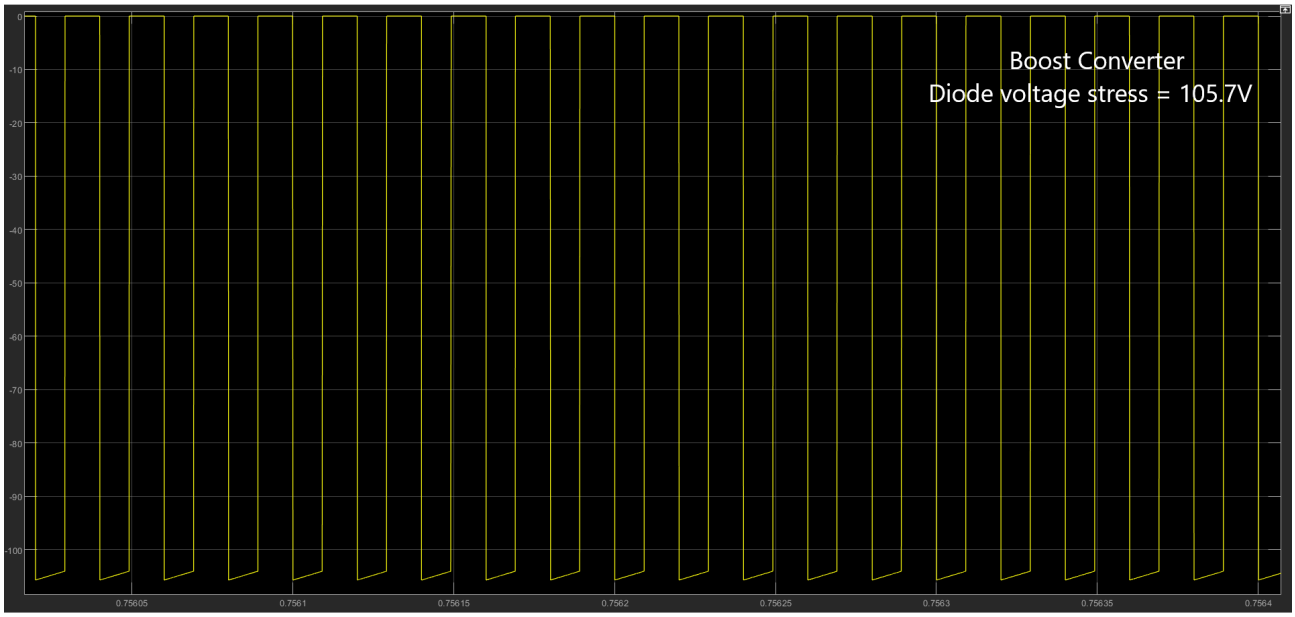
Part C:

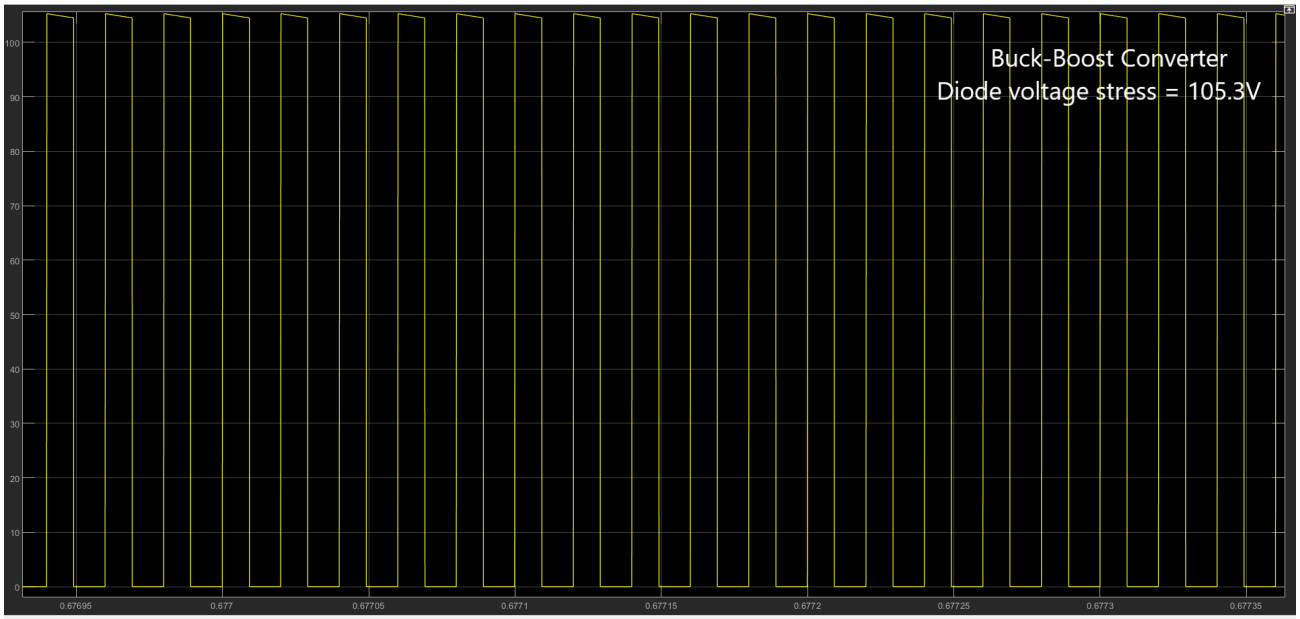
a.Voltage stress of Switch:Both are almost same



