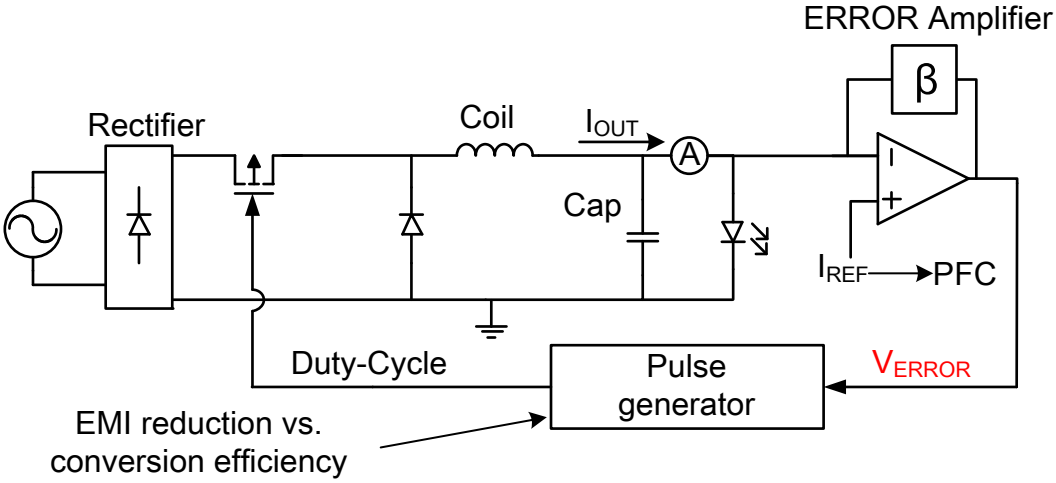
Master Thesis

Evaluation of Approaches to the Implementation of an LED Driver Circuit with Filter-less Reduction of Electromagnetic Interference and Power Factor Correction

Typically, bulky and costly filters are used to reduce the electromagnetic interference (EMI) of power or DC-DC converters. However, such filters cannot be used in low-cost and low-area applications. In order to still provide adequate suppression of EMI, the switching frequency of the converter may be changed “randomly” within a defined frequency range. As a result, the power of the EMI is not centered in a single frequency but instead distributed over a defined frequency range. However, the conversion efficiency of the converter decreases due to this randomization. Accordingly, an optimum trade-off between conversion efficiency and suppression of EMI has to be found. Moreover, a power factor correction (PFC) must be performed in order to eliminate the reactive power drawn from the power grid. Finally, the sinusoidal current delivered from the PFC must be averaged in order to supply the LED with a constant current, thus ensuring a steady light intensity.



The task of this master thesis is to evaluate approaches to the randomization of the switching frequency, e.g., Delta-Sigma A/D converter or digital random generator, and the optimization of the conversion efficiency, e.g., valley control. Subsequently, it is to be evaluated if and how promising approaches can be combined with a PFC. Moreover, the resulting conversion efficiency of the converter is to be determined. In order to achieve these objectives, Verilog-A models of the required blocks and sub-circuits are to be developed. Based on these models, the design on system-level is to be performed.

What we expect

Good understanding of and interests in systems theory and mathematics, autonomous working style, well documented work.

What we offer
Intensive supervision of the thesis, nice work environment, latest CAD and EDA tools for the design of integrated circuits, well equipped laboratory, and free space for own ideas.

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