

Driving decarbonization and digitalization. Together.



Doctoral Thesis: High current contact in power semiconductor modules (f/m/div)*

Job description

The industrial doctorate at Infineon: Pursue a doctoral degree at a university and gain professional experience simultaneously - an ideal start for your career. Advance your research with us and profit from our vast network of doctoral candidates and the expertise of a university. Mentorship is handled by both professors and dedicated Infineon employees. We are offering a doctoral thesis dealing with the electrical optimization of high current contacts in power semiconductor modules. In power modules with currents > 500 A and voltages exceeding 1200 V, screw connections are used exclusively in the power path. They each contribute to an increase in inductance of about 10 nH on the DC link side. Up to now, mainly slow-switching IGBTs have been used in such modules. In the meantime, however, the much faster switching SiC components are also being used in these modules. Their short rise time in particular leads to overvoltages during switching. To limit these overvoltages, the inductance of the DC link connection must be optimized. A suitable electrical connection is to be worked out for this purpose. In addition, special focus is to be placed on the basic design of the insulation system for applications in a voltage range of 1.5 to 6.5 kV. Suitable electrical test procedures and methods of numerical modeling for electrical-mechanical-thermal behavior will be used to evaluate the overall system in order to ensure reliable operation for up to 20 years in the application. The thesis is written in cooperation with the University of Dresden and under the supervision of PD Dr.-Ing. habil. Stephan Schlegel.

The tasks within the thesis will consist of:

- Elaboration of the state of the art and basic approaches to **solutions, a suitable low-inductance conductor arrangement and a suitable geometry of the screw connection**
- **Elaboration of a contact design** to achieve a low contact resistance at the connection of the inverter
- **Analyzing and evaluating the insulation materials** used so far for their suitability (common engineering plastics for frame modules, silicone gels)
- Elaboration of basic principles for the **design of a reliable insulation system** for voltages between 1.5 kV and 6 kV and, if necessary, identification of new insulation materials and alternative concepts
- **Creation of a numerical model** to represent the electrical-mechanical-thermal behavior of the insulation system

The learnings out of the thesis will lead to

- Optimize high power modules for fast switching semiconductors
- Improve module reliability in terms of degradation

At a glance

Location: **Warstein (Germany)**
Job ID: **HRC0273732**
Start date: **as soon as possible**
Entry level: **0-1 year**
Type: **Full time**
Contract: **Temporary**

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Job ID: **HRC0273732**
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Contact

Silke Jaschik
Recruiter



Profile

A doctoral student is a research enthusiast,

- > whose interests are scientific research combined with the passion for Infineon's innovative products and applications.
- > who enjoys working in an industrial environment in combination with an Infineon partner university.
- > who appreciates open communication and the contribution of an international environment.
- > and is thus an excellent candidate for a further academic or industrial career after completion of their thesis.

As the ideal candidate you:

- Are a university graduate in the field of **physics, electrical engineering** or equivalent and meet the **admission requirements for a doctoral degree**
- Have already gained some **experience in the field of insulation and contact materials** and **simulation-based optimization** of the electric field distribution in insulation systems
- Are **enthusiastic about scientific work**
- Do **question the existing** and do you **like to break new ground**
- Do have good oral and written communication skills in **German and English**

Know-how in following topics is preferable - but not mandatory

- Basic mechanical and design knowledge
- Material physics in the field of polymers
- Construction of multiphysical models in FEM
- Basics of current-carrying contacts and connections

Benefits

- **Warstein:** Coaching, mentoring networking possibilities; Wide range of training offers & planning of career development; International assignments; Different career paths: Project Management, Technical Ladder, Management & Individual Contributor; Flexible working conditions; Home office options; Part-time work possible (also during parental leave); Sabbatical; Holiday child care; On-site social counselling and works doctor; Health promotion programs; On-site canteen; Private insurance offers; Wage payment in case of sick leave; Corporate pension benefits; Flexible transition into retirement ; Performance bonus; Accessibility, access for wheelchairs; Possibility to work remotely from abroad (EU)

Why Us

Driving decarbonization and digitalization. Together.

Infineon designs, develops, manufactures, and markets a broad range of semiconductors and semiconductor-based solutions, focusing on key markets in the automotive, industrial, and consumer sectors. Its products range from standard components to special components for digital, analog, and mixed-signal applications to customer-specific solutions together with the appropriate software.

– **Green Industrial Power (GIP) empowers a world of unlimited green energy** –

The **GIP division** delivers leading semiconductor solutions for the smart, green, and efficient conversion of electrical energy, covering all steps in the energy chain from generation through transmission to storage and consumption. Its broad range of applications spans renewable energies, electric vehicle charging, industrial power supplies, trains, electric commercial vehicles, and home appliances.



The GIP product portfolio encompasses IGBT power transistors and the driver ICs that control them, flanked by an expanding lineup of solutions based on SiC. Its growing analytics, service, and software offering complements this wide spectrum – reaching beyond products to create additional value for customers. Infineon is the global number one in power semiconductors and – with the broadest portfolio of SiC solutions for industrial applications – GIP is leading the transition to wide-bandgap technologies. GIP solutions handle energy more intelligently and efficiently – driving decarbonization for a better tomorrow.

** The term gender in the sense of the General Equal Treatment Act (GETA) or other national legislation refers to the biological assignment to a gender group. At Infineon we are proud to embrace (gender) diversity, including female, male and diverse.*

