

Investigation of Inversion Charge Characteristics and Inversion Charge Loss for InGaAs Negative- Capacitance Double-Gate FinFETs Considering Quantum Capacitance:

Shih-En Huang, Shih-Han Lin and Pin Su

Institute of Electronics, National Chiao Tung University, Taiwan

toastn1127@gmail.com

Abstract

This work investigates the inversion charge characteristics and quantum-capacitance induced inversion charge loss for InGaAs negative-capacitance FinFETs (NC-FinFETs) using theoretical calculation corroborated with numerical simulation. Our study indicates that, the boost of inversion charges due to negative capacitance increases with increasing remnant polarization P_r . In addition, the inversion-charge boosting for the InGaAs device is significantly larger than that of the Si (110) device due to the step-like inversion capacitance characteristic stemming from the 2D density-of-states of the InGaAs device. In other words, the quantum-capacitance induced inversion-charge loss for III-V channel can be mitigated in NCFETs. [1]

[1] S.-E. Huang, S.-H. Lin, and Pin Su, "Investigation of inversion charge characteristics and inversion charge loss for InGaAs negative-capacitance double-gate FinFETs considering quantum capacitance," *IEEE Journal of the Electron Devices Society*, vol. 8, pp. 105-109, 2020.