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Hyperstone keeps up with flash memory growth

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Steck: I believe users will finally pay attention to reliability, not only cost.

The use of memory devices other than disks and tapes as storage devices can be traced back 40 years ago. For example, RAM and ROM were used to store data and program codes in the 1960s. By the 1990s, flash memory surged in popularity, appearing in USB drives and memory cards of various portable gadgets.

A must for these storage devices are dedicated controllers. Hyperstone saw vast opportunities in this memory storage segment. In 1996, the company launched its flash memory controller, whose embedded microprocessor cores, interface circuits and algorithms were all developed independently.

According to Matthias Steck, vice general manager at Hyperstone Asia Pacific Ltd, the company began flash R&D much earlier than 1998 when flash memory in the portable drive format was popularised. At present, the company has acquired multiple patents and has plenty of experience in technologies such as error-correction-code (ECC), wear-leveling and bad block management. The most important core technology for the company, however, is the 32bit processor core that was initially applied to Hyperstone's flash memory controller more than a decade ago.

32bit core

In 1996, Hyperstone integrated 32bit RISC and DSP into a single-core architecture. With this architecture, the company developed its flash memory controller series, Ethernet processor series and universal microprocessor series.

"A number of controllers were designed with 8bit cores when the flash memory application emerged," Steck said. "From the very beginning, we were geared towards 32bit products, which helped secure our position in the market."

Steck explained that the flash memory unit's complexity and special architecture requires extremely reliable and efficient control. Thus, the flash memory controller is important. This is also the reason Hyperstone decided to develop all the required software and hardware technologies independently.

Through the years, Hyperstone has created multiple product lines of flash memory controllers. These include the F2/F3 series that zeroes in on the CompactFlash card standard, and the S2/S3/S4/S6/S7 series targeting the SD/MMC card standard. In addition to the proprietary 32bit RISC processor core, the products feature hardware units such as the ECC, buffer, flash memory and host interface control logic.

Hyperstone believes the independent development of technologies differentiates the company's products from those that use licensed cores. "We can provide the customer with a complete set of software and hardware design resources from the beginning, including firmware, thus creating more value for the customer's product," stressed Steck.

Consider wear leveling, for example. Hyperstone's firmware provides the patented algorithm that uses all the memory blocks in a balanced way and improves the service life of the device. The patented algorithm also helps to avoid the capacitance or spurious coupling, noises from floating gate to floating gate and electron contamination. In addition, Hyperstone possesses patented technologies that ensure data integrity when data are transferred or written between memory blocks.

New product development

Along with improvements in memory architecture and constant micro-shrinkage of the process, Hyperstone continues to work on its algorithms. Steck revealed that the company is working closely with leading memory suppliers on new products aimed at various emerging architectures. The company is also mulling tapping the new high-speed NAND interface standard in its next-generation standards.

From portable drives to memory cards to solid-state drives (SSD), the flash memory market continues to expand and fuels requirements for control components. According to a World Semiconductor Trade Statistics forecast, the global semiconductor market is expected to reach Rs.1,174,142.22 crore ($274.2 billion) this year, with flash memory share accounting for Rs.108,764.45 crore ($25.4 billion). This figure is higher than the projected Rs.106,623.42 crore ($24.9 billion) contribution from DRAM.

For flash memory break down, NOR and NAND are expected to contribute Rs.34,256.52 crore ($8 billion) and Rs.75,364.34 crore ($17.6 billion), respectively, highlighting increasing demand for NAND from the data storage space.

SSD prospects

Meanwhile, prospects are bright for SSDs. Research firm iSuppli Corp. noted that in 2007, the shipment of SSDs hit 84,000 pieces at the average price of Rs.11,732.86 ($274), and had a market share of Rs.98.49 crore ($23 million). By 2011, iSuppli sees SSD shipment hitting 5.5 crore (55 million) units with market share forecasted at Rs.23,979.56 crore ($5.6 billion).

"Business users will dominate the SSD application market in the next wave," said Steck. Global storage market trends will reveal that enterprise use of SSD is increasing. Gartner predicts that SSD's market share in 2008 will be about Rs.4,106.50 crore ($959 million), and will climb to Rs.18,841.09 crore ($4.4 billion) in 2012, propelled by enterprise applications. In terms of power consumption, size and reliability, the SSD is far superior than the hard disc.

In terms of applications, the flash memory comes in two storage architectures: single-level cell (SLC) and multi-level cell (MLC). When zeroing on stability and long service life, the SLC architecture with high reliability and 100,000 programming/erasing cycles on the average is preferred for the traditional embedded SSD in the industrial field.

"Normally, the MLC flash memory has only 10,000 programming/erasing cycles, one-tenth of that of SLC. In the past, it restricted MLC in data storage application," Steck explained. However, with the growing use of SSD in the consumer space, the MLC flash memory, which can store multiple bits in each cell, is gaining in popularity because of its price advantage.

Steck pointed out that although SLC remains the preferred technology among most industrial and embedded applications with very high reliability requirements, the cost-effective MLC is very much welcomed in the consumer sector. Write times and stability are always the major concerns about MLC but Steck still took a fancy to the development prospects of SLC and MLC. "The industrial application that requires stability and reliability will still put an emphasis on SLC, but MLC also proves to be a wise choice in the consumer market confronted with a high cost pressure, such as the memory card for digital cameras."

Though people generally think SSD cannot possibly cater to the existing HDD field due to the large gap with the HDD cost, Steck is still optimistic about its application in the IT and consumption markets. He believes more and more IT and consumer devices will employ SSD in the coming years.

"I believe users will finally pay attention to reliability, not only cost," Steck mused. Loss of stored data in any storage medium is unacceptable indeed.

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Matthias Steck
Vice General Manager
Hyperstone Asia Pacific Ltd

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