

# Robust and Highly Efficient Wide-Input Range Power Converter for Space Application

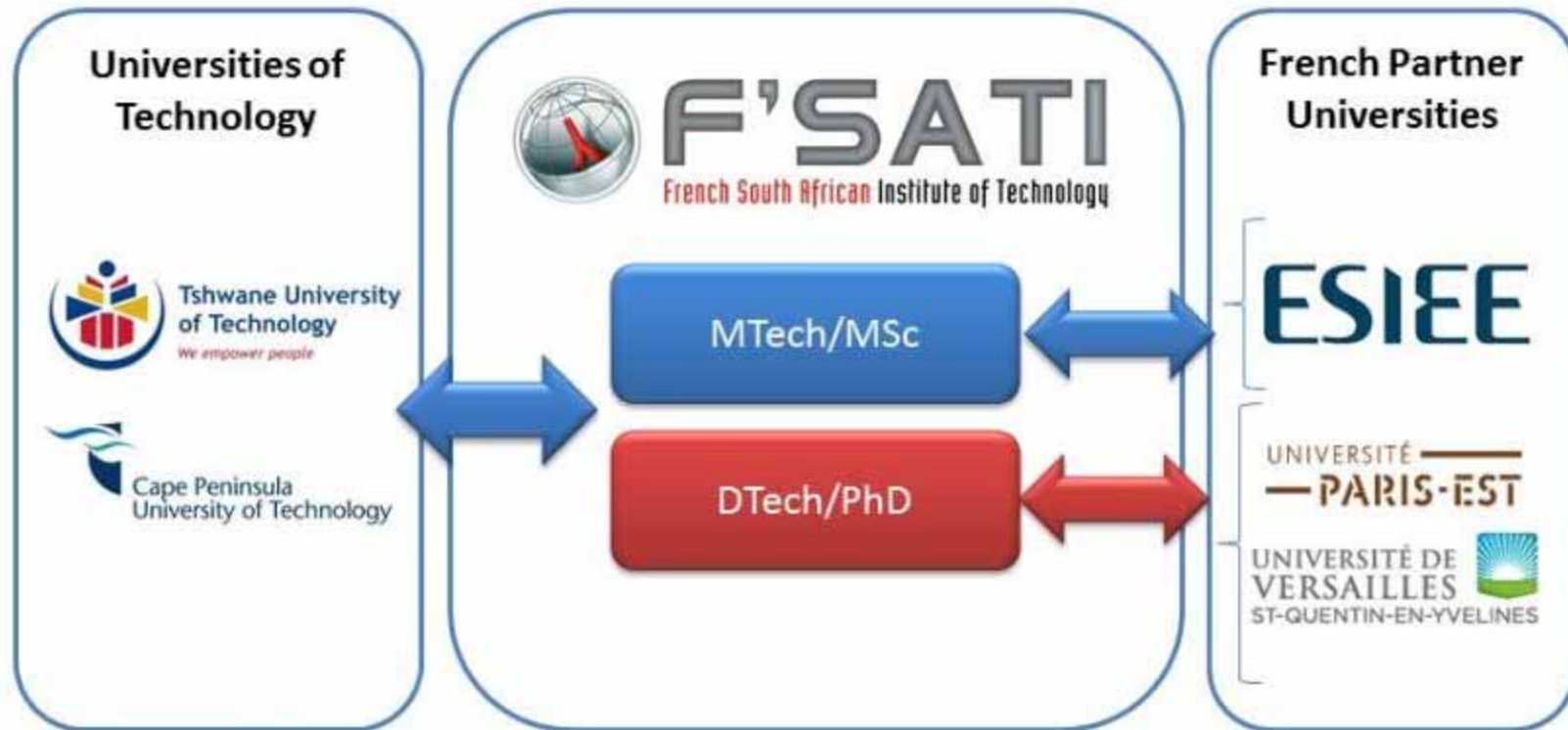
M.B. Khader, A. K. Raji, and M. Adonis



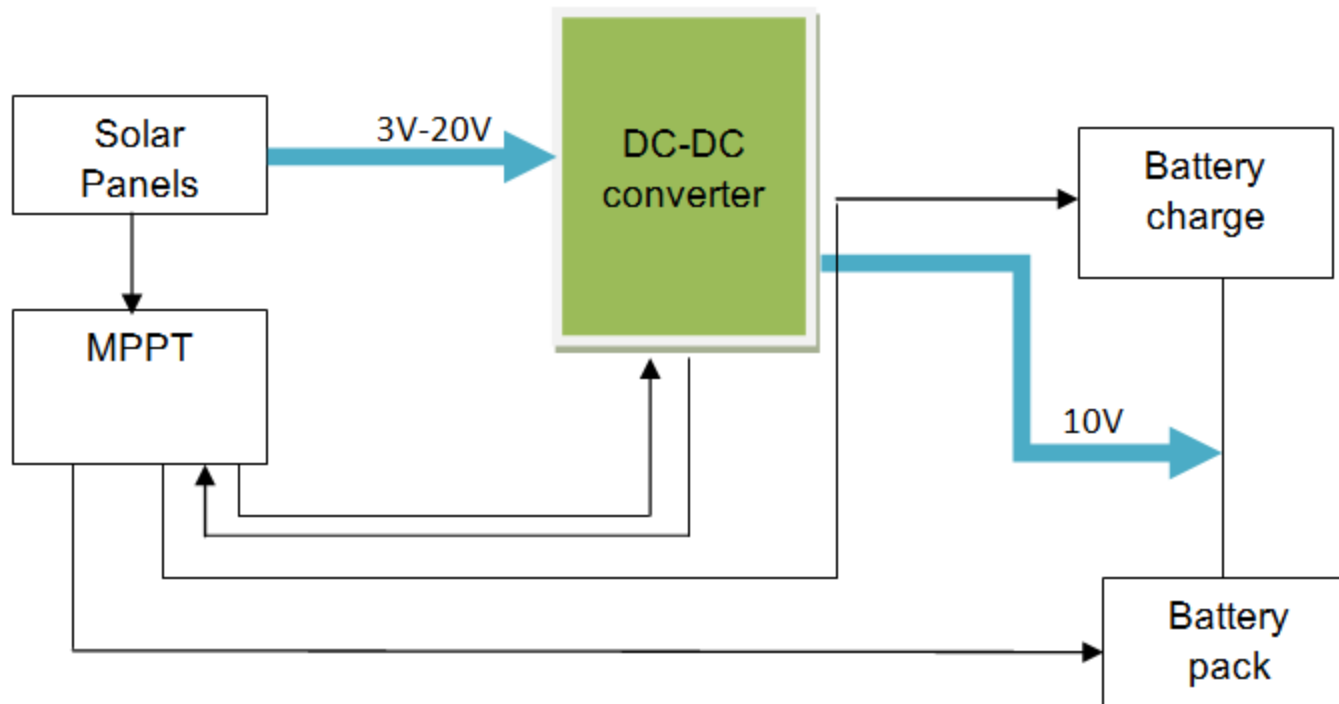
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- Design consideration and PI controller
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# Background and Introduction



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DC-DC TOPOLOGY	LOSSES	EFFICIENCY	COMPLEXITY
Buck			
Boost			
Buck-Boost			
SEPIC			

