# Solid State Disks

***The most vulnerable part of any DVR in CCTV today are the hard drives. A new technology called Solid State Disks, are on the horizon and are promising a lot.***
***Presently, Solid State Disks are at their infancy and expensive, but can we afford to ignore them?***

Solid State disks (SSD) are devices that use exclusively semiconductor memory components to store digital data. The memory components are the same ones used for the different types of computer memory: work memory, cache memory and embedded memory.

The two primary advantages resulting from using solid state memory components instead of mechanical devices to store data are higher ruggedness and significantly improved performance. Performance improvements result from the very fast and predictable access times associated with the semiconductor memory components and from the drastic reduction of latency and seek times. Additional benefits are the extended operating temperature range and the lower power consumption.

Most solid state disks have a HDD-compatible form factor, system interconnect and electric interconnect. This enables solid state disks to be added to the system very much like the magnetic or optical disk drives. From a system solution perspective, solid state disks can be regarded nowadays as HDD replacements. From a system architecture and functional perspective, they complement mechanical disk drives and have the capability to enhance the performance of individual mechanical drives and drive clusters.

In general, there are three classifications of solid state disks based on the type of memory components utilized:

DRAM-based Solid State Disk (D-SSD)
SRAM-based Solid State Disk (S-SSD)
Flash memory-based Solid State Disk (F-SSD)

The first two (D-SSD and S-SSD) are based on volatile memory components and need a data retention mechanism when the power supply is removed. This can be either built-in batteries, or a non-volatile mechanic or semiconductor backup. F-SSDs use Flash memory chips that are non-volatile memory components. Some solid state disks may use a combination of memory components in order to improve certain specifications.

SRAMs have the fastest read and write cycle times. They do not need a periodic refresh cycle to preserve the stored contents. S-SSD drawbacks are the volatile nature of the memory cell and its larger size, which leads to a lower storage density and higher cost per stored bit.

DRAMs have fast read and write cycle times as well. However, they need to periodically refresh their contents, which downgrades the average transfer performance. The DRAM cell size is considerably smaller than that of SRAMs and the storage density accordingly higher. The DRAM cost per stored bit is currently the lowest.

Flash memory has a read access time that is comparable to that of DRAMs, however, the write cycle time is significantly longer. In addition, the write operation needs to be performed in conjunction with an erase operation, simultaneously for a group of locations, called page or sector. This complicates the write process and the associated circuitry. Flash memory cell size is smaller than that of DRAM and can be reduced at a faster pace. This creates the premise for lower storage cost. From a system perspective, the main advantage of F-SSD is the non-volatile nature of its storage cell, which puts it at par with magnetic and optical disk drives.

In many business-critical enterprise applications,

a small set of files consumes the majority of I/O operations that take place. More often than not, this small subset will be responsible for most of the I/O activity and hence will be the best candidates for relocation to SSD.

BiTMICRO's E-Disk offers all of the advantages of DRAM-based solid state Disks and does not suffer from the performance limitations found in their competitor's line of Flash-based solid state Disks (Flash Disks). In terms of potential applications, E-Disk offers significantly shorter access time to stored information, acting as performance boosters for Internet and intranet servers. The main benefits are much faster I/O operations and much higher data transfer rates. E-Disks may also be used to improve the transfer performance for Direct Attached Storage (DAS), Network Attached Storage (NAS) and Storage Area Networks (SAN) architectures and Redundant Array of Independent Disks.

E-Disk® is our top-of-the-line, drop-in replacement for hard disk drives and delivers exceptional performance, speed, ruggedness, and reliability.

Each E-Disk® device is well suited for hostile (high heat, vibration, etc.) environments because of the following advantages which sets it apart from the competition.

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E-Disks may also be used to improve the transfer performance for Direct Attached Storage (DAS), Network Attached Storage (NAS) and Storage Area Networks (SAN) architectures and Redundant Array of Independent Disks (RAID) configurations by either replacing the hard disk drives used or acting as cache-disk.

