

Information Processing Structures

Abstract

An information processing structure is disclosed that is formed of single electron circuits each operating rapidly and stably by way of a single
5 electron operation. The information processing structure includes a MOSFET (11), and a plurality of quantum dots (13) disposed immediately above a gate electrode (12) of the MOSFET and each of which is made of a microconductor or microsemiconductor of a nanometer scale in size. Between each of the quantum dots and the gate electrode is there formed an
10 energy barrier that an electron is capable of directly tunneling. The total number of such electrons moved between the quantum dots and the gate electrode is used to represent information. In the structure, a power source electrode (14) is disposed in contact with the quantum dots and a pair of information electrodes (15) is disposed across a quantum dot in contact
15 therewith for having electric potentials applied thereto, representing data of information. Between each of the quantum dots and the power source electrode is there also formed a potential barrier that an electron is capable of directly tunneling. A capacitive coupling is provided between the information electrodes in pair and the quantum dot between them to
20 prevent movement of an electron between the quantum dot and the information electrodes, and an electron is rendered movable by the Coulomb blockade through the quantum dot between the power source electrode and the gate electrode in response to a relative electric potential determined at the information electrodes.

Figure 1



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