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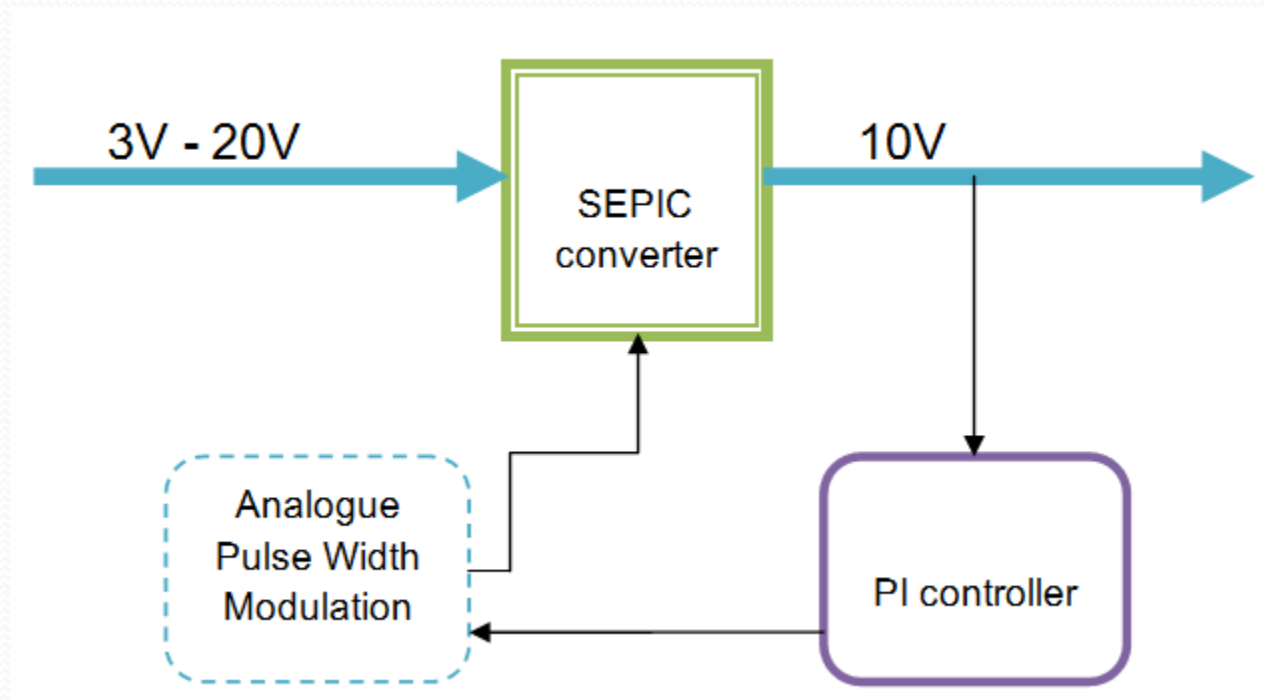
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SEPIC	Low	High	Low

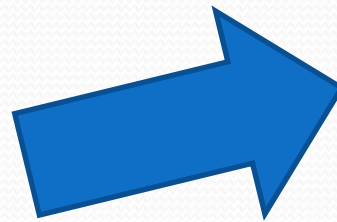
# Design consideration and PI controller



# PSIM software package

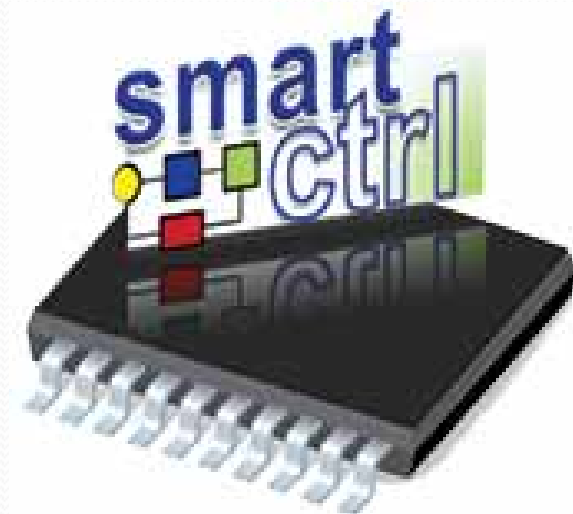
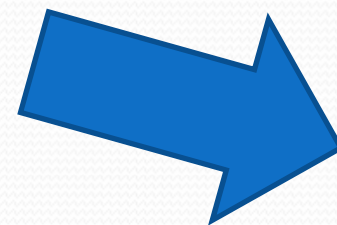
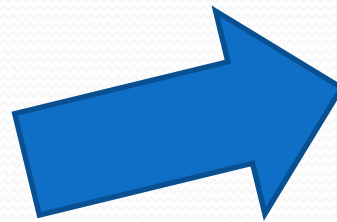


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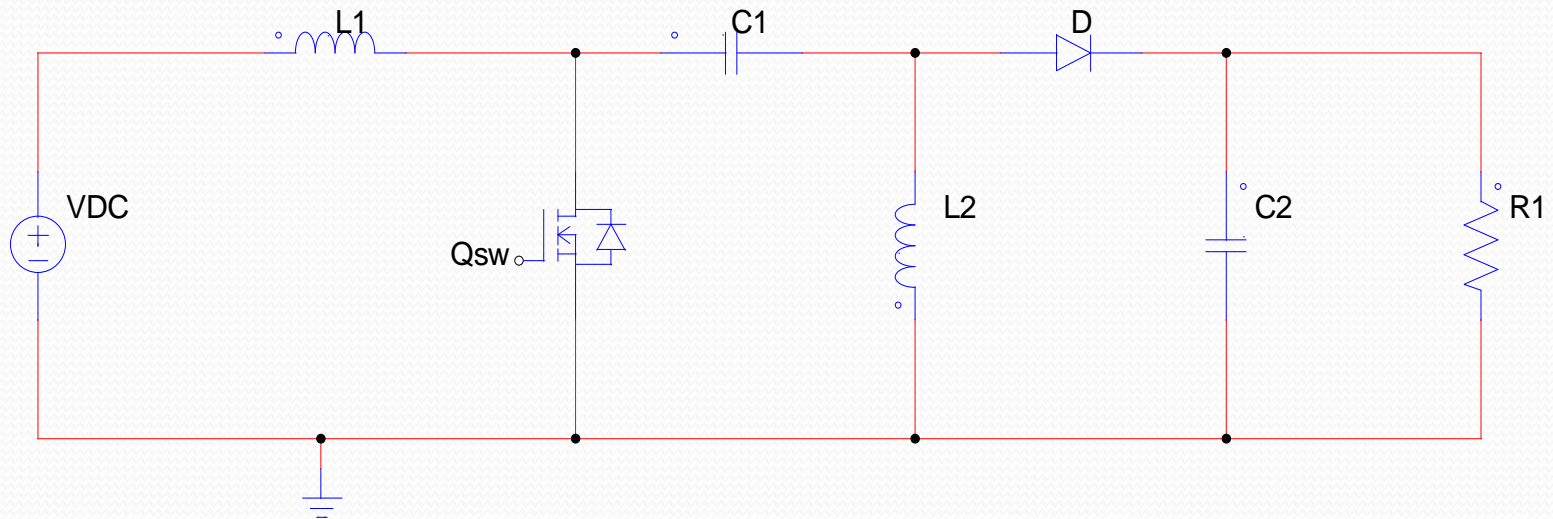


