Universität Stuttgart
Institut für Robuste Leistungshalbleitersysteme

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Bachelor/Research/ Master thesis

LE

Active Power Cycling in a three Phase Inverter for Accelerated Lifetime Test of Wide-Bandgap-Semiconductors

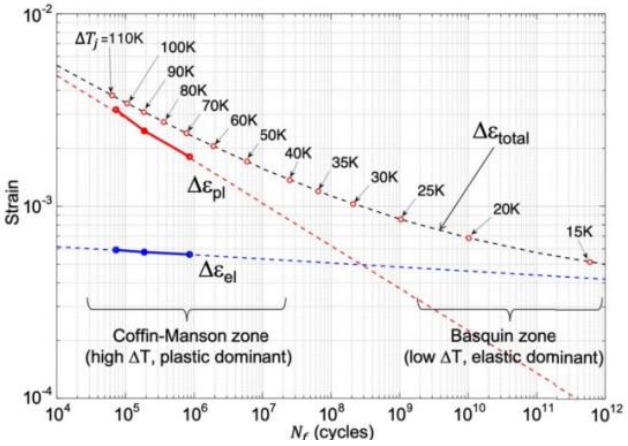
In the evolving electric vehicle market there is a need for high efficient and reliable power electronics. While Silicon existed in the market for several decades and sophisticated life time models like LESIT or CIPS08 were developed for those components such knowledge is still lacking limited applicable for SiC due to the different technology and physics. In this overall project a 3-phase inverter should be developed which provides close to application stresses. Sensor systems and highly accelerated tests as well as safety measurements should be developed. A focus on subtask is pursued and will be discussed with the tutor prior of the work.

Timeplan (exemplary) **:**

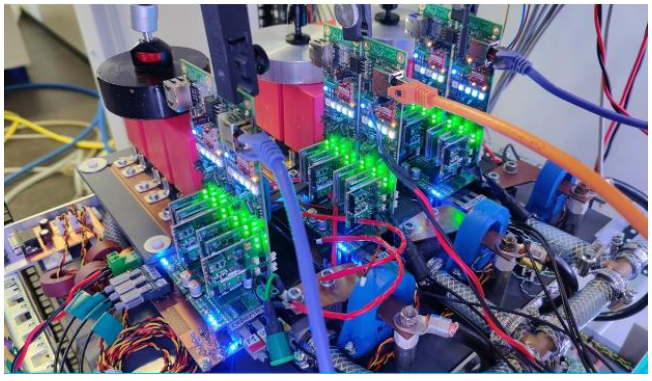
- Familirization & literature research (10%)
- Construction of a V_{DS}-TSEP measurement (20%)
- Characterization of the degreadation measurement in dependence of different parameters (30%)
- Implementation of the degredation model in a simulative approach (25%)
- Thesis writing and presentation (15%)

Helpful previous knowledge:

- Power electronics I / RPSS 1 & RPSS 2
- Matlab/Microcontroller/SCPI programming



Stress in SiC Devices in dependence of ΔT.[1]



1200 V 3-Phase Inverter for ALT and SoH-Monitoring

[1]Dornic, Nausicaa, et al. "Stress-based model for lifetime estimation of bond wire contacts using power cycling tests and finite-element modeling." *IEEE Journal of Emerging and Selected Topics in Power Electronics* 7.3 (2019): 1659-1667.