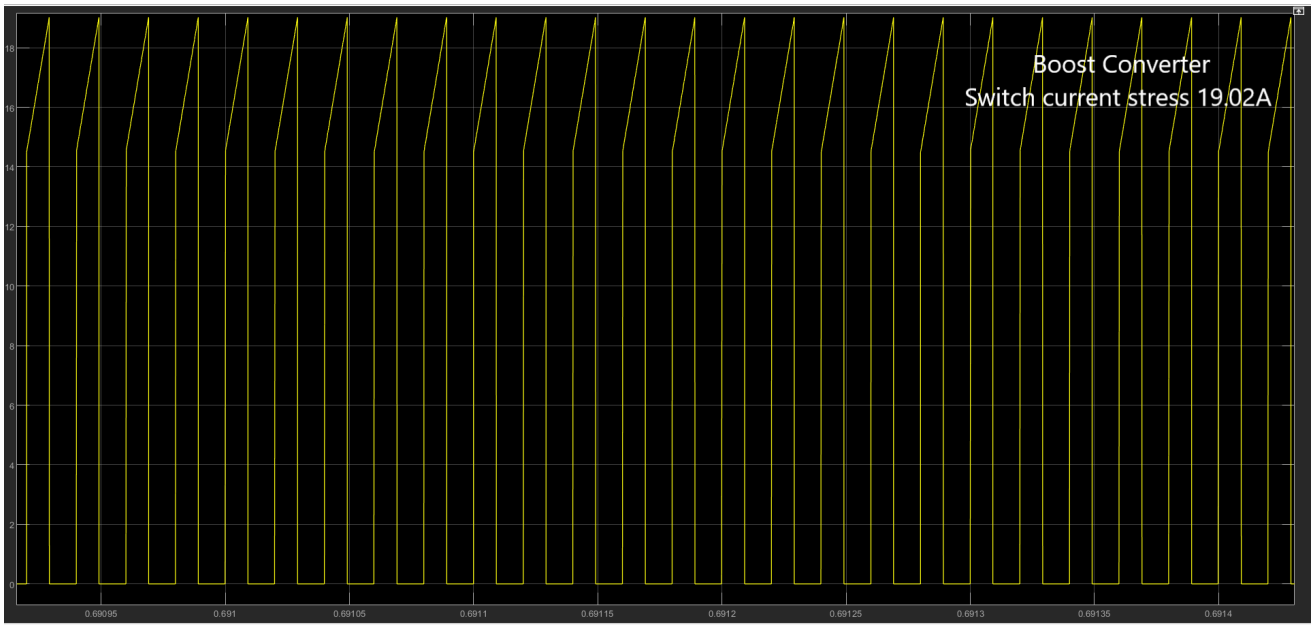


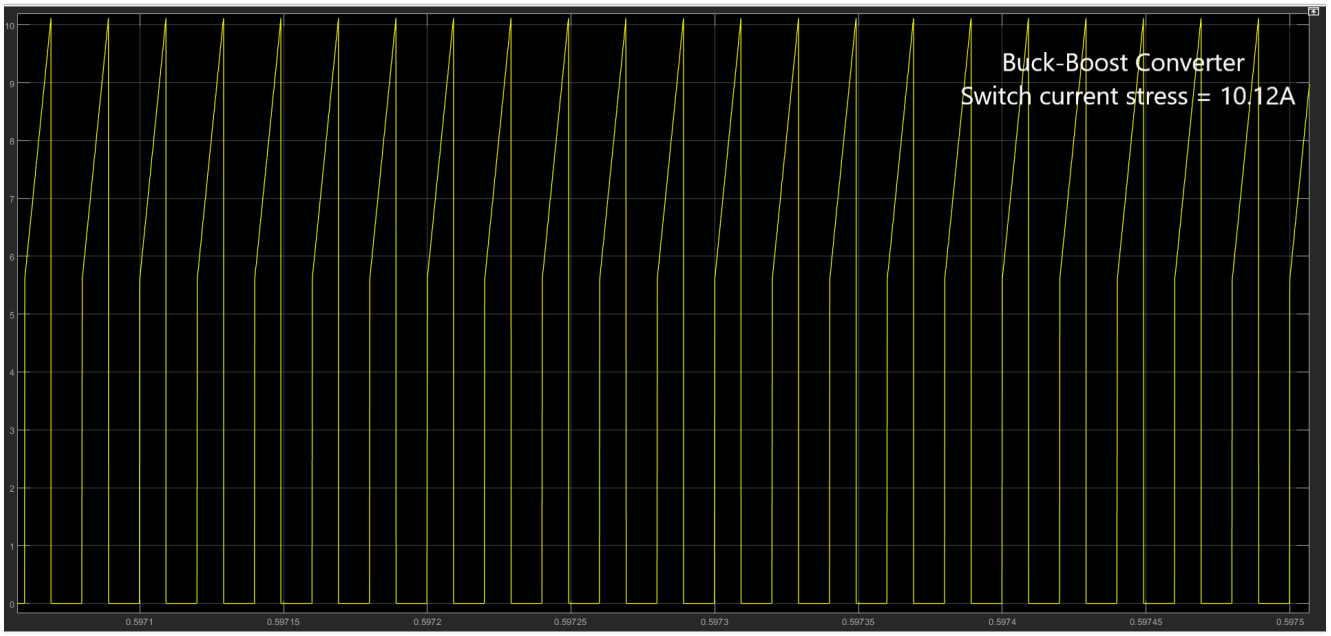
b.Voltage stress of Diode:Both are almost same