Schematics

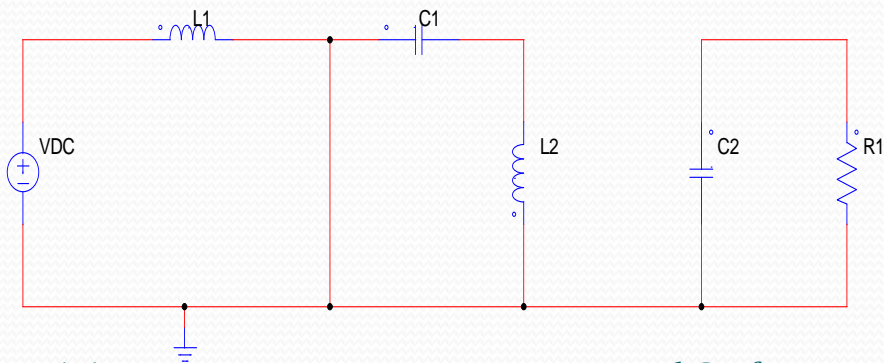
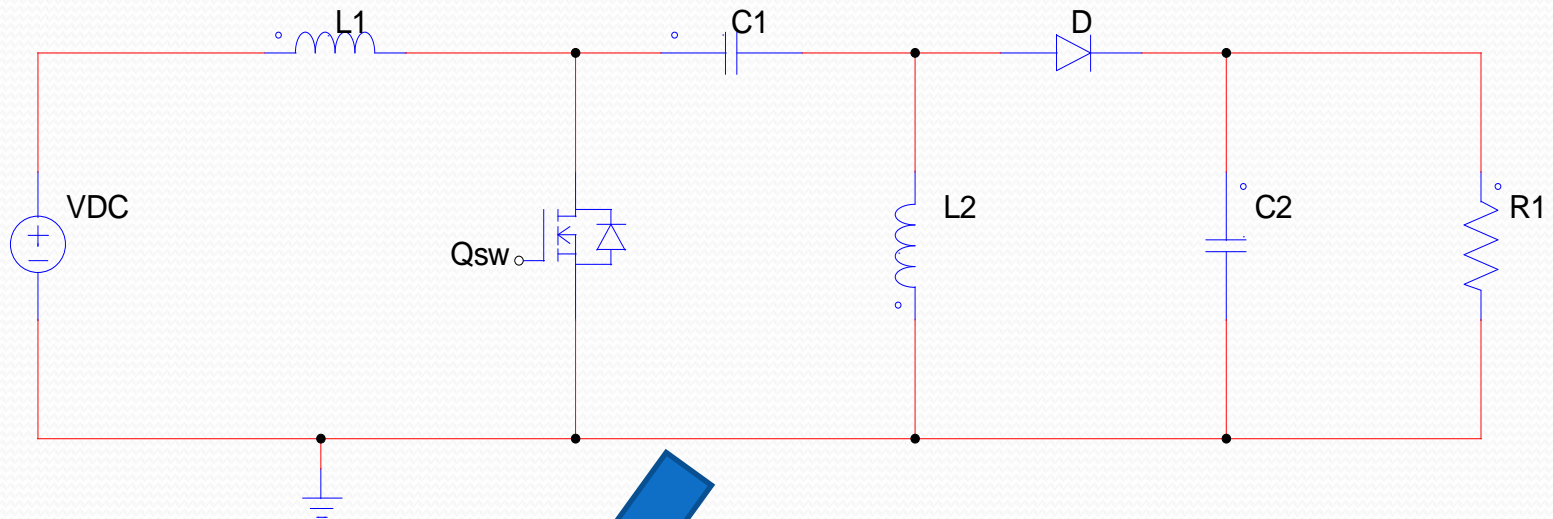
# PSIM software package



# SEPIC converter

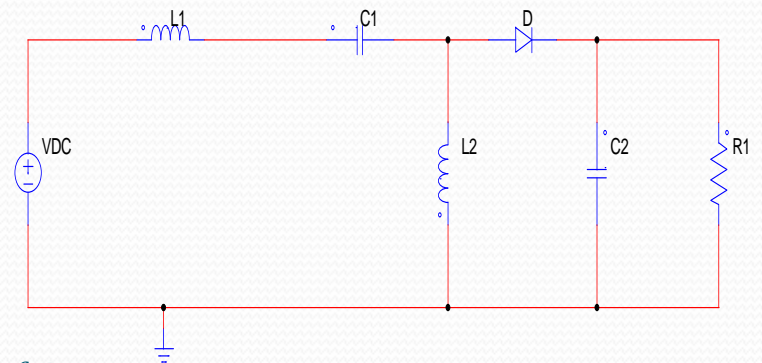
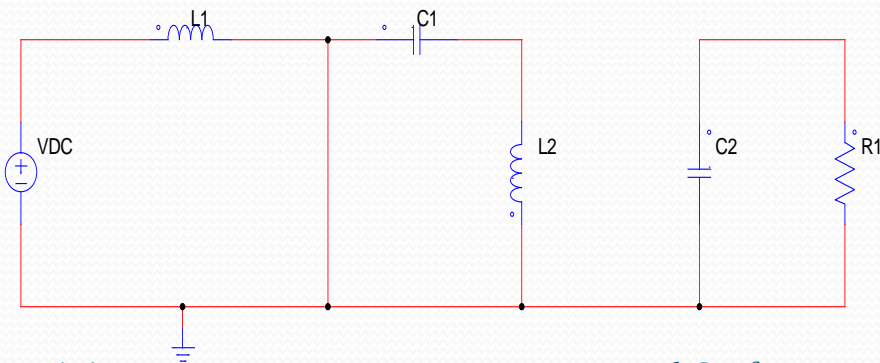
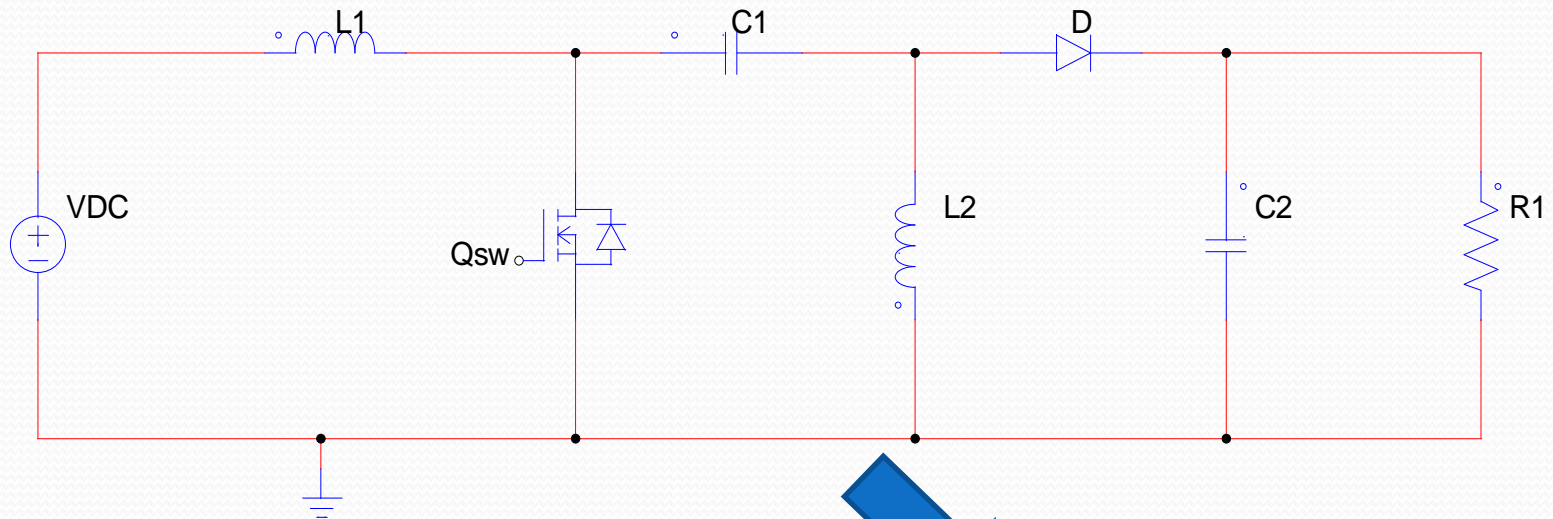


