Abstracts

Dynamic Shape of the Depletion Layer of a Submillimeter-Wave Schottky Varactor

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Most frequency multipliers at submillimeter wavelengths are based on the Schottky varactor. The main problem of these multipliers is the output power, which remains low at frequencies above 500 GHz. The aim of this work is to help the situation by studying the usability of the conventional equivalent circuit during a fast voltage modulation. The anode edge effects play an important role in this voltage modulation. While the fringing fields, due to the edge effects, reduce the capacitance modulation in small submillimeter-wave varactors, the edge effects also lessen the effect of electron velocity saturation compared with an ideal varactor with a pure parallel plate capacitance. The usefulness of the static model can be estimated by comparing the three-dimensional shape of the depletion layer to the shape given by the dynamic model. The dynamic shape can be obtained by solving the potential and electron conduction currents in the epitaxial layer of the Schottky varactor. In this work the potential and the electron currents have been calculated from simplified device physics by using numerical methods.

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