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# DC- and IF-noise performance optimization of GaAs Schottky diodes for THz applications

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## Abstract

This paper presents results which originated from a long-term systematic optimization of surface processing prior to anode formation of THz Schottky-based components. Particularly, four most promising surface-processing approaches are carefully investigated separately and in combination in order to understand the chemical and physical processes occurring on a GaAs surface. A reliable technological approach for anode formation is identified, which exhibits optimal diode characteristics and production repeatability. A model is proposed for the influence of each process on the subsequent one in the fabrication process sequence. DC- and IF-noise measurements are performed using an automated measurement system providing statistically significant data. Very good dc-parameters such as a series resistance of $R_s$ = 15 Ω, an ideality factor N = 1.168, a reverse current $I_s$ = 0.024 fA and an IF-noise temperature of 257 K at 1 mA current bias with a good uniformity are achieved for non-cooled Schottky diodes with an anode diameter of 1 μm. The best noise figure is measured to be as low as 220 K at 3.8 GHz and 1 mA current bias.