

FinFET and EdgeFET for THz detectors

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We report on the investigations of FinFET and EdgeFET AlGaN/GaN field effect transistors as THz detectors. Both devices were fabricated in the same technological runs on the base of the two-dimensional electron gas (2DEG) AlGaN/GaN epitaxial structures and then investigated towards THz detection. Design of a new FET dubbed EdgeFET is based on two lateral Schottky barrier gates on the sides of 2DEG channel, which is the significant difference to FinFET. This side gate configuration allowed us to electrically control the conductivity of the channel by changing its width while keeping the carrier density and mobility virtually unchanged. Electrical parameters and photoresponse of EdgeFET will be discussed and compared to the standard FinFET device. For understanding the transistor pinch-off process of the EdgeFET channel, we proposed a gradual channel model. Contrary to FinFET this kind of EdgeFET allowed us to efficiently control the current flow in the 2DEG conduction channel. Moreover, due to depletion, regions at a certain range of reverse biasing form a nanowire, which is beneficial for the adjustable resonant THz detection. Our studies of DC characteristics and photoresponse in the sub-terahertz frequency confirm the validity of the approach.

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