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عنوان مقاله:

Dual-Channel Indium Nitride Tunnel Field Effect Transistor : A Comprehensive Study on Design, Sensitivity, and Electrical Performance

محل انتشار:

مجله مدلسازی و شبیه سازی در مهندسی برق و الکترونیک, دوره 2, شماره 4 (سال: 1402)

تعداد صفحات اصل مقاله: 9

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خلاصه مقاله:

This paper presents a vertical tunnel field effect transistor (TFET) that incorporates two parallel side wall channels. The channel material utilized in this design is Indium Nitride (InN), which is sandwiched between lateral gates. This configuration allows for the amplification of drive current through extended tunneling area, taking advantage of the benefits offered by the vertical structure. InN is a promising channel material due to its high electron mobility and high electron velocity, which enhances the device performance. The impact of critical design parameters on the device performance is comprehensively assessed. The optimal values of a ۲D variation matrix of threshold voltage and on-state current can be determined by considering the variation of gate workfunction and source doping density, which are two crucial design measures. Additionally, a statistical analysis is carried out to evaluate the sensitivity of the device main electrical parameters with respect to the variation of critical design parameters. The findings indicate that the device attains a current of ۱ mA when in the on-state, with an on/off current ratio of ۱.۳×۱۰۱۰. Additionally, it exhibits an average subthreshold swing of ۲۰ mV/dec, and maximum subthreshold swing of ۴.۸ mV/dec, leading to reduced power consumption and enhanced switching speeds.

کلمات کلیدی:

Band to Band Tunneling, Subthreshold swing, Vertical Tunnel Field Effect Transistor, Gate Workfunction

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