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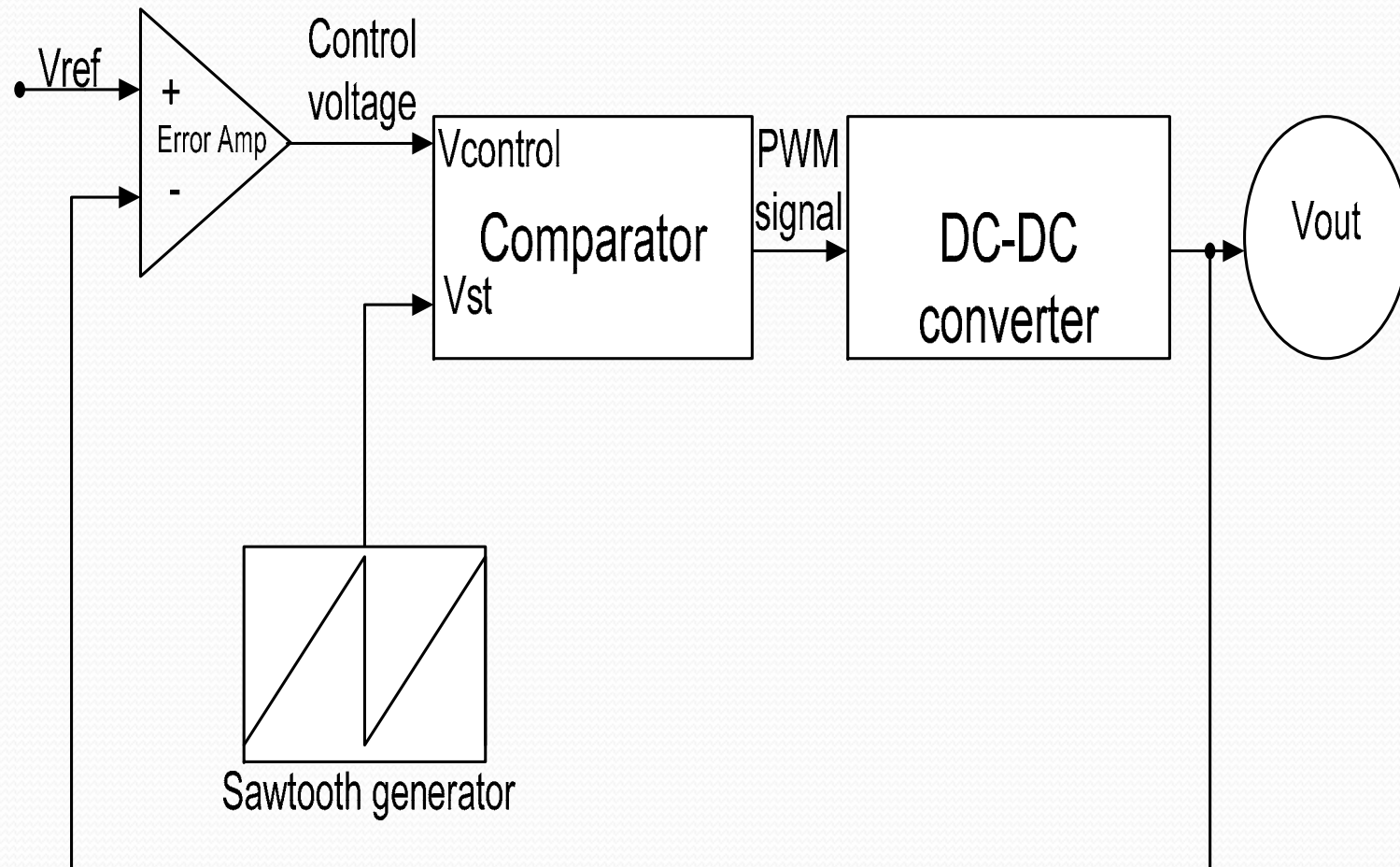




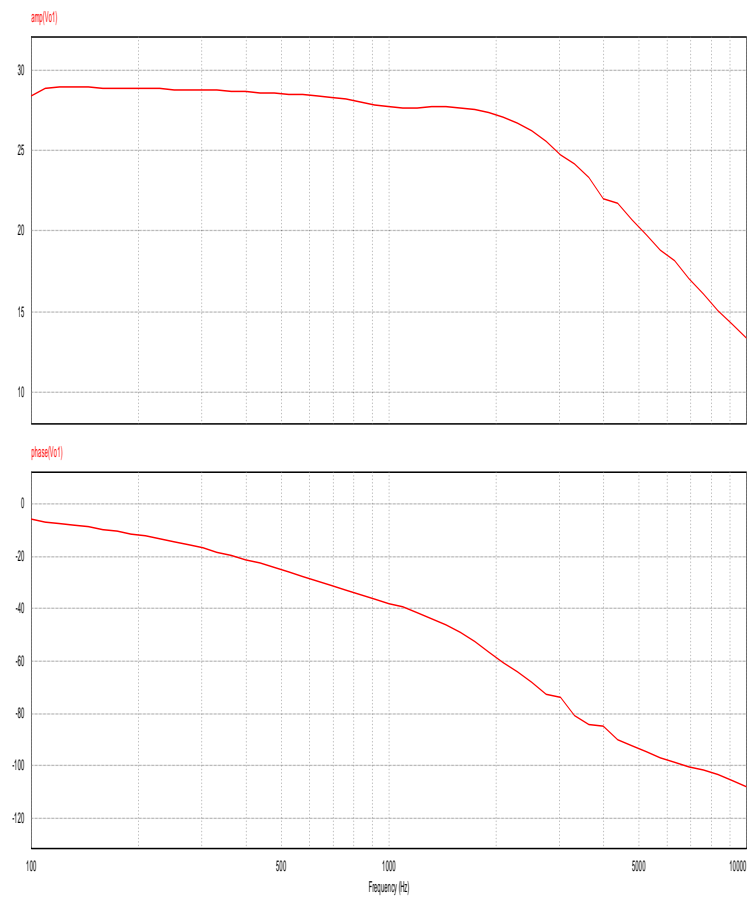
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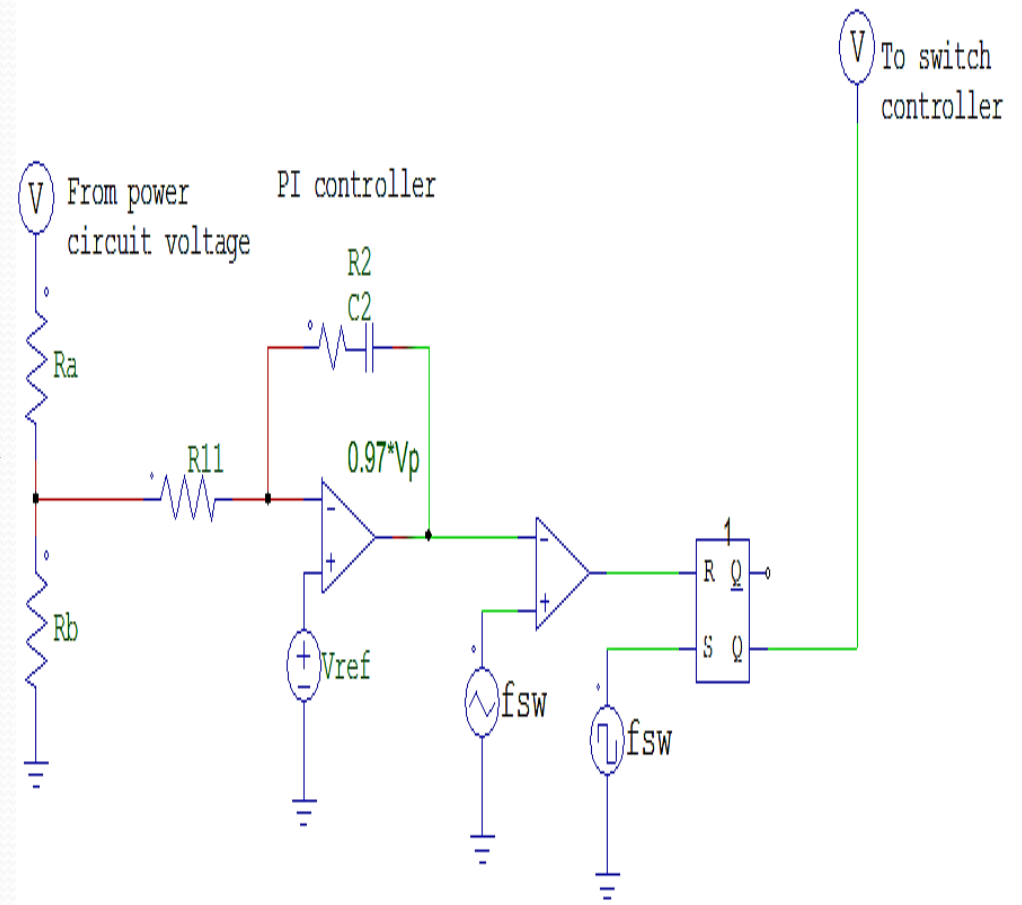
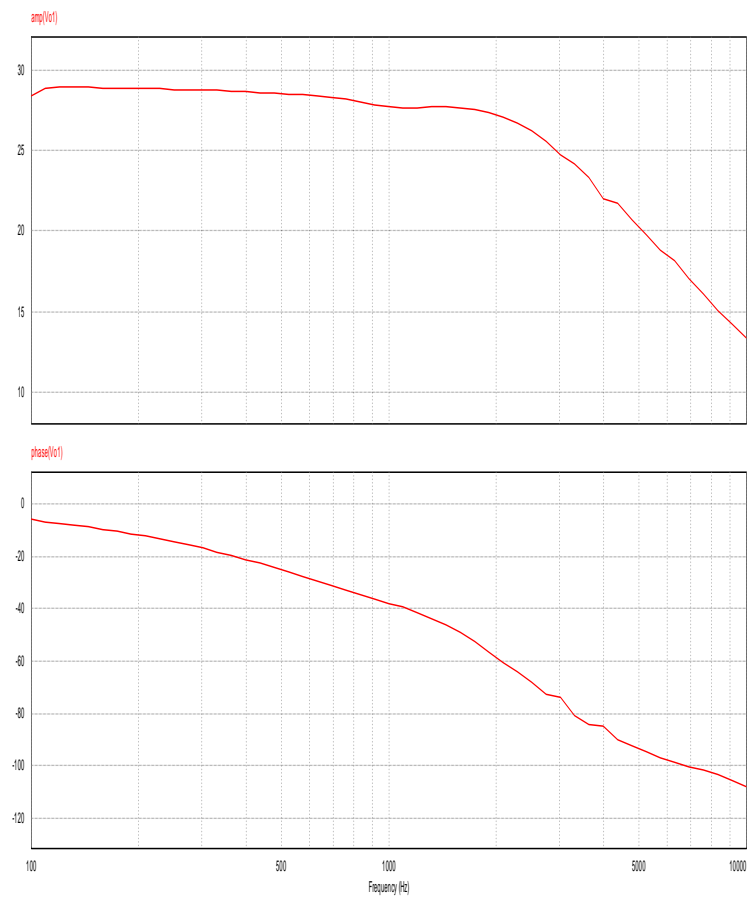
# PI Voltage mode control



