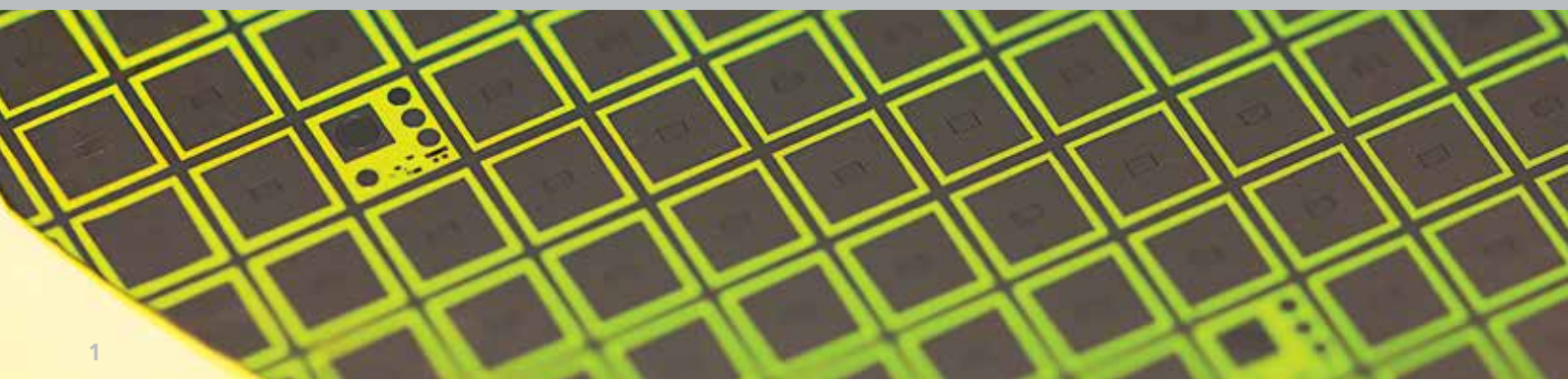
Fraunhofer
IISB

FRAUNHOFER INSTITUTE FOR INTEGRATED SYSTEMS AND DEVICE TECHNOLOGY



1 *Fully processed SiC-BIFET on 100mm wafer*

MONOLITHICALLY INTEGRATED SOLID-STATE -CIRCUIT-BREAKER (SSCB)

FOR HIGH POWER APPLICATIONS

General description

The new monolithically integrated solid-state-circuit-breaker (SSCB) is formed by a normally-on SiC-JFET and a normally-on SiC-BIFET. The SSCB is designed according to the concept of the dual-thyristor. In normal operation mode the SSCB is turned on. In case of an overcurrent, the SSCB is endued with a regenerative turn-off capability.

Features

- Regenerative turn-off capability under overcurrents
- Overcurrent limited by the saturation current of the p-type JFET and the n-type SiC-BIFET
- Saturation current scalable by the gate-voltage
- Junction Temperature up to 175°C

Advantages

- Higher reliability and robustness over a wide range of temperatures due to SiC
- High-blocking capability (>20kV) and low on-state losses due to the SiC-BIFET
- Simplified circuit design with reduced effort on cooling and passive components
- Number of turn-off events not limited
- Customized designs regarding turn-off current and voltage rating

Benefits

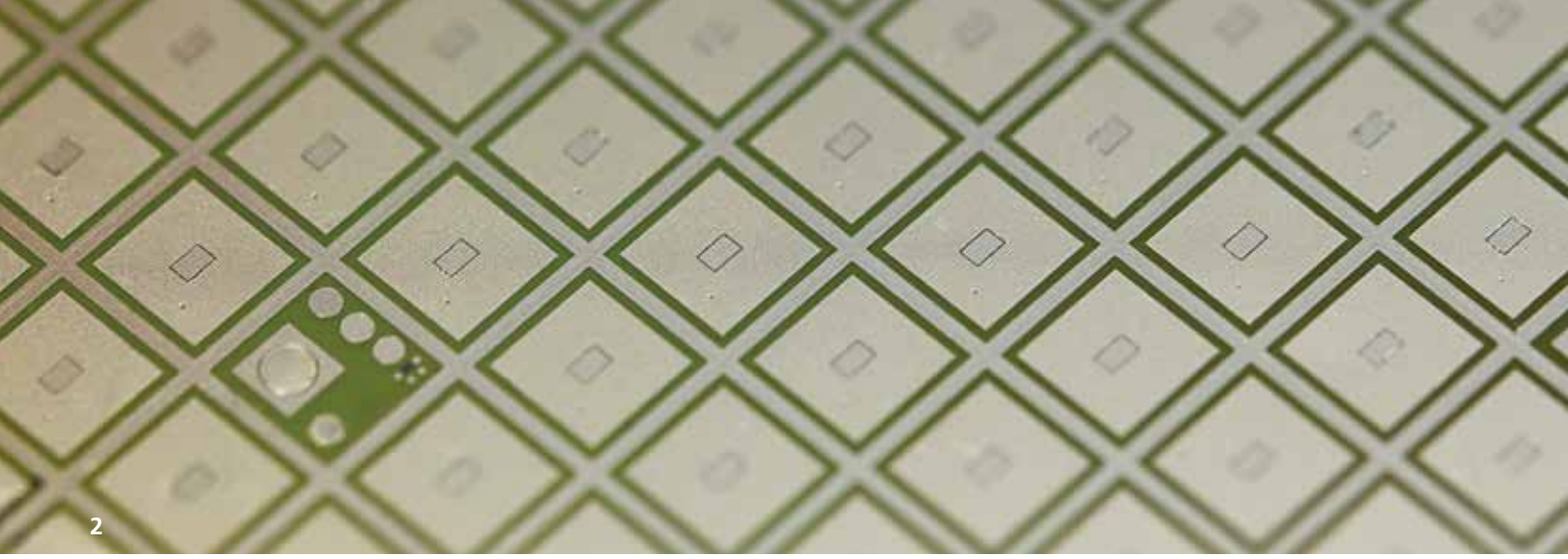
- Cost savings due to reduction of passive components
- Reduced effort on mechanical fuse elements
- Higher quality of the grid and reduced voltage drops

