

# PhD position at TU Vienna

## **Experimental and simulation analysis of ESD protection devices in advanced silicon high-speed discrete technologies**

During the manufacturing or operation of an integrated circuit (IC), the electronic devices are exposed to different kind of disturbing electrical pulses including electrostatic discharges (ESD). In high speed applications, e.g. USB 3, the protection devices need to exhibit a low capacitance which contradicts the requirement for high ESD robustness. With the technology down-scaling, the existing on-chip protection schemes are not efficient anymore due to the large area consumption for the ESD protection device in the chip. Therefore off-chip ESD protection elements based on discrete component technologies are necessary to fulfill the above requirements.

The topic of this PhD thesis is the experimental and simulation analysis of the internal behavior of advanced high-speed Si discrete technology ESD protection devices subjected to various types of ESD pulses. The PhD candidate will combine electrical and optical probing techniques to analyze breakdown phenomena, self-heating effects and the current density distribution in the devices subjected to different kinds of ESD stress. The transient interferometric mapping technique, developed at TU Vienna, will be employed to measure thermal and free-carrier response with ns time and  $\mu\text{m}$  space resolution. The obtained experimental data will be related to breakdown mechanisms, electrical triggering behavior and particular layout of ESD protection devices. The candidate will also model device behavior using TCAD simulation tools with the goal to understand the device physics and optimize the studied structure. The research activity of the PhD student will lead to publications in scientific journals and conferences.

The topic is suited both for electrical engineers and physicists with the interest in semiconductor device physics and characterization, modeling and electronics. The work will be performed in the frame of a project contract between NEXPERIA Hamburg and TU Vienna. It will contribute to the development of new ESD protection concepts.

*Requirements:* Completed master study in electrical engineering or physics, English, basic knowledge of semiconductor device physics

*Duration:* 3 years

*Start:* autumn 2020

*Salary:* Brutto 2.205Euro/Month, see

<https://www.fwf.ac.at/de/forschungsfoerderung/personalkostensaetze/>

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