Embedded Flash Drives, eMMC / UFS, SPI NAND, SLC NAND: 2012-2019

Description:
The annual EFD study analyses the drivers, markets and applications for embedded storage that is positioned between removable cards and SSDs. EFDs are internal or non-removable storage that is bundled with stacked NAND components and a controller, which is more complex than a card controller, but less sophisticated than a SSD controller. Like Flash cards, Embedded Flash Drives (EFD) are found in four market segments: video, image, audio and computer. A total of over thirty individual applications are analyzed and forecast for EFD, eMMC, SPI NAND and SLC NAND.

The study also provides a detailed forecast of the EFD market (revenue, units, ASPs, and MBs) for a five year period. In addition, the embedded NAND component usage is also broken out by density for revenue, unit, ASP, and Gbit consumption. Many of the vendors for EFDs are profiled by product offering and the 2014 and 2016 eMMC Market Shares by Vendor are listed.

Overview:
Embedded Flash Drives (EFD) have quietly emerged in the last few years as the internal storage complement to removable Flash cards. Both EFDs and cards are defined in this study as sub-systems of solid state storage ranked below solid state drives (SSD). New to this study is a chapter on Mid-Density (256Mbit-8Gbit) storage that examines the unit application usage of NOR, serial NOR, SLC and SPI NAND.

Embedded Flash Drives are rapidly emerging as the desired form factor for internal storage for many of the consumer and mobile electronics applications. Cell phones were one of the first applications that required large amounts of internal storage interfaced with a controller and connected seamlessly to the processor. Initially a few cell phone OEMs tried to integrate raw NAND components with their own chipset and have the host processor manage all the complexities of accessing, erasing, writing, reading, and managing the NAND memory. As new variations of NAND became available from multiple manufacturers, just managing the memory became quite an investment in engineering resources. Flash manufacturers like SanDisk, Samsung, Micron and Toshiba realized that they could provide an integrated, turn-key internal or embedded Flash drive system or module. Thru this EFD module these Flash manufacturers would provide the software/firmware, controller, interface, NAND components, and package all integrated within the EFD so OEMs would not have to worry about this storage sub-system. In the early years, EFDs were built as a small capacity and small footprint solid state-type of a hard disk drive. These early EFDs were installed in single board computers in a variety of applications like networking controllers, Point-of-Sale terminals, and other industrial controllers. EFDs evolved in complexity over time as storage functions became better understood and the use of the Flash memory gained prevalence. Once cell phone system memory was partitioned into work memory and internal storage, then EFD was developed for mobile applications. Cell phone MCP EFDs can use a combination of memories including NOR and NAND Flash, PSRAM, and LP DRAM. As NOR was gradually eliminated from cell phone storage system architecture, then NAND-only EFD solutions became quite popular. eMMC became the prominent EFD form factor from 2010-2014 and in 2015+ UFS should take over the interface race. Both eMMC and UFS are forecast separately for NAND component revenue and units by application and vendor market share.

Various other applications have incorporated EFDs in their design, as this EFD storage module is designed to be a ‘plug-n-play’ storage solution. Digital camcorders, Digital SLR Camera and Personal Media Players/MP3 Players use more internal storage EFDs than they use removable storage with Flash cards. GPS and Gaming have emerged as applications that are widely adopting EFDs. Tablets, Thin-n-Lite Notebooks and Flash Cache modules have also entered the EFD market, thereby bridging the compute function with the applications that concentrate on media content storage. In addition, this study forecasts the raw or internal NAND components found in eleven additional applications and within SSDs.

