

Towards SC-enabled high density highly miniaturized power LED drivers: A model-centric design framework

PROEFSCHRIFT

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door

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Het onderzoek dat in dit proefschrift wordt beschreven is uitgevoerd in overeenstemming met de TU/e Gedragscode Wetenschapsbeoefening.

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Chapter 1

H-SCC LED driver

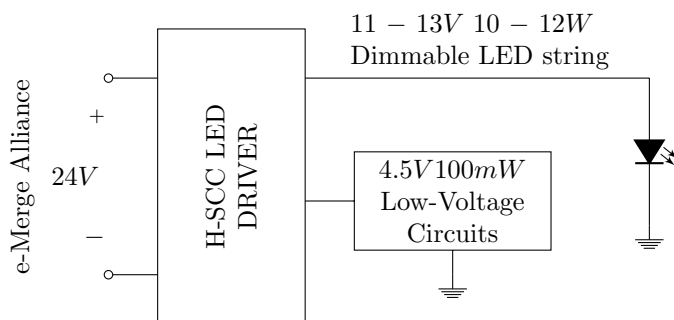
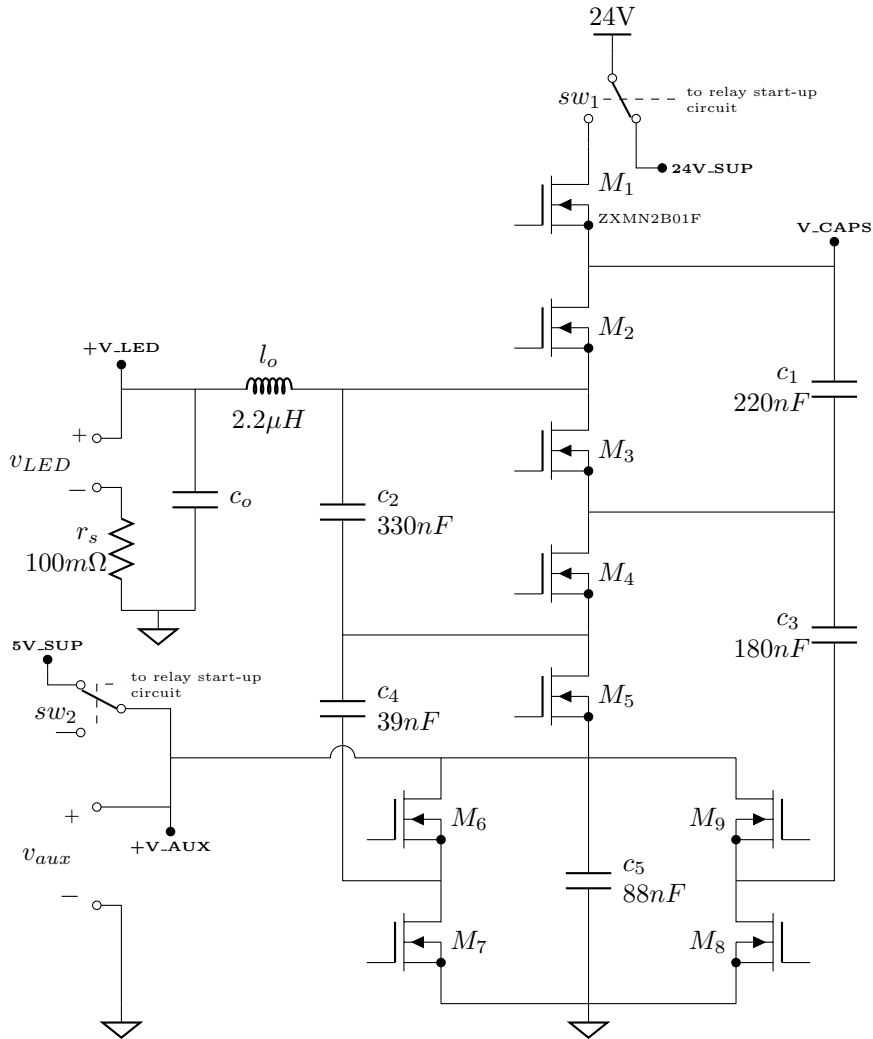


Figure 1.1: H-SCC LED driver block diagram.

An experimental converter was built with the goal to validate the performances of a H-SCC as a LED driver. The LED driver, described in the block diagram of Figure 1.1, was built using discrete components following the specifications of Table 1.1.

Table 1.1: LED driver design specifications

Items	Value	Unit
v_{src}	24	V
v_{LED} voltage	11-13	V
v_{LED} power	12	W
i_{LED} max	1	A
Δi_{LED}	± 10	%
v_{aux} voltage	4.5	V
v_{aux} power	100m	W
η	85	%
f_{sw}	3.7	MHz

Figure 1.2: 5:1 H²-Dickson power train schematic.

1.1 Design procedure

1.1.1 Power train

1.1.2 Small-signal analysis

1.1.3 Close-loop controller

1.2 Power train design

1.2.1 Capacitors

1.2.2 Transistors

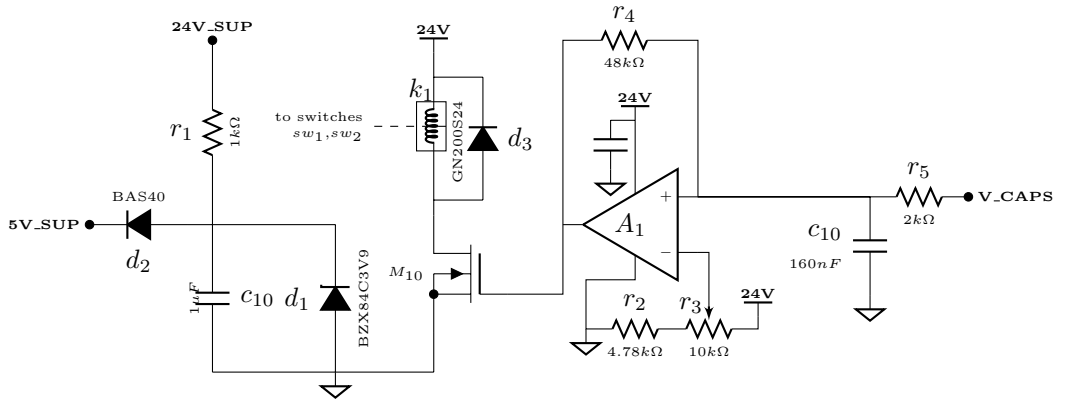


Figure 1.3: Start-up helper circuit schematic.

Chapter 2

Conclusions

Appendices

Appendix A

Modeling of Switched Capacitors Converters

A.1 3:1 Dickson converter vectors