Future memory technologies in nano-era

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Conventional semiconductor memories such as dynamic random access memory (DRAM), static random access memory (SRAM), Flash memory have successfully evolved toward high density, high performance and low cost. However, there have been concerns about whether this successful progress can be maintained in the future nano era from the point of view of the growing technical complexity, fabrication cost, and physical limit. The unclear and gloomy future ahead for these conventional memories forces many research groups and companies to develop alternative memories with longer lifetime, less technical barriers and ideal memory characteristics such as non-volatility, high density, high speed, and low power, which none of the conventional memories can satisfy at the same time.

In this article, we will evaluate the characteristics of future memories such as ferroelectric random access memory (FRAM), magnetoresistive random access memory (MRAM) and phase change random access memory (PRAM), as well as next generation of conventional memories. These memories have been recently focused because of the possibility that they can overcome the challenges that conventional memories are facing. Finally we will review critical technology barriers in developing future memory and predict the promising technology to overcome the barriers in conventional and emerging new memories, which will be technology guidelines for a future memory development.

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