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Forschungsarbeit (FA)
Masterarbeit (MA)

zu vergeben!

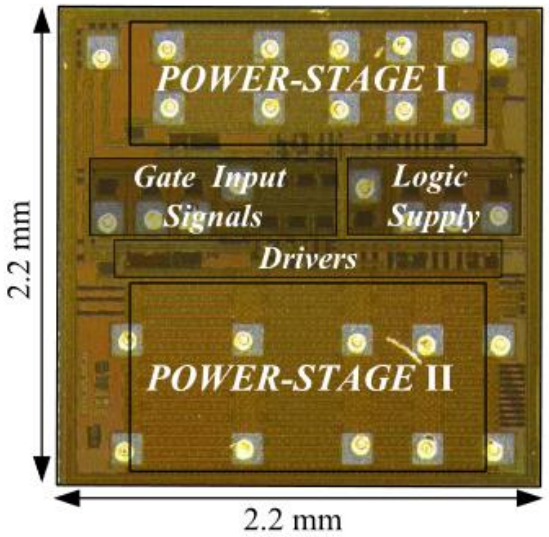
PE

Evaluation von monolithisch integrierten Gyratoren zur Emulation von Lastinduktivitäten

Moderne Schaltwandler streben immer höhere Leistungsdichten an. Da üblicherweise passive Bauteile wie Filterinduktivitäten das größte Volumen beanspruchen, werden neuartige Ansätze zu deren Miniaturisierung gesucht, um die Leistungsdichte zu erhöhen.

Ein vielsprechender Ansatz ist dabei die Emulation einer Induktivität mittels eines Gyrators und einer Kapazität. Durch den Gyrator wird die Impedanz des Kondensators in die duale Impedanz (Spule) umgewandelt und verspricht so ein deutlich kompakteres Volumen.

Ziel dieser Arbeit ist die Evaluation (Auslegung und Simulation) eines monolithisch integrierten Gyrators zur Emulation von Lastinduktivitäten. Außerdem soll ein diskreter Gyrator mit kommerziellen Komponenten zur Validierung des Funktionsprinzipes entwickelt und getestet werden.



Chip photograph of a integrated power stage with gyrator [2]

Arbeitsplan:

- Einarbeitung & Literaturrecherche (10%)
- Design und Simulation eines monolithisch integrierten Gyrators (30%)
- Aufbau diskreter Gyrator (20%)
- Charakterisierung diskreter Gyrator (20%)
- Ausarbeitung (20%)

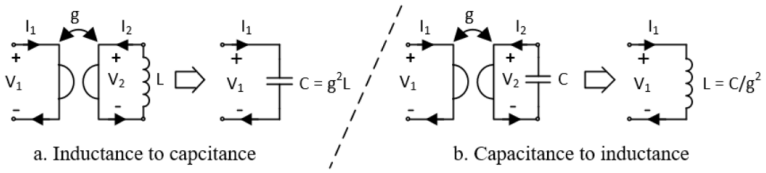


Fig. 1. Element transformation property of a gyrator [1]

[1] M. Saad and E. Alarcón, "Tunable switch-mode emulated inductive elements for enhanced power converter miniaturization," IECON 2016 - 42nd Annual Conference of the IEEE Industrial Electronics Society, Florence, 2016, pp. 1184-1189, doi: 10.1109/IECON.2016.7793358
[2] E. Abramov, A. Cervera and M. M. Peretz, "Optimal Design of a Voltage Regulator Based on Gyrator Switched-Resonator Converter IC," in *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 6, no. 2, pp. 549-562, June 2018, doi: 10.1109/JESTPE.2017.2741977.

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Research Thesis (FA)
Masterthesis (MA)

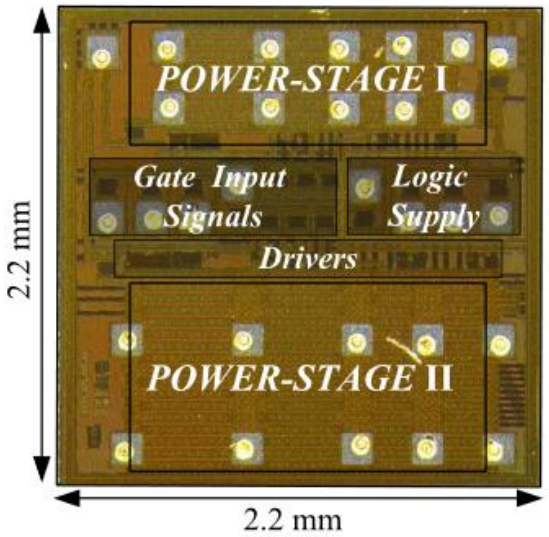
PE

Evaluation of monolithic integrated gyrators for inductance emulation

Modern switched mode power supplies (SMPS) are aiming for ever increasing power densities. Since typically passive components like the filter inductances require the most volume, there are several approaches to minimize them and therefore increase the power density in compact power electronics sub-systems.

A promising approach is the emulation of an inductance by using a gyrator and a capacitance. The gyrator is transforming the impedance of the capacitor into the dual impedance (coil) and therefore promising a much higher volume.

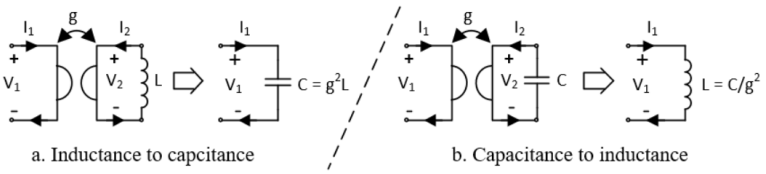
Goal of this thesis is the evaluation (design and simulation) of a monolithic integrated gyrator for an emulation of a load/filter inductance. Additionally a discrete gyrator with commercial components should be designed and tested for proof of concept.



Chip photograph of a integrated power stage with gyrator [2]

Time plan:

- Literature research (10%)
- Design and simulation of a monolithic integrated gyrator (30%)
- Design discrete gyrator (20%)
- Characterization discrete gyrator (20%)
- Written thesis (20%)



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