

# Solid State Drives (SSD) Markets and Applications

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**Web-Feet Research, Inc.**

## ***Key Findings***

SSDs in terms of how they are defined have taken on new meaning. Traditionally they were considered HDD replacements utilizing existing HDD form factors and interfaces. The first installment of the quarterly series defines what an SSD is and factors in non-traditional SSDs that are being used in low cost PCs and cache applications. This report reflects low cost PCs from OLPC, Intel, Asus, and others that are expected to enter this segment. This new segment adds significantly to SSD units and revenue toward the end of the forecast period.

MLC SSDs have been introduced this year by Mtron, STEC, Toshiba, and Samsung for PC and consumer applications. It is expected additional SSD suppliers will also offer MLC SSDs this year. SSD adoption in this segment is heavily dependent on price. MLC SSDs will provide the additional price reductions over SLC SSDs. Once MLC SSDs have proven themselves in this segment by delivering all of the inherent advantages over HDDs, expect a rapid adoption in notebook platforms. MLC SSDs for low cost PCs are expected to be the standard design later in the forecast period. Although low capacity SSDs currently use SLC technology, the industry is expected to shift to MLC technology as low cost PC volumes accelerate.

The tremendous growth of SSDs will begin to significantly impact and displace HDDs in mobile PC applications in the near future. The adoption of SLC SSDs in enterprise will increase as NAND pricing continues to decline; however, the conservative nature of the enterprise market, due to critical applications that are being run, will experience slower SSD adoption rates compared to the PC environment.

### **The following are some of the quantitative findings about SSD technologies and product developments throughout the forecast period:**

1. Total revenues from SSDs from all applications will grow to \$11.7 billion in 2012.
2. Annual average flash memory price per GB declines of 38% will drive down aggregated SSD unit prices by 27% per year. This is the blended price decline for SLC, MLC and 3-bit/4-bit per cell NAND. These unit price declines for the forecast period are driven heavily by the unit growth and lower unit ASPs from the PC and consumer segment.
3. SSDs in low cost PCs will range from 1GB to 16GB for the forecast period.
4. Unit shipments of SSDs in all segments will increase on average 203% per year. This is driven primarily by the notebook and low cost PC segment.
5. Revenue growth for all SSDs is 51.6% per year with the higher growth rates in the PC segment attributing 161.3% per year.
6. SSD adoption and pricing dynamics in the mass consumer markets will drive SSD unit price declines and contribute to unit growth increases for enterprise, industrial, medical, aerospace and military segments. These market segments will account for less than a third of the total SSD market revenues by 2012.
7. SSD adoption will continue to grow in applications for storage media in consumer, mobile and desktop computing environments due to the advantage in performance, reduced power consumption and reliability. The same can be said for enterprise environments where improved performance and reliability is heavily weighted for SSD adoption.

In terms of positioning, SSDs will gain superiority in nearly all areas, except density (defined as capacity for a given form factor) and normalized storage cost. Given this, SSDs will be best suited in applications which capacities are low, less price sensitive, or require one or more superior attributes in the areas of performance, environmental conditions, mechanical ruggedness, reliability, lightweight and low power consumption.

SSDs will compete with and compliment HDDs in the various applications and they will add to the total storage demand in certain applications. The results of this study finds; due to cost and in some applications capacity limitations, SSDs are not positioned to totally replace HDDs any time soon.

### ***Analysis and Reporting Methodology***

The report analyzes the potential of the semiconductor storage technologies, in conjunction with the magnetic storage technologies. The report also assesses future developments of the storage industry and quantifies the different aspects of market growth from 2006 through 2012. It takes into consideration economic and technology changes underway.

Because of the growing complexity and scope of the data storage industry and markets, there is a need to put the qualitative and quantitative aspects of the development trends into a broader perspective. Therefore, this report considers the technological, commercial and application development aspects of the storage industry. In particular, it explores, in general terms, the evolution of storage needs and requirements in the computing, communications and consumer industries.

Relevant primary data and information were collected from discussions with industry and company representatives. Secondary data and information have been obtained from public sources, such as company documents, press releases, annual reports and industry statistics, as well as from the existing Web-Feet Research database. Historic data have been crosschecked and correlated with industry statistics. Forecast data and their interpretation are based on analyses and assessments of Web-Feet Research.

The report is organized on two logic levels, which are not physically separated. One level describes the development trends of relevant technologies, standards and systems. It also takes into consideration how macroeconomic factors impact these trends. The resulting information is used to create models and assumptions for the analyzed markets. The other level forecasts the qualitative and quantitative development of the markets through 2012, by using the collected data and by factoring in the created models and assumptions. The understanding of the models and assumptions also helps the reader to adjust the forecast whenever the market environment and development trends modify the assumptions.

Whenever information and data were not provided or were not possible to obtain due to confidentiality concerns, an estimate of the total market has been developed. The estimates have been done by developing the identity and the character of the surveyed market segment. Additionally, use was made of a surrogate development model applicable to known similar market segments, in correlation with specific market drivers, accelerators and inhibitors.

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## *About Web-Feet Research*

Web-Feet Research, located in Monterey, California, provides market research, analysis, and consulting services for the electronics and semiconductor industries; focusing on the non-volatile memory and storage markets with an emphasis on Flash memory, SSDs and small form factor hard drives.

The company has significant expertise and experience in the areas of communications, computers and consumer electronics applications, as well as in identification, definition, design and marketing of standard and application specific semiconductor components. In addition to the syndicated market analysis reports, our analysts and consultants have worked on a series of commissioned reports and projects for customers in the electronics and semiconductor industries: customer-specific and multi-client reports, advanced applications of existing technology reports, emerging technology economics studies, potential uses of emerging technology studies, management consulting projects.

The company draws on a vast technology and systems expertise in communications, computing, consumer and automotive, including experience in the relevant areas of the semiconductor industry: micrologic, analog/mixed signal, memories, micro power management, displays and sensors, as well as semiconductor manufacturing technologies and processes. Web-Feet Research collaborators have extensive market knowledge and marketing experience in the United States, Europe and in the Asia-Pacific region.

Web-Feet Research reports take into consideration major social, political, economic and technology changes underway and the impact these changes have on the economy, the high technology industries in general, and the electronics and semiconductor industries in particular.

The growing complexity and scope of economic developments creates a need to put the qualitative and quantitative aspects of the development trends in a broader perspective and to correlate them with the macroeconomic factors. Therefore, Web-Feet Research reports embrace and correlate both the technology and commercial aspects of the developments.