# AC-Sweep and Compensation



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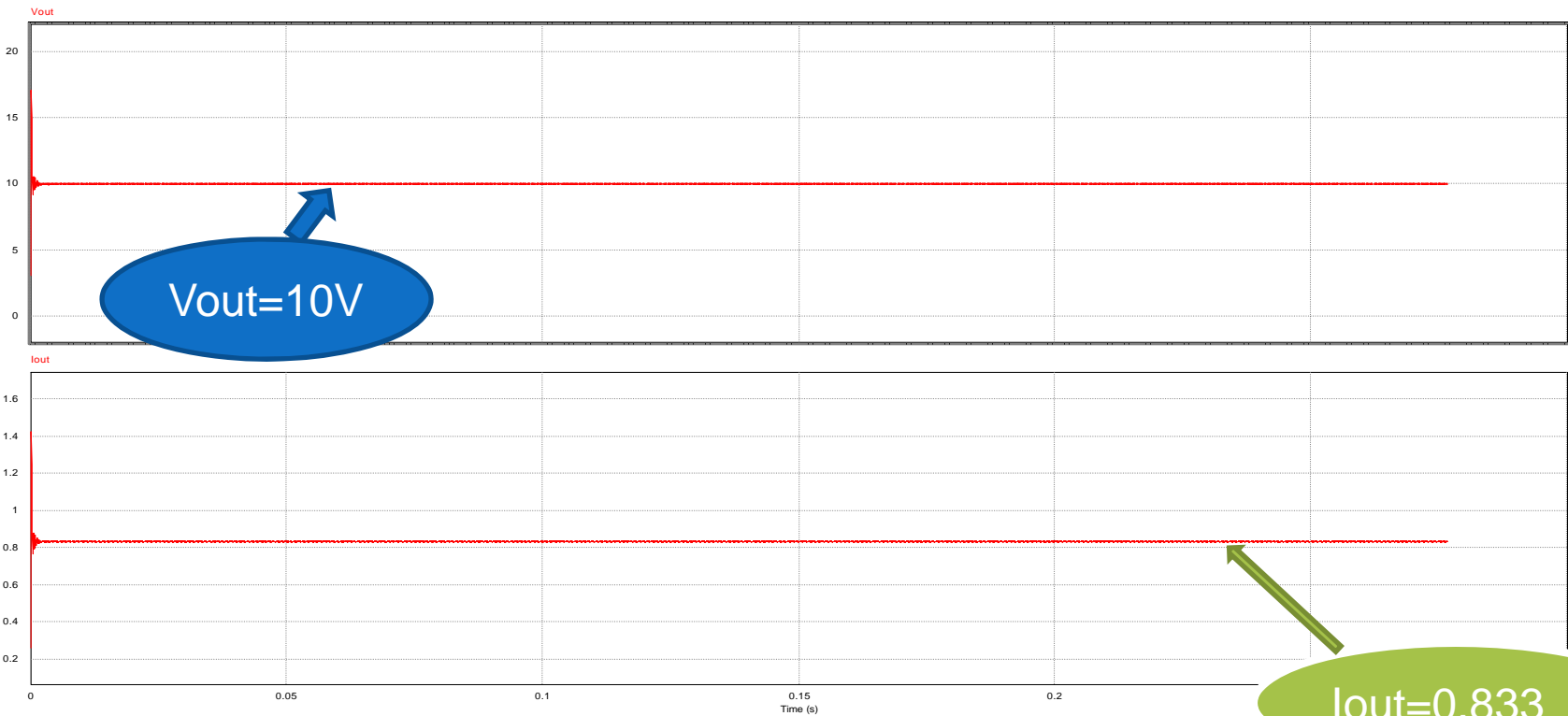