Contents:
1 Key Findings
2 Definition of Solid State Storage
3 Objectives and Methodology
4 A Market Perspective on Flash Storage
4.1 The Electronic Device Market
4.1.1 Function-based Market Segmentation
4.1.2 Device-based Market Segmentation
4.1.3 Use Model-based Market Segmentation
4.1.4 Memory/Storage Function-based Market Segmentation
4.1.5 Market Segmentation Summary
4.2 Market Segmentation Summary for Memory / Storage
4.3 Storage Market Segmentation
4.3.1 Segmentation by Form Factor
4.3.2 Segmentation by Capacity
4.3.3 Segmentation by Performance
4.3.4 Segmentation by Security Level

5 A System Architecture Perspective on Flash Storage
5.1 Market-Driven System Architecture Development
5.2 System Architecture Impact on Flash Storage

6 Market Segments
6.1 Video Market Segment Characteristics
6.2 Audio Market Segment Characteristics
6.3 Imaging Market Segment Characteristics
6.4 Computing Market Segment Characteristics

7 Embedded Flash Drive Storage Markets by Application
7.1 EFD Storage Revenue by Application
7.2 EFD Storage Units by Application
7.3 EFD Storage ASPs by Application
7.4 EFD Gigabyte Shipments by Application

8 EFD and embedded NAND Component Shipments by Application
8.1 emNAND and EFD Application device units
8.2 emNAND and EFD Component Revenue by Application
8.3 emNAND and EFD Component Units by Application
8.4 emNAND and EFD NAND Component ASPs by Application
8.5 emNAND and EFD NAND Component Gigabyte Shipments by Application

9 Serial NOR, Parallel NOR, SLC NAND and SPI NAND Mid Densities
9.1 Serial NOR, Parallel NOR, SLC NAND and SPI NAND Component Features
9.2 Serial NOR, Parallel NOR, SLC NAND and SPI NAND Unit Component Forecast by Application

10 Video End-Use Application Markets
10.1.1 Digital Camcorders
10.1.2 Televisions
10.1.3 Personal Media Player
10.1.4 Projectors
10.1.5 Set Top Boxes

11 Imaging End-Use Application Markets
11.1.1 Cell Phones
11.1.2 Photo Albums

12 Audio End-Use Application Markets
12.1.1 MP3 Players
12.1.2 Digital Radio

13 Computing End-Use Application Markets
13.1.1 Hybrid Hard Drive Flash Cache Drive
13.1.2 Notebook Flash Cache Drive
13.1.3 Desktop Flash Cache Drive
13.1.4 Glass
13.1.5 Wearables - Watches, Monitors
13.1.6 Game Consoles
13.1.7 GPS
13.1.8 Automotive
13.1.9 Printers
13.1.10 Electronic Books
13.1.11 Tablets / iPad

14 Embedded Flash Drive Storage Market Forecast

15 Embedded Flash Drive Form Factors
15.1 Disk-On-Chip, DiskOnChip 2000, and MDOC
15.2 iNAND
15.3 PCIe
15.4 eCompact Flash or eCF
15.5 NANDrive, All-in-OneMemory
15.6 OneNAND and Flex-OneNAND
15.7 moviNAND
15.8 eMMC
15.9 Managed NAND
15.10 LBA NAND and mobile LBA NAND
15.11 GB NAND, eSD and SmartNAND
15.12 Eusb
15.13 UFS

16 EFD Revenue by Capacity
16.1 EFD Revenue by Capacity
16.2 EFD Component Revenue by NAND Type and Capacity

17 EFD Storage Units by Capacity
17.1 EFD Units by Capacity
17.2 EFD Component Units by NAND Type and Capacity

18 EFD Storage ASP by Capacity
18.1 EFD ASP by Capacity
18.2 EFD Component ASPs by NAND Type and Capacity

19 EFD Storage GB by Capacity
19.1 EFD GB by Capacity
19.2 EFD Component Mbits by NAND Type and Capacity

20 eMMC Applications and Market Share
20.1 eMMC NAND Revenues by Application
20.2 eMMC NAND Units by Application
20.3 eMMC NAND Revenue Market Share by Vendor

21 Appendix A: NAND Components by Application
22 Appendix B: Biography

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