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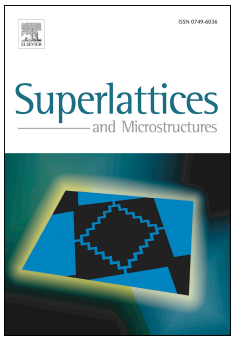

Performanance analysis of InGaAs/GaAsP heterojunction double gate tunnel field effect transistor

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Performanance analysis of InGaAs/GaAsP Heterojunction Double Gate Tunnel Field Effect Transistor

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Abstract

In this paper, analog/RF performance of InGaAs/GaAsP heterojunction double gate tunnel field effect transistor (HJTFET) has been explored. A highly doped n^+ layer is placed at the Source-Channel junction in order to improve the horizontal electric field component and thus, improve the realiability of the device. The analog performance of the device is analysed by extracting current-voltage characteristics, transcondutance (g_m), gate-to-drain capacitance (C_{gd}) and gate-to-source capacitance (C_{gs}). Further, RF performance of the device is evaluated by obtaining cut-off frequency (f_T) and Gain Bandwidth (GBW) product. I_{ON}/I_{OFF} ratio equal to $\approx 10^9$, subthreshold slope of 27 mV/dec, maximum f_T of 2.1 THz and maximum GBW of 484 GHz were achieved. Also, the impact of temperature variation on the linearity performance of the device has been investigated. Furthermore, the circuit level performance of the device is performed by implementing a Common Source (CS) amplifier; maximum gain of 31.11 dB and 3-dB cut-off frequency equal to 91.2 GHz were achieved for load resistance (R_L)=17.5KΩ.

Keywords: Indium gallium arsenide, cut-off frequency, gain bandwidth product, heterojunction tunnel field effect transistor, double gate.

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