# Results: SEPIC open-loop

•3V input voltage



10V output Voltage

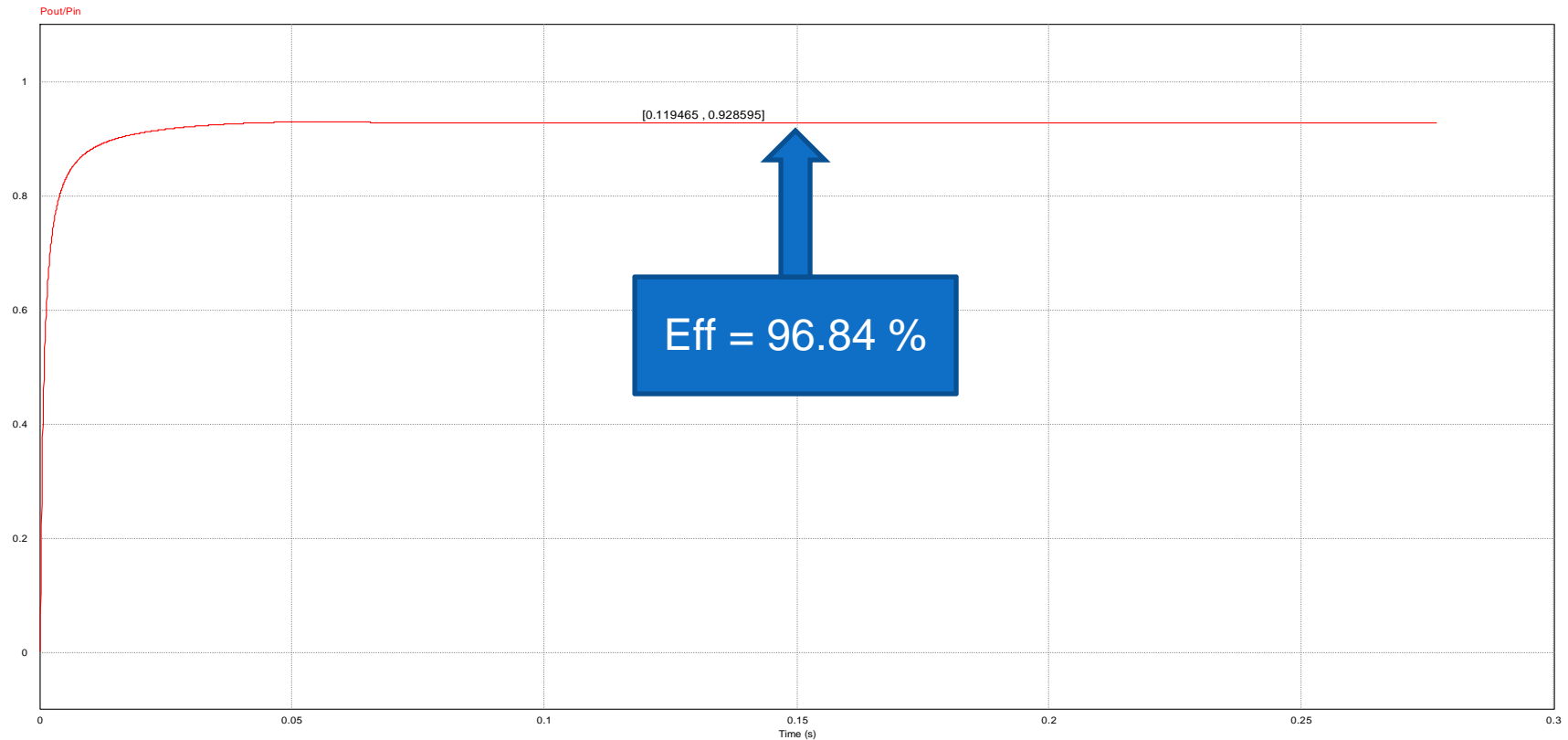


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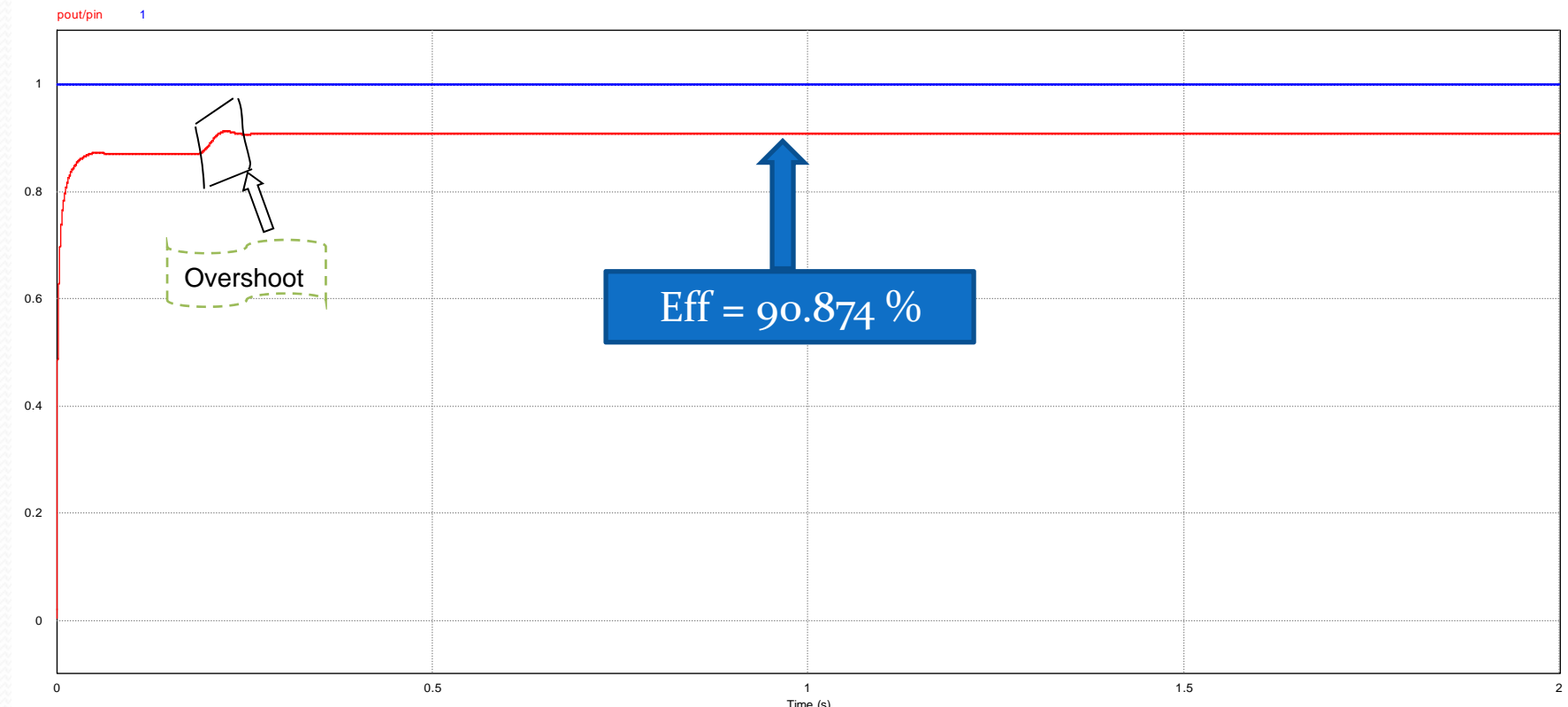


