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Efficient majority logic subtractor design using multilayer crossover in quantum-dot cellular automata

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Abstract

Quantum-dot cellular automata (QCA) is a potential upcoming nanotechnology for designing digital circuits with high performance. A subtractor is an important arithmetic circuit used in many digital circuits. An efficient multilayer full subtractor design is proposed using majority logic in QCA. The proposed design has only 53 cells and occupies a small area of about 0.03 μm^2. Using the proposed subtractor, a 4-bit ripple borrow subtractor with 256 cells and an area of about 0.20 μm^2 is realized. Verification and simulation are done using QCADesigner. Defect analysis is also done for the proposed subtractor. Energy dissipation of the proposed designs is done using QCADesignerE tool.

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