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.

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**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

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**Example Seagate SandForce SF2500 Evaluation 2.5-Inch SATA SSD Block Diagram**
## Seagate® SandForce® SF2000 Reference Design and Evaluation SSDs

### SandForce Flash Controller
- **Enterprise:** SF2500, SF2600; **Client:** SF2200

### 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)
- Best-in-class ECC protection for longest data retention and drive life

### Performance (sustained)
- **Sequential read and write transfer:** up to 500MB/s (@ 128K blocks)
- **Random read and write IOPS:** up to 60,000 (@ 4K blocks)

### Security
- **Data encryption:** AES-256 and AES-128
- **ECC recovery:** up to 55 bits correctable per 512-byte sector (BCH)
- **Unrecoverable read errors:** less than 1 sector per 10E17 bits read
- **Power failure protection:** polymer capacitor or super-capacitor circuit

### Protection (enterprise)
- **ECC recovery:** up to 55 bits correctable per 512-byte sector (BCH)
- **Unrecoverable read errors:** less than 1 sector per 10E16 bits read

### Operating Temperature
- **0°C to 70°C**

### Voltage
- **5V**

### Additional Features
- RS-232 debug port
- ACTIVITY and FAULT LED indicators
- On-board temperature sensor
- Serial EEPROM for optional custom boot code
- Midplane activity signal
- SSD staggered link up control support (enterprise)

### Configuration Details

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<td>SATA 6/3/1.5Gb/s</td>
<td>SLC, MLC, eMLC, BGA-152, Toggle, ONFi 2</td>
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<tr>
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<td>SF-2200 MO-300 mSATA ONFi</td>
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<tr>
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<tr>
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<tr>
<td>SF-2200 MO-297A SATA Toggle</td>
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