E-Disk® technology is fully compatible with Linux, Solaris, Windows, MacOS and LynxOS. It also supports AIX, FreeBSD, HP-UX, IRIX, NetBSD, OS/2, QNX, VxWorks, SCO Unixware and OpenServer, Solaris x86 and Tru64.

Typical E-Disk® applications include File System Acceleration, Information Security, Internet Appliance Accelerators, Storage Virtualization Devices, Web or E-mail Caching, Database Logging, Journaling/ Indexing, Switches, Routers, Telecom Equipment, Broadband Communications, Oil Pipeline Monitoring, Parity Disk, Plug-in Performance Boost and Caching.

*For more information visit: www.bitmicro.com*

**SPECIFICATIONS FOR E-DISK® IDE/ATA 3.5" SERIES**
**Flash Disk and Solid State Disk Storage Solutions**

### Physical Specifications:

| | | |
|---|---|---|
| Form Factor | | 3.5" |
| Storage Capacity | | 1024 MB to 147456 MB |
| Dimensions | Width | 4.0 in (101.6 mm) |
| | Length | 5.75 in (146.1 mm) |
| | Height | 0.525 in (13.34 mm) to 2.010 in (51.05 mm) |
| Weight* | | 278.78 gm (9.834 oz) to 1084.28 gm (38.247 oz) |
| Mounting Considerations | | HDD Industry Standard, All Orientations |
| Connector | | 40-Pin 0.1 inch IDE/ATA ANSI Standards |

### Power Requirements:

| | | | |
|---|---|---|---|
| Input Voltage | | 5 VDC (±5%) | |
| Power Consumption | E-Disk® Capacity | 36,864 MB | 77,824 MB |
| | Write | 3.3 watts | 4.5 watts |
| | Read | 3.1 watts | 4.3 watts |
| | Idle | 2.4 watts | 3.6 watts |

### Performance Specifications:

| | |
|---|---|
| Access Time | 100, 88, 68 µsec |
| Random Burst R/W Rate | 16.7, 33.3, 66.6 MB/sec |
| Random Sustained R/W Rate | 14, 22, 28 MB/sec |
| I/O Operations per Second | 1500, 5000, 16000 IOPS |
| Read Bit Error Rate | $< 10^{-20}$ |
| Fully Associative Cache | Standard: up to 128 MB per drive |

### Environmental Specifications:

| | | |
|---|---|---|
| Operating Temperature | Commercial | 0 to 70 °C |
| | Extended | -25 to 75 °C |
| | Industrial | -40 to 85 °C |
| | Military | -60 to 95 °C |
| Storage Temperature | | -55 to 125 °C |
| Humidity | | 5 to 95% (non-condensing) |
| Shock (Operating) | | 1,250 G |
| Vibration (Operating) | | 16.4 G rms* |
| Altitude | | -1,200 to 120,000 feet |

### Reliability:

| | | |
|---|---|---|
| MTBF | > 1.9 Million Hours @ Bellcore Issue 6, Method I, Case 3 | |
| Undetected Data Errors | $< 10^{-20}$ | |
| Data Reliability | Built-in EDC/Interleaved Reed-Solomon ECC Corrects up to Six Random Byte Error per 528-Byte Block; Detects Burst Errors up to 9 Bytes Long | |
| Data Integrity | 10 years | |
| Write Endurance (Typical) | 1 GB E-Disk® | 4.6 GB E-Disk® |
| | 27 years @ 100GB/day erase/write cycles | 123 years @ 100GB/day erase/write cycles |
| Read Endurance | Unlimited | |
| Security Erase Compliance | NISPOM DoD 5220.22-M, NSA 130-2, Air Force AFSSI 5020, Army 380-19, Navy NAVSO P-5239-26 | |
| Diagnostics | Built-in Power Power-up Self Test<br>Self-Monitoring Diagnostics Database | |