# Results: SEPIC open-loop

•20V input voltage



10V output Voltage

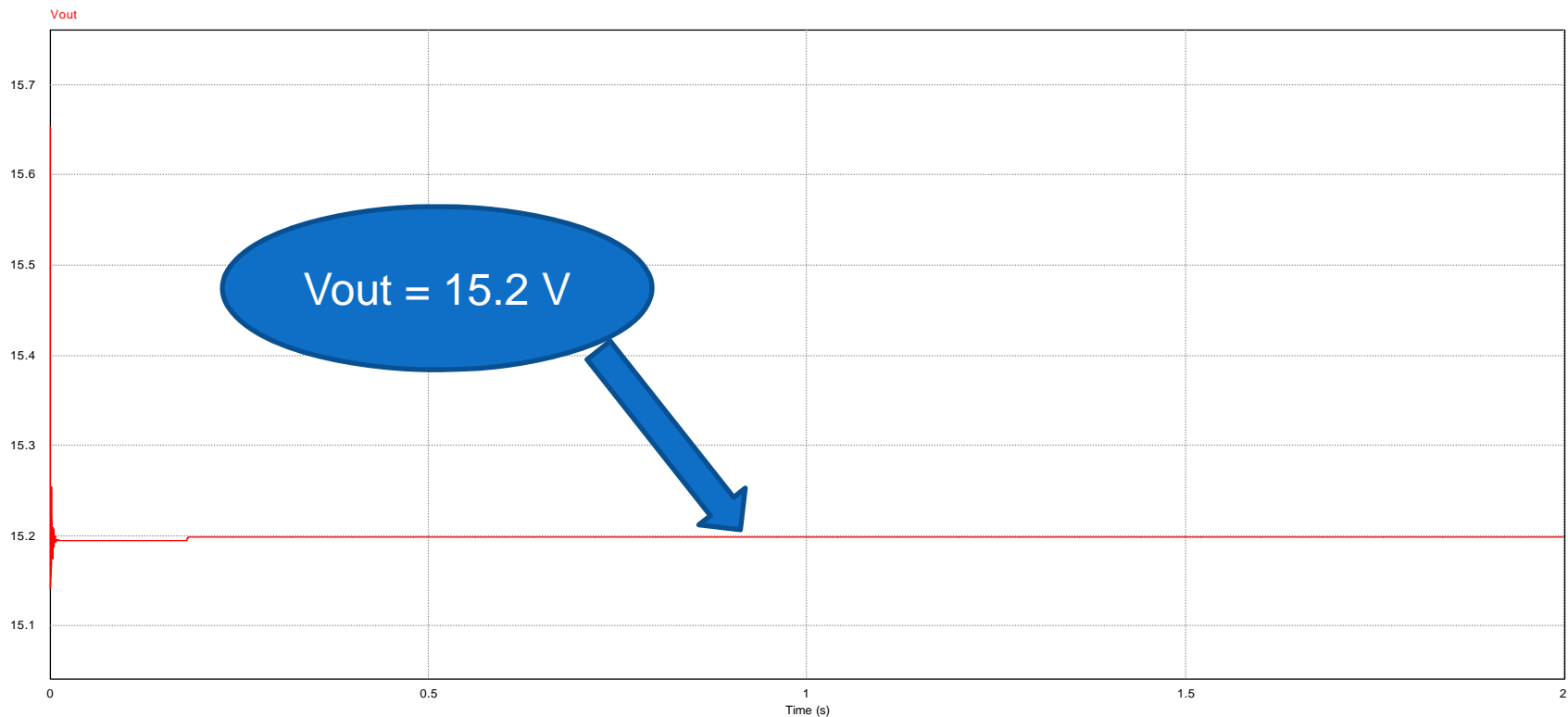


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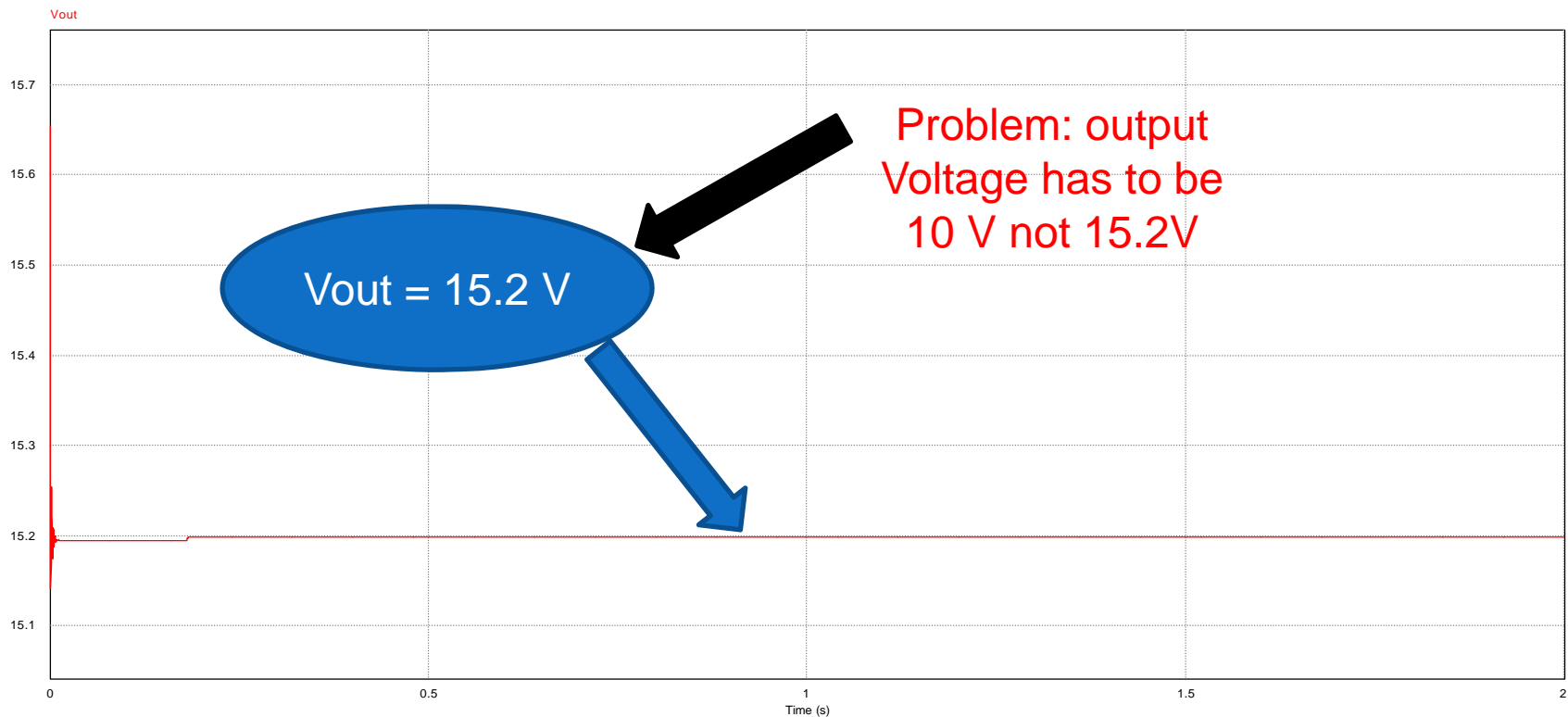


