

SandForce® SF3500 Family

CLIENT FLASH CONTROLLERS Data Sheet

Key Features and Benefits

- Optimized for client SSD applications
- Scalable and flexible SF3000 architecture
- Native SATA and PCIe NVMe interfaces in a single ASIC design
- Up to 1TB capacity
- Supports the latest 10nm-class MLC, TLC and 3D NAND flash
- DRAM support for improved latency
- Award-winning DuraClass™ technology delivers enhanced performance, endurance, reliability and power efficiency
- SHIELD™ advanced error correction combines LDPC and DSP for higher data reliability and longer endurance
- TCG Opal 2.0 and eDrive security (optional add-on)
- Ultra-low power mode and DevSleep support
- Complete solution—ASIC, FW, turnkey reference designs, tools, documentation and support

Rapidly evolving NAND flash memory that leverages new flash types and technologies delivers benefits in a form of higher density and lower cost per GB. At the same time, as NAND flash memory geometries shrink, delivering the endurance and reliability that customers demand becomes more challenging.

The Seagate® SandForce SF3500 family of flash controllers is engineered to solve the challenges of evolving NAND flash memory, and enable SSD manufacturers to build robust SATA and PCIe NVMe SSDs with a greater capacity using the most advanced NAND flash memory for cost-sensitive client SSD applications.

Performance and Power Optimizations

SF3500 flash controllers deliver exceptional, consistent performance in real-world applications with balanced read/write speeds and low predictable latency even with high entropy data. The SF3500 family is optimized for low-power environments and supports ultra-low power sleep modes to maximize battery life and meet the aggressive power requirements in the latest laptop and Ultrabook systems.

Endurance and Reliability

The SF3500 family combines several techniques to extend flash memory life and maintain data integrity. Enhanced DuraWrite™ data reduction lowers write amplification and P/E cycles to maximize SSD endurance. SHIELD™ advanced error correction further extends flash memory life by implementing an LDPC code that combines hard-decision, soft-decision, DSP and adaptive ECC.

Data Protection

SF3500 flash controllers provide superior data protection with enhanced RAISE™ (Redundant Array of Independent Silicon Elements) technology that includes levels of data protection optimized for client applications and additional redundancy ensuring access to data even after a page or block failure. RAISE technology provides the protection and reliability of RAID on a single drive without the 2× write overhead of parity.

Client Computing Security

As the workforce becomes increasingly mobile, data security becomes increasingly important. The SF3500 family implements high-level security protocols to safeguard data stored in flash memory. Dual AES-256 hardware encryption protects data at rest, and optional support for TCG Opal and eDrive provide interoperability with self-encrypting drive (SED) management tools.



SandForce® SF3500 Family

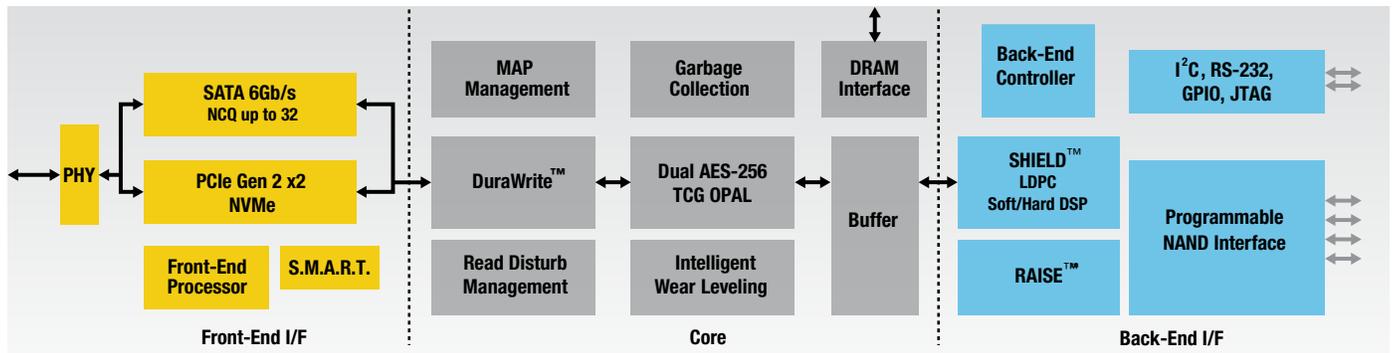


Figure 1. Seagate® SandForce® SF3500 Block Diagram

| Specifications | SF3514 | SF3504 | SF3524 |
|-------------------------------------|---|---------------------|---------------------------------|
| Applications | Mainstream SATA client | Entry PCIe client | Enthusiast SATA/PCIe client |
| DuraClass™ Technology | DuraWrite™ data reduction Enhanced RAISE™ data protection SHIELD™ error correction Intelligent block management and wear leveling Intelligent read disturb management Intelligent garbage collection Intelligent data retention optimization Power/performance balancing Thermal threshold management | | |
| Architecture | SF3000 | | |
| Host Interface | SATA 6Gb/s | PCIe Gen2 x2 (NVMe) | PCIe Gen2 x2 (NVMe), SATA 6Gb/s |
| Max Capacity Supported ¹ | 1TB | 1TB | 1TB |
| Controller Clock Frequency | 275MHz | 275MHz | 300MHz |
| Performance ² | | | |
| Sequential Read ² | Up to 550MB/s | Up to 900MB/s | Up to 900MB/s |
| Sequential Write ² | Up to 450MB/s | Up to 525MB/s | Up to 525MB/s |
| Random Read ² | Up to 100,000 IOPS | Up to 130,000 IOPS | Up to 130,000 IOPS |
| Random Write ² | Up to 90,000 IOPS | Up to 90,000 IOPS | Up to 90,000 IOPS |
| Random 70R/30W Mix ² | Up to 80,000 IOPS | Up to 120,000 IOPS | Up to 120,000 IOPS |
| Flash Memory Support | MLC, TLC, 3D from top flash memory manufacturers 4 channels up to 400MT/s 1x nm, 1y nm, 1z nm, ONFi 2.0/3.0, Toggle 1.0/2.0 | | |
| Sector Size Support | 512B | 4KB | 4KB (PCIe NVMe), 512B (SATA) |
| Security | Dual AES-256 encryption TCG Opal 2.0, IEEE-1667, Windows eDrive | | |
| Reliability | SHIELD™ error correction Full end-to-end CRC protection | | |
| Data Protection | RAISE 1 + Fractional RAISE | | |
| Package | 401-ball FCBGA—11 × 18 mm | | |
| Compliance | RoHS, halogen-free, green | | |

¹ One gigabyte, or GB, equals one billion bytes and one terabyte, or TB, equals one trillion bytes when referring to product capacity.

² Performance data is based on estimates under certain workload conditions and is subject to change. For more information please contact your local Seagate technical representative.

seagate.com

AMERICAS Seagate Technology LLC 10200 South De Anza Boulevard, Cupertino, California 95014, United States, 408-658-1000
 ASIA/PACIFIC Seagate Singapore International Headquarters Pte. Ltd. 7000 Ang Mo Kio Avenue 5, Singapore 569877, 65-6485-3888
 EUROPE, MIDDLE EAST AND AFRICA Seagate Technology SAS 16-18, rue du Dôme, 92100 Boulogne-Billancourt, France, 33 1-4186 10 00

