

Emerging Reconfigurable FETs in 22nm FDSOI Technology – From Materials to Circuits

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Abstract: With classical scaling of CMOS transistors according to Dennard's scaling rules running out of steam, new possibilities to increase the functionality of an integrated circuit at a given footprint are becoming more and more desirable. A promising concept in this direction is to enhance the functionality of a system by maintaining the same number of individual elements.

The reconfigurable field-effect transistor (RFET) can provide such a feature, as it is an electronic device whose conduction mechanism can be reversibly reconfigured between n-type and p-type operation modes. In its most versatile variant, three independent gates are patterned over a nanoscale channel, whereby the two outer gate electrodes directly control carrier injection across the Schottky junctions at source and drain. Over the last few years, Jens and his team have focused on transferring this lab technology, originally demonstrated on silicon nanowires, to mature industrial processes and materials, with a recent demonstration of device fabrication based on the industrial 22nm FDSOI platform of GlobalFoundries. The possibility of reconfiguring those transistors makes them great candidates for novel applications, such as security, AI, and cryogenic computing. At the same time, the tunability of their drive current opens up novel approaches in analog circuit design. This talk provides an overview of the underlying device physics, employed integration schemes, as well as some potential target applications.

Bio: Jens Trommer received his Dipl.-Ing. in Electronic and Sensor Materials from the Freiberg University of Mining and Technology, Germany in 2011 and the Dr.-Ing. in Electrical Engineering from Dresden University of Technology, Germany in 2017. Currently, he holds the position of Senior Scientist at NaMLab, gGmbH in Dresden, Germany, leading the emerging devices development team. His research interests focus on novel reconfigurable transistor concepts and their application in circuits and systems. In this area, Jens has authored or co-authored over 100 publications and holds one patent. In 2023, Jens was elected as an IEEE Senior Member. Since 2025 he is the Chair of the German Chapter of the IEEE Electron Device Society (EDS). Currently, he is also the coordinator of the European HORIZON project SENSOTERIC (www.sensoteric.eu).