

Non Volatile Memory Market Shares by Vendor:

2008

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Web-Feet Research, Inc.

Key Findings

2008 was the year when the 'Flash music died'. The memory markets had an extraordinary run where Flash rose from its infancy, became the darling of the industry, and with the crash of the 'Great Recession' Flash became expendable. In its 'hay day' and even today, anything to do with memory and storage, most designers would look first to Flash. Unfortunately too much product was built in 2008 in anticipation that consumption for electronics would continue 'indefinitely' as it had for the last few years.

With too much inventory and new demand did not surface as expected, then prices fell across the board for all types of memory; NAND, NOR, DRAM, and the other non volatile memories. Even Microsoft had to 'eat crow' when Vista failed to deliver on its performance improvements and then Microsoft had to correct the flaws and stimulate interest in Windows 7 for 2009. Most of this was forgotten as users focused on SSDs, and mobile applications until the financial collapse killed consumer demand. Within the semiconductor market, Flash memory suffered its first major revenue decline and joined DRAM that was plagued with another year of pricing declines. Flash declined -22.5% with revenues dropping to \$20.4 billion, while DRAM went further declining -23.2% to \$24 billion, which was the result of excess inventories, a price war, and little demand.

The above market debacle grew over the course of the year and did not become dire until the fourth quarter. With Flash memory becoming quite affordable throughout the year many new applications opened up for the everyday user. Especially in the high growth economies in China, India, Eastern Europe and a few other regions the young and digitally affluent consumers carried the major consumption of Flash and memory for three fourths of the year. This helped all non-volatile memories, along with DRAM, to sustain some market share in the semiconductor industry. Although the Flash market lived off its prior built-up momentum, there were a few minor new application demand drivers that appeared in 2008. Overall in 2008, the non-volatile memory market contributed \$22.2 billion in revenues, quite a disappointment on the \$28.2 billion shipped in 2007.

After the NOR market underwent a major decline in 2008, due mainly to pricing pressures, this led to minor declines for two of the three other NVM markets. These NOR price declines did affect pricing for EPROM, EEPROM, and OTP ROM in a downward trend. The EPROM and MROM markets were in 2007 consolidated into the OTP ROM market, where they are expected to see new life with the introduction of pre-loaded content for the OTP ROM technology from Macronix, OKI, and a variation of SanDisk's Matrix semiconductor. Serial EEPROMs are still expected to undergo a mild growth cycle

through 2014, while parallel EEPROMs are expected to slowly fade away over the next few years.

NVRAM experienced a slight increase in demand and sales in 2008 unlike EEPROM. The five year forecast for NVRAM shows Real Time Clock and Battery Backed SRAM products will support the main growth of the NVRAM segment. FRAM is included in the NVRAM forecast in low volumes as is MRAM, while Ovonic or PCM may see shipments in 2009.

For 2009, Web-Feet Research forecasts the NV Memory market to drastically decrease revenues by \$4.9 billion. This assumes a strong decline in the bit growth rate for Flash along with an acceleration of the SSD and mobile growth driver in the 2H 09 to curb the fall of NAND revenues. 2010 will be the year of recovery.

Analysis and Reporting Methodology

The 2008 Non-Volatile Memory Market Shares by Vendor report lists the revenue and market shares for each manufacturer/vendor by product for 2007 and 2008. In addition, the vendor rankings for each market are listed for 2006, 2007, and 2008. Vendor market shares are provided for the consolidated Non-Volatile memory market, as well as for total Flash memory components, NOR Flash, NAND Flash, Serial NOR Flash, total EEPROM, Serial EEPROM, Parallel EEPROM, NVRAM, and the combined EPROM and MROM or OTP ROM markets.

Two distinct research methods have been employed for this report. Each manufacturer was surveyed for revenue shipments of standalone non-volatile memory components. In the event a supplier was unable to provide product shipment revenue for 2008, Web-Feet Research estimated their respective revenue. The total reported market size for each Non-Volatile memory market was reconciled with the Semiconductor Industry Association/World Semiconductor Trade Statistics (SIA/WSTS) bluebook totals for the OTP ROM, EEPROM and NVRAM markets.

For the Flash market, Web-Feet Research compared the annual totals reported to the FMRA (Flash Memory Reporting Association) from the top eighteen Flash manufacturers. It also polled all other known product vendors. The FMRA totals and the polled totals reported to Web-Feet Research for the 2008 Flash market produced \$20.403 billion, which was significantly higher than the WSTS total of \$18.436 billion. This \$1.967 billion difference could be caused by a variety of factors, such as different parties within the same organization reporting different numbers, under estimating the Flash Combo market, calculating the Flash component revenue portion from Flash card revenues, and exchange rate differences.

This shipment data is collected to attempt to account for where all of the production of standalone component non-volatile memory is shipped. In order to refrain from double accounting, whoever sells the component to the end-use device manufacturer should be given credit for that market share. This collected information does not necessarily match the SEC accounting classification of reporting only non-volatile memory shipments from their non-volatile memory business unit. For example, Intel currently reports their NAND Flash shipments in their NAND Flash Solutions Group unit, but in 2008 the Turbo Memory product was sold with the PC motherboards in their Computing business group along with their SSD shipments and then reported in the NAND Flash Products group where these NAND component sales are accounted for. Every standalone non-volatile memory component should be accounted for regardless of in which business division it is classified.

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About Web-Feet Research

Web-Feet Research (WFR) offers a full complement of technology consulting services, management consulting services and market research for nonvolatile memory, solid state storage technologies and mobile hard disk drive products. Special emphasis has been focused on the development and growth of Flash memory, Flash cards and SSD markets.

The company has consistently identified the emerging trends in the electronics industry and has been the first to forecast their impact in the Flash and nonvolatile memory markets since its inception in 2000. Some of WFR's firsts are in the following areas: SSD, Flash cache/Hybrid Flash, Embedded Flash Drives, Ultra Low Cost PC, Mobile storage, MP3, NAND MCP, USB Drives, Flash SIM cards, micro Flash cards, 3-bit/4-bit per cell NAND, serial NOR Flash and Storage Class Memories.

The subscription services offered by Web-Feet Research concentrate on the Non-Volatile Memory and Storage Portfolio, which is segmented into three services: Manufacturing / Technology, Storage Systems, and Memory Components.

Web-Feet Research also provides custom studies, technology evaluation and competitive analyses of mobile, portable and stationary technologies, products and industry trends. The professional services and syndicated studies give Web-Feet Research, its clients and its clients' clients a competitive edge in their respective markets.