2000s
Flash memory business in full fledge
~ Integrated Circuit ~

A flash memory, a nonvolatile memory invented by Toshiba's Fujio Masuoka in 1984, rapidly advanced in capacity due to the appearance of the NAND type and multilevel memory cells, and in 1Gbit generation, it surpassed the capacity per chip of DRAM and jumped to the leading position of LSI memory. In terms of the total shipping capacity (memory capacity of chip × number of shipped chips), DRAM was overwhelming in 2000 with 30 million G bits and NAND type flash of 1.1 million G bits, while in 2005 they became almost equal, and NAND flash reversed DRAM, with 600 million G bits for NAND and 340 million G bits for DRAM.

Applications requiring a large amount of memory such as images and sounds increased, and large capacity USB memories, SD memory cards, SSD (Solid State Drive), etc. were developed one after another. The increase in memory capacity progressed along with cost reduction, and the stacked mounting technology greatly advanced such as thinning the chip to about 25 microns and stacking 17 chips. As a result, storage media based on flash memory became comparable to hard disk (HD) in storage capacity. Toshiba released 256 G bytes SSD in 2008. The application of flash memory steadily expanded to audio, video, digital camera, mobile phone, and now it has a momentum to replace the HD in PC today.

On the other hand, with the miniaturization, the limit of thinning of the tunnel oxide film, which is the key in writing and erasing, is becoming visible, and it is becoming unpredictable how far the miniaturization of NAND flash can go further from now on. In order to overcome this, proposals of a new structure such as ultra-large capacity BiCS (Bit-Cost Scalable) flash memory based on a three-dimensional structure are attracting attention. Meanwhile, the search for new nonvolatile memories using new technologies such as MRAM (Magnetoresistive Random Access Memory), PCRAM (Phase Change Random Access Memory), ReRAM (Resistance Random Access Memory) is also becoming active.

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