For Immediate Release

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SandForce SSD Processors Transform Mainstream Data Storage

Breakthrough DuraClass Technology Sets New Standards for SSD Reliability, Performance and Energy Efficiency

SARATOGA, CA. – April 13, 2009 – SandForce™ Inc., the pioneer of SSD (Solid State Drive) Processors that enable commodity NAND flash deployment in enterprise and mobile computing applications, today emerged from stealth mode and unveiled its first product, the SF-1000 SSD Processor family. These highly-integrated silicon devices address the inherent endurance, reliability, and data retention issues associated with NAND flash memory, making it possible to build SSDs that deliver unprecedented performance over the life of the drive with orders-of-magnitude higher reliability than enterprise-class HDDs (Hard Disk Drives).

The SandForce patent-pending DuraClass™ technology promises to accelerate mass-market SSD adoption. Leading OEMs are expected to release both SLC (single level cell) and MLC (multi-level cell) flash-based SSDs using SandForce single-chip SSD Processors later this year. IDC expects worldwide shipments of SSD's in the Enterprise and PC markets will exceed 40 million units in 2012, representing a CAGR of 171% from 2007-2012[1].

"The SF-1000 SSD Processor Family promises to address key NAND flash issues allowing MLC flash technologies to be reliably used in broad based, mission critical storage environments," said Mike Desens, Vice President for System Design, IBM. "These innovations can be truly disruptive and will accelerate the adoption of Solid State technologies across the data center."

[1] IDC, Worldwide Solid State Drive 2009-2012 Forecast Update, Doc # 216054, January 2009

DuraClass is the Difference

DuraClass technology represents a set of flash management features that work in tandem to deliver world-class SSD reliability, performance, and power efficiency that differentiate SandForce SSD Processors from standard flash controllers. These features include:

- *DuraWrite™*, which optimizes the number of program cycles to the flash effectively extending flash rated endurance by 80x or more when compared to standard controllers.
- *Powerful flash media error correction (ECC) and RAISE™ (Redundant Array of Independent Silicon Elements)*, which deliver an orders-of-magnitude improvement in drive reliability versus today's SSDs and enterprise HDDs. The result is single-drive RAID-like protection and recovery from a potentially catastrophic single flash block or die failure – all while avoiding the inefficiencies of traditional RAID.
- *Wear Leveling and Monitoring*, which provides monitoring of flash block operational metrics to optimize wear leveling algorithms, further extending flash endurance.
- *Advanced Read/Program Disturb Management*, which safeguards against errant re-programming of cells during read and program cycles and unexpected power loss.
- *Recycler*, which intelligently performs garbage collection with the least impact on flash endurance.

With smaller silicon geometries and the trend toward packing more bits per cell in flash devices, there has been a dramatic reduction in the cost-per-gigabyte for NAND flash-based SSDs. However, these changes have also reduced the reliability characteristics of flash devices, i.e., lower endurance, worse data integrity, and shorter data retention. DuraClass features are architected to scale and compensate for these flash shortcomings for generations to come.

"Products like the SF-1000 Family can be major catalysts for increasing SSD adoption in the enterprise," said Jeff Janukowicz, Research Manager, Hard Disk Drive Components and Solid State Disk Drives at IDC. "These products should have a highly positive impact on efficiency and total-cost-of-ownership when used in IT applications such as virtualization, transactional databases, and automated financial trading – applications which can immediately benefit from the dramatic increase in performance and performance-per-watt that SSDs provide over HDDs."

Enabling SSD Mass Market Adoption

The SF-1000 Family features a standard 3 gigabit-per-second SATA host interface connecting up to 512 gigabytes of commodity NAND flash memory, and delivers 30K IOPS (random 4K read or write transfers), and 250MB/s performance (sequential 128KB read or write transfers) with 100 micro-second latency.

SAS (Serial Attached SCSI) connectivity is easily achieved via a third-party SAS-SATA bridge available from multiple sources. Even more impressive, SF-1000-based SSDs can sustain peak performance for 5-year enterprise lifecycles without artificial daily usage restrictions or costly over-provisioning techniques. SandForce provides software, firmware, reference designs, and complete design kits to enable OEMs to bring SSDs to market quickly.

“In spite of a deluge of offerings, SSD growth has been hindered due to confusion and concerns regarding endurance, reliability, performance and prices”, said Joseph Unsworth, Research Director at Gartner, Inc. “Products that can alleviate these quality concerns through superior flash management will play a vital role in the enterprise-grade and PC-grade SSD categories.”

Green Computing

SSDs based on the SF-1000 Family are amongst the most eco-friendly storage drives in the world as they deliver an unprecedented 5K IOPS-per-watt for both reads and writes compared to enterprise HDDs, which deliver a mere 20 IOPS-per-watt.

“With a deep understanding of both system- and silicon-level issues, we’ve integrated the right balance of reliability, performance, power, cost, and time-to-market in our SSD Processors while supporting multiple flash vendors’ technology,” said Alex Naqvi, President and CEO of SandForce. “Our products combine key processing elements with hardware automation to efficiently address the traditional shortcomings of flash memory. This allows OEMs to provide enterprise-class SSDs to the mass-market using both SLC and lower-cost MLC flash devices while delivering peak read and write performance throughout the drive’s lifecycle.”

