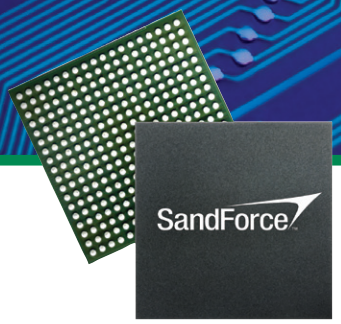
SandForce®

PRELIMINARY



PRODUCT BRIEF

SF-2200 & SF-2100 Client SSD Processors

Features

- Second generation SSD Processor with enterprise-class features for cost-sensitive client environments
- 6Gb/s SATA III with NCQ support
- Best-in-class, consistent read and write performance (500MB/s, 20K Random Writes IOPS) for client applications
- Automatic double encryption (AES-256, 128), TCG OPAL and password at the drive level ensures secure data protection
- Supports the latest 3xnm & 2xnm SLC & MLC flash memory with Asych/Toggle/ONFi2 interfaces
- DuraClass™ technology provides best-in-class endurance, performance, and low power
- Optimized, single-chip eliminates need for external memory saving cost, power and space
- High integration supports up to 512GB on a 2.5" or 1.8" drive
- Power balancing optimizes energy consumption (# active flash devices) vs. performance
- Ultra low-power mode to maximize battery life
- RAISE™ provides RAID-like protection for single SSD client systems
- Highly intelligent block management & wear leveling optimizes SSD longevity
- Complete solution provided through ASIC, FW, turnkey reference designs, tools, documentation and support

SandForce DRIVEN™

Overview

Today's award-winning SandForce Driven™ SSDs are well known for their performance and features. The SandForce® SF-2200/2100 - the second generation of SandForce SSD Processors - continue accelerating SSD deployment in enthusiast and mainstream client computing platforms. The SF-2200/2100 is an ideal solution for portable storage applications where power cosumption, boot-up time, application performance, responsiveness, and small form factor are important. The Client SSD Processors have integrated enhanced DuraClass™ technology that is architected to leverage today's densest SLC and MLC NAND flash memory. They deliver best-in-class performance, endurance, security, and power efficiency in a "DRAM-less", single chip solution. Configurations up to 512GB densities in standard 2.5" or 1.8" drive form factors, as well as ultra small form factors (e.g. MO-297A, mSATA), are all possible.

Endurance and Longevity

As the geometries of each generation of flash memory evolves and shrink in order to dramatically lower $/GB, the overall flash endurance is dropping at a very high rate. The 2x/3xnm NAND flash memory has less than 5K P/E cycles. The memory of tomorrow will likely be even lower than that. DuraWrite™ technology optimizes writes to the Flash memory over conventional controllers increasing the overall endurance and reliability of the complete SSD. Highly intelligent block management and wear leveling also extends the overall endurance. With this technology, SSD manufacturers can offer their high volume, client customers enterprise-class reliability and at least 5-year lifecycles.

Performance and Power Optimization

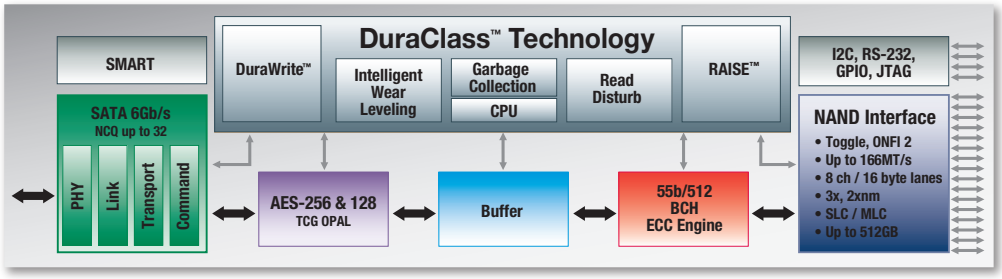
SSDs greatly outperform traditional HDDs, and in many cases reach the limits of the bus interface. Advanced high speed SATA interfaces have been implemented in newer systems to remove this performance bottleneck. SSDs are perfect to take advantage of that higher speed interface. SandForce SSD Processors deliver performance that maximizes the throughput of a 6Gb/s SATA interface with balanced read/write speeds. In extremely low-power environments, the SF-2200/2100 can tune total SSD power consumption vs. performance by limiting the number of simultaneously active flash devices. It also supports an ultra-low power sleep mode to maximize battery life.