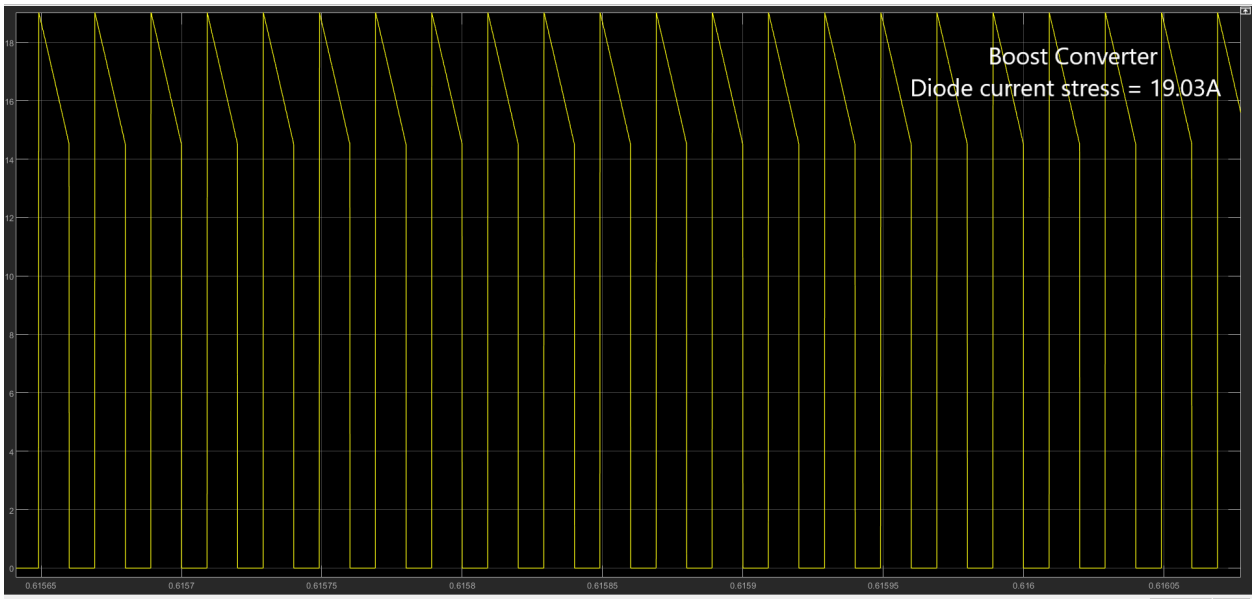
c.Current stress of Switch.Boost has higher switch current stress in a given working condition.