Fraunhofer Institute for Integrated Systems and Device Technology IISB

Schottkystraße 10
91058 Erlangen
Germany

Contact:
PD Dr.-Ing. Tobias Erlbacher
Phone: +49 9131 761 319
Fax: +49 9131 761 360
tobias.erlbacher@iisb.fraunhofer.de

www.iisb.fraunhofer.de



2

Applications

- Substitution of mechanical Circuit Breakers and Trans-former
- Protection of electrical networks and grids

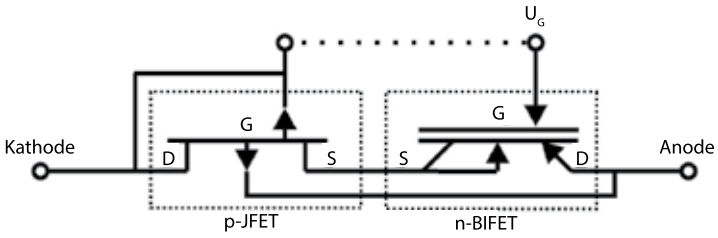


Fig. 1 Simplified equivalent circuit of the new monolithically integrated SSCB consisting of a p-type SiC-JFET and an n-type SiC-BIFET

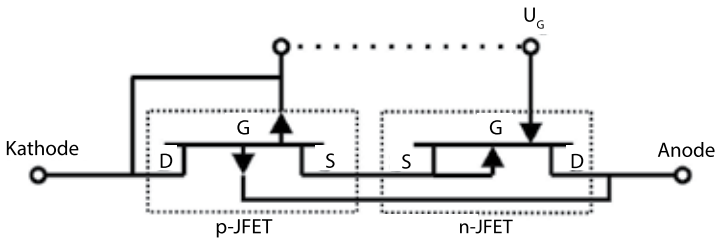


Fig. 2 Simplified equivalent circuit of the new monolithically integrated SSCB consisting of a p-type SiC-JFET and an n-type SiC-JFET

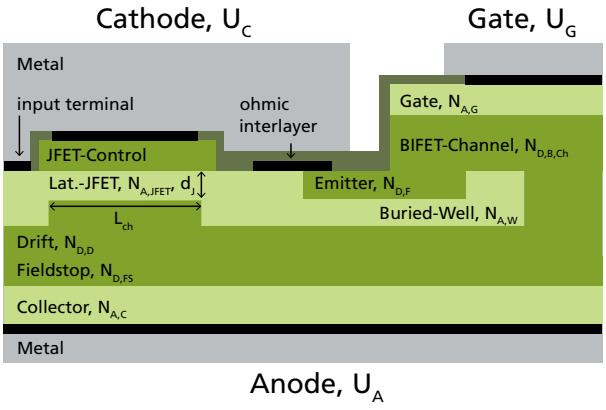


Fig. 3 Schematic cross section of the SSCB consisting of a p-type SiC-JFET and an n-type SiC-BIFET; Simple integration into an existing technology for fabricating SiC-BIFETs; Customizable dimensions

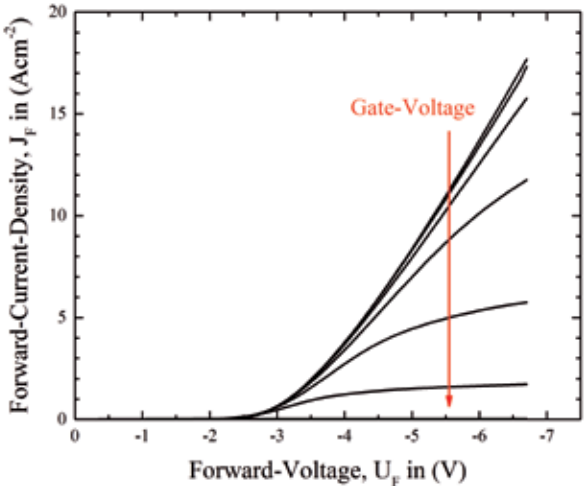


Fig. 4 Results of the measured current-voltage characteristic fabricated at IISB; Junction Temperature = 175°C

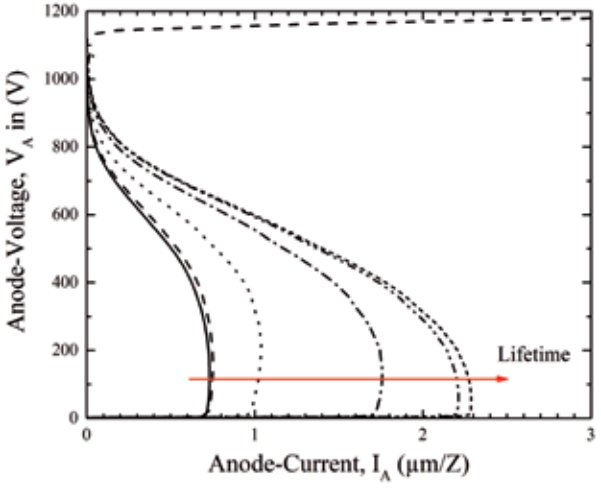


Fig. 5 Results of the numerical simulations of the current-voltage characteristic of the new SSCB