

# Eleventh International Workshop on Semiconductor Pixel Detectors for Particles and Imaging



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## First generation 4H-SiC LGAD production and its performance evaluation

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This contribution will delve into the design and performance of the newly produced Silicon Carbide Low Gain Avalanche Detectors (4H-SiC LGADs) and provide a comprehensive summary of their measured characterizations. This includes an analysis of the detector's performance, temperature stability, and the effectiveness of the internal gain layer in improving signal generation.

The 4H-SiC is re-emerging as a strong candidate for the next generation of semiconductor detectors. This material offers several advantages, including high radiation tolerance and the ability to operate over a wide range of temperatures without significant annealing effects. However, the signals generated by 4H-SiC detectors are lower than those produced by standard silicon detectors due to their higher bandgap energy. This is addressed by implementing a charge multiplication layer, which results in intrinsic gain of the device.

The presented 4H-SiC LGADs, produced by OnSemi, are specifically designed and optimized for fabrication on N type substrate/epi wafer with the gain layer implanted approximately  $1 \mu\text{m}$  below the surface. The first iteration of these LGAD structures has already been manufactured early in 2023 and since then has been subjected to laboratory evaluation. The measured properties of these detectors align well with the predictions made by performed TCAD simulations.

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