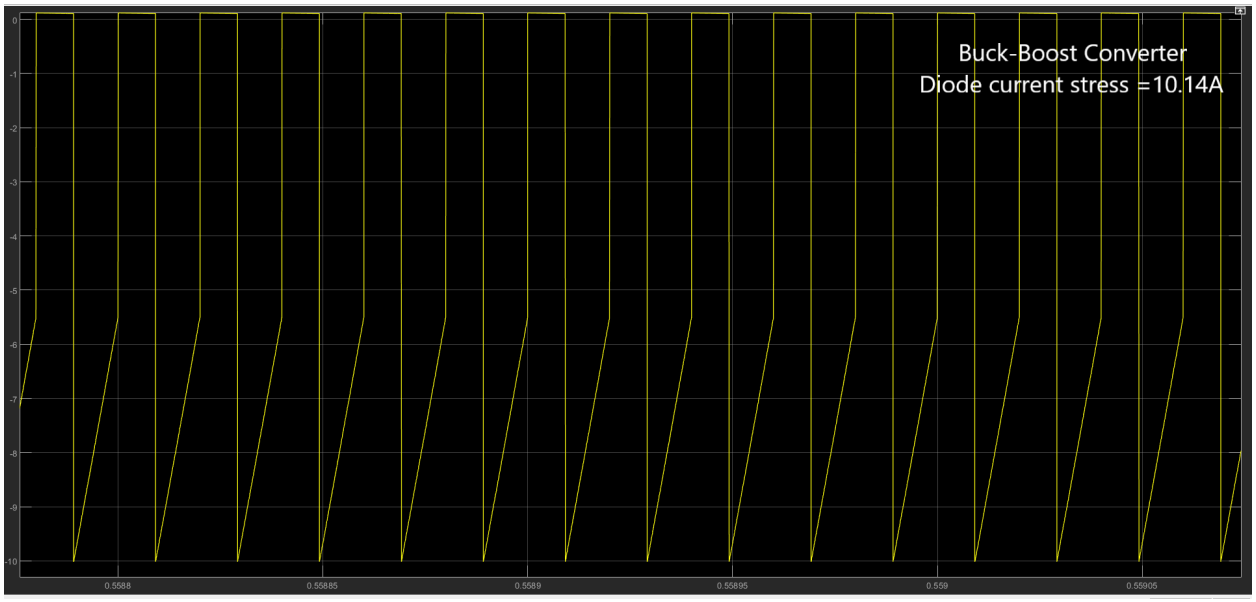




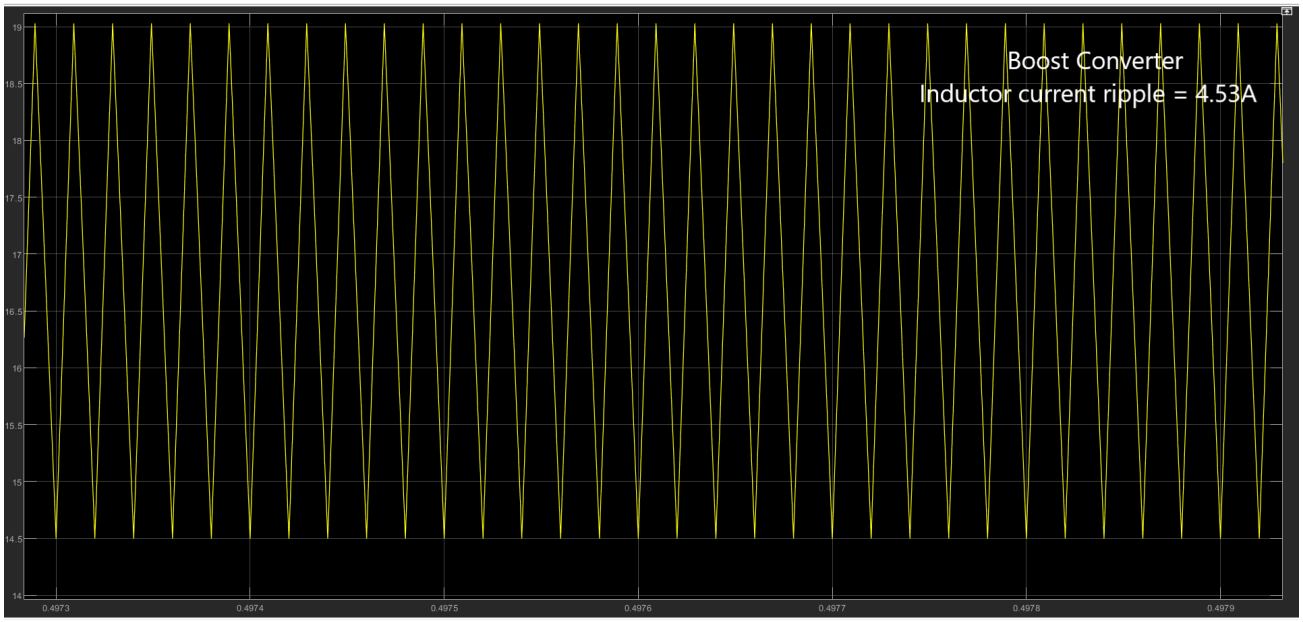
D.

