Master Thesis

Design and Evaluation of a Digital Controller for SEPIC-based AC/DC Converters Operating in Discontinuous Conduction Mode

Recently, a control scheme was developed at the Fritz Huettinger Chair of Microelectronics that maximizes the efficiency of Single-Ended-Primary-Inductance-Converter (SEPIC) based AC/DC converters in discontinuous conduction mode. It achieves an excellent regulation of the output voltage and a high power factor and can thus be applied, for example, to the power supply regulation of an LED lighting system. However, the control scheme was implemented in the analog domain. The task of this thesis is to implement the control scheme in the digital domain using the digital controller UCC3138 of Texas Instruments as illustrated in Figure 1.

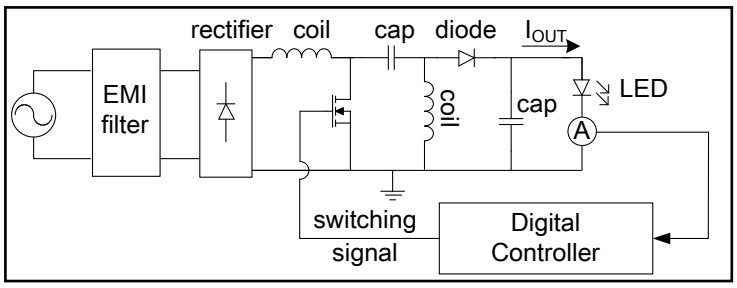

Fig. 1: AC/DC SEPIC as LED-driver

The following tasks are to be performed:

- Design & implementation of a digital control scheme based on the analog control scheme
- Design & implementation of a PCB (AC/DC converter plus digital controller)
- Evaluation & optimization of the efficiency of our control scheme
- Evaluation of the performance of further control schemes, e.g., synchronous rectification, quasi-resonant switching, and active-clamp implementation

What we expect:
Good understanding and interests in systems theory, mathematics as well as analog and digital circuits, autonomous working style, and well documented work.

What we offer:
Intensive supervision of the thesis, well equipped laboratory, latest simulation software & data analysis tools, and free space for own ideas.

Starting Date: As soon as possible

Contact Person:
Dr. Lucas Spohn
Tel.: 0761 / 203 - 7585
Email: lucas.spohn@imtek.de

Prof. Dr.-Ing. Y. Manoli
Fritz Huettinger Chair of Microelectronics
Department of Microsystems Engineering
University of Freiburg, Germany