Product Information

SF-1000 Enterprise and Mobile Computing SSD Processors will be available in prototype quantities later in the second calendar quarter of 2009. SF-1000 Evaluation SSDs and reference designs in standard 2.5” drive form factors will also be available using multiple manufacturers’ NAND flash memory. Please contact SandForce for availability, pricing and product information.

Transforming Data Storage

See what leading analysts are saying at www.sandforce.com/go/analysts-quotes , and what industry experts are saying at www.sandforce.com/go/industry-quotes . SandForce graphics are available for press and media at www.sandforce.com/go/media-graphics .

About SandForce

SandForce is transforming data storage by pioneering the use of commodity flash memory in enterprise and mobile computing applications with its innovative SSD (Solid State Drive) Processors. By delivering unprecedented reliability, performance, and energy efficiency, SSDs based on patent-pending SandForce DuraClass technology unleash the full potential for mass-market adoption of SSDs based on NAND flash memory. Founded in 2006, SandForce is funded by leading venture capital investors and first tier storage companies. For more information, visit SandForce at www.sandforce.com.

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Supporting Analyst Quotes

"Vendors who can balance read and write performance for an SSD have a real advantage in the market place. Whatever the secret sauce of such a design, balanced performance is a significant step forward and an example of innovations happening in the flash SSD market."
Gene Ruth, Senior Analyst, Burton Group

"It seems clear that solid state storage is going to be a game-changing data center technology. The speed of its adoption into enterprise environments can only be accelerated by the emergence of a choice of innovative implementations such as that from SandForce."
Mark Peters, Analyst, Enterprise Strategy Group

"DuraClass Technology from SandForce promises to dramatically improve the reliability, endurance and performance of systems employing MLC NAND flash memories to enable more cost effective SSDs for enterprise-class applications which had previously been the domain of SLC NAND flash memory."
Greg Wong, Founder and Principal Analyst, Forward Insights

"In spite of a deluge of offerings, SSD growth has been hindered due to confusion and concerns regarding endurance, reliability, performance and prices. Products that can alleviate these quality concerns through superior flash management will play a vital role in the enterprise-grade and PC-grade SSD categories."
Joseph Unsworth, Research Director, Gartner, Inc.

"Products like the SF-1000 Family can be major catalysts for increasing SSD adoption in the enterprise. These products should have a highly positive impact on efficiency and total-cost-of-ownership when used in IT applications such as virtualization, transactional databases, and automated financial trading – applications which can immediately benefit from the dramatic increase in performance and performance-per-watt that SSDs provide over HDDs."
Jeff Janukowicz, Research Manager, Hard Disk Drive Components and Solid State Disk Drives, IDC

"By enabling the use of MLC flash memory and simultaneously eliminating the need for over-provisioning or daily use restrictions, the SandForce SSD Processor could significantly reduce the cost of SSD storage and make it much more broadly applicable."
Jim Handy, Semiconductor Analyst, Objective Analysis

"Even the best of today's SSDs have trouble sustaining high write performance after the first hour or even a few minutes, but DuraClass technology from SandForce promises to end this deterioration to maintain the same high level of consistent write performance that enterprise users expect."
Deni Connor, Principal Analyst, Storage Strategies Now

"The SandForce SSD Processor is flash manufacturer-agnostic, allowing SSD manufacturers to be more flexible and multi-source their flash memory in this turbulent market."
Arun Taneja, Founder, President and Consulting Analyst, Taneja Group

"By significantly reducing write amplification, the SandForce SSD Processor promises to deliver significantly higher write performance than we have seen in any SSD drive to date."
John Chen, Sr. Director, TRENDFOCUS

"DuraClass technology from SandForce could finally make SSD storage more reliable than hard drives, incorporate MLC flash in Enterprise with five-year life, and make the traditional flash benefits of faster access and lower power consumption a practical reality."
Alan Niebel, Founder and CEO, Web-Feet Research

Supporting Industry Quotes

"We believe the entire flash memory market will benefit from the new advances in SSD Processors being introduced by SandForce which has the potential to accelerate SSD adoption."
Jonghee Han, Director of Flash Technical Marketing, Hynix Semiconductor America

"The SF-1000 SSD Processor Family promises to address key NAND flash issues allowing MLC flash technologies to be reliably used in broad based, mission critical storage environments. These innovations can be truly disruptive and will accelerate the adoption of Solid State technologies across the data center."
Mike Desens, Vice President for System Design, IBM

"Aligning the technical intricacies of SSD processors and NAND flash memory is extremely critical to ensure a successful and quality design. We worked with SandForce to validate our ONFI-based NAND products with the SandForce SF-1000 family of processors, taking a proactive approach to solving some of the complex limitations of solid state storage in enterprise applications."
Kevin Kilbuck, Director of NAND Market Development, Micron Technology, Inc.

"Our NAND Flash memory provides excellent SSD storage solutions for enterprise applications, and we are pleased to work with SandForce's SSD processors to further our enterprise outreach."
Jim Elliott, Vice President of Memory Marketing, Samsung Semiconductor, Inc.

"We expect the new SandForce SF-1000 family of SSD processors to take advantage of the performance characteristics and potential that NAND Flash offers as a storage medium for the solid state storage market."
Jeff Ohshima, VP Memory Technology Executive, Toshiba America Electronic Components, Inc.