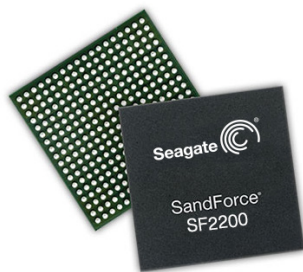


# SandForce® SF2000 Reference Design and Evaluation SSD

## Data Sheet

### Key Features

- Fully functional standard form factor SSD based on second-generation SandForce flash controllers
- DuraClass™ technology delivers
  - Award-winning performance
  - Best performance per Watt
- SATA 6Gb/s host interface
- DRAM-less design for lower BOM cost
- Full range of features supported including:
  - Temperature sensor
  - Firmware and boot code upgradable
  - LED indicators
  - RS-232 debug port
- Connector-less probing system for subsystem verification and manufacturing tests
- Turnkey solution
- Support for enterprise-class electrical and functional requirements
  - Polymer capacitor or SuperCap for catastrophic power-fail data protection
- Ultra-low power mode in client reference designs for battery driven applications



The Seagate® SandForce SF2000 reference designs and evaluation SSDs bring today's critical enterprise and client storage needs—performance, reliability, and price—together in one package like never before. Using the high-performance, second-generation SandForce SF2000 flash controller family gives drive manufacturers the flexibility to minimize costs without compromising performance or reliability. The reference design files provide a board-level production solution suitable for turnkey contract manufacturer production, as well as the basis for customized designs.

### Flash Controller Expertise

Seagate DuraClass™ technology has revolutionized flash controllers to establish a new class of SSDs that combine reliability, performance, and power efficiency using standard NAND flash memory. The state-of-the-art SandForce flash controllers ensure the SSD will operate at its maximum potential.

### Cost Effectiveness

The SF2000 reference designs have been designed and tested with a vast array of standard NAND flash memory parts, allowing the turnkey solution to be sourced to contract manufacturers with the most cost-effective memory available. Furthermore, the single-chip SF2000 flash controller family does not require external DRAM, delivering low power and cost-effective BOM designs.

### Flexibility

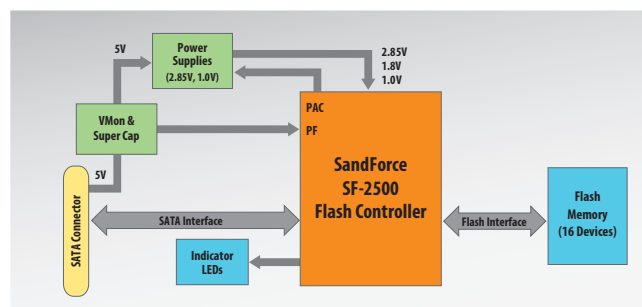
The SandForce reference design files offer configurable BOMs, editable schematic files, and layout databases for customized designs.

### Standards Compliant

The SF2000 reference design files are architected to enable drive makers to meet the latest national, international, and industry standards — including RoHS, UL, FCC Class A/B and others — to speed design and testing phases to minimize time-to-market worldwide.

### Target Applications

Enterprise SSDs, client SSDs, and small form factor MO-300 and MO-297 based portable and embedded applications.



Example Seagate SandForce SF2500 Evaluation 2.5-Inch SATA SSD Block Diagram

## Seagate® SandForce® SF2000 Reference Design and Evaluation SSDs

SandForce Flash Controller	<b>Enterprise:</b> SF2500, SF2600; <b>Client:</b> SF2200
DuraClass™ Technology	<ul style="list-style-type: none"> <li>• DuraWrite™ extends the endurance of SSDs</li> <li>• Intelligent block management and wear leveling</li> <li>• Intelligent read disturb management</li> <li>• Intelligent <i>recycling</i> for advanced free space management (garbage collection)</li> <li>• RAISE™ (Redundant Array of Independent Silicon Elements)</li> <li>• Best-in-class ECC protection for longest data retention and drive life</li> </ul>
Performance (sustained) <sup>1</sup>	<b>Sequential read and write transfer:</b> up to 500MB/s (@ 128K blocks) <b>Random read and write IOPS:</b> up to 60,000 (@ 4K blocks)
Security	<b>Data encryption:</b> AES-256 and AES-128
Protection (enterprise)	<b>ECC recovery:</b> up to 55 bits correctable per 512-byte sector (BCH) <b>Unrecoverable read errors:</b> less than 1 sector per 10E17 bits read <b>Power failure protection:</b> polymer capacitor or super-capacitor circuit
Protection (client)	<b>ECC recovery:</b> up to 55 bits correctable per 512-byte sector (BCH) <b>Unrecoverable read errors:</b> less than 1 sector per 10E16 bits read
Operating Temperature	0°C to 70°C
Voltage	5V
Additional Features	<ul style="list-style-type: none"> <li>• RS-232 debug port</li> <li>• ACTIVITY and FAULT LED indicators</li> <li>• On-board temperature sensor</li> <li>• Serial EEPROM for optional custom boot code</li> <li>• Midplane activity signal</li> <li>• SSD staggered <i>link up</i> control support (enterprise)</li> </ul>

## Configuration Details

Reference Designs	Application	Board Interface	Memory Type
SF-2500 2.5-Inch SATA Toggle	Enterprise Polymer Cap	SATA 6/3/1.5Gb/s	SLC, MLC, eMLC, BGA-152, Toggle, ONFi 2
SF-2500 2.5-Inch SATA ONFi	Enterprise SuperCap	SATA 6/3/1.5Gb/s	SLC, MLC, eMLC, BGA-100, ONFi 2
SF-2500 2.5-Inch SATA Toggle	Enterprise SuperCap	SATA 6/3/1.5Gb/s	SLC, MLC, eMLC, BGA-152, Toggle, ONFi 1/2
SF-2200 2.5-Inch SATA ONFi	Client	SATA 6/3/1.5Gb/s	SLC, MLC, BGA-100, ONFi 2
SF-2200 2.5-Inch SATA Toggle	Client	SATA 6/3/1.5Gb/s	SLC, MLC, TSOP-48, ONFi 2
SF-2200 2.5-Inch SATA TSOP	Client	SATA 6/3/1.5Gb/s	SLC, MLC, BGA-152, Toggle, ONFi 2
SF-2200 2.5-Inch SATA TSOP	Client DevSleep	SATA 6/3/1.5Gb/s	SLC, MLC, BGA-152, Toggle, ONFi 2
SF-2200 MO-300 mSATA ONFi	Client	mSATA 6/3/1.5Gb/s	SLC, MLC, BGA-100, ONFi 2
SF-2200 MO-300 mSATA Toggle	Client	mSATA 6/3/1.5Gb/s	SLC, MLC, BGA-132, Toggle, ONFi 2
SF-2200 MO-300 mSATA TSOP	Client	mSATA 6/3/1.5Gb/s	SLC, MLC, TSOP-48, ONFi 2
SF-2200 MO-300 mSATA TSOP	Client DevSleep	mSATA 6/3/1.5Gb/s	SLC, MLC, TSOP-48, ONFi 2
SF-2200 MO-297A SATA Toggle	Client	SATA 6/3/1.5Gb/s	SLC, MLC, BGA-152, Toggle, ONFi 2



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