

New applications using single-electron circuit

- Single-electron manipulation at room temperature -

Motivation

We are developing silicon devices which can transfer and detect single electrons. Device operations at high temperature and high speed are anticipated for new applications.

Originality

We have demonstrated single-electron transfer and detection at room temperature by the optimization of device structures and operation conditions. The simple scheme just by opening and closing field-effect transistors promises high-speed operation. As new possible applications, we have demonstrated a single-electron digital-analog converter and an infrared detector.

Impact

The new scheme for single-electron manipulation realizes logics with low energy consumption. Since silicon is used, a combination of our devices with conventional ones adds advanced functions to LSIs with a small size. We can also use our devices as a sensor with high sensitivity.

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Single-electron digital-analog converter