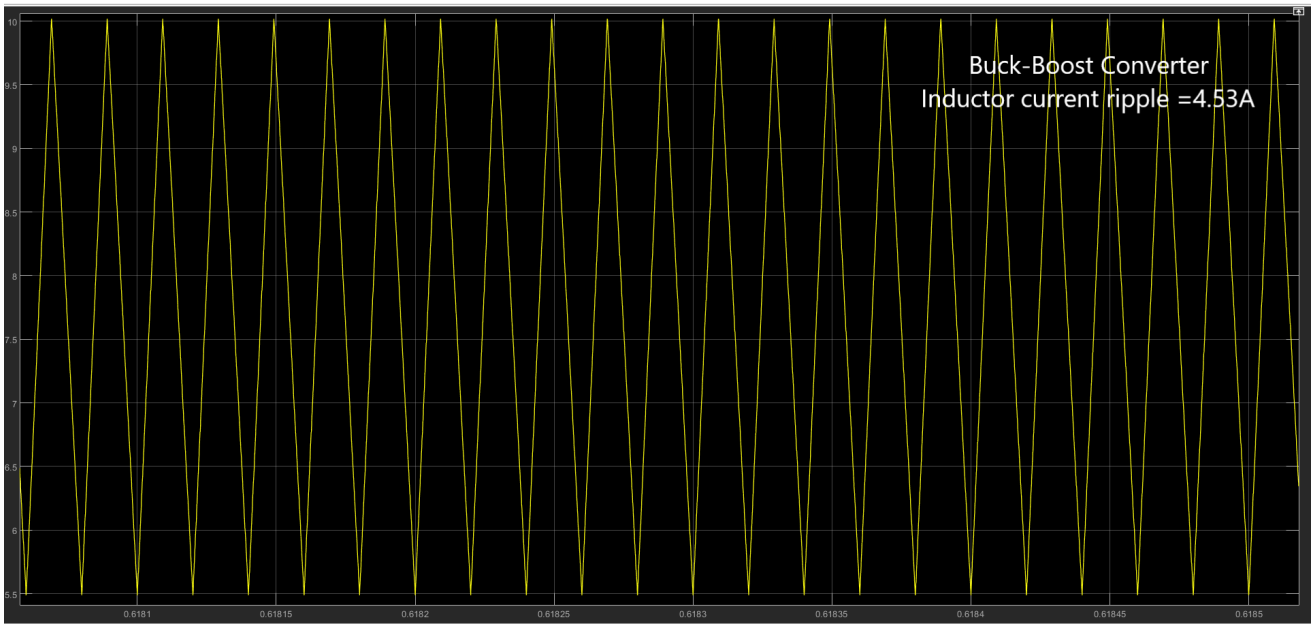
d.Current stress of Diode.Boost converter has higher diode current stress in a given working condition.



