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

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Technische Universiteit Eindhoven, op gezag van de rector magnificus prof. dr. ir. F. P. T. Baaijens, voor een commissie aangewezen door het College voor Promoties, in het openbaar te verdedigen op woensdag ?? april 2016 om 16:00 uur.

door

Julià Delos Ayllón

geboren te Mataró, Catalonië

Dit proefschrift is goedgekeurd door de promotor. De samenstelling van de promotiecommissie is als volgt:

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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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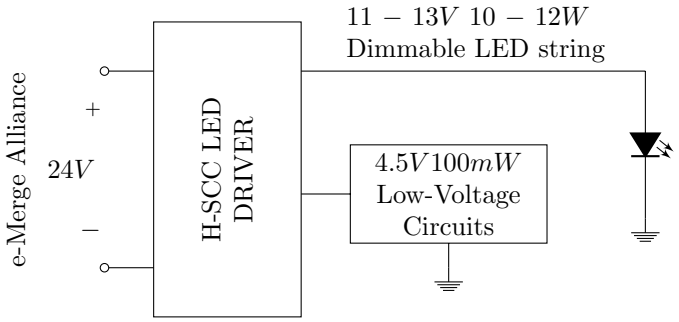

Figure 1.1: H-SCC LED driver block diagram.

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}	$\pm$ 10	%
v_{aux} voltage	4.5	V
v_{aux} power	100m	W
η	85	%
f_{sw}	3.7	MHz

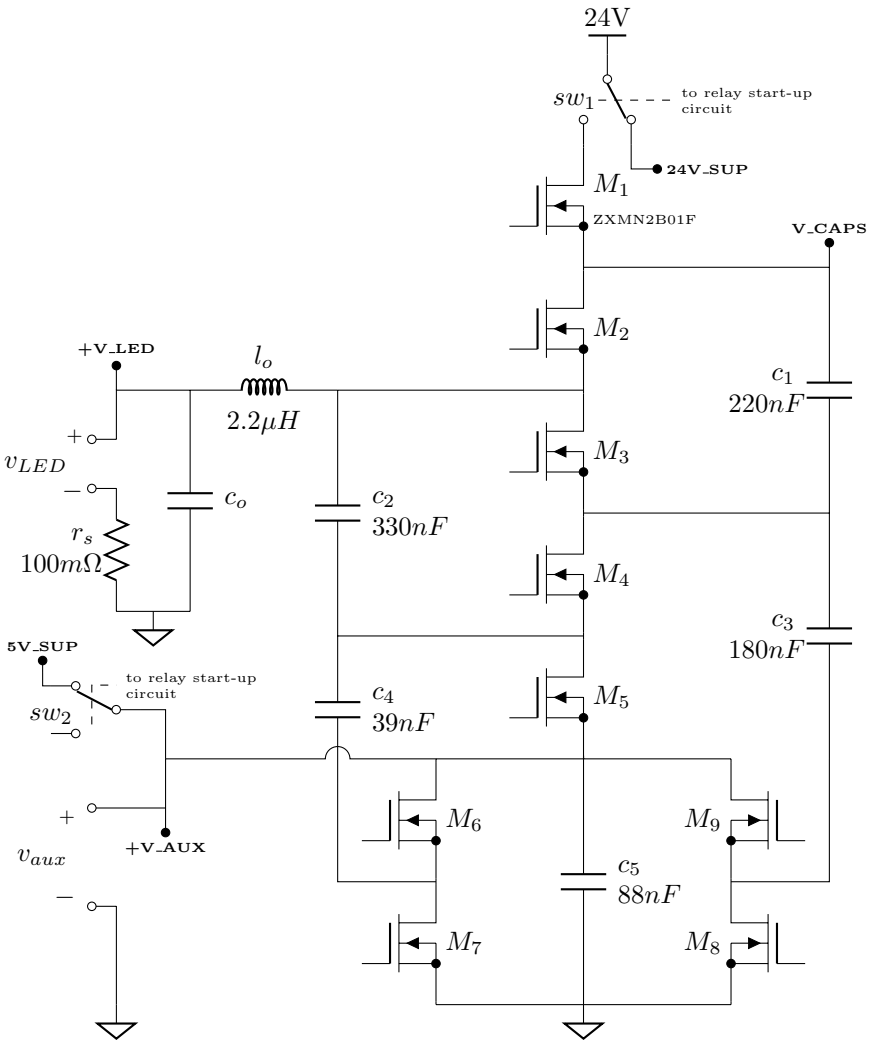

Figure 1.2: 5:1 H^2-Dickson power train schematic.

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

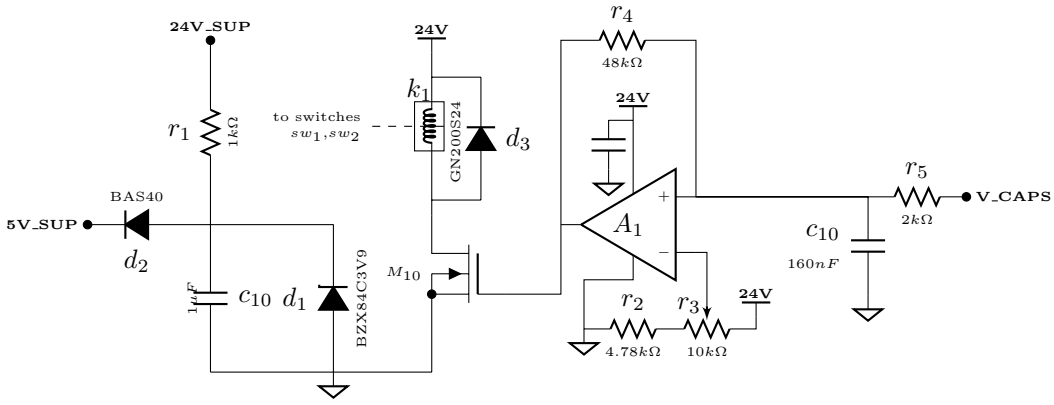

Figure 1.3: Start-up helper circuit schematic.

Chapter 2

Conclusions

Appendices

Appendix A

Modeling of Switched Capacitors Converters

A.1 3:1 Dickson converter vectors