University of Stuttgart
Germany

# SUPER – Stuttgart University Program for Experiencing Research
# Project Information

**Institute's Information**


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| Name of Institute | Institute of Robust Power Semiconductor Systems |
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**Duration of Project/Number of Students**

| | |
|---|---|
| June/July | |
| June/July/August | X |
| Number of Students | 1-2 |

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| **Name of Project** | Failure analysis of power semiconductors based on accelerated lifetime tests by means of time-domain reflectometry |
| **Beneficial Skills & Knowledge** | Background in electrical engineering<br>Basic knowledge in power electronics, metrology and thermodynamics |

**Description of Work**

The ILH conducts research in high power density power modules in switched-mode converters for electromobility and renewable based on the usage of wide-bandgap power semiconductors.

The majority of failures in power semiconductor devices are caused by thermal stress. In particular, temperature swings lead to mechanical fatigue of the device structure caused by different coefficients of thermal expansion (CTE) and thus to a reduced lifetime. The main focus of the thesis is to investigate the influence of aging of power modules on their electrical parameters. With the help of time-domain reflectometry, defects and weak spots (irregularities) with in the structure of power device caused by the aging process shall be detected. GaN-based power modules with three-dimensional structured substrates based on ceramic and metallic materials are used as device-under-test. The specific project description and definition of objectives will be defined together with the student, depending on the student's preferences and competences.

During the work, which is in the field of the latest developments and debugging/diagnose of power electronic circuits, the students will work on state-of-the-art measurement methods to gain valuable experience and knowledge to advance their engineering career.