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A method to determine electron mobility of the two-dimensional electron gas in AlGa_N/Ga_N heterostructure field-effect transistors

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Abstract

Taking into consideration the resistance variation in the free-contact area versus the gate bias, an applicable method to determine the electron mobility in AlGa_N/Ga_N heterostructure field-effect transistors was presented. Based on the measured capacitance-voltage and current-voltage curves, the new method employed iteration calculation with different scattering mechanisms. Compared to the electron mobility calculated by the traditional method, the electron mobility calculated by the new method shows an apparent difference, especially for the device with a big gate length. This difference originates from the device with a big gate length that has a stronger polarization Coulomb field scattering. At last, the correctness and necessity of this method was demonstrated by the comparison between the experimental and calculated transconductance values.

Keywords: AlGa_N/Ga_N HFETs; electron mobility; transconductance; polarization Coulomb field scattering

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