Overview Chart

Title: Development of 2D and 3D transient electro-thermal computational models to predict the radiation failures in SiC-based Schottky diodes and power field-effect transistors

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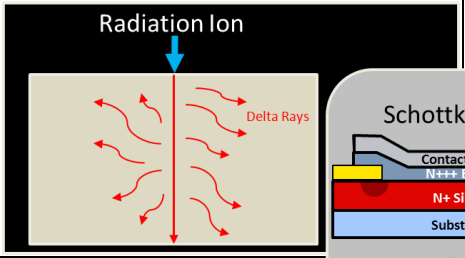
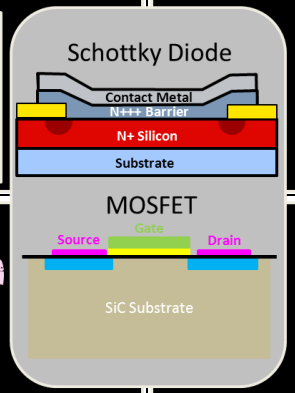
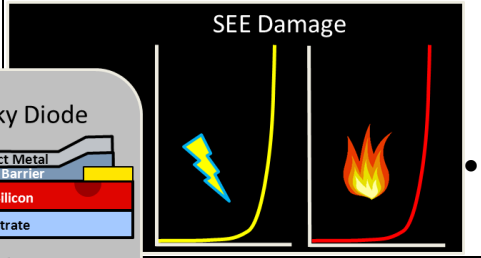


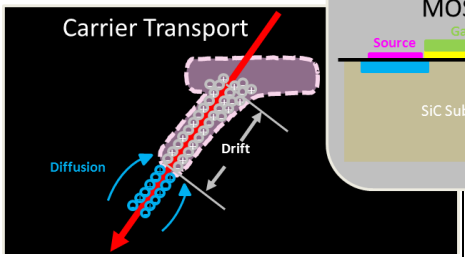




Research Objectives

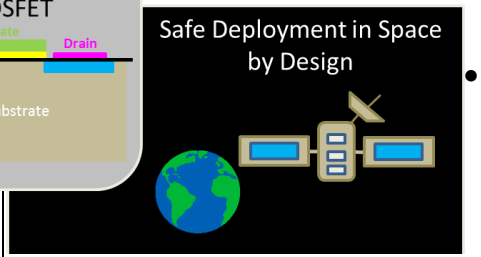
- Develop and validate 2D/3D device transient models for accurate prediction of radiation failures in SiC power devices for space applications
- Advance current device modeling capability to simulate device transient under extreme high voltage operation and high radiation environment conditions.
- Fill in the gap of State of the Art (SOA) knowledge on the radiation failure mechanism in SiC power devices. New physics-based computation models will be created.
- Start with TRL 2 and end with TRL 4

Approach



- Develop physics-based models to predict radiation-induced thermal damage in SiC material for power devices.
- Augment analytical modeling of device degradation by integrating physics-based models into Finite Element Method (FEM) TCAD device simulators.
- Test and validate the computational models by comparing with radiation damage experiments.
- Investigate the impact of device design parameters on the SEE failure for Schottky diodes and power FETs.

Potential Impact



- Assure the opportunity for safe deployment of high voltage SiC power devices for space science and exploration needs.
- Enhance capability to build most radiation-hardened electronics systems by design.
- Lead to dramatic improvements at the system level with devices of better performance, less weight, lower cost, and higher reliability.
- Minimize the shielding component for only most sensitive components in electronic devices.