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Enhancement mode single electron transistor in pure silicon BINHUI HU, C.H. YANG, Department of Electrical and Computer Engineering, University of Maryland, College Park, MD 20742 , G.M. JONES, M.J. YANG, Naval Research Laboratory, Washington DC 20375 — Solid state implementations of lateral qubits offer the advantage of being scalable and can be easily integrated by existing main stream IC technologies. In addition, the two Zeeman states of an electron spin in a quantum dot (QD) provide a promising candidate for a qubit. Spins in lateral QDs in the GaAs/AlGaAs single electron transistors (SETs) have been intensively investigated. In contrast, Si provides a number of advantages, including long spin coherence time, large g-factor, and small spin-orbit coupling effect. We have demonstrated Si SET in the few electron regime.* In this talk, we will report the isolation of a single electron in a Si QD using a fabrication technique that incorporates the standard Al/SiO2/Si system with an enhancement mode SET structure. Our SET is built in highly resistive Si substrates with bilayer gates. The high purity Si minimizes the potential disorder from impurities. The top gate induces 2D electrons, and several side gates help define the tunneling barriers, fine tune the shape of the QD, and control the number of electrons in it. We will discuss the operating principle, computer simulation, and low temperature transport data. *APPLIED PHYSICS LETTERS 89, 073106 (2006)

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