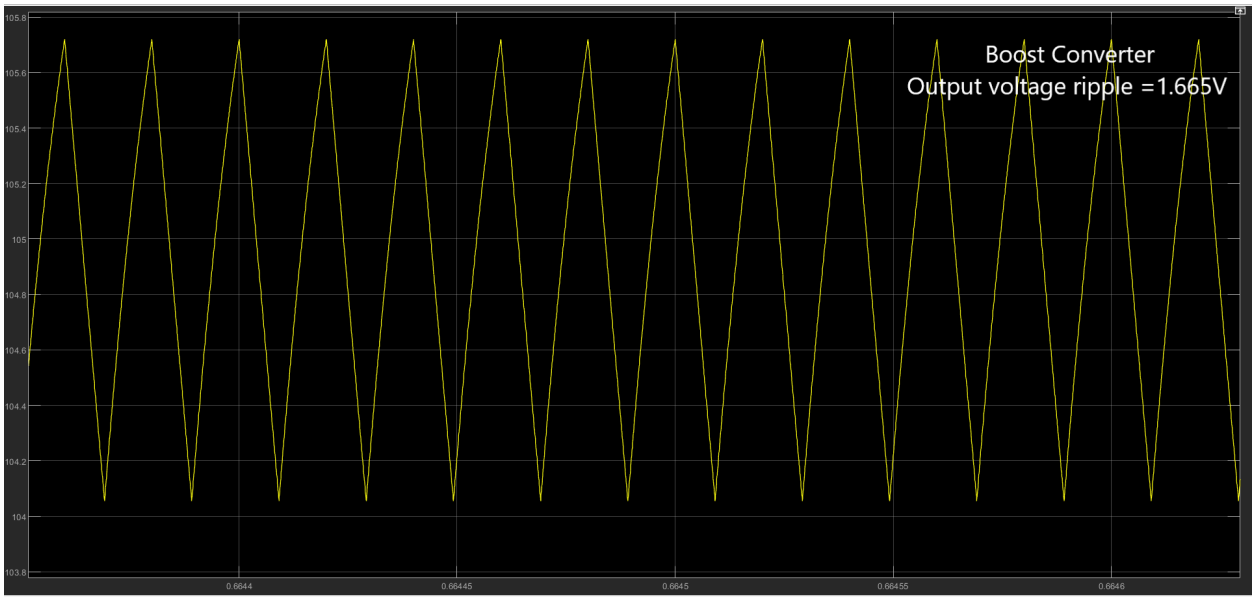


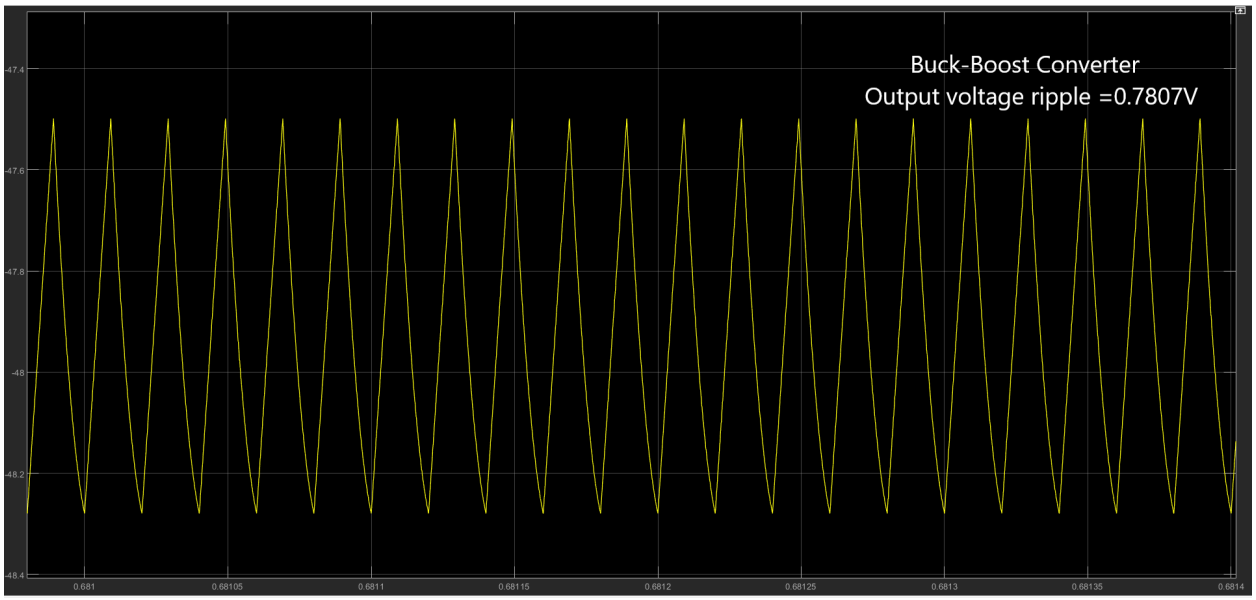
e.Inductor current ripple.Both are almost same.





f.Output voltage ripple.Ripple is more in Boost converter.





DISCUSSION:

1.