Miniaturization of LED Drivers

Ammar, Ahmed Morsi; Spliid, Frederik Monrad; Nour, Yasser; Knott, Arnold

Publication date: 2018

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Miniaturization of LED Drivers
Ahmed Ammar, Frederik Spliid, Yasser Nour & Arnold Knott
Technical University of Denmark, DTU Electrical Engineering, Electronics group
Elektrovej 325, 2nd floor, 2800 Kgs. Lyngby, Denmark

Introduction
• Great demand for miniaturization in lighting industry
• Power supplies are bottle neck, due to their bulky energy storage components
• This poster: several design considerations towards miniaturized LED drivers.

Design Considerations
• Topologies: Soft-switching resonant converters
• Control: Combination of control schemes (e.g. frequency control + burst mode control)
• Devices: Wide band-gap (WBG) devices and Integrated Passive Devices (IPDs) technologies
• Energy Storage: Active ripple port circuits allowing for employment of smaller and more robust capacitor technologies
• Frequency: HF and VHF operation.

Experimental Results
Measurement results of a class-DE series-resonant converter that can be incorporated for the AC-DC and the DC-DC stages in an LED driver:
• Up to 400V input with soft-switching
• 1 MHz operation
• High voltage GaN switches and SiC diodes
• Potential for operation in HF and VHF ranges
• Frequency modulation can be used for line/load regulation.

Conclusion
• Operation at high frequencies is key for miniaturization
• Good candidate: soft-switching resonant converters
• WBG devices show great potential for high efficiencies
• Combined control can allow for enhanced line/load regulation.

References

Acknowledgement
This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 731466