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Quantitative retention model for filamentary oxide-based Resistive RAM

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Abstract

Filamentary resistive RAM devices have been developed as a possible alternative memory device. In previous work, the device operation has been described using the hourglass model. In the present paper, a simple but quantitative retention model for OxRRAM devices is developed in the framework of the hourglass model. This is achieved by added a one-dimensional diffusion process in the top reservoir of the filament. The model describes the mean retention drift well using an activation energy that is identical to the activation energy for modeling set and reset in these devices, demonstrating that retention from the low resistance state is nothing but a spontaneous temperature-driven narrowing of the constriction.

Keywords: RRAM, retention, reliability

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