Tohoku Univ. Technology

A Nonvolatile Register with a Differential Information Storing Scheme

Reduction in power consumption and area with conventional level of short operating time

Overview

Intermittent computing enables continuous processing under unstable energy supply. In edge device implementation, a nonvolatile logic circuit using nonvolatile registers is promising as it retains internal state with only local data transfers.
Conventional nonvolatile registers, composed of multiple 1-bit memory circuits (NV-FFs), require two MTJ devices per bit, leading to high area and energy overhead. The reference-load sharing scheme (RLSS) was proposed to solve this issue, however, a new issue arose as the required operation time increased in proportion to the number of register bits.
This invention introduces a differential information storage scheme (DISS), which stores 1-bit data via resistance differences between adjacent MTJ devices. This allows two-cycle backup and restore, reducing energy and area while maintaining conventional operation speed, as confirmed by simulations.

Product Application

- Nonvolatile registers and nonvolatile flip-flops
- Intermittent Computing and Energy Harvesting
- Reduction in power consumption of existing desktop and supercomputers

IP Data

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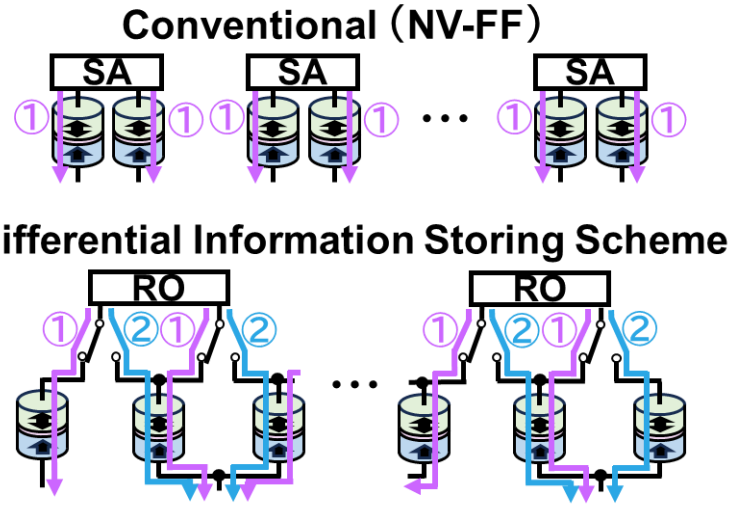
Backup and Restore Operation and Performance Comparison



	Conv.	RLSS	DISS
Area	×	○	○
Energy	×	○	○
Backup/Restore time	○	△	○

※RLSS may have better error tolerance and lower energy consumption than DISS.

Related Works

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