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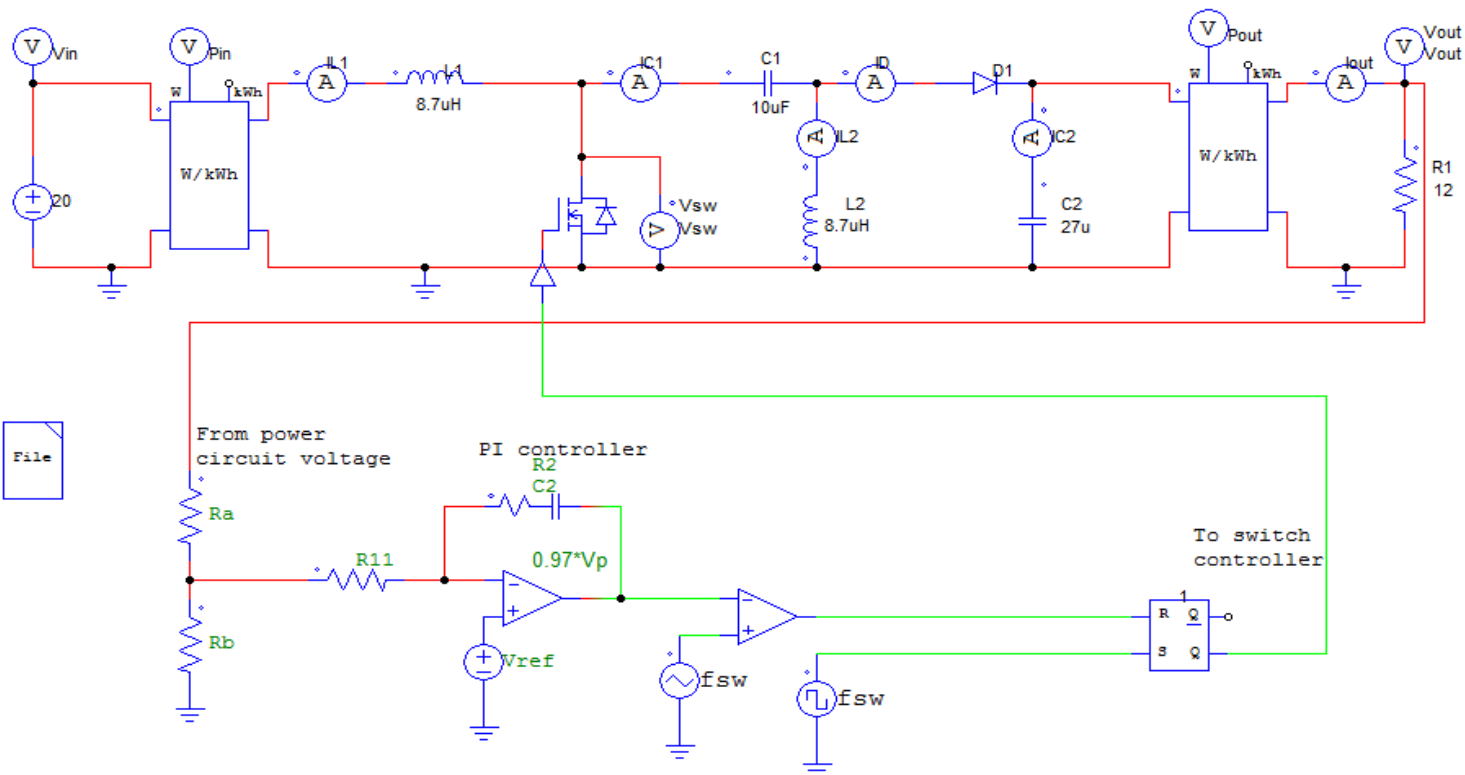
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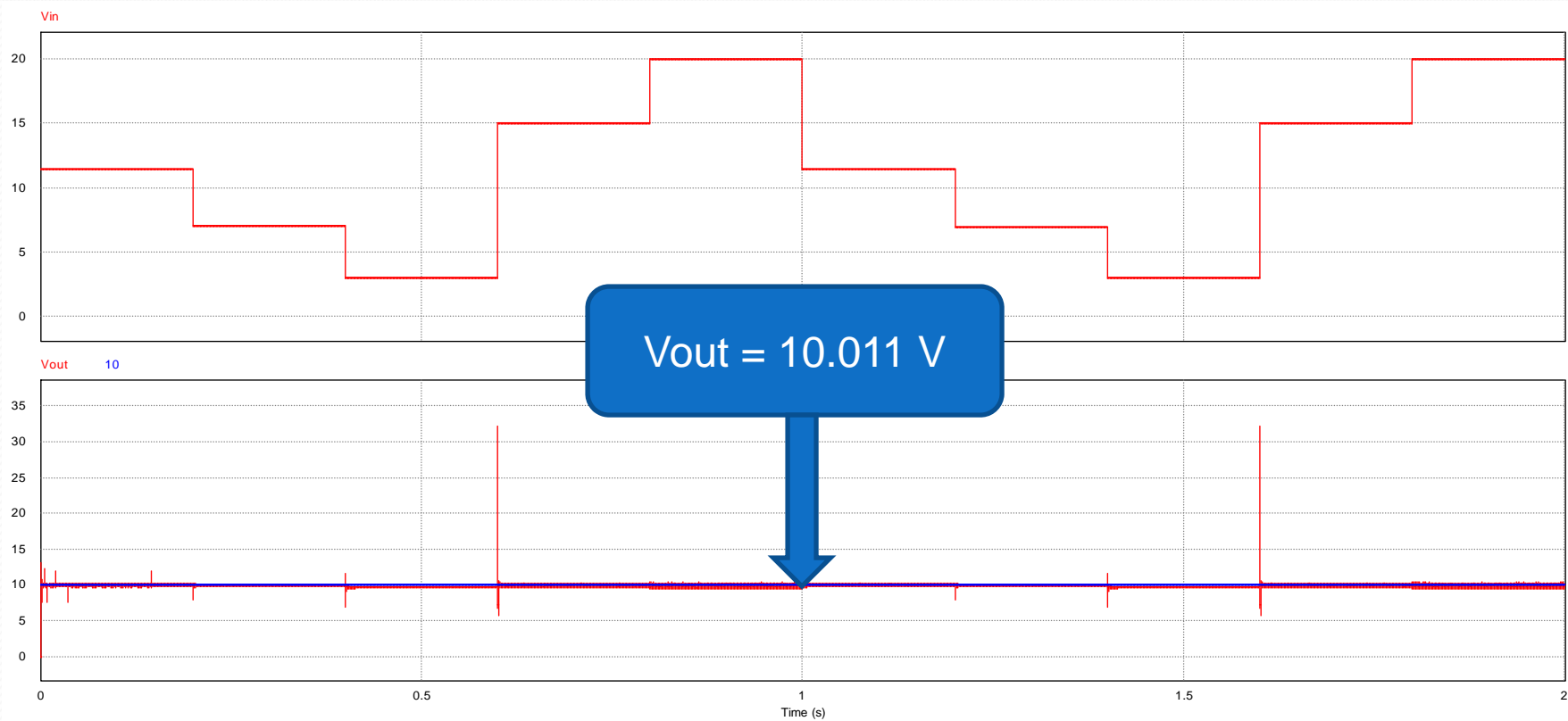
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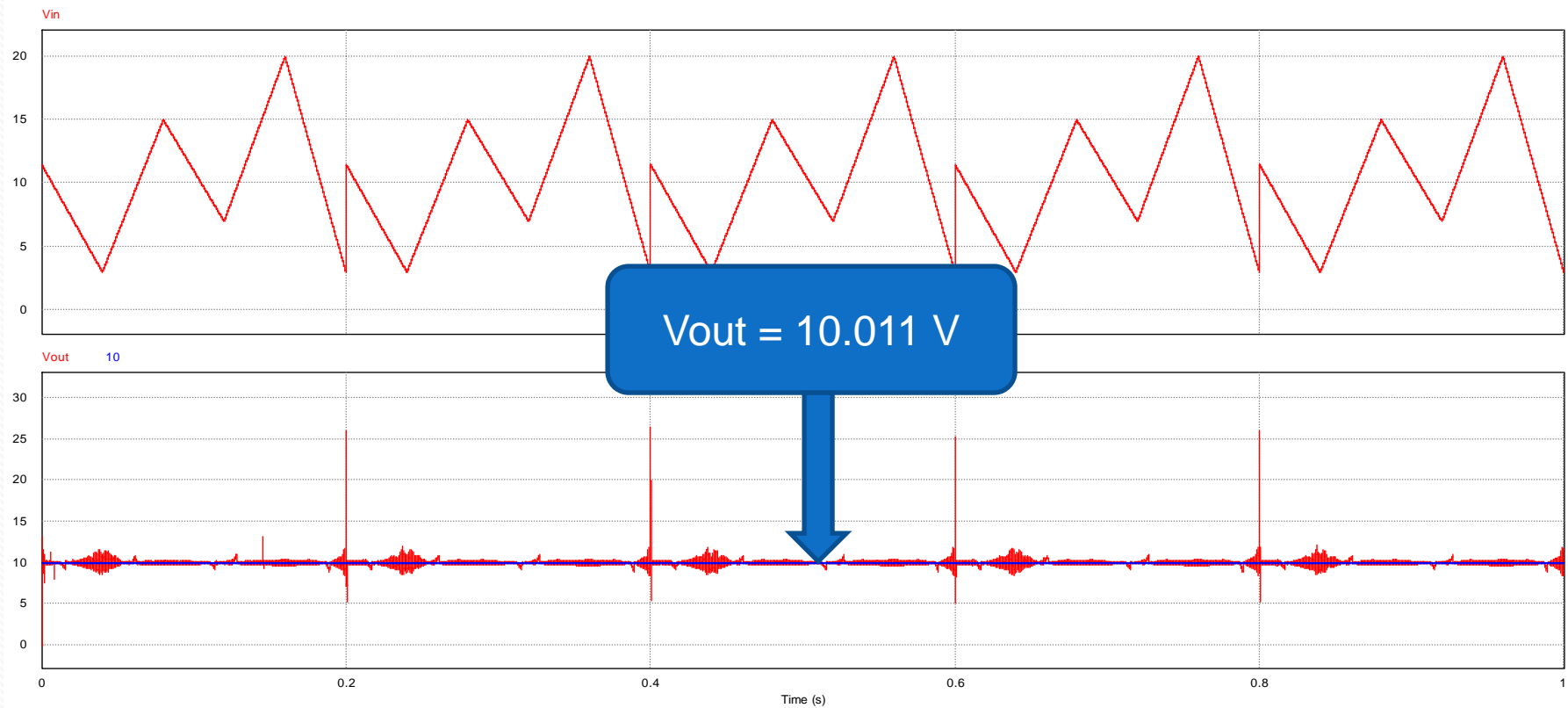
# Results: SEPIC closed-loop data

Input data			Output data			Relations	
Voltage (V)	Current (A)	Power (W)	Voltage (V)	Current (A)	Power (W)	Eff (%)	Duty cycle (%)
3	2.205	8.177	9.759	0.815	7.884	96.368	76.51
5	0.997	8.559	10.035	0.838	8.189	95.677	66.77
7	0.292	8.401	10.027	0.838	8.178	97.346	58.92
9	0.128	8.534	10.019	0.837	8.180	95.852	52.71
11.5	0.217	8.348	10.015	0.837	8.180	97.988	46.58
13	0.226	8.367	10.021	0.837	8.181	97.777	43.56
16	0.236	8.378	10.016	0.837	8.354	99.713	38.53
19	0.225	8.315	10.011	0.836	8.182	98.401	34.54
20	0.216	8.279	10.011	0.836	8.183	98.840	33.39

# Results: SEPIC closed-loop



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# Conclusion

- Performance of the PI voltage mode control
- High efficiency
- Stability of the output voltage



# Thank you