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| | Application of single-electron effects to fingerprints of chips using image recognition algorithms |
| | Appl. Phys. Lett. 115, 033504 (2019)<br>https://doi.org/10.1063/1.5100644 |
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| | Single-electron effects have been widely investigated as a typical physical phenomenon in nanoelectronics. The single-electron effect caused by trap sites has been observed in many devices. In general, traps are randomly distributed and not controllable; therefore, different current–voltage characteristics are observed through traps even in silicon transistors having the same device parameters (e.g., gate length). This allows us to use single-electron effects as fingerprints of chips. In this study, we analyze the single-electron effect of traps in conventional silicon transistors. At sufficiently low temperatures at which single-electron effects can be observed (in this case, 1.54K), we show that current–voltage characteristics can be used as fingerprints of chips through image recognition algorithms. Resonant tunneling parts in the Coulomb diagram can also be used supportively to characterize each device in a low-temperature region. These results show that single-electron effects can provide a quantum version of a physically unclonable function.<br>https://aip.scitation.org/doi/10.1063/1.5120032(解説１)<br>https://phys.org/news/2019-07-transistor-unique-quantum-fingerprintbut-id.html(解説２) |