Client Computing Security

Data security is becoming a critical component in the digital age. SandForce SF-2200/2100 SSD Processors feature high-level security protocols to protect the security of data stored in flash memory. DuraClass technology automatically stores data in a highly secure AES-256 & 128 hardware encrypted format that double encrypts the data. The SF-2200/2100 SSD Processors also optionally support TCG OPAL security requirements. An optional disk-level password can be required prior to system boot adding an extra level of data security assurance for business travelers carrying confidential information.

Data Protection and Reliability

The SF-2200/2100 SSD Processors provide data protection that surpasses the leading high-performance enterprise HDDs used today. This comes from a combination of a superior higher-level BCH ECC algorithm with up to 55 bits/512 Byte sector protection and the unique RAISE™ (Redundant Array of Independent Silicon Elements) technology. RAISE provides the protection and reliability of RAID on a single drive without the 2x write overhead of parity. This capability is transparent to the end-user and provides peace-of-mind for mobile SSD OEMs knowing their customer's data is protected.



SF-2200 Block Diagram

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SF-2200 & SF-2100 Client SSD Processors

DuraClass™ Technology:	DuraWrite™ extends the endurance of SSDs Intelligent Block Management and Wear Leveling Intelligent Read Disturb Management Intelligent "Recycling" for advanced free space management (Garbage Collection) RAISE™ (Redundant Array of Independent Silicon Elements) Intelligent Data Retention optimization Best-in-Class ECC protection for longest data retention and drive life Power/Performance Balancing Thermal Treshold Management
Host Interface:	SATA 6Gb/s, 3Gb/s and 1.5Gb/s support Native Command Queuing (up to 32 commands) SMART Command Transport
Max Capacity Supported:	512GB* (using 32Gb or 64Gb/die components)
Performance:	**Sequential Read & Write Transfer:** Up to 500MB/s (@128KB blocks) **Random Read IOPS:** Up to 60,000 (@4KB blocks) **Random Write IOPS:** Up to 60,000 burst/20,000 sustained (@4KB blocks) **Random 70/30 Read/Write mix IOPS:** Up to 60,000 burst/60,000 sustained (@4KB blocks) **Random 50/50 Read/Write mix IOPS:** Up to 60,000 burst/40,000 sustained (@4KB blocks) **PCMark Vantage:** Up to 60,000 (HDD test suite score)
Flash Memory Support:	MLC from numerous top flash memory manufacturers SLC up to 128GB* of total capacity 3xnm, 2xnm (Asynch, Toggle, ONFi2; up to 166MT/s)
Power Consumption:	**Typical:** ~1.5W (est.)
Security:	**Data Encryption:** AES-256 & 128 Optional disk password; TCG OPAL (available option)
Reliability:	**ECC Recovery:** Up to 55 bits correctable per 512-byte sector (BCH) **Unrecoverable Read Errors:** Less than 1 sector per 10^{16} bits read ECC on all internal memory; full End-to-End CRC protection; RAISE
Package:	400-Pin TFBGA – 14x14mm, 0.65mm pitch, 16 byte lanes 256-Pin TFBGA – 14x14mm, 0.80mm pitch, 8 byte lanes
Compliance:	RoHS, Halogen-Free, Green

Ordering Information

Part Number:	Description:	Package:	Capacity:*	Memory Type:	IOPS sustained***:
SF-2282VB1-SDC	Client 6Gb SATA (128 die support)	400-pin TFBGA	12GB - 512GB	MLC/SLC**	20,000
SF-2281VB1-SDC	Client 6Gb SATA (8 channel)	256-pin TFBGA	12GB - 512GB	MLC/SLC**	20,000
SF-2181TB1-SDC	Client 3Gb SATA (8 channel)	256-pin TFBGA	12GB - 512GB	MLC/SLC**	20,000
SF-2141TB1-SDC	Client 3Gb SATA (4 channel)	256-pin TFBGA	12GB - 64GB	MLC/SLC	10,000

** 1GB=1 billion bytes*
*** SLC max capacity = 128GB*
**** Random write performance @ 4KB blocks*

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