MEMRISTIVE DEVICES FOR COMPUTING

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Existing technologies for the current computing system are approaching their physical limits, and novel device concepts are required as device sizes continuously decrease. Under these new concepts, the devices need be not only increasingly infinitesimal and simple but also increasingly capable. Memristive devices (also called RRAM when used for memory) seem to fulfill these goals well for the next generation computing system and have recently been recommended for additional focus in research and development by the International Technology Roadmap for Semiconductor (ITRS) in an assessment of eight memory technologies among the Emerging Research Devices (ERDs). Memristive devices with a simple structure are not only very small but also very versatile, which makes them an ideal candidate used for the next generation computing system in the post-Si era. These devices are electrical resistance switches that can retain a state of internal resistance based on the history of applied voltage and current. Memristive devices can store and process information, and offer several key performance characteristics that exceed conventional integrated circuit technology [1]. An important class of these devices are two-terminal resistance switches based on ionic motion, which are built from a simple conductor/insulator/conductor thin-film stack. I will first describe the switching mechanisms [2, 3] of metal-oxide switches and a related family of nanodevices [4], along with their potential applications [5, 6]. Then the promises and challenges [1, 7] with respect to using these devices will be discussed together with some possible solutions [8-11].

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